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MONTICELLO NUCLEAR GENERATING PLANT
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ANNUAL REPORT
TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiation Environmental Monitoring Program
January 1 to December 31, 1997
Project No. 8010

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PREFACE

The staff of Teledyne Brown Engineering Environmental Services, Midwest Laboratory was responsible for the acquisition of the data presented in this report. Samples were collected by members of the staff of the Monticello Nuclear Generating Plant, Northern States Power Company. The report was prepared by staff members of Teledyne Brown Engineering Environmental Services, Midwest Laboratory.

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1.0 INTRODUCTION

This report summarizes and interprets results of the Radiation Environmental Monitoring Program (REMP) conducted by Teledyne Brown Engineering Environmental Services, Midwest Laboratory at the Monticello Nuclear Generating Plant, Monticello, Minnesota, 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 not included in this report. These data are included in a reference document (Teledyne Brown Engineering Environmental Services, Midwest Laboratory, 1998a) available at Northern States Power Company, Monticello Nuclear Generating Plant, Radiological Services Department.

Monticello Nuclear Generating Plant is a 575 MWe boiling water reactor located on the Mississippi River in Wright County, Minnesota, and operated by Northern States Power Company. Initial criticality was achieved on 10 December 1970. Full power was achieved on 5 March 1971 and commercial operation began on 30 June 1971.

2.0 SUMMARY

The Radiation Environmental Monitoring Program (REMP) required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Monticello Nuclear Generating Plant 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 Monticello Nuclear Generating Plant.

No effect on the environment due to the operation of the Monticello Generating Plant is indicated.

3.0 RADIATION ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.1 Program Design and Data Interpretation

The purpose of the Radiation Environmental Monitoring Program (REMP) at the Monticello Nuclear Generating Plant 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 (TLD's).

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;

(4) Industrial and medical radioactive waste; and

(5) Fallout from nuclear accidents.

In interpreting the data, effects due to the Plant 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 Monticello Plant 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 plant 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 environmental samples collected from the Plant site. The Plant's monitoring program includes analyses for tritium and iodine-131. Most samples are also analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, cerium-144, beryllium-7, and potassium-40. The first 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 10 days after reactor shutdown. On the other hand, 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). Beryllium-7 is of cosmogenic origin and potassium-40 is a naturally-occurring isotope. They were chosen as calibration monitors and should not be considered as radiological impact indicators.

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

Program Design and Data Interpretation (continued)

environment has been atmospheric nuclear testing. Nuclides of the final group, manganese-54, iron-59, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of a nuclear power plant's effluents, but are not produced in significant quantities by nuclear detonations.

Other means of distinguishing sources of environmental radiation are employed in interpreting the data. Current radiation levels are compared with previous levels, including those measured before the plant became operational. Results of the Plant'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 Radiation Environmental Monitoring Program (REMP) at the Monticello Plant is summarized in Table 5.1 and briefly reviewed below. Table 5.2 defines the sampling location codes used in Table 5.1 and specifies for each location its type (indicator or control) and its distance, direction, and sector relative to the reactor site. To assure that sampling is carried out in a reproducible manner, detailed sampling procedures have been prescribed (Monticello Generating Plant REMP Surveillances, Current Revision). Maps of sampling locations are included in Appendix D.

To monitor the air environment, airborne particulates are collected on membrane filters by continuous pumping at five locations. Also, airborne iodine is collected by continuous pumping through charcoal filters at all of these locations. Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. Quarterly composites of particulate filters from each location are gamma-scanned on a HP Ge or Ge(Li) detector. One of the five locations is a control (M-1), and four are indicators (M-2, M-3, M-4, M-5). One of the indicators is located in the geographical sector expected to be most susceptible to any atmospheric emissions from the Plant (highest D/Q sector).

Ambient gamma radiation is monitored at thirty-seven locations, using $CaSO_4$:Dy dosimeter with four sensitive areas at each location: fourteen in an inner ring in the general area of the site boundary, sixteen in the outer ring within 4-5 mile radius, six at special interest locations and one control location, 11.1 miles distant from the plant. They are replaced and measured quarterly. Also, a complete emergency set of TLD's for all locations is placed in the field at the same time as regular sets. The emergency set is returned to TBEESML quarterly for annealing and repackaging.

Milk samples are collected monthly from three farms (two indicator and one control). There are currently only two milk producers within the indicator area. The milk is collected biweekly during the growing season (May - October), because the milk animals may be on pasture. All samples are analyzed for iodine-131 and gamma-emitting isotopes.

Leafy green vegetables (cabbage) are collected annually from the highest D/Q garden and a control location and analyzed for iodine-131. Corn and potatoes are collected

Program Description (continued)

annually only if the field is irrigated by water in which radioactive effluent has been discharged. Analysis is for gamma-emitting isotopes.

The terrestrial environment is also monitored by collection of well water from four locations on a quarterly basis. All samples are analyzed for tritium and gamma-emitting isotopes.

River water is collected weekly at two locations, one upstream of the plant and one downstream. Monthly composites are analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

Drinking water is collected weekly from the City of Minneapolis water supply, which is taken from the Mississippi River downstream of the Plant. Monthly composites are analyzed for gross beta, iodine-131, and gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

The aquatic environment is also monitored by semi-annual upstream and downstream collections of fish, invertebrates, and shoreline sediments. Shoreline sediment is also collected semi-annually from one downstream recreational location. All 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) There was no Air particulate/Air Iodine sample available at location M-4 for the week ending 05-14-97. The sampler pump failed due to an open circuit breaker.

(2) There was no TLD data for location M-11A for the second quarter of 1997. The TLD was lost in shipping.

(3) There was no TLD data for location M-7B for the third quarter of 1997. The TLD was lost in the field due to a major storm.

(4) There was no Air particulate/Air Iodine sample available at location M-1 for the week ending 06-26-97. The sampler pump line cord had come unplugged.

(5) There was no Air particulate/Air Iodine sample available at location M-5 for the week ending 07-07-97. Power was shut off for building repairs.

(6) No Air Iodine analyses for stations M-1 through M-5 were performed for the week ending 07-30-97. The samples were received too late for meaningful analysis, due to the UPS strike.

(7) No Iodine-131 analyses for locations M-10, M-24 and M-28 were performed for the week of 07-30-97. The samples were received too late for meaningful analysis, due to the UPS strike.

Deviations from the program are summarized in Table 5.3.

3.4 Laboratory Procedures

The iodine-131 analyses in milk and drinking water were made using a sensitive radiochemical procedure which involves separation of the iodine using an ion-exchange method and solvent extraction and subsequent beta counting.

All gamma-spectroscopic analyses were performed with an HPGe or Ge(Li) detector. Levels of iodine-131 in cabbage and natural vegetation were determined by HPGe or Ge(Li) spectrometry. The concentrations of airborne iodine-131 in charcoal samples were measured by HPGe or Ge(Li) spectrometry.

Tritium was determined by a liquid scintillation technique.

Analytical procedures used by the Teledyne Brown Engineering Environmental Services, Midwest Laboratory 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).

Teledyne Brown Engineering Environmental Services, Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of TBEESML's QA Program are presented elsewhere (Teledyne Isotopes Midwest Laboratory, 1992). The TBEESML QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in crosscheck programs are presented in Appendix A.

