Commonwealth Edison
LaSalle County Nuclear Station
2601 N. 21st. Rd.
Marseilles, Illinois 61341
Telephone 815/357-6761

April 23, 1992

Mr. Bert Davis
Administrator
Nuclear Regulatory Commission Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

Dear Mr. Davis:

Enclosed is Part 3 of the 1991 LaSalle Station Operating Report, Docket Number 50-373 and 50-374. This report contains the results of the Radiological Environmental and Meteorological Monitoring Programs. Part 1, Facility Operating Experience, was submitted under separate cover in February, and Part 2, Radioactive Effluents, in February and August.

Two copies of the report are provided for your use. Two copies will be forwarded to the Document Control Desk and one copy to the Resident Inspector.

Sincerely,

WRo [signature]

for G. J. Diederich
Station Manager
LaSalle County Station

GJD/JH/djf

Enclosures

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LASALLE COUNTY STATION

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

1991

MARCH 1992

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INTRODUCTION

LaSalle Station, a two-unit BWR plant is located near Marseilles, Illinois, in LaSalle County, 3.5 miles south of the Illinois River. Each reactor is designed to have a capacity of 1078 MW net. Unit No. 1 loaded fuel in March 1982. Unit No. 2 loaded fuel in late December 1983. The plant has been designed to keep releases to the environment at levels below those specified in the regulations.

Liquid effluents from LaSalle County Station are released to the Illinois River in controlled batches after radioassay of each batch. Gaseous effluents are released to the atmosphere after delay to permit decay of short half-life gases. Releases to the atmosphere are calculated on the basis of analyses of routine grab samples of noble gases and continuously collected composite samples of iodine and particulate matter. The results of effluent analyses are summarized on a monthly basis and reported to the Nuclear Regulatory Commission as required per Technical Specifications. Airborne concentrations of noble gases, I-131 and particulate radioactivity in offsite areas are calculated using effluent and meteorological data.

Environmental monitoring is conducted by sampling at indicator and reference (control) locations in the vicinity of the LaSalle County Station to measure changes in radiation or radioactivity levels that may be attributable to plant operations. If significant changes attributable to LaSalle County Station are measured, these changes are correlated with effluent releases. External gamma radiation exposure from noble gases and I-131 in milk are the most critical pathways at this site; however, an environmental monitoring program is conducted which includes other pathways of less importance.

SUMMARY

Gaseous and liquid effluents for the period remained at a fraction of the Technical Specification limits. Calculations of environmental concentrations based on effluent, Illinois River flow, and meteorological data for the period indicate that consumption by the public of radionuclides attributable to the plant are well below the regulatory limits. Radiation exposure from radionuclides released to the atmosphere represented the critical pathway for the period with a maximum individual total dose estimated to be 2.30E-03 mrem for the year, when a shielding and occupancy factor of 0.7 is assumed. The assessment of radiation doses is performed in accordance with the Offsite Dose Calculation Manual (ODCM). The results of analysis confirm that the station is operating in compliance with 10CFR50 and 40CFR190.

1.0 EFFLUENTS

1.1 Gaseous Effluents to the Atmosphere

Measured concentrations of noble gases, radioiodine, and particulate radioactivity released to the atmosphere during the year, are listed in Table 1.1-1. A total of 1.06E+02 curies of fission and activation gases was released with a quarterly average release rate of 3.64 µCi/sec.

A total of 1.74E-03 curies of I-131 was released during the year, with an average release rate of 1.06E-04 µCi/sec for all iodines.

A total of 5.09E-03 curies of beta-gamma emitters were released as airborne particulate matter, with an average release rate of 1.30E-03 µCi/sec. Alpha emitting radionuclides were not measurable.

A total of 6.71E-01 curies of tritium was released, with an average release rate of 1.61E-02 µCi/sec.

1.2 Liquids Released to the Illinois River

No liquid radioactive waste was discharged into the Illinois River in 1991.

2.0 SOLID RADIOACTIVE WASTE

Solid radioactive wastes were shipped by truck to Oak Ridge, Tennessee; Beatty, Nevada; Waltz Mill, Pennsylvania; and Barnwell, South Carolina. The record of waste shipments is summarized in Table 2.0-1.

3.0 DOSE TO MAN

3.1 Gaseous Effluent Pathways

Gamma Dose Rates

Gamma air and whole body dose rates offsite were calculated based on measured release rates, isotopic composition of the noble gases, and meterological data for the period (Table 3.1-1). Isodose contours of gamma body dose for the year are shown in Figure 3.1-1.

Based on measured effluents and meteorological data, the maximum dose to an individual would be 2.30E-03 mrem for the year, with an occupancy or shielding factor of 0.7 included. The maximum gamma air dose was 3.95E-03 mrad.

Beta Air and Skin Rates

The range of beta particles in air is relatively small (on the order of a few meters or less); consequently, plumes of gaseous effluents may be considered "infinite" for purpose of calculating the dose from beta radiation incident on the skin. However, the actual dose to sensitive skin tissues is difficult to calculate because this depends on the beta particle energies, thickness of inert skin, and clothing covering sensitive tissues. For purposes of this report the skin is taken to have a thickness of 7 mg/cm^2 and an occupancy factor of 1.0 is used. The skin dose from beta and gamma radiation for the year was 3.47E-03 mrem. The maximum offsite beta air dose for the year was 4.82E-04 mrad.

The air concentrations of radioactive noble gases at the offsite receptor locations are given in Figure 3.1-2.

Radioactive Iodine

The human thyroid exhibits a significant capacity to concentrate ingested or inhaled iodine. The radioiodine, I-131, released during routine operation of the plant, may be made available to man thus resulting in a dose to the thyroid. The principal pathway of interest for this radionuclide is ingestion of radioiodine in milk by an infant.

Iodine Concentrations in Air

The calculated concentration contours for iodine in air are shown in Figure 3.1-3. Included in these calculations is an iodine cloud depletion factor which accounts for the phenomenon of elemental iodine deposition on the ground. The maximum offsite concentration is estimated to be 4.30E-04 pCi/m^3 for the year.

Dose to Infant's Thyroid

The hypothetical thyroid dose to an infant living near the plant via ingestion of milk was calculated. The radionuclide considered was I-131 and the source of milk was taken to be the nearest dairy farm with the cows pastured from May to October. The maximum infant's thyroid dose was 4.91E-03 mrem during the year (Table 3.1-1).

Concentrations of Particulates in Air

Concentration contours of radioactive airborne particulates are shown in Figure 3.1-4. The maximum offsite level is estimated to be 7.50E-05 pCi/m^3.

Summary of Doses

Table 3.1-1 summarizes the doses resulting from releases of airborne radioactivity via the different exposure pathways.

3.2 Liquid Effluent Pathways

The three principal pathways through the aquatic environment for potential doses to man from liquid waste are ingestion of potable water, eating aquatic foods, and exposure while walking on the shoreline. Not all of these pathways are applicable at a given time but a reasonable approximation of the dose can be made by adjusting the dose formula for season of the year or type and degree of use of the aquatic environment. NRC* developed equations were used to calculate the doses to the whole body, lower GI tract, thyroid, bone and skin; specific parameters for use in the equations are given in the Commonwealth Edison Offsite Dose Calculation Manual. For the year 1991, there were no radioactive liquid releases to the Illinois River, therefore exposure rates from this pathway are not applicable.

3.3. Assessment of Dose to Member of Public

In section 3/4.11 of the LaSalle Technical Specifications, 40CFR190 calculations of total dose due to the Uranium fuel Cycle are required only when calculated doses from liquid or gaseous releases of radioactivity exceed certain levels. These levels are twice the following limits:

- The RETS limits on dose or dose commitment to an individual due to radioactive materials in liquid effluents from each reactor unit (1.5 mrems to the whole body or 5 mrem to any organ during any calendar quarter; 3 mrem to the whole body or 10 mrem to any organ during any calendar year).

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* Nuclear Regulatory Commission, Regulatory Guide 1.109 (Rev. 1).

- The RETS limits on air dose in noble gases released in gaseous effluents to a member of the public from each reactor unit (5 mrad for gamma radiation or 10 mrads for beta radiation during any calendar quarter; 10 mrads for gamma radiation or 20 mrad for beta radiation during any calendar year).

- The RETS limits on dose to any individual due to iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than eight days in gaseous effluents released from each reactor unit (7.5 mrems to any organ during any calendar quarter; 15 mrems to any organ during any calendar year).

During the period January to December, 1991, LaSalle County Station did not exceed these criteria and members of the public did not exceed these criteria within the restricted area, as indicated by TLD measurements in Table 5.1-1 (assuming 100% occupancy).

4.0 SITE METEOROLOGY

A summary of the site meteorological measurements taken during each quarter of the year is given in Appendix II. The data are presented as cumulative joint frequency distributions of 375' and 33' levels. Data recovery for these measurements was about 98.9%.

5.0 ENVIRONMENTAL MONITORING

Table 5.0-1 provides an outline of the Radiological Environmental Monitoring Program as required in the Technical Specifications. Table 5.0-2 lists the program's sampling locations, collection frequencies and analyses for all samples collected. Tables 5.0-3 to 5.0-6 summarize data for the year. Figure 5.0-4 shows the locations of ingestion and waterborne exposure pathway locations. Except for tables of special interest, tables listing all data are no longer included in the annual report. All data tables are available for inspection at the Station or Corporate offices.

Specific findings for various environmental media are discussed below.

5.1 Gamma Radiation

External radiation dose from onsite sources and noble gases released to the atmosphere was measured at ten indicator and four reference (background) locations using $CaSO_4$:Tm thermoluminescent dosimeters (TLDs). A comparison of the TLD results for reference stations with onsite and offsite indicator stations is included in Table 5.1-1. A total of forty-eight additional TLDs were installed on June 1, 1980 such that each sector was covered at both five miles and the site boundary. Six (6) TLD locations were added to the monitoring program on July 1, 1985. These inner and outer ring TLDs are shown in Figures 5.0-2 and 5.0-3.

Quarterly external radiation dose at fourteen air sampling locations averaged 17.7 mR) and was similar to levels measured in 1986 (17.1 mR), 1987 (17.8 mR), 1988 (16.5 mR), 1989 (17.6 mR), and 1990 (17.8 mR). The differences are not statistically significant.

5.2 Airborne I-131 and Particulate Radioactivity

Locations of the samplers are shown in Figure 5.0-1. Airborne I-131 remained below the LLD of 0.10 pCi/m^3 throughout the year.

Gross beta concentrations ranged from 0.011 to 0.045 pCi/m^3 and averaged 0.022 pCi/m^3 and was slightly lower than in 1985 (0.025 pCi/m^3), 1986 (0.027, except for the period from May 16 through June 6 when it was influenced by the nuclear reactor accident at Chernobyl), 1987 (0.027 pCi/m^3), 1988 (0.031 pCi/m^3), 1989 (0.028 pCi/m^3) and 1990 (0.024 pCi/m^3).

Gamma-emitting isotopes were below the LLD level of 0.01 pCi/m^3 in all quarterly composites.

No radioactivity attributable to plant operation was detected in any sample.

5.3 Terrestrial Radioactivity

Well water was collected quarterly from one onsite well and five offsite wells and analyzed for tritium and gamma-emitting isotopes. All results were below the limit of detection, indicating that there was no measurable amount of radioactivity due to the Station's releases.

5.4 Aquatic Radioactivity

Weekly surface water samples from the Illinois River at Seneca and LSCS Cooling Lake were composited monthly and analyzed for gamma-emitting isotopes. Weekly samples from the same locations were composited quarterly and analyzed for tritium. None of the composited samples indicated the presence of gamma-emitting isotopes above their respective LLD levels. Tritium was detected in one upstream sample and measured 256 pCi/L. Similar results were obtained in 1988, 1989, and 1990.

Sediment samples were collected twice a year from one indicator location (downstream of the Cooling Lake discharge structure) and analyzed for gamma-emitters. Cs-137 was detected in both samples at a concentration of 0.16 pCi/g dry weight. All other gamma-emitters were below their respective detection limits in all samples. No plant effect on the environment is indicated.

Levels of gamma radioactivity in fish were measured and found in all samples to be below the lower limits of detection for the program.

5.5 Milk

Milk samples were collected monthly from November through April and weekly from May through Cctober and analyzed for iodine-131 and gamma-emitting isotopes.

I-131 remained below the detection limit of 0.5 pCi/L.

Cs-134 and Cs-137 were below the LLD level of 5 pCi/L. All other gamma-emicting isotopes, except naturally-occurring K-40, were below their respective LLDs. There was no indication of the effect on the environment due to station operation.

5.6 Sample Collections

A . samples were collected as scheduled except those listed in the Listing of Missed Samples, Appendix III.

5.7 Program Modifications

There were no changes to the program in 1991.

6.0 ANALYTICAL PROCEDURES

Analytical procedures used for analyzing radioactivity in environmental samples are presented in Appendix VI.

7.0 MILCH ANIMALS AND NEAREST CATTLE CENSUSES

A census of milch animals was conducted within five miles of the station. The survey was conducted by a "door-to-door" canvas and by information from Illinois Agricultural Agents. The census was conducted by A. Lewis on August 28, 1991. The nearest cattle census was conducted by A. Lewis on August 28, 1991. The results of each census are presented in Appendix IV.

8.0 NEAREST RESIDENCES CENSUS

A census of the nearest residences within a five (5) mile radius was conducted by A. Lewis on August 28, 1991.

Results of the nearest residence census are presented in Appendix IV.

9.0 INTERLABORATORY COMPARISON PROGRAM RESULTS

Teledyne's Interlaboratory Comparison Program results are presented in Appendix V.

Commonwealth Edison's Thermoluminescent Dosimeter (TLD) Program is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) which requires biennual review and evaluation. In addition to the biennual ANSI testing requirement, Commonwealth Edison also tests to the ANSI standard during the non-NVLAP visitation year. Commonwealth Edison additionally has an internal irradiation program that tests each of the six nuclear station TLD processors once per quarter. The results of all TLD performance tests are retained by Commonwealth Edison's Corporate Radiation Protection Department.

APPENDIX I

DATA TABLES AND FIGURES

TABLE 1.1-1

LASALLE COUNTY NUCLEAR POWER STATION
UNITS ONE AND TWO
DOCKET NUMBERS 50-373 AND 50-374

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

		First Quarter	Second Quarter
A. Fission and Activation Gases			
1. Total release	Ci	3.57E-01	3.91E+00
2. Average release rate for period	uCi/sec	1.95E-01	7.95E+00
B. Iodines			
1. Total iodine-131	Ci	3.28E-04	3.91E-04
2. Average release rate for period	uCi/sec	1.91E-04	1.69E-04
C. Particulates			
1. Particulates with T1/2 >8 days	Ci	3.37E-04	1.29E-03
2. Average release rate for period	uCi/sec	2.04E-04	4.76E-03
3. Gross alpha radioactivity	Ci	<1.00E-11	<1.00E-11
D. Tritium			
1. Total release	Ci	2.36E-01	6.19E-02
2. Average release rate for period	uCi/sec	2.79E-02	1.30E-02

"<" indicates activity of sample is less than LLD given in uci/ml

TABLE 1.1-1 (continued)

LASALLE COUNTY NUCLEAR POWER STATION
UNITS ONE AND TWO
DOCKET NUMBERS 50-373 AND 50-374

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (19[illegible])

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

			Third Quarter	Fourth Quarter
A.	Fission and Activation Gases			
1.	Total release	Ci	4.33E+1	5.86E+1
2.	Average release rate for period	uCi/sec	2.72E0	3.69E0
B.	Iodines			
1.	Total iodine-131	Ci	8.22E-4	2.04E-4
2.	Average release rate for period	uCi/sec	5.16E-5	1.28E-5
C.	Particulates			
1.	Particulates with T1/2 >8 days	Ci	2.20E-3	1.26E-3
2.	Average release rate for period	uCi/sec	1.38E-4	7.93E-5
3.	Gross alpha radioactivity (estimate)	Ci	<1.00E-11	<1.00E-11
D.	Tritium			
1.	Total release	Ci	8.53E-2	2.88E-1
2.	Average release rate for period	uCi/sec	5.36E-3	1.81E-2

"<" indicates activity of sample is less than LLD given in uci/ml

TABLE 1.2-1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (19[illegible])

UNIT ONE

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

		First Quarter	Second Quarter
A. Fission and Activation Products			
1. Total release (not including tritium, gases, alpha)	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
3. Maximum concentration released	uCi/ml	N/A	N/A
B. Tritium			
1. Total release	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
C. Dissolved Noble Gases			
1. Total release	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
D. Gross Alpha Radioactivity			
1. Total release	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
E. Volume of Waste Released	liters	0.00E+00	0.00E+00
F. Volume of Dilution Water	liters	0.00E+00	0.00E+00

"<" indicates activity of sample is less than LLD given in uCi/ml

TABLE 1.2-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1991)

UNIT ONE

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

		Third Quarter	Fourth Quarter
A. Fission and Activation Products			
1. Total release (not including tritium, gases, alpha)	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
3. Maximum concentration released	uCi/ml	N/A	N/A
B. Tritium			
1. Total release	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
C. Dissolved Noble Gases			
1. Total release	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
D. Gross Alpha Radioactivity			
1. Total release	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
E. Volume of Waste Released	liters	0.0E0	0.0E0
F. Volume of Dilution Water	liters	0.0E0	0.0E0

"<" indicates activity of sample is less than LLD given in uCi/ml

TABLE 1.2-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)

UNIT TWO

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

		First Quarter	Second Quarter
A. Fission and Activation Products			
1. Total release (not including tritium, gases, alpha)	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
3. Maximum concentration released	uCi/ml	N/A	N/A
B. Tritium			
1. Total release	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
C. Dissolved Noble Gases			
1. Total release	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
D. Gross Alpha Radioactivity			
1. Total release	Ci	0.00E+00	0.00E+00
2. Average concentration released	uCi/ml	N/A	N/A
E. Volume of Waste Released	liters	0.00E+00	0.00E+00
F. Volume of Dilution Water	liters	0.00E+00	0.00E+00

"<" indicates activity of sample is less than LLD given in uCi/ml

TABLE 1.2-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1991)

UNIT TWO

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

		Third Quarter	Fourth Quarter
A. Fission and Activation Products			
1. Total release (not including tritium, gases, alpha)	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
3. Maximum concentration released	uCi/ml	N/A	N/A
B. Tritium			
1. Total release	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
C. Dissolved Noble Gases			
1. Total release	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
D. Gross Alpha Radioactivity			
1. Total release	Ci	0.0E0	0.0E0
2. Average concentration released	uCi/ml	N/A	N/A
Volume of Waste Released	liters	0.0E0	0.0E0
F. Volume of Dilution Water	liters	0.0E0	0.0E0

"<" indicates activity of sample is less than LLD given in uCi/ml

TABLE 2.0-1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

		January	February	March	First Quarter
1. Spent resins, filter sludges, evaporator bottoms, etc.					
a. Quantity shipped	cu.m.	3.90E+01	1.11E+01	2.46E+01	7.47E+01
b. Total activity	Ci	5.78E+02	9.16E+01	1.70E+02	8.40E+02
c. Major nuclides (estimate)					
Mn-54	%	10	06	02	
Fe-55	%	65	66	85	
Co-60	%	24	27	12	
d. Container type		LSA	LSA	LSA	
e. Container volume'	cu.m.	2.08E-01 4.20E+00 5.83E+00	2.08E-01 3.14E-01 4.20E+00	2.08E-01 4.20E+00 4.84E+00 5.83E+00	
f. Solidification agent		Cement	Cement	Cement	
2. Dry compressible waste, contaminated equipment, etc.					
a. Quantity shipped	cu.m.	1.87E+01	1.13E+01	4.25E-01	3.04E+01
b. Total activity	Ci	5.79E-01	5.02E+00	2.47E-01	5.85E+00
c. Major nuclides (estimate)					
Cr-51	%	14	14	14	
Mn-54	%	15	15	15	
Fe-55	%	45	45	45	
Fe-59	%	16	16	16	
d. Container type		LSA	LSA	LSA	
e. Container volume	cu.m.	2.08E-01	2.08E-01 3.14E-01	2.08E-01	

TABLE 2.0-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

	January	February	March	First Quarter
3. Solid Waste Disposition				
a. Number of Shipments	10	05	06	21
b. Mode of Transportation	Truck	Truck	Truck	
Number	10	05	06	
c. Destination	Barnwell, SC	Barnwell, SC	Barnwell, SC	
Number	03	00	02	
	Beatty, NV	Beatty, NV	Beatty, NV	
Number	06	04	04	
	Oak Ridge, TN	Oak Ridge, TN	Oak Ridge, TN	
Number	01	01	00	

TABLE 2.0-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

		April	May	June	Second Quarter
1. Spent resins, filter sludges, evaporator bottoms, etc.					
a. Quantity shipped	cu.m.	2.45E+01	2.42E+01	1.52E+01	6.39E+01
b. Total activity	Ci	3.45E+02	7.98E+02	2.76E+02	1.42E+03
c. Major nuclides (estimate)					
Mn-54	%	10	10	10	
Fe-55	%	64	64	65	
Co-60	%	23	23	23	
d. Container type		LSA	LSA	LSA	
e. Container volume	cu.m.	2.08E-01 3.41E+00 4.20E+00 5.83E+00	2.08E-01 3.14E-01 3.41E+00 4.20E+00 4.84E+00 5.83E+00	2.08E-01 3.14E-01 3.41E+00 4.20E+00 4.84E+00	
f. Solidification agent		Cement	Cement	Cement	
2. Dry compressible waste, contaminated equipment, etc.					
a. Quantity shipped	cu.m.	7.29E+01	2.82E+01	9.39E+01	1.95E+02
b. Total activity	Ci	1.45E+01	2.03E+00	4.52E+00	2.11E+01
c. Major nuclides (estimate)					
Cr-51	%	14	14	14	
Mn-54	%	15	15	15	
Fe-55	%	45	45	45	
Fe-59	%	16	16	16	
d. Container type		LSA	LSA	LSA	
e. Container volume	cu.m.	2.08E-01 2.7[illegible]E+00	2.08E-01 2.72E+00	2.08E-01 2.72E+00 7.25E+01	

TABLE 2.0-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

	April	May	June	Second Quarter
3. Solid Waste Disposition				
a. Number of Shipments	10	07	07	24
b. Mode of Transportation	Truck	Truck	Truck	
Number	10	07	07	
c. Destination	Barnwell, SC	Barnwell, SC	Barnwell, SC	
Number	02	03	03	
	Beatty, NV	Beatty, NV	Beatty, NV	
Number	04	03	02	
	Oak Ridge, TN	Oak Ridge, TN	Oak Ridge, TN	
Number	04	01	02	

TABLE 2.0-1 (continued)

11FFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

		July	August	September	Third Quarter
1. Spent resins, filter sludges, evaporator bottoms, etc.					
a. Quantity shipped	cu.m.	1.98E+1	1.91E+1	6.67E0	2.43E+1
b. Total activity	Ci	6.62E+2	2.07E+3	2.47E+1	7.32E+1
c. Major nuclides (estimate)					
Mn-54	%	9	9	14	
Fe-55	%	62	61	52	
Co-60	%	22	22	32	
d. Container type		LSA	LSA	LSA	
e. Container volume	cu.m.	3.14E-1 4.20E0 5.28E0 5.83E0	4.20E0 4.84E0 5.83E0	2.47E0 4.20E0	
f. Solidification agent		Cement	Cement	Cement	
2. Dry compressible waste, contaminated equipment, etc.					
a. Quantity shipped	cu.m.	0.0E0	1.57E+2	1.28E+2	2.85E+2
b. Total activity	Ci	0.0E0	2.86E0	8.78E0	1.16E+1
c. Major nuclides (estimate)					
Cr-51	%	0	14	14	
Mn-54	%	0	15	15	
Fe-55	%	0	45	45	
Fe-59	%	0	16	16	
d. Container type		N/A	LSA	LSA	
e. Container volume	cu.m.	0.0E0 0.0E0	2.08E-1 2.72E0 3.51E+1	2.08E-1 2.72E0 3.86E0 4.20E0 3.51E+1	

TABLE 2.0-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

		July	August	September	Third Quarter
3. Solid Waste Disposition					
a. Number of Shipments		05	09	09	23
b. Mode of Transportation		Truck	Truck	Truck	
	Number	05	09	09	
c. Destination		Barnwell, SC	Barnwell, SC	Barnwell, SC	
	Number	03	02	01	
		Beatty, NV	Waltzmill, PA	Waltzmill, PA	
	Number	02	01	01	
			Oak Ridge, TN	Oak Ridge, TN	
	Number		04	04	
			Beatty, NV	Beatty, NV	
	Number		02	03	

TABLE 2.0-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1991)

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

		October	November	December	Fourth Quarter
1. Spent resins, filter sludges, evaporator bottoms, etc.					
a. Quantity shipped	cu.m.	4.04E+1	9.48E0	0.0E0	3.73E+1
b. Total activity	Ci	2.40E+1	2.25E+2	0.0E0	1.55E+2
c. Major nuclides (estimate)					
Mn-54	%	9	9	0	
Fe-55	%	62	64	0	
Co-60	%	22	23	0	
d. Container type		LSA	LSA	LSA	
e. Container volume	cu.m.	4.20E0 4.84E0 5.83E0	4.20E0 5.28E0	N/A	
f. Solidification agent		Cement	Cement	N/A	
2. Dry compressible waste, contaminated equipment, etc.					
a. Quantity shipped	cu.m.	7.02E+1	0.0E0	8.35E+1	1.58E+2
b. Total activity	Ci	4.31E-1	0.0E0	1.85E-1	1.35E+2
c. Major nuclides (estimate)					
Cr-51	%	14	0	14	
Mn-54	%	15	0	15	
Fe-55	%	45	0	45	
Fe-59	%	16	0	16	
Co-60	%	0	0	0	
d. Container type		LSA	N/A	LSA	
e. Container volume	cu.m.	3.51E+1	0.0E0	2.08E-1 3.51E+1	

TABLE 2.0-1 (continued)

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1991)

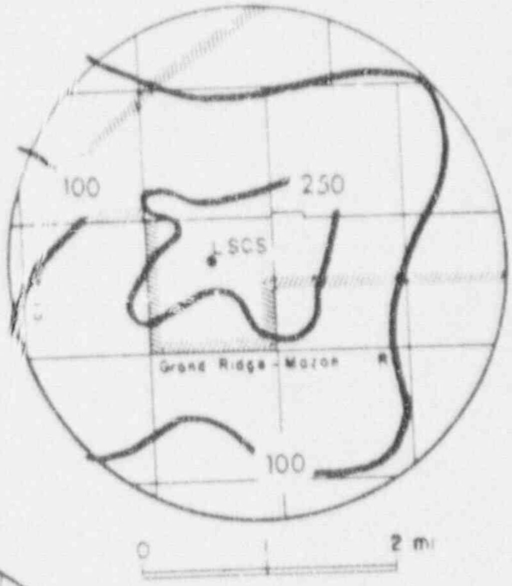
SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

		October	November	December	Fourth Quarter
3. Solid Waste Disposition					
a. Number of Shipments		10	02	03	13
b. Mode of Transportation		Truck	Truck	Truck	
	Number	10	02	03	
c. Destination		Barnwell, SC	Barnwell, SC	Waltzmill, PA	
	Number	06	01	01	
		Oak Ridge, TN	Beatty, NV	Oak Ridge, TN	
	Number	02	01	02	
		Beatty, NV			
	Number	02			

FIGURE 3.1-1

Estimated Cumulative Gamma Dose (in mrem)
from the LaSalle Station for the period
January-December 1991

<u>Isopleth Labels</u>
Small figure - multiply by 10^{-5}
Large figure - multiply by 10^{-5}



