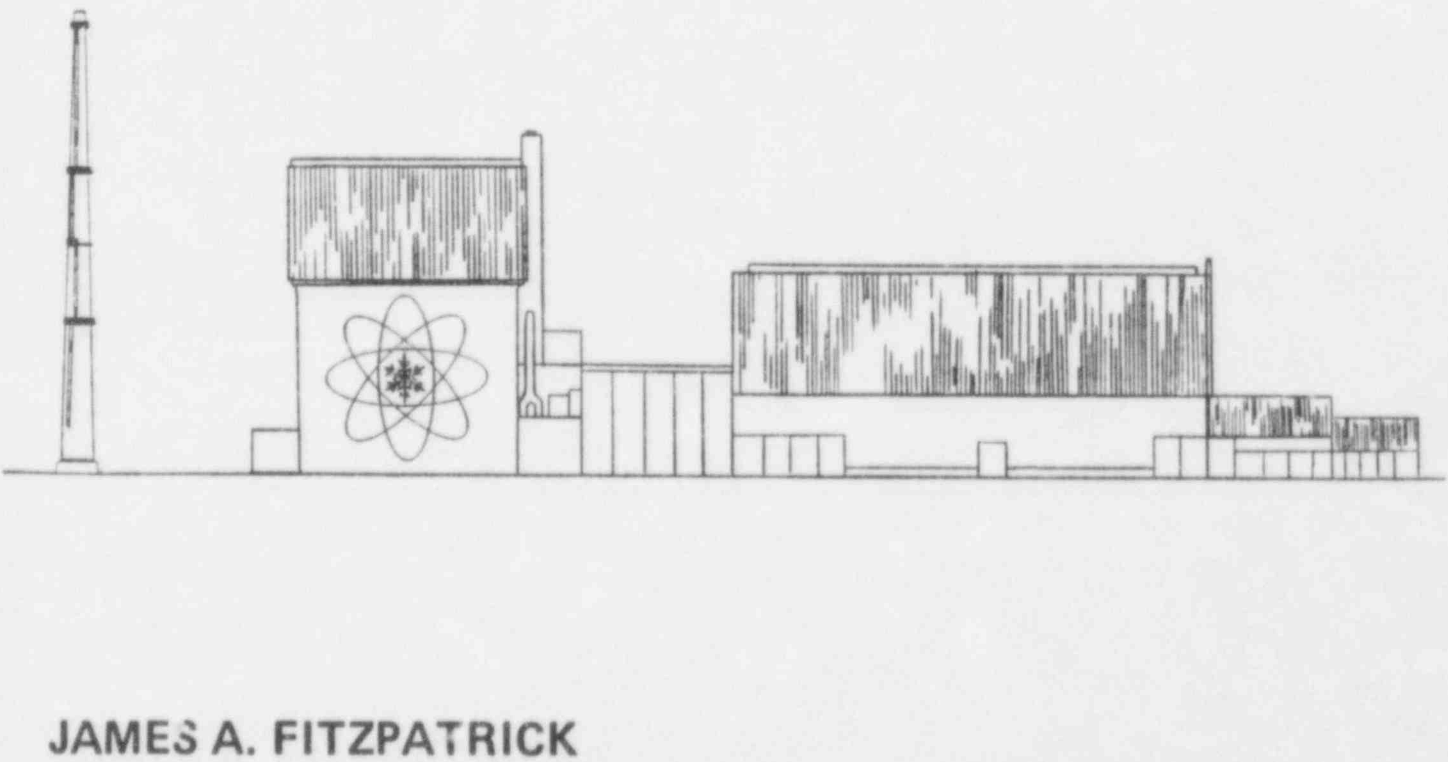
1983

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT

JANUARY 1, 1983 through DECEMBER 31, 1983



JAMES A. FITZPATRICK NUCLEAR POWER PLANT

OPERATING LICENSE NO. DPR- 59
DOCKET NO. 50- 333

NEW YORK POWER AUTHORITY

NEW YORK POWER AUTHORITY

ANNUAL ENVIRONMENTAL OPERATING REPORT
PART B: RADIOLOGICAL REPORT

JANUARY 1, 1983 - DECEMBER 31, 1983

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

FACILITY OPERATING LICENSE DPR-59

DOCKET NUMBER 50-333

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INTRODUCTION

I-A INTRODUCTION

The New York Power Authority (NYPA) is the owner and licensee of the James A. FitzPatrick Nuclear Power Plant (JAFNPP) which is located on the eastern portion of the Nine Mile Point promontory approximately one-half mile due east of the Niagara Mohawk Power Corporation (NMPC) Nine Mile Point Nuclear Power Station (NMPNPS). The NMPNPS Unit #1 is located on the western portion of the site and is a boiling water reactor with a design capacity of 620 MWe. The NMPNPS has been in commercial operation since the fall of 1969. Located between the JAFNPP and NMPNPS, Nine Mile Point Unit #2 is under construction. NMPNPS Unit #2 will have generation capacity of 1,100 MWe and is expected to be completed in 1986. The JAFNPP is a boiling water reactor with a power output of 810 MWe (net). Initial fuel loading of the reactor core was completed in November of 1974. Initial criticality was achieved in late November, 1974 and commercial operation began in July of 1975.

The site is located on the southern shore of Lake Ontario in Oswego County, New York, approximately seven miles northeast of the city of Oswego, New York. Syracuse, New York is the largest metropolitan center in the area and is located 40 miles to the south of the site. The area consists of partially wooded land and shoreline. The land adjacent to the site is used mainly for recreational and residential purposes. For many miles to the west, east and south the country is characterized by rolling terrain rising gently up from the lake, composed mainly of glacial deposits. Approximately 34 percent of the land area in Oswego County is devoted to farming.

The Radiological Environmental Monitoring Program for the FitzPatrick Plant is a site program with responsibility for the program shared by the Power Authority and Niagara Mohawk. Similar Technical Specifications for radiological monitoring of the environment allows for majority of the sampling and analysis to be a joint undertaking. Data generated by the program is shared by the two facilities with review and publication of the data undertaken through each organization.

This report is submitted in accordance with Section 5.6.1 of Appendix B, to DPR-59, Docket 50-333. Environmental reports of this nature have been compiled and submitted in semiannual and annual reports since 1974. This report contains data from samples representing the period from January 1, 1983 to December 31, 1983.

I-B PROGRAM OBJECTIVES

The objectives of the Radiological Environmental Monitoring Program are as follows:

1. To determine and evaluate the effects of plant operation on the environs and to verify the effectiveness of the controls on radioactive material sources.

2. To monitor and evaluate natural radiation levels in the environs of the JAFNPP site.

3. To meet the requirements of applicable state and federal regulatory guides and limits.

4. To provide information by which the general public can evaluate the environmental aspects of nuclear power using data which is factual and unbiased.

II

PROGRAM IMPLEMENTATION AND DESIGN

II PROGRAM IMPLEMENTATION AND DESIGN

To achieve the objectives listed in Section I-B, sampling and analysis are performed as outlined in Tables I and II in this section.

The sample collections for the radiological program are accomplished by a dedicated site environmental staff from both the James A. FitzPatrick Plant and the Nine Mile Point Station. The site staff is assisted by a contracted environmental engineering company, Ecological Analysts, Inc.(EA). EA was responsible for performing the 1983 Aquatic Ecology Study at the site which is required by Section 4.1, Appendix B of the plant operating license (DPR-59). The staff required by EA to perform the aquatic studies program is used to perform the radiological aquatic sampling and assists the site staff with the terrestrial sampling program.

1. SAMPLE COLLECTION METHODOLOGY

A. Lake Water (surface water)

The two indicator stations are the respective inlet canals at JAFNPP and NMPNPS. These samples are composited using continuously running pumps which discharge into large holding tanks.

The control station sample is collected from the city of Oswego water intake. The sample is drawn from the intake prior to treatment and is composited in a large sample bottle.

Quarterly composite samples are made up from proportional aliquotes of monthly samples.

B. Air Particulate/Iodine

The air sampling stations are located in two rings surrounding the site. The onsite locations ring the terrestrial area around the plants inside the site boundary.

The onsite sampling network is composed of nine stations. The offsite air monitoring locations range six to 17 miles from the site and are composed of six stations. Air monitoring locations are shown on Figures 1 and 2 of Section VII.

The air particulate glass fiber filters are approximately two inches in diameter and are placed in sample holders in the intake line of a vacuum sampler. Directly down stream from the particulate filter is a 2 x 1 inch charcoal cartridge used to absorb airborne radioiodine. The samplers run continuously and the charcoal cartridges and particulate filters are changed on a weekly basis.

The particulate filters are composited on a monthly basis by location (offsite, onsite) after being counted individually for gross beta activity.

C. Milk

During the first month of the 1983 grazing season, milk samples were collected from 10 locations. During the remainder of the 1983 grazing season, milk samples were collected from eight locations. Seven of these locations are considered indicator samples and the eighth is used as a control sample. Milk samples are collected in polyethylene bottles from the bulk storage tank at each sampled farm. Before the sample is drawn the tank contents are agitated from three to five minutes to assure a homogenous mixture of milk and butterfat. Two gallons are collected during the first week of each month from each of the farms. An additional one gallon is collected from each farm at mid month to make up the second half of the monthly composite. The complete composite is made up from one gallon collected during the first week of the month and one gallon from the mid month collection. The samples are frozen and shipped to the analytical contractor routinely within 36 hours of collection in insulated shipping containers. The milk sampling locations are found on Figure 4 of Section VII.

D. Meat, Poultry and Eggs

Semiannually one kilogram of meat is collected from locations within a 10 mile radius of the site. Periodic phone calls are made to the local slaughter houses to determine availability of slaughtered livestock from within the sampling area. Whenever possible meat samples are collected from locations previously used. Attempts are made to collect a control sample located outside the 10 mile radius, with each series of collections.

Semiannually one kilogram of poultry and one kilogram of eggs are collected from each of three locations within a 10 mile radius of the site. Attempts are made to collect poultry and eggs at the same time as the meat samples. The poultry and eggs are frozen and shipped in insulated containers. Whenever possible samples are obtained from previously sampled farms. Attempts are made to collect a control sample located outside the 10 mile radius, with each series of collections (see Section VII, Figure 5).

E. Human Food Crops

Human food crops are collected during the late summer harvest season at locations previously sampled, if available. One kilogram each, of the two types of fruits and/or vegetables from each of the three locations within a 10 mile radius of the site are collected. The types of fruits and vegetables sampled depend on what is locally available at the time of collection. Attempts are made to collect at least one broad leaf type vegetable from each location. The fruits and vegetables are chilled prior to shipping and shipped fresh in insulated containers. Attempts are made to collect a control sample located outside the 10 mile radius for each type of sample (see Section VII, Figure 5).

F. Soil Samples

Soil samples are required once every three years. Samples were collected during 1983. Soil samples were taken at each of the 15 air monitoring stations (see Figures VII-1 and VII-3).

G. Fish Samples

Available fish species are removed from the Nine Mile Point Aquatic Ecology Study monitoring collections during the spring and fall collection periods. Samples are collected from a combination of the four onsite sample transects and one offsite sample transect (see Section VII, Figure 1). Available species are selected under the following guidelines:

1) 0.5 to 1 kilogram of edible portion only of a maximum of three species per location.

2) Samples composed of more than 1 kilogram of single species from the same location are divided into samples of 1 kilogram each prior to shipping. A maximum of three samples per species per location are used. Weight of samples are the edible portions only.

Selected fish samples are frozen immediately after collection and segregated by species and location. Samples are shipped frozen in insulated containers for analysis.

H. GAMMARUS

GAMMARUS (fresh water shrimp) samples are collected by EA personnel during the spring and fall season from two onsite locations and from one offsite location. Natural and artificial substrates are used to collect samples. The GAMMARUS samples are removed from the sampling gear, frozen and shipped to the analytical contractor in insulated shipping containers.

I. Mollusks

During the spring and fall seasons at two onsite locations and one offsite location benthic samples are collected. The mollusks are collected by divers and sorted. The tissue is removed from the shell, frozen and shipped for analysis in insulated containers.

J. Bottom Sediments

One kilogram of bottom sediment sample is collected at two onsite locations and one offsite location. Samples are collected at the same time and location as the mollusk samples, where possible, by a diver. The samples are placed in plastic bags, sealed and shipped for analysis in insulated containers.

K. Periphyton

Periphyton (fresh water algae) samples are collected in the spring and fall seasons from two onsite locations and one offsite location. Periphyton is collected from natural substrates. The periphyton is scraped from the substrates into vials, labeled, frozen and shipped in insulated containers for offsite analysis.

L. TLD (direct radiation)

Thermoluminescent dosimeters (TLD's) are used to measure direct radiation in the JAF/NMP-1 environment. The TLD stations are placed around the site using a two zone distribution. The first group of TLD's is located within the site boundary and are called "onsite" TLD's. The second set of TLD stations is the "offsite" stations, located at the offsite air monitoring stations and in areas of special interest such as population centers. Also included in the offsite group are the field control TLD's. A total of 45 TLD stations were used for the 1983 TLD program.

TLD's used during the first three quarters of 1983 were made up of $CaSO_4$ dosimeters (two chips per dosimeter), sealed in a polyethylene package to insure dosimeter integrity. The TLD's used in the fourth quarter of 1983 were rectangular Teflon wafers impregnated with 25 percent $CaSO_4$:Dy phosphor. These were also sealed in a polyethylene package to insure dosimeter integrity. The TLD packages are further protected by placement in plastic holders, or by tape sealing to supporting surfaces. The dosimeters are collected, replaced and evaluated on a quarterly basis.

2. ANALYSIS PERFORMED

The analysis of the environmental samples is performed by the Radiation Management Corporation (RMC), Teledyne Isotopes (TI), and the James A. FitzPatrick Environmental Counting Laboratory (JAFECL). The following samples are analyzed at the JAFECL:

Air Particulate Filter - gross beta (weekly)

Air Particulate Filter Composites - gamma spectral analysis (monthly)

Airborne Radioiodine - gamma spectral analysis (weekly)

Surface Water Composites - gamma spectral analysis (monthly)

Special Samples (soil, etc.) - gamma spectral analysis (as collected)

The remainder of the sample analysis as outlined in Tables I and II in this section is performed by the RMC (January through June), or TI (July through December).

3. CHANGES TO THE 1983 SAMPLE PROGRAM

A. In January 1983 RMC was purchased by TI. Environmental samples were analyzed during the first half of 1983 by RMC under contract, and during the second half of 1983 by TI.

B. Milk sample locations number 14 and number 60 were deleted from the milk sampling program in June of 1983. These deletions were the result of the spring 1983 milch animal census which indicated that the other milk locations were in more critical locations for radionuclide deposition.

TABLE I

SAMPLE COLLECTION AND ANALYSIS

SITE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. LAKE PROGRAM[1]

MEDIA	ANALYSIS	FREQUENCY[4]	LOCATION[2]	
1. Fish	GeLi, ^{89}Sr & ^{90}Sr	2/yr	2 onsite	1 offsite
2. Mollusks	GeLi, ^{89}Sr & ^{90}Sr	2/yr	2 onsite	1 offsite
3. Gammarus	GeLi, ^{89}Sr & ^{90}Sr	2/yr	2 onsite	1 offsite
4. Bottom Sediments	GeLi, ^{90}Sr	2/yr	2 onsite	1 offsite
5. Periphyton	GeLi	2/yr	2 onsite	1 offsite
6. Lake Water	GB, GSA or GeLi ^{3}H, ^{89}Sr, ^{90}Sr	M Comp. Qtr. Comp.	3[3]	

Notes:

(1) Program continued for at least three years after the startup of James A. Fitzpatrick Nuclear Power Plant.
(2) Onsite locations samples collected in the vicinity of discharges, offsite samples collected at a distance of at least five miles from site.
(3) The three lake water samples to include Nine Mile Point Unit 1 intake water, James A. FitzPatrick intake water, and Oswego City water.
(4) Samples of items 1 through 5 collected in spring and fall when available.