3.5 Program Modifications

Well water was not available from location M-13 for the third and fourth quarters of 1997. The water was collected from the Wise residence (M-27).

3.6 Land Use Census

In accordance with the Technical Specifications 4.16 Paragraph B1, a land use census shall be conducted and shall identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 ft^2 producing fresh leafy vegetables, in each of the 16 meteorological sectors within a distance of 5 miles. The census shall also identify the locations of all milk animals and all 500 ft^2 or greater gardens producing broad leaf vegetation in each of the meteorological sectors within a distance of three miles. This census shall be conducted at least once per year between the dates of May 1 and October 31. New locations shall be added to the radiation environmental monitoring program within 30 days and sampling locations having lower calculated doses or a lower dose commitment may be deleted from this monitoring program after October 31 of the year in which the land use census was conducted. The 1997 land use census was conducted between July 21 and August 8, 1997. No changes to the highest D/Q garden, residence or dairy locations from the 1996 census were identified. The highest D/Q locations remained; Resident (0.6 mi./SW), Garden (0.7 mi./SSW), and Dairy (3.7 mi./WNW). Detailed land use census data are contained in the Land Use Census and Critical Receptor Report, Aug , 1997, Monticello Nuclear Generating Plant, Radiological Services Department.

4.0 RESULTS AND DISCUSSION

All of the scheduled collections and analyses were made except those listed in Table 5.3.

All results are summarized in Table 5.4 in a format recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.8. For each type of analysis of each sampled medium, this table lists the mean and range for all indicator locations and for all control locations. The locations with the highest mean and range are also shown.

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 facilities in 1997.

4.2 Summary of Preoperational Data

The following constitutes a summary of preoperational studies conducted at the Monticello Nuclear Generating Plant during the years 1968 to 1970, to determine background levels expected in the environment, and provided, where applicable, as a means for comparison with present day levels. Strict comparisons, however, are difficult to make, since background levels of radiation were much higher in these years due to radioactive fallout from the atmosphere. Gross beta measurements in fallout averaged 20,600 pCi/m^2 in 1969 and 12,000 pCi/m^2 in 1970. These levels are reflected throughout the various media tested.

In the air environment, ambient gamma radiation (TLDs) averaged 9.1 mR/4 weeks during preoperational studies (1970). Gross beta in air particulates in 1969 and 1970 averaged 0.20 pCi/m^3. Present day levels have stabilized at around 0.025 pCi/m^3. Airborne radioiodine remained below detection levels.

In the terrestrial environment of 1968 to 1970, milk, agricultural crops, and soil were monitored. In milk samples, low levels of Cs-137 and Sr-90 were detected. Cs-137 levels averaged 16.7 pCi/L. Soybean crop measurements in 1969 averaged 35.5 pCi/g for gross beta and 0.3 pCi/g for Cs-137. Gross beta measured in soil averaged 51.7 pCi/g . Present day measurements for cesium-137 are below detection levels in milk and agricultural crops.

The aqueous environment was monitored by testing of river water, bottom sediments, fish, aquatic vegetation, and periphyton. Specific location comparison of drinking, river, and well water concentrations for tritium and gross beta are not possible. However, tritium background levels, measured at seven separate locations from 1968 to 1970, averaged 970 pCi/L. Present day environmental samples measure below detection levels. Values for gross beta, measured from 1968 to 1970, averaged 9.8 pCi/L in upstream and downstream Mississippi River water, 4.4 pCi/L for well waters, and 18.6 pCi/L for lake waters. Gamma emitters were below the lower limit of detection (LLD). In shoreline sediments, gross beta background levels in 1970 averaged 49.8 pCi/g for both upstream and downstream samples. Cs-137 activity averaged 0.10 pCi/g for both upstream and downstream samples. The lower levels of Cs-137 occasionally observed today can still be attributed to residual activity from atmospheric fallout.

Summary of Preoperational Data (continued)

Gross beta levels in fish flesh averaged 5.3 pCi/g in 1968 and 1969. Cs-137, measured in 1969 and 1970, averaged 0.044 pCi/g. Gross beta background levels, in 1970, for aquatic vegetation, algae, and periphyton samples measured 86.7 pCi/g, 76.5 pCi/g, and 28.1 pCi/g respectively.

4.3 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in the vicinity of the Monticello Nuclear Generating Plant in 1997.

Ambient Radiation (TLD's)

Ambient radiation was measured in the general area of the site boundary, at an outer ring 4 - 5 mi. distant from the Plant, at special interest areas and at one control location. The means were similar for both inner and outer rings (13.3 and 12.8 mR/91 days, respectively). The mean for special locations was 12.7 mR/91 days. The mean for the control location was 11.0 mR/91 days. Dose rates measured at the inner and outer ring locations were similar to those observed from 1984 through 1996 and are tabulated below. No plant effect on ambient gamma radiation is indicated (Figure 5-1).

Year	Inner Ring	Outer Ring
	Dose rate (mR/91 days)	
1984	13.6	13.6
1985	12.6	12.8
1986	14.6	14.1
1987	15.4	15.5
1988	14.8	14.7
1989	15.0	15.4
1990	16.1	16.2
1991	15.2	15.8
1992	15.1	15.1
1993	15.6	15.9
1994	14.6	14.0
1995	14.4	13.6
1996	14.0	13.5
1997	13.3	12.8

Ambient gamma radiation as measured by thermoluminescent dosimetry.
Average quarterly dose rates, Inner vs. Outer Ring locations

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were identical at both indicator and control locations (0.023 pCi/m^3) and were similar to levels observed from 1984 through 1996. The results are tabulated below. The data for 1986 does not include the results from May 19 to June 9, 1986, which were influenced by the accident at Chernobyl. (Figure 5-2).

Year	Average of Indicators	Control
	Concentration (pCi/m^3)	
1984	0.025	0.024
1985	0.025	0.024
1986	0.026	0.026
1987	0.026	0.026
1988	0.030	0.030
1989	0.027	0.026
1990	0.023	0.023
1991	0.024	0.024
1992	0.023	0.023
1993	0.024	0.023
1994	0.023	0.024
1995	0.024	0.025
1996	0.023	0.023
1997	0.023	0.023

Average annual gross beta concentrations in airborne particulates.

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 in 1983 through 1997. In 1986, the spring peak could not be identified because it was overshadowed by the releases of radioactivity from Chernobyl. The highest averages for gross beta were for the months of January and December, and the first and fourth quarters, as in 1984 through 1997 (exclusive of the period between May 19, 1986 and June 9, 1986).

Two pieces of evidence indicate conclusively that the elevated activity observed during the first and fourth quarters was not attributable to the Plant operation. In the first place, elevated activity of similar size occurred simultaneously at both indicator and control locations. Secondly, an identical pattern was observed at the Prairie Island Nuclear Generating Plant, about 100 miles distant from the Monticello Nuclear Generating Plant (Northern States Power Company, 1998b).

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average of 0.073 pCi/m^3 at both indicator and control locations. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

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

Milk

Iodine-131 results were below the detection limit of 1.0 pCi/L in all samples. Cesium-137 results were below the LLD level of 15 pCi/L in all samples.

