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IES UTILITIES

April 30, 1998
NG-98-0823

Mr. A. Bill Beach
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, Illinois 60532-4351

Subject: Duane Arnold Energy Center
Docket No.: 50-331
Operating License No.: DPR-49
1997 Annual Radiological Environmental Report

Dear Mr. Beach:

Please find attached one (1) copy of the 1997 Annual Radiological Environmental Report for the Duane Arnold Energy Center. This report is transmitted in accordance with the Technical Specification (section 6.11.1.g) reporting requirements.

Sincerely,

Gary D. VanMiddlesworth
Plant Manager - Nuclear

GDV/SF/hc

Attachment

cc: U.S. Nuclear Regulatory Commission (original w/a)
Attn: Document Control Desk
Mail Station P1-37
Washington, D.C. 20555-0001

NRC Resident Inspector - DAEC (w/attachments)
R. Laufer (NRC-NRR)(w/attachments)
E. Protsch - (w/o attachments)
K. Peveler - (w/o attachments)
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IE25

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REPORT
TO
IES UTILITIES, INC.
CEDAR RAPIDS, IOWA

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
FOR THE
DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
DOCKET NO. 50-331

ANNUAL REPORT - PART I
SUMMARY AND INTERPRETATION
JANUARY - DECEMBER 1997

FOR SUBMITTAL TO
THE NUCLEAR REGULATORY COMMISSION

PREPARED AND SUBMITTED
BY
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
MIDWEST LABORATORY
PROJECT NO. 8001

Approved by: _____
Bronia Grob, M.S.
Technical Lead

PREFACE

The staff members of the Teledyne Brown Engineering Environmental Services, 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 University of Iowa Hygenic Laboratory personnel.

The report was prepared by the staff of TBEESML, 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 Teledyne Brown Engineering Environmental Services, Midwest Laboratory at the Duane Arnold Energy Center, Palo, Iowa, during the period January - December, 1997. 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.

Duane Arnold Energy Center (DAEC) is located in Linn County on the Cedar River, Iowa, and is operated by IES Utilities, Inc. The Duane Arnold Energy Center is a 565.7 MW(e) boiling water reactor. Initial criticality was attained on 23 March 1974. The reactor reached 100% power on 12 August 1974. Commercial operation began on 1 February 1975.

2.0 SUMMARY

The Radiological Environmental Monitoring Program required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Duane Arnold Energy Center is described. Results for 1997 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 due to the operation of the Duane Arnold Energy Center is indicated.

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.

3.1 Program Design and Data Interpretation (continued)

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 should not be considered radiological impact indicators.

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 twelve locations. Also, airborne iodine is collected by continuous pumping through charcoal filters at six of these locations. Nine of the twelve locations are indicators and three are controls (D-1, D-2, and D-13). Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity. If gross beta activity exceeds 10 times the yearly mean of the control samples gamma isotopic analysis is performed. Quarterly composites of airborne particulates from each location are gamma scanned on a germanium detector.

Charcoal filters are analyzed weekly for I-131 on all samples.

Ambient gamma radiation is monitored at twelve air sampling locations. In addition, gamma radiation is monitored at thirty-three special locations: seventeen in a circle within 0.5 mi. radius of the DAEC stack; six in 22.5° sectors within 1 mi. of the DAEC stack; and ten in 22.5° sectors between 1 and 3 miles of the DAEC stack. Two TLDs are placed at each location and are exchanged and analyzed quarterly.

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

Milk samples are collected monthly from five locations during the non-grazing season, October through April, and biweekly during the grazing season, May 1 through September 30. One location is a control (D-105) and the rest are indicators. All samples are analyzed for I-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-105) and eight indicators (D-16, D-57, D-58, D-63, D-72, D-93, D-94, and D-106). Grain, hay and broad leaf (green leafy) vegetation samples are analyzed for gamma-

Program Description (continued)

emitting isotopes and at least one broad leaf vegetation is analyzed for iodine-131. If cattle are slaughtered for home use, a meat sample is collected annually, during or immediately following a grazing period from animals grazing on-site. The sample is analyzed for gamma-emitting isotopes. Also, potable ground water is collected quarterly from a treated municipal water system (D-53), the inlet to the municipal water treatment system (D-54) and four additional ground water locations (D-55, D-57, D-58, and D-72). The samples are analyzed for gross beta and tritium. If gross beta activity exceeds 10 times the yearly mean of the control samples, gamma isotopic, strontium-89 and strontium-90 analyses are performed.

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

Surface water is collected monthly from five river, pond and sewage effluent locations, one control (D-49) and four indicator (D-50, D-51, D-99, and D-107). All monthly samples are analyzed for gamma-emitting isotopes. Tritium analyses are performed on quarterly composites from each location. In addition, all samples from Location D-107 (plant sewage discharge) are analyzed for K-40 by flame photometry.

The aquatic environment is also monitored by upstream and downstream (D-49 and D-61) semiannual collections of fish. River bottom sediment is also collected semiannually at the plant's intake and discharge (D-50 and D-51) and downstream of the sewage plant (D-107). 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) No air particulate sample was available from location D-13 for the week ending January 23, 1997. The sample was lost in the field due to strong winds.

(2) TLD data was not available for the third quarter, 1997 from locations D-31 and D-91. The TLDs were lost in the field.

(3) TLD data was not available for the fourth quarter, 1997 from location D-35. The TLD was lost in the field.

(4) No milk was available from location D-93 and D-101 for January and February, 1997. The goats were dry.

(5) No milk was available from location D-105 for the week ending June 17, 1997.

3.4 Laboratory Procedures

All iodine-131 analyses in milk were made by using a sensitive radiochemical procedure which involves separation of the element by use of an ion-exchange resin and subsequent beta counting.

All gamma-spectroscopic analyses were performed with high resolution germanium detectors. Levels of iodine-131 in vegetation were determined by gamma spectrometry. Levels of airborne iodine-131 in charcoal samples were measured by gamma spectrometry.

Tritium levels were determined by the liquid scintillation technique.

Analytical Procedures used by TBEESML are on file and are available for inspection. Procedures are based on those prescribed by the National Center for Radiological Health of the U.S. Public Health Service (U.S. Public Health Service, 1967) and by the Health and Safety Laboratory of the U.S. Atomic Energy Commission (U.S. Atomic Energy Commission, 1972).

Details of TBEESML's QA program are presented elsewhere (Teledyne Isotopes Midwest Laboratory, 1992). The TBEESML QA Program includes participation in the Interlaboratory Comparison (Crosscheck) Program. Results obtained in the crosscheck program are presented in Appendix A.

3.5 Program Modifications

There were no program modifications during the year, 1997.

4.0 RESULTS AND DISCUSSION

All of the scheduled collections and analyses were made on schedule except those listed in Table 5.6.

All results are summarized in Table 5.7 in a format recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.8. For each type of analysis of each sample medium, this table lists the mean and range of all indicator and control locations. The locations with the highest mean and range are also shown.

The tabulated results of all measurements made in 1997 are not included in this section, although references to these results will be made in the discussion. The complete tabulation of the 1997 results is contained in Part II of the 1997 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 1997. The last reported test was conducted by the People's Republic of China on October 16, 1980. The reported yield was in the 200 kiloton to 1 megaton range.

There were no reported accidents at nuclear reactor facilities in 1997.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in 1997.

Airborne Particulates

The average annual gross beta concentration in airborne particulates was similar at indicator and control locations (0.023 and 0.024 pCi/m^3, respectively) and similar to levels in 1984 (0.025 and 0.026 pCi/m^3, respectively), 1985 (0.024 pCi/m^3 at both locations), in 1986 (0.024 pCi/m^3, at both indicator and control locations), in 1987 (0.024 and 0.026 pCi/m^3, respectively), in 1988 (0.026 and 0.028 pCi/m^3, respectively), in 1989 (0.026 and 0.029 pCi/m^3, respectively), in 1990 (0.022 and 0.024 pCi/m^3, respectively), in 1991 (0.023 and 0.022 pCi/m^3, respectively), in 1992 (0.022 and 0.023 pCi/m^3, respectively), in 1993 (0.022 and 0.023 pCi/m^3, respectively), in 1994 (0.023 and 0.024 pCi/m^3, respectively), in 1995 (0.025 and 0.024 pCi/m^3, respectively) and in 1996 (0.024 and 0.023 pCi/m^3, respectively). The average of 0.024 pCi/m^3 for 1986 does not include the results from May 15 to June 12, 1986, which were influenced by the accident at Chernobyl.

A spring peak in beta activity had been observed almost annually for many years (Wilson et al., 1969). It had been attributed to fallout of nuclides from the stratosphere (Gold et al., 1964). It was pronounced in 1981, occurred to a lesser degree in 1982, and did not occur from 1983 through 1997. In 1986, the spring peak could not be identified because it was overshadowed by the releases of radioactivity from Chernobyl. 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

Airborne Particulates (continued)

in all samples. All other gamma-emitting isotopes were below their respective LLD limits. No plant effect was indicated.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.07 pCi/m^3 in all samples.

Ambient Radiation (TLDs)

At twelve air sampling locations, the TLD readings averaged 13.3 and 12.7 mR/quarter for indicator and control locations, respectively. At locations within 0.5 mile, 1.0 mile, and 3.0 mile radius of the stack, the measurements averaged 14.8 mR/quarter, 15.5 mR/quarter, and 12.8 mR/quarter, respectively. The average for all locations was 14.0 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 was indicated.

Precipitation

In precipitation, the tritium concentration was below the LLD of 330 pCi/L in all samples. No gamma-emitting isotopes were detected. No plant effect was indicated.

Milk

Iodine-131 results were below the detection limit of 1.0 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, the milk data for 1997 show no radiological effects of the plant operation.

Ground Water

The annual mean for gross beta activity measured 3.2 pCi/L and was similar to the levels observed in 1980 through 1996. The location with the highest mean (5.0 pCi/L) was D-58, a farm 1.0 mile distant from the plant. Tritium was below the LLD of 330 pCi/L in all samples. No plant effect was indicated.

Vegetation

Iodine-131 results in broadleaf vegetation were below the LLD level of 0.053 pCi/g wet weight in all samples.

Except for potassium-40, which was observed in all vegetation samples (broadleaf, grain, and forage), all other gamma-emitting isotopes were below detection limits in all samples. No plant effect is indicated.

Soil

Strontium-90 was detected in both samples and averaged 0.051 pCi/g dry weight. Cesium-137 was detected at an average concentration of 0.20 pCi/g dry weight. Both strontium-90 and Cesium-137 concentrations were similar to levels observed in 1987 (0.08 and 0.30 pCi/g dry weight, respectively), in 1988 (0.064 and 0.33 pCi/g dry weight, respectively), in 1989 (0.046 and 0.18 pCi/g dry weight, respectively), in 1990 (0.066 and 0.21 pCi/g dry weight, respectively), in 1991 (0.064 and 0.34 pCi/g dry weight, respectively), in 1992 (0.040 and 0.26 pCi/g dry weight, respectively), in 1993 (0.058 and 0.26 pCi/g dry weight, respectively), in 1994 (0.040 and 0.27 pCi/g dry weight, respectively) , in 1995 (0.044 and 0.21 pCi/g dry weight, respectively) and in 1996 (0.050 and 0.17 pCi/g dry weight, respectively).

The only other gamma-emitting isotope detected was potassium-40 at an average concentration of 12.94 pCi/g dry weight. No plant effect on soil was indicated.

Surface Water

Tritium was below the LLD level of 330 pCi/L in all samples.

All gamma-emitting isotopes were below their respective LLDs.

K-40 was measured at one location, D-107 (sewage effluent). The concentration ranged from 9.5 to 23.4 pCi/L and averaged 16.4 pCi/L.

No plant effect on the radioactivity of surface water was indicated.

Fish

All gamma-emitting isotopes, except naturally-occurring potassium-40, in edible portions were below detection limits. The potassium-40 level was similar at both indicator and control locations (2.88 and 2.80 pCi/g wet weight, respectively). No plant effect on fish was indicated.

River Sediments

River sediments were collected in June and September, 1997, and analyzed for gamma-emitting isotopes. Traces of Cobalt-60 were detected in two samples from location D-107 (sewage effluent) at an average concentration of 0.20 pCi/g dry weight. Potassium-40 ranged from 5.15 to 10.99 pCi/g dry weight and averaged 7.25 pCi/g dry weight.

All other gamma-emitting isotopes were below detection limits.

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 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, 1997.

Exposure Pathway and/or Sample Type	Sampling Location: Sample Point	Sampling Location: Description	Sampling and Collection Frequency	Type and Frequency of Analysis
Airborne Particulates	1	Cedar Rapids (C)	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.
	2	Marion (C)		
	3	Hiawatha		
	5	Palo		
	6	Center Point		
	7	Shellsburg		
	8	Urbana		
	10	Atkins		
	11	Toddsville		
	13	Alburnett (C)		
	15	On-site North		
	16	On-site South		
Airborne Iodine	2	Marion (C)	Continuous operation of sampler with sample collection at least once per week.	Analyze each cartridge for iodine-131.
	5	Palo		
	7	Shellsburg		
	8	Urbana		
	11	Toddville		
	15	On-site North		
Ambient Radiation	1-3, 5-8, 10, 11, 13,15, 16	Air Particulate Locations	Two dosimeters continuously at each location. Both dosimeters are changed at least quarterly.	Read gamma radiation dose quarterly .
	18-23, 28-32, 33-42	Within 0.5 mile of Stack Within 3.0 miles of Stack		
	43-48, 82-86, 91	Within 1.0 mile of Stack		
Surface Water	49	Lewis Access (C)	Once per month.	Gamma isotopic analyses of each sample (by location). Composite monthly samples to form quarterly composite (by location). Analyze quarterly composite for tritium.
	50	Plant Intake (C)		
	51	Plant Discharge		
	99	Pleasant Creek		
	107	Plant Sewage Dischange		

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

Table 5.2 Sample collection and analysis program, 1997 (continued).

Exposure Pathway and/or Sample Type	Sampling Location: Sample Point	Sampling Location: Description	Sampling and Collection Frequency	Type and Frequency of Analysis
Ground Water (potable)	53	Treated Municipal Water	Grab sample at least once per quarter	Gross beta and tritium activity analysis on quarterly sample. If gross beta is greater than ten times the yearly mean of control samples, perform gamma isotopic and Sr-89 and Sr-90 analyses.
	54	Inlet to Municipal Water Treatment System		
	55	On-site well		
	57, 58	Wells off-site and within 4 km of DAEC		
	72			
River Sediment	50	Plant Intake (C)	At least once every six months.	Gamma isotopic analysis of each sample.
	51	Plant Discharge		
	107	Sewage Effluent Canal		
Vegetation	16, 57, 58, 63, 72, 93, 94,106, 105 (C)	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.
Fish	49	Cedar River upstream of DAEC not influenced by effluent (C)	One sample per 6 months (once during January through July and once during August through December).	Gamma isotopic analysis on edible portions.
	61	Downstream of DAEC in influence of effluent		
Milk[b]	105	Control Farm near Amana, Iowa	At least once per two weeks during the grazing season.	<u>During the grazing season</u>: Gamma isotopic and iodine-131 analyses of each sample.
	63, 93, 96, 101	Dairy Farms within 10 miles of Site	At least once per month during the non-grazing season.	<u>During the non-grazing season</u>: Gamma isotopic and iodine-131 analyses of each sample.

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

Table 5.2 Sample collection and analysis program, 1997 (continued).

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

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

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

[c] Meat was not collected in 1997; no animals slaughtered for home use.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

Code	Type	Sampling Location		
		Sampling Point	Location Description	Distance and Direction from Site Stack
D-1	C	1	Cedar Rapids	11 mi @ 135°SE
D-2	C	2	Marion	11 mi @ 125°ESE
D-3		3	Hiawatha	7 mi @ 130°SE
D-5		5	Palo	3 mi @ 200°SSW
D-6		6	Center Point	7 mi @ 0°N
D-7		7	Shellsburg	6 mi @ 255°W
D-8		8	Urbana	10 mi @ 345°NW
D-10		10	Atkins	9 mi @ 210°SSW
D-11		11	Toddville	4 mi @ 90°E
D-13	C	13	Alburnett	9 mi @ 70°ENE
D-15		15	On-site, Northwest	0.5 mi @ 305°NW
D-16		16	On-site, South	0.5 mi @ 190°SSE
D-18		18		0.5 mi NNE
D-19		19		0.5 mi NE
D-20		20		0.5 mi ENE
D-21		21		0.5 mi ENE
D-22		22		0.5 mi E
D-23		23		0.5 mi ESE
D-28		28		0.5 mi WSW
D-29		29		0.5 mi W
D-30		30		0.5 mi WNW
D-31		31		0.5 mi NW
D-32		32		0.5 mi NNW
D-33		33		3.0 mi N
D-34		34		3.0 mi NNE
D-35		35		3.0 mi NE
D-36		6		3.0 mi ENE
D-37		37		3.0 mi E
D-38		38		3.0 mi ESE
D-39		39		3.0 mi SE
D-40		40		3.0 mi SSE
D-41		41		3.0 mi S
D-42		42		3.0 mi SSE
D-43		43		1.0 mi SSW
D-44		44		1.0 mi WSW
D-45		45		1.0 mi W
D-46		46		1.0 mi WNW
D-47		47		1.0 mi WNW
D-48		48		1.0 mi NW
D-49	C	49	Lewis Access, upstream of DAEC	4.0 mi NNW
D-50	C	50	Plant Intake	
D-51		51	Plant Discharge	
D-53		53	Treated Municipal Water	
D-54		54	Inlet to Municipal Water Treatment System	
D-55		55	On-site Well	

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

Code	Type	Sampling Location		
		Sampling Point	Location Description	Distance and Direction from Site Stack
D-57		57	Farm (Off-site Well)	1.0 mi WSW
D-58		58	Farm (Off-site Well)	0.5 mi WSW-SW
D-61		61	0.5 mi downstream of plant discharge	
D-63		63	Farm	1.5 mi WNW
D-72		72	Farm	2.0 mi SSW
D-82		82		0.5 mi SE
D-83		83		0.5 mi SSE
D-84		84		0.5 mi S
D-85		85		0.5 mi SSW
D-86		86		0.5 mi SW
D-91		91		0.5 mi N
D-93		93	Farm	2.8 mi NNE
D-94		94	Farm	2.7 mi N
D-96		96	Farm	8.0 mi SSW
D-99		99	Pleasant Creek Lake	2.5 mi WNW
D-101		101	Farm	4.0 mi E
D-105	C	105	Farm	21.3 mi SSW
D-106		106	Farm	4.5 mi SE
D-107		107	Sewage Effluent Canal	On-site

"C" denotes control location. All other locations are indicators.

Table 5.4 Type and Frequency of collection.

Location	Location Type	Weekly	Monthly	Quarterly	Semiannually	Annually
D-1	C	AP		TLD		
D-2	C	AP, AI		TLD		
D-3		AP		TLD		
D-5		AP, AI		TLD		
D-6		AP		TLD		
D-7		AP, AI		TLD		
D-8		AP, AI		TLD		
D-10		AP		TLD		
D-11		AP, AI		TLD		
D-13	C	AP		TLD		
D-15		AP, AI		TLD		SO
D-16		AP		TLD		SO, G
D-18 through D-23				TLD		
D-28 through D-42				TLD		
D-43 through D-48				TLD		
D-49	C		SW		F	
D-50	C		SW		RS	
D-51			SW		RS	
D-53			WW			
D-54			WW			
D-55			WW			
D-57			WW			G
D-58			WW			G
D-61					F	
D-63			M			G
D-72			WW			G
D-82 through D-86				TLD		
D-91				TLD		
D-93			M			G
D-94			M			G
D-96			M			
D-99			SW			
D-101			M			
D-105	C		M			G
D-106			M			G
D-107			SW		RS	
On-site			P			ME

"C" denotes control location. All other locations are indicators.

Table 5.5. Sample codes used in 5.4.

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

Table 5.6. Missed collections and analyses, Duane Arnold Energy Center, 1997.

Sample	Analysis	Location(s)	Collection Date or Period	Comments
Milk	I-131, Gamma	D-93	01-07-97	Sample not available.
Milk	I-131, Gamma	D-101	01-07-97	Sample not available.
AP	Gross Beta	D-13	01-23-97	Sample lost in strong wind.
Milk	I-131, Gamma	D-93	02-04-97	Sample not available.
Milk	I-131, Gamma	D-101	02-04-97	Sample not available.
Milk	I-131, Gamma	D-105	06-17-97	Lost in shipment.
TLD	Ambient Gamma	D-31, 91	3rd Qtr., 1997	Samples lost in the field.
TLD	Ambient Gamma	D-35	4th Qtr., 1997	Samples lost in the field.

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center — Docket No. 50-331
Location of Facility Linn, Iowa (County, State) — Reporting Period January - December 1997

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	Number Non-Routine Results[e]
Airborne particulates (pCi/m^3)	GB 623	0.004	0.023 (467/468) (0.010-0.072)	D-1,2,6 All locations had identical means	0.025 (154/155) (0.013-0.067)	0.024 (154/155) (0.012-0.067)	0
	GS 48						
	Be-7	0.012	0.079 (36/36) (0.049-0.11)	D-1, Cedar Rapids, 11 mi. SE	0.091 (4/4) (0.068-0.11)	0.088 (12/12) (0.054-0.11)	0
	Nb-95	0.0021	<LLD	-	-	<LLD	0
	Zr-95	0.0036	<LLD	-	-	<LLD	0
	Ru-103	0.0020	<LLD	-	-	<LLD	0
	Ru-106	0.014	<LLD	-	-	<LLD	0
	Cs-134	0.0014	<LLD	-	-	<LLD	0
	Cs-137	0.0016	<LLD	-	-	<LLD	0
	Ce-141	0.0028	<LLD	-	-	<LLD	0
	Ce-144	0.0072	<LLD	-	-	<LLD	0
Airborne Iodine (pCi/m^3)	I-131 312	0.07	<LLD	-	-	<LLD	0
TLD, AP Locations (mR/quarter)	Gamma 48	1	13.3 (36/36) (7.1-37.1)	D-7, Shellsburg, 6 mi. W	19.3 (4/4) (11.0-37.1)	12.7 (12/12) (9.8-17.0)	0
TLD, within 0.5 mi of Stack (mR/quarter)	Gamma 66	1	14.8 (66/66) (10.3-23.5)	D-31, 0.5 mi. NW	19.7 (3/3) (17.2-23.5)	None	0
TLD, within 1.0 mi of Stack (mR/quarter)	Gamma 24	1	15.5 (24/24) (10.8-20.0)	D-46, 1.0 mi. WNW	17.4 (4/4) (14.9-20.0)	None	0
TLD, within 3.0 mi of Stack (mR/quarter)	Gamma 39	1	12.8 (39/39) (9.2-17.6)	D-37, 3.0 mi. E	16.4 (4/4) (15.0-17.6)	None	0
Precipitation (pCi/L)	H-3 4	330	<LLD	-	-	None	0
	GS 12						
	Mn-54	7.3	<LLD	-	-	None	0
	Fe-59	15.0	<LLD	-	-	None	0
	Co-58	6.7	<LLD	-	-	None	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center — Docket No. 50-331
Location of Facility Linn, Iowa (County, State) — Reporting Period January - December 1997

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	Number Non-Routine Results[e]
Precipitation (pCi/L) *(continued)*	Co-60	8.2	<LLD	-	-	None	0
	Zn-65	20.5	<LLD	-	-	None	0
	Nb-95	8.0	<LLD	-	-	None	0
	Zr-95	16.9	<LLD	-	-	None	0
	I-131	20.1	<LLD	-	-	None	0
	Cs-134	7.5	<LLD	-	-	None	0
	Cs-137	8.2	<LLD	-	-	None	0
	Ba-140	44.0	<LLD	-	-	None	0
	La-140	12.7	<LLD	-	-	None	0
Milk (pCi/L)	I-131 85	1.0	<LLD	-	-	<LLD	0
	GS 85						
	K-40	100	1560 (68/68) (1000-2120)	D-93, Farm 2.8 mi. NNE	1710 (16/16) (1000-2000)	1420 (17/17) (1230-1570)	0
	Cs-134	15	<LLD	-	-	<LLD	0
	Cs-137	18	<LLD	-	-	<LLD	0
	Ba-140	60	<LLD	-	-	<LLD	0
	La-140	15	<LLD	-	-	<LLD	0
Ground Water (pCi/L)	GB 24	1.2	3.2 (14/24) (1.3-5.9)	D-58, Farm 1.0 mi. WSW-SW	5.0 (3/4) (4.3-5.9)	None	0
	H-3 24	330	<LLD	-	-	None	0
Broadleaf Vegetation (pCi/g wet)	I-131 5	0.053	<LLD	-	-	None	0
	GS 5						
	K-40	0.5	2.94 (5/5) (2.26-4.19)	D-94, Farm 2.7 mi. N	4.19 (1/1)	None	0
	Mn-54	0.025	<LLD	-	-	None	0
	Co-58	0.022	<LLD	-	-	None	0
	Co-60	0.025	<LLD	-	-	None	0
	Nb-95	0.033	<LLD	-	-	None	0
	Zr-95	0.040	<LLD	-	-	None	0
	Ru-103	0.021	<LLD	-	-	None	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center — Docket No. 50-331
Location of Facility Linn, Iowa (County, State) — Reporting Period January - December 1997

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	Number Non-Routine Results[e]
Broadleaf Vegetation (pCi/g wet) *(continued)*	Ru-106	0.26	<LLD	-	-	None	0
	Cs-134	0.024	<LLD	-	-	None	0
	Cs-137	0.025	<LLD	-	-	None	0
	Ce-141	0.046	<LLD	-	-	None	0
	Ce-144	0.16	<LLD	-	-	None	0
Vegetation (Grain) (pCi/g wet)	GS 7						
	K-40	0.5	3.55 (6/6) (2.19-8.34)	D-16, Onsite, 0.5 mi. SSE	8.34 (1/1)	1.93 (1/1)	0
	Mn-54	0.014	<LLD	-	-	<LLD	0
	Co-58	0.017	<LLD	-	-	<LLD	0
	Co-60	0.026	<LLD	-	-	<LLD	0
	Nb-95	0.020	<LLD	-	-	<LLD	0
	Zr-95	0.031	<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	0.020	<LLD	-	-	<LLD	0
	Ce-141	0.030	<LLD	-	-	<LLD	0
	Ce-144	0.086	<LLD	-	-	<LLD	0
Vegetation (Forage) (pCi/g wet)	GS 5						
	K-40	0.5	12.80 (4/4) (2.54-19.13)	D-63, Farm 1.5 mi. WNW	19.13 (1/1)	16.84 (1/1)	0
	Mn-54	0.054	<LLD	-	-	<LLD	0
	Co-58	0.046	<LLD	-	-	<LLD	0
	Co-60	0.087	<LLD	-	-	<LLD	0
	Nb-95	0.045	<LLD	-	-	<LLD	0
	Zr-95	0.090	<LLD	-	-	<LLD	0
	Ru-103	0.059	<LLD	-	-	<LLD	0
	Ru-106	0.27	<LLD	-	-	<LLD	0
	Cs-134	0.060	<LLD	-	-	<LLD	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center — Docket No. 50-331
Location of Facility Linn, Iowa (County, State) — Reporting Period January - December 1997

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	Number Non-Routine Results[e]
Vegetation - Forage (pCi/g wet) *(continued)*	Cs-137	0.063	<LLD	-	-	<LLD	0
	Ce-141	0.062	<LLD	-	-	<LLD	0
	Ce-144	0.43	<LLD	-	-	<LLD	0
Soil (pCi/g dry)	Sr-90 2	0.01	0.051 (2/2) (0.044-0.057)	D-16, Onsite, 0.5 mi. SSE	0.057 (1/1)	None	0
	GS 2						
	K-40	0.5	12.94 (2/2) (10.04-15.84)	D-15, Onsite 0.5 mi. NW	15.84 (1/1)	None	0
	Mn-54	0.019	<LLD	-	-	None	0
	Co-58	0.030	<LLD	-	-	None	0
	Co-60	0.023	<LLD	-	-	None	0
	Nb-95	0.046	<LLD	-	-	None	0
	Zr-95	0.027	<LLD	-	-	None	0
	Ru-103	0.020	<LLD	-	-	None	0
	Ru-106	0.12	<LLD	-	-	None	0
	Cs-134	0.037	<LLD	-	-	None	0
	Cs-137	0.060	0.20 (2/2) (0.12-0.28)	D-16, Onsite, 0.5 mi. SSE	0.28 (1/1)	None	0
	Ce-141	0.061	<LLD	-	-	None	0
	Ce-144	0.14	<LLD	-	-	None	0
Surface Water (pCi/L)	H-3 20	330	<LLD	-	-	<LLD	0
	K-40 12	0.5	16.4 (12/12) (9.52-23.36)	D-107, Onsite Sewage Effluent	16.4 (12/12) (9.52-23.36)	None	0
	I-131 60	15	<LLD	-	-	<LLD	0
	GS 60						
	Mn-54	15	<LLD	-	-	<LLD	0
	Fe-59	30	<LLD	-	-	<LLD	0
	Co-58	15	<LLD	-	-	<LLD	0
	Co-60	15	<LLD	-	-	<LLD	0
	Zn-65	30	<LLD	-	-	<LLD	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center — Docket No. 50-331
Location of Facility Linn, Iowa (County, State) — Reporting Period January - December 1997

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	Number Non-Routine Results[e]
Surface Water (pCi/L) *(continued)*	Nb-95	15	<LLD	-	-	<LLD	0
	Zr-95	30	<LLD	-	-	<LLD	0
	Cs-134	15	<LLD	-	-	<LLD	0
	Cs-137	18	<LLD	-	-	<LLD	0
	Ba-140	60	<LLD	-	-	<LLD	0
	La-140	15	<LLD	-	-	<LLD	0
River Sediments (pCi/g dry)	GS 6						
	K-40	1.0	7.20 (4/4) (5.15-10.99)	D-51, Plant Discharge	8.51 (2/2) (6.02-10.99)	7.36 (2/2) (6.50-8.22)	0
	Mn-54	0.048	<LLD	-	-	<LLD	0
	Co-58	0.045	<LLD	-	-	<LLD	0
	Co-60	0.025	0.20 (2/4) (0.16-0.25)	D-107, Sewage Effluent Canal	0.20 (2/2) (0.16-0.25)	<LLD	0
	Nb-95	0.062	<LLD	-	-	<LLD	0
	Zr-95	0.099	<LLD	-	-	<LLD	0
	Ru-103	0.048	<LLD	-	-	<LLD	0
	Ru-106	0.32	<LLD	-	-	<LLD	0
	Cs-134	0.055	<LLD	-	-	<LLD	0
	Cs-137	0.041	<LLD	-	-	<LLD	0
	Ce-141	0.066	<LLD	-	-	<LLD	0
	Ce-144	0.16	<LLD	-	-	<LLD	0
Fish (Edible Portions) (pCi/g wet)	GS 6						
	K-40	0.5	2.80 (3/3) (2.48-2.98)	D-49, Lewis Access, 4.0 mi. NNW	2.88 (3/3) (2.80-2.99)	2.88 (3/3) (2.80-2.99)	0
	Mn-54	0.022	<LLD	-	-	<LLD	0
	Co-58	0.012	<LLD	-	-	<LLD	0
	Co-60	0.011	<LLD	-	-	<LLD	0
	Fe-59	0.043	<LLD	-	-	<LLD	0
	Zn-65	0.071	<LLD	-	-	<LLD	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center — Docket No. 50-331
Location of Facility Linn, Iowa (County, State) — Reporting Period January - December 1997

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	Number Non-Routine Results[e]
Fish (Edible Portions) (pCi/g wet) *(continued)*	Nb-95	0.043	<LLD	-	-	<LLD	0
	Zr-95	0.038	<LLD	-	-	<LLD	0
	Ru-103	0.024	<LLD	-	-	<LLD	0
	Ru-106	0.15	<LLD	-	-	<LLD	0
	Cs-134	0.018	<LLD	-	-	<LLD	0
	Cs-137	0.018	<LLD	-	-	<LLD	0
	Ce-141	0.028	<LLD	-	-	<LLD	0
	Ce-144	0.15	<LLD	-	-	<LLD	0

[a] GB = gross beta; GS = gamma scan.