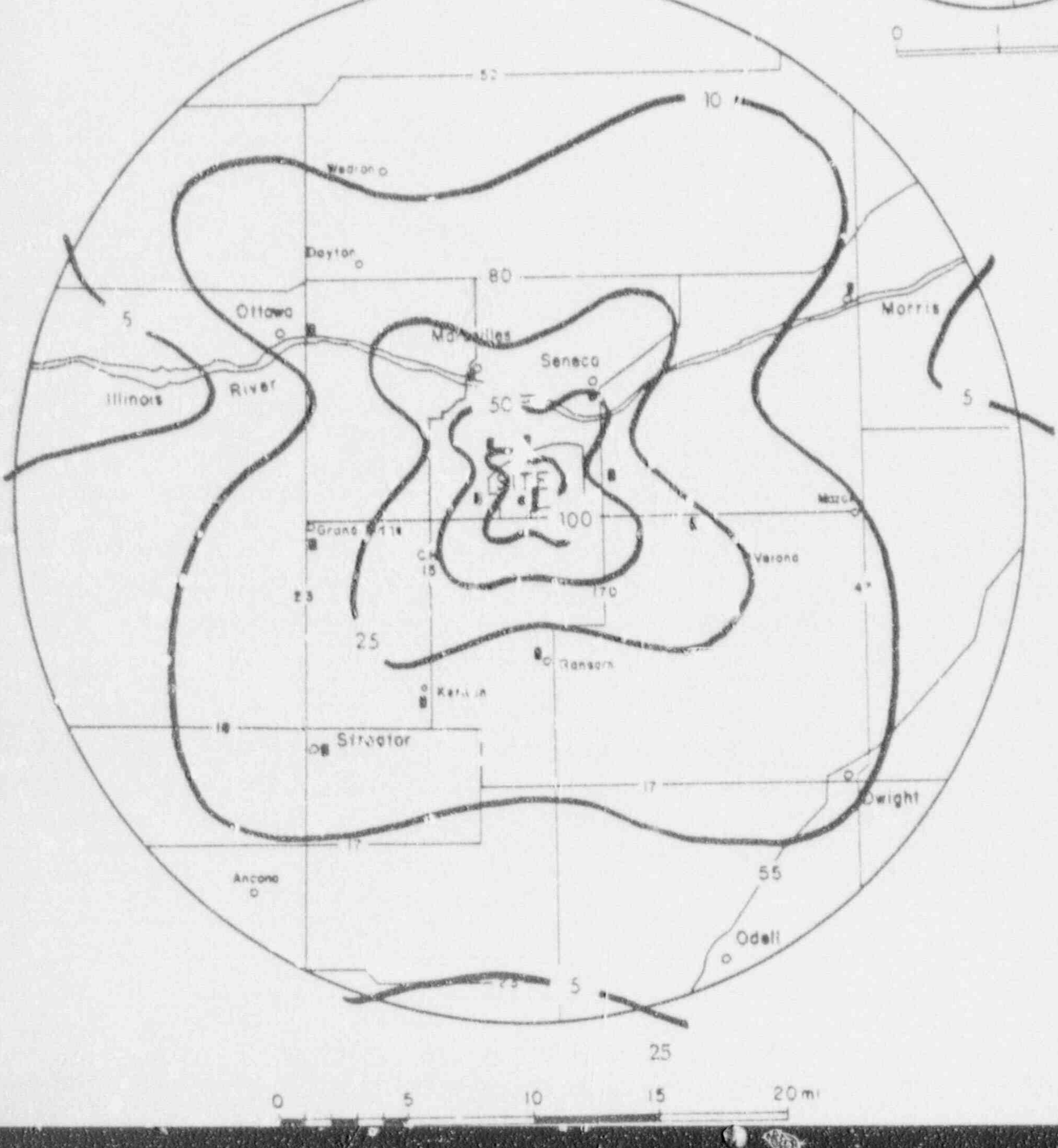
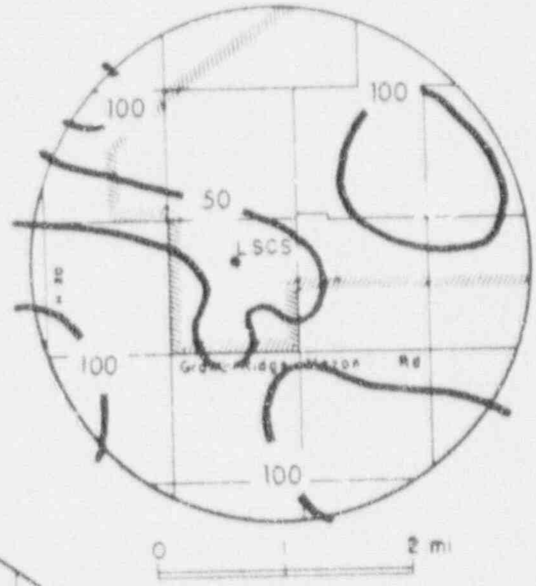


FIGURE 3.1-2

Estimated Total Concentrations (in pCi/m^3) of Noble Gases from the LaSalle Station for the Period January-December 1991

Isopleth Labels
Small figure - multiply by 10^{-2}
Large figure - multiply by 10^{-2}



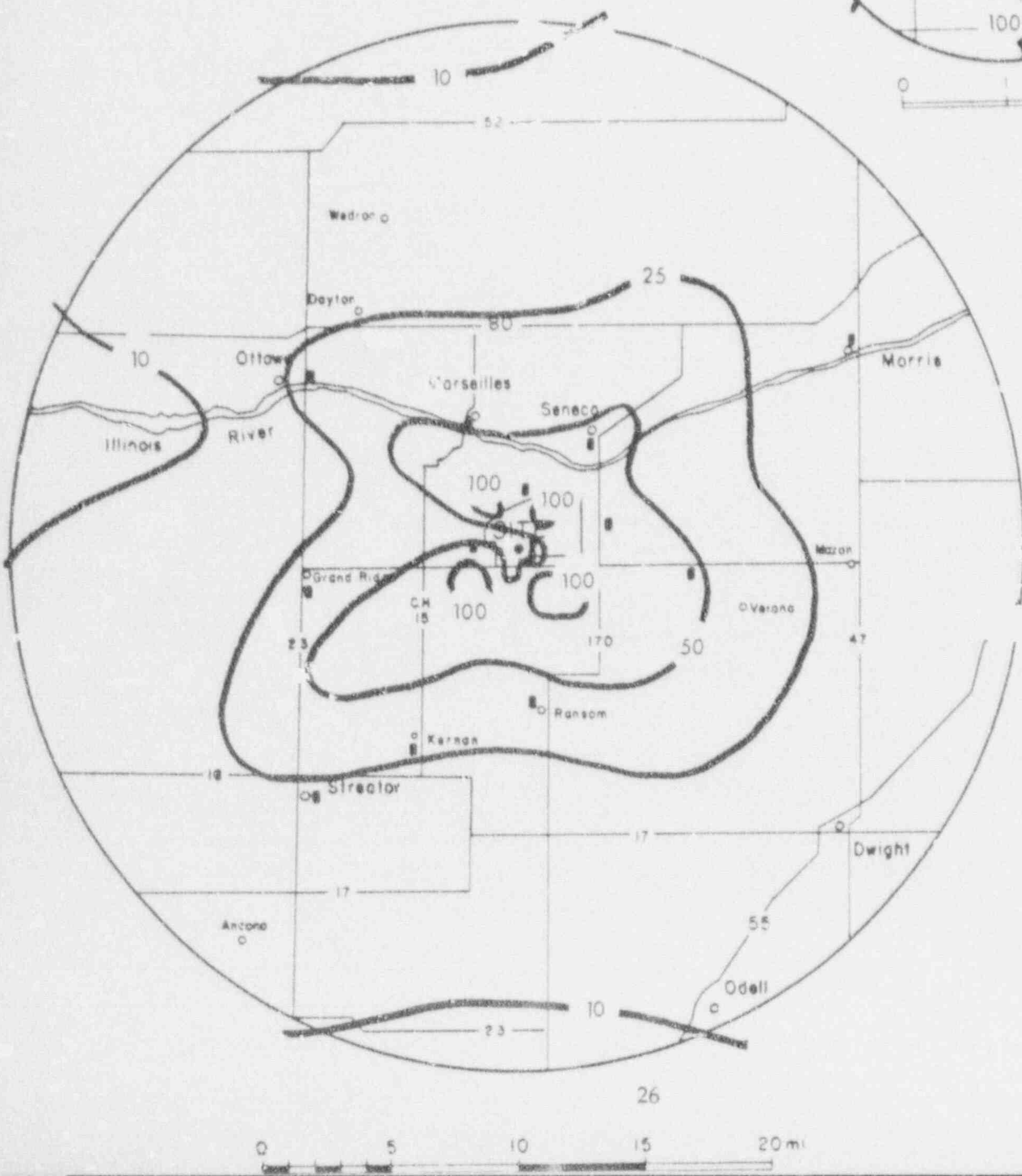
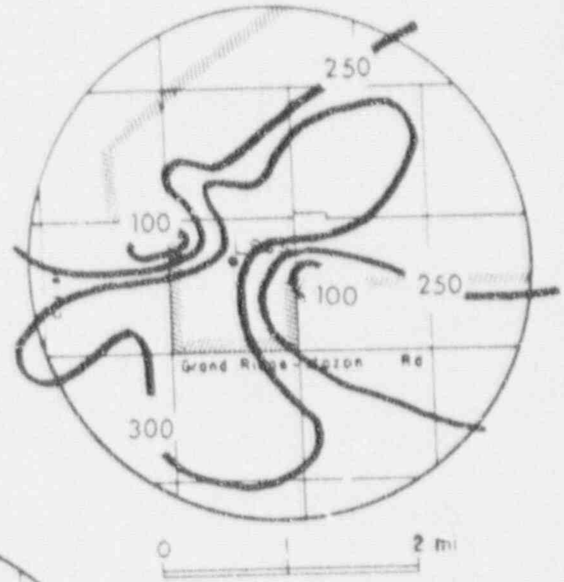


FIGURE 3.1-3

Estimated Total Concentrations (in pCi/m³) of Iodine from the LaSalle Station for the period January-December 1991

Isopleth Labels
Small figure - multiply by 10⁻⁶
Large figure - multiply by 10⁻⁶



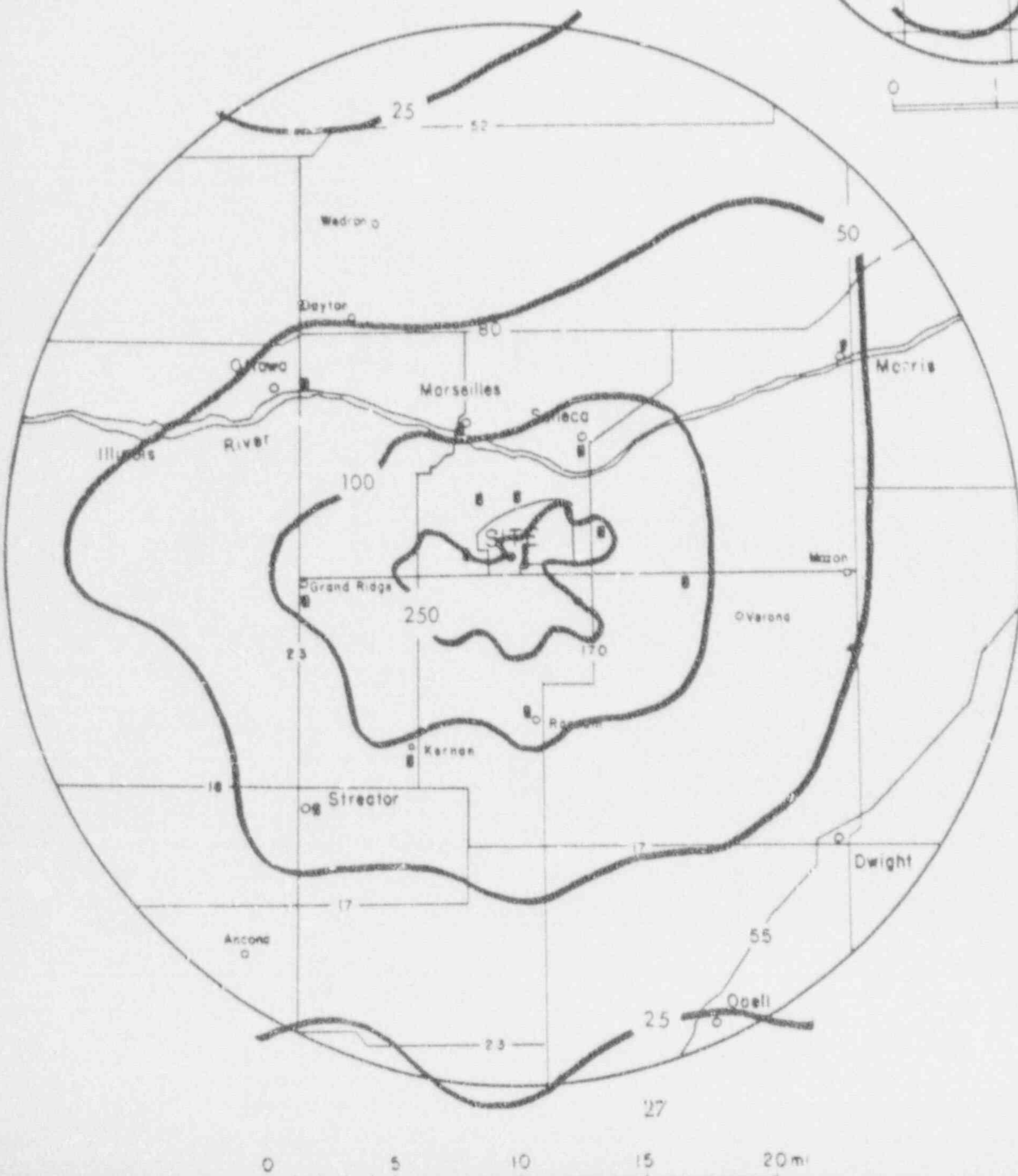


FIGURE 3.1-4

Estimated Total Concentrations (in pCi/m³) of Particulate Matter from the LaSalle Station for the period January-December 1991

<u>Isopleth Labels</u>
Small figure - multiply by 10^{-7}
Large figure - multiply by 10^{-7}

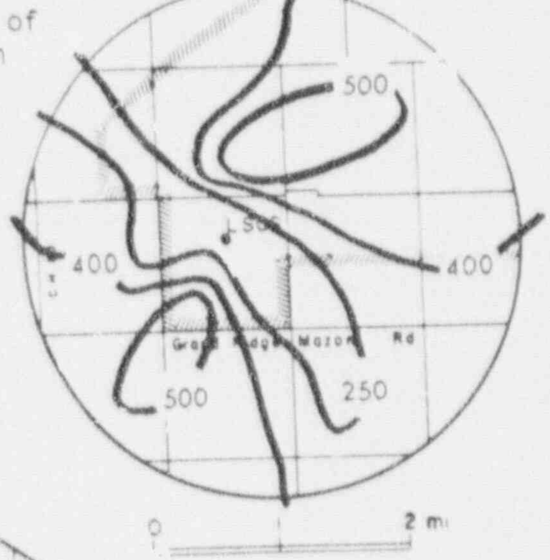


TABLE 3.1-1

LASALLE UNITS ONE AND TWO

1991 ANNUAL REPORT
MAXIMUM DOSES RESULTING FROM AIRBORNE RELEASES
PERIOD OF RELEASE - 01/01/91 TO 12/31/91 CALCULATED 02/26/92
INFANT RECEPTOR

TYPE	1ST QUARTER JAN-MAR	2ND QUARTER APR-JUN	3RD QUARTER JUL-SEP	4TH QUARTER OCT-DEC	ANNUAL
GAMMA AIR	9.28E-06	1.22E-04	1.71E-03	2.10E-03	3.95E-03
(MRAD)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
BETA AIR	1.08E-06	1.23E-05	2.26E-04	2.42E-04	4.82E-04
(MRAD)	(E)	(E)	(E)	(E)	(E)
TOT. BODY	4.92E-06	6.61E-05	1.00E-03	1.23E-03	2.30E-03
(MREM)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
SKIN	8.04E-06	1.05E-04	1.52E-03	1.84E-03	3.47E-03
(MREM)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
ORGAN	3.06E-04	8.13E-04	2.65E-03	1.13E-03	4.91E-03
(MREM)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
	THYROID	THYROID	THYROID	THYROID	THYROID

THIS IS A REPORT FOR THE CALENDAR YEAR 1991

COMPLIANCE STATUS - 10 CFR 50 APP. I
INFANT RECEPTOR

	QTRLY OBJ	------------	% OF APP I.	------------		YRLY OBJ	% OF APP.I
		1ST QTR JAN-MAR	2ND QTR APR-JUN	3RD QTR JUL-SEP	4TH QTR OCT-NOV		
GAMMA AIR (MRAD)	5.0	0.00	0.00	0.03	0.04	10.0	0.04
BETA AIR (MRAD)	10.0	0.00	0.00	0.00	0.00	20.0	0.00
TOT. BODY (MREM)	2.5	0.00	0.00	0.04	0.05	5.0	0.05
SKIN (MREM)	7.5	0.00	0.00	0.02	0.02	15.0	0.02
ORGAN (MREM)	7.5	0.00	0.01	0.04	0.02	15.0	0.03
		THYROID	THYROID	THYROID	THYROID		THYROID

TABLE 3.1-1 (continued)

LASALLE UNITS ONE AND TWO

1991 ANNUAL REPORT
MAXIMUM DOSES RESULTING FROM AIRBORNE RELEASES
PERIOD OF RELEASE - 01/01/91 TO 12/31/91 CALCULATED 02/26/92
ADULT RECEPTOR

TYPE	1ST QUARTER JAN-MAR	2ND QUARTER APR-JUN	3RD QUARTER JUL-SEP	4TH QUARTER OCT-DEC	ANNUAL
GAMMA AIR	9.28E-06	1.22E-04	1.71E-03	2.10E-03	3.95E-03
(MRAD)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
BETA AIR	1.08E-06	1.23E-05	2.26E-04	2.42E-04	4.82E-04
(MRAD)	(E)	(E)	(E)	(E)	(E)
TOT. BODY	4.92E-06	6.61E-05	1.00E-03	1.23E-03	2.30E-03
(MREM)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
SKIN	8.04E-06	1.05E-04	1.52E-03	1.84E-03	3.47E-03
(MREM)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
ORGAN	2.92E-04	6.16E-04	1.88E-03	1.10E-03	3.89E-03
(MREM)	(ESE)	(ESE)	(ESE)	(ESE)	(ESE)
	THYROID	THYROID	THYROID	THYROID	THYROID

THIS IS A REPORT FOR THE CALENDAR YEAR 1991

COMPLIANCE STATUS - 10 CFR 50 APP. I
ADULT RECEPTOR

	QTRLY OBJ	------------ % OF APP I. 1ST QTR JAN-MAR	2ND QTR APR-JUN	3RD QTR JUL-SEP	4TH QTR OCT-NOV ------------	YRLY OBJ	% OF APP.I
GAMMA AIR (MRAD)	5.0	0.00	0.00	0.03	0.04	10.0	0.04
BETA AIR (MRAD)	10.0	0.00	0.00	0.00	0.00	20.0	0.00
TOT. BODY (MREM)	2.5	0.00	0.00	0.04	0.05	5.0	0.05
SKIN (MREM)	7.5	0.00	0.00	0.02	0.02	15.0	0.02
ORGAN (MREM)	7.5	0.00	0.01	0.03	0.01	15.0	0.03
		THYROID	THYROID	THYROID	THYROID		THYROID

TABLE 3.2-1

LASALLE UNIT ONE
ADULT RECEPTOR

1991 ANNUAL REPORT
MAXIMUM DOSES (MREM) RESULTING FROM LIQUID EFFLUENTS
PERIOD OF RELEASE - 01/01/91 TO 12/31/91 CALCULATED 02/26/92

DOSE TYPE	1ST QUARTER JAN-MAR	2ND QUARTER APR-JUN	3RD QUARTER JUL-SEP	4TH QUARTER OCT-DEC	ANNUAL
TOTAL BODY	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
INTERNAL ORGAN	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

THIS IS A REPORT FOR THE CALENDAR YEAR 1991

COMPLIANCE STATUS - 10 CFR 50 APP. I

	QTRLY OBJ	------------ % OF APP I. ------------ 1ST QTR JAN-MAR	2ND QTR APR-JUN	3RD QTR JUL-SEP	4TH QTR OCT-NOV	YRLY OBJ	% OF APP.I
TOTAL BODY (MREM)	1.5	0.00	0.00	0.00	0.00	3.0	0.00
CRIT. ORGAN(MREM)	5.0	0.00	0.00	0.00	0.00	10.0	0.00

TABLE 3.2-1 (continued)

LASALLE UNIT TWO
ADULT RECEPTOR

1991 ANNUAL REPORT
MAXIMUM DOSES (MREM) RESULTING FROM LIQUID EFFLUENTS
PERIOD OF RELEASE - 01/01/91 TO 12/31/91 CALCULATED 02/26/92

DOSE TYPE	1ST QUARTER JAN-MAR	2ND QUARTER APR-JUN	3RD QUARTER JUL-SEP	4TH QUARTER OCT-DEC	ANNUAL
TOTAL BODY	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
INTERNAL ORGAN	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

THIS IS A REPORT FOR THE CALENDAR YEAR 1991

COMPLIANCE STATUS - 10 CFR 50 APP. I

	QTRLY OBJ	------------ % OF APP I. 1ST QTR JAN-MAR	2ND QTR APR-JUN	3RD QTR JUL-SEP	------------ 4TH QTR OCT-NOV	YRLY OBJ	% OF APP.I
TOTAL BODY (MREM)	1.5	0.00	0.00	0.00	0.00	3.0	0.00
CRIT. ORGAN(MREM)	5.0	0.00	0.00	0.00	0.00	10.0	0.00

FIGURE 5.0-1

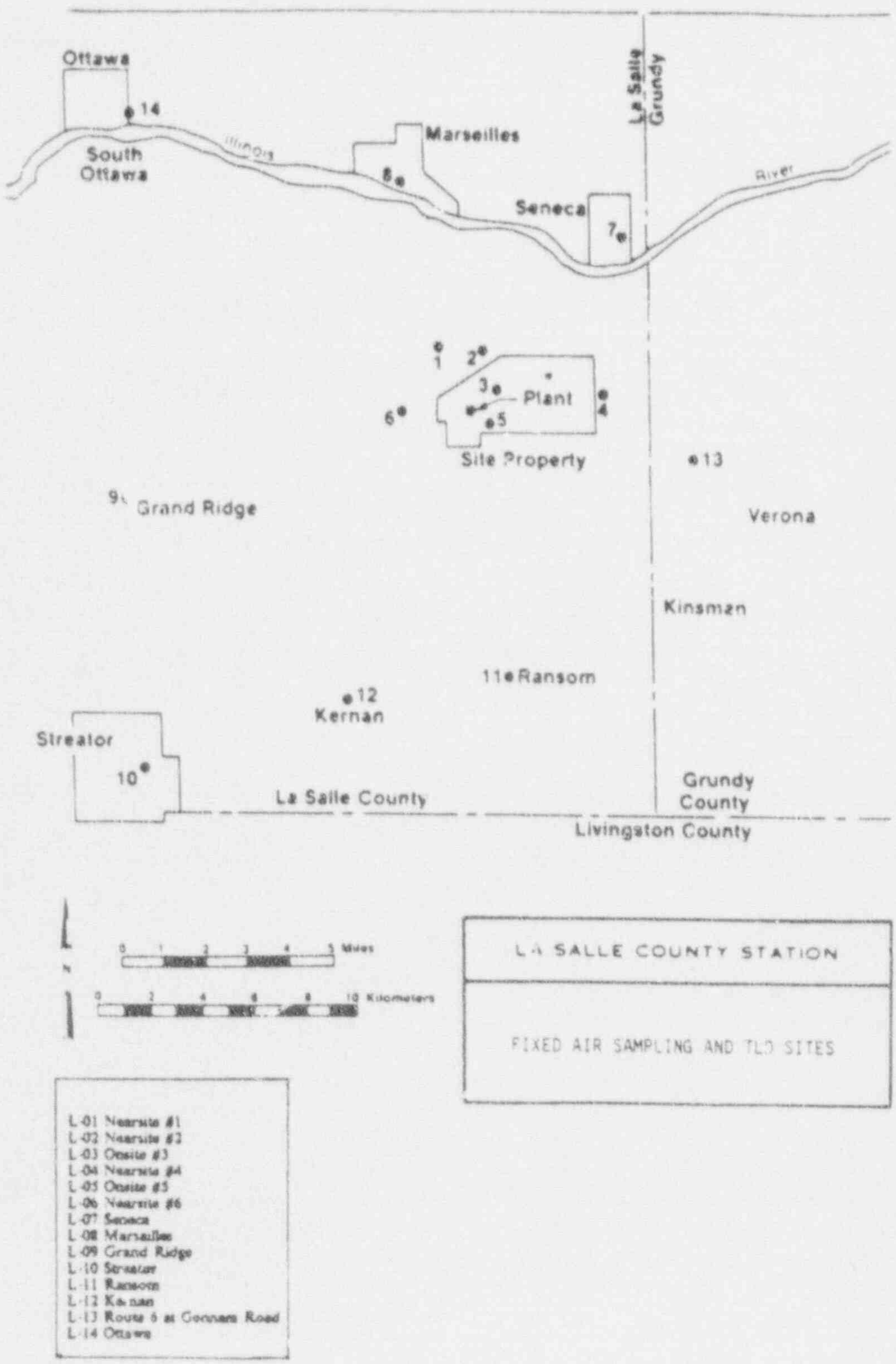
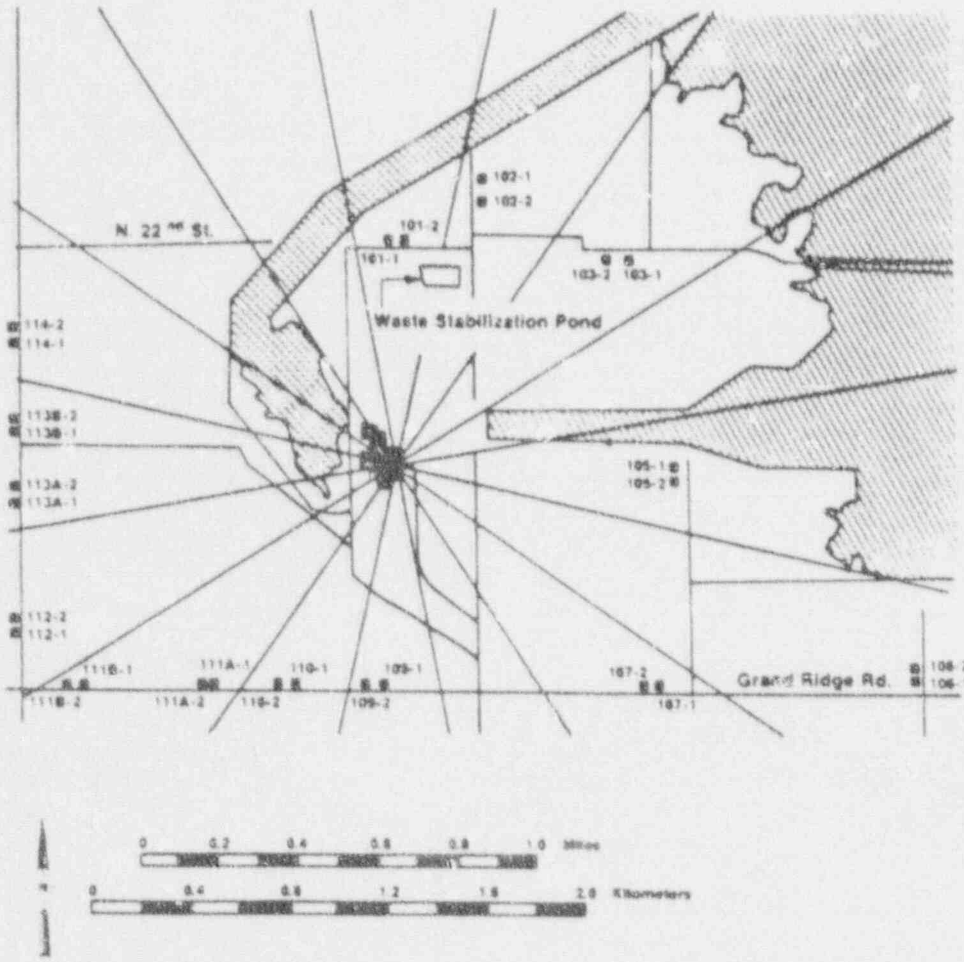