No other gamma-emitting isotopes except naturally-occurring potassium-40, were detected in any of the 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.

River Water and Drinking Water

Tritium was below the LLD of 330 pCi/L in all samples. Gross beta in Minneapolis drinking water averaged 2.3 pCi/L and was less than or similar to average levels observed from 1984 through 1996. Gross beta averages are tabulated below.

Year	Gross Beta (pCi/L)
1984	2.8
1985	2.8
1986	2.5
1987	2.4
1988	2.7
1989	2.6
1990	2.2
1991	2.9
1992	2.1
1993	2.6
1994	2.0
1995	2.3
1996	2.1
1997	2.3

Average annual concentrations; Gross beta in drinking water.

Comparisons with gross beta data reported by EPA for Minneapolis drinking water sample collected in 1975, 1976, 1977, and 1978 indicates that concentrations of these nuclides are remaining fairly constant and are in the range of drinking water levels in other parts of the country (U.S. Environmental Protection Agency, 1975, 1976, 1977, 1978). Gamma-emitting isotopes were below detection limits in all surface water samples. There was no indication of a plant effect.

Well Water

The tritium level was below the LLD level of 330 pCi/L in all samples. All gamma isotopic results were below detection limits. There was no indication of a plant effect.

Crops

Two (2) samples of cabbage were collected in September and analyzed for iodine-131. The I-131 level was below 0.013 pCi/g wet weight in both samples. There was no indication of a plant effect. There were no crops irrigated from the Mississippi River within 5 miles of the plant in 1997; therefore, no corn or potato samples were collected for analysis from irrigated fields.

Fish

Fish samples were collected in April and October. Flesh was separated from the bones and gamma-scanned. Potassium-40, the naturally-occurring isotope, was found to be similar in upstream and downstream samples (2.64 and 2.84 pCi/g wet weight, respectively). All gamma-emitting isotopes were below their respective LLD levels. There was no indication of a plant effect.

Invertebrates

Two samples were collected in May and two in October. The samples were analyzed for gamma-emitting isotopes. All isotopes were below detection limits. There was no indication of a plant effect.

Shoreline Sediments

Upstream, downstream and downstream recreational area shoreline sediment collections were made in May and October and analyzed for gamma-emitting isotopes. Cesium-137 was detected in both downstream samples, averaging 0.10 pCi/g dry weight, and recreational area samples, averaging 0.14 pCi/g dry weight, and indicate the influence of fallout deposition. Similar levels of activities and distribution were observed in 1978-1996. The only other gamma-emitting isotope detected was naturally-occurring potassium-40. There was no indication of a plant effect.

5.0 FIGURES AND TABLES

Table 5.1. Sample collection and analysis program, Monticello Nuclear Generating Plant, 1997.

Medium	Locations No.	Locations Codes (and Type)[a]	Collection Frequency[b]	Analysis Type[c]
Ambient Radiation (TLD's)	37	M-01A - M-14A M-01B - M-16B M-01S - M-06S M-01C	C/Q	Ambient gamma
Airborne particulates	5	M-1(C), M-2, M-3, M-4, M-5	C/W	GB, GS (QC of each location)
Airborne Iodine	5	M-1(C), M-2, M-3, M-4, M-5	C/W	I-131
Milk	3	M-10 (C), M-24, M-28	G/M[d]	I-131, GS
River water	2	M-8(C), M-9	G/W	GS(MC), H-3(QC)
Drinking water	1	M-14	G/W	GB(MC), I-131(MC) GS(MC), H-3(QC)
Well Water	4	M-10(C), M-11, M-12, M-13, M-27	G/Q	H-3, GS
Edible cultivated crops - Cabbage	1	M-27	G/A	I-131
Edible cultivated crops - Corn[e]	1	M-19	G/A	GS
Edible cultivated crops - Potatoes[e]	1	M-21	G/A	GS
Fish (one species, edible portion)	2	M-8(C), M-9	G/SA	GS
Algae or Aquatic Insects	2	M-8(C), M-9	G/SA	GS
Shoreline Sediment	3	M-8(C), M-9, M-15	G/SA	GS

[a] Location codes are defined in Table 5.2. Control stations are indicated by (C). All other stations are indicators.

[b] Collection type is coded as follows: C/ = continuous, G/ = grab. Collection frequency is coded as follows: W= weekly, M = monthly, Q = quarterly, SA = semiannually, A = annually.

[c] Analysis type is coded as follows: GB = gross beta, GS = gamma spectroscopy, H-3 = tritium, I-131 = iodine 131. Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

[d] Milk is collected biweekly during the grazing season (May - October) if milk animals are on pasture.

[e] Collected only if the field is irrigated by water in which liquid radioactive effluent has been discharged.

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant, 1997.

Code	Type[a]	Collection Site	Type of Sample[b]	Distance and Direction from Reactor Site
M-1	C	Air Station M-1	AP, AI	11.1 mi @ 306°/NW
M-2		Air Station M-2	AP, AI	0.8 mi @ 140°/SE
M-3		Air Station M-3	AP, AI	0.6 mi @ 104°/ESE
M-4		Air Station M-4	AP, AI	0.9 mi @ 150°/SSE
M-5		Air Station M-5	AP, AI	2.7 mi @ 136°/SE
M-8	C	Upstream of Plant	RW, BS, BO, F	0.2 mi @ 285°/WNW
M-9		Downstream of Plant	RW, BS, BO, F	0.2 mi @ 62°/ENE
M-10	C	Goenner Farm	M, WW, VE	11.5 mi @ 323°/NW
M-11		City of Monticello	WW	3.2 mi @ 128°/SE
M-12		Plant Well #1	WW	0.2 mi @ 267°/W
M-13		Ernst Residence	WW	0.6 mi @ 202°/SSW
M-14		City of Minneapolis	DW	36.0 mi @ 128°/SE
M-15		Montissippi Park	SS	1.6 mi @ 117°/ESE
M-19		River Irrigated Corn Field[c]		
M-21		River Irrigated Potato Field[c]		
M-24		Weinand Farm	M	4.8 mi @ 180°/S
M-27		Wise Residence Highest D/Q Garden	VE, WW	0.7 mi @ 208°/SSW
M-28		Hoglund Farm	M	3.7 mi @ 300°/WNW
M-29		Holthaus Farm	M	4.1 mi @ 173°/S
General Area of the Site Boundary				
M-01A		North Boundary Road	TLD	0.7 mi @ 353°/N
M-02A		North Boundary Road	TLD	0.8 mi @ 23°/NNE
M-03A		North Boundary Road	TLD	1.0 mi @ 43°/NE
M-04A		Biology Station Road	TLD	0.7 mi @ 92°/E
M-05A		Biology Station Road	TLD	0.6 mi @ 112°/ESE
M-06A		Biology Station Road	TLD	0.6 mi @ 133°/SE
M-07A		County Road 75	TLD	0.5 mi @ 158°/SSE
M-08A		County Road 75	TLD	0.5 mi @ 183°/S
M-09A		County Road 75	TLD	0.4 mi @ 203°/SSW
M-10A		County Road 75	TLD	0.3 mi @ 225°/SW
M-11A		County Road 75	TLD	0.4 mi @ 250°/WSW
M-12A		County Road 75	TLD	0.7 mi @ 273°/W
M-13A		North Boundary Road	TLD	1.1 mi @ 317°/NW
M-14A		North Boundary Road	TLD	0.8 mi @ 338°/NNW

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant, 1997 (continued).