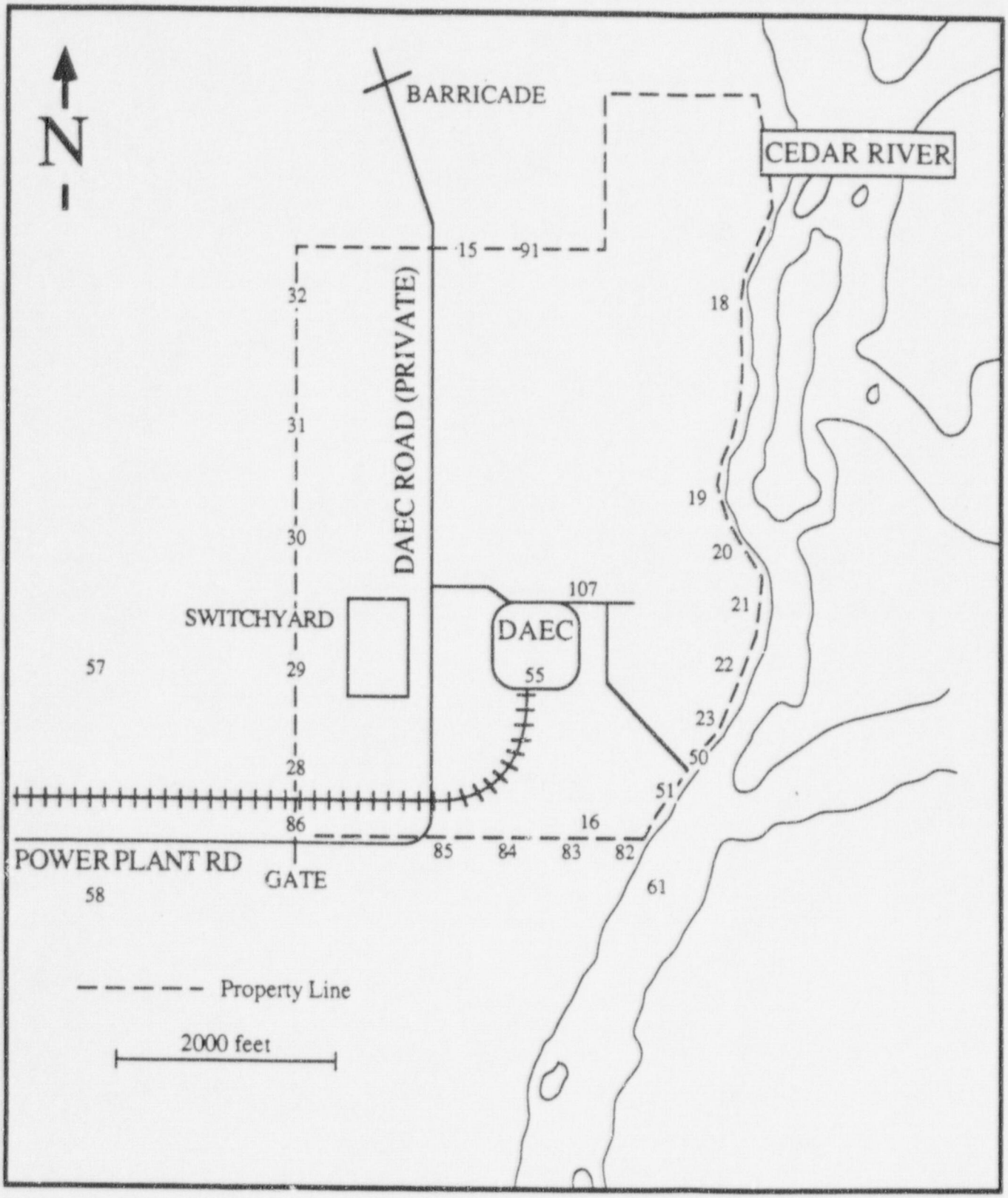
[b] LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

[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.

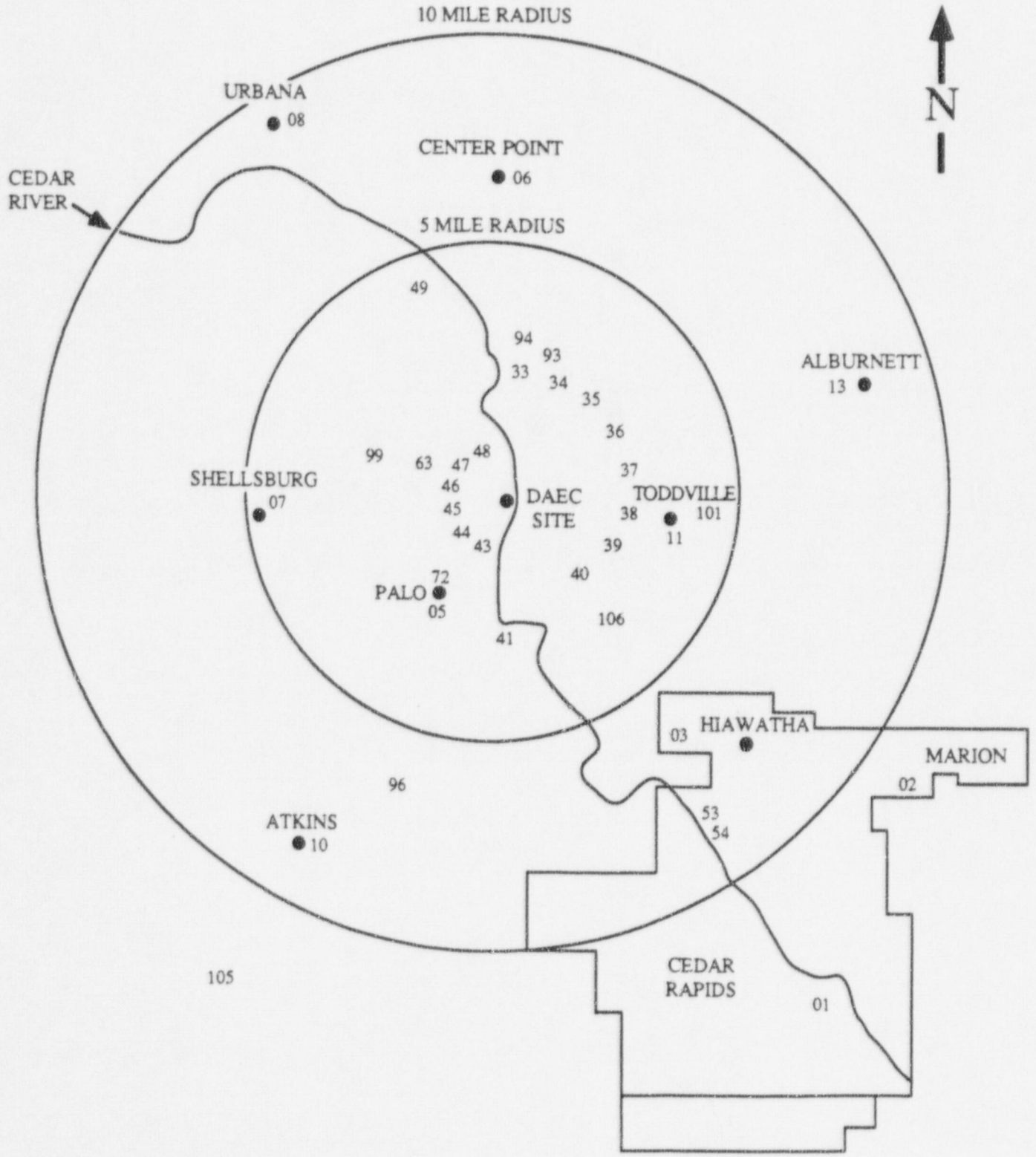
[e] Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

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: Teledyne's Midwest Laboratory participates in intercomparison studies administered by U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. The results are reported in Appendix A. Also reported are results of International Intercomparison and Teledyne testing of TLD's, as well as, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 1997 through December, 1997

Appendix A

Interlaboratory Comparison Program Results

Teledyne Brown Engineering Environmental Services Midwest Laboratory (formerly Hazleton Environmental Sciences) 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 (e.g., milk or water) 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 the laboratory's analytical procedures and to alert it to 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.

The results in Table A-1 were obtained through participation in the environmental sample crosscheck program for milk, water and air filters during the past twelve months. Data for previous years is available upon request.

This program is conducted by the U.S. Environmental Protection Agency Office of Research and Developement National Exposure Research Laboratory Characterization Research Division-Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via various International Intercomparisons of Environmental Dosimeters under the sponsorships listed in Table A-2. Also Teledyne testing results are listed.

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 list results of 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. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the mixed analyte performance evaluation program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

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 determinations
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	1s = (pCi/liter) = $169.85 \times (\text{known})^{0.0933}$ 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	6.0 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤35 pCi/liter >35 pCi/liter	6.0 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter >100 pCi/liter	10 pCi/liter 10% of known value
Others[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] Teledyne limit.

Table A-1. U.S. Environmental Protection Agency's crosscheck program, comparison of EPA and Teledyne's Midwest Laboratory results[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Teledyne Results ±2 Sigma[c]	EPA Result[d] 1s, N=1	Control Limits
STW-782	WATER	Jan, 1997	Sr-89	9.7 ± 0.6	12.0 ± 5.0	3.3 - 20.7
STW-782	WATER	Jan, 1997	Sr-90	24.0 ± 1.0	25.0 ± 5.0	16.3 - 33.7
STW-783	WATER	Jan, 1997	Gr. Alpha	10.0 ± 1.4	5.2 ± 5.0	0.0 - 13.9
STW-783	WATER	Jan, 1997	Gr. Beta	15.8 ± 2.0	14.7 ± 5.0	6.0 - 23.4
STW-784	WATER	Feb, 1997	I-131	86.0 ± 2.0	86.0 ± 9.0	70.4 - 101.6
STW-784	WATER	Feb, 1997	I-131	79.3 ± 2.0	86.0 ± 9.0	70.4 - 101.6
STWW-786	WATER	Feb, 1997	Ra-226	6.7 ± 0.2	5.9 ± 0.9	4.3 - 7.5
STWW-786	WATER	Feb, 1997	Ra-228	8.4 ± 1.1	8.2 ± 2.1	4.6 - 11.8
STWW-786	WATER	Feb, 1997	Uranium	26.5 ± 1.3	27.0 ± 3.0	21.8 - 32.3
STW-787	WATER	Mar, 1997	H-3	7,594.0 ± 279.7	7,900.0 ± 790.0	6,529.4 - 9,270.6
STW-794	WATER	Apr, 1997	Gr. Alpha	44.3 ± 1.6	48.0 ± 12.0	27.2 - 68.8
STW-794	WATER	Apr, 1997	Ra-226	10.7 ± 0.9	13.0 ± 2.0	9.5 - 16.5
STW-794	WATER	Apr, 1997	Ra-228	4.7 ± 0.4	3.1 ± 0.8	1.7 - 4.5
	All raw data and calculations were reviewed for errors. The analysis was repeated with the technician observed by the lab supervisor; the result of the reanalysis 3.1±0.5 pCi/L. The suspected cause of the higher result was the lower than expected recovery of barium tracer. No further action is planned at this time.					
STW-794	WATER	Apr, 1997	Uranium	26.8 ± 0.3	24.0 ± 3.0	18.8 - 29.2
STW-795	WATER	Apr, 1997	Co-60	21.7 ± 0.6	21.0 ± 5.0	12.3 - 29.7
STW-795	WATER	Apr, 1997	Cs-134	27.3 ± 1.2	31.0 ± 5.0	22.3 - 39.7
STW-795	WATER	Apr, 1997	Cs-137	21.7 ± 1.5	22.0 ± 5.0	13.3 - 30.7
STW-795	WATER	Apr, 1997	Gr. Beta	98.2 ± 2.1	102.1 ± 15.3	75.6 - 128.6
STW-795	WATER	Apr, 1997	Sr-89	21.3 ± 1.2	24.0 ± 5.0	15.3 - 32.7
STW-795	WATER	Apr, 1997	Sr-90	12.7 ± 0.6	13.0 ± 5.0	4.3 - 21.7
STW-796	WATER	Jun, 1997	Ba-133	24.7 ± 1.2	25.0 ± 5.0	16.3 - 33.7
STW-796	WATER	Jun, 1997	Co-60	18.7 ± 0.6	18.0 ± 5.0	9.3 - 26.7
STW-796	WATER	Jun, 1997	Cs-134	19.7 ± 0.6	22.0 ± 5.0	13.3 - 30.7
STW-796	WATER	Jun, 1997	Cs-137	52.0 ± 2.0	49.0 ± 5.0	40.3 - 57.7
STW-796	WATER	Jun, 1997	Zn-65	101.0 ± 2.0	100.0 ± 10.0	82.7 - 117.3
STW-797	WATER	Jun, 1997	Ra-226	2.7 ± 0.1	3.0 ± 0.5	2.1 - 3.9
STW-797	WATER	Jun, 1997	Ra-228	2.3 ± 0.3	3.1 ± 0.8	1.7 - 4.5
STW-797	WATER	Jun, 1997	Uranium	38.1 ± 1.0	40.3 ± 4.0	33.4 - 47.2
STW-799	WATER	Jul, 1997	Sr-89	37.7 ± 3.2	44.0 ± 5.0	35.3 - 52.7
STW-799	WATER	Jul, 1997	Sr-90	16.0 ± 1.0	16.0 ± 5.0	7.3 - 24.7
STW-802	WATER	Jul, 1997	I-131	10.7 ± 1.2	10.0 ± 6.0	0.0 - 20.4
STW-800	WATER	Jul, 1997	Gr. Alpha	3.1 ± 0.3	3.1 ± 5.0	0.0 - 11.8
STW-800	WATER	Jul, 1997	Gr. Beta	13.9 ± 0.2	15.1 ± 5.0	6.4 - 23.8
STW-801	WATER	Aug, 1997	H-3	11,348.7 ± 241.4	11,010.0 ± 1,101.0	9,099.8 - 12,920.2
STW-803	WATER	Sep, 1997	Ra-226	20.0 ± 0.8	20.0 ± 3.0	14.8 - 25.2

Table A-1. U.S. Environmental Protection Agency's crosscheck program, comparison of EPA and Teledyne's Midwest Laboratory results[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Teledyne Results ±2 Sigma[c]	EPA Result[d] 1s, N=1	Control Limits
STW-803	WATER	Sep, 1997	Ra-228	7.0 ± 0.1	8.0 ± 2.0	4.5 - 11.5
STW-803	WATER	Sep, 1997	Uranium	5.0 ± 0.1	5.1 ± 3.0	0.0 - 10.3
STW-811	WATER	Nov, 1997	Ba-133	97.3 ± 5.0	99.0 ± 10.0	81.7 - 116.3
STW-811	WATER	Nov, 1997	Co-60	28.3 ± 1.7	27.0 ± 5.0	18.3 - 35.7
STW-811	WATER	Nov, 1997	Cs-134	9.7 ± 1.0	10.0 ± 5.0	1.3 - 18.7
STW-811	WATER	Nov, 1997	Cs-137	78.0 ± 3.5	74.0 ± 5.0	65.3 - 82.7
STW-811	WATER	Nov, 1997	Zn-65	76.7 ± 2.1	75.0 ± 8.0	61.1 - 88.9

[a] Results obtained by Teledyne Brown Engineering Environmental Services Midwest Laboratory as a participant in the environmental sample crosscheck program operated by the Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (EPA), Las Vegas, Nevada.

[b] All results are in pCi/L, except for elemental potassium (K) data in milk, which are in mg/L; air filter samples, which are in pCi/Filter.

[c] Unless otherwise indicated, the TBEESML results are given as the mean ± 2 standard deviations for three determinations.

[d] USEPA results are presented as the known values and expected laboratory precision (1s, 1 determination) and control limits as defined by the EPA.

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
2nd International Intercomparison						
115-2	CaF_2: Mn Bulb	Apr, 1976	Field	17.0 ± 1.9	17.1	16.4 ± 7.7
115-2	CaF_2: Mn Bulb	Apr, 1976	Lab	20.8 ± 4.1	21.3	18.8 ± 7.6
Second International Intercomparison of Environmental Dosimeters conducted in April of 1976 by the Health and Safety Laboratory (HASL), New York, new York, and the School of Public Health of the University of Texas, Houston, Texas.						
3rd International Intercomparison						
115-3	CaF_2: Mn Bulb	Jun, 1977	Field	30.7 ± 3.2	34.9 ± 4.8	31.5 ± 3.0
115-3	CaF_2: Mn Bulb	Jun, 1977	Lab	89.6 ± 6.4	91.7 ± 14.6	86.2 ± 24.0
Third International Intercomparison of Environmental Dosimeters conducted in the summer of 1977 by Oak Ridge National Laboratory and the School of Public Health of the University of Texas, Houston, Texas.						
4th International Intercomparison						
115-4	CaF_2: Mn Bulb	Jun, 1979	Field	14.1 ± 1.1	14.1 ± 1.4	16.0 ± 9.0
115-4	CaF_2: Mn Bulb	Jun, 1979	Lab, High	40.4 ± 1.4	45.8 ± 9.2	43.9 ± 13.2
115-4	CaF_2: Mn Bulb	Jun, 1979	Lab, Low	9.8 ± 1.3	12.2 ± 2.4	12.0 ± 7.4
Fourth International Intercomparison of Environmental Dosimeters conducted in the summer of 1979 by the School of Public Health of the University of Texas, Houston, Texas.						
5th International Intercomparison						
115-5A	CaF_2: Mn Bulb	Oct, 1980	Field	31.4 ± 1.8	30.0 ± 6.0	30.2 ± 14.6
115-5A	CaF_2: Mn Bulb	Oct, 1980	Lab, End	96.6 ± 5.8	88.4 ± 8.8	90.7 ± 31.2
115-5A	CaF_2: Mn Bulb	Oct, 1980	Lab, Start	77.4 ± 5.8	75.2 ± 7.6	75.8 ± 40.4
Fifth International Intercomparison of Environmental Dosimeters conducted in the fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and the Environmental Measurements Laboratory, New York, New York, U.S. Department of Energy.						
5th International Intercomparison						
115-5B	LiF-100 Chips	Oct, 1980	Field	30.3 ± 4.8	30.0 ± 6.0	30.2 ± 14.6
115-5B	LiF-100 Chips	Oct, 1980	Lab, End	85.4 ± 11.7	88.4 ± 8.8	90.7 ± 31.2
115-5B	LiF-100 Chips	Oct, 1980	Lab, Start	81.1 ± 7.4	75.2 ± 7.6	75.8 ± 40.4
Fifth International Intercomparison of Environmental Dosimeters conducted in the fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and the Environmental Measurements Laboratory, New York, New York, U.S. Department of Energy.						
6th International Intercomparison						
115-6						
Teledyne did not participate in the Sixth International Intercomparison of Environmental Dosimeters.						
7th International Intercomparison						
115-7A	LiF-100 Chips	Jun, 1984	Field	75.4 ± 2.6	75.8 ± 6.0	75.1 ± 29.8
115-7A	LiF-100 Chips	Jun, 1984	Lab, Co-60	80.0 ± 3.5	79.9 ± 4.0	77.9 ± 27.6
115-7A	LiF-100 Chips	Jun, 1984	Lab, Cs-137	66.6 ± 2.5	75.0 ± 3.8	73.0 ± 22.2

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.						
7th International Intercomparison						
115-7B	LiF-100 Chips	Jun, 1984	Field	71.5 ± 2.6	75.8 ± 6.0	75.1 ± 29.8
115-7B	LiF-100 Chips	Jun, 1984	Lab, Co-60	84.8 ± 6.4	79.9 ± 4.0	77.9 ± 27.6
115-7B	LiF-100 Chips	Jun, 1984	Lab, Cs-137	78.8 ± 1.6	75.0 ± 3.8	73.0 ± 22.2
Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.						
7th International Intercomparison						
115-7C	$CaSO_4$: Dy Cards	Jun, 1984	Field	76.8 ± 2.7	75.8 ± 6.0	75.1 ± 29.8
115-7C	$CaSO_4$: Dy Cards	Jun, 1984	Lab, Co-60	82.5 ± 3.7	79.9 ± 4.0	77.9 ± 27.6
115-7C	$CaSO_4$: Dy Cards	Jun, 1984	Lab, Cs-137	79.0 ± 3.2	75.0 ± 3.8	73.0 ± 22.2
Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.						
8th International Intercomparison						
115-8A	LiF-100 Chips	Jan, 1986	Field, Site 1	29.5 ± 1.4	29.7 ± 1.5	28.9 ± 12.4
115-8A	LiF-100 Chips	Jan, 1986	Field, Site 2	11.3 ± 0.8	10.4 ± 0.5	10.1 ± 9.1
115-8A	LiF-100 Chips	Jan, 1986	Lab, Cs-137	13.7 ± 0.9	17.2 ± 0.9	16.2 ± 6.8
Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.						
8th International Intercomparison						
115-8B	LiF-100 Chips	Jan, 1986	Field, Site 1	32.3 ± 1.2	29.7 ± 1.5	28.9 ± 12.4
115-8B	LiF-100 Chips	Jan, 1986	Field, Site 2	9.0 ± 1.0	10.4 ± 0.5	10.1 ± 9.0
115-8B	LiF-100 Chips	Jan, 1986	Lab, Cs-137	15.8 ± 0.9	17.2 ± 0.9	16.2 ± 6.8
Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.						
8th International Intercomparison						
115-8C	$CaSO_4$: Dy Cards	Jan, 1986	Field, Site 1	32.2 ± 0.7	29.7 ± 1.5	28.9 ± 12.4
115-8C	$CaSO_4$: Dy Cards	Jan, 1986	Field, Site 2	10.6 ± 0.6	10.4 ± 0.5	10.1 ± 9.0
115-8C	$CaSO_4$: Dy Cards	Jan, 1986	Lab, Cs-137	18.1 ± 0.8	17.2 ± 0.9	16.2 ± 6.8

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.						
9th International Intercomparison						
115-9						
The Ninth International Intercomparison of Environmental Dosimeters was not available to Teledyne's Midwest Laboratory.						
10th International Intercomparison						
115-10A	LiF-100 Chips	Aug, 1993	Field	25.7 ± 1.4	27.0 ± 1.6	26.4 ± 10.2
115-10A	LiF-100 Chips	Aug, 1993	Lab, 1	22.7 ± 1.6	25.9 ± 1.3	25.0 ± 9.4
115-10A	LiF-100 Chips	Aug, 1993	Lab, 2	62.7 ± 2.6	72.7 ± 1.9	69.8 ± 20.3
The Tenth International Intercomparison of Environmental Dosimeters conducted in 1993 at Idaho State University and sponsored by the U.S. Department of Energy and the Idaho State University.						
10th International Intercomparison						
115-10B	$CaSO_4$: Dy Cards	Aug, 1993	Field	26.0 ± 2.3	27.0 ± 1.6	26.4 ± 10.2
115-10B	$CaSO_4$: Dy Cards	Aug, 1993	Lab, 1	24.1 ± 1.7	25.9 ± 1.3	25.0 ± 9.4
115-10B	$CaSO_4$: Dy Cards	Aug, 1993	Lab, 2	69.2 ± 3.0	72.7 ± 1.9	69.8 ± 20.3
The Tenth International Intercomparison of Environmental Dosimeters conducted in 1993 at Idaho State University and sponsored by the U.S. Department of Energy and the Idaho State University.						
11th International Intercomparison						
115-11		Apr, 1997				
The Eleventh International Intercomparison of Environmental Dosimeters was conducted in 1997 and was organized by the Department of Energy's Environmental Measurements Laboratory in collaboration with Brookhaven National Laboratory and the National Institute of Standards and Technology.						
Results for the Eleventh International Intercomparison were originally reported in error; The results are being re-evaluated and will be reported in a later update.						
Teledyne Testing						
89-1	LiF-100 Chips	Sep, 1989	Lab	2[illegible] ± 0.4	22.4	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in September, 1989.						
Teledyne Testing						
89-2	$CaSO_4$: Dy Cards	Nov, 1989	Lab	20.9 ± 1.0	20.3	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in June, 1990.						

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
Teledyne Testing						
90-1	$CaSO_4$: Dy Cards	Jun, 1990	Lab	20.6 ± 1.4	19.6	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in June, 1990.						
Teledyne Testing						
90-2	$CaSO_4$: Dy Cards	Jun, 1990	Lab	100.8 ± 4.3	100.0	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Dosimetry Asssociates, Inc., Northville, MI, in October, 1990.						
Teledyne Testing						
91-1	$CaSO_4$: Dy Cards	Oct, 1990	Lab, 1	33.4 ± 2.0	32.0	ND
91-1	$CaSO_4$: Dy Cards	Oct, 1990	Lab, 2	55.2 ± 4.7	58.8	ND
91-1	$CaSO_4$: Dy Cards	Oct, 1990	Lab, 3	87.8 ± 6.2	85.5	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in October, 1991.						
Teledyne Testing						
92-1	LiF-100 Chips	Feb, 1992	Lab, 1	11.1 ± 0.2	10.7	ND
92-1	LiF-100 Chips	Feb, 1992	Lab, 2	25.6 ± 0.5	25.4	ND
92-1	LiF-100 Chips	Feb, 1992	Lab, 3	46.4 ± 0.5	46.3	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in February, 1992.						
Teledyne Testing						
92-2	$CaSO_4$: Dy Cards	Apr, 1992	Reader 1, #1	20.1 ± 0.1	20.1	ND
92-2	$CaSO_4$: Dy Cards	Apr, 1992	Reader 1, #2	40.6 ± 0.1	40.0	ND
92-2	$CaSO_4$: Dy Cards	Apr, 1992	Reader 1, #3	60.0 ± 1.3	60.3	ND
92-2	$CaSO_4$: Dy Cards	Apr, 1992	Reader 2, #1	20.3 ± 0.3	20.1	ND
92-2	$CaSO_4$: Dy Cards	Apr, 1992	Reader 2, #2	39.2 ± 0.3	40.0	ND
92-2	$CaSO_4$: Dy Cards	Apr, 1992	Reader 2, #3	60.7 ± 0.4	60.3	ND

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in April, 1992.						
Teledyne Testing						
93-1	Teledyne LiF-100 Chips	Mar, 1993	Lab, 1	10.0 ± 1.0	10.2	ND
93-1	Teledyne LiF-100 Chips	Mar, 1993	Lab, 2	25.2 ± 2.2	25.5	ND
93-1	Teledyne LiF-100 Chips	Mar, 1993	Lab, 3	42.7 ± 5.7	45.9	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in March, 1993. Due to a potential error of 10-12% when cards where irradiated, results of the testing on the cards will not be published. Data is available upon request.						
Teledyne Testing						
94-1	Teledyne LiF-100 Chips	Nov, 1994	Lab, 1	15.6 ± 0.4	14.9	ND
94-1	Teledyne LiF-100 Chips	Nov, 1994	Lab, 2	30.2 ± 0.4	29.8	ND
94-1	Teledyne LiF-100 Chips	Nov, 1994	Lab, 3	59.2 ± 0.3	59.7	ND
94-1	$CaSO_4$: Dy Cards	Nov, 1994	Reader 1, #1	14.9 ± 0.1	14.9	ND
94-1	$CaSO_4$: Dy Cards	Nov, 1994	Reader 1, #2	30.8 ± 0.1	29.8	ND
94-1	$CaSO_4$: Dy Cards	Nov, 1994	Reader 1, #3	58.9 ± 0.3	59.7	ND
94-1	$CaSO_4$: Dy Cards	Nov, 1994	Reader 2, #1	15.4 ± 0.2	14.9	ND
94-1	$CaSO_4$: Dy Cards	Nov, 1994	Reader 2, #2	31.4 ± 0.2	29.8	ND
94-1	$CaSO_4$: Dy Cards	Nov, 1994	Reader 2, #3	60.1 ± 0.3	59.7	ND
ND = No Data; Teledyne Testing was only performed by Teledyne. Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in November, 1994.						
Teledyne Testing						
95-1	LiF-100 Chips	Mar, 1995	Lab, 1	16.1 ± 0.2	15.7	
95-1	LiF-100 Chips	Mar, 1995	Lab, 2	31.7 ± 0.1	32.3	
95-1	LiF-100 Chips	Mar, 1995	Lab, 3	59.7 ± 0.6	60.8	
95-1	$CaSO_4$: Dy Cards	Mar, 1995	Reader 1, #1	16.4 ± 0.1	15.7	ND

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR: Teledyne Results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
95-1	$CaSO_4$: Dy Cards	Mar, 1995	Reader 1, #2	34.9 ± 0.1	32.3	ND
95-1	$CaSO_4$: Dy Cards	Mar, 1995	Reader 1, #3	64.4 ± 1.5	60.8	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Cards and Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in March, 1995.

Teledyne Testing

95-2	$CaSO_4$: Dy Cards	Mar, 1995	Reader 2, #1	16.4 ± 0.2	15.7	ND
95-2	$CaSO_4$: Dy Cards	Mar, 1995	Reader 2, #2	33.9 ± 0.4	32.3	ND
95-2	$CaSO_4$: Dy Cards	Mar, 1995	Reader 2, #3	60.5 ± 0.3	60.8	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Cards and Chips were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in March, 1995.

Teledyne Testing

96-1	LiF-100 Chips	Mar, 1996	Lab, 1	15.9 ± 0.3	15.4	
96-1	LiF-100 Chips	Mar, 1996	Lab, 2	29.4 ± 0.3	30.8	
96-1	LiF-100 Chips	Mar, 1996	Lab, 3	62.5 ± 1.3	62.5	
96-1	$CaSO_4$: Dy Cards	Mar, 1996	Reader 1, #1	14.4 ± 0.1	15.4	ND
96-1	$CaSO_4$: Dy Cards	Mar, 1996	Reader 1, #2	31.8 ± 0.1	30.8	ND
96-1	$CaSO_4$: Dy Cards	Mar, 1996	Reader 1, #3	64.7 ± 0.4	62.5	ND

Teledyne Testing

96-2	$CaSO_4$: Dy Cards	Mar, 1996	Reader 2, #1	14.3 ± 0.4	15.4	ND
96-2	$CaSO_4$: Dy Cards	Mar, 1996	Reader 2, #2	31.8 ± 0.1	30.8	ND
96-2	$CaSO_4$: Dy Cards	Mar, 1996	Reader 2, #3	68.6 ± 0.1	62.5	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Chips and Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in March, 1996.

Teledyne Testing

97-1	LiF-100 Chips	Mar, 1997	Lab, 1	13.4 ± 1.4	15.0	
97-1	LiF-100 Chips	Mar, 1997	Lab, 2	29.8 ± 0.6	30.1	
97-1	LiF-100 Chips	Mar, 1997	Lab, 3	63.4 ± 0.9	60.2	

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR		
				Teledyne Results ± 2 Sigma	Known Value	Average ± 2 Sigma (All Participants)
97-1	$CaSO_4$: Dy Cards	Mar, 1997	Reader 1, #1	15.5 ± 0.1	15.0	ND
97-1	$CaSO_4$: Dy Cards	Mar, 1997	Reader 1, #2	34.0 ± 0.1	30.1	ND
97-1	$CaSO_4$: Dy Cards	Mar, 1997	Reader 1, #3	68.3 ± 2.1	60.2	ND
Teledyne Testing						
97-2	$CaSO_4$: Dy Cards	Mar, 1997	Reader 2, #1	16.8 ± 0.3	15.0	ND
97-2	$CaSO_4$: Dy Cards	Mar, 1997	Reader 2, #2	36.2 ± 0.2	30.1	ND
97-2	$CaSO_4$: Dy Cards	Mar, 1997	Reader 2, #3	69.6 ± 0.2	60.2	ND

ND = No Data; Teledyne Testing was only performed by Teledyne.
Chips and Cards were irradiated by Teledyne Isotopes, Inc., Westwood, New Jersey, in March, 1997.