Ottawa
14
South Ottawa
Illinois
Marseilles
8
Seneca
7
La Salle
Grundy
River
1
2
3
Plant
4
6
5
Site Property
13
9
Grand Ridge
Verona
Kinsman
11 Ransom
12
Kernan
Streator
10
La Salle County
Grundy County
Livingston County
0 1 2 3 4 5 Miles
0 2 4 6 8 10 Kilometers
LA SALLE COUNTY STATION
FIXED AIR SAMPLING AND TLD SITES
L-01 Nearsite #1
L-02 Nearsite #2
L-03 Onsite #3
L-04 Nearsite #4
L-05 Onsite #5
L-06 Nearsite #6
L-07 Seneca
L-08 Marseilles
L-09 Grand Ridge
L-10 Streator
L-11 Ransom
L-12 Kernan
L-13 Route 6 at Gonnam Road
L-14 Ottawa

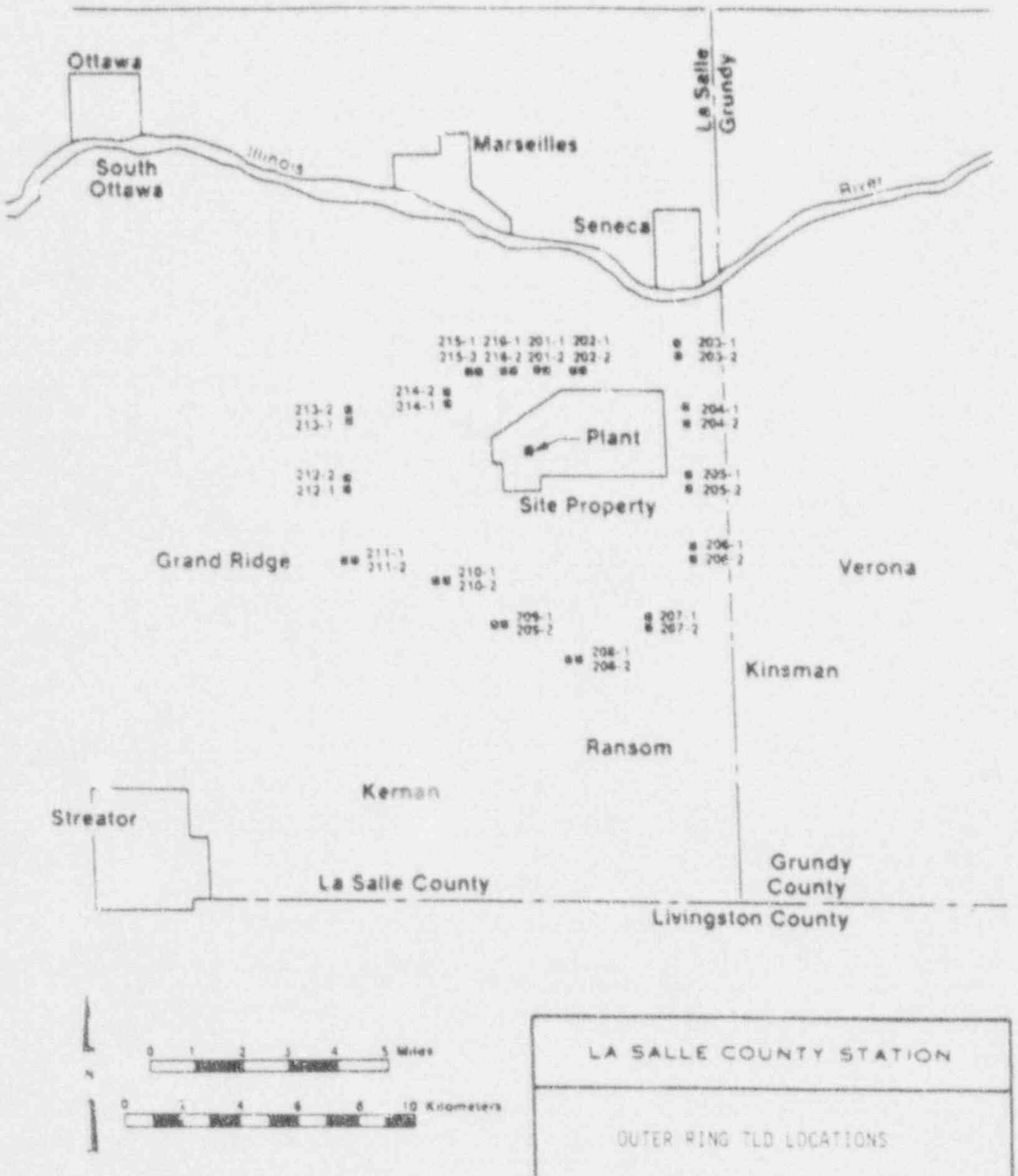
FIGURE 5.0-2



LA SALLE COUNTY STATION

INNER RING TLD LOCATIONS

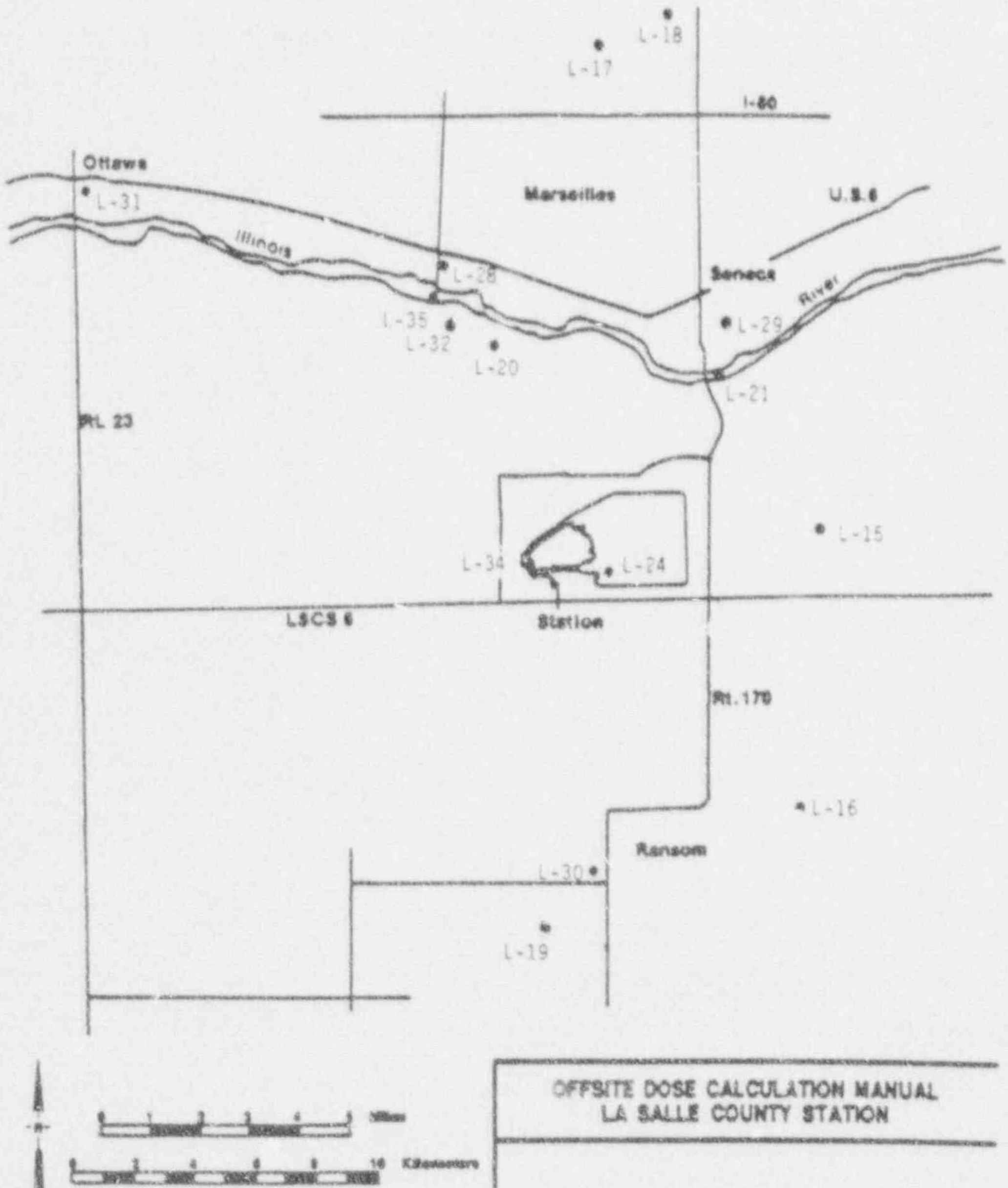
FIGURE 5.0-3



LA SALLE COUNTY STATION

OUTER RING TLD LOCATIONS

FIGURE 5.0-4



L-16 Lowery Dairy
L-17 Hayer-Patterson Dairy
L-18 Flatness Dairy
L-19 Bettenhausen Dairy
L-20 Gass Farm
L-21 Illinois River at Seneca
L-24 LSCS Cooling Lake near Recreation Area
L-27 LSCS Onsite Well
L-28 Marseilles Well Water
L-29 Seneca Well Water
L-30 Ransom Well Water
L-32 Illinois State Park Well
L-34 Cooling Lake Discharge Structure-Downstream
L-35 Marseilles Pool of Illinois River

OFFSITE DOSE CALCULATION MANUAL
LA SALLE COUNTY STATION

INGESTION AND WATERBORNE EXPOSURE
PATHWAY SAMPLE LOCATIONS

TABLE 5.0-1

LaSalle Station Radiological Environmental Monitoring Locations

Location	Air Sampling	TLD	Cooling Water	Fish	Lake Water	Milk	Public Water	Rabbits	Sediments	Surface Water	Vegetables	Ground/Well Water
L-01 Nearsite #1	O	O										
L-02 Nearsite #2	O	O										
L-03 Onsite #3	O	O										
L-04 Nearsite #4	O	O										
L-05 Onsite #5	O	O										
L-06 Nearsite #6	O	O										
L-07 Seneca	O	O										
L-08 Marseilles	O	O										
L-09 Grand Ridge	O	O										
L-10 Streator	O	O										
L-11 Ransom	O	O										
L-12 Kernan	O	O										
L-13 Route 6 at Gonnam Road	O	O										
L-14 Ottawa	O	O										
L-16 Lowery Farm						O						
L-17 Hayer-Patterson Dairy						O						
L-18 Boldt Dairy						O						
L-19 Bettenhausen Dairy						O						
L-20 Gass Farm						O						
L-21 Illinois River at Seneca										O		
L-24 LSCS Cooling Lake near Recreation Area				O						O		
L-27 LSCS Onsite Well												O
L-28 Marseilles Well Water												O
L-29 Seneca Well Water												O
L-30 Ransom Well Water												O
L-31 Ottawa Well Water												O
L-32 Illinois State Park Well												O
L-34 Cooling Lake Discharge Structure - Downstream									O			
L-35 Marseilles Pool of Illinois River				O								

CENSUS

Dairy

Residence

Table 5.0-2

LASALLE COUNTY STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

1. AIR SAMPLERS

Site Code[a]	Location	Distance (miles)	Direction (°)
L-01	Near-site No. 1	0.5	326
L-02	On-site Station No. 2	0.6	11
L-03	On-site Station No. 3	0.2	56
L-04	Near-site No. 4	1.5	90
L-05	On-site Station No. 5	0.3	145
L-06	Near-site No. 6	0.4	2[illegible]0
L-07	Seneca	5.2	18
L-08	Marseilles	7.0	326
L-09 (C)	Grand Ridge	10.4	260
L-10 (C)	Streator	13.5	220
L-11	Ransom	6.0	191
L-12 (C)	Kernan	5.0	214
L-13	Route 6 at Gonnam Road	7.0	100
L-14 (C)	Ottawa	12.0	315

2. TLDs

a. Same as No. 1.

b. Special TLD Samplers

Site Code	Distance (miles)	Direction (°)
Inner Ring		
L-101-1,2	0.5	359
L-102-1,2	0.6	17
L-103-1,2	0.7	46
L-105-1,2	0.7	91
L-106-1,2	1.4	110
L-107-1,2	0.8	128
L-109-1,2	0.6	178
L-110-1,2	0.6	205
L-111a-1,2	0.7	217
L-111b-1,2	0.8	230
L-112-1,2	0.9	244
L-113a-1,2	0.8	262
L-113b-1,2	0.8	273
L-114-1,2	0.9	288

[a] Control (reference) locations are denoted by a "C" after site code. All other locations are indicators.

TABLE 5.0-2 (continued)

LASALLE COUNTY STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

2. TLDs

b. Special TLD Samplers (continued)

Site Code	Distance (miles)	Direction (°)
Outer Ring		
L-201-1,2	2.0	15
L-202-1,2	2.3	33
L-203-1,2	4.0	56
L-204-1,2	3.5	78
L-205-1,2	3.5	102
L-206-1,2	4.3	123
L-207-1,2	4.5	146
L-208-1,2	4.5	170
L-209-1,2	4.0	192
L-210-1,2	3.3	216
L-211-1,2	4.5	240
L-212-1,2	4.0	261
L-213-1,2	3.8	283
L-214-1,2	2.0	303
L-215-1,2	2.0	330
L-216-1,2	1.5	350

3. MILK

Site Code[a]	Location	Distance (miles)	Direction (°)
L-16	Lowery Dairy Farm	8.2	120
L-17 (C)	Hayer-Patterson Dairy Farm	12.3	18
L-18 (C)	Flatness Dairy Farm	12.5	10
L-19	Bettenhousen Dairy Farm	8.5	180
L-20	Gass Farm[b]	4.6	348

[a] Control (reference) locations are denoted by a "C" after site code. All other locations are indicators.

[b] Additional farm was not required by the ODCM but was included to ensure that the program has at least four milking stations. This is not a commercial dairy but a farm having milking cows for personal use.

Table 5.0-2 (continued)

LaSALLE COUNTY STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

4. GROUND/WELL WATER

Site Code[a]	Location	Distance (miles)	Direction (°)
L-27	Onsite Well		
L-28	Marseilles Well	7.0	326
L-29 (C)	Seneca Well	5.1	18
L-30	Ransom Well	6.0	191
L-31	Ottawa Well	12.8	304
L-32	Illinois State Park	6.5	326

5. SURFACE WATER

Site Code[a]	Location	Distance (miles)	Direction (°)
L-21 (C)	Illinois River at Seneca	4.0	22
L-24	LSCS Cooling Lake	0.3	112

6. FISH

Site Code[a]	Location	Distance (miles)	Direction (°)
L-24	LSCS Cooling Lake near Recreation Area	0.3	112
L-35	Marseilles Pool of Illinois River	6.5	326

7. SHORELINE SEDIMENTS

Site Code[a]	Location	Distance (miles)	Direction (°)
L-34	Downstream of cooling lake discharge structure	At Station	

[a] Control (reference) locations are denoted by a "C" after site code. All other locations are indicators.

TABLE 5.0-2 (continued)

LASALLE COUNTY STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLE COLLECTION AND ANALYSES

Sample Media	Location Code[a]	Location Site	Collection Frequency	Type of Analysis	Frequency of Analysis	Remarks
1. Airborne Particulates	a. Onsite and Near Field		Continuous operation for a week	Gross beta Gamma Isot	Weekly Quarterly	On all samples. On quarterly composites from each location.
	L-1	Nearsite No. 1		Gamma Isot	Weekly	If gross beta in a sample exceeds 10X the yearly mean of the control samples.
	L-2	Nearsite No. 2				
	L-3	Onsite No. 3		Filter Exchange	Weekly	
	L-4	Nearsite No. 4				
	L-5	Onsite No. 5				
	L-6	Nearsite No. 6				
	b. Far Field					
	L-7	Seneca				
	L-8	Marseille				
	L-9 (C)	Grand Ridge				
	L-10 (C)	Streator				
	L-11	Ransom				
	L-12 (C)	Kernan				
	L-13	Route 6 at Gonnam Rd.				
	L-14 (C)	Ottawa				
2. Airborne Iodine	Same as 1.		Weekly	I-131	Weekly	On all samples.
3. Air Sampling Train	Same as 1.		--	Test and Maintenance	Weekly	On all samplers.
4. TLD	Same as 1.		Quarterly	Gamma	Quarterly	Two sets at all AP locations. One set read quarterly. Second set read if required by Commonwealth Edison. At other locations, all sets read quarterly. Minimum of two TLDs per set.
	L-101-1,2	Inner Ring				
	102-1,2					
	103-1,2					
	105-1,2					
	106-1,2					
	107-1,2					
	109-1,2					
	110-1,2,					
	111a-1,2,					
	111b-1,2					
	112-1,2[b]					
	113a-1,2,					
	113b-1,2					
	114-1,2[b]					

[a] Control (reference) locations are denoted by a "C" in this column. All other locations are [illegible].
[b] New special TLD site for this Spec.

TABLE 5.0-2 (continued)

LASALLE COUNTY STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLE COLLECTION AND ANALYSES

Sample Media	Location		Collection Frequency	Type of Analysis	Frequency of Analysis	Remarks
	Code[a]	Site				
4. TLD (continued)	L-201-1,2 202-1,2 203-1,2 204-1,2 205-1,2 206-1,2 207-1,2 208-1,2 209-1,2 210-1,2 211-1,2 212-1,2 213-1,2 214-1,2 215-1,2 216-1,2	Outer Ring				
5. Milk	L-16 L-17(C) L-18 (C) L-19 L-20	Lowery Dairy Hauer-Patterson Dairy Flatness Dairy Bettenhousen Dairy Gass Farm[b]	Bi-weekly: May through October	I-131 Gamma Isot.	Bi-Weekly Bi-Weekly	On all samples. LLD: 0.5 pCi/L. On all samples.
			Monthly: November through April	I-131 Gamma Isot	Monthly Monthly	On all samples. LLD: 0.5 pCi/L. On all samples.
6. Ground/Well Water	L-27 L-28 L-29 (C) L-30 L-31 L-32	Onsite Well Marseilles Well Seneca Well Ransom Well Ottawa Well Illinois State Park Well	Quarterly	Gamma Isot Tritium	Quarterly Quarterly	On all samples. On all samples.
7. Surface Water	L-21 (C)	Illinois River at Ottawa	Weekly	Gamma Isot Tritium	Monthly Quarterly	On monthly composites from each location. On quarterly composites from each location.
	L-24	LSCS Cooling Lake				
8. Fish	L-24 L-35	LSCS Cooling Lake Marseilles Pool	Semi-annual	Gamma Isot	Semi-annual	On edible portions only. Two species.

a Control (reference) locations are denoted by a "C" after site code. All other locations are indicators.
b An additional dairy was not required by the ODCM but was included to ensure that the program has at least four dairies.

TABLE 5.0-2 (continued)

LASALLE COUNTY STATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLE COLLECTION AND ES

Sample Media	Location Code[a]	Location Site	Collection Frequency	Type of Analysis	Frequency of Analysis	Remarks
9. Shoreline Sediments	L-34	Downstream of cooling lake	Semi-annual	Gamma Isot	Semi-annual	
10. Dairy Census	a. Site boundary to 2 miles		--	a. Enumeration by a door-to-door or equivalent counting technique.	Annually	During grazing season.
	b. 2 miles to 5 miles		--	b. Enumeration by using referenced information from county agricultural agents or other reliable sources.	Annually	During grazing season.
	c. At dairies listed in Item 4.		--	c. Inquire as to feeding practices: 1. Pasture only. 2. Feed and chop only. 3. Pasture and feed; if both, ask farmer to estimate fraction of food from pasture: <25%, 25-50%, 50-75%, or >75%.	Annually	During grazing season.
11. Nearest Residence Census	In all 16 sectors up to 5 miles				Annually	

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM QUARTERLY SUMMARY

Name of Facility LaSalle Nuclear Power Station Docket No. 50-373, 50-374
Location of Facility LaSalle County, Illinois Reporting Period 1st Quarter 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses	LLD	Indicator Locations Mean[a] Range	Location with Highest Quarterly Mean: Location	Location with Highest Quarterly Mean: Mean Range	Control Locations Mean[a] Range	Number of Non-routine Results
Air Particulates (pCi/m^3)	Gross Beta 77	0.01	0.025 (77/77) (0.011-0.045)	L-01, Near Site No.1 0.5 mi @ 326°	0.027 (13/13) (0.017-0.045)	None	0
	Gamma Spec. 6	0.01	<LLD	-	-	None	0
Airborne Iodine (pCi/m^3)	I-131 77	0.10	<LLD	-	-	None	0
Gamma Background (TLDs) (mR/Qtr.)	Gamma Dose 28	3.0	17.7 (20/20) (16-20)	L-01, Near Site No.1 0.5 mi @ 326°	19 (2/2)	17.1 (8/8) (16-18)	0
Milk (pCi/L)	I-131 15	0.5	<LLD	-	-	<LLD	0
	Gamma Spec. 15						
	Cs-134	5	<LLD	-	-	<LLD	0
	Cs-137	5	<LLD	-	-	<LLD	0
	Other Gammas	10	<LLD	-	-	<LLD	0
Surface Water (pCi/L)	Gamma Spec. 6						
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	10	<LLD	-	-	<LLD	0
	Other Gammas	20	<LLD	-	-	<LLD	0
	Tritium 2	200	<LLD	-	-	<LLD	0
Well Water (pCi/L)	Gamma Spec. 6						
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	10	<LLD	-	-	<LLD	0
	Other Gammas	20	<LLD	-	-	<LLD	0
	Tritium 6	200	<LLD	-	-	<LLD	0

[a] Mean and range based on detectable measurements only. Fractions indicated in parentheses.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM QUARTERLY SUMMARY

Name of Facility LaSalle Nuclear Power Station Docket No. 50-254, 50-265
Location of Facility LaSalle County, Illinois Reporting Period 2nd Quarter 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses		LLD	Indicator Locations Mean[a] Range	Location with Highest Quarterly Mean		Control Locations Mean[a] Range	Number of Non-routine Results
					Location	Mean Range		
Air Particulates (pCi/m^3)	Gross Beta	76	0.01	0.018 (76/76) (0.011-0.024)	L-01[b], Near-site Station No. 1 0.5 mi @ 326°	0.018 (13/13) (0.012-0.024)	None	0
	Gamma Spec.	6	0.01	<LLD	-	-	None	0
Airborne Iodine (pCi/m^3)	I-131	76	0.10	<LLD	-	-	None	0
Gamma Background (TLDs) (mR/Qtr.)	Gamma Dose	28	3.0	19.0 (20/20) (17-21)	L-01[c], Near-site Station No. 1 0.5 mi @ 326°	20 (2/2)	18.6 (8/8) (18-20)	0
Milk (pCi/L)	I-131	29	0.5	<LLD	-	-	<LLD	0
	Gamma Spec.	29						
	Cs-124		5	<LLD	-	-	<LLD	0
	Cs-137		5	<LLD	-	-	<LLD	0
	Other Gammas		10	<LLD	-	-	<LLD	0
Surface Water (pCi/L)	Gamma Spec.	6						
	Cs-134		10	<LLD	-	-	<LLD	0
	Cs-137		10	<LLD	-	-	<LLD	0
	Other Gammas		20	<LLD	-	-	<LLD	0
	Tritium	2	200	<LLD	-	-	<LLD	0

[a] Mean and range based on detectable measurements only. Fractions indicated in parentheses.

[b] Locations L-01, L-03, L-04, and L-06 all had identical means of 0.018 pCi/m^3.

[c] Locations L-01, L-05, and L-06 all had identical means of 20 mR/Qtr.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM QUARTERLY SUMMARY

Name of Facility LaSalle Nuclear Power Station Docket No. 50-254, 50-265

Location of Facility LaSalle County, Illinois Reporting Period 2nd Quarter 1991

(County, State)

Sample Type (Units)	Type and Number of Analyses	LLD	Indicator Locations Mean[a] Range	Location with Highest Quarterly Mean		Control Locations Mean[a] Range	Number of Non-routine Results
				Location	Mean Range		
Well Water (pCi/L)	Gamma Spec. 6						
	Cs-134	10	<LLD	-	-	<LLD	0
	Cs-137	10	<LLD	-	-	<LLD	0
	Other Gammas	20	<LLD	-	-	<LLD	0
	Tritium 6	200	<LLD	-	-	<LLD	0
Bottom Sediments (pCi/m^3)	Gamma Spec. 1						
	Cs-134	0.1	<LLD	-	-	None	0
	Cs-137	0.1	0.16 (1/1)	L-34, Downstream of Cooling Lake Discharge	0.16 (1/1)	None	0
	Other Gammas	0.2	<LLD	-	-	None	0
Fish (pCi/g wet)	Gamma Spec. 8						
	Cs-134	0.1	<LLD	-	-	<LLD	0
	Cs-137	0.1	<LLD	-	-	<LLD	0
	Other Gammas	0.2	<LLD	-	-	<LLD	0

[a] Mean and range based on detectable measurements only. Fractions indicated in parentheses.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM QUARTERLY SUMMARY

Name of Facility LaSalle Nuclear Power Station Docket No. 50-373, 50-374
Location of Facility LaSalle County, Illinois Reporting Period 3rd Quarter 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses		LLD	Indicator Locations Mean[a] Range	Location with Highest Quarterly Mean: Location	Location with Highest Quarterly Mean: Mean Range	Control Locations Mean[a] Range	Number of Non-routine Results
Air Particulates (pCi/m^3)	Gross Beta	77	0.01	0.021 (76/77) (0.012-0.031)	L-01[b], Near Site #1 0.5 mi @ 326°	0.021 (13/13) (0.012-0.030)	None	0
	Gamma Spec.	6	0.01	<LLD	-	-	None	0
Airborne Iodine (pCi/m^3)	I-131	77	0.10	<LLD	-	-	None	0
Gamma Background (TLDs) (mR/Qtr.)	Gamma Dose	28	3.0	17.2 (20/20) (16-18)	L-14, Ottawa 12.0 mi @ 315°	19 (2/2) (18-20)	16.6 (8/8) (15-20)	0
Milk (pCi/L)	I-131	32	0.5	<LLD	-	-	<LLD	0
	Gamma Spec.	32						
	Cs-134		5	<LLD	-	-	<LLD	0
	Cs-137		5	<LLD	-	-	<LLD	0
	Other Gammas		10	<LLD	-	-	<LLD	0
Surface Water (pCi/L)	Gamma Spec.	6			-			
	Cs-134		10	<LLD	-	-	<LLD	0
	Cs-137		10	<LLD	-	-	<LLD	0
	Other Gammas		20	<LLD	-	-	<LLD	0
	Tritium	2	200	<LLD	L-21, Illinois River at Seneca, 4.0 mi @ 22°	256 (1/1)	256 (1/1)	0
Well Water (pCi/L)	Gamma Spec.	6						
	Cs-134		10	<LLD	-	-	<LLD	0
	Cs-137		10	<LLD	-	-	<LLD	0
	Other Gammas		20	<LLD	-	-	<LLD	0
	Tritium	6	200	<LLD	-	-	<LLD	0

[a] Mean and range based on detectable measurements only. Fractions indicated in parentheses.
[b] Five sites (L-01, L-02, L-03, L-04, and L-06) all had identical quarterly means (0.021 pCi/m^3). Only L-01 is detailed in this summary.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM QUARTERLY SUMMARY

Name of Facility LaSalle Nuclear Power Station Docket No. 50-254, 50-265
Location of Facility LaSalle County, Illinois Reporting Period 4th Quarter 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses		LLD	Indicator Locations Mean[a] Range	Location with Highest Quarterly Mean: Location	Location with Highest Quarterly Mean: Mean Range	Control Locations Mean[a] Range	Number of Non-routine Results
Air Particulates (pCi/m^3)	Gross Beta	84	0.01	0.024 (84/84) (0.013-0.043)	L-05, Near-site Station No. 5 0.3mi @ 145°	0.025 (14/14) (0.017-0.043)	None	0
	Gamma Spec.	6	0.01	<LLD	-	-	None	0
Airborne Iodine (pCi/m^3)	I-131	84	0.10[b]	<LLD	-	-	None	0
Gamma Background (TLDs) (mR/Qtr.)	Gamma Dose	28	3.0	17.2 (20/20) (15.6-18.5)	L-01, Near Site #1 0.5 mi @ 326°	18.4 (2/2) (18.4-18.5)	16.9 (8/8) (15.5-18.3)	0
Milk (pCi/L)	I-131	30	0.5	<LLD	-	-	<LLD	0
	Gamma Spec.	30						
	Cs-124		5	<LLD	-	-	<LLD	0
	Cs-137		5	<LLD	-	-	<LLD	0
	Other Gammas		10	<LLD	-	-	<LLD	0
Surface Water (pCi/L)	Gamma Spec.	6						
	Cs-134		10	<LLD	-	-	<LLD	0
	Cs-137		10	<LLD	-	-	<LLD	0
	Other Gammas		20	<LLD	-	-	<LLD	0
	Tritium	2	200	<LLD	-	-	<LLD	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM QUARTERLY SUMMARY

Name of Facility LaSalle Nuclear Power Station Docket No. 50-254, 50-265
Location of Facility LaSalle County, Illinois Reporting Period 4th Quarter 1991
(County, State)

Sample Type (Units)	Type and Number of Analyses		LLD	Indicator Locations Mean[a] Range	Location with Highest Quarterly Mean		Control Locations Mean[a] Range	Number of Non-routine Results
					Location	Mean Range		
Well Water (pCi/L)	Gamma Spec.	6						
	Cs-134		10	<LLD	-	-	<LLD	0
	Cs-137		10	<LLD	-	-	<LLD	0
	Other Gammas		20	<LLD	-	-	<LLD	0
	Tritium	6	200	<LLD	-	-	<LLD	0
Bottom Sediments (pCi/m^3)	Gamma Spec.	1						
	Cs-134		0.1	<LLD	-	-	None	0
	Cs-137		0.1	0.16 (1/1)	L-34, Downstream of Cooling Lake Discharge	0.16 (1/1)	None	0
	Other Gammas		0.2	<LLD	-	-	None	0
Fish (pCi/g wet)	Gamma Spec.	9						
	Cs-134		0.1	[illegible]	-	-	<LLD	0
	Cs-137		0.1	<LLD	-	-	<LLD	0
	Other Gammas		0.2	<LLD	-	-	<LLD	0

[a] Mean and range based on detectable measurements only. Fractions indicated in parentheses.
[b] One result for I-131 exceeded LLD (<0.89) because of very low volume ($10\ m^3$).