Code	Type[a]	Collection Site	Type of Sample[b]	Distance and Direction from Reactor Site
Approximately 4 to 5 miles Distant from the Plant				
M-01B		Serco #1 Air Station	TLD	4.6 mi @ 02°/N
M-02B		County Road 11	TLD	4.4 mi @ 17°/NNE
M-03B		Intersection of County Road & Route 81	TLD	4.5 mi @ 49°/NE
M-04B		Sherco #6 Air Station	TLD	4.2 mi @ 67°/ENE
M-05B		City of Big Lake	TLD	4.4 mi @ 87°/ESE
M-06B		County Road #14 and 196th Street	TLD	4.3 mi @ 116°/ESE
M-07B		Monte Industrial Drive	TLD	4.4 mi @ 135°/SE
M-08B		Dale K. Larson Residence	TLD	4.6 mi @ 162°/SSE
M-09B		Norbert Weinand Farm	TLD	4.7 mi @ 180°/S
M-10B		John Reisewitz Farm	TLD	4.4 mi @ 206°/SSW
M-11B		Clifford Vanlith Farm	TLD	4.2 mi @ 225°/SW
M-12B		Lake Maria State Park	TLD	4.4 mi @ 253°/WSW
M-13B		Bridgewater Station	TLD	4.1 mi @ 271°/W
M-14B		Richard K. Anderson Residence	TLD	4.5 mi @ 228°/NW
M-15B		Gary Williamson Residence	TLD	4.5 mi @ 308°/NNW
M-16B		Sand Plain Research Farm	TLD	4.3 mi @ 338°/NNW
Special Interest Locations				
M-01S		Osowski Orchard Fun Market	TLD	0.7 mi @ 130°/SW
M-02S		Edgar Klucas Residence	TLD	0.7 mi @ 142°/SE
M-03S		Big Oaks Park	TLD	1.3 mi @ 89°/E
M-04S		Pinewood School	TLD	2.3 mi @ 132°/SE
M-05S		Rivercrest Christian Academy	TLD	2.6 mi @ 112°/ESE
M-06S		Monticello Public Works	TLD	2.7 mi @ 136°/SE
M-01C	C	Goenner Farm	TLD	11.5 mi @ 323°/NW

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

b Sample Codes:

AP	=	Airborne particulates
AI	=	Airborne Iodine
BS	=	Bottom (river) sediments
BO	=	Bottom organisms (periphyton or macroinvertebrates)
DW	=	Drinking water
F	=	Fish
M	=	Milk
RW	=	River water
SS	=	Shoreline Sediments
VE	=	Vegetation/vegetables
WW	=	Well water

c Collected only if the field is irrigated by water in which liquid radioactive effluent has been discharged.

Table 5.3. Missed collections and analyses for 1997 at the Monticello Nuclear Generating Plant. All required samples were collected and analyzed as scheduled except the following:

Sample	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AP/AI	Gross Beta, Gamma	M-4	05-14-97	Sampler pump failure; Open circuit breaker.	Monitor for recurrence; repair if necessary.
TLD	Gamma,	M-11A	2nd Qtr.,1997	TLD lost in shipping.	Isolated incident
AP/AI	Gross Beta, Gamma	M-1	06-26-97	Air sampler failure;Power disconnected.	Placed signs at all sampling locations to contact the REMP coordinator if the need to secure the pump occurs
AP/AI	Gross Beta, Gamma	M-5	07-07-97	Power secured for building repairs.	Requested the Public Works supervisor to inform us when the need to secure power to the air station is necessary.
AI	I-131	M-1, 2, 3, M-4, 5	7-30-97	Samples received too late for I-131 analysis, due to UPS strike.	None required; isolated incident.
MI	I-131	M-10, 24, M-28	7-30-97	Samples received too late for I-131 analysis, due to UPS strike.	None required; isolated incident.
TLD	Gamma	M-7B	3rd Qtr., 1997	TLD lost in the field, due to major storm.	None required; Act of Nature.

Figure 5-1. Offsite Ambient Radiation (TLDs); Inner Ring versus Outer Ring locations.

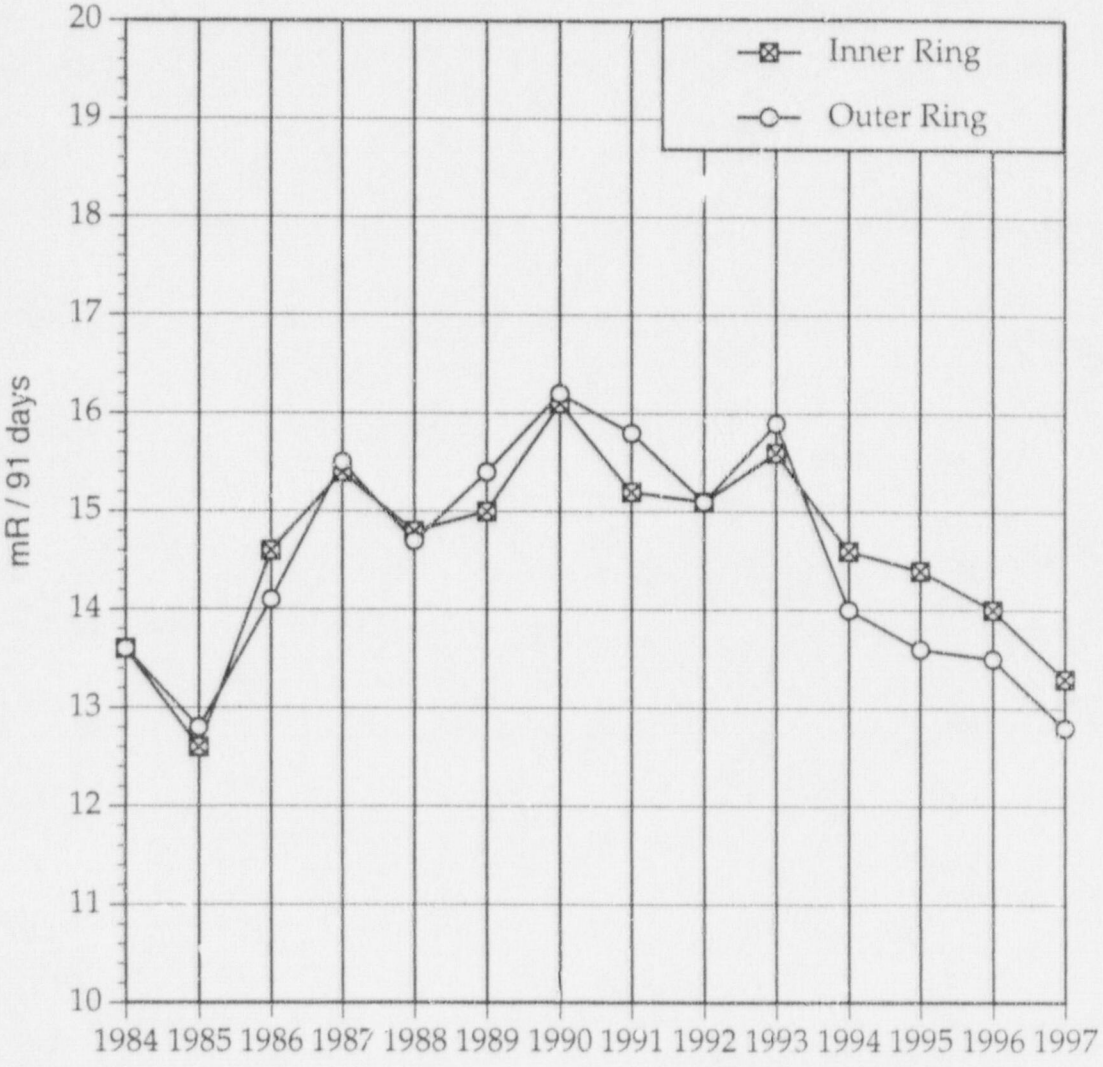

Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.