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a]		
				Teledyne Results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-844	WATER	Jan, 1997	Th-230	3.120 ± 0.104	3.070	1.842 - 4.298
SPW-844	WATER	Jan, 1997	Th-232	3.355 ± 0.108	3.070	1.842 - 4.298
SPW-548	WATER	Feb, 1997	Gr. Beta	43.881 ± 1.305	41.860	31.860 - 51.860
SPMI-534	MILK	Feb, 1997	Cs-134	48.649 ± 4.940	56.400	46.400 - 66.400
SPMI-534	MILK	Feb, 1997	Cs-137	54.700 ± 8.450	52.300	42.300 - 62.300
SPMI-535	MILK	Feb, 1997	Sr-89	49.849 ± 7.940	40.030	30.030 - 50.030
SPMI-535	MILK	Feb, 1997	Sr-90	48.856 ± 1.740	50.300	40.240 - 60.360
SPW-536	WATER	Feb, 1997	H-3	27229.744 ± 452.056	28234.000	22587.200 - 33880.800
SPW-547	WATER	Feb, 1997	Co-60	65.219 ± 8.790	62.950	52.950 - 72.950
SPW-547	WATER	Feb, 1997	Cs-134	52.996 ± 8.000	56.430	46.430 - 66.430
SPW-547	WATER	Feb, 1997	Cs-137	60.419 ± 12.900	52.320	42.320 - 62.320
SPW-600	WATER	Feb, 1997	I-131	72.182 ± 1.009	66.300	53.040 - 79.560
SPW-600	WATER	Feb, 1997	I-131(g)	68.816 ± 14.800	66.300	39.780 - 76.300
SPCH-701	CHARCOAL CANISTER	Feb, 1997	I-131(g)	1.171 ± 0.023	1.080	0.648 - 1.512
SPAP-704	AIR FILTER	Feb, 1997	Gr. Beta	6.302 ± 0.041	5.740	0.000 - 15.740
SPW-838	WATER	Feb, 1997	Ra-226	19.770 ± 0.189	17.300	12.110 - 22.490
SPW-838	WATER	Feb, 1997	Ra-228	36.784 ± 2.571	31.300	21.910 - 40.690
SPW-840	WATER	Feb, 1997	Sr-90	35.822 ± 2.020	33.520	26.816 - 40.224
SPW-841	WATER	Feb, 1997	I-129	15.525 ± 0.854	14.942	2.942 - 26.942
SPW-843	WATER	Feb, 1997	Fe-55	1.418 ± 0.530	1.535	0.000 - 21.535
SPAP-2730	AIR FILTER	Mar, 1997	Cs-137	2.151 ± 0.025	1.900	1.140 - 2.660
SPMI-1670	MILK	Apr, 1997	Cs-134	50.282 ± 8.920	53.600	43.600 - 63.600
SPMI-1670	MILK	Apr, 1997	Cs-137	56.090 ± 14.900	52.100	42.100 - 62.100
SPW-2073	WATER	Apr, 1997	Co-60	54.077 ± 4.280	51.300	41.300 - 61.300
SPW-2073	WATER	Apr, 1997	Cs-134	47.636 ± 4.150	53.200	43.200 - 63.200
SPW-2073	WATER	Apr, 1997	Cs-137	60.688 ± 5.760	52.100	42.100 - 62.100
SPW-2075	WATER	Apr, 1997	Gr. Alpha	34.554 ± 2.677	41.300	20.650 - 61.950
SPW-2075	WATER	Apr, 1997	Gr. Beta	38.729 ± 1.658	41.700	31.700 - 51.700
SPW-2546	WATER	Apr, 1997	H-3	25445.478 ± 428.384	26257.000	21005.600 - 31508.400
SPF-3434	FISH	May, 1997	Cs-134	0.199 ± 0.020	0.222	0.133 - 0.311
SPF-3434	FISH	May, 1997	Cs-137	0.234 ± 0.037	0.227	0.136 - 0.318
SPW-3750	WATER	Jun, 1997	I-131	76.174 ± 0.776	71.800	57.440 - 86.160
SPW-3750	WATER	Jun, 1997	I-131(g)	66.587 ± 8.750	71.800	43.080 - 81.800
SPMI-3752	MILK	Jun, 1997	I-131	79.851 ± 0.833	71.800	57.440 - 86.160
SPMI-3752	MILK	Jun, 1997	I-131(g)	78.887 ± 7.750	71.800	43.080 - 81.800
SPCH-3754	CHARCOAL CANISTER	Jun, 1997	I-131(g)	81.869 ± 0.317	76.600	45.960 - 86.600
SPMI-4216	MILK	Jul, 1997	Cs-134	38.265 ± 5.450	39.500	29.500 - 49.500
SPMI-4216	MILK	Jul, 1997	Cs-137	46.472 ± 10.600	41.500	31.500 - 51.500
SPMI-4216	MILK	Jul, 1997	I-131	75.247 ± 0.831	83.230	66.584 - 99.876
SPMI-4216	MILK	Jul, 1997	I-131(g)	84.872 ± 7.010	83.230	49.938 - 93.230

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Teledyne Results 2s, n=1[b]	Known Activity	Control[c] Limits
SPMI-4216	MILK	Jul, 1997	Sr-90	33.610 ± 1.430	33.210	26.568 - 39.852
SPW-4420	WATER	Jul, 1997	Co-60	26.270 ± 4.360	24.900	14.900 - 34.900
SPW-4420	WATER	Jul, 1997	Cs-134	36.591 ± 5.040	39.540	29.540 - 49.540
SPW-4420	WATER	Jul, 1997	Cs-137	45.552 ± 7.770	41.480	31.480 - 51.480
SPW-4420	WATER	Jul, 1997	I-131(g)	85.221 ± 9.660	83.230	49.938 - 93.230
SPW-4420	WATER	Jul, 1997	Sr-90	36.285 ± 1.629	33.210	26.568 - 39.852
SPMI-4916	MILK	Jul, 1997	Cs-134	38.260 ± 5.450	39.540	29.540 - 49.540
SPMI-4916	MILK	Jul, 1997	Cs-137	46.470 ± 10.600	41.480	31.480 - 51.480
SPMI-4916	MILK	Jul, 1997	I-131(g)	84.870 ± 7.010	83.230	49.938 - 93.230
SPW-5470	WATER	Jul, 1997	Fe-55	4.548 ± 0.640	5.477	0.000 - 25.477
SPW-5472	WATER	Jul, 1997	H-3	41026.000 ± 329.000	41578.000	33262.400 - 49893.600
SPW-5474	WATER	Jul, 1997	Gr. Alpha	49.266 ± 2.081	41.305	20.653 - 61.958
SPW-5474	WATER	Jul, 1997	Gr. Beta	44.450 ± 1.334	41.406	31.406 - 51.406
SPF-5476	FISH	Jul, 1997	Cs-134	0.641 ± 0.030	0.700	0.420 - 0.980
SPF-5476	FISH	Jul, 1997	Cs-137	0.632 ± 0.042	0.527	0.316 - 0.738
SPW-7500	WATER	Oct, 1997	Co-60	30.424 ± 7.530	33.642	23.642 - 43.642
SPW-7500	WATER	Oct, 1997	Cs-134	37.410 ± 6.690	36.086	26.086 - 46.086
SPW-7500	WATER	Oct, 1997	Cs-137	52.845 ± 11.300	41.221	31.221 - 51.221
The Cs-137 spike is suspect. No errors were found in the spectroscopy program and the Cs-134 and Co-60 test results on the same sample were very good. Sample results prepared with the new standard were acceptable and will be reported in the next update of Appendix A.						
SPW-7500	WATER	Oct, 1997	I-131	78.126 ± 1.201	78.302	62.642 - 93.962
SPMI-7505	MILK	Oct, 1997	Cs-134	15.166 ± 3.250	18.043	8.043 - 28.043
SPMI-7505	MILK	Oct, 1997	Cs-137	91.110 ± 8.370	82.440	72.440 - 92.440
SPMI-7505	MILK	Oct, 1997	I-131	73.529 ± 1.253	78.302	62.642 - 93.962
SPMI-7505	MILK	Oct, 1997	I-131(g)	74.613 ± 8.810	78.302	46.981 - 88.302
SPMI-7506	MILK	Oct, 1997	Sr-89	31.281 ± 4.601	39.490	29.490 - 49.490
SPMI-7506	MILK	Oct, 1997	Sr-90	31.545 ± 1.388	32.990	26.392 - 39.588
SPCH-7727	CHARCOAL CANISTER	Oct, 1997	I-131(g)	0.450 ± 0.050	0.440	0.264 - 0.616
SPAP-7730	AIR FILTER	Oct, 1997	Gr. Beta (ss)	3.080 ± 0.030	3.040	1.824 - 4.256
SPF-8485	FISH	Nov, 1997	Cs-134	0.306 ± 0.025	0.318	0.191 - 0.445
SPF-8485	FISH	Nov, 1997	Cs-137	0.738 ± 0.049	0.649	0.389 - 0.909
SPW-9315	WATER	Nov, 1997	Gr. Alpha	51.420 ± 6.385	41.280	20.640 - 61.920
SPW-9315	WATER	Nov, 1997	Gr. Beta	48.938 ± 3.735	43.164	33.164 - 53.164
SPW-9706	WATER	Dec, 1997	Gr. Alpha	40.480 ± 4.598	41.280	20.640 - 61.920
SPW-9853	WATER	Dec, 1997	Co-60	44.900 ± 8.290	42.080	32.080 - 52.080
SPW-9853	WATER	Dec, 1997	Cs-134	40.010 ± 7.010	37.850	27.850 - 47.850

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Teledyne Results 2s, n=1[b]	Known Activity	Control[c] Limits

[a] All results are in pCi/L, except for elemental potassium (K) in milk, which are in mg/L.; air filter samples, which are in pCi/Filter; and food products, which are in mg/kg.

[b] All samples are the results of single determinations.

[c] Control limits are based on Attachment A, page A2 of this report.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, Sawdust is used for the spike matrix.

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Teledyne Results (4.66 Sigma) LLD	Teledyne Results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-845	WATER	Jan 1997	Th-228	<0.9	-0.263 ± 0.560	< 1.000
SPW-845	WATER	Jan 1997	Th-230	<0.2	0.191 ± 0.236	< 1.000
SPW-845	WATER	Jan 1997	Th-232	<0.2	-0.018 ± 0.145	< 1.000
SPMI-533	MILK	Feb 1997	Cs-134	<2.7	-0.531 ± 0.647	< 10.000
SPMI-533	MILK	Feb 1997	Cs-137	<5.5	0.526 ± 3.380	< 10.000
SPW-2	WATER	Feb 1997	Ra-226	<0.1	0.000 ± 0.034	< 1.000
SPMI-533	MILK	Feb 1997	I-131	<0.5	-0.031 ± 0.316	< 0.500
SPMI-533	MILK	Feb 1997	Sr-89	<0.7	-0.994 ± 0.952	< 5.000
SPMI-533	MILK	Feb 1997	Sr-90	N/A	1.695 ± 0.439	< 1.000
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPW-537	WATER	Feb 1997	Co-60	<3.1	0.065 ± 0.179	< 10.000
SPW-537	WATER	Feb 1997	Cs-134	<3.5	0.905 ± 1.100	< 10.000
SPW-537	WATER	Feb 1997	Cs-137	<1.7	-1.430 ± 1.800	< 10.000
SPW-537	WATER	Feb 1997	Gr. Alpha	<0.4	-0.109 ± 0.218	< 1.000
SPW-537	WATER	Feb 1997	Gr. Beta	<0.9	-0.155 ± 0.596	< 3.200
SPW-537	WATER	Feb 1997	I-131	<0.4	-0.275 ± 0.235	< 0.500
SPW-537	WATER	Feb 1997	Sr-89	<0.8	-0.167 ± 0.557	< 5.000
SPW-537	WATER	Feb 1997	Sr-90	<0.5	0.099 ± 0.239	< 1.000
SPW-842	WATER	Feb 1997	Fe-55	<0.7	-0.403 ± 0.374	< 1000.000
SPW-842	WATER	Feb 1997	I-129	<0.9	-0.129 ± 0.442	< 1.500
SPW-842	WATER	Feb 1997	Ra-226	<0.04	0.013 ± 0.026	< 1.000
SPAP-2731	AIR FILTER	Mar 1997	Co-60	<2.5	0.000 ± 0.000	< 10.000
SPAP-2731	AIR FILTER	Mar 1997	Cs-134	<2.6	-0.000 ± 0.000	< 10.000
SPAP-2731	AIR FILTER	Mar 1997	Cs-137	<2.9	0.000 ± 0.001	< 10.000
SPMI-1669	MILK	Apr 1997	Cs-134	<5.5	0.069 ± 0.118	< 10.000
SPMI-1669	MILK	Apr 1997	Cs-137	<3.8	0.717 ± 2.480	< 10.000
SPW-2074	WATER	Apr 1997	Co-60	<3.6	0.857 ± 8.380	< 10.000
SPW-2074	WATER	Apr 1997	Cs-134	<4.7	1.610 ± 10.200	< 10.000
SPW-2074	WATER	Apr 1997	Cs-137	<5.0	1.800 ± 3.200	< 10.000
SPW-2074	WATER	Apr 1997	Gr. Alpha	<0.5	0.119 ± 0.307	< 1.000
SPW-2074	WATER	Apr 1997	Gr. Beta	<1.3	0.464 ± 0.720	< 3.200
SPW-2547	WATER	Apr 1997	H-3	< 150	12.822 ± 75.126	< 200.000
SPW-5	WATER	May 1997	Ra-226	<0.03	-0.053 ± 0.025	< 1.000
SPF-3435	FISH	May 1997	Cs-134	<0.015	-0.014 ± 0.002	< 10.000
SPF-3435	FISH	May 1997	Cs-137	<0.016	0.001 ± 0.011	< 10.000
SPW-6	WATER	Jun 1997	Ra-226	<0.04	-0.044 ± 0.027	< 1.000

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Teledyne Results (4.66 Sigma) LLD	Teledyne Results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-3751	WATER	Jun 1997	I-131	<0.3	-0.127 ± 0.145	< 0.500
SPMI-3753	MILK	Jun 1997	I-131	<0.3	0.089 ± 0.167	< 0.500
SPCH-3755	CHARCOAL CANISTER	Jun 1997	I-131(g)	<0.017	0.010 ± 0.009	< 9.600
SPMI-4217	MILK	Jul 1997	Co-60	<4.8	-0.392 ± 1.230	< 10.000
SPMI-4217	MILK	Jul 1997	Cs-134	<3.0	-0.874 ± 1.700	< 10.000
SPMI-4217	MILK	Jul 1997	Cs-137	<5.9	1.600 ± 3.430	< 10.000
SPMI-4217	MILK	Jul 1997	I-131	<0.3	-0.049 ± 0.171	< 0.500
SPW-4421	WATER	Jul 1997	Co-60	<1.9	-4.660 ± 4.750	< 10.000
SPW-4421	WATER	Jul 1997	Cs-134	<4.7	-1.450 ± 3.090	< 10.000
SPW-4421	WATER	Jul 1997	Cs-137	<5.7	0.739 ± 4.550	< 10.000
SPMI-4217	MILK	Jul 1997	Sr-89	<1.5	-0.165 ± 1.901	< 5.000
SPMI-4217	MILK	Jul 1997	Sr-90	N/A	1.677 ± 0.418	< 1.000
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPW-4421	WATER	Jul 1997	Sr-89	<1.7	0.917 ± 1.547	< 5.000
SPW-4421	WATER	Jul 1997	Sr-90	<0.6	0.341 ± 0.332	< 1.000
SPW-5471	WATER	Jul 1997	Fe-55	<733	48.157 ± 448.317	< 1000.000
SPW-5473	WATER	Jul 1997	H-3	<161	22.700 ± 58.200	< 200.000
SPW-5475	WATER	Jul 1997	Gr. Alpha	<0.6	0.170 ± 0.425	< 1.000
SPW-5475	WATER	Jul 1997	Gr. Beta	<0.5	0.173 ± 0.473	< 3.200
SPF-5477	FISH	Jul 1997	Co-60	<0.011	-0.001 ± 0.002	< 10.000
SPF-5477	FISH	Jul 1997	Cs-134	<0.015	0.005 ± 0.008	< 10.000
SPF-5477	FISH	Jul 1997	Cs-137	<0.018	0.006 ± 0.010	< 10.000
SPW-7501	WATER	Oct 1997	I-131	<0.4	0.010 ± 0.009	< 0.500
SPW-7504	WATER	Oct 1997	Sr-89	<1.1	-0.650 ± 0.800	< 5.000
SPW-7504	WATER	Oct 1997	Sr-90	<0.4	0.150 ± 0.210	< 1.000
SPMI-7507	MILK	Oct 1997	Co-60	<6.2	-1.190 ± 1.620	< 10.000
SPMI-7507	MILK	Oct 1997	Cs-134	<4.9	1.710 ± 1.950	< 10.000
SPMI-7507	MILK	Oct 1997	Cs-137	<6.5	-0.232 ± 3.740	< 10.000
SPMI-7507	MILK	Oct 1997	I-131	<0.3	-0.022 ± 0.157	< 0.500
SPMI-7507	MILK	Oct 1997	Sr-89	<1.0	0.862 ± 1.107	< 5.000
SPMI-7507	MILK	Oct 1997	Sr-90	N/A	1.031 ± 0.319	< 1.000
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
RA-W-11	WATER	Dec 1997	Ra-228	<0.7	0.134 ± 0.318	< 1.000
SPW-9852	WATER	Dec 1997	Co-60	<2.4	-1.600 ± 9.460	< 10.000
SPW-9852	WATER	Dec 1997	Cs-134	<5.7	-0.450 ± 2.340	< 10.000

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Teledyne Results (4.66 Sigma) LLD	Teledyne Results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-9852	WATER	Dec 1997	Cs-137	<6.0	2.190 ± 3.550	< 10.000

[a] Liquid sample results are reported in pCi/Liter, air filter sample results are in pCi/filter, charcoal sample results are in pCi/charcoal, and solid sample results are in pCi/kilogram.
[b] The activity reported is the net activity result.

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SW - 42, 43	Jan, 1997	Gr. Beta	3.0753 ± 0.9097	2.5036 ± 0.8819	2.7894 ± 0.6335
MI - 63, 64	Jan, 1997	Co-60	0.8960 ± 2.5500	0.8290 ± 1.4300	0.8625 ± 1.4618
MI - 63, 64	Jan, 1997	Cs-137	0.4480 ± 2.0600	0.7240 ± 1.3800	0.5860 ± 1.2398
MI - 19, 20	Jan, 1997	Co-60	2.7900 ± 2.6200	1.4300 ± 2.4700	2.1100 ± 1.8004
MI - 19, 20	Jan, 1997	Cs-137	-0.8750 ± 2.7600	2.3900 ± 1.9100	0.7575 ± 1.6782
MI - 92, 93	Jan, 1997	I-131	0.0455 ± 0.2124	0.1031 ± 0.2405	0.0743 ± 0.1604
MI - 92, 93	Jan, 1997	K-40	1,466.8000 ± 129.0000	1,417.3000 ± 163.0000	1,442.0500 ± 103.9351
WW - 116, 117	Jan, 1997	I-131	0.1299 ± 0.2579	-0.0824 ± 0.2359	0.0237 ± 0.1747
LW - 146, 147	Jan, 1997	Co-60	-0.1850 ± 0.4500	1.9100 ± 16.9000	0.8625 ± 8.4550
LW - 146, 147	Jan, 1997	Cs-137	-0.8360 ± 2.1600	0.2350 ± 3.4500	-0.3005 ± 2.0352
LW - 146, 147	Jan, 1997	Gr. Beta	6.9782 ± 1.4082	7.8900 ± 1.5599	7.4341 ± 1.0507
LW - 224, 225	Jan, 1997	Co-60	1.8300 ± 4.2500	-1.2200 ± 0.9290	0.3050 ± 2.1752
LW - 224, 225	Jan, 1997	Cs-137	-0.9650 ± 3.4000	1.4500 ± 1.7100	0.2425 ± 1.9029
LW - 224, 225	Jan, 1997	Gr. Beta	6.2889 ± 1.3951	7.3610 ± 1.5370	6.8250 ± 1.0379
WW - 322, 323	Jan, 1997	H-3	-5.4270 ± 80.6586	-14.4721 ± 80.2518	-9.9496 ± 56.8906
CW - 355, 356	Jan, 1997	Gr. Beta	3.1262 ± 1.4281	2.0589 ± 1.4561	2.5926 ± 1.0198
CW - 355, 356	Jan, 1997	Gr. Beta	-0.3849 ± 1.2993	0.4440 ± 1.3725	0.0296 ± 0.9450
CW - 299, 300	Jan, 1997	Gr. Beta	2.4965 ± 1.0877	2.7913 ± 1.4707	2.6439 ± 0.9146
CW - 299, 300	Jan, 1997	Gr. Beta	0.2070 ± 1.3507	0.7394 ± 1.3907	0.4732 ± 0.9715
SW - 441, 442	Jan, 1997	Co-60	-0.2460 ± 1.3100	0.3250 ± 0.3190	0.0395 ± 0.6741
SW - 441, 442	Jan, 1997	Cs-137	0.0619 ± 2.3900	3.0200 ± 2.8400	1.5410 ± 1.8559
SWU - 389, 390	Jan, 1997	Gr. Beta	2.7555 ± 0.5392	2.6585 ± 0.5182	2.7070 ± 0.3739
SWU - 389, 390	Jan, 1997	H-3	158.6398 ± 94.8968	125.0455 ± 93.5661	141.8427 ± 66.6333
MI - 377, 378	Jan, 1997	I-131	0.1482 ± 0.2260	0.0950 ± 0.2541	0.1216 ± 0.1700
MI - 377, 378	Jan, 1997	K-40	1,379.5000 ± 122.0000	1,304.8000 ± 113.0000	1,342.1500 ± 83.1460
MI - 377, 378	Jan, 1997	Sr-89	-0.4172 ± 0.8436	-0.2671 ± 0.7827	-0.3421 ± 0.5754
MI - 377, 378	Jan, 1997	Sr-90	0.9881 ± 0.3785	1.0431 ± 0.3340	1.0156 ± 0.2524
CW - 416, 417	Jan, 1997	Gr. Beta	3.7493 ± 1.2558	4.5363 ± 1.1489	4.1428 ± 0.8510
CW - 416, 417	Jan, 1997	Gr. Beta	0.1479 ± 1.3455	0.6807 ± 1.3926	0.4143 ± 0.9682
PW - 607, 608	Jan, 1997	Co-60	-0.4870 ± 0.6140	0.8310 ± 2.4300	0.1720 ± 1.2532
PW - 607, 608	Jan, 1997	Cs-137	-0.7370 ± 2.6100	0.2580 ± 3.0900	-0.2395 ± 2.0224
PW - 607, 608	Jan, 1997	Gr. Beta	5.7315 ± 1.8872	5.5786 ± 1.7689	5.6550 ± 1.2933
CW - 846, 847	Jan, 1997	Gr. Alpha	0.0484 ± 0.4520	0.6758 ± 0.4786	0.3621 ± 0.3292
CW - 846, 847	Jan, 1997	Gr. Beta	1.3287 ± 0.5381	2.1250 ± 0.5415	1.7268 ± 0.3817
CW - 846, 847	Jan, 1997	H-3	1,518.5023 ± 131.0155	1,631.7608 ± 134.0877	1,575.1316 ± 93.7344
CW - 846, 847	Jan, 1997	Sr-89	0.3800 ± 0.5210	0.7406 ± 0.8976	0.5603 ± 0.5189
CW - 846, 847	Jan, 1997	Sr-90	0.1424 ± 0.2458	0.7292 ± 0.3717	0.4358 ± 0.2228

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
WW - 576, 577	Feb, 1997	H-3	150.9770 ± 84.0813	241.2023 ± 87.8687	196.0897 ± 60.8083
MI - 486, 487	Feb, 1997	I-131	-0.0797 ± 0.1694	-0.1161 ± 0.1703	-0.0979 ± 0.1201
MI - 486, 487	Feb, 1997	K-40	1,278.2000 ± 167.0000	1,316.5000 ± 141.0000	1,297.3500 ± 109.2817
MI - 486, 487	Feb, 1997	Sr-89	-0.8027 ± 0.9962	-0.4554 ± 0.9484	-0.6290 ± 0.6877
MI - 486, 487	Feb, 1997	Sr-90	1.8013 ± 0.4825	1.4892 ± 0.4537	1.6453 ± 0.3312
MI - 510, 511	Feb, 1997	Co-60	0.6890 ± 1.0200	-2.2000 ± 4.1400	-0.7555 ± 2.1319
MI - 510, 511	Feb, 1997	Cs-137	0.7830 ± 2.6300	2.2400 ± 3.2800	1.5115 ± 2.1021
MI - 510, 511	Feb, 1997	I-131	0.0764 ± 0.2227	0.0373 ± 0.2345	0.0568 ± 0.1617
MI - 531, 532	Feb, 1997	I-131	0.0368 ± 0.1942	-0.0045 ± 0.2095	0.0161 ± 0.1429
MI - 531, 532	Feb, 1997	K-40	1,300.3000 ± 178.0000	1,488.5000 ± 156.0000	1,394.4000 ± 118.3427
CW - 554, 555	Feb, 1997	Gr. Beta	3.6552 ± 1.5170	2.7825 ± 1.4922	3.2189 ± 1.0639
CW - 554, 555	Feb, 1997	Gr. Beta	0.5033 ± 1.0364	-0.2368 ± 0.9931	0.1332 ± 0.7177
MI - 632, 633	Feb, 1997	I-131	-0.2709 ± 0.2349	-0.1024 ± 0.1676	-0.1867 ± 0.1443
MI - 632, 633	Feb, 1997	K-40	1,408.0000 ± 165.0000	1,243.1000 ± 145.0000	1,325.5500 ± 109.8294
MI - 723, 724	Feb, 1997	I-131	-0.0581 ± 0.2376	0.2433 ± 0.2658	0.0926 ± 0.1783
MI - 723, 724	Feb, 1997	K-40	1,574.8000 ± 218.0000	1,396.8000 ± 162.0000	1,485.8000 ± 135.8013
LW - 757, 758	Feb, 1997	Gr. Beta	3.7439 ± 0.9482	4.0547 ± 0.9711	3.8993 ± 0.6786
CW - 883, 884	Feb, 1997	Gr. Beta	1.2996 ± 1.2901	2.3358 ± 1.3877	1.8177 ± 0.9474
DW - 1030, 1031	Feb, 1997	Gr. Beta	2.0791 ± 0.4817	2.0596 ± 0.5098	2.0694 ± 0.3507
DW - 1030, 1031	Feb, 1997	I-131	-0.1816 ± 0.3127	-0.1217 ± 0.3071	-0.1517 ± 0.2192
SWU - 929, 930	Feb, 1997	Gr. Beta	2.4729 ± 0.6238	2.9908 ± 0.6691	2.7319 ± 0.4574
SWU - 929, 930	Feb, 1997	H-3	170.1477 ± 84.5878	202.2735 ± 85.9328	186.2106 ± 60.2900
WW - 979, 980	Feb, 1997	H-3	102.1168 ± 92.0531	12.4533 ± 88.3392	57.2850 ± 63.7918
SW - 1370, 1371	Feb, 1997	H-3	50.6979 ± 73.8916	-8.0656 ± 76.2734	21.3161 ± 54.8669
LW - 953, 954	Mar, 1997	Co-60	0.7490 ± 1.7500	-1.3300 ± 3.8800	-0.2905 ± 2.1282
LW - 953, 954	Mar, 1997	Cs-137	-0.3220 ± 2.2800	1.5500 ± 2.7200	0.6140 ± 1.7746
LW - 953, 954	Mar, 1997	Gr. Beta	3.7343 ± 1.0079	4.6558 ± 0.9898	4.1951 ± 0.7063
SW - 1036, 1037	Mar, 1997	Gr. Beta	1.7736 ± 0.7279	2.1268 ± 0.7453	1.9502 ± 0.5209
SW - 1576, 1577	Mar, 1997	H-3	219.6612 ± 84.0956	250.7943 ± 85.3666	235.2277 ± 59.9156
SW - 1576, 1577	Mar, 1997	Sr-89	-0.5258 ± 1.1183	-0.6149 ± 0.9822	-0.5704 ± 0.7442
SW - 1576, 1577	Mar, 1997	Sr-90	0.6723 ± 0.3462	0.7181 ± 0.3074	0.6952 ± 0.2315
MI - 1055, 1056	Mar, 1997	I-131	0.1081 ± 0.1729	0.0400 ± 0.1677	0.0741 ± 0.1204
MI - 1055, 1056	Mar, 1997	K-40	1,452.9000 ± 126.0000	1,530.3000 ± 124.0000	1,491.6000 ± 88.3912
LW - 1120, 1121	Mar, 1997	Gr. Beta	2.5963 ± 0.6078	1.8604 ± 0.6077	2.2283 ± 0.4298
MI - 1158, 1159	Mar, 1997	I-131	0.0239 ± 0.2040	0.0708 ± 0.2015	0.0473 ± 0.1434
MI - 1158, 1159	Mar, 1997	K-40	1,523.5000 ± 152.0000	1,418.5000 ± 157.0000	1,471.0000 ± 109.2623
CW - 1187, 1188	Mar, 1997	Gr. Beta	4.8369 ± 1.9131	3.4999 ± 1.8196	4.1684 ± 1.3201

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
CW - 1187, 1188	Mar, 1997	Gr. Beta	0.1481 ± 1.5087	-0.0888 ± 1.4896	0.0296 ± 1.0601
LW - 1145, 1146	Mar, 1997	Co-60	1.5000 ± 3.3300	3.6600 ± 6.9500	2.5800 ± 3.8533
LW - 1145, 1146	Mar, 1997	Cs-137	1.6200 ± 3.2500	-0.9330 ± 4.1100	0.3435 ± 2.6199
LW - 1145, 1146	Mar, 1997	Gr. Beta	4.2278 ± 1.2135	3.5675 ± 1.2356	3.8976 ± 0.8659
MI - 1275, 1276	Mar, 1997	I-131	-0.0683 ± 0.2309	0.3734 ± 0.4565	0.1525 ± 0.2558
MI - 1275, 1276	Mar, 1997	K-40	1,491.1000 ± 193.0000	1,754.0000 ± 177.0000	1,622.5500 ± 130.9370
WW - 1309, 1310	Mar, 1997	H-3	4,282.8089 ± 188.1304	4,034.4635 ± 183.5207	4,158.6362 ± 131.4086
SWT - 1519, 1520	Mar, 1997	Gr. Beta	2.5242 ± 0.6065	2.0921 ± 0.5846	2.3082 ± 0.4212
WW - 1539, 1540	Mar, 1997	Gr. Beta	1.2878 ± 0.6803	1.8468 ± 0.7043	1.5673 ± 0.4896
WW - 1539, 1540	Mar, 1997	H-3	-34.4755 ± 72.6445	41.3706 ± 76.1590	3.4476 ± 52.6246
DW - 1688, 1689	Mar, 1997	Gr. Beta	4.5141 ± 1.3660	4.6886 ± 1.2681	4.6013 ± 0.9319
DW - 1688, 1689	Mar, 1997	I-131	-0.1688 ± 0.3758	0.3183 ± 0.3363	0.0748 ± 0.2522
SW - 2204, 2205	Mar, 1997	H-3	62.0000 ± 152.0000	112.0000 ± 152.0000	87.0000 ± 107.4802
CW - 1909, 1910	Mar, 1997	H-3	435.8375 ± 96.4774	430.4271 ± 96.2750	433.1323 ± 68.1483
LW - 1931, 1932	Mar, 1997	H-3	168.9801 ± 83.1073	137.7304 ± 81.7913	153.3552 ± 58.3023
CW - 1599, 1600	Mar, 1997	Gr. Beta	3.4372 ± 1.5949	3.4464 ± 1.5289	3.4418 ± 1.1047
CW - 1599, 1600	Mar, 1997	Gr. Beta	1.0978 ± 0.9656	1.0340 ± 0.9528	1.0659 ± 0.6783
AP - 2572, 2573	Mar, 1997	Co-60	-0.0006 ± 0.0102	-0.0002 ± 0.0002	-0.0004 ± 0.0051
AP - 2572, 2573	Mar, 1997	Cs-137	0.0008 ± 0.0007	0.0000 ± 0.0005	0.0004 ± 0.0004
SWU - 2045, 2046	Mar, 1997	Sr-89	-0.0237 ± 0.7179	0.1072 ± 0.6305	0.0417 ± 0.4777
SWU - 2045, 2046	Mar, 1997	Sr-90	0.3676 ± 0.3471	0.1910 ± 0.2933	0.2793 ± 0.2272
MI - 1641, 1642	Apr, 1997	I-131	-0.6675 ± 0.3099	-0.5511 ± 0.3244	-0.6093 ± 0.2243
MI - 1641, 1642	Apr, 1997	K-40	1,556.3000 ± 111.0000	1,393.1000 ± 160.0000	1,474.7000 ± 97.3666
LW - 1763, 1764	Apr, 1997	Gr. Beta	2.3656 ± 0.8258	2.1732 ± 0.8478	2.2694 ± 0.5917
LW - 1763, 1764	Apr, 1997	H-3	97.1488 ± 79.2640	160.3540 ± 82.0162	128.7514 ± 57.0295
AP - 1974, 1975	Apr, 1997	Sr-89	-0.0001 ± 0.0006	-0.0005 ± 0.0015	-0.0003 ± 0.0008
AP - 1974, 1975	Apr, 1997	Sr-90	0.0001 ± 0.0002	0.0001 ± 0.0004	0.0001 ± 0.0002
AP - 1994, 1995	Apr, 1997	Co-60	-0.0003 ± 0.0013	0.0002 ± 0.0007	-0.0000 ± 0.0007
AP - 1994, 1995	Apr, 1997	Cs-134	-0.0001 ± 0.0006	-0.0001 ± 0.0016	-0.0001 ± 0.0008
AP - 1994, 1995	Apr, 1997	Cs-137	-0.0002 ± 0.0005	-0.0001 ± 0.0005	-0.0002 ± 0.0004
AP - 1994, 1995	Apr, 1997	I-131(g)	-0.0001 ± 0.0002	0.0001 ± 0.0002	0.0000 ± 0.0001
AP - 1994, 1995	Apr, 1997	K-40	0.0306 ± 0.0192	0.0114 ± 0.0180	0.0210 ± 0.0132
WW - 1665, 1666	Apr, 1997	I-131	-0.4430 ± 0.2674	-0.0311 ± 0.2626	-0.2370 ± 0.1874
WW - 1708, 1709	Apr, 1997	Gr. Beta	1.2245 ± 0.6161	1.2858 ± 0.6134	1.2551 ± 0.4347
WW - 1785, 1786	Apr, 1997	Gr. Beta	2.9118 ± 2.0703	0.3820 ± 2.1095	1.6469 ± 1.4779
WW - 1785, 1786	Apr, 1997	H-3	-19.0365 ± 73.7753	-74.4153 ± 71.1298	-46.7259 ± 51.2402
WW - 1785, 1786	Apr, 1997	Sr-89	0.6539 ± 0.6546	-0.4951 ± 0.5197	0.0794 ± 0.4179