TABLE 5.1-1

Gamma Radiation Measured in mR by TLDs

	Quarter 1 1991	Quarter 2 1991	Quarter 3 1991	Quarter 4 1991
On-Site and Near-Site Indicator Locations				
L01-1 NEAR-SITE NO. 1	18	20	18	18.5
L01-2 NEAR-SITE NO. 1	20	20	18	18.4
L02-1 NEAR-SITE NO. 2	17	19	17	16.5
L02-2 NEAR-SITE NO. 2	17	19	17	16.9
L03-1 ON-SITE NO. 3	17	18	16	16.1
L03-2 ON-SITE NO. 3	17	18	16	16.3
L04-1 NEAR-SITE NO. 4	17	19	17	16.8
L04-2 NEAR-SITE NO. 4	17	18	17	17.0
L05-1 ON-SITE NO. 5	18	19	17	18.2
L05-2 ON-SITE NO. 5	18	21	18	17.7
L06-1 NEAR-SITE NO. 6	18	21	17	18.2
L06-2 NEAR-SITE NO. 6	18	19	18	17.6
Mean ± S.D.	18 ± 1	19 ± 1	17 ± 1	17.4 ± 0.9
Off-Site Indicator Locations(Far Field)				
L07-1 SENECA	19	19	18	17.9
L07-2 SENECA	18	20	18	18.1
L08-1 MARSEILLES	19	20	18	17.7
L08-2 MARSEILLES	18	19	18	17.5
L11-1 RANSOM	17	17	16	16.0
L11-2 RANSOM	16	17	15	15.6
L13-1 RT. 6 AT GONNAM ROAD	17	18	17	16.5
L13-2 RT. 6 AT GONNAM ROAD	18	18	17	16.6
Mean ± S.D.	18 ± 1	19 ± 1	17 ± 1	17.0 ± 0.9
Background Locations				
L09-1 GRAND RIDGE	17	19	16	16.7
L09-2 GRAND RIDGE	17	19	16	17.0
L10-1 STREATOR	17	18	16	16.1
L10-2 STREATOR	17	18	16	16.4
L12-1 KERNAN	16	18	15	16.6
L12-1 KERNAN	17	18	16	15.5
L14-1 OTTAWA	18	19	20	18.3
L14-2 OTTAWA	18	20	18	18.3
Mean ± S.D.	17 ± 1	19 ± 1	17 ± 2	16.9 ± 1.0
Inner Ring, Near-site Boundary, Indicator Locations				
L101-1 NORTH	19	20	18	18.4
L101-2 NORTH	19	20	18	18.0
L102-1 NORTH NORTHEAST	20	21	20	19.4
L102-2 NORTH NORTHEAST	20	21	20	19.9
L103-1 NORTHEAST	19	19	18	18.0
L103-2 NORTHEAST	20	20	19	18.4
L105-1 EAST	20	21	20	20.1
L105-2 EAST	20	21	19	19.6
L106-1 EAST SOUTHEAST	18	19	17	17.3
L106-2 EAST SOUTHEAST	18	19	18	17.7
L107-1 SOUTHEAST	19	20	19	18.3
L107-2 SOUTHEAST	19	20	19	18.0
L109-1 SOUTH	18	20	19	18.6
L109-2 SOUTH	19	20	20	18.6

TABLE 5.1-1 (continued)

	Quarter 1 1991	Quarter 2 1991	Quarter 3 1991	Quarter 4 1991
L110-1 SOUTH SOUTHWEST	19	20	18	17.4
L110-2 SOUTH SOUTHWEST	18	19	18	17.9
L111A1 SOUTHWEST	19	20	18	18.1
L111A2 SOUTHWEST	18	20	18	17.7
L111B1 SOUTHWEST	19	20	18	18.5
L111B2 SOUTHWEST	19	19	18	17.8
L112-1 WEST SOUTHWEST	19	19	17	17.4
L112-2 WEST SOUTHWEST	19	19	18	17.5
L113A1 WEST	20	21	19	19.1
L113A2 WEST	19	20	19	18.5
L113B1 WEST	19	22	19	18.4
L113B2 WEST	20	20	20	18.8
L114-1 WEST NORTHWEST	18	21	19	18.9
L114-2 WEST NORTHWEST	19	20	19	19.2
Mean ± S.D.	19 ± 1	20 ± 1	19 ± 1	18.4 ± 0.8

Outer Ring, Near 5 Mile Radius, Indicator Locations

	Quarter 1 1991	Quarter 2 1991	Quarter 3 1991	Quarter 4 1991
L201-1 NORTH NORTHEAST	19	20	18	18.8
L201-2 NORTH NORTHEAST	19	20	19	18.7
L202-1 NORTH NORTHEAST	18	19	19	18.5
L202-2 NORTH NORTHEAST	18	19	18	17.2
L203-1 NORTHEAST	18	19	18	17.9
L203-2 NORTHEAST	19	21	19	18.4
L204-1 EAST NORTHEAST	18	20	18	18.6
L204-2 EAST NORTHEAST	18	19	19	18.2
L205-1 EAST SOUTHEAST	18	20	18	18.9
L205-2 EAST SOUTHEAST	18	19	17	18.1
L206-1 EAST SOUTHEAST	19	20	18	17.8
L206-2 EAST SOUTHEAST	18	20	18	17.3
L207-1 SOUTHEAST	18	20	19	18.5
L207-2 SOUTHEAST	18	19	18	17.6
L208-1 SOUTH	18	19	19	18.2
L208-2 SOUTH	19	21	19	18.6
L209-1 SOUTH SOUTHWEST	19	20	18	18.0
L209-2 SOUTH SOUTHWEST	18	20	18	17.5
L210-1 SOUTHWEST	19	21	19	19.3
L210-2 SOUTHWEST	19	21	19	18.8
L211-1 WEST SOUTHWEST	19	21	20	20.0
L211-2 WEST SOUTHWEST	20	20	19	19.0
L212-1 WEST	19	20	18	18.4
L212-2 WEST	19	21	18	18.3
L213-1 WEST NORTHWEST	19	20	18	18.4
L213-2 WEST NORTHWEST	19	20	18	18.5
L214-1 WEST NORTHWEST	20	21	19	19.6
L214-2 WEST NORTHWEST	20	22	20	19.4
L215-1 NORTH NORTHWEST	20	21	20	18.5
L215-2 NORTH NORTHWEST	20	21	20	19.3
L216-1 NORTH	19	21	24	18.7
L216-2 NORTH	19	20	19	18.2
Mean ± S.D.	19 ± 1	20 ± 1	19 ± 1	18.5 ± 0.6

RESTRICTED AREA MONITORING PROGRAM

	Quarter 1 1991	Quarter 2 1991	Quarter 3 1991	Quarter 4 1991
L304-1 LEASED FARM LAND	20	21	19	19.9
L305-1 BOAT RAMP	19	20	18	18.5
L310-1 NGET BUILDING	23	25	23	20.8
L316-1 LEASED FARM LAND	18	20	19	18.2
Mean ± S.D.	20 ± 2	22 ± 2	20 ± 2	19.4 ± 1.2

APPENDIX II

METEOROLOGICAL DATA

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STABILITY CLASS - EXTREMELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4-7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	1	1
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	1	1

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STABILITY CLASS - MODERATELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	.7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	3	1	0	0	0	4
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	10	10
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	3	1	0	0	10	14

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STABILITY CLASS - SLIGHTLY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	2	1	3
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	1	0	1
WSW	0	0	0	0	0	0	0
W	0	0	1	0	0	0	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	2	1	6	9
NNW	0	0	0	0	0	1	1
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	0	1	2	4	8	15

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STABILITY CLASS - NEUTRAL (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	.7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	1	7	25	45	34	6	118
NNE	0	4	12	28	18	2	64
NE	0	3	16	16	0	0	35
ENE	0	0	2	6	6	4	18
E	0	0	6	8	7	11	32
ESE	0	2	2	2	3	9	18
SE	0	0	6	9	7	2	24
SSE	0	1	3	10	9	13	36
S	2	2	3	6	10	6	29
SSW	1	2	2	7	12	21	45
SW	1	5	6	7	15	15	49
WSW	0	6	3	19	14	10	52
W	0	3	19	12	15	9	58
WNW	0	4	20	22	27	64	137
NW	1	6	25	32	44	37	145
NNW	1	5	24	40	21	9	100
VARIABLE	0	0	0	0	0	0	0
TOTAL	7	50	174	269	242	218	960

WIND SPEED (IN MPH)

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 108
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STAB Y CLASS - SLIGHTLY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND	WIND SPEED (IN MPH)						
DIRECTION	.7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	3	8	11	4	0	26
NNE	0	1	4	5	4	6	20
NE	0	4	16	15	2	0	37
ENE	1	2	7	7	1	0	18
E	0	4	12	10	16	8	50
ESE	0	1	2	9	15	25	52
SE	0	0	2	8	7	4	21
SSE	0	1	2	4	7	17	31
S	0	1	2	4	7	24	38
SSW	0	1	8	5	11	48	7[illegible]
SW	0	3	3	5	15	44	70
WSW	0	3	11	7	20	18	59
W	0	2	7	16	25	15	65
WNW	1	1	4	17	22	19	64
NW	0	5	6	11	10	7	39
NNW	0	2	4	11	13	0	30
VARIABLE	0	0	0	0	0	0	0
TOTAL	2	34	98	145	179	235	693

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 19
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STABILITY CLASS - MODERATELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	1	2	1	2	0	6
NNE	0	1	0	2	0	0	3
NE	0	0	1	1	3	0	5
ENE	0	0	2	4	3	0	9
E	0	0	0	0	3	2	5
ESE	0	0	1	1	1	6	9
SE	0	0	0	3	3	5	11
SSE	0	0	0	3	3	5	11
S	0	2	2	0	5	10	19
SSW	0	2	2	7	1	25	37
SW	2	0	4	7	7	52	72
WSW	0	0	1	3	12	17	33
W	0	1	1	4	8	15	29
WNW	0	0	4	4	6	7	21
NW	0	0	0	3	2	1	6
NNW	0	1	2	2	2	0	7
VARIABLE	0	0	0	0	0	0	0
TOTAL	2	8	22	45	61	145	283

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JANUARY-MARCH 1991
STABILITY CLASS - EXTREMELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	1	0	1	0	0	0	2
NE	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	3	3
S	0	0	1	1	2	3	7
SSW	0	0	2	1	3	7	13
SW	0	0	0	2	1	14	17
WSW	0	0	0	0	1	10	11
W	0	0	0	0	2	4	6
WNW	0	0	0	0	1	1	2
NW	0	0	0	2	1	0	3
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	2	0	4	6	11	42	65

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - EXTREMELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4-7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	1	0	0	0	0	1
NE	0	2	4	3	0	0	9
ENE	0	0	5	10	6	1	22
E	0	0	0	1	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	12	3	0	15
SW	0	0	2	4	2	0	8
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	3	11	30	11	1	56

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - MODERATELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	1	1	0	0	2
NNE	0	0	3	2	0	0	5
NE	0	3	4	0	1	0	8
ENE	0	0	8	6	2	0	16
E	0	0	4	0	1	0	5
ESE	0	3	2	0	0	0	5
SE	0	4	2	0	0	0	6
SSE	0	2	0	1	0	0	3
S	0	1	1	3	0	0	5
SSW	0	1	4	9	6	1	21
SW	0	1	5	5	1	0	12
WSW	0	0	3	3	0	3	9
W	0	0	0	0	0	1	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	15	37	30	11	5	98

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - SLIGHTLY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4-7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	3	1	0	0	4
NNE	0	1	1	3	0	0	5
NE	0	5	2	0	3	0	10
ENE	0	4	9	6	4	2	25
E	0	3	2	2	2	3	12
ESE	1	2	1	0	3	0	7
SE	0	3	1	0	1	0	5
SSE	0	0	2	2	0	0	4
S	0	3	3	2	0	0	8
SSW	0	4	5	2	3	1	15
SW	0	2	5	3	8	2	20
WSW	0	2	0	1	0	7	10
W	0	5	2	1	0	3	11
WNW	0	0	3	0	0	3	6
NW	0	1	0	0	0	0	1
NNW	0	0	1	0	0	0	1
VARIABLE	0	0	0	0	0	0	0
TOTAL	1	35	40	23	24	21	144

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - NEUTRAL (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	6	14	12	1	0	33
NNE	1	8	14	28	6	0	57
NE	2	11	12	32	11	1	69
ENE	1	3	11	54	57	15	141
E	1	4	8	35	40	26	114
ESE	2	6	10	18	12	12	60
SE	1	3	16	18	6	7	51
SSE	0	4	19	10	2	2	37
S	0	6	10	10	10	8	44
SSW	0	3	9	20	13	9	54
SW	0	8	10	15	18	10	61
WSW	0	4	8	23	13	18	66
W	2	2	12	12	4	37	69
WNW	0	7	6	9	1	23	46
NW	1	3	10	12	13	6	45
NNW	0	2	14	9	2	5	32
VARIABLE	0	0	0	0	0	0	0
TOTAL	11	80	183	317	209	179	979

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 7
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - SLIGHTLY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	3	2	1	0	6
NNE	0	4	2	2	1	0	9
NE	1	2	1	3	0	0	7
ENE	0	4	5	11	1	0	21
E	0	3	10	35	13	3	64
ESE	1	3	5	17	17	17	60
SE	1	3	5	9	7	14	39
SSE	0	3	3	5	6	9	26
S	1	4	7	12	13	2	39
SSW	1	1	6	19	24	23	74
SW	0	4	6	10	16	16	52
WSW	0	5	8	15	14	14	56
W	0	1	5	7	10	4	27
WNW	0	1	4	8	4	6	23
NW	0	4	6	6	6	4	28
NNW	0	0	0	1	0	0	1
VARIABLE	0	0	0	0	0	0	0
TOTAL	5	42	76	164	133	112	532

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 12
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - MODERATELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	1	0	1	0	0	0	2
NNE	0	2	1	1	0	0	4
NE	0	0	0	2	0	0	2
ENE	0	0	3	1	0	0	4
E	0	0	3	7	8	0	18
ESE	0	1	1	2	5	2	11
SE	1	3	1	8	8	19	40
SSE	0	1	2	9	1	2	15
S	0	3	0	8	5	1	17
SSW	1	1	[illegible]	7	10	16	40
SW	0	3	8	14	13	37	75
WSW	1	3	2	14	9	4	33
W	0	1	5	13	5	1	25
WNW	0	0	3	8	1	0	12
NW	0	1	2	5	4	0	12
NNW	0	1	1	1	0	0	3
VARIABLE	0	0	0	0	0	0	0
TOTAL	4	20	38	100	69	82	313

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - APRIL-JUNE 1991
STABILITY CLASS - EXTREMELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	5	5
SSE	0	0	0	2	0	3	5
[illegible]	0	0	0	3	4	0	7
SSW	0	0	0	3	1	2	6
SW	0	0	0	2	3	1	6
WSW	0	0	0	0	3	0	3
W	0	0	0	2	4	1	7
WNW	0	0	0	1	0	0	1
NW	0	0	0	1	0	0	1
NNW	0	0	0	1	0	0	1
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	0	0	15	15	12	42

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - EXTREMELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4-7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	2	2	0	0	4
NNE	0	0	6	3	0	0	9
NE	0	2	3	3	1	0	9
ENE	0	0	4	0	4	0	8
E	0	0	0	2	0	0	2
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	1	0	1
S	0	0	7	0	0	0	7
SSW	0	0	9	5	5	4	23
SW	0	1	4	12	6	1	24
WSW	0	0	1	4	2	1	8
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	5	0	5
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	3	36	31	24	6	100

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - MODERATELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	1	7	5	0	0	13
NNE	0	6	13	2	0	0	21
NE	0	2	2	5	0	0	9
ENE	0	2	5	3	1	0	11
E	0	0	1	1	0	0	2
ESE	0	2	5	0	0	0	7
SE	0	0	0	0	0	0	0
SSE	0	5	9	1	2	0	17
S	0	4	11	6	0	0	21
SSW	0	9	6	3	2	1	21
SW	0	7	12	11	6	4	40
WSW	0	1	8	6	4	3	22
W	1	0	0	1	3	1	6
WNW	0	0	0	3	3	1	7
NW	0	0	0	2	2	2	6
NNW	0	0	4	3	0	2	9
VARIABLE	0	0	0	0	0	0	0
TOTAL	1	39	83	52	23	14	212

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - SLIGHTLY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	3	6	2	4	0	15
NNE	0	2	10	0	0	0	12
NE	0	3	1	3	0	0	7
ENE	0	1	7	0	0	0	8
E	0	2	8	5	0	0	15
ESE	0	1	3	1	0	0	5
SE	0	2	4	2	0	0	8
SSE	0	1	3	1	1	0	6
S	0	1	2	2	0	0	5
SSW	0	3	2	1	2	0	8
SW	0	2	6	4	1	1	14
WSW	0	2	8	4	3	4	21
W	0	2	6	2	3	2	15
WNW	0	0	2	5	6	4	17
NW	0	1	1	6	2	1	11
NNW	0	5	6	7	2	1	21
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	31	75	45	24	13	188

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - NEUTRAL (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	1	11	23	2	18	0	55
NNE	1	8	7	20	0	0	36
NE	2	10	20	15	1	0	48
ENE	3	4	14	19	13	0	53
E	1	5	13	34	10	0	63
ESE	0	9	10	20	7	0	46
SE	1	7	10	3	0	0	21
SSE	1	1	10	5	5	0	22
S	1	1	6	5	1	2	16
SSW	0	1	10	3	6	1	21
SW	0	4	7	17	19	2	49
WSW	0	3	12	19	13	2	49
W	0	7	6	10	8	0	31
WNW	0	6	12	8	6	6	33
NW	1	6	7	13	7	5	39
NNW	0	8	9	13	4	0	34
VARIABLE	0	0	0	0	0	0	0
TOTAL	12	91	176	206	118	18	621

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 26
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - SLIGHTLY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	4	5	15	6	0	30
NNE	2	2	8	10	8	0	30
NE	3	3	20	3	1	0	30
ENE	1	2	16	8	0	0	27
E	3	1	16	46	21	1	88
ESE	0	1	11	14	19	1	46
SE	1	1	5	10	7	4	28
SSE	0	0	1	8	6	2	17
S	1	1	2	6	5	2	17
SSW	2	1	3	16	17	16	55
SW	0	1	3	17	25	19	65
WSW	1	2	4	7	10	2	26
W	1	1	8	7	13	0	30
WNW	1	4	4	9	6	1	25
NW	0	4	3	9	8	12	36
NNW	0	3	0	11	3	0	17
VARIABLE	0	0	0	0	0	0	0
TOTAL	16	31	109	196	155	60	567

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 19
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - MODERATELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	1	3	3	2	0	9
NNE	0	0	4	3	0	0	7
NE	1	8	0	0	0	0	9
ENE	0	1	0	0	0	0	1
E	0	2	6	7	3	1	19
ESE	0	1	7	8	3	3	22
SE	0	6	6	3	6	2	23
SSE	0	3	3	4	7	1	18
S	0	5	6	8	7	8	34
SSW	0	2	2	7	22	5	38
SW	1	3	2	15	17	14	52
WSW	0	1	6	6	12	7	32
W	0	1	3	5	5	1	15
WNW	0	1	1	19	14	0	35
NW	0	4	1	8	15	2	30
NNW	0	0	2	2	1	0	5
VARIABLE	0	0	0	0	0	0	0
TOTAL	2	39	52	98	114	44	349

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 1
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - JULY-SEPTEMBER 1991
STABILITY CLASS - EXTREMELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	1	0	0	1
SSE	0	0	0	6	1	1	8
S	0	0	0	5	1	7	13
SSW	0	0	2	4	8	6	20
SW	0	0	1	7	7	6	21
WSW	0	1	1	5	6	0	13
W	0	0	0	2	4	0	6
WNW	0	2	0	4	2	0	8
NW	0	0	2	5	1	0	8
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	4	6	39	30	20	99

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 26

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - EXTREMELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	1	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	1	0	1
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	0	0	1	1	0	2

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 65

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - MODERATELY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4-7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	4	0	0	4
NNE	0	0	0	2	0	0	2
NE	0	0	0	2	1	0	3
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	1	0	3	0	0	4
S	0	1	0	3	0	2	6
SSW	0	2	1	0	4	6	13
SW	1	1	3	2	2	3	12
WSW	0	1	0	0	1	1	3
W	0	1	0	1	1	2	5
WNW	0	0	0	1	0	0	1
NW	0	0	0	0	0	0	0
NNW	0	0	0	2	0	0	2
VARIABLE	0	0	0	0	0	0	0
TOTAL	1	7	4	20	9	14	55

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 65

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - SLIGHTLY UNSTABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	1	0	1	4	3	0	9
NNE	0	0	3	4	0	0	7
NE	0	0	0	1	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	1	0	0	1
SSE	0	0	0	4	1	0	5
S	0	0	1	3	2	5	11
SSW	0	0	1	0	4	3	8
SW	0	0	3	2	4	1	10
WSW	0	0	0	3	0	1	4
W	0	1	0	9	1	6	17
WNW	0	2	0	5	3	1	11
NW	0	0	0	2	1	2	5
NNW	0	0	0	0	3	0	3
VARIABLE	0	0	0	0	0	0	0
TOTAL	1	3	9	38	22	19	92

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 3
Hours of missing stability measurements in all stability classes: 65

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - NEUTRAL (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	13	42	24	5	84
NNE	1	2	19	29	8	0	59
NE	1	4	30	28	6	0	69
ENE	1	1	5	41	30	1	79
E	1	2	1	8	10	11	33
ESE	0	1	4	2	2	25	34
SE	1	10	22	8	1	7	49
SSE	1	4	5	11	12	11	44
S	0	5	2	4	9	29	49
SSW	1	1	5	6	12	49	74
SW	0	4	5	11	15	14	49
WSW	2	3	1	16	2	34	58
W	0	5	16	21	15	71	128
WNW	1	3	14	14	21	65	118
NW	0	7	29	16	10	8	70
NNW	1	6	16	24	13	6	66
VARIABLE	0	0	0	0	0	0	0
TOTAL	11	58	187	281	190	336	1063

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 42
Hours of missing stability measurements in all stability classes: 65

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - SLIGHTLY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4-7	8-12	13-18	19-24	GT 24	TOTAL
N	0	2	7	[illegible]	5	1	20
NNE	1	3	3	2	3	2	14
NE	0	7	6	4	0	0	17
ENE	2	2	4	7	1	0	16
E	0	0	4	2	1	2	9
ESE	0	2	3	1	1	14	21
SE	0	0	5	5	3	11	24
SSE	0	2	3	6	8	16	35
S	0	2	1	7	9	54	73
SSW	0	2	2	9	6	88	107
SW	0	0	5	14	7	39	65
WSW	0	0	1	5	6	1	13
W	0	1	6	9	15	13	44
WNW	1	1	3	5	31	4	45
NW	0	3	4	12	5	4	28
NNW	0	4	5	11	13	0	33
VARIABLE	0	0	0	0	0	0	0
TOTAL	4	31	62	104	114	249	564

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 23
Hours of missing stability measurements in all stability classes: 65

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - MODERATELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	1	1	0	2	1	0	5
NNE	0	2	0	1	1	0	4
NE	0	0	0	1	0	0	1
ENE	1	3	0	1	0	0	5
E	0	1	0	0	0	0	1
ESE	0	0	1	1	1	0	3
SE	0	1	4	3	1	0	9
SSE	0	1	3	5	6	3	18
S	0	3	2	7	3	7	22
SSW	0	0	3	7	14	44	68
SW	0	0	1	5	10	30	46
WSW	0	0	4	3	11	5	23
W	0	2	0	5	2	4	13
WNW	0	0	0	4	11	2	17
NW	0	1	0	4	4	1	10
NNW	0	3	1	3	0	0	7
VARIABLE	0	0	0	0	0	0	0
TOTAL	2	18	19	52	65	96	252

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 2
Hours of missing stability measurements in all stability classes: 65

LASALLE NUCLEAR POWER STATION
PERIOD OF RECORD - OCTOBER-DECEMBER 1991
STABILITY CLASS - EXTREMELY STABLE (DIFF TEMP 375-33 FT)
WINDS MEASURED AT 375 FEET

WIND DIRECTION	WIND SPEED (IN MPH) .7-3	4- 7	8-12	13-18	19-24	GT 24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	1	0	0	1
S	0	0	0	7	1	0	8
SSW	0	0	2	7	5	7	21
SW	0	1	0	2	1	5	9
WSW	0	1	0	0	0	0	1
W	0	0	0	1	1	0	2
WNW	0	0	0	0	0	0	0
NW	0	0	0	3	0	0	3
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
TOTAL	0	2	2	21	8	12	45

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 65

APPENDIX III

LISTING OF MISSED SAMPLES

2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
Air Particulate/ Air Iodine	L-03[a]	03-15-91	Road not accessible due to snow.
Air Particulate/ Air Iodine	L-03[a]	05-24-91	No power at pump site.
Air Particulate/ Air Iodine	L-03[a]	05-31-91	No power at pump site.
Milk	L-20	06-28-91	Cow dry; no milk available.
Milk	L-20	07-05-91	Cow dry; no milk available.
Air Particulate/ Air Iodine	L-03[a]	07-13-91	No power at pump site.
Milk	L-20	07-19-91	Cow dry; no milk available.
Milk	L-20	08-02-91	Cow dry; no milk available.

[a] The power supply to fixed air sampler L-3 was replaced in December 1991.

APPENDIX IV

MILCH ANIMALS, NEAREST CATTLE, AND

NEAREST RESIDENCES CENSUSES

LASALLE

MILCH ANIMALS CENSUS, 1991

There are no dairy farms within four miles radius of LaSalle County Station.

Sampling Locations

L-19 Robert Bettenhousen Farm
8.5 miles @ 180°

Number of cows - 78
Number of fresh cows - 62

Diet consists of feed and grass.

L-16 Lowery Dairy Farm
8.2 miles @ 120°

Number of cows - 105
Number of fresh cows - 80

Diet consists of feed and grass.