TABLE II

SAMPLE COLLECTION AND ANALYSIS

SITE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

B. LAND PROGRAM(1)

MEDIA	ANALYSIS	FREQUENCY	NO. OF LOCATIONS	LOCATIONS	
1. Air Particulates	GB GSA	W M Comp.(6)	At least 10	9 onsite	6 offsite
2. Soil	GSA, ^{90}Sr	Every 3 years	15	9 onsite	6 offsite
3. TLD	Gamma Dose	Qtr.	20	14 onsite	6 offsite
4. Radiation Monitors	Gamma Dose	C	10	9 onsite	1 offsite
5. Airborne - I^{131}	GSA	W	At least 10	9 onsite	6 offsite
6. Milk	I GSA, ^{90}Sr	M M Comp.	4(7)	(8)	
7. Human Food Crops	GSA, ^{131}I	A	3	(8)	
8. Meat, Poultry, Eggs	GSA Edible Portion	SA	3	(8)	

Notes: (Cont.)

(6) Onsite samples counted together, offsite counted together, any high count samples counted separately.
(7) Frequency applied only during grazing season.
(8) Samples to be collected from farms within a 10-mile radius having the highest potential concentrations of radionuclides.

Abbreviations:

M Comp. - Monthly composite of weekly or bi-weekly samples
GB - Gross beta analysis
GeLi - Gamma spectral analysis on a GeLi system (quantitative)
GSA - Gamma spectral analysis on a NaI system (quantitative)

A - Annually
W - Weekly
M - Monthly
C - Continuous

BW - Bi-weekly (alternate wks.)
Qtr. - Quarterly
SA - Semiannually

III

SAMPLE SUMMARIES

III SAMPLE SUMMARIES

All sample data is summarized in table form. The tables are titled "Environmental Sample Data Summary" and use the following format:

A. Sample medium.

B. Type of analysis performed.

C. Number of analyses performed.

D. Range of detectable levels. The data column is labeled "Lower Limits of Detection". This wording indicates that inclusive data is based on 4.66 sigma of background.

E. Mean value of the data, based on positive measured values*.

F. Standard deviation, based on positive measured values. (The standard deviations represent the variability of measured results for different samples rather than single sample uncertainty*.)

G. Maximum and minimum values.

H. Range of the data, calculated by subtracting the minimum value from the maximum value.

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* Only positive measured values are used in statistical calculations. The use of LLD's in these calculations would result in the means being biased high and the standard deviations being biased low.

ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake Periphyton pCi/g (wet)	Gamma Isotopic							
	Control							
	Be-7	2	NONE	1.16	0.37	1.42	0.90	0.52
	K-40	2	NONE	2.00	1.37	2.97	1.03	1.94
	Mn-54	2	0.005 0.01	ALL LLD	-	-	-	-
	Co-60	2	0.006 0.009	ALL LLD	-	-	-	-
	Zr-95	2	0.008 0.02	ALL LLD	-	-	-	-
	Ru-106	2	0.04 0.09	ALL LLD	-	-	-	-
	Cs-137	2	NONE	0.10	0.06	0.14	0.06	0.08
	Ce-144	2	0.04 0.07	ALL LLD	-	-	-	-
	Ra-226	2	0.12 0.12	0.42	A	0.42	0.42	0.00
	Th-228	2	NONE	0.12	0.08	0.17	0.06	0.11
	Cs-134	2	0.006 0.01	ALL LLD	-	-	-	-
	Ru-103	2	0.009 0.02	ALL LLD	-	-	-	-
	Co-58	2	0.006 0.01	ALL LLD	-	-	-	-
	Fe-59	2	0.02 0.04	ALL LLD	-	-	-	-
	Indicator							
	Be-7	4	NONE	1.97	0.63	2.63	1.18	1.45
	K-40	4	NONE	2.02	1.04	3.53	1.17	2.36
	Mn-54	4	NONE	0.03	0.01	0.05	0.01	0.04
	Co-60	4	NONE	0.19	0.07	0.25	0.12	0.13
	Zr-95	4	0.009 0.02	ALL LLD	-	-	-	-
	Ru-106	4	0.06 0.10	ALL LLD	-	-	-	-
	Cs-137	4	NONE	0.35	0.23	0.69	0.17	0.52
	Ce-144	4	0.05 0.07	ALL LLD	-	-	-	-
	Ra-226	4	0.13 0.20	0.33	A	0.33	0.33	0.00
	Th-228	4	NONE	0.12	0.05	0.17	0.05	0.12
	Cs-134	4	0.009 0.01	0.05	A	0.05	0.05	0.00
	Ru-103	4	0.01 0.02	ALL LLD	-	-	-	-
	Co-58	4	0.009 0.02	ALL LLD	-	-	-	-
	Fe-59	4	0.02 0.04	ALL LLD	-	-	-	-

A - ONLY ONE POSITIVE VALUE, NO STATISTICS POSSIBLE.

ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake Mollusk pCi/g (wet)	Gamma Isotopic							
	Control							
	Nb-95	2	0.01 0.02	ALL LLD	-	-	-	-
	Zn-65	2	0.002 0.03	ALL LLD	-	-	-	-
	K-40	2	NONE	0.31	0.06	0.35	0.27	0.08
	Mn-54	2	0.01 0.01	ALL LLD	-	-	-	-
	Co-60	2	0.01 0.01	ALL LLD	-	-	-	-
	Ra-226	2	0.20 0.20	ALL LLD	-	-	-	-
	Co-58	2	0.01 0.02	ALL LLD	-	-	-	-
	Cs-137	2	0.01 0.01	ALL LLD	-	-	-	-
	Cs-134	2	0.01 0.01	ALL LLD	-	-	-	-
	Fe-59	2	0.02 0.05	ALL LLD	-	-	-	-
	Indicator							
	Nb-95	4	0.007 0.03	ALL LLD	-	-	-	-
	Zn-65	4	0.01 0.03	ALL LLD	-	-	-	-
	K-40	4	0.30 0.30	0.38	0.12	0.51	0.27	0.24
	Mn-54	4	NONE	0.14	0.03	0.18	0.10	0.08
	Co-60	4	NONE.	0.05	0.02	0.07	0.03	0.04
	Ra-226	4	0.20 0.40	0.21	A	0.21	0.21	0.00
	Co-58	4	0.006 0.02	ALL LLD	-	-	-	-
	Cs-137	4	0.007 0.02	ALL LLD	-	-	-	-
	Cs-134	4	0.006 0.02	ALL LLD	-	-	-	-
	Fe-59	4	0.01 0.06	ALL LLD	-	-	-	-
Lake Mollusk pCi/g (wet)	Sr-89, Sr-90							
	Control							
	Sr-89	2	0.009 0.04	ALL LLD	-	-	-	-
	Sr-90	2	NONE	0.035	0.007	0.04	0.03	0.01
	Indicator							
	Sr-89	4	0.009 0.20	ALL LLD	-	-	-	-
	Sr-90	4	NONE	0.11	0.03	0.14	0.07	0.07

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake Bottom Sediment pCi/g (dry)	Gamma Isotopic Sr-90							
	Control							
	Be-7	2	0.70 0.70	0.69	A	0.69	0.69	0.00
	K-40	2	NONE	8.82	2.24	10.40	7.23	3.17
	Co-60	2	0.02 0.05	ALL LLD	-	-	-	-
	Nb-95	2	0.02 0.09	ALL LLD	-	-	-	-
	Cs-137	2	NONE	0.24	0.08	0.29	0.18	0.11
	Cs-134	2	0.02 0.06	ALL LLD	-	-	-	-
	Ra-226	2	0.70 0.70	0.88	A	0.88	0.88	0.00
	Mn-54	2	0.02 0.05	ALL LLD	-	-	-	-
	Sr-90	2	0.002 0.002	0.14	A	0.14	0.14	0.00
	Indicator							
	Be-7	4	0.10 0.70	0.55	A	0.55	0.55	0.00
	K-40	4	NONE	12.27	3.50	16.70	8.27	8.43
	Co-60	4	NONE	0.14	0.03	0.16	0.10	0.06
	Nb-95	4	0.02 0.08	0.05	A	0.05	0.05	0.00
	Cs-137	4	NONE	0.33	0.11	0.43	0.18	0.25
	Cs-134	4	0.03 0.05	0.02	A	0.02	0.02	0.00
	Ra-226	4	0.50 0.70	1.02	0.47	1.36	0.69	0.67
	Mn-54	4	0.01 0.05	ALL LLD	-	-	-	-
	Sr-90	4	0.002 0.003	0.05	A	0.05	0.05	0.00

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake GAMMARUS pCi/g (wet)	Gamma Isotopic Sr-89, Sr-90							
	Control							
	Co-60	2	0.03 0.20	ALL LLD	-	-	-	-
	Mn-54	2	0.03 0.10	ALL LLD	-	-	-	-
	Cs-137	2	0.03 0.10	ALL LLD	-	-	-	-
	Cs-134	2	0.04 0.10	ALL LLD	-	-	-	-
	Zn-65	2	0.07 0.30	ALL LLD	-	-	-	-
	Sr-89	2	0.02 0.20	ALL LLD	-	-	-	-
	Sr-90	2	NONE	0.07	0.03	0.10	0.05	0.05
	Co-58	2	0.04 0.20	ALL LLD	-	-	-	-
	Fe-59	2	0.11 0.50	ALL LLD	-	-	-	-
	Indicator							
	Co-60	4	0.04 0.80	0.05	A	0.05	0.05	0.00
	Mn-54	4	0.03 0.80	ALL LLD	-	-	-	-
	Cs-137	4	0.03 0.90	0.21	0.21	0.36	0.06	0.30
	Cs-134	4	0.03 0.90	ALL LLD	-	-	-	-
	Zn-65	4	0.07 2.00	ALL LLD	-	-	-	-
	Sr-89	4	0.03 1.00	ALL LLD	-	-	-	-
	Sr-90	4	0.40 0.40	0.18	0.03	0.21	0.16	0.05
	Co-58	4	0.04 1.00	ALL LLD	-	-	-	-
	Fe-59	4	0.09 3.00	ALL LLD	-	-	-	-

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake Fish pCi/g (wet)	Gamma Isotopic Sr-89, Sr-90							
	Control							
	K-40	6	NONE	3.13	0.33	3.78	2.83	0.95
	Mn-54	6	0.007 0.02	ALL LLD	-	-	-	-
	Cs-137	6	NONE	0.05	0.009	0.06	0.04	0.02
	Cs-134	6	0.007 0.02	ALL LLD	-	-	-	-
	Co-58	6	0.008 0.03	ALL LLD	-	-	-	-
	Sr-89	6	0.004 0.03	ALL LLD	-	-	-	-
	Sr-90	6	0.002 0.003	ALL LLD	-	-	-	-
	Co-60	6	0.007 0.02	ALL LLD	-	-	-	-
	Fe-59	6	0.02 0.08	ALL LLD	-	-	-	-
	Zn-65	6	0.02 0.04	ALL LLD	-	-	-	-
	Indicator							
	K-40	12	NONE	3.26	0.37	3.93	2.65	1.28
	Mn-54	12	0.005 0.02	ALL LLD	-	-	-	-
	Cs-137	12	NONE	0.05	0.009	0.06	0.03	0.03
	Cs-134	12	0.005 0.02	ALL LLD	-	-	-	-
	Co-58	12	0.006 0.04	ALL LLD	-	-	-	-
	Sr-89	12	0.001 0.10	ALL LLD	-	-	-	-
	Sr-90	12	0.001 0.003	ALL LLD	-	-	-	-
	Co-60	12	0.005 0.03	ALL LLD	-	-	-	-
	Fe-59	12	0.02 0.10	ALL LLD	-	-	-	-
	Zn-65	12	0.01 0.05	ALL LLD	-	-	-	-

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake Water Analysis pCi/l	Gross Beta							
	Control	12	NONE	2.98	1.74	7.92	1.47	6.45
	Indicator	24	2.6 3.0	3.34	1.59	7.90	0.57	7.33
Lake Water Analysis pCi/l	Tritium							
	Control	4	NONE	250	21.8	280	230	50
	Indicator	8	NONE	317	116.9	560	190	370
Lake Water Analysis pCi/l	Sr-89							
	Control	4	0.76 2.00	ALL LLD	-	-	-	-
	Indicator	8	0.59 2.00	ALL LLD	-	-	-	-
Lake Water Analysis pCi/l	Sr-90							
	Control	4	0.90 0.90	0.89	0.08	0.97	0.82	0.15
	Indicator	8	0.70 0.70	0.83	0.21	1.10	0.60	0.50

A - ONLY ONE POSITIVE VALUE, NO STATISTICS POSSIBLE.

ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Lake Water Analysis pCi/l	Gamma Isotopic							
	Control							
	Ce-144	12	2.78 6.34	ALL LLD	-	-	-	-
	Cs-134	12	0.46 1.53	ALL LLD	-	-	-	-
	Cs-137	12	0.50 1.62	ALL LLD	-	-	-	-
	Zr-95	12	1.67 4.53	ALL LLD	-	-	-	-
	Nb-95	12	1.21 3.59	ALL LLD	-	-	-	-
	Co-58	12	0.66 1.88	ALL LLD	-	-	-	-
	Mn-54	12	0.51 1.72	ALL LLD	-	-	-	-
	Fe-59	12	0.90 3.11	ALL LLD	-	-	-	-
	Co-60	12	0.51 1.95	ALL LLD	-	-	-	-
	Indicator							
	Ce-144	24	3.27 6.70	ALL LLD	-	-	-	-
	Cs-134	24	0.65 1.24	ALL LLD	-	-	-	-
	Cs-137	24	0.60 1.36	ALL LLD	-	-	-	-
	Zr-95	24	2.64 4.73	ALL LLD	-	-	-	-
	Nb-95	24	1.27 3.33	ALL LLD	-	-	-	-
	Co-58	24	1.02 2.04	ALL LLD	-	-	-	-
	Mn-54	24	0.75 1.40	ALL LLD	-	-	-	-
	Fe-59	24	1.26 3.09	ALL LLD	-	-	-	-
	Co-60	24	1.02 2.00	ALL LLD	-	-	-	-
Airborne Particulate Analysis pCi/m^3	Gross Beta Activity							
	Control	312	NONE	0.024	0.009	0.085	0.007	0.078
	Indicator	468	NONE	0.023	0.009	0.062	0.003	0.059

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Airborne Particulate Analysis pCi/m³ x 10⁻³	Gamma Isotopic							
	Control							
	Co-60	12	0.18 0.27	0.29	0.19	0.53	0.11	0.42
	Mn-54	12	0.14 0.25	ALL LLD	-	-	-	-
	Co-58	12	0.17 0.28	ALL LLD	-	-	-	-
	Nb-95	12	0.18 0.34	ALL LLD	-	-	-	-
	Zr-95	12	0.35 0.60	ALL LLD	-	-	-	-
	Cs-137	12	0.15 0.26	0.19	0.06	0.26	0.11	0.15
	Cs-134	12	0.12 0.20	ALL LLD	-	-	-	-
	Ce-141	12	0.23 0.36	ALL LLD	-	-	-	-
	Ce-144	12	0.65 0.94	ALL LLD	-	-	-	-
	Ru-103	12	0.16 0.28	ALL LLD	-	-	-	-
	Be-7	12	NONE	107.2	21.2	136.0	77.6	58.4
	Indicator							
	Co-60	12	0.15 0.24	0.35	0.24	0.71	0.18	0.53
	Mn-54	12	0.11 0.18	0.27	A	0.27	0.27	0.0
	Co-58	12	0.13 0.20	ALL LLD	-	-	-	-
	Nb-95	12	0.15 0.29	ALL LLD	-	-	-	-
	Zr-95	12	0.28 0.43	ALL LLD	-	-	-	-
	Cs-137	12	0.13 0.18	0.19	0.04	0.25	0.13	0.12
	Cs-134	12	0.10 0.17	ALL LLD	-	-	-	-
	Ce-141	12	0.21 0.32	ALL LLD	-	-	-	-
	Ce-144	12	0.53 0.76	ALL LLD	-	-	-	-
	Ru-103	12	0.14 0.21	ALL LLD	-	-	-	-
	Be-7	12	NONE	97.4	20.5	133.0	74.8	58.2
Airborne Iodine Analysis pCi/m³	Gamma Analysis I-131							
	Control	312	0.005 0.115	ALL LLD	-	-	-	-
	Indicator	468	0.006 0.070	0.028	0.007	0.035	0.022	0.013