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a]		
			First Result	Second Result	Averaged Result
WW - 1785, 1786	Apr, 1997	Sr-90	-0.0023 ± 0.2013	0.2468 ± 0.2347	0.1223 ± 0.1546
WW - 1737, 1738	Apr, 1997	Gr. Beta	15.0355 ± 1.5075	15.6924 ± 1.6231	15.3640 ± 1.1076
WW - 1737, 1738	Apr, 1997	H-3	13.8405 ± 75.2790	-5.1902 ± 74.3991	4.3251 ± 52.9201
LW - 2848, 2849	Apr, 1997	Gr. Beta	2.4095 ± 0.6377	1.7316 ± 0.5601	2.0706 ± 0.4244
MI - 1845, 1846	Apr, 1997	Co-60	0.0309 ± 0.0778	-1.8500 ± 22.4000	-0.9096 ± 11.2001
MI - 1845, 1846	Apr, 1997	Cs-134	0.1600 ± 0.1350	0.5860 ± 2.2600	0.3730 ± 1.1320
MI - 1845, 1846	Apr, 1997	Cs-137	0.7580 ± 1.1500	0.6290 ± 2.6700	0.6935 ± 1.4536
MI - 1845, 1846	Apr, 1997	I-131	-0.2586 ± 0.2297	-0.0829 ± 0.2149	-0.1708 ± 0.1573
MI - 1845, 1846	Apr, 1997	I-131(g)	-0.0707 ± 0.2970	-0.7200 ± 3.2700	-0.3954 ± 1.6417
MI - 1845, 1846	Apr, 1997	K-40	1,592.5000 ± 52.5000	1,559.3000 ± 127.0000	1,575.9000 ± 68.7118
MI - 1845, 1846	Apr, 1997	Sr-89	0.2592 ± 1.3259	-0.3095 ± 0.8315	-0.0252 ± 0.7825
MI - 1845, 1846	Apr, 1997	Sr-90	1.3583 ± 0.3573	0.8755 ± 0.2294	1.1169 ± 0.2123
F - 2175, 2176	Apr, 1997	Gr. Alpha	0.0245 ± 0.0359	0.0672 ± 0.0377	0.0458 ± 0.0260
F - 2175, 2176	Apr, 1997	Gr. Beta	2.3387 ± 0.2713	1.7003 ± 0.3684	2.0195 ± 0.2288
F - 2175, 2176	Apr, 1997	K-40	2.5383 ± 0.3610	2.5345 ± 0.3640	2.5364 ± 0.2563
F - 2175, 2176	Apr, 1997	Sr-89	0.0003 ± 0.0053	0.0021 ± 0.0048	0.0012 ± 0.0036
F - 2175, 2176	Apr, 1997	Sr-90	-0.0002 ± 0.0018	-0.0003 ± 0.0016	-0.0002 ± 0.0012
SWU - 2091, 2092	Apr, 1997	Gr. Beta	3.3295 ± 0.6698	2.7374 ± 0.6670	3.0334 ± 0.4726
SWU - 2091, 2092	Apr, 1997	H-3	42.6019 ± 76.2782	46.1034 ± 76.4388	44.3526 ± 53.9936
SWU - 2636, 2637	Apr, 1997	H-3	17.9011 ± 75.4236	92.3927 ± 78.7712	55.1469 ± 54.5290
SL - 2432, 2433	Apr, 1997	K-40	1.8447 ± 0.4400	1.6811 ± 0.5400	1.7629 ± 0.3483
WW - 2462, 2463	Apr, 1997	Co-60	-0.5320 ± 0.7550	0.4650 ± 0.7810	-0.0335 ± 0.5431
WW - 2462, 2463	Apr, 1997	Cs-137	0.6250 ± 3.6500	-1.4600 ± 3.4400	-0.4175 ± 2.5078
WW - 2462, 2463	Apr, 1997	H-3	19.6154 ± 75.4335	-21.9230 ± 73.5027	-1.1538 ± 52.6613
F - 2412, 2413	Apr, 1997	K-40	3.0009 ± 0.1660	3.0594 ± 0.1470	3.0302 ± 0.1109
LW - 2550, 2551	Apr, 1997	Gr. Beta	2.0074 ± 0.8317	3.6936 ± 0.8973	2.8505 ± 0.6117
LW - 2550, 2551	Apr, 1997	K-40	102.7800 ± 55.6000	96.6520 ± 54.9000	99.7160 ± 39.0684
SP - 2806, 2807	Apr, 1997	Gr. Alpha	0.0245 ± 0.3861	0.1365 ± 0.3720	0.0805 ± 0.2681
SP - 2806, 2807	Apr, 1997	Sr-89	-1.4194 ± 6.8147	-5.6447 ± 8.6109	-3.5321 ± 5.4906
SP - 2806, 2807	Apr, 1997	Sr-90	2.6542 ± 2.3158	7.1752 ± 2.9780	4.9147 ± 1.8862
PW - 2736, 2737	Apr, 1997	Co-60	0.1300 ± 4.6800	-0.6250 ± 9.8400	-0.2475 ± 5.4481
PW - 2736, 2737	Apr, 1997	Cs-137	-0.2740 ± 4.2100	1.7400 ± 3.3400	0.7330 ± 2.6870
PW - 2736, 2737	Apr, 1997	Gr. Beta	2.8037 ± 1.5036	2.6658 ± 1.4461	2.7348 ± 1.0431
WW - 2712, 2713	Apr, 1997	H-3	1,482.0205 ± 125.6515	1,596.1107 ± 128.7524	1,539.0656 ± 89.9520
SW - 2657, 2658	May, 1997	Gr. Beta	13.2739 ± 1.3358	13.1663 ± 1.2719	13.2201 ± 0.9222
SO - 2677, 2678	May, 1997	Cs-137	0.1078 ± 0.1000	0.2315 ± 0.0507	0.1697 ± 0.0561
SO - 2677, 2678	May, 1997	Gr. Alpha	5.5187 ± 3.4094	8.3190 ± 4.0540	6.9189 ± 2.6486

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SO - 2677, 2678	May, 1997	Gr. Beta	21.9926 ± 2.7808	21.8461 ± 3.0806	21.9193 ± 2.0750
SO - 2677, 2678	May, 1997	Sr-89	0.0075 ± 0.0954	-0.0008 ± 0.0808	0.0034 ± 0.0625
SO - 2677, 2678	May, 1997	Sr-90	0.0713 ± 0.0197	0.0642 ± 0.0164	0.0677 ± 0.0128
MI - 2764, 2765	May, 1997	Co-60	0.0636 ± 0.0966	-1.5300 ± 7.2300	-0.7332 ± 3.6153
MI - 2764, 2765	May, 1997	Cs-137	5.5000 ± 5.2800	1.7700 ± 4.9900	3.6350 ± 3.6324
MI - 2764, 2765	May, 1997	I-131	-0.1635 ± 0.1612	-0.0766 ± 0.1452	-0.1201 ± 0.1085
MI - 2828, 2829	May, 1997	I-131	-0.0153 ± 0.2503	-0.0855 ± 0.2257	-0.0504 ± 0.1685
MI - 2828, 2829	May, 1997	K-40	1,786.4000 ± 126.0000	1,897.0000 ± 192.0000	1,841.7000 ± 114.8260
G - 2879, 2880	May, 1997	Co-60	0.0044 ± 0.1100	-0.0207 ± 0.2030	-0.0081 ± 0.1154
G - 2879, 2880	May, 1997	Cs-134	0.0081 ± 0.0305	-0.0030 ± 0.0133	0.0025 ± 0.0166
G - 2879, 2880	May, 1997	Cs-137	0.0006 ± 0.0234	0.0013 ± 0.0166	0.0010 ± 0.0143
G - 2879, 2880	May, 1997	Gr. Beta	6.4712 ± 0.2029	6.6206 ± 0.1927	6.5459 ± 0.1399
G - 2879, 2880	May, 1997	I-131(g)	0.0093 ± 0.0456	0.0220 ± 0.6620	0.0157 ± 0.3318
G - 2879, 2880	May, 1997	K-40	6.2539 ± 0.8340	5.7979 ± 0.7160	6.0259 ± 0.5496
SO - 2904, 2905	May, 1997	Co-60	-0.0097 ± 0.0201	-0.0021 ± 0.0224	-0.0059 ± 0.0150
SO - 2904, 2905	May, 1997	Cs-134	0.0348 ± 0.0682	0.0208 ± 0.1500	0.0278 ± 0.0824
SO - 2904, 2905	May, 1997	Cs-137	0.2709 ± 0.0541	0.2768 ± 0.0463	0.2738 ± 0.0356
SO - 2904, 2905	May, 1997	Gr. Beta	24.4695 ± 2.3915	26.5459 ± 2.5962	25.5077 ± 1.7649
SO - 2904, 2905	May, 1997	K-40	18.8100 ± 1.0100	19.1610 ± 0.8920	18.9855 ± 0.6738
F - 2926, 2927	May, 1997	Co-60	0.0071 ± 0.0082	-0.0010 ± 0.0015	0.0031 ± 0.0042
F - 2926, 2927	May, 1997	Cs-137	-0.0047 ± 0.0122	-0.0029 ± 0.0088	-0.0038 ± 0.0075
SW - 3008, 3009	May, 1997	H-3	101.2957 ± 91.5729	123.2634 ± 92.4471	112.2795 ± 65.0616
MI - 3050, 3051	May, 1997	Sr-89	-0.1527 ± 0.9022	0.0234 ± 0.8795	-0.0646 ± 0.6300
MI - 3050, 3051	May, 1997	Sr-90	0.9779 ± 0.3707	0.9427 ± 0.3596	0.9603 ± 0.2583
F - 3070, 3071	May, 1997	Co-60	-0.0093 ± 0.0979	0.0094 ± 0.0303	0.0000 ± 0.0512
F - 3070, 3071	May, 1997	Cs-137	0.0064 ± 0.0113	-0.0003 ± 0.0078	0.0030 ± 0.0069
G - 3090, 3091	May, 1997	K-40	5.0649 ± 0.2170	4.9752 ± 0.2830	5.0201 ± 0.1783
MI - 3116, 3117	May, 1997	I-131	-0.1346 ± 0.1762	-0.0964 ± 0.1650	-0.1155 ± 0.1207
F - 3277, 3278	May, 1997	Gr. Beta	2.9487 ± 0.1093	3.0022 ± 0.1035	2.9755 ± 0.0753
F - 3277, 3278	May, 1997	K-40	2.8485 ± 0.2780	2.4647 ± 0.3130	2.6566 ± 0.2093
MI - 3232, 3233	May, 1997	I-131	-0.1723 ± 0.2021	-0.2680 ± 0.2044	-0.2202 ± 0.1437
MI - 3232, 3233	May, 1997	K-40	1,550.6000 ± 121.0000	1,517.9000 ± 141.0000	1,534.2500 ± 92.9005
BS - 3311, 3312	May, 1997	Co-60	-0.0035 ± 0.0348	-0.0044 ± 0.0031	-0.0039 ± 0.0175
BS - 3311, 3312	May, 1997	Cs-137	0.0676 ± 0.0334	0.0677 ± 0.0297	0.0676 ± 0.0223
F - 3484, 3485	May, 1997	K-40	2.4582 ± 0.3320	1.8380 ± 0.2990	2.1481 ± 0.2234
SW - 3533, 3534	May, 1997	H-3	-95.4129 ± 90.4309	-117.7172 ± 89.5093	-106.5650 ± 63.6193
WW - 3395, 3396	May, 1997	I-131	-0.1507 ± 0.1841	-0.0473 ± 0.2108	-0.0990 ± 0.1399

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
F - 3720, 3721	May, 1997	K-40	2.6063 ± 0.4030	2.6623 ± 0.3390	2.6343 ± 0.2633
LW - 3464, 3465	May, 1997	Co-60	-0.2860 ± 1.2700	-0.0583 ± 0.0489	-0.1722 ± 0.6355
LW - 3464, 3465	May, 1997	Cs-137	2.4600 ± 2.8100	1.5000 ± 3.2400	1.9800 ± 2.1444
LW - 3464, 3465	May, 1997	Gr. Beta	3.3532 ± 0.9801	3.7723 ± 0.9839	3.5628 ± 0.6944
SW - 3883, 3884	May, 1997	H-3	-20.5031 ± 87.7694	124.8827 ± 93.7412	52.1898 ± 64.2084
MI - 3513, 3514	Jun, 1997	I-131	-0.1592 ± 0.1592	-0.1028 ± 0.1714	-0.1310 ± 0.1170
MI - 3513, 3514	Jun, 1997	K-40	1,560.3000 ± 129.0000	1,521.9000 ± 179.0000	1,541.1000 ± 110.3200
P - 3794, 3795	Jun, 1997	H-3	109.9207 ± 93.1034	24.2198 ± 89.6079	67.0702 ± 64.6100
F - 4049, 4050	Jun, 1997	K-40	2.8350 ± 0.3980	3.0237 ± 0.2420	2.9294 ± 0.2329
MI - 3903, 3904	Jun, 1997	I-131	0.1550 ± 0.1840	-0.1290 ± 0.1587	0.0130 ± 0.1215
MI - 3903, 3904	Jun, 1997	K-40	2,020.1000 ± 142.0000	1,822.5000 ± 188.0000	1,921.3000 ± 117.8007
VE - 3839, 3840	Jun, 1997	Gr. Alpha	0.2489 ± 0.0857	0.1876 ± 0.0698	0.2183 ± 0.0553
VE - 3839, 3840	Jun, 1997	Gr. Beta	4.4859 ± 0.4451	4.1281 ± 0.4123	4.3070 ± 0.3034
VE - 3839, 3840	Jun, 1997	K-40	5.4016 ± 0.3360	4.6783 ± 0.4282	5.0400 ± 0.2721
F - 3928, 3929	Jun, 1997	Co-60	-0.0025 ± 0.0121	0.0045 ± 0.0034	0.0010 ± 0.0063
F - 3928, 3929	Jun, 1997	Cs-134	0.0050 ± 0.0115	-0.0030 ± 0.0114	0.0010 ± 0.0081
F - 3928, 3929	Jun, 1997	Cs-137	0.0841 ± 0.0225	0.0796 ± 0.0286	0.0818 ± 0.0182
F - 3928, 3929	Jun, 1997	Gr. Beta	2.7146 ± 0.0950	2.6357 ± 0.0977	2.6752 ± 0.0681
F - 3928, 3929	Jun, 1997	I-131(g)	0.0206 ± 0.0449	0.0158 ± 0.0458	0.0182 ± 0.0321
F - 3928, 3929	Jun, 1997	K-40	1.8883 ± 0.3970	1.4854 ± 0.3780	1.6869 ± 0.2741
SWU - 3980, 3981	Jun, 1997	Gr. Beta	2.1443 ± 0.6206	2.3149 ± 0.6407	2.2296 ± 0.4460
SWU - 3980, 3981	Jun, 1997	H-3	221.0233 ± 89.9165	105.6271 ± 85.0852	163.3252 ± 61.8960
CW - 3948, 3949	Jun, 1997	Gr. Beta	-0.4402 ± 1.0747	-0.3764 ± 1.1259	-0.4083 ± 0.7782
SW - 4150, 4151	Jun, 1997	H-3	30.4430 ± 77.1886	56.0152 ± 78.3895	43.2291 ± 55.0068
MI - 4091, 4092	Jun, 1997	I-131	-0.0475 ± 0.1439	-0.0071 ± 0.1516	-0.0273 ± 0.1045
SWT - 4240, 4241	Jun, 1997	Gr. Beta	2.1204 ± 0.6338	2.8553 ± 0.6330	2.4879 ± 0.4479
SW - 5186, 5187	Jun, 1997	H-3	190.3311 ± 89.7491	192.1730 ± 89.8246	191.2521 ± 63.4889
DW - 4280, 4281	Jun, 1997	Gr. Alpha	-0.4934 ± 0.7635	-0.4930 ± 0.7640	-0.4932 ± 0.5401
DW - 4280, 4281	Jun, 1997	Gr. Beta	2.0633 ± 0.8600	2.0630 ± 0.8700	2.0631 ± 0.6117
WW - 4811, 4812	Jun, 1997	H-3	48.4888 ± 83.6998	50.3302 ± 83.7808	49.4095 ± 59.2133
CW - 5207, 5208	Jun, 1997	H-3	151.5810 ± 88.1060	135.0114 ± 87.4113	143.2962 ± 62.0552
SW - 4364, 4365	Jun, 1997	H-3	83.4415 ± 83.9269	94.4046 ± 84.4029	88.9230 ± 59.5138
AP - 4983, 4984	Jun, 1997	Co-60	-0.0002 ± 0.0009	0.0001 ± 0.0007	-0.0000 ± 0.0006
AP - 4983, 4984	Jun, 1997	Cs-137	0.0003 ± 0.0004	-0.0001 ± 0.0007	0.0001 ± 0.0004
AP - 5004, 5005	Jun, 1997	Co-60	0.0002 ± 0.0002	0.0003 ± 0.0008	0.0002 ± 0.0004
AP - 5004, 5005	Jun, 1997	Cs-137	-0.0002 ± 0.0004	0.0002 ± 0.0006	-0.0000 ± 0.0004
DW - 4484, 4485	Jun, 1997	Gr. Beta	2.0708 ± 0.6272	1.9172 ± 0.5805	1.9940 ± 0.4273

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
DW - 4484, 4485	Jun, 1997	H-3	39.2579 ± 83.2425	66.8612 ± 84.4541	53.0596 ± 59.2913
SW - 4460, 4461	Jul, 1997	Gr. Beta	1.8471 ± 0.7685	2.2801 ± 0.7788	2.0636 ± 0.5471
DW - 4510, 4511	Jul, 1997	H-3	1.2216 ± 80.7150	21.3772 ± 81.6249	11.2994 ± 57.3967
AP - 4917, 4918	Jul, 1997	Co-60	0.0002 ± 0.0003	0.0002 ± 0.0006	0.0002 ± 0.0003
AP - 4917, 4918	Jul, 1997	Cs-134	0.0002 ± 0.0003	0.0002 ± 0.0052	0.0002 ± 0.0026
AP - 4917, 4918	Jul, 1997	Cs-137	0.0005 ± 0.0004	0.0002 ± 0.0004	0.0003 ± 0.0003
AP - 4917, 4918	Jul, 1997	I-131(g)	-0.0009 ± 0.0017	0.0022 ± 0.0762	0.0006 ± 0.0381
AP - 4917, 4918	Jul, 1997	K-40	0.0239 ± 0.0081	0.0305 ± 0.0086	0.0272 ± 0.0059
SP - 5024, 5025	Jul, 1997	Gr. Alpha	0.4224 ± 0.9602	1.7836 ± 1.2429	1.1030 ± 0.7853
SP - 5024, 5025	Jul, 1997	Sr-90	65.8931 ± 7.2660	61.7118 ± 6.1959	63.8024 ± 4.7745
BS - 4573, 4574	Jul, 1997	K-40	11.9570 ± 0.5550	12.0610 ± 0.5170	12.0090 ± 0.3792
WW - 4535, 4536	Jul, 1997	Co-60	-0.0955 ± 0.4620	1.0800 ± 1.5100	0.4923 ± 0.7895
WW - 4535, 4536	Jul, 1997	Cs-137	-0.7200 ± 2.3500	0.1650 ± 3.3100	-0.2775 ± 2.0297
WW - 4535, 4536	Jul, 1997	H-3	565.2121 ± 103.8753	524.7523 ± 102.4326	544.9822 ± 72.9426
G - 4745, 4746	Jul, 1997	Co-60	-0.0147 ± 0.1270	-0.0016 ± 0.0036	-0.0082 ± 0.0635
G - 4745, 4746	Jul, 1997	Cs-134	0.0055 ± 0.0386	-0.0118 ± 0.0963	-0.0032 ± 0.0519
G - 4745, 4746	Jul, 1997	Cs-137	0.0057 ± 0.0186	0.0132 ± 0.0180	0.0095 ± 0.0129
G - 4745, 4746	Jul, 1997	Gr. Beta	5.0148 ± 0.1659	4.7792 ± 0.1700	4.8970 ± 0.1188
G - 4745, 4746	Jul, 1997	I-131(g)	0.0040 ± 0.0078	0.0104 ± 0.0269	0.0072 ± 0.0140
G - 4745, 4746	Jul, 1997	K-40	4.5596 ± 0.5840	4.1530 ± 0.6150	4.3563 ± 0.4241
SWU - 4832, 4833	Jul, 1997	Gr. Beta	2.7683 ± 0.6756	3.4254 ± 0.6591	3.0968 ± 0.4719
LW - 4782, 4783	Jul, 1997	Co-60	2.8200 ± 20.3000	-1.9900 ± 6.6500	0.4150 ± 10.6807
LW - 4782, 4783	Jul, 1997	Cs-137	0.6730 ± 3.2000	-0.6030 ± 2.2500	0.0350 ± 1.9559
LW - 4782, 4783	Jul, 1997	Gr Beta	4.0046 ± 1.0458	3.5274 ± 0.9990	3.7660 ± 0.7232
MI - 4897, 4898	Jul, 1997	I-131	-0.0412 ± 0.2182	0.0463 ± 0.2335	0.0026 ± 0.1598
MI - 4897, 4898	Jul, 1997	K-40	1,531.3000 ± 123.0000	1,270.5000 ± 152.0000	1,400.9000 ± 97.7663
CW - 5150, 5151	Jul, 1997	Gr. Beta	4.7218 ± 1.5818	4.2648 ± 1.6666	4.4933 ± 1.1488
CW - 5150, 5151	Jul, 1997	Gr. Beta	-0.2253 ± 1.0995	0.5464 ± 1.2464	0.1605 ± 0.8310
G - 5296, 5297	Jul, 1997	K-40	6.8000 ± 0.6000	8.2000 ± 0.8000	7.5000 ± 0.5000
WW - 5369, 5370	Jul, 1997	H-3	18,013.8557 ± 373.4409	18,133.8988 ± 374.6263	18,073.8773 ± 264.4820
CW - 5321, 5322	Jul, 1997	Gr. Beta	1.5612 ± 1.4170	1.3507 ± 1.2764	1.4560 ± 0.9535
CW - 5321, 5322	Jul, 1997	Gr. Beta	-0.6334 ± 1.0849	0.5162 ± 1.2191	-0.0586 ± 0.8160
WW - 5348, 5349	Jul, 1997	H-3	1,763.0308 ± 139.9964	1,813.1908 ± 141.3214	1,788.1108 ± 99.4620
MI - 5464, 5465	Jul, 1997	I-131	-0.2555 ± 0.2878	-0.3511 ± 0.2946	-0.3033 ± 0.2059
MI - 5464, 5465	Jul, 1997	K-40	1,282.9000 ± 143.0000	1,380.0000 ± 124.0000	1,331.4500 ± 94.6375
VE - 5506, 5507	Jul, 1997	Gr. Beta	7.2756 ± 0.2197	7.0057 ± 0.2090	7.1407 ± 0.1516
VE - 5506, 5507	Jul, 1997	K-40	8.1566 ± 0.3970	8.1817 ± 0.4360	8.1692 ± 0.2948

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a]		
			First Result	Second Result	Averaged Result
WW - 5848, 5849	Jul, 1997	H-3	51.6431 ± 83.4870	40.4434 ± 82.9847	46.0433 ± 58.8569
WW - 5529, 5530	Aug, 1997	Gr. Beta	5.1545 ± 2.1632	4.3564 ± 1.9691	4.7555 ± 1.4626
WW - 5529, 5530	Aug, 1997	H-3	235.5502 ± 91.5917	372.4741 ± 97.6610	304.0122 ± 66.9453
MI - 5606, 5607	Aug, 1997	I-131	-0.0759 ± 0.3043	-0.1020 ± 0.3423	-0.0889 ± 0.2290
SL - 5563, 5564	Aug, 1997	Gr. Beta	1.9301 ± 0.2206	2.0961 ± 0.2125	2.0131 ± 0.1531
SL - 5563, 5564	Aug, 1997	K-40	1.1254 ± 0.3530	1.3185 ± 0.4050	1.2220 ± 0.2686
SL - 5563, 5564	Aug, 1997	Sr-89	-0.0078 ± 0.0216	0.0096 ± 0.0196	0.0009 ± 0.0146
SL - 5563, 5564	Aug, 1997	Sr-90	0.0097 ± 0.0059	0.0031 ± 0.0048	0.0064 ± 0.0038
SW - 5584, 5585	Aug, 1997	Gr. Beta	2.9875 ± 0.7744	2.0205 ± 1.0326	2.5040 ± 0.6454
LW - 5678, 5679	Aug, 1997	Co-60	0.4180 ± 1.2900	0.7270 ± 1.4500	0.5725 ± 0.9704
LW - 5678, 5679	Aug, 1997	Cs-134	0.8140 ± 0.6510	0.8340 ± 0.4840	0.8240 ± 0.4056
LW - 5678, 5679	Aug, 1997	Cs-137	1.1400 ± 1.1800	0.7750 ± 1.1900	0.9575 ± 0.8379
LW - 5678, 5679	Aug, 1997	Gr. Beta	2.6926 ± 0.6727	2.4242 ± 0.6023	2.5584 ± 0.4515
LW - 5678, 5679	Aug, 1997	I-131	-0.1036 ± 0.3234	-0.0921 ± 0.3371	-0.0979 ± 0.2336
LW - 5678, 5679	Aug, 1997	I-131(g)	-10.1000 ± 11.1000	-3.6000 ± 5.8200	-6.8500 ± 6.2666
LW - 5678, 5679	Aug, 1997	K-40	137.0000 ± 16.5000	124.0000 ± 17.3000	130.5000 ± 11.9535
G - 5653, 5654	Aug, 1997	K-40	6.0419 ± 0.5940	5.5554 ± 0.5870	5.7987 ± 0.4176
CW - 5759, 5760	Aug, 1997	Gr. Beta	4.3051 ± 1.5501	2.0048 ± 1.4570	3.1550 ± 1.0637
CW - 5759, 5760	Aug, 1997	Gr. Beta	-0.5860 ± 1.1030	-0.0177 ± 1.1407	-0.3018 ± 0.7934
CW - 5708, 5709	Aug, 1997	Gr. Beta	1.7190 ± 1.4125	1.8843 ± 1.4139	1.8017 ± 0.9993
MI - 5891, 5892	Aug, 1997	I-131	0.0000 ± 0.2400	0.1928 ± 0.2253	0.0964 ± 0.1646
MI - 5891, 5892	Aug, 1997	K-40	1,438.6000 ± 131.0000	1,218.6000 ± 175.0000	1,328.6000 ± 109.3000
MI - 5926, 5927	Aug, 1997	I-131	-0.0311 ± 0.1690	-0.1446 ± 0.1748	-0.0879 ± 0.1216
MI - 5926, 5927	Aug, 1997	K-40	1,577.8000 ± 216.0000	1,429.9000 ± 178.0000	1,503.8500 ± 139.9464
SWU - 5972, 5973	Aug, 1997	H-3	274.7574 ± 93.6817	157.2707 ± 88.8812	216.0140 ± 64.5681
CW - 6013, 6014	Aug, 1997	Gr. Beta	4.9801 ± 1.3048	4.5882 ± 1.6114	4.7841 ± 1.0367
CW - 6013, 6014	Aug, 1997	Gr. Beta	-0.5668 ± 1.0528	-0.6145 ± 1.1307	-0.5907 ± 0.7725
SL - 6034, 6035	Aug, 1997	Co-60	0.0183 ± 0.0235	0.0159 ± 0.2550	0.0171 ± 0.1280
SL - 6034, 6035	Aug, 1997	Cs-134	0.0046 ± 0.0136	0.0015 ± 0.0020	0.0030 ± 0.0069
SL - 6034, 6035	Aug, 1997	Cs-137	0.0118 ± 0.0097	0.0175 ± 0.0098	0.0147 ± 0.0069
SL - 6034, 6035	Aug, 1997	Gr. Beta	2.1826 ± 0.1949	1.9837 ± 0.1773	2.0831 ± 0.1317
SL - 6034, 6035	Aug, 1997	I-131(g)	-0.0039 ± 0.0134	0.0013 ± 0.0060	-0.0013 ± 0.0073
SL - 6034, 6035	Aug, 1997	K-40	1.6231 ± 0.2940	1.4676 ± 0.2750	1.5454 ± 0.2013
CW - 6172, 6173	Aug, 1997	Gr. Beta	3.2828 ± 1.0951	3.7336 ± 1.6212	3.5082 ± 0.9782
CW - 6172, 6173	Aug, 1997	Gr. Beta	1.2291 ± 1.3108	0.0271 ± 1.1175	0.6281 ± 0.8612
CW - 6080, 6081	Aug, 1997	Gr. Beta	2.4263 ± 1.5665	4.0378 ± 1.5325	3.2321 ± 1.0957
CW - 6080, 6081	Aug, 1997	Gr. Beta	-0.0198 ± 1.1927	0.9870 ± 1.1701	0.4836 ± 0.8354