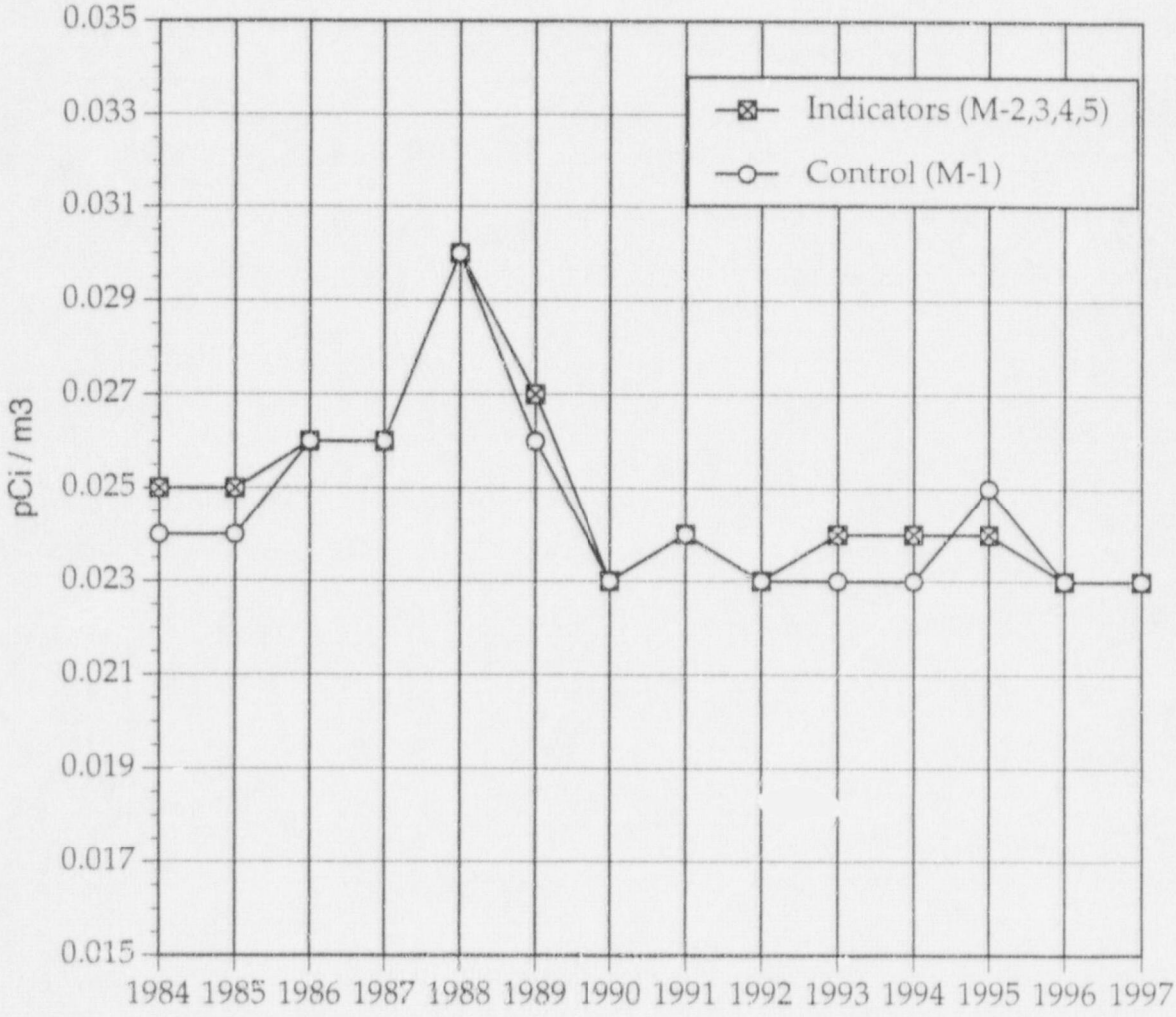

Table 5.4. Radiation Environmental Monitoring Program Summary.

Name of Facility Monticello Nuclear Generating Plant Docket No. 50-263
Location of Facility Wright, Minnesota (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]
TLD (mR/91 days) (Inner Ring, General Area at Site Boundary)	Gamma 55	3.0	13.3 (55/55) (9.4-15.8)	M-01A, M-12A (Both identical means)	14.1 (8/8) (11.5-15.8)	(See Control below.)	0
TLD (mR/91 days) (Outer Ring, 4 - 5 miles distant)	Gamma 63	3.0	12.8 (63/63) (7.8-15.7)	M-10B, Acacia Ave., 4.4 mi @ 206°/SSW	14.0 (4/4) (11.3-15.7)	(See Control below.)	0
TLD (mR/91 days) (Special Interest Areas)	Gamma 24	3.0	12.7 (24/24) (9.0-14.7)	M-06S, Monticello Public Works Bldg 2.7 mi @ 136°/SE	13.7 (4/4) (11.8-14.7)	(See Control below.)	0
TLD (mR/91 days) (Control)	Gamma 4	3.0	None	M-01C, Kirchenbauer Farm, 11.5 mi @ 323°/NW	11.0 (4/4) (9.4-11.9)	11.0 (4/4) (9.4-11.9)	0
Airborne Particulates (pCi/m^3)	GB 259	0.002	0.023 (207/207) (0.008-0.060)	M-5, Air Station 2.7 mi. @136°/SE	0.024 (52/207) (0.012-0.057)	0.023 (52/52) (0.010-0.059)	0
	GS 20						
	Be-7	0.020	0.074 (16/16) (0.048-0.11)	M-2, Air Station 0.8 mi. @140°/SE	0.076 (4/4) (0.049-0.11)	0.068 (4/4) (0.046-0.10)	0
	Mn-54	0.0010	<LLD	-	-	<LLD	0
	Co-58	0.0013	<LLD	-	-	<LLD	0
	Co-60	0.0009	<LLD	-	-	<LLD	0
	Zn-65	0.0018	<LLD	-	-	<LLD	0
	Zr-Nb-95	0.0018	<LLD	-	-	<LLD	0
	Ru-103	0.0013	<LLD	-	-	<LLD	0
	Ru-106	0.0087	<LLD	-	-	<LLD	0
	Cs-134	0.0011	<LLD	-	-	<LLD	0
	Cs-137	0.0009	<LLD	-	-	<LLD	0
	Ba-La-140	0.0027	<LLD	-	-	<LLD	0
	Ce-141	0.0018	<LLD	-	-	<LLD	0
	Ce-144	0.0058	<LLD	-	-	<LLD	0
Airborne Iodine (pCi/m^3)	I-131 254	0.07	<LLD	-	-		0

Table 5.4. Radiation Environmental Monitoring Program Summary.