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Environmental TLD Readings mrem/Standard Month	Offsite TLD's							
	First Quarter	23	NONE	5.9	0.4	7.2	5.2	2.0
	Second Quarter	23	NONE	5.7	0.5	6.8	4.6	2.2
	Third Quarter	22	NONE	5.1	0.4	5.8	4.2	1.6
	Fourth Quarter	22	NONE	5.5	0.5	6.6	4.7	1.9
	Year	90	NONE	5.5	0.4	7.2	4.2	3.0
	Onsite Monitor TLD's (Excluding D-1 Onsite)							
	First Quarter	8	NONE	6.4	1.2	9.0	5.3	3.7
	Second Quarter	8	NONE	6.3	0.7	7.5	5.1	2.4
	Third Quarter	6	NONE	5.4	0.3	5.9	5.0	0.9
	Fourth Quarter	8	NONE	6.6	0.9	8.5	5.6	2.9
	Year	30	NONE	6.2	0.9	9.0	5.0	4.0
Continuous Radiation Monitors mR/hr (Average Monthly Value)	Exposure Rate Location							
	Offsite							
	C	13	NONE	0.017	0.004	0.030	0.013	0.017
	Onsite							
	D-1	13	NONE	0.019	0.004	0.025	0.011	0.014
	D-2	13	NONE	0.015	0.002	0.020	0.012	0.008
	E	13	NONE	0.016	0.002	0.020	0.013	0.007
	F	13	NONE	0.022	0.005	0.033	0.015	0.018
	G	13	NONE	0.021	0.003	0.025	0.015	0.010
	H	13	NONE	0.022	0.002	0.025	0.020	0.005
	I	13	NONE	0.021	0.005	0.028	0.013	0.015
	J	13	NONE	0.014	0.002	0.018	0.012	0.006
	K	13	NONE	0.017	0.002	0.018	0.012	0.006

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Milk Analysis pCi/l	I-131							
	Location							
	No. 4	8	0.14 0.40	ALL LLD	-	-	-	-
	No. 7	8	0.16 0.42	ALL LLD	-	-	-	-
	No. 5	8	0.14 0.50	ALL LLD	-	-	-	-
	No. 14	1	0.25 0.25	ALL LLD	-	-	-	-
	No. 16	8	0.10 0.30	ALL LLD	-	-	-	-
	No. 45	8	0.17 0.33	ALL LLD	-	-	-	-
	No. 40 (Control)	8	0.12 0.30	ALL LLD	-	-	-	-
	No. 50	8	0.16 0.40	ALL LLD	-	-	-	-
	No. 55	8	0.17 0.40	ALL LLD	-	-	-	-
	No. 60	1	0.32 0.32	ALL LLD	-			
Milk Analysis pCi/l	Gamma Isotopic Sr-90							
	Location							
	No. 4							
	K-40	8	NONE	1219	158.3	1500	1060	440
	Cs-137	8	4.2 6.0	ALL LLD	-	-	-	-
	Cs-134	8	3.3 6.0	ALL LLD	-	-	-	-
	La-140	8	5.0 11.0	ALL LLD	-	-	-	-
	Ba-140	8	5.0 57.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	2.71	0.79	3.97	1.30	2.67
	No. 7							
	K-40	8	NONE	1280	224.1	1520	923	597
	Cs-137	8	4.0 8.0	ALL LLD	-	-	-	-
	Cs-134	8	2.8 8.0	ALL LLD	-	-	-	-
	La-140	8	5.1 10.0	ALL LLD	-	-	-	-
	Ba-140	8	5.1 45.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	2.48	0.95	4.10	1.30	2.80

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Milk Analysis pCi/l	Gamma Isotopic Sr-90 (cont.)							
	Location							
	No. 5							
	K-40	8	NONE	1219	136.2	1400	990	410
	Cs-137	8	4.1 8.0	5.1	A	5.1	5.1	0.0
	Cs-134	8	3.9 7.0	ALL LLD	-	-	-	-
	La-140	8	3.8 13.0	ALL LLD	-	-	-	-
	Ba-140	8	3.8 56.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	2.38	0.89	4.10	1.00	3.10
	No. 14							
	K-40	1	NONE	1300	A	1300	1300	0.00
	Cs-137	1	4.4 4.4	ALL LLD	-	-	-	-
	Cs-134	1	3.6 3.6	ALL LLD	-	-	-	-
	La-140	1	11.0 11.0	ALL LLD	-	-	-	-
	Ba-140	1	40.0 40.0	ALL LLD	-	-	-	-
	Sr-90	1	NONE	4.45	A	4.45	4.45	0.00
	No. 16							
	K-40	8	NONE	1254	208.9	1500	938	562
	Cs-137	8	3.6 6.0	ALL LLD	-	-	-	-
	Cs-134	8	2.6 7.0	ALL LLD	-	-	-	-
	La-140	8	5.7 11.0	ALL LLD	-	-	-	-
	Ba-140	8	5.7 46.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	3.03	1.11	4.72	1.60	3.12

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Milk Analysis pCi/l	Gamma Isotopic Sr-90 (cont.)							
	Location							
	No. 45							
	K-40	8	NONE	1250	169.5	1500	1010	490
	Cs-137	8	4.0 8.0	ALL LLD	-	-	-	-
	Cs-134	8	3.2 8.0	ALL LLD	-	-	-	-
	La-140	8	5.0 11.0	ALL LLD	-	-	-	-
	Ba-140	8	5.0 48.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	2.87	0.98	4.06	1.30	2.76
	No. 40 (Control)							
	K-40	8	NONE	1280	188.2	1600	1070	530
	Cs-137	8	3.5 7.5	ALL LLD	-	-	-	-
	Cs-134	8	2.9 7.0	ALL LLD	-	-	-	-
	La-140	8	5.5 9.1	ALL LLD	-	-	-	-
	Ba-140	8	5.5 50.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	1.91	0.50	2.60	1.00	1.60

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Milk Analysis pCi/l	Gamma Isotopic Sr-90 (cont.)							
	Location							
	No. 50							
	K-40	8	NONE	1244	198.6	1500	1020	480
	Cs-137	8	4.6 7.9	ALL LLD	-	-	-	-
	Cs-134	8	3.4 7.7	ALL LLD	-	-	-	-
	La-140	8	7.0 11.0	ALL LLD	-	-	-	-
	Ba-140	8	7.0 60.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	1.86	0.62	3.17	1.10	2.07
	No. 55							
	K-40	7	NONE	1302	205.0	1500	947	553
	Cs-137	7	4.0 7.4	ALL LLD	-	-	-	-
	Cs-134	7	3.4 7.1	ALL LLD	-	-	-	-
	La-140	7	4.5 11.0	ALL LLD	-	-	-	-
	Ba-140	7	4.5 43.0	ALL LLD	-	-	-	-
	Sr-90	7	NONE	2.66	1.27	5.05	1.27	3.78
	No. 60							
	K-40	1	NONE	1500	A	1500	1500	0.00
	Cs-137	1	4.5 4.5	ALL LLD	-	-	-	-
	Cs-134	1	3.2 3.2	ALL LLD	-	-	-	-
	La-140	1	9.5 9.5	ALL LLD	-	-	-	-
	Ba-140	1	50.0 50.0	ALL LLD	-	-	-	-
	Sr-90	1	NONE	3.79	A	3.79	3.79	0.00

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Meat & Poultry pCi/g (wet)	Gamma Isotopic							
	Control							
	Co-60	4	0.005 0.019	ALL LLD	-	-	-	-
	K-40	4	NONE	2.7	0.7	3.3	1.7	1.6
	Cs-134	4	0.005 0.014	ALL LLD	-	-	-	-
	Cs-137	4	0.006 0.014	ALL LLD	-	-	-	-
	Co-58	4	0.006 0.021	ALL LLD	-	-	-	-
	Mn-54	4	0.005 0.015	ALL LLD	-	-	-	-
	Ce-144	4	0.04 0.08	ALL LLD	-	-	-	-
	Be-7	4	0.05 0.22	ALL LLD	-	-	-	-
	Indicator							
	Co-60	12	0.004 0.019	ALL LLD	-	-	-	-
	K-40	12	NONE	2.9	0.3	3.4	2.3	1.1
	Cs-134	12	0.005 0.019	ALL LLD	-	-	-	-
	Cs-137	12	0.007 0.018	0.02	0.01	0.04	0.01	0.03
	Co-58	12	0.005 0.031	ALL LLD	-	-	-	-
	Mn-54	12	0.004 0.021	ALL LLD	-	-	-	-
	Ce-144	12	0.03 0.15	ALL LLD	-	-	-	-
	Be-7	12	0.04 0.31	ALL LLD	-	-	-	-

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Chicken Eggs pCi/g (wet)	Gamma Isotopic							
	Control							
	Co-60	2	0.009 0.030	ALL LLD	-	-	-	-
	K-40	2	NONE	0.88	0.18	1.01	0.75	0.26
	Cs-134	2	0.008 0.018	ALL LLD	-	-	-	-
	Cs-137	2	0.008 0.019	ALL LLD	-	-	-	-
	Co-58	2	0.009 0.035	ALL LLD	-	-	-	-
	Mn-54	2	0.008 0.021	ALL LLD	-	-	-	-
	Ce-144	2	0.06 0.16	ALL LLD	-	-	-	-
	Be-7	2	0.11 0.37	ALL LLD	-	-	-	-
	Indicator							
	Co-60	6	0.005 0.024	ALL LLD	-	-	-	-
	K-40	6	NONE	1.10	0.10	1.14	0.90	0.24
	Cs-134	6	0.005 0.022	ALL LLD	-	-	-	-
	Cs-137	6	0.005 0.024	ALL LLD	-	-	-	-
	Co-58	6	0.005 0.038	ALL LLD	-	-	-	-
	Mn-54	6	0.005 0.024	ALL LLD	-	-	-	-
	Ce-144	6	0.04 0.18	ALL LLD	-	-	-	-
	Be-7	6	0.05 0.40	ALL LLD	-	-	-	-

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Produce pCi/g (wet)	Gamma Isotopic							
	Control							
	K-40	2	NONE	2.04	1.17	2.86	1.21	1.65
	Cs-134	2	0.007 0.012	ALL LLD	-	-	-	-
	Cs-137	2	0.007 0.013	ALL LLD	-	-	-	-
	Be-7	2	0.06 0.013	ALL LLD	-	-	-	-
	Ce-144	2	0.06 0.08	ALL LLD	-	-	-	-
	Nb-95	2	0.006 0.011	ALL LLD	-	-	-	-
	Indicator							
	K-40	6	NONE	2.58	1.27	4.58	1.57	3.01
	Cs-134	6	0.006 0.016	ALL LLD	-	-	-	-
	Cs-137	6	0.006 0.016	ALL LLD	-	-	-	-
	Be-7	6	0.04 0.13	ALL LLD	-	-	-	-
	Ce-144	6	0.04 0.11	ALL LLD	-	-	-	-
	Nb-95	6	0.005 0.014	ALL LLD	-	-	-	-
Produce pCi/g (wet)	I-131							
	Control	2	0.009 0.014	ALL LLD	-	-	-	-
	Indicator	6	0.007 0.019	ALL LLD	-	-	-	-

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ENVIRONMENTAL SAMPLE DATA SUMMARY

SAMPLE MEDIUM (units)	TYPE OF ANALYSIS PERFORMED AND NUCLIDE	NO. OF ANALYSIS PERFORMED	LOWER LIMITS OF DETECTION (range)	MEAN	STANDARD DEVIATION	MAXIMUM VALUE	MINIMUM VALUE	RANGE
Soil pCi/g (dry)	Gamma Isotopic							
	Control							
	K-40	6	NONE	12.5	3.4	18.1	9.0	9.1
	Cs-137	6	NONE	0.67	0.49	1.46	0.20	1.26
	Ra-226	6	0.96 1.40	1.47	0.26	1.77	1.30	0.47
	Th-228	6	NONE	0.72	0.15	0.94	0.55	0.39
	Indicator							
	K-40	9	NONE	12.9	3.5	19.4	7.2	12.2
	Cs-137	9	0.043 0.045	0.42	0.41	1.19	0.07	1.12
	Ra-226	9	0.71 0.99	1.44	0.42	2.15	1.13	1.02
	Th-228	9	NONE	0.69	0.15	0.94	0.52	0.42
Soil pCi/g (dry)	Sr-90							
	Control	6	NONE	0.18	0.09	0.32	0.10	0.22
	Indicator	9	0.037 0.038	0.18	0.18	0.47	0.03	0.44

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IV

ANALYTICAL RESULTS

IV ANALYTICAL RESULTS

Sample Summaries

Environmental sample data is summarized by tables. Tables are provided for select sample media and contain data summaries based on quarterly mean values. Mean values are comprised of both positive and LLD values where applicable. These tables are entitled "Environmental Sample Summary".

TABLE 1

CONCENTRATIONS OF GAMMA EMITTERS IN PERIPHYTON SAMPLES
Results in Units of pCi/g (wet) ± 2 sigma

COLLECTION SITE	NUCLIDES FOUND	JUNE 1983	AUGUST 1983
FitzPatrick (03)	Be-7	2.63 ±0.26	2.28 ±0.23
	K-40	1.17 ±0.12	1.74 ±0.17
	Mn-54	0.013±0.006	0.047±0.009
	Co-58	<0.01	<0.011
	Fe-59	<0.03	<0.03
	Co-60	0.238±0.024	0.251±0.025
	Zn-65	<0.02	<0.018
	Cs-134	0.048±0.007	<0.011
	Cs-137	0.685±0.069	0.327±0.033
	Ra-226	<0.20	<0.15
	Th-228	0.048±0.007	0.166±0.017
	Others	<LLD	<LLD
Nine Mile Point (02)	Be-7	1.18 ±0.16	1.78 ±0.18
	K-40	3.53 ±0.35	1.63 ±0.16
	Mn-54	0.024±0.011	0.037±0.007
	Co-58	<0.02	<0.01
	Fe-59	<0.04	<0.023
	Co-60	0.120±0.014	0.142±0.014
	Zn-65	<0.03	<0.015
	Cs-134	<0.01	<0.009
	Cs-137	0.171±0.017	0.207±0.021
	Ra-226	0.328±0.167	<0.13
	Th-228	0.141±0.014	0.119±0.012
	Others	<LLD	<LLD
Oswego (Control - 00)	Be-7	1.42 ±0.14	0.901±0.090
	K-40	2.97 ±0.30	1.03 ±0.10
	Mn-54	<0.01	<0.005
	Co-58	<0.01	<0.006
	Fe-59	<0.04	<0.017
	Co-60	<0.009	<0.006
	Zn-65	<0.02	<0.011
	Cs-134	<0.01	<0.006
	Cs-137	0.136±0.014	0.056±0.006
	Ra-226	0.423±0.137	<0.12
	Th-228	0.173±0.017	0.058±0.006
	Others	<LLD	<LLD

TABLE 2

CONCENTRATIONS OF STRONTIUM-90 AND GAMMA EMITTERS IN BOTTOM SEDIMENT SAMPLES

Results in Units of pCi/g (dry) ± 2 sigma

COLLECTION SITE	COLLECTION DATE	Sr-90	GAMMA EMITTERS K-40	Co-60	Cs-134	Cs-137	Ra-226	OTHERS
FitzPatrick (03)	06/16/83	<0.002	8.27±0.83	0.102±0.028	<0.03	0.179±0.028	<0.50	<LLD
	10/10/83	<0.002	11.3 ±1.1	0.130±0.013	0.025±0.012	0.309±0.031	0.694±0.201	<LLD
Nine Mile Point (02)	06/16/83	0.051±0.02	16.7 ±1.7	0.164±0.047	<0.05	0.382±0.058	<0.70	<LLD
	10/05/83	<0.003	12.8 ±1.3	0.146±0.028	<0.03	0.426±0.043	1.36 ±0.39	<LLD
Oswego (Control - 00)	06/15/83	0.140±0.04	7.23±0.80	<0.05	<0.06	0.1[illegible]2±0.052	<0.70	<LLD
	10/04/83	<0.002	10.4 ±1.0	<0.02	<0.020	0.287±0.029	0.884±0.270	<LLD