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
VE - 6106, 6107	Aug, 1997	Co-60	0.0021 ± 0.0173	0.0019 ± 0.0087	0.0020 ± 0.0097
VE - 6106, 6107	Aug, 1997	Cs-137	0.0017 ± 0.0057	-0.0005 ± 0.0072	0.0006 ± 0.0046
VE - 6149, 6150	Aug, 1997	Co-60	0.0043 ± 0.1740	0.0004 ± 0.0012	0.0024 ± 0.0870
VE - 6149, 6150	Aug, 1997	Cs-137	-0.0026 ± 0.0056	0.0018 ± 0.0060	-0.0004 ± 0.0041
MI - 6203, 6204	Aug, 1997	Co-60	2.3200 ± 83.8000	0.7940 ± 1.9700	1.5570 ± 41.9116
MI - 6203, 6204	Aug, 1997	Cs-137	0.5560 ± 3.0200	1.2900 ± 2.6500	0.9230 ± 2.0089
MI - 6203, 6204	Aug, 1997	I-131	-0.2456 ± 0.3252	-0.1688 ± 0.[illegible]245	-0.2072 ± 0.2297
VE - 6224, 6225	Aug, 1997	Co-60	-0.0042 ± 0.0160	0.00[illegible]78	0.0002 ± 0.0089
VE - 6224, 6225	Aug, 1997	Cs-137	-0.0057 ± 0.0131	0.0[illegible]7	0.0007 ± 0.0070
VE - 6251, 6252	Aug, 1997	Gr. Beta	3.4988 ± 0.1337	3.50[illegible]38	3.4998 ± 0.0946
VE - 6251, 6252	Aug, 1997	K-40	3.8744 ± 0.5410	3.3980 ± 0.6150	3.6362 ± 0.4095
MI - 6335, 6336	Aug, 1997	I-131	0.0196 ± 0.2826	0.0564 ± 0.2698	0.0380 ± 0.1953
MI - 6335, 6336	Aug, 1997	K-40	1,488.7000 ± 128.0000	1,538.6000 ± 116.0000	1,513.6500 ± 86.3713
SL - 6982, 6983	Aug, 1997	Co-60	0.0869 ± 0.0110	0.0888 ± 0.0135	0.0879 ± 0.0087
SL - 6982, 6983	Aug, 1997	Cs-137	0.0826 ± 0.0110	0.0993 ± 0.0165	0.0909 ± 0.0099
SL - 6982, 6983	Aug, 1997	Gr. Beta	-0.7733 ± 0.1093	-0.6988 ± 0.0989	-0.7361 ± 0.0737
WW - 6312, 6313	Aug, 1997	H-3	4,401.6798 ± 200.9023	4,585.7685 ± 204.3507	4,493.7241 ± 143.2837
LW - 6560, 6561	Aug, 1997	Gr. Alpha	0.4838 ± 0.3847	0.7647 ± 0.3421	0.6242 ± 0.2574
LW - 6560, 6561	Aug, 1997	Gr. Beta	1.6502 ± 0.3609	1.6339 ± 0.3320	[illegible]20 ± 0.2452
LW - 6560, 6561	Aug, 1997	H-3	164.1455 ± 90.4249	131.5719 ± 89.0337	147.8587 ± 63.4501
LW - 6520, 6521	Sep, 1997	Gr. Beta	1.9762 ± 0.5715	2.3786 ± 0.6284	2.1774 ± 0.4247
LW - 6520, 6521	Sep, 1997	H-3	104.7304 ± 87.8580	66.4144 ± 86.1708	85.5724 ± 61.5314
CW - 6489, 6490	Sep, 1997	Gr. Beta	0.2448 ± 1.3049	1.9046 ± 1.3290	1.0747 ± 0.9313
G - 6773, 6774	Sep, 1997	K-40	3.7979 ± 0.2420	3.5568 ± 0.3270	3.6774 ± 0.2034
CW - 6796, 6797	Sep, 1997	Gr. Beta	3.3658 ± 1.5585	5.0139 ± 1.1808	4.1899 ± 0.9777
CW - 6796, 6797	Sep, 1997	Gr. Beta	-1.1040 ± 1.0241	-0.7623 ± 1.0723	-0.9332 ± 0.7414
SWU - 7009, 7010	Sep, 1997	Gr. Beta	3.2034 ± 0.6793	3.2645 ± 0.6681	3.2339 ± 0.4764
SWU - 7009, 7010	Sep, 1997	H-3	165.8491 ± 90.5715	150.5986 ± 89.9273	158.2239 ± 63.8164
G - 6820, 6821	Sep, 1997	K-40	4.8113 ± 0.4160	4.7307 ± 0.5360	4.7710 ± 0.3392
MI - 6886, 6887	Sep, 1997	I-131	0.0177 ± 0.1519	0.0180 ± 0.1520	0.0179 ± 0.1074
MI - 6886, 6887	Sep, 1997	K-40	1,241.7000 ± 155.0000	1,062.0000 ± 156.0000	1,151.8500 ± 109.9557
WW - 7031, 7032	Sep, 1997	H-3	-38.0852 ± 81.4466	-19.0426 ± 82.3323	-28.5639 ± 57.9054
CW - 6907, 6908	Sep, 1997	Gr. Beta	3.8333 ± 1.5682	4.5001 ± 1.6814	4.1667 ± 1.1496
CW - 6907, 6908	Sep, 1997	Gr. Beta	-0.0397 ± 1.1726	-0.1621 ± 1.1478	-0.1009 ± 0.8204
F - 7221, 7222	Sep, 1997	K-40	3.0101 ± 0.3970	2.6722 ± 0.4720	2.8412 ± 0.3084
CW - 7177, 7178	Sep, 1997	Gr. Beta	0.5864 ± 0.9867	2.3794 ± 1.4286	1.4829 ± 0.8681
CW - 7177, 7178	Sep, 1997	Gr. Beta	-1.0971 ± 1.0379	-0.1387 ± 1.1507	-0.6179 ± 0.7748

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a]		
			First Result	Second Result	Averaged Result
LW - 7198, 7199	Sep, 1997	Gr. Beta	1.6523 ± 0.6116	2.3619 ± 0.6044	2.0071 ± 0.4299
VE - 7141, 7142	Sep, 1997	Co-60	0.0012 ± 0.0118	-0.0001 ± 0.0004	0.0005 ± 0.0059
VE - 7141, 7142	Sep, 1997	Cs-137	-0.0011 ± 0.0090	0.0081 ± 0.0103	0.0035 ± 0.0068
SWU - 7364, 7365	Sep, 1997	Gr. Beta	2.4372 ± 0.6226	2.7949 ± 0.6153	2.6160 ± 0.4377
SWU - 7364, 7365	Sep, 1997	H-3	245.3799 ± 94.1721	269.0627 ± 95.1596	257.2213 ± 66.9398
WW - 7408, 7409	Sep, 1997	Co-60	0.4170 ± 0.8010	2.0100 ± 6.7100	1.2135 ± 3.3788
WW - 7408, 7409	Sep, 1997	Cs-137	-0.2190 ± 1.6500	0.8220 ± 3.0600	0.3015 ± 1.7383
WW - 7408, 7409	Sep, 1997	H-3	7,907.0011 ± 264.0275	7,543.2790 ± 258.5239	7,725.1400 ± 184.7601
LW - 7765, 7766	Sep, 1997	Gr. Alpha	0.2614 ± 0.4857	0.3882 ± 0.5450	0.3248 ± 0.3650
LW - 7765, 7766	Sep, 1997	Gr. Beta	3.6490 ± 0.5140	2.7232 ± 0.4728	3.1861 ± 0.3492
LW - 7765, 7766	Sep, 1997	H-3	3,168.6312 ± 176.2295	3,030.6146 ± 173.2010	3,099.6229 ± 123.5470
AP - 8208, 8209	Sep, 1997	Co-60	0.0002 ± 0.0004	0.0004 ± 0.0008	0.0003 ± 0.0005
AP - 8208, 8209	Sep, 1997	Cs-137	0.0003 ± 0.0005	-0.0004 ± 0.0006	-0.0000 ± 0.0004
G - 7244, 7245	Oct, 1997	Gr. Beta	9.0000 ± 0.3000	8.4000 ± 0.3000	8.7000 ± 0.2121
G - 7244, 7245	Oct, 1997	K-40	8.8853 ± 0.7960	9.1594 ± 0.7550	9.0224 ± 0.5486
G - 7244, 7245	Oct, 1997	Sr-89	-0.0058 ± 0.0181	-0.0056 ± 0.0097	-0.0057 ± 0.0103
G - 7244, 7245	Oct, 1997	Sr-90	0.0053 ± 0.0052	0.0017 ± 0.0029	0.0035 ± 0.0029
G - 7265, 7266	Oct, 1997	K-40	6.5763 ± 0.5250	6.0640 ± 0.6540	6.3202 ± 0.4193
SW - 7313, 7314	Oct, 1997	Gr. Beta	24.5727 ± 2.0773	21.9706 ± 2.0623	23.2717 ± 1.4636
SW - 7313, 7314	Oct, 1997	K-40	114.6700 ± 41.9000	90.9920 ± 37.6000	102.8310 ± 28.1486
G - 7432, 7433	Oct, 1997	Co-60	0.0073 ± 0.0252	0.0041 ± 0.0059	0.0057 ± 0.0129
G - 7432, 7433	Oct, 1997	Cs-134	0.0057 ± 0.0110	0.0009 ± 0.0010	0.0033 ± 0.0055
G - 7432, 7433	Oct, 1997	Cs-137	0.0863 ± 0.0217	0.0835 ± 0.0247	0.0849 ± 0.0164
G - 7432, 7433	Oct, 1997	Gr. Beta	5.3675 ± 0.2025	5.3318 ± 0.2123	5.3496 ± 0.1467
G - 7432, 7433	Oct, 1997	I-131(g)	-0.0038 ± 0.0069	0.0218 ± 0.4830	0.0090 ± 0.2415
G - 7432, 7433	Oct, 1997	K-40	4.4899 ± 0.4020	4.9632 ± 0.5470	4.7266 ± 0.3394
CW - 7339, 7340	Oct, 1997	Gr. Beta	0.2969 ± 1.2051	-0.2575 ± 0.8630	0.0197 ± 0.7411
AP - 7537, 7538	Oct, 1997	Sr-89	0.0006 ± 0.0008	-0.0001 ± 0.0008	0.0002 ± 0.0006
AP - 7537, 7538	Oct, 1997	Sr-90	-0.0001 ± 0.0003	0.0001 ± 0.0003	0.0000 ± 0.0002
CW - 7560, 7561	Oct, 1997	Gr. Beta	3.7764 ± 1.5088	3.7707 ± 1.5155	3.7735 ± 1.0692
CW - 7560, 7561	Oct, 1997	Gr. Beta	0.4496 ± 1.1864	0.3374 ± 1.2009	0.3935 ± 0.8440
F - 7474, 7475	Oct, 1997	Co-60	-0.0010 ± 0.0016	0.0020 ± 0.0058	0.0005 ± 0.0030
F - 7474, 7475	Oct, 1997	Cs-137	0.0071 ± 0.0064	0.0001 ± 0.0113	0.0036 ± 0.0065
F - 7495, 7496	Oct, 1997	Co-60	0.0025 ± 0.0076	0.0086 ± 0.1430	0.0055 ± 0.0716
F - 7495, 7496	Oct, 1997	Cs-137	0.0078 ± 0.0083	0.0044 ± 0.0056	0.0061 ± 0.0050
F - 7626, 7627	Oct, 1997	K-40	2.2464 ± 0.3120	1.5663 ± 0.3760	1.9064 ± 0.2443
CW - 7669, 7670	Oct, 1997	Gr. Beta	5.7005 ± 1.8448	3.6801 ± 1.7132	4.6903 ± 1.2588

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a]		
			First Result	Second Result	Averaged Result
CW - 7669, 7670	Oct, 1997	Gr. Beta	-0.0304 ± 1.1674	0.1259 ± 1.1344	0.0478 ± 0.8139
WW - 7648, 7649	Oct, 1997	Co-60	38.3320 ± 4.3000	31.7400 ± 3.3600	35.0360 ± 2.7285
WW - 7648, 7649	Oct, 1997	Cs-137	2.8800 ± 2.3000	0.5180 ± 1.9100	1.6990 ± 1.4948
WW - 7648, 7649	Oct, 1997	H-3	241.3364 ± 105.7031	265.5372 ± 106.6226	253.4368 ± 75.0692
MI - 7787, 7788	Oct, 1997	I-131	-0.0456 ± 0.2490	0.0257 ± 0.2696	-0.0099 ± 0.1835
MI - 7787, 7788	Oct, 1997	K-40	1,514.0000 ± 114.0000	1,684.0000 ± 102.0000	1,599.0000 ± 76.4853
SO - 8010, 8011	Oct, 1997	Cs-137	0.3513 ± 0.0712	0.3182 ± 0.0693	0.3347 ± 0.0497
SO - 8010, 8011	Oct, 1997	K-40	22.4300 ± 1.3200	22.0830 ± 1.2900	22.2565 ± 0.9228
SL - 8123, 8124	Oct, 1997	Cs-137	0.0368 ± 0.0335	0.0242 ± 0.0137	0.0305 ± 0.0181
SL - 8123, 8124	Oct, 1997	K-40	2.8000 ± 0.5510	2.5777 ± 0.2960	2.6889 ± 0.3127
F - 7915, 7916	Oct, 1997	Cs-137	0.0072 ± 0.0118	0.0031 ± 0.0085	0.0052 ± 0.0073
MI - 7968, 7969	Oct, 1997	I-131	-0.1451 ± 0.3579	-0.4853 ± 0.3455	-0.3152 ± 0.2487
MI - 7968, 7969	Oct, 1997	K-40	1,324.1000 ± 132.0000	1,313.0000 ± 118.0000	1,318.5500 ± 88.5268
MI - 7968, 7969	Oct, 1997	Sr-90	1.2892 ± 0.4152	1.2892 ± 0.7200	1.2892 ± 0.4156
VE - 7934, 7935	Oct, 1997	Co-60	0.0071 ± 0.1160	-0.0029 ± 0.0139	0.0021 ± 0.0584
VE - 7934, 7935	Oct, 1997	Cs-137	0.0022 ± 0.0110	-0.0041 ± 0.0099	-0.0010 ± 0.0074
SWU - 8946, 8947	Oct, 1997	Gr. Beta	2.9772 ± 0.6530	2.2888 ± 0.5953	2.6330 ± 0.4418
SWU - 8946, 8947	Oct, 1997	H-3	187.7210 ± 97.3682	125.5659 ± 94.9331	156.6435 ± 67.9943
CW - 8230, 8231	Oct, 1997	Gr. Beta	3.6262 ± 1.7126	4.9561 ± 1.7938	4.2911 ± 1.2400
CW - 8230, 8231	Oct, 1997	Gr. Beta	1.7276 ± 0.9533	0.1316 ± 1.1929	0.9296 ± 0.7635
CW - 8100, 8101	Oct, 1997	Gr. Beta	4.1481 ± 1.6095	4.5744 ± 1.5764	4.3612 ± 1.1264
CW - 8100, 8101	Oct, 1997	Gr. Beta	-0.5655 ± 0.8528	0.9791 ± 1.2280	0.2068 ± 0.7475
SS - 8501, 8502	Oct, 1997	Gr. Alpha	7.9580 ± 3.4566	6.5709 ± 3.1487	7.2645 ± 2.3379
SS - 8501, 8502	Oct, 1997	Gr. Beta	19.4568 ± 2.9472	17.6686 ± 2.6664	18.5627 ± 1.9872
SS - 8501, 8502	Oct, 1997	K-40	12.4630 ± 0.4450	13.4420 ± 0.7910	12.9525 ± 0.4538
CW - 8310, 8311	Oct, 1997	Gr. Beta	2.1293 ± 1.4423	2.1830 ± 1.4550	2.1562 ± 1.0243
CW - 8310, 8311	Oct, 1997	Gr. Beta	0.1798 ± 1.1387	-0.0397 ± 1.1504	0.0701 ± 0.8093
CW - 8376, 8377	Oct, 1997	Gr. Beta	4.7932 ± 2.0194	7.3047 ± 1.3637	6.0490 ± 1.2184
CW - 8376, 8377	Oct, 1997	Gr. Beta	0.5653 ± 1.8020	-0.0566 ± 1.7632	0.2544 ± 1.2606
MI - 8442, 8443	Oct, 1997	I-131	-0.0290 ± 0.2689	0.1059 ± 0.2666	0.0384 ± 0.1893
MI - 8442, 8443	Oct, 1997	K-40	1,591.7000 ± 178.0000	1,456.0000 ± 116.0000	1,523.8500 ± 106.2309
SWU - 8543, 8544	Oct, 1997	Gr. Beta	2.2027 ± 0.6193	2.1585 ± 0.6134	2.1806 ± 0.4358
SWU - 8543, 8544	Oct, 1997	H-3	120.4712 ± 87.0152	174.9557 ± 89.2606	147.7134 ± 62.3280
WW - 8473, 8474	Oct, 1997	H-3	-28.9600 ± 77.6404	27.1500 ± 80.2139	-0.9050 ± 55.8174
WW - 8566, 8567	Oct, 1997	Co-60	0.4520 ± 1.7400	0.3400 ± 4.0500	0.3960 ± 2.2040
WW - 8566, 8567	Oct, 1997	Cs-137	1.0300 ± 2.2000	-0.7300 ± 2.8600	0.1500 ± 1.8041
LW - 8608, 8609	Oct, 1997	Gr. Beta	2.8483 ± 0.6660	2.3035 ± 0.6052	2.5759 ± 0.4500

Table A-5. In-house "duplicate" samples.

Lab Codes[b]	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
MI - 8587, 8588	Nov, 1997	I-131	-0.0013 ± 0.1396	0.0109 ± 0.1350	0.0048 ± 0.0971
MI - 8587, 8588	Nov, 1997	K-40	1,441.6000 ± 160.0000	1,499.6000 ± 176.0000	1,470.6000 ± 118.9285
WW - 8654, 8655	Nov, 1997	Gr. Beta	0.6704 ± 0.5213	0.8560 ± 0.5226	0.7632 ± 0.3691
WW - 8654, 8655	Nov, 1997	H-3	131.2268 ± 87.3749	87.6861 ± 85.5477	109.4565 ± 61.1408
CW - 8753, 8754	Nov, 1997	Gr. Beta	5.4805 ± 1.9992	4.3820 ± 2.0409	4.9312 ± 1.4285
CW - 8753, 8754	Nov, 1997	Gr. Beta	0.2821 ± 1.7806	0.1129 ± 1.7701	0.1975 ± 1.2554
F - 9131, 9132	Nov, 1997	Cs-137	0.0576 ± 0.0192	0.0568 ± 0.0171	0.0572 ± 0.0129
F - 9131, 9132	Nov, 1997	Gr. Beta	2.9445 ± 0.0965	3.0473 ± 0.0919	2.9959 ± 0.0666
F - 9131, 9132	Nov, 1997	K-40	2.3452 ± 0.3460	2.4680 ± 0.3260	2.4066 ± 0.2377
CW - 8854, 8855	Nov, 1997	Gr. Beta	5.6208 ± 1.7991	3.5028 ± 1.6326	4.5618 ± 1.2147
CW - 8854, 8855	Nov, 1997	Gr. Beta	0.0000 ± 1.1731	0.6107 ± 1.1604	0.3053 ± 0.8250
WW - 9087, 9088	Nov, 1997	H-3	20.1985 ± 81.0438	73.4489 ± 83.4219	46.8237 ± 58.1535
WW - 9160, 9161	Nov, 1997	Co-60	-0.9580 ± 9.1800	-0.4340 ± 4.2400	-0.6960 ± 5.0559
WW - 9160, 9161	Nov, 1997	Cs-137	-0.1440 ± 2.3300	-0.5270 ± 2.0700	-0.3355 ± 1.5583
SWT - 9341, 9342	Nov, 1997	Gr. Beta	1.4657 ± 0.7780	2.7123 ± 0.8202	2.0890 ± 0.5652
CW - 9410, 9411	Dec, 1997	Gr. Beta	3.2958 ± 1.5674	4.2062 ± 1.5722	3.7510 ± 1.1100
CW - 9410, 9411	Dec, 1997	Gr. Beta	0.6244 ± 1.1948	-0.6229 ± 1.0939	0.0007 ± 0.8099
CW - 9466, 9467	Dec, 1997	Gr. Beta	1.6082 ± 1.6557	2.0375 ± 1.6921	1.8228 ± 1.1837
CW - 9466, 9467	Dec, 1997	Gr. Beta	-0.0563 ± 1.7639	-1.1838 ± 1.6912	-0.6201 ± 1.2218
WW - 9603, 9604	Dec, 1997	Co-60	1.7300 ± 1.7600	-0.6190 ± 0.7560	0.5555 ± 0.9577
WW - 9603, 9604	Dec, 1997	Co-60	1.7300 ± 1.7600	-0.0389 ± 0.3420	0.8456 ± 0.8965
WW - 9603, 9604	Dec, 1997	Cs-137	0.4460 ± 2.0800	0.0557 ± 1.2900	0.2509 ± 1.2238
LW - 9789, 9790	Dec, 1997	Co-60	0.1010 ± 0.1080	0.1510 ± 2.0300	0.1260 ± 1.0164
LW - 9789, 9790	Dec, 1997	Cs-137	1.0000 ± 2.1300	0.9130 ± 2.0300	0.9565 ± 1.4712
LW - 9789, 9790	Dec, 1997	Gr. Beta	5.6924 ± 1.0952	4.5180 ± 0.7757	5.1052 ± 0.6711
CW - 9947, 9948	Dec, 1997	Gr. Beta	0.9320 ± 0.9447	1.5072 ± 0.9762	1.2196 ± 0.6792
AP - 10249, 10250	Dec, 1997	Co-60	0.0000 ± 0.0001	0.0004 ± 0.0016	0.0002 ± 0.0008
AP - 10249, 10250	Dec, 1997	Cs-137	0.0005 ± 0.0008	0.0002 ± 0.0003	0.0004 ± 0.0004

[a] All concentrations are reported in pCi/liter, except solid samples, which are reported in pCi/gram.

[b] Lab codes are comprised of the sample media and the sample numbers. Client codes have been eliminated to protect client anonymity.

Table A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP), comparison of MAPEP and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration[b] Teledyne Results ±Standard Deviation[c]	MAPEP Result[d] 1s, N=1	Control Limits
STW-751	WATER	Sep, 1995	Am-241	1.370 ± 0.120	1.320 ± 0.070	1.056 - 1.584
STW-751	WATER	Sep, 1995	Co-57	91.000 ± 0.950	92.380 ± 0.600	73.904 - 110.856
STW-751	WATER	Sep, 1995	Cs-137	55.000 ± 0.500	58.770 ± 0.730	47.016 - 70.524
STW-751	WATER	Sep, 1995	Mn-54	99.170 ± 1.600	99.080 ± 1.000	79.264 - 118.896
STW-751	WATER	Sep, 1995	Pu-238	1.700 ± 0.040	1.830 ± 0.080	1.464 - 2.196
STW-751	WATER	Sep, 1995	Pu-239	1.380 ± 0.220	1.340 ± 0.060	1.072 - 1.608
STW-751	WATER	Sep, 1995	Sr-90	13.730 ± 0.950	15.690 ± 0.300	12.552 - 18.828
STW-751	WATER	Sep, 1995	U-234	0.630 ± 0.070	0.650 ± 0.050	0.520 - 0.780
STW-751	WATER	Sep, 1995	U-238	0.700 ± 0.020	0.650 ± 0.050	0.520 - 0.780
STSO-776	SOIL	Sep, 1996	Am-241	27.000	28.700 ± 2.830	20.900 - 37.310
STSO-776 - Standard deviation of three determinations was not reported in the Mixed Analyte Performance Evaluation Program Summary .						
STSO-776	SOIL	Sep, 1996	Co-60	879.000	812.000 ± 83.500	568.400 - 1,055.600
STSO-776	SOIL	Sep, 1996	Cs-137	1,716.000	1,531.000 ± 193.420	1,071.700 - 1,990.300
STSO-776	SOIL	Sep, 1996	Pu-238	13.000	15.900 ± 1.770	11.130 - 20.670
STSO-776	SOIL	Sep, 1996	Pu-239/240	18.000	19.700 ± 1.960	13.790 - 25.610
STSO-776	SOIL	Sep, 1996	Sr-90	441.000	536.000 ± 57.110	375.200 - 696.800
STSO-776	SOIL	Sep, 1996	U-234/233	59.000	63.900 ± 7.270	44.730 - 83.070
STSO-776	SOIL	Sep, 1996	U-238	60.000	64.000 ± 6.360	44.800 - 83.200

[a] Results obtained by Teledyne Brown Engineering Environmental Services Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho.

[b] All results are in Bq/kg or Bq/L as requested by the Department of Energy.

[c] Unless otherwise indicated, the TBEESML results are given as the mean ± 1 standard deviations for three determinations.

[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.

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML), comparison of EML and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in Bq/L[b] Teledyne Result[c]	EML Result[d]	Control Limits[e]
STW-755	WATER	Mar, 1996	Am-241	0.800 ± 0.100	0.766 ± 0.013	0.660 - 1.560
STW-755	WATER	Mar, 1996	Co-60	33.600 ± 1.000	32.800 ± 0.580	0.870 - 1.170
STW-755	WATER	Mar, 1996	Cs-137	42.800 ± 1.300	38.300 ± 0.881	0.900 - 1.250
STW-755	WATER	Mar, 1996	Fe-55	109.000 ± 21.700	83.000 ± 3.440	0.270 - 1.620
STW-755	WATER	Mar, 1996	H-3	434.000 ± 34.100	251.000 ± 11.400	0.690 - 1.910
STW-755	WATER	Mar, 1996	Mn-54	41.900 ± 1.400	38.400 ± 1.160	0.880 - 1.210
STW-755	WATER	Mar, 1996	Pu-238	0.900 ± 0.100	0.982 ± 0.074	0.680 - 1.330
STW-755	WATER	Mar, 1996	Pu-239	0.700 ± 0.100	0.772 ± 0.056	0.620 - 1.380
STW-755	WATER	Mar, 1996	Sr-90	2.200 ± 0.700	1.450 ± 0.034	0.730 - 1.650
STW-756	WATER	Mar, 1996	Gr. Alpha	2,180.000 ± 53.500	1,850.000 ± 185.000	0.550 - 1.310
STW-756	WATER	Mar, 1996	Gr. Beta	872.000 ± 27.000	744.000 ± 74.000	0.750 - 1.650
STSO-757	SOIL	Mar, 1996	Am-241	6.230 ± 2.880	3.690 ± 0.454	0.520 - 2.410
STSO-757	SOIL	Mar, 1996	Cs-137	404.000 ± 0.150	359.000 ± 10.000	0.740 - 1.400
STSO-757	SOIL	Mar, 1996	K-40	525.000 ± 23.300	465.000 ± 30.000	0.700 - 1.590
STSO-757	SOIL	Mar, 1996	Pu-238	42.300 ± 1.590	43.000 ± 2.440	0.220 - 1.990
STSO-757	SOIL	Mar, 1996	Pu-239	9.000 ± 0.700	9.230 ± 0.346	0.620 - 1.990
STSO-757	SOIL	Mar, 1996	Sr-90	1,200.000 ± 32.300	1,340.000 ± 113.000	0.580 - 2.960
STSO-757	SOIL	Mar, 1996	Uranium	68.200 ± 2.400	71.700 ± 4.150	0.270 - 1.480
STVE-758	VEGETATION	Mar, 1996	Am-241	6.100 ± 1.300	5.600 ± 0.184	0.580 - 2.860
STVE-758	VEGETATION	Mar, 1996	Cm-244	6.000 ± 1.200	4.440 ± 0.202	0.400 - 1.870
STVE-758	VEGETATION	Mar, 1996	Co-60	65.600 ± 4.000	59.700 ± 0.963	0.640 - 1.490
STVE-758	VEGETATION	Mar, 1996	Cs-137	1,100.000 ± 12.600	944.000 ± 16.200	0.750 - 1.480
STVE-758	VEGETATION	Mar, 1996	K-40	1,190.000 ± 61.600	1,030.000 ± 33.000	0.450 - 1.510
STVE-758	VEGETATION	Mar, 1996	Pu-239	9.200 ± 1.300	9.820 ± 1.220	0.600 - 1.980
STVE-758	VEGETATION	Mar, 1996	Sr-90	1,210.000 ± 32.200	1,300.000 ± 52.400	0.500 - 1.370
STAF-759	AIR FILTER	Mar, 1996	Am-241	0.270 ± 0.040	0.189 ± 0.007	0.620 - 1.930
STAF-759	AIR FILTER	Mar, 1996	Ce-144	23.200 ± 1.020	33.300 ± 3.300	0.610 - 1.310
STAF-759	AIR FILTER	Mar, 1996	Co-57	6.050 ± 0.130	8.900 ± 0.900	0.630 - 1.290
STAF-759	AIR FILTER	Mar, 1996	Co-60	26.500 ± 0.430	29.500 ± 2.900	0.740 - 1.250
STAF-759	AIR FILTER	Mar, 1996	Cs-134	12.900 ± 0.280	14.700 ± 1.460	0.700 - 1.210
STAF-759	AIR FILTER	Mar, 1996	Cs-137	6.200 ± 0.900	6.640 ± 0.700	0.720 - 1.320
STAF-759	AIR FILTER	Mar, 1996	Mn-54	3.270 ± 0.350	3.440 ± 0.380	0.760 - 1.330
STAF-759	AIR FILTER	Mar, 1996	Pu-238	0.080 ± 0.020	0.096 ± 0.002	0.610 - 1.550
STAF-759	AIR FILTER	Mar, 1996	Pu-239	0.090 ± 0.020	0.093 ± 0.003	0.670 - 1.580
STAF-759	AIR FILTER	Mar, 1996	Ru-106	10.200 ± 1.850	11.600 ± 1.440	0.540 - 1.590
STAF-759	AIR FILTER	Mar, 1996	Sb-125	10.100 ± 0.750	9.780 ± 1.030	0.350 - 1.400
STAF-759	AIR FILTER	Mar, 1996	Sr-90	1.070 ± 0.230	1.060 ± 0.037	0.620 - 2.260
STAF-759	AIR FILTER	Mar, 1996	Uranium	0.118 ± 0.020	0.107 ± 0.003	0.790 - 2.880

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML), comparison of EML and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in Bq/L[b] Teledyne Result[c]	EML Result[d]	Control Limits[e]
STAF-760	AIR FILTER	Mar, 1996	Gr. Alpha	2.210 ± 0.050	1.620 ± 0.150	0.820 - 1.580
STAF-760	AIR FILTER	Mar, 1996	Gr. Beta	1.950 ± 0.040	1.770 ± 0.150	0.750 - 1.940
STW-770	WATER	Sep, 1996	Am-241	1.300 ± 0.200	1.080 ± 0.040	0.640 - 1.730
STW-770	WATER	Sep, 1996	Co-60	65.000 ± 2.210	61.100 ± 0.730	0.920 - 1.180
STW-770	WATER	Sep, 1996	Cs-137	96.100 ± 3.010	89.500 ± 1.360	0.900 - 1.280
STW-770	WATER	Sep, 1996	Gr. Alpha	993.000 ± 12.200	1,210.000 ± 121.000	0.500 - 1.290
STW-770	WATER	Sep, 1996	Gr. Beta	579.000 ± 8.070	540.000 ± 54.000	0.600 - 1.640
STW-770	WATER	Sep, 1996	H-3	488.000 ± 34.600	587.000 ± 58.000	0.650 - 1.910
STW-770	WATER	Sep, 1996	Mn-54	65.000 ± 2.960	60.500 ± 0.550	0.870 - 1.220
STW-770	WATER	Sep, 1996	Pu-238	1.320 ± 0.333	1.910 ± 0.070	0.740 - 1.270
An investigation was conducted. No errors in calculations or transcription were noted. The analysis was repeated in duplicate under the observation of the Technical Lead. No discrepancies were noted in the performance of the procedure. The result of the reanalysis was 2.14±0.11 Bq/L. No further action is planned.						
STW-770	WATER	Sep, 1996	Pu-239	0.698 ± 0.247	0.840 ± 0.030	0.780 - 1.420
STW-770	WATER	Sep, 1996	Sr-90	3.600 ± 0.700	2.710 ± 0.240	0.720 - 1.660
STW-770	WATER	Sep, 1996	U-234	0.517 ± 0.196	0.480 ± 0.040	0.770 - 1.530
STW-770	WATER	Sep, 1996	U-238	0.416 ± 0.118	0.480 ± 0.370	0.770 - 1.350
STSO-771	SOIL	Sep, 1996	Am-241	15.600 ± 3.830	13.500 ± 0.510	0.520 - 2.650
STSO-771	SOIL	Sep, 1996	Co-60	4.030 ± 2.500	2.920 ± 0.210	0.500 - 1.500
STSO-771	SOIL	Sep, 1996	Cs-137	1,750.000 ± 24.400	1,550.000 ± 22.200	0.800 - 1.340
STSO-771	SOIL	Sep, 1996	K-40	369.000 ± 59.500	300.000 ± 25.000	0.730 - 1.670
STSO-771	SOIL	Sep, 1996	Pu-238	0.770 ± 0.360	1.130 ± 0.240	0.400 - 1.900
STSO-771	SOIL	Sep, 1996	Pu-239	24.000 ± 1.940	21.800 ± 1.080	0.660 - 1.930
STSO-771	SOIL	Sep, 1996	Sr-90	63.600 ± 3.950	69.900 ± 5.100	0.460 - 2.840
STSO-771	SOIL	Sep, 1996	U-234	37.200 ± 3.750	39.200 ± 2.440	0.380 - 1.260
STSO-771	SOIL	Sep, 1996	U-238	40.800 ± 3.980	41.600 ± 0.610	0.350 - 1.550
STVE-772	VEGETATION	Sep, 1996	Am-241	1.530 ± 0.884	1.230 ± 0.410	0.680 - 2.780
STVE-772	VEGETATION	Sep, 1996	Cm-244	0.612 ± 0.495	0.830 ± 0.120	0.490 - 1.690
STVE-772	VEGETATION	Sep, 1996	Co-60	14.000 ± 4.420	10.900 ± 0.710	0.620 - 1.420
STVE-772	VEGETATION	Sep, 1996	Cs-137	219.000 ± 10.100	190.000 ± 6.680	0.810 - 1.450
STVE-772	VEGETATION	Sep, 1996	K-40	1,160.000 ± 99.400	992.000 ± 29.000	0.790 - 1.500
STVE-772	VEGETATION	Sep, 1996	Sr-90	1,420.000 ± 35.100	1,390.000 ± 12.000	0.480 - 1.290
STAP-773	AIR FILTER	Sep, 1996	Co-57	11.800 ± 0.296	14.800 ± 0.814	0.620 - 1.220
STAP-773	AIR FILTER	Sep, 1996	Co-60	9.230 ± 0.402	8.640 ± 0.431	0.740 - 1.240
STAP-773	AIR FILTER	Sep, 1996	Cs-134	9.620 ± 0.376	10.800 ± 0.392	0.720 - 1.210
STAP-773	AIR FILTER	Sep, 1996	Cs-137	8.720 ± 0.403	8.520 ± 0.366	0.720 - 1.320
STAP-773	AIR FILTER	Sep, 1996	Gr. Alpha	0.731 ± 0.037	1.150 ± 0.110	0.830 - 1.550
An investigation was conducted and a transcription error while calculating the result was discovered. The recalculated value is 1.15±0.01Bq/filter. No further action is planned.						