L-17 Earl Hayer - Andrew Patterson Dairy
12.3 miles @ 18°

Number of cows - 42
Number of fresh cows - 31

Diet consists of feed and grass.

MILCH ANIMALS CENSUS, 1991 (continued)

L-18 Flatness Dairy Farm
12.5 miles @ 10°

Number of cows - 80
Number of fresh cows - 46

Diet consists of feed and grass.

L-20 Gass Farm
4.6miles @ 348°

Number of cows - 2
Number of fresh cows - 1

Diet consists of feed and grass.

Census conducted by A. Lewis on August 28, 1991.

LASALLE

NEAREST RESIDENCE CENSUS, 1991

Nearest resident of the LaSalle Station within a five (5) mile radius.

Direction	Distance
N	2.2 miles
NNE	1.4 miles
NE	1.8 miles
ENE	3.4 miles
E	3.1 miles
ESE	1.6 miles
SE	1.5 miles
SSE	1.1 miles
S	2.2 miles
SSW	2.0 miles
SW	0.7 miles
WSW	1.3 miles
W	0.9 miles
WNW	1.0 miles
NW	2.6 miles
NNW	1.2 miles

Census conducted by A. Lewis on August 28, 1991. There was no change from 1990.

LASALLE

NEAREST CATTLE CENSUS, 1991

Nearest cattle of the LaSalle Station within a five (5) mile radius.

Direction	Distance
N	4.2 miles
NNE	3.0 miles
NE	4.6 miles
ENE	3.0 miles
E	No cattle
ESE	No cattle
SE	4.5 miles
SSE	4.5 miles
S	No cattle
SSW	No cattle
SW	No cattle
WSW	No cattle
W	3.5 miles
WNW	.1 miles
NW	No cattle
NNW	5.0 miles

Census conducted by A. Lewis on August 28. 1991.

APPENDIX V

INTERLABORATORY COMPARISON PROGRAM RESULTS

Appendix V

Interlaboratory Comparison Program Results

Teledyne Isotopes Midwest Laboratory (formerly Hazleton Environmental Sciences) has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December 1971. These programs are operated by agencies which supply environmental-type samples (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, air filters, and food samples during the period January 1988 through November 1991. This program has been conducted by the U.S. Environmental Protection Agency Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada.

The results in Table A-2 were obtained for thermoluminescent dosimeters (TLDs) during the period 1976, 1977, 1979, 1980, 1984, and 1985-86 through participation in the Second, Third, Fourth, Fifth, Seventh, and Eighth International Intercomparison 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.

Table A-4 lists results of the analyses on in-house "blank" samples.

Attachment B lists acceptance criteria for "spiked" samples.

Addendum to Appendix A provides explanation for out-of-limit results.

Table A-1. U.S. Environmental Protection Agency's crosscheck program, comparison of EPA and Teledyne Isotopes Midwest Laboratory results for milk, water, air filters, and food samples, 1988 through 1991.[a]

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b]: TIML Result ±2σ[c]	EPA Result[d]: 1s, N=1	EPA Result[d]: Control Limits
STW-521	Water	Jan 1988	Sr-89	27.3±5.0	30.0±5.0	21.3-38.7
			Sr-90	15.3±1.2	15.0±1.5	12.4-17.6
STW-523	Water	Jan 1988	Gr. alpha	2.3±1.2	4.0±5.0	0.0-12.7
			Gr. beta	7.7±1.2	8.0±5.0	0.0-16.7
STF-524	Food	Jan 1988	Sr-89	44.0±4.0	46.0±5.0	37.3-54.7
			Sr-90	53.0±2.0	55.0±2.8	50.2-59.8
			I-131	102.3±4.2	102.0±10.2	84.3-119.7
			Cs-137	95.7±6.4	91.0±5.0	82.3-99.7
			K	1011±158	1230±62	1124-1336
STW-525	Water	Feb 1988	Co-60	69.3±2.3	69.0±5.0	60.3-77.7
			Zn-65	99.0±3.4	94.0±9.4	77.7-110.3
			Ru-106	92.7±14.4	105.0±10.5	[illegible]8-123.2
			Cs-134	61.7±8.0	64.0±5.0	55.3-72.7
			Cs-137	99.7±3.0	94.0±5.0	85.3-102.7
STW-526	Water	Feb 1988	H-3	3453±103	3327±362	2700-3954
STW-527	Water	Feb 1988	Uranium	3.0±0.0	3.0±6.0	0.0-13.4
STM-528	Milk	Feb 1988	I-131	4.7±1.2	4.0±0.4	3.3-4.7
STW-529	Water	Mar 1988	Ra-226	7.1±0.6	7.6±1.1	5.6-9.6
			Ra-228	NA[e]	7.7±1.2	5.7-9.7
STW-530	Water	Mar 1988	Gr. alpha	4.3±1.2	6.0±5.0	0.0-14.7
			Gr. beta	13.3±1.3	13.0±5.0	4.3-21.7
STAF-531	Air Filter	Mar 1988	Gr. alpha	21.0±2.0	20.0±5.0	11.3-28.7
			Gr. beta	48.0±0.0	50.0±5.0	41.3-58.7
			Sr-90	16.7±1.2	17.0±1.5	14.4-19.6
			Cs-137	18.7±1.3	16.0±5.0	7.3-24.7
STW-532	Water	Apr 1988	I-131	9.0±2.0	7.5±0.8	6.2-8.8

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b]		
				TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-533 534	Water (Blind)	Apr 1988				
	Sample A		Gr. alpha	ND[f]	46.0±11.0	27.0-65.0
			Ra-226	ND	6.4±1.0	4.7-8.1
			Ra-228	ND	5.6±0.8	4.2-7.0
			Uranium	6.0±6.0	6.0±6.0	0.0-16.4
	Sample B		Gr. beta	ND	57.0±5.0	48.3-65.7
			Sr-89	3.3±1.2	5.0±5.0	0.0-13.7
			Sr-90	5.3±1.2	5.0±1.5	2.4-7.6
			Co-60	63.3±1.3	50.0±5.0	41.3-58.7
			Cs-134	7.7±1.2	7.0±5.0	0.0-15.7
			Cs-137	8.3±1.2	7.0±5.0	0.0-15.7
STU-535	Urine	Apr 1988	H-3	6483±155	6202±620	5128-7276
STW-536	Water	Apr 1988	Sr-89	14.7±1.3	20.0±5.0	11.3-28.7
			Sr-90	20.0+2.0	20.0±1.5	17.4-22.6
STW-538	Water	Jun 1988	Cr-51	331.7±13.0	302.0±30.0	250.0-354.0
			Co-60	16.0±2.0	15.0±5.0	6.3-23.7
			Zn-65	107.7±11.4	101.0±10.0	83.7-118.3
			Ru-106	191.3±11.0	195.0±20.0	160.4-229.6
			Cs-134	18.3±4.6	20.0±5.0	11.3-28.7
			Cs-137	26.3±1.2	25.0±5.0	16.3-33.7
STW-539	Water	Jun 1988	H-3	5586±92	5565±557	4600-6530
STM-541	Milk	Jun 1988	Sr-89	33.7±11.4	40.0±5.0	31.3-48.7
			Sr-90	55.3±5.8	60.0±3.0	54.8-65.2
			I-131	103.7±3.1	94.0±9.0	78.4-109.6
			Cs-137	52.7±3.1	51.0±5.0	42.3-59.7
			K	1587±23	1600±80	1461-1739
STW-542	Water	Jul 1988	Gr. alpha	8.7±4.2	15.0±5.0	6.3-23.7
			Gr. beta	5.3±1.2	4.0±5.0	0.0-12.7
STF-543	Food	Jul 1988	Sr-89	ND[f]	33.0±5.0	24.3-41.7
			Sr-90	ND	34.0±2.0	30.5-37.5
			I-131	115.0±5.3	107.0±11.0	88.0-126.0
			Cs-137	52.7±6.4	49.0±5.0	40.3-57.7
			K	1190±66	1240±62	1133-1347

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b]: TIML Result ±2σ[c]	EPA Result[d]: 1s, N=1	EPA Result[d]: Control Limits
STW-544	Water	Aug 1988	I-131	80.0±0.0	76.0±8.0	62.1-89.9
STW-545	Water	Aug 1988	Pu-239	11.0±0.2	10.2±1.0	8.5-11.9
STW-546	Water	Aug 1988	Uranium	6.0±0.0	6.0±6.0	0.0-16.4
STAF-547	Air Filter	Aug 1988	Gr. alpha	8.0±0.0	8.0±5.0	0.0-16.7
			Gr. beta	26.3±1.2	29.0±5.0	20.3-37.7
			Sr-90	8.0±2.0	8.0±1.5	5.4-10.6
			Cs-137	13.0±2.0	12.0±5.0	3.3-20.7
STW-548	Water	Sep 1988	Ra-226	9.3±0.5	8.4±2.6	6.2-10.6
			Ra-228	5.8±0.4	5.4±1.6	4.0-6.8
STW-549	Water	Sep 1988	Gr. alpha	7.0±2.0	8.0±5.0	0.0-16.7
			Gr. beta	11.3±1.2	10.0±5.0	1.3-18.7
STW-550	Water	Oct 1988	Cr-51	252.0±14.0	251.0±25.0	207.7-294.3
			Co-60	26.0±2.0	25.0±5.0	16.3-33.7
			Zn-65	158.3±10.2	151.0±15.0	125.0-177.0
			Ru-106	153.0±9.2	152.0±15.0	126.0-178.0
			Cs-134	28.7±5.0	25.0±5.0	16.3-33.7
			Cs-137	16.3±1.2	15.0±5.0	6.3-23.7
STW-551	Water	Oct 1988	H-3	2333±127	2316±350	1710-2927
STW-552 553	Water (Blind)	Oct 1988				
	Sample A		Gr. alpha	38.3±8.0	41.0±10.0	23.7-58.3
			Ra-226	4.5±0.5	5.0±0.8	3.6-6.4
			Ra-228	4.4±0.6	5.2±0.8	3.6-6.4
			Uranium	4.7±1.2	5.0±6.0	0.0-15.4
	Sample B		Gr. beta	51.3±3.0	54.0±5.0	45.3-62.7
			Sr-89	3.7±1.2	11.0±5.0	2.3-19.7
			Sr-90	10.7±1.2	10.0±1.5	7.4-12.6
			Cs-134	15.3±2.3	15.0±5.0	6.3-23.7
			Cs-137	16.7±1.2	15.0±5.0	6.3-23.7

Table A-1. (continued)

				Concentration in pCi/l[b]		
					EPA Result[d]	
Lab Code	Sample Type	Date Collected	Analysis	TIML Result ±2σ[c]	1s, N=1	Control Limits
STM-554	Milk	Oct 1988	Sr-89	40.3±7.0	40.0±5.0	31.3-48.7
			Sr-90	51.0±2.0	60.0±3.0	54.8-65.2
			I-131	94.0±3.4	91.0±9.0	75.4-106.6
			Cs-137	45.0±4.0	50.0±5.0	41.3-58.7
			K	1500±45	1600±80	1461-1739
STU-555	Urine	Nov 1988	H-3	3030±209	3025±359	2403-3647
STW-556	Water	Nov 1988	Gr. alpha	9.0±3.5	9.0±5.0	0.3-17.7
			Gr. beta	9.7±1.2	9.0±5.0	0.3-17.7
STW-557	Water	Dec 1988	I-131	108.7±3.0	115.0±12.0	94.2-135.8
STW-559	Water	Jan 1989	Sr-89	40.0±8.7	40.0±5.0	31.3-48.7
			Sr-90	24.3±3.1	25.0±1.5	22.4-27.6
STW-560	Water	Jan 1989	Pu-239	5.8±1.1	4.2±0.4	3.5-4.9
STW-561	Water	Jan 1989	Gr. alpha	7.3±1.2	8.0±5.0	0.0-16.7
			Gr. beta	5.3±1.2	4.0±5.0	0.0-12.7
STW-562	Water	Feb 1989	Cr-51	245±46	235±24	193.4-276.6
			Co-60	10.0±2.0	10.0±5.0	1.3-18.7
			Zn-65	170±10	159±16	139.2-186.7
			Ru-106	181±7.6	178±18	146.8-209.2
			Cs-134	9.7±3.0	10.0±5.0	1.3-18.7
			Cs-137	11.7±1.2	10.0±5.0	1.3-18.7
STW-563	Water	Feb 1989	I-131	109.0±4.0	106.0±11.0	86.9-125.1
STW-564	Water	Feb 1989	H-3	2820±20	2754±356	2137-3371
STW-565	Water	Mar 1989	Ra-226	4.2±0.3	4.9±0.7	3.7-6.1
			Ra-228	1.9±1.0	1.7±0.3	1.2-2.2
STW-566	Water	Mar 1989	U	5.0±0.0	5.0±6.0	0.0-15.4
STAF-567	Air Filter	Mar 1989	Gr. alpha	21.7±1.2	21.0±5.0	12.3-29.7
			Gr. beta	68.3±4.2	62.0±5.0	53.3-70.7
			Sr-90	20.0±2.0	20.0±1.5	17.4-22.6
			Cs-137	21.3±1.2	20.0±5.0	11.3-28.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	EPA Result[d] Control Limits
STW-568 569	Water (Blind)	Apr 1989				
	Sample A		Gr. alpha	22.7±2.3	29.0±7.0	16.9-41.2
			Ra-226	3.6±0.6	3.5±0.5	2.6-4.4
			Ra-228	2.6±1.0	3.6±0.5	2.7-4.5
			U	3.0±0.0	3.0±6.0	0.0-13.4
	Sample B		Gr. beta	52.3±6.1	57.0±5.0	43.3-65.7
			Sr-89	9.3±5.4	8.0±5.0	0.0-16.7
			Sr-90	7.0±0.0	8.0±1.5	5.4-10.6
			Cs-134	21.0±5.2	20.0±5.0	11.3-28.7
			Cs-137	23.0±2.0	20.0±5.0	11.3-28.7
STM-570	Milk	Apr 1989	Sr-89	26.0±10.0	39.0±5.0	30.3-47.7
			Sr-90	45.7±4.2	55.0±3.0	49.8-60.2
			Cs-137	54.0±6.9	50.0±5.0	41.3-58.7
			K-40	1521±208	1600±80	1461-1739
STW-571[g]	Water	May 1989	Sr-89	<0.7	6.0±5.0	0.0-14.7
			Sr-90	5.0±1.0	6.0±1.5	3.4-8.6
STW-572	Water	May 1989	Gr. alpha	24.0±2.0	30.0±8.0	16.1-43.9
			Gr. beta	49.3±15.6	50.0±5.0	41.3-58.7
STW-573	Water	Jun 1989	Ba-133	50.7±1.2	49.0±5.0	40.3-57.7
			Co-60	31.3±2.3	31.0±5.0	22.3-39.7
			Zn-65	167±10	165±17	135.6-194.4
			Ru-106	123±9.2	128±13	105.5-150.5
			Cs-134	40.3±1.2	39±5	30.3-47.7
			Cs-137	22.3±1.2	20±5	11.3-28.7
STW-574	Water	Jun 1989	H-3	4513±136	450[illegible]50	372[illegible]-5282
STW-575	Water	Jul 1989	Ra-226	16.8±3.1	17.7±2.7	13.0-22.4
			Ra-228	13.8±3.7	18.3±2.7	13.6-23.0
STW-576	Water	Jul 1989	U	40.3±1.2	41.0±6.0	30.6±51.4
STW-577	Water	Aug 1989	I-131	84.7±5.8	83.0±8.0	69.1-96.9
STAF-579	Air Filter	Aug 1989	Gr. alpha	6.0±0.0	6.0±5.0	0.0-14.7
			Cs-137	10.3±2.3	10.0±5.0	1.3-18.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b]		
					EPA Result[d]	
				TIML Result $\pm 2\sigma$[c]	1s, N=1	Control Limits
STW-580	Water	Sep 1989	Sr-89	14.7±1.2	14.0±5.0	5.3-22.7
			Sr-90	9.7±1.2	10.0±1.5	7.4-12.6
STW-581	Water	Sep 1989	Gr. alpha	5.0±0.0	4.0±5.0	0.0-12.7
			Gr. beta	8.7±2.3	6.0±5.0	0.0-14.7
STW-583	Water	Oct 1989	Ba-133	60.3±10.0	59.0±6.0	48.6-69.4
			Co-60	29.0±4.0	30.0±5.0	21.1-38.7
			Zn-65	132.3±6.0	129.0±13.0	106.5-151.5
			Ru-106	155.3±6.1	161.0±16.0	133.3-188.7
			Cs-134	30.7±6.1	29.0±5.0	20.3-37.7
			Cs-137	66.3±4.6	59.0±5.0	50.3±67.7
STW-584	Water	Oct 1989	H-3	3407±150	3496±364	2866±4126
STW-585 586	Water (Blind)	Oct 1989				
	Sample A		Gr. alpha	41.7±9.4	49.0±12.0	28.2-69.8
			Ra-226	7.9±0.4	8.4±1.3	6.2-10.6
			Ra-228	4.4±0.8	4.1±0.6	3.1-5.1
			U	12.0±0.0	12.0±6.0	1.6-22.4
	Sample B		Gr. beta	31.7±2.3	32.0±5.0	23.3-40.7
			Sr-89	13.3±4.2	15.0±5.0	6.3-23.7
			Sr-90	7.0±2.0	7.0±3.0	4.4-9.6
			Cs-134	5.0±0.0	5.0±5.0	0.0-13.7
			Cs-137	7.0±0.0	5.0±5.0	0.0-13.7
STW-587	Water	Nov 1989	Ra-226	7.9±0.4	8.7±1.3	6.4-11.0
			Ra-228	8.9±1.2	9.3±1.2	6.9-11.7
STW-588	Water	Nov 1989	U	15.0±0.08	15.0±6.0	4.6-25.4
STW-589	Water	Jan 1990	Sr-89	22.7±5.0	25.0±5.0	16.3-33.7
			Sr-90	17.3±1.2	20.0±1.5	17.4-22.6
STW-591	Water	Jan 1990	Gr. alpha	10.3±3.0	12.0±5.0	3.3-20.7
			Gr. beta	12.3±1.2	12.0±5.0	3.3-20.7

Table A-1. (continued)

				Concentration in pCi/L[b]		
					EPA Result[d]	
Lab Code	Sample Type	Date Collected	Analysis	TIML Result ±2σ[c]	1s, N=1	Control Limits
STW-592	Water	Jan 1990	Co-60	14.7±2.3	15±5.0	6.3-23.7
			Zn-65	135.0±6.9	139.0±14.0	114.8-163.2
			Ru-106	133.3±13.4	139.0±14.0	114.8-163.2
			Cs-134	17.3±1.2	18.0±5.0	9.3-26.7
			Cs-137	19.3±1.2	18.0±5.0	9.3-26.7
			Ba-133	78.0±0.0	74.0±7.0	61.9-86.1
STW-593	Water	Feb 1990	H-3	4827±83	4976±498	4113-5839
STW-594	Water	Mar 1990	Ra-226	5.0±0.2	4.9±0.7	4.1-5.7
			Ra-228	13.5±0.7	12.7±1.9	9.4-16.0
STW-595	Water	Mar 1990	U	4.0±0.0	4.0±6.0	0.0-14.4
STAF-596	Air Filter	Mar 1990	Gr. alpha	7.3±1.2	5.0±5.0	0.0-13.7
			Gr. beta	34.0±0.0	31.0±5.0	22.3-39.7
			Sr-90	10.0±0.0	10.0±1.5	7.4-12.6
			Cs-137	9.3±1.2	10.0±5.0	1.3-18.7
STW-597 598	Water (Blind)	Apr 1990				
	Sample A		Gr. alpha	81.0±3.5	90.0±23.0	50.1-129.9
			Ra-226	4.9±0.4	5.0±0.8	3.6-6.4
			Ra-228	10.6±0.3	10.2±1.5	7.6-12.8
			U	18.7±3.0	20.0±6.0	9.6-30.4
	Sample B		Gr. beta	51.0±10.1	52.0±5.0	43.3-60.7
			Sr-89	9.3±1.2	10.0±5.0	1.3-18.7
			Sr-90	10.3±3.1	10.0±1.5	8.3-11.7
			Cs-134	16.0±0.0	15.0±5.0	6.3-23.7
			Cs-137	19.0±2.0	15.0±5.0	6.3-23.7
STM-599	Milk	Apr 1990	Sr-89	21.7±3.1	23.0±5.0	14.3-31.7
			Sr-90	21.0±7.0	23.0±5.0	14.3-31.7
			I-131	98.7±1.2	99.0±10.0	81.7-116.3
			Cs-137	26.0±6.0	24.0±5.0	15.3-32.7
			K	1300.0±69.2	1550.0±78.0	1414.7-1685.3
STW-600	Water	May 1990	Sr-89	6.0±2.0	7.0±5.0	0.0-15.7
			Sr-90	6.7±1.2	7.0±5.0	0.0-15.7
STW-601	Water	May 1990	Gr. alpha	11.0±2.0	22.0±6.0	11.6-32.4
			Gr. beta	12.3±1.2	15.0±5.0	6.3-23.7

Table A-1. (continued)

				Concentration in pCi/L[b]		
					EPA Result[d]	
Lab Code	Sample Type	Date Collected	Analysis	TIML Result ±2σ[c]	1s, N=1	Control Limits
STW-602	Water	Jun 1990	Co-60	25.3±2.3	24.0±5.0	15.3-32.7
			Zn-65	155.0±10.6	148.0±15.0	130.6-165.4
			Ru-106	202.7±17.2	210.0±21.0	173.6-246.4
			Cs-134	23.7±1.2	24.0±5.0	18.2-29.8
			Cs-137	27.7±3.1	25.0±5.0	16.3-33.7
			Ba-133	100.7±8.1	99.0±10.0	81.7-116.3
STW-603	Water	Jun 1990	H-3	292[illegible]±[illegible]06	2933±358	2312-3554
STW-604	Water	Jul 1990	Ra-226	11.8±0.9	12.1±1.8	[illegible]0-15.2
			Ra-228	4.1±1.4	5.1±1.3	2.8-7.4
STW-605	Water	Jul 1990	U	20.3±1.7	20.8±3.0	15.6-26.0
STW-606	Water	Aug 1990	I-131	43.0±1.2	39.0±6.0	28.6±49.4
STW-607	Water	Aug 1990	Pu-239	10.0±1.7	9.1±0.9	7.5-10.7
STAF-608	Air Filter	Aug 1990	Gr. alpha	14.0±0.0	10.0±5.0	1.3-18.7
			Gr. beta	65.3±1.2	62.0±5.0	53.3-70.7
			Sr-90	19.0±6.9	20.0±5.0	11.3-28.7
			Cs-137	19.0±2.0	20.0±5.0	11.3-28.7
STW-609	Water	Sep 1990	Sr-89	9.0±2.0	10.0±5.0	1.3-18.7
			Sr-90	9.0±2.0	9.0±5.0	0.3-17.7
STW-6[illegible]	Water	Sep 1990	Gr. alpha	8.3±1.2	10.0±5.0	1.3-18.7
			Gr. beta	10.3±1.2	10.0±5.0	1.3-18.7
STM-611	Milk	Sep 1990	Sr-89	11.7±3.1	16.0±5.0	7.3-24.7
			Sr-90	15.0±0.0	20.0±5.0	11.3-28.7
			I-131	63.0±6.0	58.0±6.0	47.6-68.4
			Cs-137	20.0±2.0	20.0±5.0	11.3-28.7
			K	1673.3±70.2	1700.0±85.0	1552.5-1847.5
STW-612	Water	Oct 1990	Co-60	20.3±3.1	20.0±5.0	11.3-28.7
			Zn-65	115.3±12.2	115.0±12.0	94.2-135.8
			Ru-106	152.0±8.0	151.0±15.0	125.0-177.0
			Cs-134	11.0±0.0	12.0±5.0	3.3-20.7
			Cs-137	14.0±2.0	12.0±5.0	3.3-20.7
			Ba-133	116.7±9.9	110.0±11.0	90.9-129.
STW-613	Water	Oct 1990	H-3	7167±330	7203±720	5954-8452

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b]: TIML Result ±2σ[c]	EPA Result[d]: 1s, N=1	EPA Result[d]: Control Limits
STW-614 615	Water	Oct 1990				
	Sample A		Gr. alpha	68.7±7.2	62.0±16.0	34.2-89.8
			Ra-226	12.9±0.3	13.6±2.0	10.1-17.1
			Ra-228	4.2±0.6	5.0±1.3	2.7-7.3
			U	10.4±0.6	10.2±3.0	5.0-15.4
	Sample B		Gr. beta	55.0±8.7	53.0±5.0	44.3-61.7
			Sr-89	15.7±2.9	20.0±5.0	11.3-28.7
			Sr-90	12.0±2.0	15.0±5.0	6.3-23.7
			Cs-134	9.0±1.7	7.0±5.0	0.0-15.7
			Cs-137	7.7±1.2	5.0±5.0	0.0-13.7
STW-616	Water	Nov 1990	Ra-226	6.8±1.0	7.4±1.1	5.5-9.3
			Ra-228	5.3±1.7	7.7±1.9	4.4-11.0
STW-617[g]	Water	Nov 1990	U	35.0±0.4	35.5±3.6	29.3±41.7
STW-618	Water	Jan 1991	Sr-89	4.3±1.2	5.0±5.0	0.0 -13.7
			Sr-90	4.7±1.2	5.0±5.0	0.0-13.7
STW-619	Water	Jan 1991	Pu-239	3.6±0.2	3.3±0.3	2.8-3.8
STW-620	Water	Jan 1991	Gr. alpha	6.7±3.0	5.0±5.0	0.0-13.7
			Gr. beta	6.3±1.2	5.0±5.0	0.0-13.7
STW-621	Water	Feb 1991	Co-60	41.3±8.4	40.0±5.0	31.3-48.7
			Zn-65	166.7±19.7	149.0±15.0	123.0-175.0
			Ru-106	209.7±18.6	186.0±19.0	153.0-219.0
			Cs-134	9.0±2.0	8.0±5.0	0.0-16.7
			Cs-137	9.7±1.2	8.0±5.0	0.0-16.7
			Ba-133	85.7±9.2	75.0±8.0	61.1-88.9
STW-622	Water	Feb 1991	I-131	81.3±6.1	75.0±8.0	61.1-88.9
STW-623	Water	Feb 1991	H-3	4310.0±144.2	4418.0±442.0	3651.2-5184.8
STW-624	Water	Mar 1991	Ra-226	31.4±3.2	31.8±4.8	23.5-40.1
			Ra-228	ND[h]	21.1±5.3	11.9-30.3
STW-625	Water	Mar 1991	U	6.7±0.4	7.6±3.0	2.4-12.8

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STAF-626	Filter	Mar 1991	Gr. alpha	38.7±1.2	25.0±6.0	14.6-35.4
			Gr. beta	130.0±4.0	124.0±6.0	113.6-134.4
			Sr-90	35.7±1.2	40.0±5.0	31.3-48.7
			Cs-137	33.7±4.2	40.0±5.0	31.3-48.7
STW-627 628	Water	Apr 1991				
	Sample A		Gr. alpha	51.0±6.0	54.0±14.0	29.7-78.3
			Ra-226	7.0±0.8	8.0±1.2	5.9-10.1
			Ra-228	9.7±1.9	15.2±3.8	8.6-21.8
			U	27.7±2.4	29.8±3.0	24.6-35.0
	Sample B		Gr. beta	93.3±6.4	115.0±17.0	85.5-144.5
			Sr-89	21.0±3.5	28.0±5.0	19.3-36.7
			Sr-90	23.0±0.0	26.0±5.0	17.3-34.7
			Cs-134	27.3±1.2	24.0±5.0	15.3-32.7
			Cs-137	29.0±2.0	25.0±5.0	16.3-33.7
STM-629	Milk	Apr 1991	Sr-89	24.0±8.7	32.0±5.0	23.3-40.7
			Sr-90	28.0±2.0	32.0±5.0	23.3-40.7
			I-131	65.3±14.7	60.0±6.0	49.6-70.4
			Cs-137	54.7±11.0	49.0±5.0	40.3-57.7
			K	1591.7±180.1	1650.0±83.0	1506.0-1794.0
STW-630	Water	May 1991	Sr-89	40.7±2.3	39.0±5.0	30.3-47.7
			Sr-90	23.7±1.2	24.0±5.0	15.3-32.7
STW-631	Water	May 1991	Gr. alpha	27.7±5.8	24.0±6.0	13.6-34.4
			Gr. beta	46.0±0.0	46.0±5.0	37.3-54.7
STW-632	Water	Jun 1991	Co-60	11.3±1.[illegible]	10.0±5.0	1.3-18.7
			Zn-65	119.3±16.3	108.0±11.0	88.9-127.1
			Ru-106	162.3±19.0	149.0±15.0	123.0-175.0
			Cs-134	15.3±1.2	15.0±5.0	6.3-23.7
			Cs-137	16.3±1.2	14.0±5.0	5.3-22.7
			Ba-133	74.0±6.9	62.0±6.0	51.6-72.4
STW-633	Water	Jun 1991	H-3	13470.0±385.8	12480.0±1248.0	10314.8-14645.2
STW-634	Water	Jul 1991	Ra-226	14.9±0.4	15.9±2.4	11.7-20.1
			Ra-228	17.6±1.8	16.7±4.2	9.4-24.0