Name of Facility Monticello Nuclear Generating Plant Docket No 50-263
Location of Facility Wright, Minnesota (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]
Milk, (pCi/L)	I-131 54	1.0	<LLD	-	-	<LLD	0
	GS 57						
	K-40	200	1420 (38/38) (1260-1740)	M-24 Weinand Farm, 4.8 mi @ 180°/S	1440 (19/19) (1260-1740)	1420 (19/19) (1230-1690)	0
	Cs-134	15	<LLD	-	-	<LLD	0
	Cs-137	15	<LLD	-	-	<LLD	0
	Ba-La-140	15	<LLD	-	-	<LLD	0
River Water (pCi/L)	H-3 8	330	<LLD	-	-	<LLD	0
	GS 24						
	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
	Zr-Nb-95	15	<LLD	-	-	<LLD	0
	Cs-134	15	<LLD	-	-	<LLD	0
	Cs-137	18	<LLD	-	-	<LLD	0
	Ba-La-140	15	<LLD	-	-	<LLD	0
	Ce-144	68	<LLD	-	-	<LLD	0

Table 5.4. Radiation Environmental Monitoring Program Summary.

Name of Facility Monticello Nuclear Generating Plant Docket No. 50-263
Location of Facility Wright, Minnesota Reporting Period January - December 1997
(County, State)

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean Location[d]	Location with Highest Annual Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Drinking Water (pCi/L)	GB 12	1.0	2.3 (12/12) (1.5-2.9)	M-14, Minneapolis 36.0 mi @ 128°/SE	2.3 (12/12) (1.5-2.9)	None	0
	I-131 12	1.0	<LLD	-	-	None	0
	H-3 4	330	<LLD	-	-	None	0
	GS 12						
	Mn-54	15	<LLD	-	-	None	0
	Fe-59	30	<LLD	-	-	None	0
	Co-58	15	<LLD	-	-	None	0
	Co-60	15	<LLD	-	-	None	0
	Zn-65	30	<LLD	-	-	None	0
	Zr-Nb-95	15	<LLD	-	-	None	0
	Cs-134	10	<LLD	-	-	None	0
	Cs-137	10	<LLD	-	-	None	0
	Ba-La-140	15	<LLD	-	-	None	0
	Ce-144	61	<LLD	-	-	None	0
Well Water (pCi/L)	H-3 16	330	<LLD	-	-	<LLD	0
	GS 16						
	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
	Zr-Nb-95	15	<LLD	-	-	<LLD	0
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	18	<LLD	-	-	<LLD	0
	Ba-La-140	15	<LLD	-	-	<LLD	0
	Ce-144	66	<LLD	-	-	<LLD	0
Crops - Cabbage (pCi/g wet)	I-131 2	0.013	<LLD	-	-	<LLD	0

Table 5.4. Radiation Environmental Monitoring Program Summary.

Name of Facility Monticello Nuclear Generating Plant Docket No. 50-263
Location of Facility Wright, Minnesota Reporting Period January - December 1997
(County, State)

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean Location[d]	Location with Highest Annual Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Fish (pCi/g wet)	GS 4						
	K-40	0.1	2.84 (2/2) (2.63-3.05)	M-9, Downstream of Plant, 0.2 mi @ 62°/ENE	2.84 (2/2) (2.63-3.05)	2.64 (2/2) (2.32-2.95)	0
	Mn-54	0.018	<LLD	-	-	<LLD	0
	Fe-59	0.060	<LLD	-	-	<LLD	0
	Co-58	0.018	<LLD	-	-	<LLD	0
	Co-60	0.020	<LLD	-	-	<LLD	0
	Zn-65	0.031	<LLD	-	-	<LLD	0
	Nb-95	0.030	<LLD	-	-	<LLD	0
	Zr-95	0.032	<LLD	-	-	<LLD	0
	Cs-134	0.027	<LLD	-	-	<LLD	0
	Cs-137	0.022	<LLD	-	-	<LLD	0
	Ba-La-140	0.027	<LLD	-	-	<LLD	0
Invertebrates (pCi/g wet)	GS 4						
	Be-7	1.26	<LLD	-	-	<LLD	0
	K-40	3.80	<LLD	-	-	<LLD	0
	Mn-54	0.14	<LLD	-	-	<LLD	0
	Co-58	0.13	<LLD	-	-	<LLD	0
	Co-60	0.14	<LLD	-	-	<LLD	0
	Zn-65	0.54	<LLD	-	-	<LLD	0
	Zr-Nb-95	0.25	<LLD	-	-	<LLD	0
	Ru-103	0.17	<LLD	-	-	<LLD	0
	Ru-106	1.31	<LLD	-	-	<LLD	0
	Cs-134	0.14	<LLD	-	-	<LLD	0
	Cs-137	0.17	<LLD	-	-	<LLD	0
	Ba-La-140	0.36	<LLD	-	-	<LLD	0
	Ce-141	0.26	<LLD	-	-	<LLD	0
	Ce-144	0.71	<LLD	-	-	<LLD	0

Table 5.4. Radiation Environmental Monitoring Program Summary.

Name of Facility Monticello Nuclear Generating Plant Docket No. 50-263
Location of Facility Wright, Minnesota Reporting Period January - December 1997
(County, State)

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean Location[d]	Location with Highest Annual Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Shoreline Sediments (pCi/g dry)	GS 6						
	Be-7	0.24	<LLD	-	-	<LLD	0
	K-40	0.5	11.03 (4/4) (10.39-11.32)	M-15, Montissippi Park 1.6 mi @ 117°/ESE	11.20 (2/2) (11.10-11.30)	10.14 (2/2) (9.05-11.22)	
	Mn-54	0.025	<LLD	-	-	<LLD	0
	Co-58	0.029	<LLD	-	-	<LLD	0
	Co-60	0.033	<LLD	-	-	<LLD	0
	Zn-65	0.095	<LLD	-	-	<LLD	0
	Nb-95	0.044	<LLD	-	-	<LLD	0
	Zr-95	0.053	<LLD	-	-	<LLD	0
	Ru-103	0.028	<LLD	-	-	<LLD	0
	Ru-106	0.23	<LLD	-	-	<LLD	0
	Cs-134	0.033	<LLD	-	-	<LLD	0
	Cs-137	0.024	0.10 (4/4) (0.055-0.14)	M-15, Montissippi Park 1.6 mi @ 117°/ESE	0.14 (2/2) (0.14-0.14)	<LLD	0
	Ba-La-140	0.081	<LLD	-	-	<LLD	0
	Ce-141	0.048	<LLD	-	-	<LLD	0
	Ce-144	0.14	<LLD	-	-	<LLD	0

a GB = Gross beta; GS = gamma scan.