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML), comparison of EML and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in Bq/L[b] Teledyne Result[c]	EML Result[d]	Control Limits[e]
STAP-773	AIR FILTER	Sep, 1996	Gr. Beta	0.540 ± 0.037	0.500 ± 0.050	0.730 - 1.840
STAP-773	AIR FILTER	Sep, 1996	Mn-54	7.060 ± 0.472	6.350 ± 0.270	0.750 - 1.270
STAP-773	AIR FILTER	Sep, 1996	Ru-106	11.500 ± 3.190	10.800 ± 1.140	0.580 - 1.300
STAP-773	AIR FILTER	Sep, 1996	Sb-125	12.400 ± 0.965	10.800 ± 0.540	0.600 - 1.390
STW-788	WATER	Mar, 1997	Am-241	0.840 ± 0.220	0.837 ± 0.028	0.640 - 1.730
STW-788	WATER	Mar, 1997	Co-60	96.000 ± 3.500	90.850 ± 1.150	0.920 - 1.180
STW-788	WATER	Mar, 1997	Cs-137	77.000 ± 3.500	69.780 ± 1.230	0.900 - 1.280
STW-788	WATER	Mar, 1997	Fe-55	175.500 ± 25.400	235.000 ± 20.000	0.310 - 1.540
STW-788	WATER	Mar, 1997	Gr. Alpha	1,042.600 ± 36.800	1,130.000 ± 10.000	0.500 - 1.290
STW-788	WATER	Mar, 1997	Gr. Beta	591.400 ± 23.300	744.000 ± 10.000	0.600 - 1.640
STW-788	WATER	Mar, 1997	H-3	272.000 ± 29.700	250.300 ± 4.200	0.650 - 1.910
STW-788	WATER	Mar, 1997	Mn-54	23.700 ± 3.400	20.850 ± 0.310	0.870 - 1.220
STW-788	WATER	Mar, 1997	Pu-238	1.400 ± 0.200	1.291 ± 0.063	0.740 - 1.270
STW-788	WATER	Mar, 1997	Pu-239	0.900 ± 0.100	0.850 ± 0.050	0.780 - 1.420
STW-788	WATER	Mar, 1997	Sr-90	25.500 ± 1.700	23.200 ± 1.350	0.720 - 1.660
STW-788	WATER	Mar, 1997	U	1.500 ± 0.200	1.105 ± 0.050	0.350 - 1.420
STSO-790	SOIL	Mar, 1997	Am-241	6.740 ± 3.730	5.680 ± 0.500	0.520 - 2.650
STSO-790	SOIL	Mar, 1997	Co-60	2.010 ± 1.170	1.060 ± 0.120	0.500 - 1.500
The sample size was too small for an accurate measurement. The activity ± error overlap the known value.						
STSO-790	SOIL	Mar, 1997	Cs-137	918.640 ± 8.400	825.500 ± 14.100	0.800 - 1.340
STSO-790	SOIL	Mar, 1997	K-40	359.140 ± 32.100	334.250 ± 7.140	0.730 - 1.670
STSO-790	SOIL	Mar, 1997	Pu-238	0.300 ± 0.200	0.530 ± 0.110	0.400 - 1.900
STSO-790	SOIL	Mar, 1997	Pu-239	132.420 ± 5.170	134.930 ± 17.100	0.660 - 1.930
STSO-790	SOIL	Mar, 1997	Sr-90	38.830 ± 5.770	40.310 ± 0.420	0.460 - 2.840
STSO-790	SOIL	Mar, 1997	U	79.260 ± 3.800	81.270 ± 4.830	0.270 - 1.360
STVE-791	VEGETATION	Mar, 1997	Am-241	1.673 ± 0.688	1.183 ± 0.113	0.680 - 2.780
STVE-791	VEGETATION	Mar, 1997	Cm-244	0.688 ± 0.468	0.900 ± 0.050	0.490 - 1.690
STVE-791	VEGETATION	Mar, 1997	Co-60	16.914 ± 3.580	12.500 ± 0.320	0.620 - 1.420
STVE-791	VEGETATION	Mar, 1997	Cs-137	216.667 ± 9.383	189.250 ± 7.270	0.810 - 1.450
STVE-791	VEGETATION	Mar, 1997	Pu-239	1.771 ± 0.817	1.942 ± 0.222	0.650 - 1.950
STVE-791	VEGETATION	Mar, 1997	Sr-90	361.130 ± 19.715	361.000 ± 43.300	0.480 - 1.290
STAP-792	AIR FILTER	Mar, 1997	Co-57	9.528 ± 0.230	10.810 ± 1.000	0.620 - 1.220
STAP-792	AIR FILTER	Mar, 1997	Co-60	5.325 ± 0.266	5.010 ± 0.300	0.740 - 1.240
STAP-792	AIR FILTER	Mar, 1997	Cs-134	10.767 ± 0.337	10.880 ± 1.000	0.720 - 1.210
STAP-792	AIR FILTER	Mar, 1997	Cs-137	9.116 ± 0.404	8.700 ± 0.800	0.720 - 1.320
STAP-792	AIR FILTER	Mar, 1997	Gr. Alpha	1.199 ± 0.045	0.960 ± 0.050	0.830 - 1.550
STAP-792	AIR FILTER	Mar, 1997	Gr. Beta	0.608 ± 0.024	0.450 ± 0.030	0.730 - 1.840
STAP-792	AIR FILTER	Mar, 1997	Mn-54	8.494 ± 0.429	7.620 ± 0.600	0.750 - 1.270

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML), comparison of EML and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in Bq/L[b] Teledyne Result[c]	EML Result[d]	Control Limits[e]
STAP-792	AIR FILTER	Mar, 1997	Pu-238	0.022 ± 0.016	0.100 ± 0.006	0.620 - 1.460
The cause of the deviation for the transuranic analysis (Pu-238, 239, U) is unknown. A dilution error is suspected.The analysis is being repeated.						
STAP-792	AIR FILTER	Mar, 1997	Pu-239	0.031 ± 0.010	0.119 ± 0.006	0.500 - 1.500
STAP-792	AIR FILTER	Mar, 1997	Sb-125	14.118 ± 1.099	12.330 ± 1.000	0.600 - 1.390
STAP-792	AIR FILTER	Mar, 1997	Sr-90	1.291 ± 0.275	1.450 ± 0.149	0.660 - 2.650
STAP-792	AIR FILTER	Mar, 1997	U	0.150 ± 0.020	0.211 ± 0.008	0.808 - 3.360
STW-805	WATER	Sep, 1997	Co-60	23.630 ± 1.450	23.300 ± 1.200	0.920 - 1.180
STW-805	WATER	Sep, 1997	Cs-134	63.500 ± 2.600	66.000 ± 2.600	0.500 - 1.500
STW-805	WATER	Sep, 1997	Cs-137	34.880 ± 2.430	34.300 ± 1.700	0.900 - 1.280
STW-805	WATER	Sep, 1997	Fe-55	101.730 ± 33.530	115.000 ± 10.000	0.310 - 1.540
STW-805	WATER	Sep, 1997	Gr. Alpha	597.000 ± 12.000	557.000 ± 60.000	0.500 - 1.290
STW-805	WATER	Sep, 1997	Gr. Beta	985.000 ± 13.000	712.000 ± 70.000	0.600 - 1.640
STW-805	WATER	Sep, 1997	H-3	227.600 ± 1.800	115.000 ± 6.000	0.650 - 1.910
The sample was acidic, causing a breakdown of resin in the tritium column. The sample was neutralized to pH 7 and reanalyzed. Results of reanalysis: 116.2±3.6 Bq/L.						
STW-805	WATER	Sep, 1997	Mn-54	38.480 ± 3.230	37.800 ± 1.900	0.870 - 1.220
STW-805	WATER	Sep, 1997	Sr-90	3.460 ± 0.690	2.940 ± 0.180	0.720 - 1.660
STVE-806	VEGETATION	Sep, 1997	Co-60	32.330 ± 5.560	32.400 ± 1.600	0.620 - 1.420
STVE-806	VEGETATION	Sep, 1997	Cs-137	627.330 ± 16.670	624.000 ± 31.000	0.810 - 1.450
STVE-806	VEGETATION	Sep, 1997	K-40	1,091.670 ± 95.180	1,130.000 ± 70.000	0.790 - 1.500
STVE-806	VEGETATION	Sep, 1997	Sr-90	1,335.000 ± 32.000	1,434.000 ± 75.000	0.480 - 1.290
STSO-807	SOIL	Sep, 1997	Cs-137	1,239.440 ± 22.460	810.000 ± 40.000	0.800 - 1.340
The sample size was not standard. The sample was reanalyzed using a different geometry. Results of reanalysis: Cs-137 - 813.1±9.0 Bq/kg; K-40 - 275.9± 34.6 Bq/kg.						
STSO-807	SOIL	Sep, 1997	K-40	478.000 ± 29.000	315.000 ± 70.020	0.730 - 1.670
STSO-807	SOIL	Sep, 1997	Pu-239	10.800 ± 0.400	10.160 ± 0.370	0.660 - 1.930
STSO-807	SOIL	Sep, 1997	Sr-90	31.480 ± 5.560	34.750 ± 1.000	0.460 - 2.840
STSO-807	SOIL	Sep, 1997	U	57.000 ± 1.100	72.900 ± 0.850	0.270 - 1.360
STAP-808	AIR FILTER	Sep, 1997	Gr. Alpha	1.820 ± 0.080	1.490 ± 0.090	0.830 - 1.550
STAP-808	AIR FILTER	Sep, 1997	Gr. Beta	3.250 ± 0.080	3.000 ± 0.140	0.730 - 1.840
STAP-808	AIR FILTER	Sep, 1997	Pu-238	0.230 ± 0.100	0.210 ± 0.007	0.620 - 1.460
STAP-808	AIR FILTER	Sep, 1997	U	0.130 ± 0.100	0.110 ± 0.004	0.800 - 3.360
STAP-809	AIR FILTER	Sep, 1997	Ce-144	16.250 ± 1.670	19.120 ± 0.700	0.500 - 1.500
STAP-809	AIR FILTER	Sep, 1997	Co-57	10.570 ± 0.270	12.640 ± 0.430	0.620 - 1.220
STAP-809	AIR FILTER	Sep, 1997	Co-60	9.820 ± 0.270	10.730 ± 10.900	0.740 - 1.240
STAP-809	AIR FILTER	Sep, 1997	Cs-134	24.700 ± 0.490	28.170 ± 0.730	0.720 - 1.210
STAP-809	AIR FILTER	Sep, 1997	Cs-137	7.240 ± 0.370	7.310 ± 0.250	0.720 - 1.320
STAP-809	AIR FILTER	Sep, 1997	Mn-54	6.800 ± 0.430	6.720 ± 0.270	0.750 - 1.270

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML), comparison of EML and Teledyne's Midwest Laboratory results for various sample media[a].

Lab Code	Sample Type	Date Collected	Analysis	Concentration in Bq/L[b] Teledyne Result[c]	EML Result[d]	Control Limits[e]
STAP-809	AIR FILTER	Sep, 1997	Sb-125	17.980 ± 1.270	16.120 ± 0.790	0.600 - 1.390
STAP-809	AIR FILTER	Sep, 1997	Sr-90	2.830 ± 0.370	2.760 ± 0.100	0.660 - 2.650

[a] The Environmental Measurements Laboratory provides the following nuclear species : Air Filters, Soil, Tissue, Vegetation and Water. Teledyne does not participate in the Tissue program.

[b] Results are reported in Bq/L with the following exceptions: Air Filter results are reported in Bq/Filter, Soil results are reported in Bq/Kg, Vegetation results are reported in Bq/Kg.

[c] Teledyne results are reported as the mean of three determinations±standard deviation.

[d] The EML result listed is the mean of replicate determinations for each nuclide±the standard error of the mean.

[e] The control limits are reported by EML as the ratio of Reported Value / EML Value and are established from percentiles of historic data distributions (1982-1992). The evaluation of this historic data and the development of the control limits is presented in DOE report EML-564.

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 found to be below the lower limit of detection L it is reported as

$$<L$$

where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

3.1 Individual results: $x_1 \pm s_1$
$x_2 \pm s_2$

Reported result: $x \pm s$

where $x = (1/2)(x_1 + x_2)$

$$s = (1/2)\sqrt{s_1^2 + s_2^2}$$

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:

$$\bar{x} = \frac{1}{n} \Sigma x$$

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

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

4.3 If all of the 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 figure following those to be retained is less than 5, the figure is dropped, and the retained figures are kept unchanged. As an example, 11.443 is rounded off to 11.44.

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

APPENDIX C

Effluent Concentration Limits

for Radioactivity in Air and Water

Above Background in Unrestricted Areas

Table C-1. Effluent concentration limits for radioactivity in air and water above natural background in unrestricted areas[a].

Air		Water	
Iodine-131[b]	0.29 pCi/m^3	Strontium-89	8,000 pCi/L
		Strontium-90	500 pCi/L
		Cesium-137	1,000 pCi/L
		Barium-140	8,000 pCi/L
		Iodine-131	1000 pCi/L
		Potassium-40[c]	4,000 pCi/L
		Tritium	1×10^6 pCi/L

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

[b] From 10 CFR 20 but 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 1997 was completed during the third week of September 1997. All milk animals 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 11th 1997 for water use downstream of the DAEC to Cedar Rapids.

There were 147 gardens found in the 1997 Census. This number exceeds the number of gardens found in the 1996 survey by 10. This difference can be attributed to the removal of 47 gardens and the addition of 57 new gardens.

Milk animals locations remained unchanged since the 1995 census. Two of the locations have goats that do not provide samples during the winter months.

The locations of the nearest resident for each sector remained the same. Twenty-two new homes were built or were under construction within three miles of the DAEC, compared to the thirty new homes identified in 1996. Most of the new houses built were located in the sectors between the plant and Cedar Rapids (SSE, and SE) and in Palo (S and SSW). A listing of the newly identified homes is attached.

The Cedar River survey revealed no new withdrawals of river water compared to previous surveys. Irrigation of the strawberry farm in Palo and fishing remain the only food pathway uses of river water between the DAEC and Cedar Rapids.

Several adjustments were made to the MIDAS dose projection model based on the results of this census. They include changes to the location of the nearest gardens for the NNE, ENE, ESE, SE, SSW, SW and WNW sectors.

APPENDIX E

ANNUAI 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 dosimeter 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 1997 TLD results were compared using a paired difference test. No significant differences in the TLD populations were observed for the 0.5 mile and one mile TLD populations using a confidence level of 99%.

2. As stated in Part 1, page 8 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 effluent releases was calculated by the Meteorological Information and Dose Assessment System (MIDAS) computer program in accordance with ODAM. The calculation methods follow those prescribed by Reg Guide 1.109. Because there were no nuclides detected in the environment at or beyond the site boundry that were due to the operation of the DAEC, no comparison of calculated dose from stack releases and dose calculated from environmental contamination was performed.

Results of the MIDAS dose calculations are discussed below and are shown in tabular form on page E-4

1. There were no releases of radioactive material to liquid effluents in 1997.

2. The dose to air from noble gases released was 2.76E-03 mrad from gamma radiation at 455 meters South and 2.87E-04 mrad beta radiation at 4022 meters WNW.

3. The total body dose equivalent to the maximally exposed individual from noble gases was 1.78E-03 mrem, at 805 meters West.

4. The skin dose equivalent to the maximally exposed individual from noble gases was 1.82E-03 mrem, at 805 meters West.

5. The maximally exposed organ due to iodines and particulates with half-lives greater than eight days was the thyroid of a child at 805 meters West, with and estimated dose equivalent of 5.62E-03 mrem.

Conclusion:

No measureable dose due to the operation of the DAEC was detected by environmental TLDs in 1997. 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 1997

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				None	
Noble Gas					
Gamma Air Dose		481	S	2.76E-03 mrad	10 mrad
Beta Air Dose		4022	WNW	2.87E-04 mrad	20 mrad
Total Body	All	805	W	1.78E-03 mrad	*
Skin	All	805	W	1.82E-03 mrad	*
Particulates & Iodines					
Organ Dose	Child - Thyroid	805	W	5.62E-03 mrem	15 mrem

* No Appendix I limit but is used to determine compliance with 40 CFR 190 limits of 25 mrem total body and 75 mrem thyroid.

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REPORT
TO
IES UTILITIES, INC.
CEDAR RAPIDS, IOWA

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
FOR THE
DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
Docket No. 50-331

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES
JANUARY - DECEMBER 1997

PREPARED AND SUBMITTED
BY
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
MIDWEST LABORATORY

PROJECT NO. 8001

Reviewed and
Approved by _____
Bronia Grob, M.S.
Technical Lead

April 2, 1998

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LIST OF TABLES (continued)

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 1997. Results of completed analyses are presented in the attached tables.

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

2.0 LISTING OF MISSED SAMPLES

Sample	Location(s)	Collection Date or Period	Comments
Milk	I-131, Gamma	D-93	01-07-97	Sample not available.
Milk	I-131, Gamma	D-101	01-07-97	Sample not available.
AP	Gross Beta	D-13	01-23-97	Sample lost in strong wind.
Milk	I-131, Gamma	D-93	02-04-97	Sample not available.
Milk	I-131, Gamma	D-101	02-04-97	Sample not available.
Milk	I-131, Gamma	D-105	06-17-97	Lost in shipment.
TLD	Ambient Gamma	D-31, 91	3rd Qtr., 1997	Samples lost in the field.
TLD	Ambient Gamma	D-35	4th Qtr., 1997	Samples lost in the field.

3.0 DATA TABLES

DUANE ARNOLD

Table 1. Airborne particulates and charcoal canisters, analysis for gross beta.
Location: D-1 (Cedar Rapids)
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			0.010
01-09-97	286	0.028 ± 0.004	07-10-97	285	0.015 ± 0.003
01-16-97	285	0.029 ± 0.004	07-17-97	285	0.023 ± 0.003
01-23-97	287	0.022 ± 0.003	07-24-97	286	0.023 ± 0.003
01-30-97	284	0.028 ± 0.004	07-31-97	286	0.024 ± 0.004
02-06-97	285	0.029 ± 0.004	08-07-97	286	0.025 ± 0.003
02-12-97	246	0.024 ± 0.003	08-14-97	284	0.025 ± 0.003
02-20-97	325	0.033 ± 0.004	08-21-97	286	0.020 ± 0.003
02-27-97	286	0.022 ± 0.003	08-28-97	285	0.041 ± 0.004
03-06-97	286	0.021 ± 0.003	09-04-97	286	0.032 ± 0.003
03-13-97	284	0.023 ± 0.003	09-11-97	285	0.030 ± 0.004
03-20-97	285	0.023 ± 0.003	09-18-97	286	0.043 ± 0.004
03-27-97	288	0.021 ± 0.003	09-25-97	286	0.024 ± 0.004
04-03-97	282	0.014 ± 0.003	10-02-97	286	0.023 ± 0.003
1st Quarter Mean±s.d.		0.024 ± 0.005	3rd Quarter Mean±s.d.		0.027 ± 0.008
04-10-97	284	0.017 ± 0.003	10-09-97	285	0.036 ± 0.004
04-16-97	246	0.026 ± 0.004	10-16-97	285	0.027 ± 0.003
04-24-97	326	0.021 ± 0.003	10-23-97	286	0.024 ± 0.004
05-01-97	289	0.016 ± 0.003	10-30-97	277	0.032 ± 0.004
05-08-97	147[a]	0.040 ± 0.006	11-06-97	286	0.021 ± 0.003
05-15-97	287	0.013 ± 0.003	11-12-97	245	0.016 ± 0.003
05-22-97	284	0.014 ± 0.003	11-20-97	327	0.039 ± 0.004
05-29-97	285	0.017 ± 0.003	11-26-97	244	0.059 ± 0.005
06-04-97	245	0.013 ± 0.003	12-04-97	327	0.025 ± 0.003
06-12-97	328	0.018 ± 0.003	12-11-97	285	0.013 ± 0.003
06-19-97	284	0.015 ± 0.003	12-18-97	284	0.037 ± 0.004
06-26-97	285	0.021 ± 0.003	12-26-97	326	0.031 ± 0.003
07-03-97	286	0.020 ± 0.003	01-02-98	285	0.022 ± 0.003
2nd Quarter Mean±s.d.		0.019 ± 0.007	4th Quarter Mean±s.d.		0.029 ± 0.012

Cumulative Average: 0.025
Previous Annual Average: 0.024

[a] Low volume due to power loss at substation.

DUANE ARNOLD

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-2 (Marion)
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			0.010
01-09-97	287	0.029 ± 0.004	07-10-97	285	0.016 ± 0.003
01-16-97	285	0.031 ± 0.004	07-17-97	285	0.024 ± 0.003
01-23-97	287	0.023 ± 0.003	07-24-97	286	0.025 ± 0.003
01-30-97	285	0.026 ± 0.004	07-31-97	287	0.030 ± 0.004
02-06-97	285	0.028 ± 0.004	08-07-97	286	0.029 ± 0.003
02-12-97	246	0.027 ± 0.004	08-14-97	283	0.022 ± 0.003
02-20-97	324	0.035 ± 0.004	08-21-97	287	0.017 ± 0.003
02-27-97	287	0.024 ± 0.003	08-28-97	284	0.037 ± 0.004
03-06-97	286	0.026 ± 0.003	09-04-97	287	0.026 ± 0.003
03-13-97	284	0.025 ± 0.003	09-11-97	284	0.027 ± 0.003
03-20-97	284	0.024 ± 0.003	09-18-97	286	0.037 ± 0.004
03-27-97	289	< 0.003[b]	09-25-97	286	0.023 ± 0.003
04-03-97	282	0.016 ± 0.003	10-02-97	288	0.020 ± 0.003
1st Quarter Mean±s.d.		0.026 ± 0.005	3rd Quarter Mean±s.d.		0.026 ± 0.007
04-10-97	286	0.017 ± 0.003	10-09-97	284	0.033 ± 0.004
04-16-97	246	0.025 ± 0.004	10-16-97	285	0.028 ± 0.003
04-24-97	325	0.020 ± 0.003	10-23-97	285	0.022 ± 0.004
05-01-97	285	0.020 ± 0.003	10-30-97	284	0.029 ± 0.004
05-08-97	285	0.018 ± 0.003	11-06-97	286	0.021 ± 0.003
05-15-97	287	0.013 ± 0.003	11-12-97	245	0.016 ± 0.003
05-22-97	284	0.016 ± 0.003	11-20-97	327	0.043 ± 0.004
05-29-97	285	0.016 ± 0.003	11-26-97	243	0.067 ± 0.005
06-04-97	245	0.014 ± 0.004	12-04-97	327	0.027 ± 0.003
06-12-97	329	0.023 ± 0.003	12-11-97	284	0.013 ± 0.003
06-19-97	283	0.016 ± 0.003	12-18-97	307	0.036 ± 0.004
06-26-97	284	0.024 ± 0.003	12-26-97	326	0.033 ± 0.003
07-03-97	287	0.023 ± 0.004	01-02-98	284	0.022 ± 0.003
2nd Quarter Mean±s.d.		0.019 ± 0.004	4th Quarter Mean±s.d.		0.030 ± 0.014

Cumulative Average:	0.025
Previous Annual Average:	0.023

[a] Iodine-131 concentrations are <0.07 pCi/m^3 unless otherwise noted.
[b] Filter density light.

DUANE ARNOLD

Table 3. Airborne particulates and charcoal canisters, analysis for gross beta.
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			0.010
01-09-97	288	0.026 ± 0.003	07-10-97	284	0.013 ± 0.003
01-16-97	285	0.030 ± 0.004	07-17-97	286	0.018 ± 0.003
01-23-97	287	0.022 ± 0.003	07-24-97	286	0.021 ± 0.003
01-30-97	284	0.026 ± 0.004	07-31-97	283	0.023 ± 0.004
02-06-97	285	0.031 ± 0.004	08-07-97	288	0.029 ± 0.003
02-12-97	246	0.026 ± 0.004	08-14-97	285	0.024 ± 0.003
02-20-97	325	0.031 ± 0.004	08-21-97	290	0.021 ± 0.003
02-27-97	286	0.025 ± 0.003	08-28-97	282	0.040 ± 0.004
03-06-97	285	0.022 ± 0.003	09-04-97	286	0.029 ± 0.003
03-13-97	285	0.027 ± 0.003	09-11-97	285	0.028 ± 0.003
03-20-97	285	0.019 ± 0.003	09-18-97	285	0.037 ± 0.004
03-27-97	288	0.019 ± 0.003	09-25-97	286	0.023 ± 0.003
04-03-97	282	0.013 ± 0.003	10-02-97	286	0.024 ± 0.003
	1st Quarter Mean±s.d.	0.024 ± 0.005		3rd Quarter Mean±s.d.	0.025 ± 0.007
04-10-97	285	0.017 ± 0.003	10-09-97	285	0.041 ± 0.004
04-16-97	246	0.024 ± 0.004	10-16-97	285	0.030 ± 0.003
04-24-97	326	0.019 ± 0.003	10-23-97	285	0.025 ± 0.004
05-01-97	285	0.020 ± 0.003	10-30-97	287	0.030 ± 0.004
05-08-97	285	0.017 ± 0.003	11-06-97	286	0.020 ± 0.003
05-15-97	286	0.014 ± 0.003	11-12-97	245	0.016 ± 0.003
05-22-97	283	0.013 ± 0.003	11-20-97	326[a]	< 0.003
05-29-97	284	0.013 ± 0.003	11-26-97	245	0.055 ± 0.005
06-04-97	246	0.014 ± 0.004	12-04-97	326	0.023 ± 0.003
06-12-97	328	0.015 ± 0.002	12-11-97	285	0.011 ± 0.003
06-19-97	284	0.013 ± 0.003	12-18-97	285	0.036 ± 0.004
06-26-97	284	0.018 ± 0.003	12-26-97	325	0.027 ± 0.003
07-03-97	287	0.018 ± 0.003	01-02-98	287	0.016 ± 0.003
	2nd Quarter Mean±s.d.	0.016 ± 0.003		4th Quarter Mean±s.d.	0.027 ± 0.012
				Cumulative Average:	0.023
				Previous Annual Average:	0.022

[a] Filter light; Particulates allowed to bypass filter due to bad seal.

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Table 4. 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			0.010
01-09-97	287	0.033 ± 0.004	07-10-97	286	0.015 ± 0.003
01-16-97	286	0.029 ± 0.004	07-17-97	285	0.022 ± 0.003
01-23-97	286	0.019 ± 0.003	07-24-97	286	0.024 ± 0.003
01-30-97	284	0.025 ± 0.004	07-31-97	284	0.025 ± 0.004
02-06-97	285	0.033 ± 0.004	08-07-97	287	0.027 ± 0.003
02-12-97	246	0.027 ± 0.004	08-14-97	285	0.022 ± 0.003
02-20-97	325	0.029 ± 0.003	08-21-97	287	0.016 ± 0.003
02-27-97	286	0.024 ± 0.003	08-28-97	284	0.031 ± 0.004
03-06-97	286	0.027 ± 0.003	09-04-97	286	0.023 ± 0.003
03-13-97	284	0.026 ± 0.003	09-11-97	285	0.018 ± 0.003
03-20-97	286	0.025 ± 0.003	09-18-97	285	0.031 ± 0.004
03-27-97	286	0.020 ± 0.003	09-25-97	287	0.019 ± 0.003
04-03-97	285	0.014 ± 0.003	10-02-97	287	0.019 ± 0.003
1st Quarter Mean±s.d.		0.025 ± 0.005	3rd Quarter Mean±s.d.		0.022 ± 0.005
04-10-97	284	0.020 ± 0.003	10-09-97	284	0.028 ± 0.004
04-16-97	247	0.022 ± 0.004	10-16-97	285	0.023 ± 0.003
04-24-97	324	0.020 ± 0.003	10-23-97	286	0.021 ± 0.003
05-01-97	286	0.015 ± 0.003	10-30-97	271	0.028 ± 0.004
05-08-97	286	0.020 ± 0.003	11-06-97	285	0.016 ± 0.003
05-15-97	286	0.015 ± 0.003	11-12-97	245	0.014 ± 0.003
05-22-97	284	0.013 ± 0.003	11-20-97	326	0.035 ± 0.004
05-29-97	286	0.013 ± 0.003	11-26-97	245	0.059 ± 0.005
06-04-97	245	0.010 ± 0.003	12-04-97	326	0.017 ± 0.003
06-12-97	328	0.015 ± 0.002	12-11-97	285	0.012 ± 0.003
06-19-97	284	0.015 ± 0.003	12-18-97	285	0.032 ± 0.004
06-26-97	284	0.018 ± 0.003	12-26-97	325	0.029 ± 0.003
07-03-97	286	0.016 ± 0.003	01-02-98	286	0.021 ± 0.003
2nd Quarter Mean±s.d.		0.016 ± 0.003	4th Quarter Mean±s.d.		0.026 ± 0.012

Cumulative Average:	0.023
Previous Annual Average:	0.024

[a] Iodine-131 concentrations are <0.07 pCi/m^3 unless otherwise noted.