Table A-1. (continued)

				Concentration in pCi/L[b]		
					EPA Result[d]	
Lab Code	Sample Type	Date Collected	Analysis	TIML Result ±2σ[c]	1s, N=1	Control Limits
STW-635	Water	Jul 1991	U	12.8±0.1	14.2±3.0	9.0-19.4
STW-636	Water	Aug 1991	I-131	19.3±1.2	20.0±6.0	9.6-30.4
STW-637	Water	Aug 1991	Pu-239	21.4±0.5	19.4±1.9	16.1-22.7
STAF-638	Air Filter	Aug 1991	Gr. alpha	33.0±2.0	25.0±6.0	14.6-35.4
			Gr. beta	88.7±1.2	92.0±10.0	80.4-103.6
			Sr-90	27.0±4.0	30.0±5.0	21.3-38.7
			Cs-137	26.3±1.2	30.0±5.0	21.3-38.7
STW-639	Water	Sep 1991	Sr-89	47.0±10.4	49.0±5.0	40.3-57.7
			Sr-90	24.0±2.0	25.0±5.0	16.3-[illegible]
STW-640	Water	Sep 1991	Gr. alpha	12.0±4.0	10.0±5.0	1.3-18.7
			Gr. beta	20.3±1.2	20.0±5.0	11.3-28.7
STM-64[illegible]	Milk	Sep 1991	Sr-89	20.3±5.0	25.0±5.0	16.3-33.7
			Sr-90	19.7±3.1	25.0±5.0	16.3-33.7
			I-131	130.7±16.8	108.0±11.0	88.9-127.1
			Cs-137	33.7±3.2	30.0±5.0	21.3-38.7
			K	1743.3±340.8	1740.0±87.0	1589.1-1890.9
STW-642	Water	Oct 1991	Co-60	29.7±1.2	29.0±5.0	20.3-37.7
			Zn-65	75.7±8.3	75.[illegible]7.0	60.9-85.1
			Ru-106	196.3±15.1	199.0±20.0	164.3-233.7
			Cs-134	9.7±1.2	10.0±5.0	1.3-18.7
			Cs-137	11.0±2.0	10.0±5.0	1.3-18.7
			Ba-133	94.7±3.1	98.0±10.0	80.7-115.3
STW-643	Water	Oct 1991	H-3	2640.0±156.2	2454.0±352.0	1843.3-3064.7
STW-644	Water	Oct 1991				
645	Sample A		Gr. alpha	73.0±13.1	82.0±21.0	45.6-118.4
			Ra-226	20.9±2.0	22.0±3.3	16.3-27.7
			Ra-228	19.6±2.3	22.2±5.6	12.5-31.9
			U	13.5±0.6	13.5±3.0	8.3-18.7
	Sample B		Gr. beta	55.3±3.1	65.0±10.0	47.7-82.3
			Sr-89	9.7±3.1	10.0±5.0	1.3-18.7
			Sr-90	8.7±1.2	10.0±5.0	1.3-18.7
			Co-60	20.3±1.2	20.0±5.0	11.3-28.7
			Cs-134	9.0±5.3	10.0±5.0	1.3-18.7
			Cs-137	14.7±5.0	11.0±5.0	2.3-19.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-646	Water	Nov 1991	Ra-226	5.6±1.2	6.5±1.0	4.8-8.2
			Ra-228	9.6±0.5	8.1±2.0	4.6-11.6
STW-647	Water	Nov 1991	U	24.7±2.3	24.9±3.0	19.7-30.1

[a] Results obtained by Teledyne Isotopes 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; and food, which is in mg/kg.

[c] Unless otherwise indicated, the TIML 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 EPA.

[e] NA = Not analyzed.

[f] ND = No data; not analyzed due to relocation of lab.

[g] Sample was analyzed but the results not submitted to EPA because deadline was missed (all data on file).

[h] ND = No data; sample lost during analyses.

Table A-2. Crosscheck program results, thermoluminescent dosimeters (TLDs).

Lab Code	TLD Type	Measurement ±2σ[a]	mR Teledyne Result Value[c]	 Known	 Average ±2σ[d] (All Participants)
2nd International Intercomparison[b]					
115-2	CaF_2:Mn Bulb	Field	17.0±1.9	17.1	16.4±7.7
		Lab	20.8±4.1	21.3	18.8±7.6
3rd International Intercomparison[e]					
115-3	CaF_2:Mn Bulb	Field	30.7±3.2	34.9±4.8	31.5±3.0
		Lab	89.6±6.4	91.7±14.6	86.2±24.0
4th International Intercomparison[f]					
115-4	CaF_2:Mn Bulb	Field	14.1±1.1	14.1±1.4	16.0±9.0
		Lab (Low)	9.3±1.3	12.2±2.4	12.0±7.4
		Lab (High)	40.4±1.4	45.8±9.2	43.9±13.2
5th International Intercomparison[g]					
115-5A	CaF_2:Mn Bulb	Field	31.4±1.8	30.0±6.0	30.2±14.6
		Lab at beginning	77.4±5.8	75.2±7.6	75.8±40.4
		Lab at the end	96.6±5.8	88.4±8.8	90.7±31.2
115-5B	LiF-100 Chips	Field	30.3±4.8	30.0±6.0	30.2±14.6
		Field at beginning	81.1±7.4	75.2±7.6	75.8±40.4
		Lab at the end	85.4±11.7	88.4±8.8	90.7±31.2
7th International Comparison[h]					
115-7A	LiF-100 Chips	Field	75.4±2.6	75.8±6.0	75.1±29.8
		Lab (Co-60)	80.0±3.5	79.9±4.0	77.9±27.6
		Lab (Cs-137)	66.6±2.5	75.0±3.8	7[illegible].0±22.2

Table A-2. Crosscheck program results, thermoluminescent dosimeters (TLDs).

Lab Code	TLD Type	Measurement $\pm 2\sigma^a$	mR: Teledyne Result Value[c]	mR: Known Value	mR: Average $\pm 2\sigma^d$ (All Participants)
115-7B	CaF_2:Mn Bulbs	Field	71.5±2.6	75.8±6.0	75.1±29.8
		Lab (Co-60)	84.8±6.4	79.9±4.0	77.9±27.6
		Lab (Cs-137)	78.8±1.6	75.0±3.8	73.0±22.2
115-7C	$CaSO_4$:Dy Cards	Field	76.8±2.7	75.8±6.0	75.1±29.8
		Lab (Co-60)	82.5±3.7	79.9±4.0	77.9±27.6
		Lab (Cs-137)	79.0±3.2	75.0±3.8	73.0±22.2
8th International Intercomparison[i]					
115-8A	LiF-100 Chips	Field Site 1	29.5±1.4	29.7±1.5	28.9±12.4
		Field Site 2	11.3±0.8	10.4±0.5	10.1±9.06
		Lab (Cs-137)	13.7±0.9	17.2±0.9	16.2±6.8
115-8B	CaF_2:Mn Bulbs	Field Site 1	32.3±1.2	29,7±1.5	28.9±12.4
		Field Site 2	9.0±1.0	10.4±0.5	10.1±9.0
		Lab (Cs-137)	15.8±0.9	17.2±0.9	16.2±6.8
115-8C	$CaSO_4$:Dy Cards	Field Site 1	32.2±0.7	29.7±1.5	28.9±12.4
		Field Site 2	10.6±0.6	10.4±0.5	10.1±9.0
		Lab (Cs-137)	18.1±0.8	17.2±0.9	16.2±6.8
Teledyne Testing[j]					
89-1	LiF-100 Chips	Lab	21.0±0.4	22.4	--
89-2	Teledyne $CaSO_4$:Dy Cards	Lab	20.9±1.0	20.3	--

Table A 2. (continued)

Lab Code	TLD Type	Measurement ±2σ[a]	mR Teledyne Result Value[c]	Known	Average ±2σ[d] (All Participants)
Teledyne Testing[j]					
90-1[k]	Teledyne $CaSO_4$:Dy Cards	Lab	20.6±1.4	19.6	--
90-1[l]	Teledyne $CaSO_4$:Dy Cards	Lab	100.8±4.3	100.0	--
91-1[m]	Teled[illegible] CaS[illegible]Dy Cards	Lab	33.4±2.0	32.0	--
			55.2±4.7	58.8	--
			87.8±6.2	85.5	--

[a] Lab result given is the mean ±2 standard deviations of three determinations.

[b] 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.

[c] Value determined by sponsor of the intercomparison using continuously operated pressurized ion chamber.

[d] Mean ±2 standard deviations of results obtained by all laboratories participating in the program.

[e] Third International Intercomparison of Environmental Dosimeters conducted in summer of 1977 by Oak Ridge National Laboratory and the School of Public Health of the University of Texas, Houston, Texas.

[f] Fourth International Intercomparison of Environmental Dosimeters conducted in summer of 1979 by the School of Public Health of the University of Texas Houston, Texas.

[g] Fifth International Intercomparison of Environmental Dosimeters conducted in fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and Environmental Measurements Laboratory, New York, New York. U.S. Department of Energy.

[h] 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 U.S. Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.

[i] 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.

[j] Chips were submitted in September 1989 and cards were submitted in November 1989 to Teledyne Isotopes, Inc., Westwood, NJ for irradiation.

[k] Cards were irradiated by Teledyne Isotopes, Inc., Westwood, NJ on June 19, 1990.

[l] Cards were irradiated by Dosimetry Associates, Inc., Northville, MI on October 30, 1990.

[m] Irradiated cards were provided by Teledyne Isotopes, INC., Westwood, NJ. Irradiated on October 8, 1991.

Table A-3. In-house spiked samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result n=1	Known Activity	Expected Precision 1s, n=1[a]
QC-MI-16	Milk	Feb 1988	Sr-89	31.8±4.7	31.7±6.0	8.7
			Sr-90	25.5±2.7	27.8±3.5	5.2
			I-131	26.4±0.5	23.2±5.0	10.4
			Cs-134	23.8±2.3	24.2±6.0	8.7
			Cs-137	26.5±0.8	25.1±6.0	8.7
QC-MI-17	Milk	Feb 1988	I-131	10.6±1.2	14.3±1.6	10.4
QC-W-35	Water	Feb 1988	I-131	9.7±1.1	11.6±1.1	10.4
QC-W-36	Water	Mar 1988	I-131	10.5±1.3	11.6±1.0	10.4
QC-W-37	Water	Mar 1988	Sr-89	17.1±2.0	19.8±8.0	8.7
			Sr-90	18.7±0.9	17.3±5.0	5.2
QC-MI-18	Milk	Mar 1988	I-131	33.2±2.3	26.7±5.0	10.4
			Cs-134	31.3±2.1	30.2±5.0	8.7
			Cs-137	29.9±1.4	26.2±5.0	8.7
QC-W-38	Water	Apr 1988	I-131	17.1±1.1	14.2±5.0	10.4
QC-W-39	Water	Apr 1988	H-3	4439±31	4176±500	724
QC-W-40	Water	Apr 1988	Co-60	23.7±0.5	26.1±4.0	8.7
			Cs-134	25.4±2.6	29.2±4.5	8.7
			Cs-137	26.6±2.3	26.2±4.0	8.7
QC-W-41	Water	Jun 1988	Gr. alpha	12.3±0.4	13.1±5.0	8.7
			Gr. beta	22.6±1.0	20.1±5.0	8.7
QC-MI-19	Milk	Jul 1988	Sr-89	15.1±1.6	16.4±5.0	8.7
			Sr-90	18.0±0.6	18.3±5.0	5.2
			I-131	88.4±4.9	86.6±8.0	10.4
			Cs-137	22.7±0.8	20.8±6.0	8.7
QC-W-42	Water	Sep 1988	Sr-89	48.5±3.3	50.8±8.0	8.7
			Sr-90	10.9±1.0	11.4±3.5	5.2
QC-W-43	Water	Oct 1988	Co-60	20.9±3.2	21.4±3.5	8.7
			Cs-134	38.7±1.6	38.0±6.0	8.7
			Cs-137	19.0±2.4	21.0±3.5	8.7
QC-W-44	Water	Oct 1988	I-131	22.2±0.6	23.3±3.5	10.4

1

IMAGE EVALUATION TEST TARGET (MT-3)

1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5 2.8 3.2 3.6 4.0

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

Table A-3. In-house spiked samples(continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L: TIML Result n=1	Known Activity	Expected Precision 1s, n=1[a]
QC-W-45	Water	Oct 1988	H-3	4109±43	4153±500	724
QC-MI-20	Milk	Oct 1988	I-131	59.8±0.9	60.6±9.0	10.4
			Cs-134	49.6±1.8	48.6±7.5	8.7
			Cs-137	25.3±4.6	24.7±4.0	8.7
QC-W-46	Water	Dec 1988	Gr. alpha	11.5±2.3	15.2±5.0	8.7
			Gr. beta	26.5±2.0	25.7±5.0	8.7
QC-MI-21	Milk	Jan 1989	Sr-89	25.5±10.3	34.0±10.0	8.7
			Sr-90	28.3±3.2	27.1±3.0	5.2
			I-131	540±13	550±20	10.4
			Cs-134	24.5±2.6	22.6±5.5	8.7
			Cs-137	24.0±0.6	20.5±5.0	8.7
QC-W-47	Water	Mar 1989	Sr-89	15.2±3.8	16.1±5.0	8.7
			Sr-90	16.4±1.7	16.9±3.0	5.2
QC-MI-22	Milk	Apr 1989	I-131	36.3±1.1	37.2±5.0	10.4
			Cs-134	20.8±2.8	20.7±8.0	8.7
			Cs-137	22.2±2.4	20.4±8.0	8.7
QC-W-48	Water	Apr 1989	Co-60	23.5±2.0	25.1±8.0	8.7
			Cs-134	24.2±1.1	25.9±8.0	8.7
			Cs-137	23.6±1.2	23.0±8.0	8.7
QC-W-49	Water	Apr 1989	I-131	37.2±3.7	37.2±5.0	10.4
QC-W-50	Water	Apr 1989	H-3	3011±59	3089±500	724
QC-W-51	Water	Jun 1989	Gr. alpha	13.0±1.8	15.0±5.0	8.7
			Gr. beta	26.0±1.2	25.5±8.0	8.7
QC-MI-23	Milk	Jul 1989	Sr-89	19.4±6.5	22.0±10.0	8.7
			Sr-90	27.6±3.5	28.6±3.0	5.2
			I-131	46.8±3.2	43.4±5.0	10.4
			Cs-134	27.4±1.8	28.3±6.0	8.7
			Cs-137	24.1±1.8	20.8±6.0	8.7
QC-MI-24	Milk	Aug 1989	Sr-89	25.4±2.7	27.2±10.0	8.7
			Sr-90	46.0±1.1	47.8±9.6	8.3
QC-W-52	Water	Sep 1989	I-131	9.6±0.3	9.7±1.9	10.4

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result n=1	Known Activity	Expected Precision 1s, n=1[a]
QC-W-53	Water	Sep 1989	I-131	19.0±0.2	20.9±4.2	10.4
QC-W-54	Water	Sep 1989	Sr-89	25.8±4.6	24.7±4.0	8.7
			Sr-90	26.5±5.3	29.7±5.0	5.2
QC-MI-25	Milk	Oct 1989	I-131	70.0±3.3	73.5±20.0	10.4
			Cs-134	22.1±2.6	22.6±8.0	8.7
			Cs-137	29.4±1.5	27.5±8.0	8.7
QC-W-55	Water	Oct 1989	I-131	33.3±1.3	35.3±10.0	10.4
QC-W-56	Water	Oct 1989	Co-60	15.2±0.9	17.4±5.0	8.7
			Cs-134	22.1±4.4	18.9±8.0	8.7
			Cs-137	27.2±1.2	22.9±8.0	8.7
QC-W-57	Water	Oct 1989	H-3	3334±22	3379±500	724
QC-W-58	Water	Nov 1989	Sr-89	10.9±1.4[d]	11.1±1.0[d]	8.7
			Sr-90	10.4±1.0[d]	10.3±1.0[d]	5.2
QC-W-59	Water	Nov 1989	Sr-89	101.0±6.0[d]	104.1±10.5[d]	17.5
			Sr-90	98.0±3.9[d]	95.0±10.0[d]	17.0
QC-W-60	Water	Dec 1989	Gr. alpha	10.8±1.1	10.6±4.0	8.7
			Gr. beta	11.6±0.5	11.4±4.0	8.7
QC-MI-26	Milk	Jan 1990	Cs-134	19.3±1.0	20.8±8.0	8.7
			Cs-137	25.2±1.2	22.8±8.0	8.7
QC-MI-27	Milk	Feb 1990	Sr-90	18.0±1.6	18.8±5.0	5.2
QC-MI-28	Milk	Mar 1990	I-131	63.8±2.2	62.6±6.0	6.3
QC-MI-61	Water	Apr 1990	Sr-89	17.9±5.5	23.1±8.[illegible]	8.7
			Sr-90	19.4±2.5	23.5±5.2	5.2
QC-MI-29	Milk	Apr 1990	I-131	90.7±9.2	82.5±8.5	10.4
			Cs-134	18.3±1.0	19.7±5.0	8.7
			Cs-137	20.3±1.0	18.2±5.0	8.7
QC-W-62	Water	Apr 1990	Co-60	8.7±0.4	9.4±5.0	8.7
			Cs-134	20.0±0.2	19.7+5.0	8.7
			Cs-137	28.7±1.4	22.7±5.0	8.7

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result n=1	Known Activity	Expected Precision 1s, n=1[a]
QC-W-63	Water	Apr 1990	I-131	63.5±8.0	66.0±6.7	6.6
QC-W-64	Water	Apr 1990	H-3	1941±130	1826.0±350.0	724
QC-W-65	Water	Jun 1990	Ra-226	6.4±0.2	6.9±1.0	1.0
QC-W-66	Water	Jun 1990	U	6.2±0.2	6.0±6.0	6.0
QC-MI-30	Milk	Jul 1990	Sr-89	12.8±0.4	18.4±10.0	8.7
			Sr-90	18.2±1.4	18.7±6.0	5.2
			Cs-134	46.0±1.3	49.0±5.0	8.7
			Cs-137	27.6±1.3	25.3±5.0	8.7
QC-W-68	Water	Jun 1990	Gr. alpha	9.8±0.3	10.6±6.0	8.7
			Gr. beta	11.4±0.6	11.3±7.0	8.7
QC-MI-31	Milk	Aug 1990	I-131	68.8±1.6	61.4±12.3	10.4
QC-W-69	Water	Sep 1990	Sr-89	17.7±1.6	19.2±10.0	8.7
			Sr-90	13.9±1.6	17.4±10.0	5.2
QC-MI-32	Milk	Oct 1990	I-131	34.8±0.2	32.4±6.5	8.7
			Cs-134	25.8±1.2	27.3±10.0	8.7
			Cs-137	25.3±2.0	22.4±10.0	8.7
QC-W-70	Water	Oct 1990	H-3	2355±59	2276±455	605
QC-W-71	Water	Oct 1990	I-131	55.9±0.9	51.8±10.4	10.4
QC-W-73	Water	Oct 1990	Co-60	18.3±2.7	16.8±5.0	8.7
			Cs-134	28.3±2.3	27.0±5.0	8.7
			Cs-137	22.7±1.3	22.4±5.0	8.7
QC-W-74	Water	Dec 1990	Gr. alpha	21.4±1.0	26.1±6.5	11.3
			Gr. beta	25.9±1.0	22.3±5.6	9.7
QC-MI-33	Milk	Jan 1991	Sr-89	20.7±3.3	21.6±5.0	5.0
			Sr-90	19.0±1.4	23.0±3.0	3.0
			Cs-134	22.2±1.7	19.6±5.0	5.0
			Cs-137	26.1±1.6	22.3±5.0	5.0
QC-MI-34	Milk	Feb 1991	I-131	40.7±1.8	40.1±6.0	6.0
QC-W-75	Water	Mar 1991	Sr-89	18.8±1.5	23.3±5.0	5.0
			Sr-90	16.0±0.8	17.2±3.0	3.0

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L		
				TIML Result n=1	Known Activity	Expected Precision 1s, n=1[a]
QC-W-76	Water	Apr 1991	I-131	56.5±1.7	59.0±5.9	5.9
QC-W-77	Water	Apr 1991	Co-60	16.4±2.2	15.7±5.0	5.0
			Cs-134	23.8±2.5	22.6±5.0	5.0
			Cs-137	25.0±2.4	21.1±5.0	5.0
QC-W-78	Water	Apr 1991	H-3	4027±188	4080±408	408
QC-MI-35	Milk	Apr 1991	I-131	48.0±0.8	49.2±6.0	6.0
			Cs-134	19.2±2.0	22.6±5.0	5.0
			Cs-137	22.8±2.2	22.1±5.0	5.0
QC-W-79	Water	Jun 1991	Gr. alpha	7.4±0.7	7.8±5.0	5.0
			Gr. beta	11.0±0.7	11.0±5.0	5.0
QC-MI-36	Milk	Jul 1991	Sr-89	28.1±2.1	34.0±10.0	10.0
			Sr-90	11.6±0.7	11.5±3.0	3.0
			I-131	14.4±1.9	18.3±5.0	5.0
			Cs-137	34.3±3.0	35.1±5.0	5.0
QC-W-80	Water	Oct 1991	Sr-89	27.4±6.9	24.4±5.0	5.0
			Sr-90	11.7±1.4	14.1±5.0	5.0
QC-W-81	Water	Oct 1991	I-131	19.1±0.7	20.6±4.2	4.2
QC-W-82	Water	Oct 1991	Co-60	22.6±2.7	22.1±5.0	5.0
			Cs-134	15.5±1.8	17.6±5.0	5.0
			Cs-137	17.5±2.1	17.6±5.0	5.0
QC-W-83	Water	Oct 1991	H-3	4639±137	4382±438	438
QC-MI-37	Milk	Oct 1991	I-131	23.6±3.2	25.8±5.0	5.0
			Cs-134	22.7±2.8	22.1±5.0	5.0
			Cs-137	38.3±3.0	35.1±5.0	5.0
QC-W-84	Water	Dec 1991	Gr. alpha	6.2±0.6	7.8±5.0	5.0
			Gr. beta	11.0±0.7	11.0±5.0	5.0

[a] n=3 unless noted otherwise.

[b] n=2 unless noted otherwise.

[c] n=1 unless noted otherwise.

[d] Concentration in pCi/ml.

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Acceptance Criteria (4.66 σ)
SPS-5386	Milk	Jan 1988	I-131	<0.1	<1
SPW-5448	"Dead" Water	Jan 1988	H-3	<177	<300
SPS-5615	Milk	Mar 1988	Cs-134	<2.4	<10
			Cs-137	<2.5	<10
			I-131	<0.3	<1
			Sr-89	<0.4	<5
			Sr-90	2.4±0.5[a]	<1
SPS-5650	D.I. Water	Mar 1988	Th-228	<0.3	<1
			Th-230	<0.04	<1
			Th-232	<0.05	<1
			U-234	<0.03	<1
			U-235	<0.03	<1
			U-238	<0.03	<1
			Am-241	<0.06	<1
			Cm-241	<0.01	<1
			Pu-238	<0.08	<1
			Pu-240	<0.02	<1
SPS-6090	Milk	Jul 1988	Sr-89	<0.5	<1
			Sr-90	1.8±0.5	<1
			I-131	<0.4	<1
			Cs-137	<0.4	<10
SPW-6209	Water	Jul 1988	Fe-55	<0.8	<1
SPW-6292	Water	Sep 1988	Sr-89	<0.7	<1
			Sr-90	<0.7	<1
SPS-6477	Milk	Oct 1988	I-131	<0.2	<1
			Cs-134	<6.1	<10
			Cs-137	<5.9	<10
SPW-6478	Water	Oct 1988	I-131	<0.2	<1
SPW-6479	Water	Oct 1988	Co-60	<5.7	<10
			Cs-134	<3.7	<10
			Cs-137	<4.3	<10
SPW-6480	Water	Oct 1988	H-3	<170	<300

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Acceptance Criteria (4.66 σ)
SPW-6625	Water	Dec 1988	Gr. alpha	<0.7	<1
			Gr. beta	<1.9	<4
SPS-6723	Milk	Jan 1989	Sr-89	<0.6	<5
			Sr-90	1.9±0.5[a]	<1
			I-131	<0.2	<1
			Cs-134	<4.3	<10
			Cs-137	<4.4	<10
SPW-6877	Water	Mar 1989	Sr-89	<0.4	<5
			Sr-90	<0.6	<1
SPS-6963	Milk	Apr 1989	I-131	<0.3	<1
			Cs-134	<5.9	<10
			Cs-137	<6.2	<10
SPW-7561	Water	Apr 1989	H-3	<150	<300
SPW-7207	Water	Jun 1989	Ra-226	<0.2	<1
			Ra-228	<0.6	<1
SPS-7208	Milk	Jun 1989	Sr-89	<0.6	<5
			Sr-90	2.1±0.5[a]	<1
			I-131	<0.3	<1
			Cs-134	<6.4	<10
			Cs-137	<7.2	<10
SPW-7588	Water	Jun 1989	Gr. alpha	<[illegible]	<1
			Gr. beta	<1.0	<4
SPS-7322	Milk	Aug 1989	Sr-89	<1.4	<5
			Sr-90	4.8±1.0[a]	<1
			I-131	<0.2	<1
			Cs-134	<6.9	<10
			Cs-137	<8.2	<10
SPW-7559	Water	Sep 1989	Sr-89	<2.0	<5
			Sr-90	<0.7	<1
SPW-7560	Water	Oct 1989	I-131	<0.1	<1
SPW-7562	Water	Oct 1989	H-3	<140	<300

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Acceptance Criteria (4.66 σ)
SPS-7605	Milk	Nov 1989	I-131	<0.2	<1
			Cs-134	<8.6	<10
			Cs-137	<10	<10
SPW-7971	Water	Dec 1989	Gr. alpha	<0.4	<1
			Gr. beta	<0.8	<4
SPW-8039	Water	Jan 1990	Ra-226	<0.2	<1
SPS-8040	Milk	Jan 1990	Sr-89	<0.8	<5
			Sr-90	<1.0	<1
SPS-8208	Milk	Jan 1990	Sr-89	<0.8	<5
			Sr-90	1.6±0.5[a]	<1
			Cs-134	<3.6	<10
			Cs-137	<4.7	<10
SPS-8312	Milk	Feb 1990	Sr-89	<0.3	<5
			Sr-90	1.2±0.3[a]	<1
SPW-8312A	Water	Feb 1990	Sr-89	<0.6	<5
			Sr-90	<0.7	<5
SPS-8314	Milk	Mar 1990	I-131	<0.3	<1
SPS-8510	Milk	May 1990	I-131	<0.2	<1
			Cs-134	<4.6	<10
			Cs-137	<4.8	<10
SPW-8511A	Water	May 1990	H-3	<200	<300
SPS-8600	Milk	Jul 1990	Sr-89	<0.8	<5
			Sr-90	1.7±0.6[a]	<1
			I-131	<0.3	<1
			Cs-134	<5.0	<10
			Cs-137	<7.0	<10
SPM-8877	Milk	Aug 1990	I-131	<0.2	<1
SPW-8925	Water	Aug 1990	H-3	<200	<300

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Acceptance Criteria (4.66 σ)
SPW-8926	Water	Aug 1990	Gr. alpha	<0.3	<1
			Gr. beta	<0.7	<4
SPW-8927	Water	Aug 1990	U-234	<0.01	<1
			U-235	<0.02	<1
			U-238	<0.01	<1
SPW-8928	Water	Aug 1990	Mn-54	<4.0	<5
			Co-58	<4.1	<5
			Co-60	<2.4	<5
			Cs-[illegible]	<3.3	<5
			Cs-137	<3.7	<5
SPW-8929	Water	Aug 1990	Sr-89	<1.4	<5
			Sr-90	<0.6	<1
SPW-69	Water	Sep 1990	Sr-89	<1.8	<5
			Sr-90	<0.8	<1
SPW-106	Water	Oct 1990	H-3	<180	<300
			I-131	<0.3	<1
SPM-107	Milk	Oct 1990	I-131	<0.4	<1
			Cs-134	<3.3	<5
			Cs-137	<4.3	<5
SPW-370	Water	Oct 1990	Mn-54	<1.7	<5
			Co-58	<2.5	<5
			Co-60	<1.6	<5
			Cs-134	<1.7	<5
			Cs-137	<1.8	<5
SPW-372	Water	Dec 1990	Gr. alpha	<0.3	<1
			Gr. beta	<0.8	<4
SPS-406	Milk	Jan 1991	Sr-89	<0.4	<5
			Sr-90	1.8±0.4 [a]	<1
			Cs-134	<3.7	<5
			Cs-137	<5.2	<5
SPS-421	Milk	Feb 1991	I-131	<0.3	<1
SPW-451	Water	Feb 1991	Ra-226	<0.1	<1
			Ra-228	<0.9	<1

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Acceptance Criteria (4.66 σ)
SPW-514	Water	Mar 1991	Sr-89	<1.1	<5
			Sr-90	<0.9	<1
SPW-586	Water	Apr 1991	I-131	<0.2	<1
			Co-60	<2.5	<5
			Cs-134	<2.4	<5
			Cs-137	<2.2	<5
SPS-587	Milk	Apr 1991	I-131	<0.2	<1
			Cs-134	<1.7	<5
			Cs-137	<1.9	<5
SPW-837	Water	Jun 1991	Gr. alpha	<0.6	<1
			Gr. beta	<1.1	<4
SPM-953	Milk	Jul 1991	Sr-89	<0.7	<5
			Sr-90	0.4±0.3[a]	<1
			I-131	<0.2	<1
			Cs-137	<4.9	<5
SPM-1236	Milk	Oct 1991	I-131	<0.2	<1
			Cs-134	<3.7	<5
			Cs-137	<4.6	<5
SPW-1254	Water	Oct 1991	Sr-89	<2.8	<5
			Sr-90	<0.7	<1
SPW-1256	Water	Oct 1991	I-131	<0.4	<1
			Co-60	<3.6	<5
			Cs-134	<4.0	<5
			Cs-137	<3.6	<5
SPW-1259	Water	Oct 1991	H-3	<160	<300
SPW-1444	Water	Dec 1991	Gr. alpha	<0.4	<1
			Gr. beta	<0.8	<4

[a] Low level of Sr-90 concentration in milk (1 - 5 pCi/L) is not unusual.