TABLE 3

CONCENTRATIONS OF STRONTIUM-89 AND STRONTIUM-90 AND GAMMA EMITTERS IN MOLLUSK SAMPLES

Results in Units of pCi/g (wet) ± 2 sigma

COLLECTION SITE	COLLECTION DATE	Sr-89	Sr-90	K-40	Mn-54	GAMMA EMITTERS Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	Ra-226	OTHERS
FitzPatrick (03)	06/17/83	<0.20	0.13 ±0.01	0.507±0.132	0.149±0.027	<0.02	<0.06	0.068±0.021	<0.03	<0.02	<0.02	<0.40	<LLD
	10/10/83	<0.009	0.074±0.002	0.265±0.07	0.178±0.018	<0.008	<0.01	0.062±0.008	<0.02	<0.009	<0.01	<0.20	<LLD
Nine Mile Point (02)	06/16/83	<0.06	0.14 ±0.01	<0.30	0.130±0.016	<0.02	<0.04	0.036±0.012	<0.03	<0.02	<0.02	<0.30	<LLD
	10/05/83	<0.009	0.083±0.002	0.371±0.059	0.104±0.010	<0.006	<0.01	0.030±0.006	<0.01	<0.006	<0.007	0.209±0.109	<LLD
Oswego (Control - 00)	06/15/83	<0.04	0.04 ±0.004	0.348±0.097	<0.01	<0.02	<0.05	<0.01	<0.03	<0.01	<0.01	<0.20	<LLD
	10/04/83	<0.009	0.034±0.001	0.271±0.085	<0.01	<0.01	<0.02	<0.01	<0.002	<0.01	<0.01	<0.20	<LLD

TABLE 4

CONCENTRATIONS OF STRONTIUM-89 AND STRONTIUM-90 AND GAMMA EMITTERS IN GAMMARUS SAMPLES

Results in Units of pCi/g (wet) ± 2 sigma

COLLECTION SITE	COLLECTION DATE	Sr-89	Sr-90	Mn-54	Co-58	GAMMA EMITTERS Fe-59	Co-60	Zn-65	Cs-137	Cs-137	OTHERS
FitzPatrick (03)	06/01/83 to 06/15/83	<1.0	<0.40	<0.80	<1.0	<3.0	<0.80	<2.0	<0.9	<0.9	<LLD
	08/15/83 to 08/29/83	<0.04	0.18 ±0.01	<0.027	<0.036	<0.087	0.049±0.024	<0.061	<0.028	0.057±0.023	K-40 1.93±0.26 ALL OTHERS <LLD
Nine Mile Point (02)	06/01/83 to 06/15/83	<0.20	0.21 ±0.08	<0.20	<0.20	<0.50	<0.20	<0.40	<0.20	0.357±0.130	<LLD
	08/15/83 to 08/29/83	<0.03	0.16 ±0.01	<0.028	<0.036	<0.09	<0.036	<0.062	<0.032	<0.032	K-40 1.68±0.26 ALL OTHERS <LLD
Oswego (Control - 00)	06/01/83 to 06/15/83	<0.20	0.096±0.039	<0.10	<0.20	<0.50	<0.20	<0.30	<0.10	<0.10	<LLD
	08/15/83 to 08/29/83	<0.020	0.053±0.004	<0.034	<0.043	<0.11	<0.03	<0.068	<0.036	<0.034	K-40 1.10±0.28 ALL OTHERS <LLD

TABLE 5

CONCENTRATIONS OF STRONTIUM-89 AND STRONTIUM-90 AND GAMMA EMITTERS IN FISH SAMPLES

Results in Units of pCi/g (wet) ± 2 sigma

SAMPLE DATE	SAMPLE TYPE	Sr-89	Sr-90	GAMMA EMITTERS K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS
				FITZPATRICK								
May 1983	Brown Trout	<0.084	<0.003	3.1±0.31	<0.017	<0.027	<0.092	<0.020	<0.049	<0.015	0.042±0.013	ALL<LLD
	Lake Trout #1	<0.033	<0.002	3.1±0.31	<0.016	<0.027	<0.084	<0.019	<0.045	<0.013	0.038±0.015	ALL<LLD
	Lake Trout #2	<0.095	<0.003	3.8±0.38	<0.022	<0.034	<0.100	<0.030	<0.050	<0.018	0.051±0.014	ALL<LLD
October 1983	Brown Trout	<0.002	<0.001	3.7±0.37	<0.005	<0.007	<0.018	<0.005	<0.013	<0.005	0.050±0.006	ALL<LLD
	Lake Trout#1	<0.003	<0.001	3.2±0.32	<0.006	<0.007	<0.022	<0.007	<0.015	<0.006	0.055±0.007	ALL<LLD
	Lake Trout#2	<0.002	<0.001	2.7±0.27	<0.007	<0.008	<0.020	<0.008	<0.014	<0.007	0.039±0.008	ALL<LLD
				NINE MILE POINT								
May 1983	Brown Trout	<0.099	<0.003	3.2±0.32	<0.020	<0.035	<0.100	<0.019	<0.047	<0.019	0.046±0.015	ALL<LLD
	Lake Trout #1	<0.052	<0.002	3.3±0.33	<0.018	<0.030	<0.089	<0.025	<0.041	<0.015	0.056±0.011	ALL<LLD
	Lake Trout #2	<0.066	<0.003	2.9±0.29	<0.014	<0.024	<0.083	<0.018	<0.042	<0.013	0.033±0.010	ALL<LLD
October 1983	Brown Trout	*	*	3.9±0.39	<0.006	<0.007	<0.019	<0.006	<0.014	<0.005	0.041±0.006	ALL<LLD
	Lake Trout#1	<0.002	<0.001	3.0±0.30	<0.009	<0.006	<0.016	<0.006	<0.015	<0.006	0.038±0.007	ALL<LLD
	Lake Trout#2	<0.002	<0.001	3.3±0.33	<0.006	<0.010	<0.025	<0.009	<0.022	<0.010	0.047±0.009	ALL<LLD
				OSWEGO								
CONTROL												
May 1983	Brown Trout	<0.027	<0.001	3.1±0.31	<0.016	<0.026	<0.083	<0.021	<0.040	<0.014	0.046±0.010	ALL<LLD
	Lake Trout #1	<0.031	<0.002	3.0±0.30	<0.018	<0.029	<0.073	<0.016	<0.044	<0.016	0.057±0.015	ALL<LLD
	Lake Trout #2	<0.033	<0.002	3.0±0.30	<0.013	<0.019	<0.060	<0.016	<0.035	<0.012	0.049±0.010	ALL<LLD
October 1983	Brown Trout	<0.006	<0.002	3.8±0.38	<0.007	<0.009	<0.025	<0.007	<0.017	<0.007	0.057±0.007	ALL<LLD
	Lake Trout#1	<0.004	<0.002	2.8±0.28	<0.007	<0.008	<0.023	<0.007	<0.017	<0.007	0.041±0.006	ALL<LLD
	Lake Trout#2	<0.004	<0.002	3.1±0.31	<0.008	<0.010	<0.029	<0.008	<0.020	<0.009	0.044±0.008	ALL<LLD

*Sample lost in analysis for Sr-89 and Sr-90.

TABLE 6

CONCENTRATIONS OF BETA EMITTERS IN LAKE WATER SAMPLES - 1983

Results in Units of pCi/l ± 2 sigma

Station code	January	February	March	April	May	June
JAF Inlet	0.6±0.5	1.8±0.6	2.6±0.7	2.7±0.6	2.9±0.7	3.1±1.3
NMP Inlet	0.6±0.5	2.5±0.7	2.5±0.6	0.6±0.4	2.9±0.7	7.9±1.7
Raw City Water (control)	0.8±0.6	2.1±0.6	1.8±0.6	1.5±0.5	2.6±0.7	2.3±1.2

Station code	July	August	September	October	November	December
JAF Inlet	2.2±1.2	3.2±0.5	4.2±1.9	<2.6	3.1±1.8	<2.0
NMP Inlet	3.5±1.3	2.9±1.2	3.0±1.8	<2.6	3.3±1.8	3.5±1.7
Raw City Water (control)	2.4±1.2	2.6±1.2	3.5±1.8	2.7±1.8	3.3±1.9	<2.0

TABLE 7

CONCENTRATIONS OF TRITIUM AND STRONTIUM-89 AND STRONTIUM-90 IN LAKE WATER
(QUARTER COMPOSITE SAMPLES)

Results in Units of pCi/l ± 2 sigma

STATION CODE	PERIOD	DATE	TRITIUM	Sr-89	Sr-90
JAF INLET	First Quarter	12/30/82 to 03/31/83	249 ± 130	<0.593	1.764 ± 0.33
	Second Quarter	03/31/83 to 06/30/83	260 ± 140	<2.00	1.00 ± 0.50
	Third Quarter	06/30/83 to 09/30/83	560 ± 80	<2.00	0.60 ± 0.34
	Fourth Quarter	09/30/83 to 01/04/84	320 ± 70	<1.40	0.63 ± 0.33
NMP INLET	First Quarter	12/30/82 to 03/31/83	260 ± 130	<1.14	1.03 ± 0.40
	Second Quarter	03/31/83 to 06/30/83	410 ± 140	<2.00	0.72 ± 0.39
	Third Quarter	06/30/83 to 09/30/83	290 ± 90	<1.00	<0.70
	Fourth Quarter	09/30/83 to 12/28/83	190 ± 90	<1.60	1.10 ± 0.40
RAW CITY WATER (Control)	First Quarter	12/30/82 to 03/31/83	239 ± 130	<0.757	0.968 ± 0.32
	Second Quarter	03/31/83 to 06/30/83	230 ± 140	<2.000	<0.90
	Third Quarter	06/30/83 to 09/30/83	280 ± 70	<2.00	0.88 ± 0.37
	Fourth Quarter	09/30/83 to 12/28/83	250 ± 80	<1.40	0.82 ± 0.40

TABLE 8

CONCENTRATIONS OF GAMMA EMITTERS IN LAKE WATER SAMPLES - 1983

Results in Units of pCi/l ± 2 sigma

Station Code	Nuclide	January	February	March	April	May	June
OSWEGO CITY WATER (00, CONTROL)	Ce-144	<5.46	<5.33	<5.40	<4.93	<5.06	<5.40
	Cs-134	<0.97	<0.99	<1.15	<0.97	<0.85	<0.99
	Cs-137	<1.18	<1.10	<1.45	<1.15	<0.90	<0.94
	Zr-95	<3.03	<3.21	<4.03	<3.30	<3.18	<4.54
	Nb-95	<1.97	<2.03	<1.97	<1.90	<2.05	<3.35
	Co-58	<1.30	<1.54	<1.72	<1.33	<1.46	<1.68
	Mn-54	<1.01	<1.22	<1.30	<1.11	<1.07	<0.88
	Fe-59	<2.52	<1.98	<2.32	<2.39	<1.56	<1.51
	Co-60	<1.58	<1.52	<1.75	<1.45	<1.02	<1.09
	K-40	<13.3	<17.1	<15.5	<11.7	<12.9	13.2±7.3
NINE MILE POINT (02, INLET)	Ce-144	<5.15	<5.15	<6.02	<5.88	<4.73	<5.36
	Cs-134	<1.10	<0.90	<1.05	<1.07	<0.94	<1.06
	Cs-137	<1.23	<1.10	<1.27	<1.22	<0.96	<1.10
	Zr-95	<3.18	<3.84	<4.15	<3.51	<3.24	<4.34
	Nb-95	<1.94	<1.91	<2.23	<1.83	<2.37	<4.27
	Co-58	<1.29	<1.75	<1.62	<1.42	<1.43	<1.60
	Mn-54	<1.35	[illegible]	[illegible].23	<1.26	<1.16	<1.26
	Fe-59	<2.4[illegible]	[illegible]	[illegible].21	<1.93	<1.86	<2.32
	Co-60	<1.64	[illegible]	[illegible].67	<1.39	<1.14	<1.32
	K-40	<16.4	[illegible]	[illegible]4.0	16.5±8.7	<12.6	6.7±6.2
FITZPATRICK (03, INLET)	Ce-144	<5.39	[illegible]	<5.47	<5.12	<5.39	<5.03
	Cs-134	<1.05	[illegible]	<1.18	<1.01	<1.03	<0.90
	Cs-137	<1.11	<[illegible].28	<1.34	<1.12	<1.08	<0.88
	Zr-95	<2.93	<3.36	<3.34	<3.23	<2.66	<2.94
	Nb-95	<1.68	<2.36	<2.00	<1.27	<2.11	<1.98
	Co-58	<1.02	<1.36	<1.35	<1.19	<1.33	<1.38
	Mn-54	<1.22	<1.09	<1.12	<1.09	<1.01	<1.23
	Fe-59	<1.74	<2.32	<2.00	<2.49	<1.66	<1.75
	Co-60	<1.25	<1.29	<1.46	<1.08	<1.33	<1.14
	K-40	<18.2	<14.5	<13.5	<12.3	<11.3	<15.8

TABLE 8 (Cont'd)

CONCENTRATIONS OF GAMMA EMITTERS IN LAKE WATER SAMPLES - 1983

Results in Units of pCi/l ± 2 sigma

Station Code	Nuclide	July	August	September	October	November	December
OSWEGO CITY WATER (00, CONTROL)	Ce-144	<5.66	<4.79	<5.22	<4.39	<6.34	<5.65
	Cs-134	<1.05	<0.86	<1.09	<0.84	<1.53	<0.94
	Cs-137	<1.11	<1.32	<1.08	<0.88	<1.62	<1.08
	Zr-95	<3.08	<2.97	<3.60	<3.28	<4.51	<2.96
	Nb-95	<1.75	<1.51	<1.79	<1.53	<2.47	<2.13
	Co-58	<1.40	<1.17	<1.34	<1.49	<1.68	<1.15
	Mn-54	<1.03	<1.03	<1.02	<0.99	<1.72	<1.15
	Fe-59	<1.74	<1.90	<2.11	<2.16	<3.11	<2.02
	Co-60	<1.20	<1.52	<1.16	<1.12	<1.95	<1.27
	K-40	<14.0	<10.7	<16.0	<16.9	<20.6	<13.6
NINE MILE POINT (02, INLET)	Ce-144	<4.50	<5.79	<5.41	<6.55	<5.99	<5.18
	Cs-134	<0.95	<1.11	<0.94	<1.43	<1.06	<0.55
	Cs-137	<1.14	<1.06	<1.03	<1.32	<1.30	<0.96
	Zr-95	<3.09	<4.02	<3.70	<5.05	<3.82	<3.51
	Nb-95	<1.65	<2.47	<1.67	<3.63	<2.23	<1.71
	Co-58	<1.18	<1.81	<1.44	<2.35	<1.70	<1.45
	Mn-54	<1.18	<1.10	<1.18	<1.47	<1.31	<0.93
	Fe-59	<1.95	<2.27	<1.99	<3.03	<2.91	<2.40
	Co-60	<1.56	<1.32	<1.42	<1.26	<1.76	<1.02
	K-40	<12.9	<11.7	13.6±7.8	<21.2	<18.8	<12.8
FITZPATRICK (03, INLET)	Ce-144	<4.79	<5.56	<4.77	<6.70	<6.08	<5.37
	Cs-134	<0.86	<1.18	<1.06	<1.40	<1.16	<1.10
	Cs-137	<1.01	<1.22	<1.03	<1.36	<1.22	<1.00
	Zr-95	<2.88	<4.11	<3.96	<4.73	<3.36	<2.70
	Nb-95	<1.83	<2.59	<2.70	<3.33	<1.99	<2.02
	Co-58	<1.30	<2.04	<1.52	<1.69	<1.54	<1.16
	Mn-54	<1.06	<1.40	<1.20	<1.30	<1.38	<1.09
	Fe-59	<2.03	<2.51	<1.73	<2.67	<3.09	<1.72
	Co-60	<1.05	<1.52	<1.28	<1.57	<2.00	<1.20
	K-40	<10.7	<17.9	<14.6	<14.4	<20.4	9.6±6.4