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Table 5. Airborne particulates and charcoal canisters, analysis for gross beta.
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			0.010
01-09-97	287	0.036 ± 0.004	07-10-97	286	0.016 ± 0.003
01-16-97	285	0.035 ± 0.004	07-17-97	285	0.025 ± 0.003
01-23-97	286	0.015 ± 0.003	07-24-97	284	0.026 ± 0.003
01-30-97	285	0.021 ± 0.003	07-31-97	286	0.032 ± 0.004
02-06-97	285	0.027 ± 0.004	08-07-97	287	0.028 ± 0.003
02-12-97	246	0.026 ± 0.004	08-14-97	285	0.021 ± 0.003
02-20-97	325	0.034 ± 0.004	08-21-97	287	0.020 ± 0.003
02-27-97	286	0.022 ± 0.003	08-28-97	284	0.035 ± 0.004
03-06-97	285	0.022 ± 0.003	09-04-97	286	0.027 ± 0.003
03-13-97	284	0.024 ± 0.003	09-11-97	285	0.027 ± 0.003
03-20-97	285	0.019 ± 0.003	09-18-97	281	0.038 ± 0.004
03-27-97	250	0.022 ± 0.003	09-25-97	287	0.020 ± 0.003
04-03-97	282	0.015 ± 0.003	10-02-97	287	0.020 ± 0.003
1st Quarter Mean±s.d.		0.024 ± 0.007	3rd Quarter Mean±s.d.		0.026 ± 0.006
04-10-97	284	0.019 ± 0.003	10-09-97	284	0.038 ± 0.004
04-16-97	246	0.032 ± 0.004	10-16-97	285	0.030 ± 0.003
04-24-97	324	0.025 ± 0.003	10-23-97	286	0.023 ± 0.004
05-01-97	285	0.019 ± 0.003	10-30-97	286	0.029 ± 0.004
05-08-97	286	0.021 ± 0.003	11-06-97	285	0.024 ± 0.003
05-15-97	286	0.014 ± 0.003	11-12-97	246	0.016 ± 0.003
05-22-97	284	0.017 ± 0.003	11-20-97	325	0.037 ± 0.004
05-29-97	286	0.012 ± 0.003	11-26-97	245	0.061 ± 0.005
06-04-97	245	0.019 ± 0.004	12-04-97	326	0.027 ± 0.003
06-12-97	329	0.019 ± 0.003	12-11-97	285	0.014 ± 0.003
06-19-97	283	0.016 ± 0.003	12-18-97	285	0.040 ± 0.004
06-26-97	284	0.023 ± 0.003	12-26-97	326	0.035 ± 0.003
07-03-97	286	0.021 ± 0.003	01-02-98	286	0.026 ± 0.003
2nd Quarter Mean±s.d.		0.020 ± 0.005	4th Quarter Mean±s.d.		0.031 ± 0.012

Cumulative Average:	0.025
Previous Annual Average:	0.026

Table 6. 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			0.010
01-09-97	287	0.026 ± 0.003	07-10-97	286	0.013 ± 0.003
01-16-97	286	0.033 ± 0.004	07-17-97	285	0.019 ± 0.003
01-23-97	286	0.020 ± 0.003	07-24-97	286	0.023 ± 0.003
01-30-97	284	0.025 ± 0.003	07-31-97	284	0.025 ± 0.004
02-06-97	285	0.032 ± 0.004	08-07-97	287	0.025 ± 0.003
02-12-97	246	0.027 ± 0.004	08-14-97	285	0.018 ± 0.003
02-20-97	325	0.029 ± 0.003	08-21-97	287	0.015 ± 0.003
02-27-97	286	0.023 ± 0.003	08-28-97	284	0.032 ± 0.004
03-06-97	286	0.024 ± 0.003	09-04-97	286	0.024 ± 0.003
03-13-97	284	0.026 ± 0.003	09-11-97	285	0.024 ± 0.003
03-20-97	286	0.019 ± 0.003	09-18-97	285	0.034 ± 0.004
03-27-97	286	0.019 ± 0.003	09-25-97	287	0.018 ± 0.003
04-03-97	285	0.015 ± 0.003	10-02-97	287	0.021 ± 0.003
	1st Quarter Mean±s.d.	0.024 ± 0.005		3rd Quarter Mean±s.d.	0.022 ± 0.006
04-10-97	284	0.016 ± 0.003	10-09-97	131[b]	0.034 ± 0.007
04-16-97	247	0.024 ± 0.004	10-16-97	285	0.027 ± 0.003
04-24-97	324	0.017 ± 0.003	10-23-97	286	0.019 ± 0.003
05-01-97	286	0.018 ± 0.003	10-30-97	286	0.025 ± 0.003
05-08-97	286	0.016 ± 0.003	11-06-97	285	0.018 ± 0.003
05-15-97	286	0.012 ± 0.003	11-12-97	245	0.017 ± 0.003
05-22-97	284	0.013 ± 0.003	11-20-97	326	0.034 ± 0.004
05-29-97	286	0.012 ± 0.003	11-26-97	245	0.051 ± 0.005
06-04-97	245	0.016 ± 0.004	12-04-97	326	0.024 ± 0.003
06-12-97	328	0.012 ± 0.002	12-11-97	286	0.011 ± 0.003
06-19-97	284	0.016 ± 0.003	12-18-97	285	0.038 ± 0.004
06-26-97	284	0.017 ± 0.003	12-26-97	326	0.034 ± 0.003
07-03-97	286	0.017 ± 0.003	01-02-98	286	0.026 ± 0.003
	2nd Quarter Mean±s.d.	0.016 ± 0.003		4th Quarter Mean±s.d.	0.027 ± 0.011

Cumulative Average:	0.023
Previous Annual Average:	0.023

[a] Iodine-131 concentrations are <0.07 pCi/m^3 unless otherwise noted.
[b] Low volume due to power loss at substation.

Table 7. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-8 (Urbana)
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			0.010
01-09-97	287	0.030 ± 0.004	07-10-97	286	0.013 ± 0.003
01-16-97	286	0.029 ± 0.004	07-17-97	285	0.023 ± 0.003
01-23-97	286	0.021 ± 0.003	07-24-97	286	0.023 ± 0.003
01-30-97	285	0.027 ± 0.004	07-31-97	284	0.028 ± 0.004
02-06-97	285	0.031 ± 0.004	08-07-97	287	0.029 ± 0.003
02-12-97	246	0.026 ± 0.004	08-14-97	285	0.023 ± 0.003
02-20-97	325	0.033 ± 0.004	08-21-97	288	0.019 ± 0.003
02-27-97	286	0.027 ± 0.003	08-28-97	283	0.039 ± 0.004
03-06-97	286	0.024 ± 0.003	09-04-97	286	0.026 ± 0.003
03-13-97	284	0.024 ± 0.003	09-11-97	285	0.028 ± 0.003
03-20-97	286	0.024 ± 0.003	09-18-97	274	0.033 ± 0.004
03-27-97	288	0.020 ± 0.003	09-25-97	287	0.022 ± 0.003
04-03-97	283	0.019 ± 0.003	10-02-97	287	0.022 ± 0.003
	1st Quarter Mean±s.d.	0.026 ± 0.004		3rd Quarter Mean±s.d.	0.025 ± 0.006
04-10-97	284	0.018 ± 0.003	10-09-97	284	0.035 ± 0.004
04-16-97	246	0.023 ± 0.004	10-16-97	285	0.030 ± 0.003
04-24-97	324	0.021 ± 0.003	10-23-97	286	0.019 ± 0.003
05-01-97	285	0.017 ± 0.003	10-30-97	272	0.028 ± 0.004
05-08-97	286	0.019 ± 0.003	11-06-97	285	0.016 ± 0.003
05-15-97	286	0.014 ± 0.003	11-12-97	245	0.013 ± 0.003
05-22-97	284	0.012 ± 0.003	11-20-97	326	0.038 ± 0.004
05-29-97	286	0.016 ± 0.003	11-26-97	245	0.063 ± 0.005
06-04-97	245	0.017 ± 0.004	12-04-97	326	0.024 ± 0.003
06-12-97	329	0.017 ± 0.003	12-11-97	285	0.012 ± 0.003
06-19-97	283	0.014 ± 0.003	12-18-97	285	0.039 ± 0.004
06-26-97	281	0.025 ± 0.003	12-26-97	326	0.031 ± 0.003
07-03-97	286	0.018 ± 0.003	01-02-98	286	0.021 ± 0.003
	2nd Quarter Mean±s.d.	0.018 ± 0.004		4th Quarter Mean±s.d.	0.028 ± 0.014

Cumulative Average:	0.024
Previous Annual Average:	0.025

[a] Iodine-131 concentrations are <0.07 pCi/m^3 unless otherwise noted.

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Table 8. Airborne particulates and charcoal canisters, analysis for gross beta.
Location: D-10 (Atkins)
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			0.010
01-09-97	286	0.022 ± 0.003	07-10-97	284	0.013 ± 0.003
01-16-97	285	0.026 ± 0.003	07-17-97	285	0.020 ± 0.003
01-23-97	287	0.020 ± 0.003	07-24-97	285	0.027 ± 0.003
01-30-97	285	0.026 ± 0.004	07-31-97	286	0.026 ± 0.004
02-06-97	285	0.029 ± 0.004	08-07-97	287	0.027 ± 0.003
02-12-97	247	0.024 ± 0.003	08-14-97	282	0.020 ± 0.003
02-20-97	323	0.030 ± 0.003	08-21-97	281	0.016 ± 0.003
02-27-97	286	0.024 ± 0.003	08-28-97	290	0.037 ± 0.004
03-06-97	286	0.022 ± 0.003	09-04-97	286	0.024 ± 0.003
03-13-97	284	0.021 ± 0.003	09-11-97	285	0.020 ± 0.003
03-20-97	285	0.019 ± 0.003	09-18-97	286	0.032 ± 0.004
03-27-97	283	0.020 ± 0.003	09-25-97	286	0.018 ± 0.003
04-03-97	289	0.015 ± 0.003	10-02-97	284	0.024 ± 0.003
	1st Quarter Mean±s.d.	0.023 ± 0.004		3rd Quarter Mean±s.d.	0.023 ± 0.007
04-10-97	284	0.017 ± 0.003	10-09-97	285	0.032 ± 0.004
04-16-97	246	0.024 ± 0.004	10-16-97	280	0.029 ± 0.003
04-24-97	326	0.018 ± 0.003	10-23-97	285	0.021 ± 0.003
05-01-97	284	0.021 ± 0.003	10-30-97	275	0.028 ± 0.004
05-08-97	284	0.018 ± 0.003	11-06-97	286	0.020 ± 0.003
05-15-97	286	0.015 ± 0.003	11-12-97	245[b]	0.021 ± 0.004
05-22-97	286	0.013 ± 0.003	11-20-97	327	0.039 ± 0.004
05-29-97	284	0.014 ± 0.003	11-26-97	244	0.072 ± 0.005
06-04-97	245	0.013 ± 0.004	12-04-97	327	0.029 ± 0.003
06-12-97	328	0.018 ± 0.003	12-11-97	285	0.012 ± 0.003
06-19-97	284	0.016 ± 0.003	12-18-97	284	0.043 ± 0.004
06-26-97	285	0.023 ± 0.003	12-26-97	327	0.032 ± 0.003
07-03-97	288	0.019 ± 0.003	01-02-98	285	0.025 ± 0.003
	2nd Quarter Mean±s.d.	0.018 ± 0.003		4th Quarter Mean±s.d.	0.031 ± 0.015
				Cumulative Average:	0.024
				Previous Annual Average:	0.025

[a] Volume estimated; Collector reported timer failure, data suggests a normal sampler pump run-time.

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Table 9. 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			0.010
01-09-97	288	0.030 ± 0.004	07-10-97	285	0.012 ± 0.003
01-16-97	284	0.033 ± 0.004	07-17-97	286	0.021 ± 0.003
01-23-97	287	0.020 ± 0.003	07-24-97	286	0.022 ± 0.003
01-30-97	284	0.022 ± 0.003	07-31-97	283	0.029 ± 0.004
02-06-97	285	0.028 ± 0.004	08-07-97	287	0.026 ± 0.003
02-12-97	246	0.029 ± 0.004	08-14-97	286	0.022 ± 0.003
02-20-97	325	0.032 ± 0.004	08-21-97	290	0.017 ± 0.003
02-27-97	286	0.022 ± 0.003	08-28-97	281	0.033 ± 0.004
03-06-97	285	0.023 ± 0.003	09-04-97	286	0.023 ± 0.003
03-13-97	284	0.022 ± 0.003	09-11-97	285	0.025 ± 0.003
03-20-97	286	0.023 ± 0.003	09-18-97	285	0.034 ± 0.004
03-27-97	289	0.015 ± 0.003	09-25-97	286	0.024 ± 0.003
04-03-97	282	0.015 ± 0.003	10-02-97	286	0.024 ± 0.003
	1st Quarter Mean±s.d.	0.024 ± 0.006		3rd Quarter Mean±s.d.	0.024 ± 0.006
04-10-97	284	0.022 ± 0.003	10-09-97	285	0.037 ± 0.004
04-16-97	246	0.029 ± 0.004	10-16-97	285	0.031 ± 0.003
04-24-97	325	0.023 ± 0.003	10-23-97	285	0.023 ± 0.004
05-01-97	286	0.019 ± 0.003	10-30-97	287	0.028 ± 0.004
05-08-97	273	0.018 ± 0.003	11-06-97	286	0.020 ± 0.003
05-15-97	286	0.017 ± 0.003	11-12-97	245	0.017 ± 0.003
05-22-97	285	0.014 ± 0.003	11-20-97	326	0.038 ± 0.004
05-29-97	284	0.016 ± 0.003	11-26-97	245	0.066 ± 0.005
06-04-97	245	0.014 ± 0.004	12-04-97	327	0.026 ± 0.003
06-12-97	329	0.016 ± 0.003	12-11-97	286	0.015 ± 0.003
06-19-97	284	0.016 ± 0.003	12-18-97	284	0.043 ± 0.004
06-26-97	284	0.021 ± 0.003	12-26-97	325	0.034 ± 0.003
07-03-97	287	0.018 ± 0.003	01-02-98	285	0.024 ± 0.003
	2nd Quarter Mean±s.d.	0.019 ± 0.004		4th Quarter Mean±s.d.	0.031 ± 0.013

Cumulative Average:	0.024
Previous Annual Average:	0.026

[a] Iodine-131 concentrations are <0.07 pCi/m^3 unless otherwise noted.

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Table 10. Airborne particulates and charcoal canisters, analysis for gross beta.
Location: D-13
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			0.010
01-09-97	287	0.024 ± 0.003	07-10-97	286	0.015 ± 0.003
01-16-97	286	0.025 ± 0.003	07-17-97	285	0.025 ± 0.003
01-23-97	ND[a]	-	07-24-97	286	0.027 ± 0.003
01-30-97	285	0.023 ± 0.003	07-31-97	284	0.018 ± 0.003
02-06-97	285	0.029 ± 0.004	08-07-97	287	0.031 ± 0.003
02-12-97	246	0.023 ± 0.003	08-14-97	285	0.020 ± 0.003
02-20-97	325	0.029 ± 0.003	08-21-97	288	0.019 ± 0.003
02-27-97	286	0.019 ± 0.003	08-28-97	284	0.033 ± 0.004
03-06-97	286	0.018 ± 0.003	09-04-97	286	0.025 ± 0.003
03-13-97	284	0.020 ± 0.003	09-11-97	285	0.023 ± 0.003
03-20-97	285	0.020 ± 0.003	09-18-97	281	0.036 ± 0.004
03-27-97	290	0.017 ± 0.003	09-25-97	287	0.021 ± 0.003
04-03-97	282	0.014 ± 0.003	10-02-97	286	0.022 ± 0.003
	1st Quarter Mean±s.d.	0.022 ± 0.005		3rd Quarter Mean±s.d.	0.024 ± 0.006
04-10-97	284	0.012 ± 0.003	10-09-97	284	0.032 ± 0.004
04-16-97	246	0.021 ± 0.004	10-16-97	284	0.029 ± 0.003
04-24-97	324	0.018 ± 0.003	10-23-97	288	0.019 ± 0.003
05-01-97	286	0.017 ± 0.003	10-30-97	237	0.031 ± 0.004
05-08-97	285	0.018 ± 0.003	11-06-97	285	0.015 ± 0.003
05-15-97	286	0.012 ± 0.003	11-12-97	245	0.012 ± 0.003
05-22-97	286	0.016 ± 0.003	11-20-97	325	0.034 ± 0.004
05-29-97	284	0.015 ± 0.003	11-26-97	245	0.057 ± 0.005
06-04-97	245	0.015 ± 0.004	12-04-97	326	0.024 ± 0.003
06-12-97	326	0.016 ± 0.003	12-11-97	286	0.012 ± 0.003
06-19-97	136	0.018 ± 0.006	12-18-97	285	0.042 ± 0.004
06-26-97	245	0.022 ± 0.003	12-26-97	327	0.033 ± 0.003
07-03-97	286	0.020 ± 0.003	01-02-98	286	0.024 ± 0.003
	2nd Quarter Mean±s.d.	0.017 ± 0.003		4th Quarter Mean±s.d.	0.028 ± 0.013
			Cumulative Average:		0.023
			Previous Annual Average:		0.023

[a] ND = No data; Sample lost in strong winds.

Table 11. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-15 (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			0.010
01-09-97	288	0.031 ± 0.004	07-10-97	286	0.011 ± 0.003
01-16-97	286	0.032 ± 0.004	07-17-97	285	0.021 ± 0.003
01-23-97	286	0.021 ± 0.003	07-24-97	285	0.019 ± 0.003
01-30-97	285	0.025 ± 0.004	07-31-97	284	0.029 ± 0.004
02-06-97	285	0.032 ± 0.004	08-07-97	287	0.025 ± 0.003
02-12-97	246	0.027 ± 0.004	08-14-97	285	0.015 ± 0.003
02-20-97	325	0.032 ± 0.004	08-21-97	286	0.012 ± 0.003
02-27-97	286	0.023 ± 0.003	08-28-97	285	0.027 ± 0.004
03-06-97	285	0.021 ± 0.003	09-04-97	286	0.020 ± 0.003
03-13-97	285	0.023 ± 0.003	09-11-97	285	0.020 ± 0.003
03-20-97	286	0.025 ± 0.003	09-18-97	285	0.029 ± 0.004
03-27-97	286	0.016 ± 0.003	09-25-97	287	0.016 ± 0.003
04-03-97	285	0.014 ± 0.003	10-02-97	285	0.019 ± 0.003
1st Quarter Mean±s.d.		0.025 ± 0.006	3rd Quarter Mean±s.d.		0.020 ± 0.006
04-10-97	284	0.017 ± 0.003	10-09-97	285	0.031 ± 0.004
04-16-97	246	0.025 ± 0.004	10-16-97	285	0.025 ± 0.003
04-24-97	324	0.021 ± 0.003	10-23-97	285	0.021 ± 0.003
05-01-97	286	0.018 ± 0.003	10-30-97	287	0.025 ± 0.003
05-08-97	285	0.019 ± 0.003	11-06-97	285	0.017 ± 0.003
05-15-97	286	0.013 ± 0.003	11-12-97	245	0.014 ± 0.003
05-22-97	285	0.013 ± 0.003	11-20-97	326	0.036 ± 0.004
05-29-97	286	0.014 ± 0.003	11-26-97	245	0.061 ± 0.005
06-04-97	245	0.012 ± 0.003	12-04-97	326	0.023 ± 0.003
06-12-97	328	0.018 ± 0.003	12-11-97	285	0.010 ± 0.003
06-19-97	284	0.014 ± 0.003	12-18-97	285	0.035 ± 0.004
06-26-97	284	0.018 ± 0.003	12-26-97	325	0.027 ± 0.003
07-03-97	286	0.017 ± 0.003	01-02-98	286	0.019 ± 0.003
2nd Quarter Mean±s.d.		0.017 ± 0.004	4th Quarter Mean±s.d.		0.026 ± 0.013

Cumulative Average:	0.022
Previous Annual Average:	0.022

[a] Iodine-131 concentrations are <0.07 pCi/m^3 unless otherwise noted.

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Table 12. Airborne particulates and charcoal canisters, analysis for gross beta.
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			0.010
01-09-97	288	0.033 ± 0.004	07-10-97	286	0.013 ± 0.003
01-16-97	281	0.031 ± 0.004	07-17-97	285	0.020 ± 0.003
01-23-97	286	0.022 ± 0.003	07-24-97	285	0.021 ± 0.003
01-30-97	285	0.028 ± 0.004	07-31-97	284	0.022 ± 0.004
02-06-97	285	0.026 ± 0.004	08-07-97	287	0.024 ± 0.003
02-12-97	246	0.027 ± 0.004	08-14-97	285	0.026 ± 0.003
02-20-97	325	0.033 ± 0.004	08-21-97	287	0.018 ± 0.003
02-27-97	286	0.023 ± 0.003	08-28-97	284	0.033 ± 0.004
03-06-97	285	0.024 ± 0.003	09-04-97	286	0.023 ± 0.003
03-13-97	285	0.026 ± 0.003	09-11-97	285	0.023 ± 0.003
03-20-97	286	0.026 ± 0.003	09-18-97	285	0.030 ± 0.004
03-27-97	286	0.019 ± 0.003	09-25-97	287	0.018 ± 0.003
04-03-97	285	0.013 ± 0.003	10-02-97	284	0.019 ± 0.003
1st Quarter Mean±s.d.		0.025 ± 0.006	3rd Quarter Mean±s.d.		0.022 ± 0.005
04-10-97	284	0.017 ± 0.003	10-09-97	285	0.034 ± 0.004
04-16-97	246	0.028 ± 0.004	10-16-97	285	0.028 ± 0.003
04-24-97	324	0.023 ± 0.003	10-23-97	285	0.020 ± 0.003
05-01-97	278	0.021 ± 0.003	10-30-97	287	0.025 ± 0.003
05-08-97	285	0.021 ± 0.003	11-06-97	285	0.015 ± 0.003
05-15-97	286	0.012 ± 0.003	11-12-97	245	0.015 ± 0.003
05-22-97	285	0.015 ± 0.003	11-20-97	326	0.029 ± 0.004
05-29-97	286	0.016 ± 0.003	11-26-97	245	0.057 ± 0.005
06-04-97	244	0.014 ± 0.004	12-04-97	326	0.023 ± 0.003
06-12-97	329	0.015 ± 0.002	12-11-97	285	0.010 ± 0.003
06-19-97	284	0.013 ± 0.003	12-18-97	285	0.033 ± 0.004
06-26-97	284	0.015 ± 0.003	12-26-97	325	0.028 ± 0.003
07-03-97	286	0.017 ± 0.003	01-02-98	286	0.015 ± 0.003
2nd Quarter Mean±s.d.		0.018 ± 0.004	4th Quarter Mean±s.d.		0.026 ± 0.012

Cumulative Average: 0.023
Previous Annual Average: 0.024

Table 13. Airborne particulate samples; analysis for gamma emitting isotopes.
Collection: Quarterly composite of weekly samples
Units: pCi/m^3

Location	D-1			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2331	DAP-4960	DAP-8169	DAP-10203
Volume	3709	3576	3712	3742
Be-7	0.076 ± 0.018	0.11 ± 0.014	0.11 ± 0.014	0.068 ± 0.011
Zr-95	< 0.0017	< 0.0014	< 0.0006	< 0.0018
Nb-95	< 0.0021	< 0.0009	< 0.0008	< 0.0008
Ru-103	< 0.0008	< 0.0006	< 0.0006	< 0.0008
Ru-106	< 0.0142	< 0.0084	< 0.0058	< 0.0032
Cs-134	< 0.0014	< 0.0007	< 0.0009	< 0.0004
Cs-137	< 0.0016	< 0.0010	< 0.0006	< 0.0008
Ce-141	< 0.0021	< 0.0009	< 0.0011	< 0.0011
Ce-144	< 0.0072	< 0.0024	< 0.0028	< 0.0027

Location	D-2			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2332	DAP-4961	DAP-8170	DAP-10204
Volume	3711	3711	3714	3767
Be-7	0.083 ± 0.014	0.11 ± 0.011	0.091 ± 0.013	0.071 ± 0.010
Zr-95	< 0.0017	< 0.0009	< 0.0010	< 0.0008
Nb-95	< 0.0012	< 0.0004	< 0.0007	< 0.0009
Ru-103	< 0.0006	< 0.0007	< 0.0013	< 0.0004
Ru-106	< 0.0077	< 0.0065	< 0.0034	< 0.0030
Cs-134	< 0.0009	< 0.0006	< 0.0006	< 0.0006
Cs-137	< 0.0007	< 0.0003	< 0.0005	< 0.0007
Ce-141	< 0.0007	< 0.0010	< 0.0022	< 0.0004
Ce-144	< 0.0015	< 0.0038	< 0.0050	< 0.0020

Location	D-3			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2333	DAP-4962	DAP-8171	DAP-10205
Volume	3711	3709	3712	3752
Be-7	0.075 ± 0.015	0.087 ± 0.011	0.11 ± 0.017	0.051 ± 0.010
Zr-95	< 0.0023	< 0.0018	< 0.0008	< 0.0013
Nb-95	< 0.0015	< 0.0010	< 0.0005	< 0.0009
Ru-103	< 0.0014	< 0.0008	< 0.0005	< 0.0005
Ru-106	< 0.0044	< 0.0056	< 0.0030	< 0.0031
Cs-134	< 0.0006	< 0.0007	< 0.0007	< 0.0006
Cs-137	< 0.0011	< 0.0009	< 0.0004	< 0.0006
Ce-141	< 0.0019	< 0.0011	< 0.0008	< 0.0011
Ce-144	< 0.0040	< 0.0048	< 0.0032	< 0.0036

Table 13. Airborne particulate samples; analysis for gamma emitting isotopes.
Collection: Quarterly composite of weekly samples
Units: pCi/m^3

Location	D-5			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2334	DAP-4963, 4	DAP-8172	DAP-10206
Volume	3712	3710	3714	3734
Be-7	0.073 ± 0.015	0.089 ± 0.009	0.073 ± 0.013	0.055 ± 0.009
Zr-95	< 0.0019	< 0.0010	< 0.0036	< 0.0014
Nb-95	< 0.0012	< 0.0005	< 0.0014	< 0.0010
Ru-103	< 0.0004	< 0.0007	< 0.0011	< 0.0006
Ru-106	< 0.0059	< 0.0057	< 0.0019	< 0.0048
Cs-134	< 0.0005	< 0.0006	< 0.0003	< 0.0006
Cs-137	< 0.0009	< 0.0009	< 0.0006	< 0.0003
Ce-141	< 0.0011	< 0.0006	< 0.0023	< 0.0007
Ce-144	< 0.0037	< 0.0017	< 0.0036	< 0.0030

Location	D-6			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2335	DAP-4965	DAP-8173	DAP-10207, 8
Volume	3671	3708	3710	3750
Be-7	0.059 ± 0.010	0.10 ± 0.020	0.11 ± 0.015	0.059 ± 0.007
Zr-95	< 0.0013	< 0.0015	< 0.0011	< 0.0011
Nb-95	< 0.0006	< 0.0020	< 0.0009	< 0.0006
Ru-103	< 0.0005	< 0.0014	< 0.0011	< 0.0004
Ru-106	< 0.0039	< 0.0109	< 0.0093	< 0.0049
Cs-134	< 0.0007	< 0.0007	< 0.0008	< 0.0006
Cs-137	< 0.0008	< 0.0010	< 0.0006	< 0.0005
Ce-141	< 0.0012	< 0.0019	< 0.0018	< 0.0009
Ce-144	< 0.0048	< 0.0038	< 0.0025	< 0.0028

Location	D-7			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2336	DAP-4966	DAP-8174	DAP-10209
Volume	3712	3710	3714	3598
Be-7	0.072 ± 0.023	0.090 ± 0.012	0.081 ± 0.013	0.056 ± 0.011
Zr-95	< 0.0016	< 0.0018	< 0.0014	< 0.0015
Nb-95	< 0.0020	< 0.0005	< 0.0005	< 0.0009
Ru-103	< 0.0020	< 0.0007	< 0.0018	< 0.0009
Ru-106	< 0.0089	< 0.0053	< 0.0060	< 0.0055
Cs-134	< 0.0009	< 0.0004	< 0.0005	< 0.0003
Cs-137	< 0.0010	< 0.0006	< 0.0006	< 0.0009
Ce-141	< 0.0021	< 0.0007	< 0.0028	< 0.0010
Ce-144	< 0.0041	< 0.0032	< 0.0047	< 0.0031

Table 13. Airborne particulate samples; analysis for gamma emitting isotopes.
Collection: Quarterly composite of weekly samples
Units: pCi/m^3

Location	D-8			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2337	DAP-4967	DAP-8175	DAP-10210
Volume	3713	3705	3703	3736
Be-7	0.070 ± 0.015	0.11 ± 0.013	0.11 ± 0.016	0.064 ± 0.018
Zr-95	< 0.0015	< 0.0016	< 0.0006	< 0.0023
Nb-95	< 0.0015	< 0.0004	< 0.0004	< 0.0015
Ru-103	< 0.0012	< 0.0007	< 0.0009	< 0.0014
Ru-106	< 0.0095	< 0.0034	< 0.0054	< 0.0088
Cs-134	< 0.0007	< 0.0007	< 0.0005	< 0.0013
Cs-137	< 0.0003	< 0.0008	< 0.0005	< 0.0009
Ce-141	< 0.0017	< 0.0013	< 0.0014	< 0.0024
Ce-144	< 0.0028	< 0.0017	< 0.0040	< 0.0058

Location	D-10			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2338	DAP-4968	DAP-8176	DAP-10211
Volume	3711	3710	3707	3521
Be-7	0.063 ± 0.013	0.11 ± 0.013	0.10 ± 0.017	0.073 ± 0.013
Zr-95	< 0.0012	< 0.0017	< 0.0007	< 0.0021
Nb-95	< 0.0008	< 0.0012	< 0.0007	< 0.0004
Ru-103	< 0.0009	< 0.0004	< 0.0004	< 0.0009
Ru-106	< 0.0032	< 0.0073	< 0.0025	< 0.0073
Cs-134	< 0.0003	< 0.0008	< 0.0004	< 0.0008
Cs-137	< 0.0008	< 0.0008	< 0.0008	< 0.0010
Ce-141	< 0.0018	< 0.0014	< 0.0017	< 0.0009
Ce-144	< 0.0046	< 0.0041	< 0.0044	< 0.0022

Location	D-11			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2339	DAP-4969	DAP-8177	DAP-10212
Volume	3711	3698	3712	3751
Be-7	0.067 ± 0.013	0.11 ± 0.021	0.091 ± 0.014	0.062 ± 0.010
Zr-95	< 0.0024	< 0.0019	< 0.0007	< 0.0009
Nb-95	< 0.0012	< 0.0017	< 0.0010	< 0.0004
Ru-103	< 0.0010	< 0.0013	< 0.0010	< 0.0008
Ru-106	< 0.0054	< 0.0108	< 0.0037	< 0.0048
Cs-134	< 0.0005	< 0.0010	< 0.0005	< 0.0005
Cs-137	< 0.0004	< 0.0010	< 0.0004	< 0.0006
Ce-141	< 0.0007	< 0.0021	< 0.0018	< 0.0015
Ce-144	< 0.0038	< 0.0047	< 0.0051	< 0.0048

Table 13. Airborne particulate samples; analysis for gamma emitting isotopes.
Collection: Quarterly composite of weekly samples
Units: pCi/m^3

Location	D-13			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2340	DAP-4970	DAP-8178	DAP-10213
Volume	3427	3519	3710	3703
Be-7	0.069 ± 0.013	0.10 ± 0.018	0.10 ± 0.015	0.054 ± 0.009
Zr-95	< 0.0025	< 0.0012	< 0.0011	< 0.0011
Nb-95	< 0.0012	< 0.0014	< 0.0008	< 0.0008
Ru-103	< 0.0007	< 0.0012	< 0.0010	< 0.0009
Ru-106	< 0.0047	< 0.0077	< 0.0030	< 0.0030
Cs-134	< 0.0008	< 0.0013	< 0.0008	< 0.0002
Cs-137	< 0.0010	< 0.0010	< 0.0005	< 0.0004
Ce-141	< 0.0013	< 0.0017	< 0.0025	< 0.0006
Ce-144	< 0.0037	< 0.0033	< 0.0046	< 0.0034

Location	D-15			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2341	DAP-4971	DAP-8179	DAP-10214
Volume	3714	3709	3711	3750
Be-7	0.068 ± 0.016	0.087 ± 0.012	0.073 ± 0.014	0.049 ± 0.013
Zr-95	< 0.0025	< 0.0017	< 0.0004	< 0.0021
Nb-95	< 0.0011	< 0.0006	< 0.0009	< 0.0012
Ru-103	< 0.0011	< 0.0006	< 0.0009	< 0.0010
Ru-106	< 0.0060	< 0.0056	< 0.0067	< 0.0063
Cs-134	< 0.0004	< 0.0004	< 0.0006	< 0.0005
Cs-137	< 0.0009	< 0.0008	< 0.0004	< 0.0006
Ce-141	< 0.0019	< 0.0011	< 0.0019	< 0.0017
Ce-144	< 0.0058	< 0.0018	< 0.0047	< 0.0022

Location	D-16			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2342	DAP-4972	DAP-8180	DAP-10215
Volume	3709	3701	3710	3750
Be-7	0.080 ± 0.019	0.10 ± 0.015	0.073 ± 0.014	0.049 ± 0.014
Zr-95	< 0.0032	< 0.0016	< 0.0004	< 0.0011
Nb-95	< 0.0008	< 0.0009	< 0.0009	< 0.0020
Ru-103	< 0.0016	< 0.0008	< 0.0009	< 0.0014
Ru-106	< 0.0108	< 0.0097	< 0.0067	< 0.0049
Cs-134	< 0.0009	< 0.0003	< 0.0006	< 0.0012
Cs-137	< 0.0013	< 0.0004	< 0.0004	< 0.0010
Ce-141	< 0.0014	< 0.0006	< 0.0019	< 0.0020
Ce-144	< 0.0053	< 0.0025	< 0.0047	< 0.0062

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Table 14. Ambient gamma radiation (TLDs), quarterly exposure, 1997.
Units: mR/91 days

	1st Qtr	2nd Quarter	3rd Quarter	4th Quarter
Air Stations				
D-1	10.5 ± 0.2	10.6 ± 0.2	11.2 ± 0.3	15.7 ± 0.5
D-2	12.1 ± 0.2	9.8 ± 0.2	12.3 ± 0.2	15.4 ± 0.4
D-3	11.3 ± 0.3	9.4 ± 0.3	11.2 ± 0.2	14.7 ± 0.3
D-5	12.0 ± 0.2	9.3 ± 0.2	12.7 ± 0.2	15.8 ± 0.4
D-6	11.4 ± 0.3	8.9 ± 0.3	11.3 ± 0.2	15.9 ± 0.3
D-7	11.0 ± 0.3	37.1 ± 0.2	12.0 ± 0.2	17.0 ± 0.3
D-8	15.9 ± 0.2	14.3 ± 0.3	16.0 ± 0.2	20.9 ± 0.4
D-10	11.6 ± 0.2	11.3 ± 0.2	12.7 ± 0.2	17.4 ± 0.3
D-11	9.0 ± 0.2	7.1 ± 0.2	9.2 ± 0.2	12.1 ± 0.3
D-13	13.2 ± 0.2	11.2 ± 0.2	13.6 ± 0.2	17.0 ± 0.3
D-15	11.6 ± 0.2	9.9 ± 0.2	12.4 ± 0.2	15.7 ± 0.5
D-16	12.1 ± 0.2	10.8 ± 0.2	13.5 ± 0.2	15.6 ± 0.4
Mean±s.d.	11.8 ± 1.6	12.5 ± 7.9	12.3 ± 1.7	16.1 ± 2.0
W/in 0.5 mi. of Stack				
D-18	12.6 ± 0.2	11.7 ± 0.2	14.2 ± 0.2	16.4 ± 0.6
D-19	10.9 ± 0.4	12.3 ± 0.2	12.1 ± 0.2	15.8 ± 0.4
D-20	13.6 ± 0.2	15.8 ± 0.2	14.7 ± 0.3	19.5 ± 0.4
D-21	13.7 ± 0.2	14.4 ± 0.3	15.9 ± 0.2	18.3 ± 0.3
D-22	12.4 ± 0.2	12.7 ± 0.3	12.6 ± 0.2	16.9 ± 0.3
D-23	10.5 ± 0.2	10.7 ± 0.2	11.3 ± 0.3	15.6 ± 0.5
D-28	13.3 ± 0.2	15.8 ± 0.2	15.7 ± 0.2	18.5 ± 0.3
D-29	14.8 ± 0.3	17.5 ± 0.2	17.0 ± 0.2	20.9 ± 0.5
D-30	14.9 ± 0.3	17.2 ± 0.2	17.8 ± 0.2	20.2 ± 0.4
D-31	17.2 ± 0.2	18.3 ± 0.3	ND[a]	23.5 ± 0.3
D-32	16.5 ± 0.2	15.8 ± 0.2	17.7 ± 0.2	21.0 ± 0.3
D-82	10.3 ± 0.2	10.3 ± 0.2	13.1 ± 0.2	13.7 ± 0.3
D-83	11.6 ± 0.2	12.7 ± 0.2	13.6 ± 0.2	15.8 ± 0.3
D-84	12.0 ± 0.2	12.8 ± 0.2	14.0 ± 0.2	15.3 ± 0.3
D-85	11.4 ± 0.3	12.5 ± 0.2	13.4 ± 0.2	15.9 ± 0.4
D-86	14.2 ± 0.2	14.1 ± 0.4	15.8 ± 0.2	17.1 ± 0.3
D-91	10.8 ± 0.5	12.8 ± 0.2	ND[a]	15.5 ± 0.5
Mean±s.d.	13.0 ± 2.1	14.0 ± 2.4	14.6 ± 2.0	17.6 ± 2.6

[a] ND = No data; TLD lost in the field.