ATTACHMENT B

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

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

Analysis	Level	One Standard Deviation for Single Determination
Gamma Emitters	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg >50 pCi/liter or kg	5 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg >30 pCi/liter or kg	3.0 pCi/liter 10% of known value
Potassium	>0.1 g/liter or kg	5% of known value
Gross alpha	<20 pCi/liter >20 pCi/liter	5 pCi/liter 25% of known value
Gross beta	<100 pCi/liter >100 pCi/liter	5 pCi/liter 5% of known value
Tritium	<4,000 pCi/liter >4,000 pCi/liter	$1s = (pCi/liter) = 169.85 \times (known)^{.0933}$ 10% of known value
Radium-226, -228	<0.1 pCi/liter	15% of known value
Plutonium	0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	<55 pCi/liter >55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-64[b], Technetium-99[b]	<35 pCi/liter >35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter >100 pCi/liter	10 pCi/liter 10% of known value

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

[b] TIML limit.

ADDENDUM TO APPENDIX A

The following is an explanation of the reasons why certain samples were outside the control limit specified by the Environmental Protection Agency for the Interlaboratory Comparions Program starting January 1988.

Lab Code	Analysis	TIML Result (pCi/L)[a]	EPA Control Limit (pCi/L)[a]	Explanation
STF-524	K	1010.7±158.5[b]	1123.5-1336.5[b]	Error in transference of data. Correct data was 1105±33 mg/kg. Results in the past have been within the limits and TIML will monitor the situation in the future.
STW-532	I-131	9.0±2.0	6.2-8.8	Sample recounted after 12 days. The average result was 8.8±1.7 pCi/L (within EPA control limits). The sample was recounted in order to check the decay. Results in the past have been within the limits and TIML will continue to monitor the situation in the future.
STW-534	Co-60	63.3±1.3	41.3-58.7	High level of Co-60 was due to contamination of beaker. Beaker was discarded upon discovery of contamination and sample was recounted. Recount results were 53.2±3.6 and 50.9±2.4 pCi/L.
STM-554	Sr-90	51.0±2.0	54.8-65.2	The cause of low result was due to very high fat content of milk. It should be noted that 63% of all participants failed this test. Also, the average for all participants was 54.0 pCi/L before the Grubb and 55.8 pCi/L after the Grubb.
STW-560	Pu-239	5.8±1.1	3.5-4.9	The cause of high results is not known though it is suspected that the standard was not properly calibrated by supplier and is under investigation. New Pu-236 standard was obtained and will be used for the next test.
STW-568	Ra-228	2.6±1.0	2.7-4.5	The cause of low results is not known. Next EPA cross check results were within the control imits. No further action is planned.

ADDENDUM TO APPENDIX A (continued)

Lab Code	Analysis	TIML Result (pCi/L)[a]	EPA Control Limit (pCi/L)[a]	Explanation
STM-570	Sr-89 Sr-90	26.0±10.0 45.7±4.2	30.3-47.7 49.8-60.2	The cause of low results was falsely high recovery due to suspected incomplete calcium removal. Since EPA sample was used up, internal spike was prepared and analyzed. The results were within control limits (See table A-3, sample QC-MI-24). No further action is planned.
STW-589	Sr-90	17.3±1.2	17.4-22.6	Sample was reanalyzed in triplicate; results of reanalyses were 18.8±1.5 pCi/L. No further action is planned.
STM-599	K	1300.0±69.2[c]	1414.7-1685.3[c]	Sample was reanalyzed in triplicate. Results of reanalyses were 1421.7±95.3 mg/L. The cause of low results is unknown.
STW-601	Gr. alpha	11.0±2.0	11.6-32.4	Sample was reanalyzed in triplicate. Results of reanalyses were 13.4±1.0 pCi/L.
STAF-626	Gr. alpha	38.7±1.2	14.6-35.4	The cause of high results is the difference in geometery between standard used in the TIML lab and EPA filter.
STW-632	Ba-133	74.0±6.9	51.6-72.4	Sample was reanalyzed. Results of the reanalyses were 63.8±6.9 pCi/L within EPA limit.
STM-641	I-131	130.7±16.8	88.9-127.1	The cause of high result is unknown. In-house spike sample was prepared with activity of I-131 68.3±6.8 pCi/L. Result of the analysis was 69.1±9.7 pCi/L.

[a] Reported in pCi/L unless otherwise noted.

[b] Concentrations are reported in mg/kg.

[c] Concentrations are reported in mg/L.

APPENDIX VI

ANALYTICAL PROCEDURES

ANALYTICAL PROCEDURES MANUAL

TELEDYNE ISOTOPES MIDWEST LABORATORY

PREPARED FOR

COMMONWEALTH EDISON COMPANY

Note: Only procedures applicable to the CECo Radiological Environmental Monitoring Program are included in this manual.

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CECo

List of Procedures

Procedure Number		Revision Number	Revision Date
SP-01	Sample Preparation	0	07-02-86
AP-02	Determination of Gross Alpha and/ or Gross Beta in Air Particulate Filters	1	07-15-91
AP-03	Procedure for Compositing Air Particulate Filters for Gamma Spectroscopic Analysis	0	12-15-89
W(DS)-01	Determination of Gross Alpha and/ or Gross Beta in Water (Dissolved Solids or Total Residue)	2	05-03-91
W(SS)-02	Determination of Gross Alpha and/ or Gross Beta in Water (Suspended Solids)	0	11-22-85
AB-01	Determination of Gross Alpha and/ or Gross Beta in Solid Samples	0	08-04-86
GS-01	Determination of Gamma Emitters by Gamma Spectroscopy	0	07-21-86
T-02	Determination of Tritium in Water	1	09-27-91
I-131-01	Determination of I-131 in Milk by Anion Exchange (Batch Method)	3	04-10-91
I-131-02	Determination of Airborne I-131 in Charcoal Cartridges by Gamma Spectroscopy	0	07-04-86
COMP-01	Procedure for Compositing Water and Milk Samples	0	11-07-88

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SAMPLE PREPARATION

PROCEDURE NO. TIML-SP-01

Prepared by

Teledyne Isotopes Midwest Laboratory

Copy No. ________

Revision No.	Date	Pages	Prepared by	Approved by
0	07-02-86	11	[signature]	[signature]

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TABLE OF CONTENTS

SAMPLE PREPARATION

Principle of Method

Different classes of samples require different preparations. In general, food products are prepared as for home use, while others are dried ard ashed as received.

Reagents

Formaldehyde

Apparatus

Balance
Blender
Ceramic Dishes
Counting Containers
Cutting Board
Drying Oven
Drying Pans
Grinder
High Temperature Marking Pen
Knives
Muffle Furnace
Plastic Bags
Pulverizer
Scissors
Spatulas

Procedure for Packing Counting Containers

A. 3.5 l - Place 3.5 l of water into the container. Mark the level and then empty the container. Fill with the sample to the mark.

B. 500 ml - Fill to the rim of the inside wall, which is 1/4" from the top.

C. 4 oz - Fill to the 100 ml mark.

Pack the sample tightly. When filling with soil and bottom sediments, make sure it is level.

A. Vegetables and Fruits

1. Wash and prepare vegetables and fruits as for eating.
2. Homogenize in a blender.
3. Transfer blended sample to a standard calibrated container (3.5 l, 500 ml, or 4 oz); use the largest size possible for the amount of sample available. Record the wet weight.
4. Add a few cc of formaldehyde to prevent spoilage.
5. Seal with cover. Attach paper tape on top of the cover and write sample number, net weight, and date and time collected.
6. Submit to the counting room for gamma spectroscopic analysis without delay or store in a cooler until counting (for short period).

   NOTE: If I-131 analysis is required, it is imperative that the sample be prepared and submitted to the counting room immediately. Mark "I-131" on the tape.

7. After gamma scanning is completed, transfer the sample to a drying pan and dry at 110° C.

   NOTES: If only gamma scan is required, skip drying and ashing (Steps 7 through 11). Transfer the sample to a plastic bag, seal, label, and store in the cooler until disposal.

   If there is sufficient quantity, use surplus sample for drying and ashing instead of waiting for gamma scanning to be completed.

8. Cool, weigh, and record dry weight. Grind.
9. Weigh out accurately in a tarred ceramic dish 100-120 g of the ground sample. Record the weight. (If sample weight is less than 100 g, use two dishes; mark one as "A" and the second one as "B.") Ash in a muffle furnace by gradually increasing the temperature to 600° C. Ash overnight.

   NOTE: If ashing is incomplete (black carbon remains), cool the dish, crush the ash with spatula, and continue ashing overnight at 600° C. At this stage, it is not necessary to increase the temperature gradually. Set the temperature at 600° C and turn on the furnace.

10. Cool and weigh the ashed sample and record the ash weight. Grind to pass a 30 mesh screen. Transfer to 4 oz container, seal, and write sample number, weight, analysis required, and date and time of collection. The sample is now ready for analysis.
11. Store remaining ground sample in a plastic bag for possible future rechecking.

B. Grass and Cattle Feed

1. Take approximately 1 kg of fresh grass or 2 kg of cattle feed or silage.

2. Cut up grass into approximately 1" - 2" long stems and pack into a standard calibrated container (3.5 l or 500 ml). Pack cattle feed and silage as is; use 3.5 l size if enough sample is available. Record the wet weight.

3. Add a few cc of formaldehyde.

4. Seal with cover. Attach paper tape on top of the cover and label with sample number, net weight, and date and time collected.

5. Submit to the counting room for gamma spectroscopic analysis or store in a cooler until counting (for a short period) without delay.

   NOTE: If I-131 analysis is required, it is imperative that the sample be prepared and submitted to the counting room immediately. Mark "I-131" on the tape.

6. After gamma scanning is completed, transfer the sample to a drying pan and dry at 110° C.

   NOTES: If only gamma scan is required, skip drying and ashing (Steps 6 through 10). Transfer the sample to a plastic bag, seal, label, and store in the cooler until disposal.

   If there is sufficient quantity, use surplus sample for dryng and ashing instead of waiting for gamma scanning to be completed.

7. Cool, weigh, and record dry weight. Grind.

8. Weigh out accurately in a tarred ceramic dish 100-120 g. of the ground sample. Record the weight. (If sample weight is less than 100 g, use two dishes; mark one as "A" and the second one as "B.") Ash in a muffle furnace by gradually increasing the temperature to 600° C. Ash overnight.

   NOTE: If ashing is incomplete (black carbon remains), cool the dish, crush the ash with spatula, and continue ashing overnight at 600° C. At this stage, it is not necessary to increase the temperature gradually. Set the temperature at 600° C and turn on the furnace.

9. Cool and weigh the ashed sample and record the ash weight. Grind to pass a 30 mesh screen. Transfer to 4 oz container, seal, and write sample number, weight, analyses required, and date and time of collection. The sample is now ready for analyses.

10. Store the remaining ground sample in a plastic bag for possible future rechecking.

C. Fish

1. Wash the fish.

2. Fillet and place the flesh immediately (to prevent moisture loss) in a 500 ml or 4 oz standard calibrated container. Use 500 ml size if enough sample is available. Record the wet weight.

3. Add a few cc of formaldehyde.

4. Seal with cover. Attach paper tape on top of the cover and label with sample number, weight, and date and time of collection.

NOTE: If bones are to be analyzed, boil remaining fish in water for about 1 hour. Clean the bones. Air dry weigh, and record as wet weight. Dry at 110° C. Record dry weight. Ash at 800° C, cool, weigh, and record the ash weight. Grind to a homogeneous sample. The sample is ready for analysis.

4. Submit to the counting room for gamma spectroscopic analysis without delay or store in a refrigerator until counting.

NOTE: If I-131 analysis is required, it is imperative that the sample be prepared and submitted to the counting room immediately. Mark "I-131" on the tape.

5. After gamma spectroscopic analysis is completed, transfer the sample to a drying pan and dry at 110° C.

NOTES: If only gamma scan is required, skip drying and ashing (Steps 5 through 9). Transfer the sample to a plastic bag, seal, label, and store in the freezer until disposal.

If there is sufficient quantity, use surplus flesh for drying and ashing instead of waiting for gamma scanning to be completed.

6. Cool, weigh, and record dry weight.

7. Transfer to a tarred ceramic dish. Record dry weight for ashing.

8. Ash in a muffle furnace by gradually increasing the temperature to 450° C. If considerable amount of carbon remains after overnight ashing, the sample should be brushed and placed back in the muffle furnace until ashing is completed.

9. Cool and weigh the ashed sample and record the ash weight. Grind to pass a 30 mesh screen. Transfer to a 4 oz container, seal, and write sample number, weight, analyses required, and date and time of collection. The sample is now ready for analysis.

D. Waterfowl, Meat, and Wildlife

1. Skin and clean the animal. Remove a sufficent amount of flesh to fill an appropriate standard calibrated container (500 or 4 oz). Weigh without delay (to prevent moisture loss), and record the wet weight.

2. Add a few cc of formaldehyde.

   NOTE: If bones are to be analyzed, boil remaining flesh in water for about 1 hour. Clean the bones. Air dry, weigh, and record as wet weight. Dry at 110° C. Record dry weight. Ash at 800° C, cool, weigh, and record the ash weight. Grind to a homogeneous sample. The sample is ready for analysis.

3. Seal with the cover. Attach paper tape on top of the cover and label with sample number, wet weight, and date and time of collection.

4. Submit to the counting room for gamma spectroscopic analysis without delay or store in a refrigerator until counting (for short period).

   NOTE: If I-131 analysis is required, it is imperative that the sample be prepared and submitted to the counting room immediately. Mark "I-131" on the tape.

5. After the gamma scanning is completed, transfer the sample to a drying pan and dry at 110° C.

6. Cool, weigh, and record dry weight.

7. Transfer to a tarred ceramic dish. Record dry weight for ashing.

8. Ash in a muffle furnace by gradually increasing the temperature to 450° C. If considerable amounts of carbon remain after overnight ashing, the sample should be brushed and placed back in the muffle furnace until ashing is completed.

9. Cool and weigh the ashed sample and record the ash weight. Grind to pass a 30 mesh screen. Transfer to a 4 oz container. Seal and write sample number, weight, analyses required, and date and time of collection. The sample is now ready for analyses.

E. Eggs

1. Remove the egg shells and mix the eggs with a spatula. Use about one (1) dozen eggs.

2. Transfer the mixed eggs to a standard calibrated 500 ml container. Record the wet weight.

3. Add a few cc of formaldehyde.

4. Seal with cover. Attach paper tape on top of the cover and label with sample number, wet weight, and date and time of collection.

5. Submit to the counting room for gamma spectroscopic analysis without delay or store in a refrigerator until counting (for short period).

6. After gamma spectrascopic analysis is completed, tranfer the sample to a plastic bag, seal, label, and store in a freezer until disposal.

   NOTE: If only a gamma scan is required, skip Steps 7 through 11.

7. Weigh the rest of the sample, record wet weight, and dry in an oven at 110° C.

8. Cool, weigh, and record dry weight.

9. Weigh out accurately 100-120 g of the sample in a tarred ceramic dish. Record the weight. Ash in a muffle furnace by gradually increasing the temperature to 550° C. If a considerable amount of carbon remains after overnight ashing, the sample should be crushed and placed back in the muffle furnace until ashing is completed.

10. Cool and weigh the ashed sample and record the weight. Grind to pass a 30 mesh screen. Transfer to a 4 oz container, seal, and write sample number, weight, analyses required, and date and time of collection. The sample is now ready for analysis.

11. Store the remaining ground sample in a plastic bag for possible future rechecking.

F. Slime and Aquatic Vegetation

1. Remove foreign materials.

2. Place the sample in a sieve pan and wash until all sand and dirt is removed (turn the sample over several times.)

3. Squeeze out the water by hand.

4. Place the sample in a standard calibrated 500 ml or 4 oz container; weigh and record wet weight. Use 500 ml container if enough sample is available.

5. Add a few cc of formaldehyde.

6. Seal with cover. Attach paper tape on top of the cover and label with sample number, weight, and date and time of collection.

7. Submit to the counting room without delay. Slime decomposes quickly even with formaldehyde. If gamma scanning must be delayed, freeze.

   NOTE: If I-131 analysis is required, it is imperative that the sample be prepared and analyzed immediately. Mark "I-131" on the tape.

8. After gamma scanning is completed, transfer the sample to a drying pan and dry at 110° C.

   NOTE: If only gamma scan is required, skip drying and ashing (Steps 8 through 11). Transfer the sample to a plastic bag, seal, label, and store in the freezer until disposal.

9. Cool, weigh, and record dry weight.

10. Transfer to a tarred ceramic dish, and record dry weight for ashing. Ash in a muffle furnace by gradually increasing the temperature to 600° C.

    NOTE: If ashing is incomplete (black carbon remains), cool the dish, crush the ash with spatula, and continue ashing overnight at 600° C. At this stage, it is not necessary to increase the temperature gradually. Set the temperature at 600° C. and turn on the furnace.

11. Cool and weigh the ashed sample and record ash weight. Grind to pass a 30 mesh screen. Transfer to a 4 oz container, seal, and label with sample number, weight, analyses required, and date and time of collection. The sample is now ready for analyses.

G. Bottom Sediments and Soil

1. Remove rocks, roots, and any other foreign materials.
2. Place approximately 1 kg of sample on the drying pan and dry at 110° C.
3. Seal, label, and save remaining sample.
4. Grind or pulverize the dried sample and sieve through a No. 20 mesh screen.
5. For gamma spectroscopic analysis, transfer sieved sample to a standard calibrated 500 ml container or to 4 oz container.
6. Seal with cover. Weigh and record dry weight. Attach paper tape on top of the cover and write sample number, weight, and date and time of collection.
7. Submit to the counting room for gamma spectroscopic analysis without delay.
8. For other analyses, e.g. gross beta, radiostrontium, etc., fill 4 oz container to the top, seal, and write sample number, types of analyses required, and date and time of collection.
9. Store the remaining sieved sample in a plastic bag for possible future rechecking.
10. After the gamma scanning is completed, transfer the sample to a plastic bag, seal, label, and store until disposal.

H. Drinking (Clear) Water (EPA Method 900.0)

A representative sample must be collected from a free-flowing source of drinking water and should be large enough so that adequate aliquots can be taken to obtain the required sensitivity.

It is recommended that samples be preserved at the time of collection by adding enough 1N HNO_3 to the sample to bring it to pH 2 (15 ml 1N HNO_3 per liter of sample is usually sufficient). If samples are to be collected without preservation, they should be brought to the laboratory within 5 days, then preserved and held in the original container for a minimum of 16 hours before analysis or transfer of the sample.

The container choice should be plastic over glass to prevent loss due to breakage during transportation and handling.

If the sample was not acidified at the time of collection, use the following procedure:

Procedure

1. Remove 100 ml of sample for tritium analysis and 1 l for I-131 analysis, if required.

2. At 15 ml of 1:1 HNO_3 per gallon of sample in the original container.

3. Hold the sample in the original container for a minimum of 16 hours before analysis or transfer of the sample.

4. When taking an aliquot for analysis, take acid addition into account. For example:

Sample Volume to Be analyzed	Volume of Aliquot Required
200 ml	203 ml
400 ml	406 ml
600 ml	609 ml
800 ml	812 ml
1000 ml	1015 ml
2000 ml	2030 ml
3000 ml	3045 ml
3500 ml	3552 ml

For other volumes, adjust aliquots accordingly, at the rate of 1.5 ml per 100 ml of sample.

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN AIR PARTICULATE FILTERS

PROCEDURE NO. TIML-AP-02

Prepared by

Teledyne . es Midwest Laboratory

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Revised Pages	Revision No.	Date	Pages	Prepared by	Approved by
	0	07-11-86	3	B. Grob	L.G. Huebner
2	1	07-15-91	3	B. Grob	L.G. Huebner

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN AIR PARTICULATE FILTERS

Principle of Method

Air particulate filters are stored for at least 72 hours to allow for the | 1
decay of short-lived radon and thoron daughters and then counted in the proportional counter.

Apparatus

Forceps
Loading Sheet
Proportional Counter
Stainless Steel Planchets (standard 2" x 1/8")

Procedure

1. Store the filters for at least 72 hours from the day of collection. | 1

2. Place filters on a stainless steel planchet.

3. Fill out a sample loading sheet. Fill in the date, counter number, counting time, sample identification number, sample collection date, and initials.

   NOTES: When loading samples in the holder, load blanks (unexposed filter paper) in positions 1, 12, 23, 34, 45, etc.

   If filters from more than one project are loaded, make sure that the appropriate blanks are loaded with each batch. Load the counter blank planchet as a last sample.

4. Count in a proporational counter long enough to obtain the required LLDs.

5. After counting is completed, return the filters to the original envelopes.

6. Submit the counter printout, field collection sheet, and the loading sheet to the data clerk for calculations.

Calculations

Gross alpha (beta) concentration:

$$(pCi/liter) = \frac{A}{B \times C \times 2.22} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{B \times C \times 2.22}$$

Where:

A = Net alpha (beta) count (cpm)

B = Efficiency for counting alpha (beta) activity (cpm/dpm)

C = Volume of s.

E_{sb} = Counting error of sample plus background

E_b = Counting error of background

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PROCEDURE FOR COMPOSITING AIR PARTICULATE FILTERS FOR GAMMA SPECTROSCOPIC ANALYSIS

PROCEDURE NO. TIML-AP-03

Prepared by

Teledyne Isotopes Midwest Laboratory

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0	12-15-89	3	B. Grob	L. G. Huebner

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PROCEDURE FOR COMPOSITING AIR PARTICULATE FILTERS

FOR GAMMA SPECTROSCOPIC ANALYSIS

Principle of Method

AP filters are placed in a Petrie Dish in chronological order, labeled and submitted to counting room for analysis.

Materials

Forceps (long)
Blank filter paper
Small Petrie Dish
Scotch Tape

Procedure

1. Stack APs from each location in chronological order, with the latest collection date on top.

2. Place blank filter paper in the Petrie Dish.

3. Starting from the top of the stack, remove each AP from the envelope and place it in the Petrie Dish with the deposit facing up.

4. Continue transferring AP's from envelopes to the Petrie Dish until all are transferred.

5. Place blank filter paper on top.

6. Cap the Petrie Dish. Use scotch tape to hold cap in place, if needed.

7. Record sample ID (project), sample No., location, last date of collection, collection period and date composited in the Recording Book.

8. Write sample ID, sample No., last date of collection and collection period on the Petrie Dish using black marker.

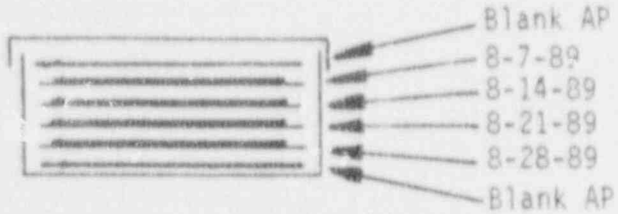
9. Submit the samples to the counting room.

10. After counting, return AP's to the original envelopes in reverse order.

Example

Project: BAP
Location: 2
Sample No.: 1675
Last Collection Date: 08-28-89
Collection period: August, 1989
Samples collected: 8-7, 8-14, 8-21, 8-28

Side View



Top View

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN WATER

(DISSOLVED SOLIDS OR TOTAL RESIDUE)

PROCEDURE NO. TIML-W(DS)-01

Prepared by

Teledyne Isotopes Midwest Laboratory

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Revised Pages	Revision No.	Date	Pages	Prepared by	Approved by
	0	11-25-85	4	B. Grob	L. G. Huebner
2,3	1	02-28-91	4	B. Grob	L. G. Huebner
3	2	05-03-91	4	B. Grob	L. G. Huebner

DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN WATER
(Dissolved Solids or Total Residue[a,b])

Principle of Method

Water samples containing suspended matter are filtered through a membrane filter and the filtrate is analyzed. The filtered water sample is evaporated and the residue is transferred to a tared planchet for counting gross alpha and gross beta activity.

Reagents

All chemicals should be of "reagent-grade" or equivalent whenever they are commercially available.

Lucite: 0.5 mg/ml in acetone
Nitric acid, HNO_3: 16 N (concentrated), 3 N (187 ml of 16 N HNO_3 diluted to 1 liter), 1 N (62 ml of 16 N HNO_3 diluted to 1 liter)

Apparatus

Filter, Millipore, membrane Type AA, 0.08
Filtration equipment
Planchets (Standard 2" x 1/8" ringed planchet)
Proportional counter
Electric hot plate
Drying oven
Muffle furnace

Procedure

1. Filter a volume of sample containing not more than 100 mg of dissolved solids for alpha assay, or not more than 200 mg of dissolved solids for beta assay.[a,b] 1

   NOTE: For gross alpha and gross beta assay in the same sample, limit the amount of solids to 100 mg.

---

[a] For analysis of total residue (for clear water), proceed as described above but do not filter the water. Measure out the appropriate amount and proceed to Step 3.

[b] For Duquesne Light Company samples ONLY - Procedure, Step 1: Do NOT filter. Shake well and immediately withdraw required aliquot. Do not allow solids to settle. 1

2. Transfer assembly holding filter paper to another filtering flask and wash the non-filterable solids on the filter paper with D.I. water. Discard wash water. (Save the filters with suspended matter for separate analysis. See Procedure No. TIML-W-02.)