TABLE 9

NMP/JAF SITE

ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF SITE STATIONS

GROSS BETA ACTIVITY pCi/m^3 ± 2 Sigma

WEEK END DATE	LOCATION C--OFF	D1-OFF	D2-OFF	E--OFF	F--OFF	G--OFF
83/01/11	0.022+0.003	0.022+0.004	0.022+0.003	0.024+0.004	0.019+0.003	0.024+0.004
83/01/19	0.019±0.003	0.021±0.003	0.022±0.003	0.020±0.003	0.018±0.003	0.019±0.003
83/01/25	0.021±0.004	0.021±0.004	0.020±0.003	0.017±0.003	0.018±0.003	0.021±0.004
83/02/01	0.028±0.004	0.021±0.003	0.026±0.004	0.025±0.004	0.024±0.004	0.023±0.004
83/02/08	C.015±0.003	0.016±0.003	0.019±0.003	0.018±0.003	0.017±0.003	0.020±0.003
83/02/15	0.025±0.004	0.024±0.004	0.027±0.004	0.025±0.004	0.028±0.004	0.025±0.004
83/02/23	0.040±0.004	0.040±0.004	0.041±0.004	0.035±0.004	0.040±0.004	0.040±0.004
83/03/01	0.024±0.004	0.022±0.004	0.025±0.004	0.021±0.004	0.026±0.004	0.022±0.004
83/03/08	0.022±0.004	0.019±0.003	0.020±0.003	0.022±0.004	0.023±0.004	0.021±0.003
83/03/15	0.014±0.003	0.016±0.003	0.019±0.003	0.018±0.003	0.017±0.003	0.019±0.003
83/03/22	0.015±0.003	0.017±0.003	0.016±0.003	0.014±0.003	0.011±0.003	0.014±0.003
83/03/29	0.028±0.004	0.021±0.003	0.026±0.004	0.025±0.004	0.024±0.003	0.023±0.003
83/04/05	0.023±0.004	0.022±0.004	0.020±0.003	0.018±0.003	0.021±0.003	0.022±0.003
83/04/12	0.007±0.002	0.010±0.003	0.007±0.002	0.011±0.003	0.010±0.002	0.011±0.003
83/04/19	0.012±0.003	0.015±0.003	0.015±0.003	0.013±0.003	0.011±0.003	0.013±0.003
83/04/26	0.010±0.003	0.009±0.003	0.010±0.003	0.011±0.003	0.013±0.003	0.012±0.003
83/05/03	0.026±0.004	0.020±0.003	0.019±0.003	0.021±0.004	0.021±0.003	0.018±0.003
83/05/11	0.018±0.003	0.019±0.003	0.018±0.003	C.024±0.004	0.025±0.003	0.019±0.003
83/05/17	0.014±0.003	0.013±0.003	0.013±0.003	0.015±0.003	0.018±0.003	0.011±0.003
83/05/24	0.019±0.003	0.018±0.003	0.019±0.003	0.020±0.004	0.016±0.003	0.019±0.003
83/06/01	0.012±0.002	0.010±0.002	0.011±0.002	0.013±0.002	0.010±0.002	0.012±0.002
83/06/07	0.014±0.003	0.012±0.003	0.014±0.003	0.011±0.003	0.015±0.003	0.012±0.003
83/06/14	0.033±0.004	0.033±0.004	0.031±0.003	0.030±0.004	0.032±0.003	0.030±0.003
83/06/21	0.039±0.004	0.033±0.003	0.032±0.003	0.034±0.004	0.034±0.003	0.056±0.013
83/06/28	0.025±0.003	0.023±0.003	0.025±0.003	0.026±0.003	0.022±0.003	0.040±0.005
83/07/06	0.019±0.002	0.020±0.003	0.021±0.003	0.020±0.003	0.019±0.003	0.022±0.003
83/07/12	0.018±0.003	0.025±0.004	0.022±0.003	0.025±0.004	0.033±0.004	0.021±0.003
83/07/22	0.036±0.004	0.034±0.004	0.032±0.004	0.030±0.004	0.030±0.004	0.022±0.003
83/07/27	0.025±0.003	0.028±0.004	0.028±0.003	0.030±0.003	0.030±0.003	0.027±0.003
83/08/02	0.028±0.004	0.028±0.004	0.022±0.003	0.026±0.004	0.027±0.004	0.024±0.003
83/08/9	0.025±0.003	0.023±0.003	0.025±0.003	0.024±0.003	0.024±0.003	0.026±0.003
83/08/16	0.019±0.003	0.017±0.003	0.017±0.003	0.020±0.003	0.024±0.003	0.018±0.003
83/08/23	0.037±0.004	0.035±0.004	0.037±0.004	0.032±0.004	0.035±0.004	0.034±0.004
83/08/31	0.041±0.004	0.031±0.004	0.037±0.003	0.045±0.004	0.038±0.003	0.035±0.003
83/09/7	0.041±0.004	0.042±0.005	0.039±0.004	0.043±0.004	0.048±0.004	0.044±0.004
83/09/13	0.030±0.004	0.034±0.004	0.030±0.004	0.029±0.004	0.027±0.004	0.010±0.003
83/09/20	0.028±0.003	0.024±0.003	0.026±0.003	0.026±0.003	0.026±0.003	0.020±0.003
83/09/27	0.025±0.003	0.032±0.004	0.029±0.003	0.029±0.003	0.026±0.003	0.032±0.004
83/10/4	0.036±0.004	0.033±0.004	3.037±0.004	0.040±0.004	0.036±0.004	0.031±0.004
83/10/13	0.022±0.003	0.021±0.003	0.022±0.003	0.022±0.003	0.023±0.003	0.029±0.004
83/10/18	0.013±0.003	0.014±0.003	0.021±0.004	C.023±0.004	0.021±0.004	0 016±0.004
83/10/25	0.022±0.003	0.019±0.003	0.021±0.003	0.017±0.003	0.021±0.003	0.016±0.003
83/11/1	0.017±0.003	0.017±0.003	0.019±0.003	0.020±0.003	0.021±0.003	0.020±0.003
83/11/08	0.018±0.003	0.017±0.003	0.016±0.003	0.020±0.003	0.018±0.003	0.022±0.003
83/11/15	0.033±0.004	0.031±0.004	0.033±0.004	0.032±0.004	0.031±0.004	0.038±0.004
83/11/22	0.019±0.001	0.021±0.001	0.019±0.001	0.021±0.001	0.022±0.001	0.024±0.001
83/11/29	0.018±0.003	0.023±0.003	0.022±0.003	0.021±0.003	0.024±0.003	0.024±0.003
83/12/6	0.021±0.003	0.022±0.003	0.020±0.003	0.019±0.003	0.019±0.003	0.018±0.003
83/12/13	0.026±0.003	0.025±0.003	0.028±0.003	0.028±0.003	0.026±0.003	0.025±0.003
83/12/20	0.021±0.001	0.023±0.001	0.023±0.001	0.022±0.001	0.026±0.001	0.023±0.001
83/12/28	0.029±0.001	0.031±0.001	0.033±0.002	0.032±0.002	0.031±0.002	0.030±0.002
84/01/4	0.032±0.002	0.033±0.002	0.034±0.002	0.036±0.002	0.034±0.002	0.085±0.002

TABLE 10

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ON SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 2 Sigma

LOCATION

WEEK END DATE	D1-ON	D2-ON	E--ON	F--ON	G--ON	H--ON	I--ON	J--ON	K--ON
83/01/10	0.022±0.003	0.027±0.004	0.021±0.004	0.021±0.004	0.024±0.005	0.020±0.003	0.023±0.003	0.023±0.003	0.022±0.003
83/01/17	0.015±0.003	0.016±0.003	0.018±0.003	0.021±0.004	0.017±0.004	0.016±0.003	0.018±0.003	0.021±0.003	0.013±0.003
83/01/24	0.021±0.003	0.027±0.007	0.023±0.004	0.024±0.005	0.023±0.005	0.021±0.004	0.021±0.003	0.018±0.003	0.021±0.003
83/01/31	0.021±0.003	0.024±0.004	0.025±0.004	0.024±0.005	0.023±0.005	0.027±0.004	0.023±0.003	0.026±0.005	0.017±0.003
83/02/07	0.017±0.003	0.019±0.004	0.020±0.004	0.022±0.005	0.018±0.004	0.026±0.004	0.016±0.003	0.016±0.003	0.018±0.003
83/02/14	0.020±0.003	0.028±0.005	0.023±0.004	0.020±0.005	0.022±0.005	0.021±0.004	0.019±0.003	0.023±0.003	0.021±0.004
83/02/22	0.031±0.003	0.039±0.005	0.041±0.005	0.044±0.006	0.040±0.004	0.027±0.003	0.028±0.003	0.024±0.003	0.058±0.007
83/02/28	0.024±0.004	0.023±0.005	0.029±0.005	0.028±0.006	0.020±0.004	0.021±0.004	0.021±0.004	0.018±0.004	0.022±0.004
83/03/07	0.024±0.003	0.026±0.005	0.023±0.004	0.024±0.005	0.024±0.004	0.022±0.004	0.017±0.003	0.024±0.004	0.024±0.065
83/03/14	0.014±0.003	0.014±0.003	0.014±0.003	0.013±0.004	0.013±0.003	0.013±0.003	0.014±0.003	0.013±0.003	0.013±0.003
83/63/21	0.015±0.003	0.021±0.004	0.018±0.004	0.015±0.005	0.015±0.003	0.017±0.003	0.014±0.003	0.014±0.003	0.011±0.003
83/03/28	0.023±0.004	0.027±0.004	0.029±0.004	0.032±0.005	0.027±0.004	0.025±0.004	0.024±0.003	0.027±0.003	0.026±0.004
83/04/04	0.025±0.004	0.023±0.004	0.020±0.004	0.026±0.005	0.022±0.004	0.020±0.003	0.020±0.003	0.026±0.003	0.021±0.003
83/04/11	0.015±0.003	0.012±0.003	0.011±0.003	0.008±0.003	0.011±0.003	0.015±0.003	0.007±0.002	0.007±0.002	0.009±0.002
83/04/18	0.010±0.003	0.013±0.004	0.014±0.003	0.015±0.004	0.015±0.004	0.010±0.003	0.014±0.003	0.025±0.009	0.011±0.003
83/04/25	0.015±0.003	0.018±0.004	0.013±0.003	0.015±0.004	0.012±0.003	0.016±0.003	0.014±0.003	0.015±0.003	0.014±0.003
83/05/02	0.020±0.003	0.019±0.004	0.021±0.004	0.019±0.004	0.019±0.004	0.023±0.004	0.020±0.003	0.016±0.004	0.018±0.003
83/05/09	0.019±0.003	0.016±0.004	0.018±0.003	0.014±0.003	0.017±0.004	0.025±0.004	0.016±0.003	0.016±0.003	0.014±0.003
83/05/16	0.013±0.003	0.016±0.004	0.015±0.004	0.012±0.003	0.012±0.004	0.011±0.003	0.012±0.003	0.013±0.003	0.012±0.003
83/05/23	0.024±0.004	0.022±0.004	0.022±0.004	0.016±0.004	0.023±0.005	0.023±0.004	0.019±0.003	0.017±0.003	0.018±0.003
83/05/31	0.014±0.002	0.013±0.003	0.012±0.002	0.014±0.003	0.011±0.003	0.016±0.003	0.013±0.002	0.012±0.002	0.010±0.002
83/06/06	0.014±0.003	0.016±0.004	0.016±0.003	0.015±0.003	0.013±0.003	0.019±0.003	0.014±0.003	0.013±0.002	0.011±0.002
83/06/13	0.025±0.003	0.025±0.004	0.026±0.003	0.028±0.004	0.028±0.004	0.027±0.003	0.025±0.003	0.021±0.003	0.022±0.003
83/06/20	0.039±0.004	0.048±0.006	0.045±0.005	0.037±0.004	0.029±0.004	0.033±0.004	0.014±0.002	0.053±0.005	0.028±0.003
83/06/27	0.027±0.003	0.025±0.004	0.025±0.004	0.025±0.004	0.021±0.004	0.023±0.003	0.023±0.003	0.019±0.004	0.020±0.003
83/07/05	0.020±0.003	0.022±0.003	0.021±0.003	0.019±0.005	0.022±0.003	0.022±0.003	0.016±0.002	0.020±0.004	0.015±0.002
83/07/11	0.018±0.003	0.021±0.004	0.020±0.003	0.022±0.003	0.024±0.004	0.018±0.003	0.018±0.003	0.015±0.003	0.017±0.003
83/07/18	0.025±0.004	0.028±0.005	0.029±0.004	0.031±0.004	0.032±0.005	0.030±0.004	0.015±0.003	0.023±0.004	0.027±0.004
83/07/26	0.026±0.003	0.027±0.004	0.025±0.003	0.028±0.003	0.023±0.003	0.025±0.003	0.034±0.005	0.022±0.003	0.022±0.003
83/08/01	0.029±0.004	0.032±0.005	0.028±0.004	0.029±0.004	0.024±0.004	0.029±0.004	0.008±0.002	0.030±0.003	0.022±0.003
83/08/8	0.026±0.003	0.029±0.004	0.026±0.003	0.026±0.003	0.018±0.003	0.026±0.003	0.027±0.003	0.025±0.003	0.028±0.003
83/08/15	0.015±0.003	0.017±0.003	0.021±0.003	0.021±0.003	0.018±0.003	0.015±0.003	0.017±0.003	0.018±0.003	0.018±0.003
83/08/22	0.034±0.004	0.040±0.005	0.031±0.004	0.031±0.003	0.032±0.004	0.033±0.004	0.024±0.003	0.030±0.003	0.031±0.003
83/08/29	0.031±0.003	0.030±0.004	0.033±0.004	0.037±0.003	0.033±0.004	0.017±0.003	0.025±0.003	0.031±0.003	0.013±0.002
83/09/6	0.045±0.004	0.052±0.005	0.051±0.004	0.051±0.004	0.042±0.004	0.050±0.004	0.054±0.004	0.045±0.004	0.042±0.003
83/09/12	0.030±0.004	0.034±0.005	0.030±0.004	0.028±0.003	0.026±0.004	0.030±0.004	0.030±0.004	0.027±0.004	0.022±0.003
83/09/19	0.021±0.003	0.024±0.004	0.023±0.004	0.026±0.003	0.017±0.003	0.022±0.003	0.020±0.003	0.021±0.003	0.018±0.003
83/09/26	0.026±0.003	0.026±0.004	0.023±0.004	0.026±0.003	0.026±0.004	0.020±0.003	0.027±0.003	0.030±0.003	0.021±0.003
83/10/3	0.036±0.004	0.041±0.005	0.035±0.004	0.038±0.004	0.035±0.004	0.035±0.004	0.035±0.004	0.031±0.022	0.034±0.003
83/10/11	0.027±0.003	0.033±0.004	0.028±0.003	0.030±0.003	0.027±0.003	0.014±0.003	0.022±0.003	0.029±0.003	0.022±0.003
83/10/17	0.017±0.003	0.017±0.004	0.015±0.003	0.021±0.004	0.015±0.003	0.017±0.003	0.015±0.003	0.013±0.003	0.016±0.003
83/10/24	0.023±0.003	0.029±0.004	0.022±0.004	0.023±0.003	0.023±0.003	0.020±0.003	0.013±0.002	0.023±0.003	0.022±0.003
83/10/31	0.020±0.003	0.018±0.004	0.019±0.003	0.019±0.003	0.022±0.003	0.018±0.003	0.021±0.004	0.019±0.003	0.015±0.003
83/11/07	0.016±0.003	0.018±0.004	0.019±0.003	0.015±0.003	0.016±0.003	0.018±0.003	0.017±0.003	0.013±0.002	0.014±0.002
83/11/14	0.031±0.004	0.041±0.005	0.034±0.004	0.030±0.004	0.035±0.004	0.024±0.004	0.027±0.004	0.034±0.004	0.032±0.004
83/11/21	0.027±0.001	0.027±0.002	0.037±0.002	0.035±0.002	0.031±0.002	0.020±0.001	0.021±0.001	0.032±0.002	0.021±0.001
83/11/28	0.024±0.003	0.023±0.004	0.027±0.004	0.023±0.003	0.029±0.004	0.021±0.003	0.015±0.002	0.024±0.003	0.027±0.003
83/12/5	0.018±0.003	0.021±0.004	0.022±0.003	0.018±0.003	0.019±0.003	0.024±0.006	0.020±0.003	0.018±0.003	0.017±0.003
83/12/12	0.027±0.003	0.030±0.004	0.031±0.004	0.032±0.004	0.020±0.003	0.026±0.004	0.029±0.004	0.027±0.004	0.023±0.003
83/12/19	0.016±0.001	0.022±0.002	0.002±0.001	0.019±0.001	0.062±0.002	0.029±0.002	0.018±0.001	0.019±0.001	0.020±0.002
83/12/27	0.028±0.001	0.046±0.002	0.033±0.002	0.027±0.001	0.014±0.001	0.030±0.002	0.043±0.002	0.030±0.002	0.031±0.002
84/01/3	0.051±0.003	0.043±0.002	0.045±0.002	0.026±0.001	0.046±0.002	0.044±0.002	0.038±0.002	0.043±0.002	0.033±0.002