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Table 14. Ambient gamma radiation (TLDs), quarterly exposure, 1997.
Units: mR/91 days

	1st Qtr	2nd Quarter	3rd Quarter	4th Quarter
W/in 1.0 mi. of Stack				
D-43	10.8 ± 0.2	12.3 ± 0.2	13.1 ± 0.2	15.3 ± 0.3
D-44	14.3 ± 0.3	16.0 ± 0.2	16.9 ± 0.2	18.9 ± 0.3
D-45	10.9 ± 0.3	12.3 ± 0.2	13.1 ± 0.2	16.6 ± 0.3
D-46	14.9 ± 0.4	16.9 ± 0.2	17.6 ± 0.2	20.0 ± 0.3
D-47	14.2 ± 0.2	14.4 ± 0.2	16.2 ± 0.2	19.4 ± 0.3
D-48	15.0 ± 0.3	15.9 ± 0.2	17.1 ± 0.2	19.6 ± 0.3
Mean±s.d.	13.4 ± 2.0	14.6 ± 2.0	15.7 ± 2.0	18.3 ± 1.9
W/in 3.0 mi. of Stack				
D-33	9.2 ± 0.2	9.2 ± 0.3	11.4 ± 0.2	12.9 ± 0.3
D-34	9.6 ± 0.2	10.6 ± 0.2	11.9 ± 0.2	13.3 ± 0.3
D-35	10.7 ± 0.2	10.6 ± 0.2	12.5 ± 0.2	ND[a]
D-36	12.3 ± 0.2	11.2 ± 0.2	14.0 ± 0.2	14.8 ± 0.3
D-37	15.0 ± 0.2	15.8 ± 0.2	17.6 ± 0.2	17.3 ± 0.3
D-38	12.2 ± 0.2	12.9 ± 0.2	14.7 ± 0.3	15.7 ± 0.3
D-39	12.2 ± 0.2	12.3 ± 0.2	14.4 ± 0.2	15.9 ± 0.4
D-40	11.1 ± 0.3	11.5 ± 0.2	13.2 ± 0.2	14.7 ± 0.3
D-41	11.3 ± 0.2	11.9 ± 0.2	13.5 ± 0.2	14.7 ± 0.3
D-42	9.9 ± 0.2	11.3 ± 0.2	11.2 ± 0.3	14.1 ± 0.3
Mean±s.d.	11.4 ± 1.7	11.7 ± 1.8	13.4 ± 1.9	14.8 ± 1.4

[a] ND = No data; TLD lost in the field.

Table 15. 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)
Units: pCi/L
Location: D-63

Lab Code	DMI-91	DMI-505	DMI-1051	DMI-1639	DMI-2827
Date Collected	1/7/97	2/4/97	3/4/97	4/1/97	5/6/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1240 ± 140	1350 ± 140	1410 ± 90	1410 ± 130	1420 ± 160
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-3230	DMI-3610	DMI-4351	DMI-4475	DMI-5007
Date Collected	5/20/97	6/3/97	6/17/97	7/1/97	7/15/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1350 ± 130	1410 ± 110	1500 ± 120	1470 ± 120	1460 ± 170
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-5460	DMI-5830	DMI-6205	DMI-6626	DMI-7081
Date Collected	7/29/97	8/12/97	8/26/97	9/9/97	9/23/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1250 ± 110	1410 ± 120	1440 ± 120	1430 ± 120	1360 ± 170
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-63

Lab Code	DMI-7521	DMI-8591	DMI-9391
Date Collected	10/7/97	11/4/97	12/2/97
I-131	< 1.0	< 1.0	< 1.0
K-40	1270 ± 150	1240 ± 150	1280 ± 140
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-93

Lab Code	ND[a]	ND[a]	DMI-1052	DMI-1640	DMI-2828, 9
Date Collected	1/7/97	2/4/97	3/4/97	4/1/97	5/6/97
I-131	-	-	< 1.0	< 1.0	< 1.0
K-40	-	-	1570 ± 130	1790 ± 170	1840 ± 110
Cs-134	-	-	< 15.0	< 15.0	< 15.0
Cs-137	-	-	< 18.0	< 18.0	< 18.0
Ba-140	-	-	< 60.0	< 60.0	< 60.0
La-140	-	-	< 15.0	< 15.0	< 15.0

Lab Code	DMI-3231	DMI-3611	DMI-4052	DMI-4476	DMI-5008
Date Collected	5/20/97	6/3/97	6/17/97	7/1/97	7/15/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1740 ± 200	1660 ± 170	1810 ± 190	1650 ± 170	1680 ± 130
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-5461	DMI-5831	DMI-6206	DMI-6627	DMI-7082
Date Collected	7/29/97	8/12/97	8/26/97	9/9/97	9/23/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1760 ± 180	1770 ± 130	1940 ± 200	1810 ± 200	1750 ± 170
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Table 15. 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)

Units: pCi/L

Location: D-93

Lab Code	DMI-7522	DMI-8592	DMI-9392
Date Collected	10/7/97	11/4/97	12/2/97
I-131	< 1.0	< 1.0	< 1.0
K-40	2000 ± 200	1660 ± 180	1000 ± 90
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-96

Lab Code	DMI-92, 3	DMI-506	DMI-1053	DMI-1641, 2	DMI-2830
Date Collected	1/7/97	2/4/97	3/4/97	4/1/97	5/6/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1440 ± 100	1440 ± 100	1460 ± 140	1470 ± 100	1520 ± 160
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-3232, 3	DMI-3705	DMI-4053	DMI-4477	DMI-5009
Date Collected	5/20/97	6/3/97	6/17/97	7/1/97	7/15/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1530 ± 90	1500 ± 120	1460 ± 170	1450 ± 160	1520 ± 160
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-5462	DMI-5832	DMI-6207	DMI-6628	DMI-7083
Date Collected	7/29/97	8/12/97	8/26/97	9/9/97	9/23/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1540 ± 110	1510 ± 170	1480 ± 180	1410 ± 120	1470 ± 170
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-96

Lab Code	DMI-7523	DMI-8593	DMI-9393
Date Collected	10/7/97	11/4/97	12/2/97
I-131	< 1.0	< 1.0	< 1.0
K-40	1470 ± 180	1680 ± 180	1370 ± 150
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-101

Lab Code	ND[a]	ND[a]	DMI-1054	DMI-1643	DMI-2831
Date Collected	1/7/97	2/4/97	3/4/97	4/1/97	5/6/97
I-131	-	-	< 1.0	< 1.0	< 1.0
K-40	-	-	1270 ± 140	1680 ± 140	1550 ± 160
Cs-134	-	-	< 15.0	< 15.0	< 15.0
Cs-137	-	-	< 18.0	< 18.0	< 18.0
Ba-140	-	-	< 60.0	< 60.0	< 60.0
La-140	-	-	< 15.0	< 15.0	< 15.0

Lab Code	DMI-3234	DMI-3612	DMI-4054	DMI-4478	DMI-5010
Date Collected	5/20/97	6/3/97	6/17/97	7/1/97	7/15/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1730 ± 180	1800 ± 190	2120 ± 220	1690 ± 120	1820 ± 180
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-5463	DMI-5833	DMI-6208	DMI-6629	DMI-7084
Date Collected	7/29/97	8/12/97	8/26/97	9/9/97	9/23/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1530 ± 190	1750 ± 210	1570 ± 190	1690 ± 170	1820 ± 130
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-101

Lab Code	DMI-7524	DMI-8594	DMI-9394
Date Collected	10/7/97	11/4/97	12/2/97
I-131	< 1.0	< 1.0	< 1.0
K-40	1680 ± 200	1810 ± 210	1410 ± 110
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-105

Lab Code	DMI-94	DMI-507	DMI-1055, 6	DMI-1644	DMI-2832
Date Collected	1/7/97	2/4/97	3/4/97	4/1/97	5/6/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1570 ± 180	1490 ± 140	1490 ± 90	1420 ± 150	1510 ± 170
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Lab Code	DMI-3235	DMI-3706	ND[a]	DMI-4479	DMI-5011
Date Collected	5/20/97	6/3/97	6/17/97	7/1/97	7/15/97
I-131	< 1.0	< 1.0	-	< 1.0	< 1.0
K-40	1370 ± 140	1280 ± 170	-	1380 ± 160	1500 ± 190
Cs-134	< 15.0	< 15.0	-	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	-	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	-	< 60.0	< 60.0
La-140	< 15.0	< 15.0	-	< 15.0	< 15.0

Lab Code	DMI-5464, 5	DMI-5834	DMI-6209	DMI-6630	DMI-7085
Date Collected	7/29/97	8/12/97	8/26/97	9/9/97	9/23/97
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
K-40	1330 ± 90	1420 ± 170	1430 ± 120	1540 ± 170	1390 ± 120
Cs-134	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0

Table 15. 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)
Units: pCi/L
Location: D-105

Lab Code	DMI-7525	DMI-8595	DMI-9395
Date Collected	10/7/97	11/4/97	12/2/97
I-131	< 1.0	< 1.0	< 1.0
K-40	1310 ± 170	1230 ± 150	1540 ± 180
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 18.0	< 18.0	< 18.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

[a] ND = No Data; sample not received.

Table 16. Well water samples, analyses for gross beta and tritium.
Collection: Quarterly
Units: pCi/L

Location	D-53 Treated Municipal Water			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DWW-1536	DWW-4084	DWW-7126	DWW-9541
Gross Beta	2.2 ± 0.6	2.7 ± 0.7	4.6 ± 0.6	1.6 ± 0.4
H-3	< 330	< 330	< 330	< 330

Location	D-54 Inlet to Municipal Water			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DWW-1537	DWW-4085	DWW-7127	DWW-9542
Gross Beta	3.5 ± 0.8	4.3 ± 0.8	3.2 ± 0.6	3.0 ± 0.6
H-3	< 330	< 330	< 330	< 330

Location	D-55 On-site Well			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DWW-1538	DWW-4086	DWW-7128	DWW-9543
Gross Beta	< 1.2	< 0.9	< 0.9	0.9 ± 0.5
H-3	< 330	< 330	< 330	< 330

Location	D-57 Bull Farm			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DWW-1539, 40	DWW-4087	DWW-7129	DWW-9544
Gross Beta	1.6 ± 0.5	1.1 ± 0.5	1.4 ± 0.5	1.3 ± 0.5
H-3	< 330	< 330	< 330	< 330

Location	D-58 Franz Farm			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DWW-1541	DWW-4088	DWW-7130	DWW-9545
Gross Beta	5.9 ± 0.9	4.3 ± 0.7	4.9 ± 0.6	1.0 ± 0.4
H-3	< 330	< 330	< 330	< 330

Table 16. Well water samples, analyses for gross beta and tritium.
Collection: Quarterly
Units: pCi/L

Location	D-72 Van Note Farm			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DWW-1542	DWW-4089	DWW-7131	DWW-9546
Gross Beta	< 1.0	< 0.8	< 0.8	< 0.8
H-3	< 330	< 330	< 330	< 330

Table 17. Vegetation samples (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

Location	D-57	D-93	D-94	D-105	D-106
Lab Code	DVE-5012	DVE-5013	DVE-5014	DVE-5015	DVE-5016
Date Collected	7/15/97	7/15/97	7/15/97	7/15/97	7/15/97
Sample Type	Lettuce	Cabbage	Lettuce	Cabbage	Cabbage
K-40	3.50 ± 0.47	2.34 ± 0.37	4.19 ± 0.35	2.43 ± 0.38	2.26 ± 0.42
Mn-54	< 0.008	< 0.012	< 0.019	< 0.025	< 0.010
Co-58	< 0.016	< 0.009	< 0.016	< 0.022	< 0.008
Co-60	< 0.025	< 0.023	< 0.020	< 0.023	< 0.010
Zr-95	< 0.040	< 0.023	< 0.023	< 0.037	< 0.032
Nb-95	< 0.020	< 0.014	< 0.021	< 0.033	< 0.017
Ru-103	< 0.019	< 0.010	< 0.018	< 0.021	< 0.013
Ru-106	< 0.190	< 0.105	< 0.163	< 0.255	< 0.129
I-131	< 0.035	< 0.034	< 0.036	< 0.053	< 0.028
Cs-134	< 0.023	< 0.007	< 0.023	< 0.022	< 0.024
Cs-137	< 0.021	< 0.021	< 0.023	< 0.025	< 0.012
Ce-141	< 0.025	< 0.015	< 0.029	< 0.046	< 0.037
Ce-144	< 0.146	< 0.076	< 0.100	< 0.164	< 0.112

Table 18. Vegetation samples (hay and grain), analysis for gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

Location	D-16	D-16	D-57	D-57	D-58
Lab Code	DVE-5816	DVE-7224	DVE-5817	DVE-8276	DVE-8277
Date Collected	8/12/97	9/26/97	8/12/97	10/20/97	10/20/97
Sample Type	Grass	Soy Beans	Hay	Corn	Corn
K-40	2.54 ± 0.54	8.34 ± 0.26	9.12 ± 0.60	2.70 ± 0.34	2.19 ± 0.36
Mn-54	< 0.016	< 0.007	< 0.032	< 0.014	< 0.011
Co-58	< 0.023	< 0.006	< 0.031	< 0.007	< 0.011
Co-60	< 0.037	< 0.012	< 0.038	< 0.020	< 0.020
Zr-95	< 0.067	< 0.013	< 0.056	< 0.022	< 0.016
Nb-95	< 0.018	< 0.010	< 0.030	< 0.011	< 0.020
Ru-103	< 0.025	< 0.007	< 0.021	< 0.013	< 0.016
Ru-106	< 0.217	< 0.083	< 0.131	< 0.104	< 0.112
Cs-134	< 0.033	< 0.011	< 0.029	< 0.010	< 0.013
Cs-137	< 0.042	< 0.009	< 0.031	< 0.015	< 0.018
Ce-141	< 0.040	< 0.020	< 0.042	< 0.021	< 0.014
Ce-144	< 0.181	< 0.070	< 0.169	< 0.083	< 0.086
Location	D-63	D-63	D-72	D-93	D-105
Lab Code	DVE-5818	DVE-8278	DVE-8279	DVE-5828	DVE-5829
Date Collected	8/12/97	10/20/97	10/20/97	8/12/97	8/12/97
Sample Type	Hay	Corn	Corn	Hay	Hay
K-40	19.13 ± 0.87	2.62 ± 0.35	2.71 ± 0.42	16.39 ± 0.59	16.84 ± 1.57
Mn-54	< 0.029	< 0.008	< 0.009	< 0.020	< 0.054
Co-58	< 0.035	< 0.017	< 0.008	< 0.017	< 0.046
Co-60	< 0.048	< 0.009	< 0.026	< 0.027	< 0.087
Zr-95	< 0.066	< 0.031	< 0.030	< 0.024	< 0.090
Nb-95	< 0.034	< 0.015	< 0.020	< 0.015	< 0.045
Ru-103	< 0.015	< 0.008	< 0.015	< 0.016	< 0.059
Ru-106	< 0.270	< 0.083	< 0.080	< 0.164	< 0.251
Cs-134	< 0.040	< 0.014	< 0.018	< 0.020	< 0.060
Cs-137	< 0.033	< 0.009	< 0.020	< 0.022	< 0.063
Ce-141	< 0.059	< 0.013	< 0.030	< 0.042	< 0.062
Ce-144	< 0.235	< 0.060	< 0.071	< 0.154	< 0.430

Table 18. Vegetation samples (hay and grain), analyses gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

Location	D-105	D-106
Lab Code	DVE-8280	DVE-8281
Date Collected	10/20/97	10/20/97
Sample Type	Corn	Corn
K-40	1.93 ± 0.24	2.75 ± 0.43
Mn-54	< 0.009	< 0.014
Co-58	< 0.006	< 0.015
Co-60	< 0.012	< 0.010
Zr-95	< 0.011	< 0.018
Nb-95	< 0.007	< 0.014
Ru-103	< 0.009	< 0.020
Ru-106	< 0.054	< 0.067
Cs-134	< 0.010	< 0.016
Cs-137	< 0.011	< 0.016
Ce-141	< 0.021	< 0.019
Ce-144	< 0.048	< 0.069

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-49

Lab Code	DSW-344	DSW-901	DSW-1530
Date Collected	1/22/97	2/19/97	3/24/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-2392, 3	DSW-3423	DSW-4144
Date Collected	4/21/97	5/27/97	6/18/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-49

Lab Code	DSW-5178	DSW-6211	DSW-7086
Date Collected	7/18/97	8/26/97	9/22/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-8152	DSW-9199	DSW-9535
Date Collected	10/20/97	11/21/97	12/10/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-50

Lab Code	DSW-345	DSW-902	DSW-1531
Date Collected	1/22/97	2/19/97	3/20/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-2394	DSW-3424	DSW-4145
Date Collected	4/16/97	5/21/97	6/16/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-50

Lab Code	DSW-5179	DSW-6212	DSW-7087
Date Collected	7/15/97	8/21/97	9/17/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-8153	DSW-9458	DSW-9536
Date Collected	10/16/97	11/19/97	12/10/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-51

Lab Code	DSW-346	DSW-903	DSW-1532
Date Collected	1/22/97	2/19/97	3/20/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-2395	DSW-3425	DSW-4146
Date Collected	4/16/97	5/21/97	6/16/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-51

Lab Code	DSW-5180	DSW-6213	DSW-7088
Date Collected	7/15/97	8/21/97	9/17/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-8154	DSW-9459	DSW-9537
Date Collected	10/16/97	11/19/97	12/10/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-99

Lab Code	DSW-347	DSW-904	DSW-1533
Date Collected	1/22/97	2/19/97	3/24/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-2396	DSW-3426	DSW-4147
Date Collected	4/21/97	5/27/97	6/18/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 19. Surface water samples, analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-99

Lab Code	DSW-5181	DSW-6214	DSW-7089
Date Collected	7/18/97	8/26/97	9/22/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-8155	DSW-9200	DSW-9538
Date Collected	10/20/97	11/21/97	12/10/97
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 20. Surface water samples, analyses for potassium-40 by flame photometry (fp), iodine-131 and other gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-107

Lab Code	DSW-348	DSW-905	DSW-1534
Date Collected	1/22/97	2/25/97	3/24/97
K-40(fp)	18.17	9.52	17.30
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-2397	DSW-3427	DSW-4148
Date Collected	4/21/97	5/27/97	6/18/97
K-40(fp)	23.36[a]	14.71	11.25
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Table 20. Surface water samples, analyses for potassium-40 by flame photometry (fp), iodine-131 and other gamma-emitting isotopes.

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

Lab Code	DSW-5182	DSW-6215	DSW-7090
Date Collected	7/18/97	8/26/97	9/22/97
K-40(fp)	11.25	21.63	12.11
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

Lab Code	DSW-8156	DSW-9201	DSW-9539
Date Collected	10/20/97	11/21/97	12/10/97
K-40(fp)	17.30	22.49	17.30
Mn-54	< 15.0	< 15.0	< 15.0
Fe-59	< 30.0	< 30.0	< 30.0
Co-58	< 15.0	< 15.0	< 15.0
Co-60	< 15.0	< 15.0	< 15.0
Zn-65	< 30.0	< 30.0	< 30.0
Zr-95	< 30.0	< 30.0	< 30.0
Nb-95	< 15.0	< 15.0	< 15.0
I-131	< 15.0	< 15.0	< 15.0
Cs-134	< 15.0	< 15.0	< 15.0
Cs-137	< 15.0	< 15.0	< 15.0
Ba-140	< 60.0	< 60.0	< 60.0
La-140	< 15.0	< 15.0	< 15.0

[a] Corrected data.

Table 21. Surface water samples, analysis for tritium.
Collection: Quarterly composites of monthly samples
Units: pCi/L

Location	D-49			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DSW-1920	DSW-5188	DSW-8614	DSW-10115
H-3	< 330	< 330	< 330	< 330

Location	D-50			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DSW-1923	DSW-5189	DSW-8615	DSW-10116
H-3	< 330	< 330	< 330	< 330

Location	D-51			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DSW-1924	DSW-5190	DSW-8616	DSW-10117
H-3	< 330	< 330	< 330	< 330

Location	D-99			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DSW-1919	DSW-5191	DSW-8617	DSW-10118
H-3	< 330	< 330	< 330	< 330

Location	D-107			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DSW-1921	DSW-5192	DSW-8618	DSW-10119
H-3	< 330	< 330	< 330	< 330

Table 22. Fish samples, analysis of edible portion for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location	Upstream D-49		
Lab Code	DF-4046	DF-4047	DF-7221, 2
Date Collected	6/6/97	6/6/97	9/19/97
Sample Type	Carp	Buffalo	Carp
K-40	2.80 ± 0.37	2.99 ± 0.37	2.84 ± 0.31
Mn-54	< 0.010	< 0.014	< 0.012
Fe-59	< 0.032	< 0.035	< 0.031
Co-58	< 0.016	< 0.009	< 0.009
Co-60	< 0.007	< 0.016	< 0.006
Zn-65	< 0.042	< 0.028	< 0.033
Zr-95	< 0.019	< 0.040	< 0.019
Nb-95	< 0.022	< 0.025	< 0.017
Ru-103	< 0.012	< 0.017	< 0.018
Ru-106	< 0.098	< 0.093	< 0.054
Cs-134	< 0.008	< 0.014	< 0.014
Cs-137	< 0.013	< 0.014	< 0.007
Ce-141	< 0.012	< 0.020	< 0.025
Ce-144	< 0.067	< 0.087	< 0.069
Location	Downstream D-61		
Lab Code	DF-4048	DF-4049, 50	DF-7223
Date Collected	6/6/97	6/6/97	9/19/97
Sample Type	Carpsucker	Carp	Carp
K-40	2.48 ± 0.53	2.93 ± 0.23	2.98 ± 0.52
Mn-54	< 0.019	< 0.009	< 0.022
Fe-59	< 0.025	< 0.010	< 0.043
Co-58	< 0.012	< 0.008	< 0.009
Co-60	< 0.010	< 0.011	< 0.008
Zn-65	< 0.032	< 0.013	< 0.071
Zr-95	< 0.038	< 0.013	< 0.022
Nb-95	< 0.011	< 0.007	< 0.043
Ru-103	< 0.020	< 0.006	< 0.024
Ru-106	< 0.125	< 0.070	< 0.151
Cs-134	< 0.014	< 0.006	< 0.018
Cs-137	< 0.018	< 0.006	< 0.013
Ce-141	< 0.016	< 0.014	< 0.028
Ce-144	< 0.057	< 0.037	< 0.150

Table 23. River sediment samples, analysis for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	D-50	
Lab Code	DBS-4055	DBS-7123
Date Collected	6/4/97	9/17/97
K-40	6.50 ± 0.42	8.22 ± 0.38
Mn-54	< 0.020	< 0.011
Co-58	< 0.025	< 0.013
Co-60	< 0.013	< 0.011
Zr-95	< 0.061	< 0.012
Nb-95	< 0.031	< 0.017
Ru-103	< 0.023	< 0.012
Ru-106	< 0.115	< 0.058
Cs-134	< 0.021	< 0.033
Cs-137	< 0.019	< 0.016
Ce-141	< 0.043	< 0.029
Ce-144	< 0.087	< 0.088

Location	D-51	
Lab Code	DBS-4056	DBS-7124
Date Collected	6/4/97	9/17/97
K-40	6.024 ± 0.59	10.99 ± 0.62
Mn-54	< 0.019	< 0.018
Co-58	< 0.026	< 0.035
Co-60	< 0.025	< 0.019
Zr-95	< 0.076	< 0.044
Nb-95	< 0.033	< 0.029
Ru-103	< 0.036	< 0.016
Ru-106	< 0.167	< 0.173
Cs-134	< 0.028	< 0.051
Cs-137	< 0.022	< 0.019
Ce-141	< 0.042	< 0.066
Ce-144	< 0.157	< 0.079

Table 23. River sediment samples, analysis for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	D-107	
Lab Code	DBS-4057	DBS-7125
Date Collected	6/4/97	9/17/97
K-40	5.15 ± 0.69	6.62 ± 0.93
Mn-54	< 0.048	< 0.043
Co-58	< 0.045	< 0.026
Co-60	0.248 ± 0.039	0.159 ± 0.051
Zr-95	< 0.056	< 0.099
Nb-95	< 0.034	< 0.062
Ru-103	< 0.037	< 0.048
Ru-106	< 0.311	< 0.319
Cs-134	< 0.055	< 0.053
Cs-137	< 0.041	< 0.038
Ce-141	< 0.050	< 0.060
Ce-144	< 0.120	< 0.129

Table 24. Precipitation samples, analysis for gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: Duane Arnold

Lab Code	DP-349	DP-900	DP-1535
Date Collected	1/22/97	2/19/97	3/24/97
Mn-54	< 7.0	< 3.5	< 3.9
Fe-59	< 8.5	< 7.9	< 2.4
Co-58	< 6.3	< 2.3	< 5.4
Co-60	< 8.0	< 4.4	< 2.9
Zn-65	< 16.9	< 5.7	< 15.3
Zr-95	< 11.2	< 8.2	< 4.3
Nb-95	< 5.7	< 3.7	< 4.0
I-131	< 7.1	< 8.0	< 8.8
Cs-134	< 3.4	< 3.6	< 3.4
Cs-137	< 5.8	< 4.8	< 2.8
Ba-140	< 39.1	< 19.5	< 11.1
La-140	< 8.3	< 3.6	< 3.8

Lab Code	DP-2398	DP-3422	DP-4149
Date Collected	4/21/97	5/27/97	6/18/97
Mn-54	< 3.0	< 4.1	< 5.7
Fe-59	< 4.8	< 9.1	< 4.6
Co-58	< 1.7	< 5.9	< 3.6
Co-60	< 2.7	< 4.2	< 5.8
Zn-65	< 9.7	< 6.2	< 5.5
Zr-95	< 6.7	< 9.8	< 7.6
Nb-95	< 1.5	< 3.6	< 5.3
I-131	< 3.2	< 9.0	< 9.5
Cs-134	< 2.9	< 4.7	< 7.1
Cs-137	< 3.1	< 3.9	< 4.8
Ba-140	< 12.2	< 27.8	< 27.4
La-140	< 1.6	< 5.2	< 3.5

Table 24. Precipitation samples, analysis for gamma-emitting isotopes
Collection: Monthly
Units: pCi/L
Location: Duane Arnold

Lab Code	DP-5183	DP-6216	DP-7132
Date Collected	7/18/97	8/26/97	9/23/97
Mn-54	< 4.3	< 6.6	< 6.4
Fe-59	< 11.9	< 5.7	< 11.6
Co-58	< 5.1	< 5.6	< 2.8
Co-60	< 4.9	< 6.8	< 6.6
Zn-65	< 7.7	< 10.0	< 9.6
Zr-95	< 5.6	< 13.7	< 14.3
Nb-95	< 5.9	< 6.0	< 7.0
I-131	< 12.9	< 13.6	< 8.0
Cs-134	< 3.6	< 4.5	< 7.5
Cs-137	< 5.8	< 8.2	< 6.6
Ba-140	< 37.6	< 36.1	< 24.0
La-140	< 7.2	< 7.3	< 4.3

Lab Code	DP-8157	DP-9460	DP-9540
Date Collected	10/20/97	11/19/97	12/10/97
Mn-54	< 2.7	< 6.8	< 7.3
Fe-59	< 3.3	< 15.0	< 5.6
Co-58	< 1.6	< 6.7	< 5.1
Co-60	< 3.2	< 4.7	< 8.2
Zn-65	< 10.6	< 11.4	< 20.5
Zr-95	< 7.5	< 8.7	< 10.3
Nb-95	< 2.4	< 8.0	< 7.7
I-131	< 4.2	< 20.1	< 7.8
Cs-134	< 1.9	< 6.8	< 5.1
Cs-137	< 3.4	< 7.9	< 6.6
Ba-140	< 10.5	< 44.0	< 35.0
La-140	< 2.5	< 12.7	< 8.8

Table 25. Precipitation samples, analysis for tritium.
Collection: Quarterly composites of monthly samples
Units: pCi/L

Location	Duane Arnold			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DP-1922	DP-5193	DP-8619	DP-10137
H-3	< 158	< 185	< 160	< 160

Table 27. Soil samples, analyses for strontium-90 and gamma-emitting isotopes.
Collection: Annually
Units: pCi/g dry

Location	D-15	D-16
Lab Code	DSO-7121	DSO-7122
Date Collected	9/23/97	9/23/97
Sr-90	0.044 ± 0.011	0.057 ± 0.016
K-40	15.84 ± 0.64	10.042 ± 0.46
Mn-54	< 0.019	< 0.012
Co-58	< 0.030	< 0.021
Co-60	< 0.023	< 0.013
Zr-95	< 0.018	< 0.027
Nb-95	< 0.046	< 0.028
Ru-103	< 0.020	< 0.018
Ru-106	< 0.118	< 0.053
Cs-134	< 0.032	< 0.037
Cs-137	0.120 ± 0.027	0.282 ± 0.026
Ce-141	< 0.061	< 0.035
Ce-144	< 0.143	< 0.068