3. Evaporate the filtrate to NEAR dryness on a hot plate.

4. Add 25 ml of concentrated HNO_3 and evaporate to NEAR dryness again.

   NOTE: If water samples are known or suspected to contain chloride salts, these chloride salts should be converted to nitrate salts before the sample residue is transferred to a stainless steel planchet. (Chlorides will attack stainless steel and increase the sample solids. No correction can be made for these added solids.) Chloride salts can be converted to nitrate salts by adding concentrated HNO^3 and evaporating to near dryness.

5. With D.I. water and a few drops of 3 N HNO_3, transfer the residue to a 50 ml beaker using a rubber policeman to wash the walls. Evaporate to NEAR dryness.

6. Transfer quantitatively the residue to a TARED PLANCHET, using an unused plastic disposable pipette for each sample, (not more than 1 mL at a time) evaporating each portion to dryness under the lamp. Spread residue uniformly on the planchet.

   NOTE: Non-uniformity of the sample residue in the counting planchet interferes with the accuracy and precision of the method.

7. Wash the beaker with a minimum amount of 1 N HNO_3 several times and combine the washings and the residue in the planchet, using the rubber policeman to wash the walls. Evaporate to dryness.[c]

   NOTE: Rinse the rubber policeman with D.I. water between samples.

8. Bake in muffle furnace at 450°C for 45 minutes, cool and weigh.

9. Add a few drops (6 - 7) of the lucite solution and dry under the infrared lamp for 10 - 20 minutes.

10. Store the sample in a dessicator until ready to count because vapors from the moist residue can damage the detector and the window and can cause erratic measurements.

---

[c] For Duquesne Light Company and CH_2M Hill samples ONLY - Procedure, Step 7: Do NOT bake. Proceed directly to Step 9. 2

11. Count the gross alpha and/or the gross beta activity in a low background proportional counter.

    NOTE: If the gas-flow internal proportional counter does not discriminate for the higher energy alpha pulses at the beta plateau, the activity must be subtracted from the beta plus alpha activity. This is particularly important for samples with high alpha activity.

    Samples may be counted for beta activity immediately after baking; alpha counting should be delayed at least 72 hours (until equilibrium has occurred).

Calculations

Gross alpha (beta) activity:

$$(\text{pCi/liter}) = \frac{A}{B \times C \times D \times 2.22} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{B \times C \times D \times 2.22}$$

Where:

A = Net alpha (beta) count (cpm)

B = Efficiency for counting alpha (beta) activity (cpm/dpm)

C = Volume of sample (liters)

D = Correction factor for self-absorption in the sample

E_{sb} = Counting error of sample plus background

E_b = Counting error of background

References: Radioassay Procedures for Environmental Samples, U.S. Department of Health, Education and Welfare. Environmental Health Series, January 1967.

EPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water. August 1980.

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN WATER
(SUSPENDED SOLIDS)

PROCEDURE NO. TIML-W(SS)-02

Prepared by

Teledyne Isotopes Midwest Laboratory

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0	11-22-85	3	L. G. Huebner	L G Huebner

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN WATER

(SUSPENDED SOLIDS)

Principle of Method

The sample is filtered through a tared membrane filter. The filter containing the solids is transferred to a stainless steel planchet, dried, and fixed to the planchet. The gross alpha and gross beta activities are measured in a low background internal proportional counter. If the sample contains sand, it is placed in the separatory funnel, the sand allowed to settle to the bottom and drained off.

Reagents

Acetone

Apparatus

Filter, Millipore, membrane Type AA 0.08
Filtration equipment
Planchets (Standard 2" x 1/8" planchet)
Proportional counter

Procedure

1. Filter one liter of sample through a TARED membrane filter. Wash the non-filterable solids on the filter with D.I. water.

   Note: If the sample contains sand, place it in the separatory funnel, allow the sand to settle for 30 minutes, then drain off the sand at the bottom. Shake the funnel and repeat as above two (2) more times.

2. Place the filter in a planchet, placing the ring over it to prevent curling, and air dry for 24 hours.

3. Dry under the infared lamp for 20-30 minutes. Dessicate to constant weight and weigh.

4. Fix the filter to the planchet at four peripheral points using glue. Air dry.

5. Count for gross alpha and gross beta activity using a proportional counter.

6. Calculate the activity in pCi/l using the computer program designed for this analysis.

Calculations

Gross alpha (beta) activity:

$$(pCi/liter) = \frac{A}{B \times C \times D \times 2.22} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{B \times C \times D \times 2.22}$$

Where:

A = Net alpha (beta) count (cpm)

B = Efficiency for counting alpha (beta) activity (cpm/dpm)

C = Volume of sample (liters)

D = Correction factor for self-absorption in the sample

E_{sb} = Counting error of sample plus background

E_b = Counting error of background

References: Radioassay Procedures for Environmental Samples, U.S. Department of Health, Education and Welfare. Environmental Health Series, January 1967.

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA IN SOLID SAMPLES

PROCEDURE NO. TIML-AB-01

Prepared by

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0	08-04-86	5	J. Grob	L.G. Huebner

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DETERMINATION OF GROSS ALPHA AND/OR GROSS BETA

IN SOLID SAMPLES

Principle of Method

100 mg to 200 mg of sample is distributed evenly on a 2" ringed planchet, counted in a proportional counter, and concentrations of gross alpha and/or gross beta are calculated.

Reagents

Lucite: 0.5 mg/ml in acetone

Appartus

Balance
Infrared lamp
Planchets (standard 2" x 1/8" ringed planchet)
Proportional counter

A. Gross Alpha and/or Gross Beta in Vegetation

Procedure

1. Weigh out accurately in a planchet no more than 100 mg of ashed or dried and ground sample for gross alpha assay and no more than 200 mg for gross beta assay.

   NOTE: If both gross alpha and gross beta analyses are required, do not use more than 100 mg.

2. Add a few drops of water and spread uniformly over the area of the planchet. Dry under the infrared lamp.

3. Add 2 - 3 drops of lucite solution in acetone and dry again under the infrared lamp.

4. Store the planchets in a desiccator until counting.

5. Count the gross alpha and gross beta activity in a low background proportional counter.

Calculations

Gross alpha (beta) concentration:

$$(pCi/g\ wet) = \frac{A}{B \times C \times D \times F \times 2.22} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{B \times C \times D \times F \times 2.22}$$

Where:

A = Net alpha (beta) count (cpm)

B = Efficiency for counting alpha (beta) activity (cpm/dpm)

C = Weight of sample (grams), ash or dry

D = Correction factor for self-absorption in the sample

E_{sb} = Counting error of sample plus background

E_b = Counting error of background

F = Ratio of wet weight to ashed or dry weight

REFERENCE: Radioassay Procedures for Environmental Samples, U. S. Department of Health, Education and Welfare. Environmental Health Series, January 1967.

B. Gross Alpha and/or Gross Beta in Meat, Fish, and Wildlife

Procedure

1. Weigh out accurately in a planchet no more than 100 mg of ashed sample for gross alpha assay and no more than 200 mg for gross beta assay.

   NOTE: If both gross alpha and gross beta analyses are required, do not use more than 100 mg.

2. Add a few drops of water and spread uniformly over the area of the planchet. Dry under the infrared lamp.

3. Add 2 - 3 drops of lucite solution in acetone and dry again under the infrared lamp.

4. Store the planchets in a desiccator until counting.

5. Count the gross alpha and gross beta activity in a low background proportional counter.

Calculations

Gross alpha (beta) concentration:

$$(\text{pCi/g wet}) = \frac{A}{B \times C \times D \times F \times 2.22} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{B \times C \times D \times F \times 2.22}$$

Where:

A = Net alpha (beta) count (cpm)

B = Efficiency for counting alpha (beta) activity (cpm/dpm)

C = Weight of sample (grams), ash

D = Correction factor for self-absorption in the sample

E_{sb} = Counting error of sample plus background

E_b = Counting error of background

F = Ratio of wet weight to ashed weight

REFERENCE: Radioassay Procedures for Environmental Samples, U. S. Department of Health, Education and Welfare. Environmental Health Series, January 1967.

C. Gross Alpha and/or Gross Beta in Soil and Bottom Sediments

Procedure

1. Weigh out accurately in a planchet no more than 100 mg of a pulverized sample for gross alpha assay and no more than 200 mg for a gross beta assay.

   NOTE: If both gross alpha and gross beta analyses are required, do not use more than 100 mg.

2. Add a few drops of water and spread uniformly over the area of the planchet. Dry under the infrared lamp.

3. Add 2 - 3 drops of lucite solution in acetone and dry again under the infrared lamp.

4. Store the planchets in a desiccator until counting.

5. Count the gross alpha and gross beta activity in a low background proportional counter.

Calculations

Gross alpha (beta) concentration:

$$(\text{pCi/g dry}) = \frac{A}{B \times C \times D \times 2.22} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{B \times C \times D \times 2.22}$$

Where:

- A = Net alpha (beta) count (cpm)
- B = Efficiency for counting alpha (beta) activity (cpm/dpm)
- C = Weight of sample (grams)
- D = Correction factor for self-absorption in the sample
- E_{sb} = Counting error of sample plus background
- E_b = Counting error of background

REFERENCE: Radioassay Procedures for Environmental Samples, U. S. Department of Health, Education and Welfare. Environmental Health Series, January 1967.

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DETERMINATION OF GAMMA EMITTERS
BY GAMMA SPECTROSCOPY
(GERMANIUM DETECTORS)

PROCEDURE NO. TIML-GS-01

Prepared by

Teledyne Isotopes Midwest Laboratory

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0	07-21-86	5	B. Grob	L. G. Huebner

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DETERMINATION OF GAMMA EMITTERS

BY GAMMA SPECTROSCOPY

(GERMANIUM DETECTORS)

Principle of Method

The sample is placed in a calibrated container and counted for a length of time required to reach the required LLD. The results are decay corrected to the sampling time, where appropriate, using a dedicated computer and software.

Apparatus

Counting containers
Counting Equipment
Cylinders
Marking Pens
Recording Books

A. Milk and Water

1. Measure accurately 3.5 l or 500 ml of sample and put it in the calibrated counting container. Always use larger volume if sample is in sufficient quantity.

   NOTE: Occasionally the sample size is too large for 500 ml geometry but not sufficient for 3.5 geometry. In such a case, follow the following procedure.

   a. If the sample size is less than 2 l, use 500 ml geometry.

   b. If the sample size is more than 2 l, measure the sample accurately and dilute to 3.5 l with deionized water. Use 3.5 l geometry but use actual sample volume when doing the calculations. Return the diluted sample to the original container and mark the volume of the original sample and deionized water used.

2. Cover and attach a gummed label to the cover; write the sample number, volume, and date and time of collection on the label. Mark "I-131" if analysis for I-131 is required by gamma spectroscopy.

3. Count without delay for estimated time required to meet LLDs. Record file number, sample identification number, date and time counting started, detector number, geometry, sample size, and date and time of collection.

4. Stop counting; transfer specra to the disc and print out the results.

5. Check LLDs before taking the sample off. If LLDs are not met, continue counting until they do.

6. After counting is completed, record the date and time counting ended and counting time.

7. Return the sample to the original container and mark with a red marker.

B. Airborne Particulates

1. Place air filters in a filter cup container.

2. Place on the detector and count long enough to meet the LLD requirements. Record the file number, sample identification number, date and time counting started, detector number, geometry, sample size, and date and time collected.

3. Stop counting and transfer spectra to the disc. Print out the results and check the LLDs before taking the sample off. If LLD levels are not met, continue counting until they do.

4. After counting is completed, record the date and time counting ended and counting time.

5. Replace air filters in the original envelopes for storage or further analyses.

C. Other Samples

NOTE: Samples, e.g., soil, vegetation, fish, etc., are prepared in the prep lab and delivered to the counting room.

1. Place the sample on the detector and count long enough to meet LLD requirements. Record the file number, sample identification number, date and time counting started, detector number, geometry, sample size, and date and time of collection.

2. Stop counting and transfer spectra to the disc. Print out the results and check the LLDs before taking the sample off. If LLD levels are not met, continue counting until they are.

3. After counting is completed, record date and time counting ended and counting time. Mark the container with red marker and return to the prep lab for transfer to the plastic bag for storage or further analyses.

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DETERMINATION OF TRITIUM IN WATER

(DIRECT METHOD)

PROCEDURE NO. TIML-T-02

Prepared by

Teledyne Isotopes Midwest Laboratory

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	0	11-22-85	5	L. G. Huebner	L G Huebner
2,3	1	09-27-91	4	B. Grob	L G Huebner

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DETERMINATION OF TRITIUM IN WATER

(DIRECT METHOD)

Principle of Method

The water sample is purified by distillation, a portion of the distillate is transferred to a counting vial and the scintillation fluid added. The contents of the vial are thoroughy mixed and counted in a liquid scintillation counter.

Reagents

Scintillation medium, Insta-Gel scintillator
Tritium standard solution
Dead water
Ethyl alcohol

Apparatus

Condenser
Distillation flask, 250-ml capacity
Liquid scintillation counter
Liquid scintillation counting vials
Kimwipes

Procedure

NOTE: All glassware must be dry. Dry it in the drying oven at 100-125°C. 1

1. Place 60-70 ml of the sample in a 250-ml distillation flask. Add a boiling chip to the flask. Add one NaOH pellet and ca. 0.02g $KMnO_4$. Connect a side arm adapter and a condenser to the outlet of the flask. Place a receptacle at the outlet of the condenser. Set variac at 70 1
mark. Heat to boiling to distill. Discard the first 5-10 ml of distillate. Collect next 20-25 ml of distillate for analysis. Do not distill to dryness.

2. Mark the vial caps with the sample number and date.

   Note: Use the same type of vial for the whole batch (samples, background, and standard.

3. Mark three (3) vial caps "Bkg 1", "Bkg 2", "Bkg 3", and date.

4. Mark three (3) vial caps "St-1", "St-2", "St-3"; standard number, and date.

5. Dispense 13 ml of sample into marked vials and "dead" water into vials marked Bkg-1,2, and 3.

   Note 1: Pipetter is set (and calibrated) to deliver 6.5 ml, so pipette twice into each vial. Use new tip for each sample and new tip (one) for three background samples.

   Note 2: Make sure the pipetter has not been reset. If it has been reset, or if you are not sure, do not use it; check with your supervisor.

   Note 3: Make sure the plastic tip is pushed all the way on to the pipetter and is tight. If it is not, the air will be drawn in and the volume withdrawn will not be correct (it will be smaller).

6. Dispense 13 ml (see Notes 1,2, and 3, above) of "dead" water into each vial marked "St-1", "St-2", and "St-3."

7. Take a 0.1 ml (100) pipetter and withdraw 0.1 ml of water from each of the three standard vials. Discard this 0.1 ml of water.

8. Take a new 0.1 ml tip. Dispense 0.1 ml of standard into each of the three vials marked "St-1", "St-2", and "St-3."

9. Take all vials containing samples, background, and standard to the counting room.

   Note: To avoid spurious counts, scintillator should not be added under flourescent light.

10. Dispense 10 ml of Insta-Gel into each vial (one at a time), cap tightly, and shake VIGOROUSLY for at least 0.5 minutes. Recheck the cap for tightness.

11. Wet a Kimwipe with alcohol and wipe off each vial in the following order:

    Background
    Samples
    Standard

12. Load the vials in the following order:

    Bkg 1
    St-1
    Samples
    Bkg-2*
    St-2*
    Samples
    Bkg-3
    St-3

    * Bkg 2 and St-2 should be approximately in the middle of the batch. |1

13. Let the vials dark- and temperature-adapt for about one hour.

Note 1: To check if vials reached counter temperature, inspect one vial (Bkg). The liquid should be transparent. If the temperature is too high (or too low), the liquid will be white and very viscous.

Note 2: The temperature inside the counter should be between 10° and 14° C (check thermometer). In this temperature range, the liquid is transparent.

14. Set the counter for 100 min counting time and infinite cycles. (Follow manufacturer's procedure for setting the counter.)

15. Fill out the loading sheet, being sure to indicate the date and time counting started, and your initials.

Note: Do not count prepared background and standard sets with another batch of samples if plastic vials are used. Prepare new backgrounds and standards for each batch.

If glass vials are used, the prepared background and standard sets can be counted with other batcher up to one (1) month after preparation provided they are not taken out of the counter (not warmed up) and the same vial type from the same manufacturing batch (the same carton) is used. After one month prepare new sets of backgrounds and standards.

Calculations

$$pCi/l = \frac{\frac{A}{t_1} - \frac{B}{t_2}}{2.22 \times E \times V \times e^{-\lambda t_3}} \pm \frac{2\sqrt{\frac{A}{t_1^2} + \frac{B}{t_2^2}}}{2.22 \times E \times V \times e^{-\lambda t_3}}$$

Where:

A = Total counts, sample
B = Total counts, background
E = Efficiency (cpm/dpm)
V = Volume (liter)
e = Base of the natural logorithm = 2.71828
$\lambda = \frac{0.693}{12.26} = 0.05652$
t_1 = Counting time, sample
t_2 = Counting time, background
t_3 = Elapsed time from the time of collection to the time of counting (in years)

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DETERMINATION OF I-131 IN MILK BY ANION EXCHANGE

(BATCH METHOD)

PROCEDURE NO. TIML-I-131-01

Prepared by

Teledyne Isotopes Midwest Laboratory

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______	0	06-12-85	6	[signature]	L G Huebner
5	1	11-25-85	6	[signature]	L G Huebner
2,3,4,5	2	03-24-89	6	[signature]	L G Huebner
2,3,5	3	04-10-91	6	[signature]	L G Huebner

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Determination of I-131 in Milk by Ion Exchange

(Batch Method)

Principle of Method

After samples have been treated to convert all iodine in the sample to a common oxidation state, the iodine is isolated by solvent extraction or a combination of ion exchange and solvent extraction steps.

Iodine, as the iodide, is concentrated by adsorption on an anion resin. Following a NaCl wash, the iodine is eluted with sodium hypochlorite. Iodine in the iodate form is reduced to I_2 and the elemental iodine extracted into $CHCl_3$, back-extracted into water then finally precipitated as palladium iodide.

Chemical recovery of the added carrier is determined gravimetrically from the PdI_2 precipitate. I-131 is determined by beta counting the PdI_2.

Reagents

Anion Exchange Resin, Dowex 1-X8 (20-50 mesh) chloride form | 3

Chloroform, $CHCl_3$ - reagent grade

Hydrochloric Acid, HCl, 1N

Hydrochloric Acid, HCl, 3N

Wash Solution: H_2O - HNO_3 - NH_2OH HCL, 50 mL H_2O; 10 mL 1M - NH_2OH-HCl; 10 mL conc. HNO_3

Hydroxylamine Hydrochloride, NH_2OH HCl - 1 M

Nitric Acid, HNO_3 - concentrated

Palladium Chloride, $PdCl_2$, 7.2 mg Pd^{++}/mL (1.2 g $PdCl_2$/100 mL of 6N HCl) | 3

Sodium Bisulfite, $NaHSO_3$ - 1 M

Sodium Chloride, NaCl - 2M

Sodium Hypochlorite, NaOCl - 5% (Clorox)

Special Apparatus

Chromatographic Column, 20 mm x 150 mm (Reliance Glass Cat. #R2725T)

Vacuum Filter Holder, 2.5 cm^2 filter area

Filter Paper, Whatman #42, 2l mm

Mylar

Polyester Gummed Tape, 1/2", Scotch #853

Heat Lamp

Part A

Ion Exchange Procedure

1. Transfer 2 liters (if available) of sample to the beaker. Add 1.00 mL of standardized iodide carrier to each sample. 3

2. Add a clean magnetic stirring bar to each sample beaker. Stir each sample for 5 minutes or longer on a magnetic stirrer. Allow sample to equilibrate at least 1/2 hour. If a milk sample is curdled or lumpy, vacuum filter the sample through a Buchner funnel using a cheesecloth filter. Wash the curd thoroughly with deionized water, collecting the washings with the filtrate. Pour the filtrate back into the original washed and labeled 4 liter beaker and discard the curd.

3. Add approximately 45 grams of Dowex 1X8 (20-50 mesh) anion resin to each sample beaker and stir on a magnetic stirrer for at least 1 hour. Turn off the stirrer and allow the resin to settle for 10 minutes.

4. Gently decant and discard the milk or water sample taking care to retain as much resin as possible in the beaker. Add approximately 1 liter of deionized water to rinse the resin, allow to settle 2 minutes, and pour off the rinse. Repeat rinsing in the case of milk samples until all traces of milk are removed from the resin.

5. Using a deionized water wash bottle, transfer the resin to the column marked with the sample number. Allow resin to settle 2 minutes and drain the standing water. Wash the resin with 100 mL of 2M NaCl.

6. Measure 50 mL 5% sodium hypochlorite in a graduated cylinder. Add sodium hypochlorite to column in 10-20 mL increments, stirring resin as needed to eliminate gas bubbles and maintain flow rate of 2 mL/min. Collect eluate in 250 mL beaker and discard the resin.

Part B

Iodine Extraction Procedure

1. Acidify the eluate from Step 6 using concentrated HNO_3 to make the sample 2-3 N in HNO_3 and transfer to 250 mL separatory funnel. (Add the acid slowly with stirring until the vigorous reaction subsides.) Volumn of concentr ed HNO_3 required will depend on eluate volume as follows:

Eluate Volume (mL)	Concentrated HNO_3 (mL)
50-60	10
60-70	12
70-80	14
80-90	16

2. Add 50 mL of $CHCl_3$ and 10 mL of 1 M hydroxylamine hydrochloride (freshly prepared). Extract iodine into organic phase (about 2 minutes equilibration). Draw off the organic phase (lower phase) into another separatory funnel.

3. Add 25 mL of $CHCl_3$ and 5 mL of 1 M hydroxylamine hydrochloride to the first separatory funnel and again equilibrate for 2 minutes. Combine the organic phases. Discard the aqueous phase (Upper phase) if no other analyses are required. If Pu, U or Sr is required on the same sample aliquot, submit the aqueous phase and data sheet to the appropriate laboratory section.

4. Add 20 mL H_2O-HNO_3-NH_2OH HCl wash solution to the separatory funnel containing the $CHCl_4$. Equilibrate 2 minutes. Allow phases to separate and transfer $CHCl_3$ (lower phase) to a clean separatory funnel. Discard the wash solution.

5. Add 25 mL H_2O and 10 drops of 1 M sodium bisulfite (freshly prepared) to the separatory funnel containing the $CHCl_3$. Equilibrate for 2 minutes. Discard the organic phase (lower phase). Drain aqueous phase (upper phase) into a 100 mL beaker. Proceed to the Precipitation of PdI_2.

Part C

Precipitation of Palladium Iodide

CAUTION: AMMONIUM HYDROXIDE INTERFERES WITH THIS PROCEDURE

1. Add 10 mL of 3 N HCl to the aqueous phase from the iodine extraction procedure in Step 5.

2. Place the beaker on a stirrer-hot plate. Using the magnetic stirrer, boil and stir the sample until it evaporates to 30 mL or begins to turn yellow.

3. Turn the heat off. Remove the magnetic stirrer, rinse with deionized water.

4. Add, dropwise, to the solution, 2.0 mL of palladium chloride.

5. Cool the sample to room temperature. Place the beaker with sample on the stainless steel tray and put in the refrigerator overnight.

6. Weigh a clean 21 mm Whatman #42 filter which has been dried under a heat lamp.

7. Place the weighed filter in the filter holder. Filter the sample and wash the residue with water and then with absolute alcohol.

8. Remove filter from filter holder and place it in the labeled petri dish.

9. Dry under the lamp for 5-10 minutes. 3

10. Weigh the filter with the precipitate.

11. Cut a 1-1/2" strip of polyester tape and lay it on a clean surface, gummed side up. Place the filter, precipitate side up, in the center of the tape.

12. Cut a 1-1/2" wide piece of mylar. Using a spatula to press it in place, put it directly over the precipitate and seal the edges to the polyester tape. Trim to about 5 mm from the edge of the filter with scissors.

13. Mount the sample on the plastic disc and write the sample number on the back side of the disc.

14. Count the sample on a proportional beta counter.

Calculations

Calculate the sample activity using computer program I131.

Part C

Precipitation of Palladium Iodide (continued)

I-131 concentration:

$$(pCi/l) = \frac{A}{2.22 \times B \times C \times D} \pm \frac{2\sqrt{E_{sb}^2 + E_b^2}}{2.22 \times B \times C \times D}$$

where:

A = Net cpm, sample

B = Efficiency for counting beta I-131 (cpm/dpm)

C = Volume of sample (liters)

D = Correction for decay to the time of collection = $e^{-\lambda t}$ =

$$Exp\left(- \frac{0.693 \times t}{8.04}\right) = e^{-0.0862t}$$

where t = elapsed time from the time of collection to the counting time (in days)

E_{sb} = Counting error of sample plus background

E_b = Counting error of background

Reference: "Determination of I-131 by Beta-Gamma coincidence Counting of PdI_2". Radiological Science Laboratory. Division of Laboratories and Research, New York State Department of Health, March 1975, Revised February 1977.

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DETERMINATION OF AIRBORNE I-131 IN CHARCOAL CARTRIDGES BY GAMMA SPECTROSCOPY

PROCEDURE NO. TIML-I-131-02

Prepared by

Teledyne Isotopes Midwest Laboratory

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0	07-04-86	3	B. Grob	L. G. Huebner

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DETERMINATION OF AIRBORNE I-131 IN CHARCOAL CARTRIDGES BY GAMMA SPECTROSCOPY

Principle of Method

Each charcoal cartridge is placed on the detector and counted. A peak of 0.36 MeV is used to calculate the concentration at counting time. The equilibrium concentration at the end of collection is then calculated. Decay correction between the end of collection period and the counting time is then made.

Materials

Charcoal Cartridges

Apparatus

Counting Container
Germanium Detector
Plastic Bags
Plastic Bag Sealer
Paper Tape
Scissors

Procedure

NOTE: Because of the short half-life of I-131, count the samples as soon as possible after receipt and no later than 48 hours.

1. Load the charcoal cartridges in a specially designed holder or transfer charcoal from each cartridge to individual plastic bags. Seal the bags.

2. Label each bag with corresponding project ID, locations ID, and date of collection.

3. Place the bags in a standard geometry container, cap the container and secure the cap with a tape.

4. Place the holder or container on the detector and count for a period of time that will meet the required Lower Limit of Detection (LLD).

Calculation:

$$A_1 = \text{I-131 activity (pCi/sample)} = \frac{A}{2.22 \times B} \quad \text{(at counting time)} \qquad (1)$$

Where:

A = Net count rate of I-131 in the 0.36 MeV peak (cpm)

B = Efficiency for the I-131 in 0.36 MeV peak (cpm/dpm)

Correction for Equilibrium (assuming constant concentration over the sampling period) and Decay:

$$C = \frac{\lambda A_1 e^{\lambda t_1}}{F(1-e^{-\lambda t_2})} \qquad (2)$$

Where:

C = Equilibrium concentration of I-131 (pCi/m^3)

A_1 = Activity of I-131 at the time of counting (pCi/sample)

e = The base of the natural logarithm = 2.71828

λ = 0.693/half life (days) = 0.693/8.04 = 0.0862/day

t_1 = Elapsed time between the end of sampling and mid-counting point (in days)

t_2 = Duration of coll‹ tion (in days)

F = m^3/day

Reference: Radiation Safety Technician Training Course, Argonne National Laboratory, Section 14, pp. 361-364, May 1972.

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PROCEDURE FOR COMPOSITING WATER AND MILK SAMPLES

PROCEDURE NO. TIML-COMP-01

Prepared by

Teledyne Isotopes Midwest Laboratory

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Procedure for Compositing Water and Milk Samples

1. At the beginning of each composite period, (month, quarter, semi-annual), prepare a one-gallon cubitainer for a specific location and time-period.

2. Remove an equal aliquot of original sample (for example, one liter) and transfer to prepared cubitainer. Do this for each week, month, etc. Mark date of original sample on prepared cubitainer.

3. When prepared container is complete, give the sample to the recording clerk for assigning a number.

4. Analyze according to the client requirement.