TABLE 11

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF AIR PARTICULATE SAMPLES 1983

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

OFFSITE COMPOSITE

Nuclides	January	February	March	April	May	June
Ce-144	<0.794	<0.939	<0.805	<0.612	<0.777	<0.913
Ce-141	<0.296	<0.353	<0.299	<0.338	<0.268	<0.355
Be-7	77.6±4.3	126±5	111±4	88.7±4.5	87.5±4.0	136±6
Ru-103	<0.225	<0.277	<0.206	<0.247	<0.158	<0.245
Cs-134	<0.172	<0.192	<0.167	<0.193	<0.134	<0.189
Cs-137	<0.222	0.210±0.167	0.172±0.097	<0.229	0.108±0.075	0.256±0.130
Zr-95	<0.561	<0.548	<0.380	<0.601	<0.354	<0.546
Nb-95	<0.241	<0.340	<0.243	<0.340	<0.177	<0.306
Co-58	<0.223	<0.266	<0.172	<0.229	0.180	0.210
Mn-54	<0.165	<0.218	<0.182	<0.199	<0.137	<0.175
Co-60	<0.252	<0.270	<0.215	<0.260	0.113±0.069	<0.255

ONSITE COMPOSITE

Nuclides	January	February	March	April	May	June
Ce-144	<0.654	<0.760	<0.532	<0.647	<0.585	<0.746
Ce-141	<0.245	<0.271	<0.221	<0.246	<0.209	<0.320
Be-7	74.8±3.6	104±4	100±4	77.0±3.6	93.0±3.7	133±5
Ru-103	<0.170	<0.204	<0.179	<0.172	<0.172	<0.210
Cs-134	<0.172	<0.156	<0.103	<0.123	<0.106	<0.141
Cs-137	<0.176	0.190±0.086	0.178±0.097	0.191±0.098	<0.166	0.253±0.135
Zr-95	<0.411	<0.420	<0.360	<0.427	<0.324	<0.396
Nb-95	<0.209	<0.232	<0.197	<0.180	<0.154	<0.260
Co-58	<0.184	<0.178	<0.130	<0.154	<0.125	<0.198
Mn-54	<0.157	<0.142	0.270±0.140	<0.135	<0.116	<0.177
Co-60	<0.236	<0.217	<0.168	<0.160	0.184±0.095	0.295±0.121

TABLE 11 (cont.)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1983

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Nuclides	July	August	September	October	November	December
			OFFSITE COMPOSITE			
Ce-144	<0.847	<0.748	<0.750	<0.785	<0.652	<0.702
Ce-141	<0.338	<0.308	<0.282	<0.300	<0.225	<0.512
Be-7	136+5	135+5	106+4	89.4+4.3	95.8+3.1	81.2+4.9
Ru-103	<0.190	<0.186	<0.182	<0.195	<0.172	<0.360
Cs-134	<0.167	<0.156	<0.117	<0.156	<0.150	<0.131
Cs-137	<0.195	<0.220	<0.147	<0.190	<0.153	<0.169
Zr-95	<0.488	<0.384	<0.373	<0.498	<0.389	<0.569
Nb-95	<0.268	<0.251	<0.189	<0.220	<0.202	<0.461
Co-58	<0.163	<0.195	<0.172	<0.229	0.171	0.258
Mn-54	<0.147	<0.218	<0.182	<0.199	<0.137	<0.175
Co-60	0.163±0.107	0.366±0.193	<0.176	<0.184	<0.185	0.526±0.163
			ONSITE COMPOSITE			
Ce-144	<0.709	<0.660	<0.546	<0.593	<0.625	<0.591
Ce-141	<0.294	<0.281	<0.236	<0.217	<0.230	<0.435
Be-7	130+5	118+4	85.2+3.4	75.2+3.3	82.1+3.4	81.6+4.1
Ru-103	<0.175	<0.168	<0.140	<0.147	<0.165	<0.275
Cs-134	<0.117	<0.113	<0.108	<0.112	<0.121	<0.099
Cs-137	0.131±0.102	0.180±0.075	<0.130	<0.137	<0.152	<0.133
Zr-95	<0.350	<0.300	<0.350	<0.281	<0.379	<0.466
Nb-95	<0.219	<0.216	<0.175	<0.175	<0.203	<0.530
Co-58	<0.182	<0.147	<0.158	<0.139	<0.177	<0.190
Mn-54	<0.136	<0.138	<0.147	<0.110	<0.184	<0.137
Co-60	<0.179	<0.177	0.217±0.097	<0.150	<0.219	0.708±0.154

TABLE 12

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 2 sigma

LOCATION

WEEK END DATE	C--OFF	D1-OFF	D2-OFF	E--OFF	F--OFF	G--OFF
83/01/11	<0.014	<0.022	<0.016	<0.015	<0.017	<0.013
83/01/19	<0.014	<0.015	<0.009	<0.018	<0.018	<0.014
83/01/25	<0.022	<0.020	<0.022	<0.018	<0.022	<0.013
83/02/01	<0.015	<0.017	<0.020	<0.024	<0.016	<0.016
83/02/08	<0.015	<0.019	<0.017	<0.019	<0.019	<0.012
83/02/15	<0.021	<0.013	<0.023	<0.017	<0.022	<0.019
83/02/23	<0.015	<0.020	<0.019	<0.021	<0.016	<0.018
83/03/01	<0.028	<0.036	<0.020	<0.020	<0.013	<0.028
83/03/08	<0.011	<0.021	<0.016	<0.023	<0.017	<0.018
83/03/15	<0.020	<0.023	<0.026	<0.019	<0.021	<0.015
83/03/22	<0.021	<0.019	<0.017	<0.018	<0.024	<0.015
83/03/29	<0.021	<0.017	<0.009	<0.018	<0.018	<0.019
83/04/05	<0.029	<0.018	<0.019	<0.029	<0.025	<0.028
83/04/12	<0.020	<0.023	<0.022	<0.018	<0.016	<0.017
83/04/19	<0.016	<0.020	<0.016	<0.020	<0.022	<0.017
83/04/26	<0.012	<0.013	<0.014	<0.020	<0.020	<0.022
83/05/03	<0.010	<0.015	<0.015	<0.022	<0.020	<0.018
83/05/11	<0.015	<0.013	<0.015	<0.019	<0.019	<0.014
83/05/17	<0.013	<0.015	<0.016	<0.015	<0.019	<0.013
83/05/24	<0.013	<0.019	<0.019	<0.019	<0.021	<0.013
83/06/01	<0.007	<0.012	<0.009	<0.015	<0.015	<0.014
83/06/07	<0.011	<0.016	<0.019	<0.019	<0.009	<0.017
83/06/14	<0.019	<0.018	<0.011	<0.016	<0.011	<0.015
83/06/21	<0.012	<0.015	<0.011	<0.018	<0.017	<0.115
83/06/28	<0.019	<0.016	<0.011	<0.019	<0.005	<0.029
83/07/06	<0.011	<0.014	<0.012	<0.014	<0.018	<0.014
83/07/12	<0.015	<0.020	<0.007	<0.017	<0.017	<0.017
83/07/22	<0.011	<0.018	<0.019	<0.016	<0.017	<0.012
83/07/27	<0.022	<0.012	<0.012	<0.017	<0.005	<0.006
83/08/02	<0.014	<0.017	<0.018	<0.015	<0.017	<0.015
83/08/9	<0.011	<0.013	<0.016	<0.011	<0.006	<0.015
83/08/16	<0.014	<0.015	<0.016	<0.019	<0.010	<0.014
83/08/23	<0.016	<0.014	<0.012	<0.016	<0.006	<0.016
83/08/31	<0.016	<0.019	<0.012	<0.016	<0.011	<0.017
83/09/7	<0.017	<0.026	<0.022	<0.018	<0.018	<0.018
83/09/13	<0.013	<0.021	<0.017	<0.015	<0.021	<0.020
83/09/20	<0.018	<0.017	<0.021	<0.016	<0.019	<0.021
83/09/27	<0.012	<0.014	<0.015	<0.012	<0.016	<0.020
83/10/4	<0.019	<0.020	<0.006	<0.017	<0.014	<0.023
83/10/13	<0.014	<0.016	<0.016	<0.013	<0.015	<0.020
83/10/18	<0.025	<0.025	<0.020	<0.024	<0.020	<0.029
83/10/25	<0.015	<0.019	<0.024	<0.013	<0.016	<0.014
83/11/1	<0.026	<0.021	<0.018	<0.018	<0.015	<0.012
83/11/08	<0.016	<0.012	<0.017	<0.017	<0.016	<0.017
83/11/15	<0.018	<0.020	<0.018	<0.026	<0.020	<0.023
83/11/22	<0.022	<0.019	<0.022	<0.022	<0.019	<0.020
83/11/29	<0.022	<0.015	<0.017	<0.019	<0.028	<0.023
83/12/6	<0.016	<0.014	<0.017	<0.022	<0.024	<0.020
83/12/13	<0.024	<0.013	<0.019	<0.017	<0.015	<0.018
83/12/20	<0.017	<0.020	<0.022	<0.019	<0.021	<0.018
83/12/28	<0.020	<0.019	<0.027	<0.021	<0.019	<0.017
84/01/4	<0.018	<0.023	<0.021	<0.022	<0.024	<0.020

TABLE 13

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ON SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 2 sigma

WEEK END DATE	LOCATION D1-ON	D2-ON	E--ON	F--ON	G--ON	H--ON	I--ON	J--ON	K--ON
83/01/10	<0.017	<0.019	<0.017	<0.023	<0.018	<0.023	<0.013	<0.013	<0.011
83/01/17	<0.012	<0.024	<0.025	<0.030	<0.026	<0.014	<0.017	<0.018	<0.011
83/01/24	<0.021	<0.047	<0.020	<0.026	<0.029	<0.019	<0.018	<0.023	<0.017
83/01/31	<0.010	<0.016	<0.023	<0.026	<0.036	0.022+0.015	<0.018	<0.020	<0.022
83/02/07	<0.014	<0.020	<0.023	<0.038	<0.029	<0.027	<0.024	<0.020	<0.021
83/02/14	<0.017	<0.021	<0.021	<0.026	<0.029	<0.019	<0.010	<0.023	<0.025
83/02/22	<0.018	<0.033	<0.027	<0.031	<0.016	<0.023	<0.016	<0.020	<0.045
83/02/28	<0.015	<0.028	<0.026	<0.034	<0.027	<0.038	<0.020	<0.021	<0.021
83/03/07	<0.017	<0.033	<0.018	<0.032	<0.023	<0.021	<0.021	<0.025	<0.033
83/03/14	<0.018	<0.018	<0.019	<0.027	<0.016	<0.017	<0.016	<0.020	<0.018
83/03/21	<0.018	<0.026	<0.027	<0.022	<0.020	<0.023	<0.017	<0.022	<0.011
83/03/28	<0.020	<0.029	<0.018	<0.035	<0.015	<0.014	<0.022	<0.016	<0.019
83/04/04	<0.015	<0.024	<0.019	<0.038	<0.034	<0.023	<0.015	<0.016	<0.015
83/04/11	<0.029	<0.024	<0.019	<0.031	<0.016	<0.016	<0.013	<0.016	<0.020
83/04/18	<0.021	<0.025	<0.016	<0.029	<0.015	<0.019	<0.018	<0.068	<0.011
83/04/25	<0.010	<0.030	<0.018	<0.020	<0.020	<0.022	<0.020	<0.022	<0.018
83/05/02	<0.009	<0.021	<0.018	<0.022	<0.027	<0.019	<0.017	<0.026	<0.012
93/05/09	<0.014	<0.021	<0.014	<0.019	<0.023	<0.019	<0.019	<0.017	<0.015
83/05/16	<0.017	<0.025	<0.021	<0.020	<0.023	<0.020	<0.020	<0.018	<0.013
83/05/23	<0.015	<0.021	<0.032	<0.015	<0.019	<0.020	<0.019	<0.015	<0.015
83/05/31	<0.016	<0.024	<0.015	<0.017	<0.030	<0.022	<0.018	<0.019	<0.014
83/06/06	<0.014	<0.023	<0.023	<0.014	<0.030	0.032+0.017	<0.023	<0.020	<0.011
83/06/13	<0.017	<0.021	<0.017	<0.016	<0.020	0.035+0.016	<0.019	<0.012	<0.015
83/06/20	<0.017	<0.031	<0.029	<0.017	<0.027	<0.019	<0.021	<0.031	<0.018
83/06/27	<0.017	<0.029	<0.012	<0.028	<0.017	<0.022	<0.013	<0.027	<0.024
83/07/05	<0.012	<0.016	<0.011	<0.044	<0.019	<0.021	<0.011	<0.028	<0.011
83/07/11	<0.018	<0.013	<0.028	<0.016	<0.027	<0.024	<0.011	<0.018	<0.017
83/07/18	<0.009	<0.019	<0.016	<0.010	<0.020	<0.023	<0.015	<0.018	<0.014
83/07/26	<0.013	<0.019	<0.023	<0.013	<0.014	<0.021	<0.031	<0.012	<0.013
83/08/01	<0.019	<0.013	<0.024	<0.014	<0.024	<0.018	<0.016	<0.017	<0.018
83/08/8	<0.016	<0.026	<0.017	<0.014	<0.008	<0.020	<0.010	<0.017	<0.017
83/08/15	<0.012	<0.015	<0.019	<0.016	<0.019	<0.015	<0.012	<0.015	<0.014
83/08/22	<0.014	<0.025	<0.017	<0.015	<0.007	<0.016	<0.016	<0.015	<0.019
83/08/29	<0.015	<0.014	<0.018	<0.015	<0.018	<0.013	<0.014	<0.010	<0.015
83/09/6	<0.014	<0.016	<0.013	<0.014	<0.017	<0.008	<0.014	<0.014	<0.011
83/09/12	<0.017	<0.024	<0.018	<0.019	<0.019	<0.028	<0.022	<0.021	<0.011
83/09/19	<0.023	<0.031	<0.030	<0.022	<0.025	<0.025	<0.026	<0.021	<0.016
83/09/26	<0.022	<0.028	<0.019	<0.016	<0.016	<0.025	<0.016	<0.015	<0.011
83/10/3	<0.019	<0.024	<0.025	<0.016	<0.022	<0.022	<0.018	<0.023	<0.018
83/10/11	<0.021	<0.030	<0.016	<0.013	<0.006	<0.022	<0.023	<0.025	<0.015
83/10/17	<0.025	<0.037	<0.022	<0.026	<0.025	<0.029	<0.019	<0.020	<0.027
83/10/24	<0.017	<0.036	<0.025	<0.017	<0.016	<0.014	<0.024	<0.018	<0.018
83/10/31	<0.021	<0.025	<0.018	<0.019	<0.024	<0.017	<0.028	<0.012	<0.018
83/11/07	<0.014	<0.022	<0.017	<0.019	<0.021	<0.018	<0.018	<0.013	<0.019
83/11/14	<0.023	<0.034	<0.026	<0.023	<0.021	<0.020	<0.019	<0.023	<0.017
83/11/21	<0.020	<0.030	<0.029	<0.029	<0.032	<0.024	<0.025	<0.025	<0.020
83/11/28	<0.017	<0.023	<0.024	<0.017	<0.016	<0.014	<0.020	<0.011	<0.021
83/12/5	<0.023	<0.032	<0.023	<0.018	<0.024	<0.070	<0.019	<0.022	<0.017
83/12/12	<0.017	<0.035	<0.020	<0.017	<0.024	<0.019	<0.020	<0.022	<0.012
83/12/19	<0.019	<0.030	<0.024	<0.015	<0.018	0.023+0.013	<0.019	<0.023	<0.023
83/12/27	<0.019	<0.026	<0.026	<0.019	<0.026	<0.020	<0.030	<0.026	<0.025
84/01/3	<0.040	<0.041	<0.025	<0.010	<0.028	<0.026	<0.025	<0.032	<0.024