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

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

d Locations are specified: (1) by name and/or code (Table 2) and (2) by distance, direction and sector relative to reactor site.

e Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the typical pre-operational value for the medium or location.

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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 ± [illegible]	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	21.0 ± 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).

				mR		
Lab Code	TLD Type	Date	Measurement	Teledyne Results ± 2 Sigma	Known Value	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).

				mR		
Lab Code	TLD Type	Date	Measurement	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 ± 12.100	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	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 a new standard are acceptable.					
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
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

[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	<6.7	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 ± 8.4530
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	0.44[illegible] ± 1.3725	0.0296 ± 0.9450
CW - 299, 300	Jan, 1997	Gr. Beta	2.4965 ± 1.0877	2.7913 ± [illegible]	2.6439 ± 0.9146
CW - 299, 300	Jan, 1997	Gr. Beta	0.2070 ± 1.3507	0.7394 ± 1.39[illegible]	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 ± 78.8916	-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 ± 0.2070	-0.7200 ± 3.2700	-0.3954 ± 1.6417
MI - 1845, 1846	Apr, 1997	K-40	1,592.5000 ± 62.5000	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	6.545[c] ± 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 ± 0.0068	-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	12.009 ± 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 ± 0.3245	-0.2072 ± 0.2297
VE - 6224, 6225	Aug, 1997	Co-60	-0.0042 ± 0.0160	0.0045 ± 0.0078	0.0002 ± 0.0089
VE - 6224, 6225	Aug, 1997	Cs-137	-0.0057 ± 0.0131	0.0071 ± 0.0047	0.0007 ± 0.0070
VE - 6251, 6252	Aug, 1997	Gr. Beta	3.4988 ± 0.1337	3.5009 ± 0.1338	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	1.6420 ± 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 ± 0.0085	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 ± 4.1300	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
Standard deviation for three determinations not reported in Mixed Analyte Performance Evaluation Program Summary Report.						
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	41.000 ± 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:

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

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

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

4.3 If all 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

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

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

Air			Water	
Gross alpha	3	pCi/m^3	Strontium-89	3,000 pCi/L
Gross beta	100	pCi/m^3	Strontium-90	300 pCi/L
Iodine-131[b]	0.14	pCi/m^3	Cesium-137	20,000 pCi/L
			Barium-140	20,000 pCi/L
			Iodine-131	300 pCi/L
			Potassium-40[c]	3,000 pCi/L
			Gross alpha	30 pCi/L
			Gross beta	100 pCi/L
			Tritium	3×10^6 pCi/L

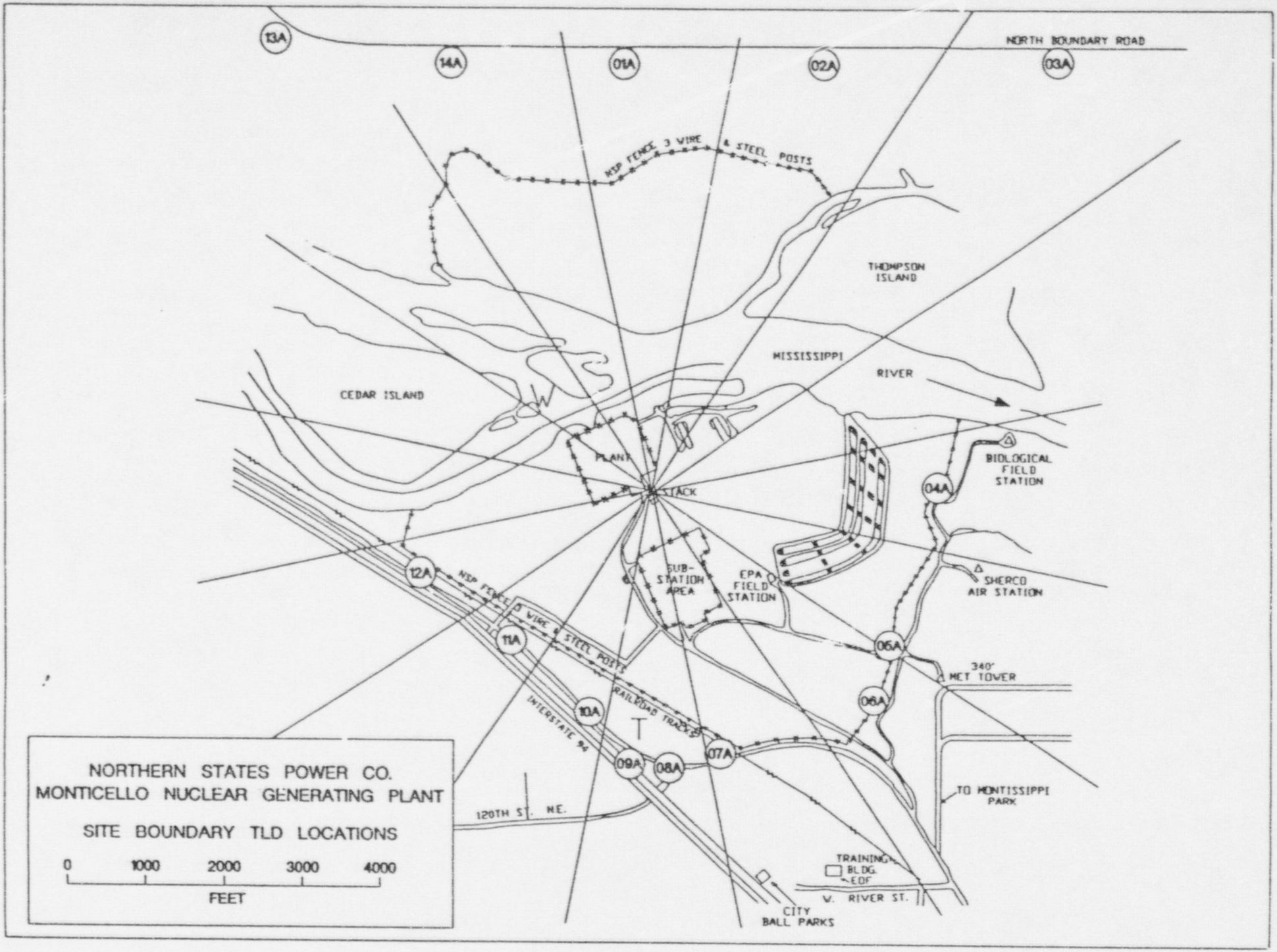
[a] Taken from Table II of Appendix B to Code of Federal Regulations Title 10, Part 20.1-20.601, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] From 10 CFR 20.1-20.601 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