TABLE 14

DIRECT RADIATION MEASUREMENTS - QUARTERLY RESULTS (1983)

Results in Units of mrem/Std. Month ± 2 Sigma

STATION NUMBER	LOCATION	JANUARY THROUGH MARCH	APRIL THROUGH JUNE	JULY THROUGH SEPTEMBER	OCTOBER THROUGH DECEMBER	LOCATION (DIRECTION AND (DISTANCE)*
3	D1 on Site	12.89±1.88	10.81±0.66	6.75±0.84	16.5±1.0	0.25 miles @ 65°
4	D2 on Site	7.00±1.23	5.96±0.43	5.66±0.98	7.2±0.5	0.40 miles @ 140°
5	E on Site	5.71±0.61	6.13±1.31	5.39±0.64	6.4±0.6	0.40 miles @ 175°
6	F on Site	5.30±0.51	5.08±0.17	(1)	5.6±0.3	0.50 miles @ 210°
7	G on Site	5.60±0.52	5.80±0.53	5.27±0.44	6.3±0.2	0.70 miles @ 250°
8	C off Site	7.17±0.56	6.82±1.11	5.75±0.37	6.1±0.4	16.00 miles @ 42°
9	D1 off Site	6.09±0.89	5.31±0.48	4.61±0.82	5.5±0.1	11.40 miles @ 80°
10	D2 off Site	5.92±0.26	5.00±0.72	5.16±0.40	5.7±0.4	9.00 miles @ 117°
11	E off Site	5.46±0.45	5.59±0.99	5.31±0.75	5.3±0.3	7.20 miles @ 160°
12	F off Site	5.64±0.34	4.64±0.72	5.17±0.17	5.4±0.2	7.70 miles @ 190°
13	G off Site	5.77±0.41	5.52±0.26	5.05±0.37	5.8±0.3	5.30 miles @ 225°
14	DeMass Rd, SW Oswego-Control	5.85±0.49	5.34±0.54	4.86±0.69	5.7±0.2	12.80 miles @ 225°
15	Pole 66, W. Boundary-Bible Camp	5.31±1.00	5.36±0.61	4.38±0.32	4.9±0.2	0.90 miles @ 238°
18	Progress Center-Picnic Area	5.51±0.62	5.62±0.56	5.50±0.90	6.8±0.3	0.50 miles @ 268°
19	East Boundary-JAF, Pole 9	5.83±0.33	6.82±0.25	5.11±0.66	5.6±0.7	1.30 miles @ 81°
23	H on Site	8.97±0.70	7.46±1.31	5.90±0.19	8.5±0.6	0.80 miles @ 71°
24	I on Site	6.59±1.08	6.44±0.98	(1)	6.2±0.6	0.60 miles @ 96°
25	J on Site	6.04±0.21	6.50±1.33	5.41±0.16	6.4±0.3	0.90 miles @ 110°
26	K on Site	6.31±0.31	6.73±0.26	5.03±0.62	6.0±0.4	0.50 miles @ 132°
27	Nor. Fence-NNW Sector, JAF	20.95±2.23	15.76±2.55	10.78±0.76	21.5±2.2	0.40 miles @ 60°
28	Light Pole (E) JAF	47.05±5.10	41.17±1.93	26.18±3.56	52.4±4.3	0.50 miles @ 66°
29	Nor. Fence (E) JAF	74.80±11.44	58.20±10.58	33.21±2.21	72.8±3.9	0.50 miles @ 65°
30	Nor. Fence (NW) JAF	16.02±0.74	13.85±2.35	9.16±0.47	18.6±1.2	0.40 miles @ 57°
31	Nor. Fence (NW) NMP-1	21.39±2.05	17.96±1.64	17.65±1.28	21.6±0.5	0.20 miles @ 290°
39	East Fence, Rad. Waste-NMP-1	58.04±5.78	12.65±1.76	12.83±0.79	16.3±0.4	0.10 miles @ 292°
43	.9 mi Rt. 3 from Rt. 104B	6.01±1.30	6.55±0.39	5.32±0.60	5.4±0.3	9.40 miles @ 88°
44	Cor. Rt 3 and Kelly Drive	6.17±0.53	5.99±1.15	5.35±0.26	5.9±0.2	12.60 miles @ 64°

TABLE 14 (Con't.)

DIRECT RADIATION MEASUREMENTS - QUARTERLY RESULTS (1983)

Results in Units of mrem/Std. Month ± 2 Sigma

STATION NUMBER	LOCATION	JANUARY THROUGH MARCH	APRIL THROUGH JUNE	JULY THROUGH SEPTEMBER	OCTOBER THROUGH DECEMBER	LOCATION (DIRECTION AND (DISTANCE)*
45	Cor. Rt 64 and Rt. 35	6.14±0.36	6.56±1.12	5.39±0.54	6.6±0.5	7.60 miles @ 130°
46	Cor. Rt 176 and Black Creek Rd.	5.75±0.19	5.90±0.75	5.08±0.47	6.0±0.7	7.90 miles @ 178°
47	NE Shoreline (JAF)	45.33±9.97	17.15±1.57	8.76±1.14	16.9±0.7	0.60 miles @ 69°
48	.36 mi (N) on Access Rd. (JAF)	7.95±0.74	6.77±0.17	(1)	7.3±0.3	0.80 miles @ 92°
49	Phoenix, NY-Control	5.82±0.57	5.70±0.57	4.99±0.44	4.9±0.2	20.00 miles @ 165°
50	Lake Rd.West of J On-Site	(1)	6.48±0.65	4.82±0.44	5.6±0.3	0.70 miles @ 115°
51	Oswego Steam Sta. N End of W Fence	6.14±0.22	5.76±0.18	(1)	(1)	7.50 miles @ 233°
52	East 111th St. Fitzhugh Park Sch.	5.62±0.57	4.93±1.39	5.02±0.30	5.9±0.4	5.80 miles @ 227°
53	Broadwell & Chestnut Sts-Fulton H.S.	5.98±0.30	5.74±0.36	5.54±0.05	5.8±0.1	13.70 miles @ 183°
54	Liberty St. & Co. Rt. 16-MexicoH.S.	5.23±0.35	5.60±0.23	4.76±0.31	5.0±0.2	9.30 miles @ 115°
55	Hinnmann Rd. & Co. Rt. 5-Pulaski H.S.	5.72±0.26	5.56±0.38	4.64±0.71	5.0±0.2	13.70 miles @ 75°
56	Rt. 104 - New Haven H.S. (SE Corner)	6.02±0.08	6.17±1.43	5.15±0.44	6.3±0.3	5.40 miles @ 120°
57	Co. Rt. 29&Miner Rd.(SE)-Lycoming,NY	5.77±0.51	5.76±0.21	4.21±0.52	5.3±0.3	1.90 miles @ 145°
58	Co. Rt. 1 - ALCAN (S of Entrance Rd.)	5.41±0.26	6.18±0.77	5.13±0.59	6.0±0.2	3.20 miles @ 220°
59	Environmental Lab - JAF	20.37±3.17	15.07±3.57	9.32±1.46	31.1±3.4	0.50 miles @ 95°
60	S.Shore (Fish Point) Little Sodus Bay, NY	6.74±0.32	6.19±0.14	5.16±0.51	4.8±0.1	21.00 miles @ 225°
61	700' N of #48 (On Access Rd.)-JAF	10.47±0.75	8.49±0.34	(1)	9.9±0.8	0.80 miles @ 83°
65	Dutch Ridge Rd. & Kerfien Rd.(SE)	5.74±0.26	5.46±0.58	4.97±0.85	4.7±0.1	7.60 miles @ 198°

(1) TLDs lost

* Direction and distance based on NMP-2 Reactor Centerline

TABLE 15

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

FIRST HALF

LOCATION	PERIOD 1983	MIN.	mR/hr MAX.	AVG.
C Offsite	01/05 to 02/01	0.010	0.050	0.015
	02/01 to 03/01	0.010	0.020	0.015
	03/01 to 03/29	0.010	0.025	0.015
	03/29 to 04/26	0.010	0.080	0.030
	04/26 to 05/24	0.010	0.025	0.018
	05/24 to 06/28	0.010	0.023	0.018
D_1 Onsite	01/06 to 02/03	0.010	0.045	0.015
	02/03 to 03/03	0.010	0.052	0.020
	03/03 to 03/29	0.013	0.075	0.020
	03/29 to 04/28	0.010	0.050	0.022
	04/28 to 05/27	0.012	0.032	0.023
	05/27 to 06/27	0.010	0.027	0.011
D_2 Onsite	01/06 to 02/03	0.010	0.050	0.015
	02/03 to 03/03	0.010	0.043	0.016
	03/03 to 03/29	0.010	0.095	0.012
	03/29 to 04/28	0.010	0.038	0.013
	04/28 to 05/27	0.010	0.025	0.012
	05/27 to 06/27	0.010	0.028	0.013
E Onsite	01/06 to 02/03	0.010	0.19	0.020
	02/03 to 03/03	0.010	0.050	0.018
	03/03 to 03/29	0.010	0.052	0.013
	03/29 to 04/28	0.010	0.030	0.015
	04/28 to 05/27	0.010	0.042	0.015
	05/27 to 06/27	0.011	0.025	0.015
F Onsite	01/06 to 02/03	0.010	0.030	0.018
	02/03 to 03/03	0.010	0.024	0.018
	03/03 to 03/29	0.012	0.050	0.015
	03/29 to 04/28	0.010	0.078	0.016
	04/28 to 05/27	0.020	0.090	0.033
	05/27 to 06/27	0.012	0.040	0.023

* Detectors are "bugged" to insure on scale readings.

TABLE 15 (Cont'd)

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

SECOND HALF

LOCATION	PERIOD 1983	MIN.	MAX. (mR/hr)	AVG. (mR/hr)
C Offsite	06/28 to 07/27	0.010	0.032	0.018
	07/27 to 08/26	0.010	0.042	0.015
	08/26 to 09/27	0.010	0.045	0.013
	09/27 to 10/21	0.010	0.035	0.015
	10/21 to 11/15	0.010	0.040	0.020
	11/15 to 12/13	0.012	0.025	0.018
	12/13 to 01/10	0.010	0.025	0.015
D_1 Onsite	06/27 to 07/26	0.010	0.018	0.012
	07/26 to 08/25	0.010	0.025	0.018
	08/25 to 09/23	0.010	0.030	0.020
	09/23 to 10/20	0.010	0.042	0.020
	10/20 to 11/14	0.012	0.060	0.023
	11/14 to 12/12	0.016	0.060	0.025
	12/12 to 01/09	0.011	0.065	0.018
D_2 Onsite	06/27 to 07/26	0.010	0.020	0.013
	07/26 to 08/25	0.012	0.022	0.015
	08/25 to 09/23	0.012	0.028	0.018
	09/23 to 10/20	0.013	0.028	0.020
	10/20 to 11/14	0.012	0.060	0.015
	11/14 to 12/12	0.011	0.060	0.015
	12/12 to 01/09	0.010	0.050	0.015
E Onsite	06/27 to 07/26	0.013	0.035	0.018
	07/26 to 08/25	0.012	0.025	0.018
	08/25 to 09/23	0.012	0.025	0.018
	09/23 to 10/20	0.012	0.025	0.018
	10/20 to 11/14	0.013	0.026	0.015
	11/14 to 12/12	0.012	0.070	0.015
	12/12 to 01/09	0.010	0.085	0.015
F Onsite	06/27 to 07/26	0.010	0.035	0.022
	07/26 to 08/25	0.015	0.048	0.022
	08/25 to 09/23	0.018	0.040	0.022
	09/23 to 10/20	0.015	0.035	0.025
	10/20 to 11/14	0.015	0.032	0.025
	11/14 to 12/12	0.015	0.060	0.023
	12/12/ to 01/09	0.012	0.060	0.018

* Detectors are "bugged" to insure on scale readings.

TABLE 15 (Cont'd)

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

FIRST HALF

LOCATION	PERIOD 1983	MIN.	MAX.	AVG.
			mR/hr	
G Onsite	01/06 to 02/03	0.012	0.033	0.021
	02/03 to 03/03	0.012	0.065	0.020
	03/03 to 03/29	0.013	0.060	0.020
	03/29 to 04/28	0.015	0.047	0.020
	04/28 to 05/27	0.015	0.045	0.025
	05/27 to 06/27	0.015	0.040	0.024
H Onsite	01/06 to 02/03	0.012	0.13	0.020
	02/03 to 03/03	0.012	0.045	0.023
	03/03 to 03/29	0.012	0.050	0.020
	03/29 to 04/28	0.013	0.040	0.020
	04/28 to 05/27	0.012	0.045	0.020
	05/27 to 06/27	0.015	0.040	0.020
I Onsite	01/06 to 02/03	0.013	0.072	0.018
	02/03 to 03/03	0.012	0.039	0.022
	03/03 to 03/29	0.015	0.080	0.025
	03/29 to 04/28	0.020	0.060	0.028
	04/28 to 05/27	0.013	0.073	0.025
	05/27 to 06/27	0.018	0.039	0.028
J Onsite	01/06 to 02/03	0.010	0.065	0.013
	02/03 to 03/03	0.010	0.051	0.018
	03/03 to 03/29	0.010	0.052	0.013
	03/29 to 04/28	0.010	0.042	0.013
	04/28 to 05/27	0.010	0.062	0.018
	05/27 to 06/27	0.010	0.042	0.015
K Onsite	01/06 to 02/03	0.010	0.023	0.012
	02/03 to 03/03	0.010	0.039	0.018
	03/03 to 03/29	0.011	0.059	0.018
	03/29 to 04/28	0.013	0.032	0.018
	04/28 to 05/27	0.010	0.035	0.018
	05/27 to 06/27	0.012	0.030	0.018

* Detectors are "bugged" to insure on scale readings.

TABLE 15 (Cont'd)

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

SECOND HALF

LOCATION	PERIOD 1983	MIN.	MAX. (mR/hr)	AVG. (mR/hr)
G Onsite	06/27 to 07/26	0.018	0.038	0.025
	07/26 to 08/25	0.016	0.049	0.023
	08/25 to 09/23	0.013	0.036	0.022
	09/23 to 10/20	0.015	0.032	0.020
	10/20 to 11/14	0.015	0.035	0.021
	11/14 to 12/12	0.015	0.060	0.019
	12/12 to 01/09	0.010	0.055	0.015
H Onsite	06/27 to 07/26	0.012	0.062	0.025
	07/26 to 08/25	0.018	0.13	0.024
	08/25 to 09/23	0.015	0.13	0.022
	09/23 to 10/20	0.015	0.080	0.025
	10/20 to 11/14	0.015	0.090	0.025
	11/14 to 12/12	0.015	0.080	0.025
	12/12 to 01/09	0.010	0.050	0.020
I Onsite	06/27 to 07/26	0.010	0.038	0.028
	07/26 to 08/25	0.010	0.030	0.020
	08/25 to 09/23	0.010	0.028	0.013
	09/23 to 10/20	0.010	0.030	0.015
	10/20 to 11/14	0.010	0.030	0.015
	11/14 to 12/12	0.012	0.040	0.020
	12/12 to 01/09	0.010	0.025	0.015
J Onsite	06/27 to 07/26	0.010	0.025	0.013
	07/26 to 08/25	0.010	0.025	0.013
	08/25 to 09/23	0.010	0.080	0.013
	09/23 to 10/20	0.010	0.020	0.015
	10/20 to 11/14	0.010	0.10	0.015
	11/14 to 12/12	0.010	0.040	0.013
	12/12 to 01/09	0.010	0.055	0.012
K Onsite	06/27 to 07/26	0.012	0.038	0.018
	07/26 to 08/25	0.010	0.028	0.018
	08/25 to 09/23	0.010	0.026	0.018
	09/23 to 10/20	0.012	0.052	0.018
	10/70 to 11/14	0.010	0.030	0.015
	11/14 to 12/12	0.010	0.030	0.016
	12/12 to 01/09	0.010	0.040	0.012

* Detectors are "bugged" to insure on scale readings.