Sampling Location Maps



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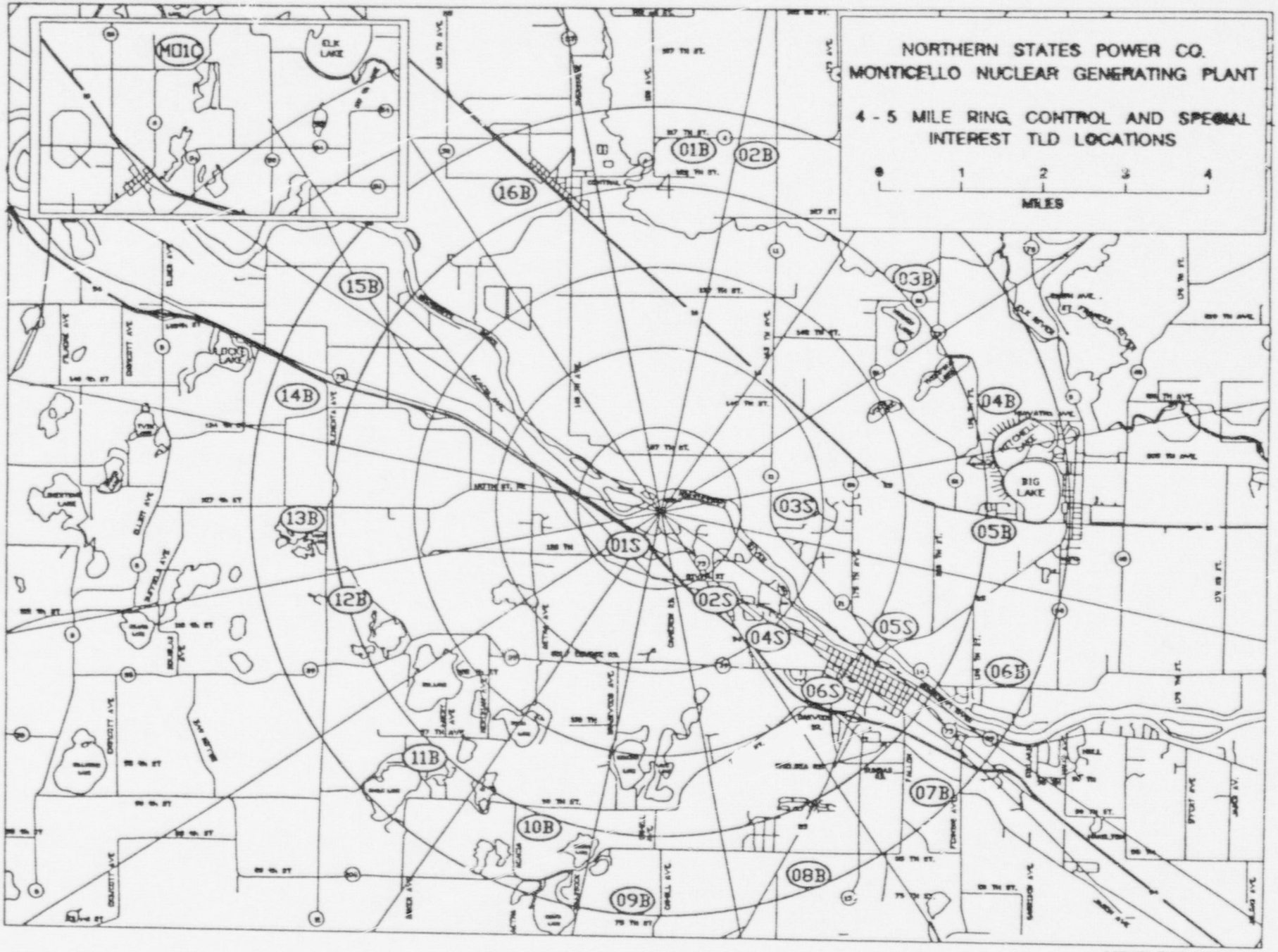
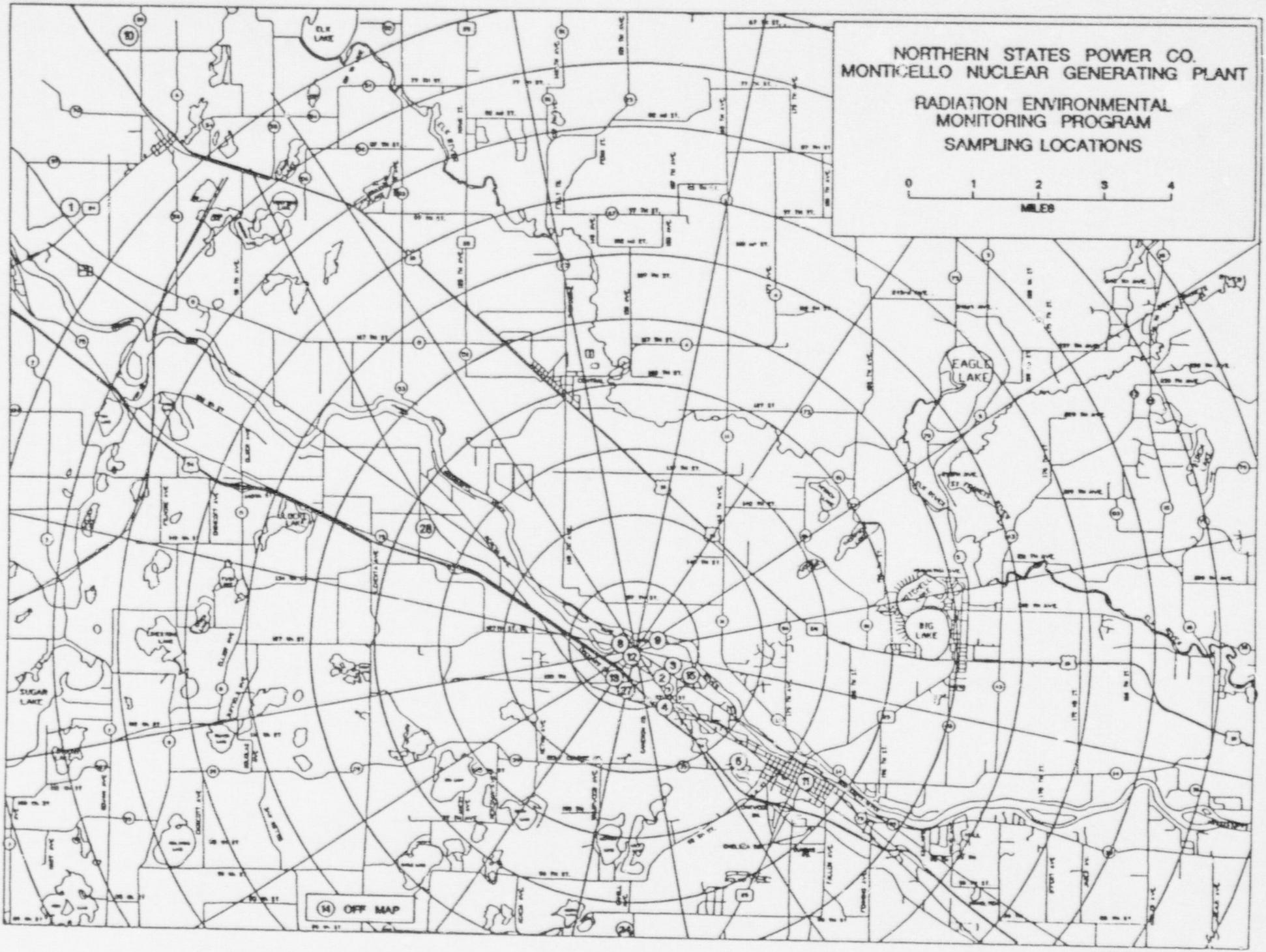


MONTI CAD M08522



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