TABLE 16

CONCENTRATIONS OF IODINE-131 IN MILK

Results in Units of pCi/l ± 2 sigma

Station*	May	June	July	August	September	October	November	December
16	<0.104	<0.228	<0.167	<0.20	<0.30	<0.30	<0.13	<0.27
4	<0.277	<0.205	<0.140	<0.30	<0.40	<0.30	<0.17	<0.21
45	<0.231	<0.329	<0.168	<0.30	<0.30	<0.30	<0.18	<0.24
5	<0.254	<0.229	<0.137	<0.30	<0.20	<0.50	<0.15	<0.26
7	<0.271	<0.177	<0.163	<0.30	<0.20	<0.30	<0.16	<0.42
40 (Control)	<0.122	<0.289	<0.185	<0.30	<0.20	<0.30	<0.18	<0.17
50	<0.200	<0.245	<0.227	<0.30	<0.20	<0.40	<0.32	<0.16
55	<0.397	<0.169	<0.142	<0.40	<0.20	<0.30	<0.19	<0.28
14	<0.247	-	-	-	-	-	-	-
60	<0.321	-	-	-	-	-	-	-

* Corresponds to sample locations listed on Figure 5, Section VII.

\- Sampling station no longer required by Technical Specifications, therefore discontinued.

TABLE 17
CONCENTRATIONS OF GAMMA EMITTERS IN MILK
(MONTHLY COMPOSITE SAMPLES)
Results in Units of pCi/l ± 2 sigma

STATION*	NUCLIDES	05/09/83 to 05/23/83	06/06/83 to 06/20/83	07/04/83 to 07/18/83	08/01/83 to 08/15/83	09/12/83 to 09/26/83	10/10/83 to 10/24/83	11/08/83 to 11/21/83	12/05/83 to 12/19/83
No. 16	K-40	1500±150	1400±140	1400±140	1170±120	938± 94	1150±120	1030±100	1440±140
	Cs-134	<2.6	<3.2	<4.0	<7.0	<4.6	<4.4	<4.3	<4.7
	Cs-137	<3.6	<4.8	<6.0	<6.0	<5.7	<5.1	<4.7	<5.4
	Ba-140	<46.0	<42.0	<6.0	<9.0	<6.0	<5.7	<9.7	<7.1
	La-140	<8.5	<11.0	<6.0	<9.0	<6.0	<5.7	<9.7	<7.1
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1300±130	1500±150	1120±110	1370±140	1120±110	1070±110	1060±110	1210±120
	Cs-134	<3.3	<3.4	<6.0	<4.0	<4.1	<4.2	<4.1	<4.5
	Cs-137	<4.4	<4.6	<6.0	<5.0	<4.2	<4.7	<4.8	<4.8
	Ba-140	<57.0	<51.0	<9.0	<7.0	<5.0	<5.2	<11.0	<5.9
	La-140	<8.5	<9.9	<9.0	<7.0	<5.0	<5.2	<11.0	<5.9
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 45	K-40	1300±130	1500±150	11[illegible]0±120	1210±120	1310±130	1060±110	1010±100	1430±140
	Cs-134	<3.4	<3.2	<8.0	<7.0	<6.5	<4.2	<4.2	<4.6
	Cs-137	<4.0	<6.2	<8.0	<8.0	<6.5	<4.2	<5.1	<5.3
	Ba-140	<35.0	<48.0	<10.0	<10.0	<7.4	<5.0	<9.4	<6.3
	La-140	<8.0	<11.0	<10.0	<10.0	<7.4	<5.0	<9.4	<6.3
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 5	K-40	1400±140	1400±140	1130±110	1180±120	990± 99	1220±120	1180±100	1250±130
	Cs-134	<4.0	<3.9	<7.0	<4.0	<4.0	<4.1	<4.0	<6.8
	Cs-137	<4.5	5.1±2.8	<7.0	<8.0	<5.6	<4.1	<4.3	<6.9
	Ba-140	<54.0	<56.0	<10.0	<6.0	<3.8	<6.5	<8.5	<8.2
	La-140	<11.0	<13.0	<10.0	<6.0	<3.8	<6.5	<8.5	<8.2
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1500±150	1500±150	1520±150	1120±110	1160±120	1140±110	923± 92	1380±140
	Cs-134	<2.9	<2.8	<8.0	<5.0	<5.6	<4.6	<4.6	<5.7
	Cs-137	<4.1	<4.0	<8.0	<6.0	<5.8	<5.0	<5.4	<6.1
	Ba-140	<41.0	<45.0	<10.0	<8.0	<5.1	<7.1	<10.0	<7.5
	La-140	<7.2	<9.2	<10.0	<8.0	<5.1	<7.1	<10.0	<7.5
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Corresponds to sample locations noted on Figure 5, Section VII.

TABLE 17 (cont.)
CONCENTRATIONS OF GAMMA EMITTERS IN MILK
(MONTHLY COMPOSITE SAMPLES)
Results in Units of pCi/l ± 2 sigma

STATION*	NUCLIDES	05/09/83 to 05/23/83	06/06/83 to 06/20/83	07/04/83 to 07/18/83	08/01/83 to 08/15/83	09/12/83 to 09/26/83	10/10/83 to 10/24/83	11/08/83 to 11/21/83	12/05/83 to 12/19/83
No. 40 (Control)	K-40	1600+160	1500+150	1130+110	1120+110	1240+120	1250+120	1070+110	1330+130
	Cs-134	<2.9	<3.7	<4.0	<4.0	<7.0	<3.7	<4.3	<4.3
	Cs-137	<3.5	<4.9	<6.0	<5.0	<7.5	<5.5	<5.5	<4.8
	Ba-140	<42.0	<50.0	<9.0	<6.0	<9.1	<5.5	<8.8	<6.0
	La-140	<6.3	<7.7	<9.0	<6.0	<9.1	<5.5	<8.8	<6.0
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1500+150	1500+150	1190+120	1420+140	1020+100	1160+120	1070+110	1090+110
	Cs-134	<3.4	<4.0	<6.0	<6.0	<7.6	<5.3	<5.4	<7.7
	Cs-137	<4.6	<4.8	<6.0	<7.0	<7.4	<5.4	<6.5	<7.9
	Ba-140	<53.0	<60.0	<8.0	<8.0	<7.4	<7.0	<11.0	<10.0
	La-140	<7.6	<11.0	<8.0	<8.0	<7.4	<7.0	<11.0	<10.0
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1400+140	1500+150	**	1370+140	947+ 95	1080+110	1400+140	1420+140
	Cs-134	<3.7	<3.4	**	<4.0	<4.1	<7.1	<4.7	<4.3
	Cs-137	<4.7	<4.0	**	<4.0	<4.6	<7.4	<5.0	<4.8
	Ba-140	<41.0	<43.0	**	<7.0	<4.5	<11.0	<11.0	<6.8
	La-140	<9.8	<4.6	**	<7.0	<4.5	<11.0	<11.0	<6.8
	Others	<LLD	<LLD	**	<LLD	<LLD	<LLD	<LLD	<LLD
No. 14	K-40	1300+130	-	-	-	-	-	-	-
	Cs-134	<3.6	-	-	-	-	-	-	-
	Cs-137	<4.4	-	-	-	-	-	-	-
	Ba-140	<40.0	-	-	-	-	-	-	-
	La-140	<11.0	-	-	-	-	-	-	-
	Others	<LLD	-	-	-	-	-	-	-
No. 60	K-40	1500+150	-	-	-	-	-	-	-
	Cs-134	<3.2	-	-	-	-	-	-	-
	Cs-137	<4.5	-	-	-	-	-	-	-
	Ba-140	<50.0	-	-	-	-	-	-	-
	La-140	<9.5	-	-	-	-	-	-	-
	Others	<LLD	-	-	-	-	-	-	-

* Corresponds to sample locations noted on Figure 5, Section VII.
\- Sampling stations discontinued (not required by Environmental Technical Specifications).
**Sample lost in shipment.

TABLE 18

CONCENTRATIONS OF STRONTIUM-90 IN MILK
(MONTHLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 2 sigma

Station*	May	June	July	August
16	2.84 ± 0.53	4.72 ± 1.8	4.5 ± 0.7	2.0 ± 0.6
4	2.72 ± 0.87	3.97 ± 0.84	3.0 ± 0.7	2.8 ± 0.7
45	4.06 ± 1.10	1.30 ± 0.30	3.2 ± 0.7	3.2 ± 0.7
5	2.84 ± 0.53	1.69 ± 1.1	4.1 ± 0.7	2.5 ± 0.6
7	3.66 ± 0.73	2.45 ± 1.4	4.1 ± 0.7	2.4 ± 0.6
40 (Control)	1.99 ± 0.51	1.50 ± 0.30	2.4 ± 0.6	2.1 ± 0.5
50	3.17 ± 0.78	1.79 ± 0.89	1.7 ± 0.5	1.8 ± 0.4
55	1.27 ± 0.70	5.05 ± 1.3	**	1.6 ± 0.6
14	4.45 ± 1.60	-	-	-
60	3.79 ± 0.72	-	-	-

Station*	September	October	November	December
16	2.9 ± 0.6	2.4 ± 0.7	1.6 ± 0.6	3.3 ± 0.6
4	1.3 ± 0.6	2.5 ± 0.6	3.3 ± 0.6	2.1 ± 0.5
45	3.8 ± 0.5	2.7 ± 0.5	1.6 ± 0.6	3.1 ± 0.6
5	2.5 ± 0.7	1.0 ± 0.7	2.2 ± 0.5	2.2 ± 0.7
7	2.1 ± 0.5	1.3 ± 0.6	1.7 ± 0.8	2.1 ± 0.5
40 (Control)	1.9 ± 0.4	1.0 ± 0.6	1.8 ± 0.5	2.6 ± 0.5
50	1.3 ± 0.4	1.9 ± 0.6	1.1 ± 0.4	2.1 ± 0.4
55	2.0 ± 0.5	3.1 ± 0.8	2.5 ± 0.7	3.1 ± 0.6

* Corresponds to sample locations listed on Figure 5, Section VII.
\- Sampling station no longer required by Environmental Technical Specifications.
** Sample lost in shipment.

TABLE 19
MILCH ANIMAL CENSUS
SPRING 1983

TOWN	NUMBER ON CENSUS MAP(1)	NUMBER OF MILCH ANIMALS
Scriba	1	None ***
	16*	39C
	2	30C
	3	1C
	6	1C
New Haven	8	30C
	9	40C
	4*	75C
	45*	22C
	10	28C
	5*	45C
	11	40C
	7*	54C
Mexico	12	70C
	13	2C
	14*	65C
	15	35C
	17	43C
	18	46C
	19	41C
	20	7C
	60*	40C
	50*	150C
	55*	51C
	21	78C
Richland	22	40C
	23	65C
Oswego	24	31C
Hannibal	40**	34C
Volney	25	10C
	TOTALS	1213 Cows 0 Goats

C = Cows
G = Goats
* = Milk sample location
** = Milk sample control location
*** = Previous 1982 location
(1) = References Figure 5

TABLE 19 (Continued)
MILCH ANIMAL CENSUS
SUMMER 1983

TOWN	NUMBER ON CENSUS MAP(1)	NUMBER OF MILCH ANIMALS
Scriba	1	2G
	16*	39C
	2	NA
	3	1C
	6	1C
	26	1C
New Haven	8	30C
	9	40C
	4*	65C
	45*	23C
	10	27C
	5*	45C
	11	35C
	7*	53C
Mexico	12	66C
	13	2C
	14	60C
	15	33C
	17	43C
	18	47C
	19	42C
	20	None***
	60*	40C
	50*	150C
	55*	52C
	21	78C
Richland	22	58C
	23	70C
Oswego	24	None***
Hannibal	40**	34C
Volney	25	10C
	TOTALS	1145 Cows 2 Goats

C = Cows
G = Goats
* = Milk sample location
** = Milk sample control location
*** = Previous 1983 location
NA = Did not wish to participate in the survey
(1) = References Figure 5

TABLE 20

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS

Results in Units of pCi/g(wet) ± 2 sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	Others
A	5-10-83	Eggs	<0.31	0.9 ± 0.2	(1)	<0.018	<0.016	<LLD
B	5-19-83	Eggs	<0.40	1.2 ± 0.3	<3.6	<0.022	<0.024	<LLD
C	6-3-83	Eggs	<0.22	1.1 ± 0.2	<0.7	<0.014	<0.016	<LLD
D(control)	5-10-83	Eggs	<0.37	0.8 ± 0.4	(1)	<0.018	<0.019	<LLD
A	5-10-83	Poultry	<0.25	2.9 ± 0.3	(1)	<0.015	<0.015	<LLD
B	5-19-83	Poultry	<0.31	2.8 ± 0.3	<2.8	<0.016	<0.018	<LLD
C	6-3-83	Poultry	<0.15	2.8 ± 0.3	<0.5	<0.010	0.018 ± 0.008	<LLD
D(control)	5-10-83	Poultry	<0.18	1.7 ± 0.2	(1)	<0.010	<0.010	<LLD
E	6-2-83	Beef	<0.24	2.9 ± 0.3	<0.7	<0.015	<0.017	<LLD
F	5-25-83	Beef	<0.30	2.5 ± 0.3	<1.6	<0.019	0.023 ± 0.013	<LLD
G	5-25-83	Beef	<0.20	2.3 ± 0.3	<1.1	<0.015	<0.018	<LLD
H(control)	5-18-83	Beef	<0.22	2.6 ± 0.3	<1.7	<0.014	<0.014	<LLD

(1) I-131 not in the radionuclide library.

TABLE 26 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS

Results in Units of pCi/g(wet) ± 2 sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	Others
A	11-30-83	Eggs	<0.04	1.1 ± 0.1	<0.02	<0.005	<0.005	<LLD
B	11-8-83	Eggs	<0.07	1.1 ± 0.1	<0.12	<0.005	<0.006	<LLD
C	11-7-83	Eggs	<0.08	1.1 ± 0.1	<0.15	<0.006	<0.007	<LLD
D(control)	11-1-83	Eggs	<0.11	1.0 ± 0.1	<0.34	<0.008	<0.006	<LLD
A	11-30-83	Poultry	<0.07	3.1 ± 0.3	<0.03	<0.009	<0.009	<LLD
B	11-8-83	Poultry	<0.08	3.2 ± 0.3	<0.12	<0.007	<0.007	<LLD
C	11-7-83	Poultry	<0.09	3.1 ± 0.3	<0.16	<0.008	<0.008	<LLD
D(control)	11-1-83	Poultry	<0.09	3.3 ± 0.3	<0.25	<0.007	<0.007	<LLD
I	11-8-83	Beef	<0.06	2.9 ± 0.3	<0.10	<0.005	0.044 ± 0.006	<LLD
J	12-2-83	Beef	<0.04	2.4 ± 0.2	<0.01	<0.005	0.014 ± 0.004	<LLD
K	11-18-83	Beef	<0.08	3.4 ± 0.3	<0.07	<0.009	0.023 ± 0.007	<LLD
H(control)	11-11-83	Beef	<0.05	3.2 ± 0.3	<0.08	<0.005	<0.006	<LLD

TABLE 20 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS

Results in Units of pCi/g(wet) ± 2 sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	Others
I	9-26-83	Swiss Chard	<0.08	3.7 ± 0.4	<0.01	<0.008	<0.010	<LLD
I	9-26-83	Tomatoes	<0.04	2.3 ± 0.2	<0.01	<0.006	<0.006	<LLD
L	9-26-83	Swiss Chard	<0.13	4.6 ± 0.5	<0.02	<0.016	<0.016	<LLD
L	9-25-83	Cucumbers	<0.05	1.6 ± 0.2	<0.01	<0.007	<0.010	<LLD
N	9-26-83	Cabbage	<0.09	1.8 ± 0.2	<0.01	<0.011	<0.013	<LLD
N	9-26-83	Squash	<0.11	1.6 ± 0.2	<0.02	<0.014	<0.014	<LLD
M(control)	9-26-83	Cabbage	<0.09	2.9 ± 0.3	<0.01	<0.012	<0.013	<LLD
M(control)	9-26-83	Zucchini	<0.06	1.2 ± 0.1	<0.01	<0.007	<0.007	<LLD

TABLE 21

CONCENTRATIONS OF STRONTIUM-90 AND GAMMA EMITTERS IN SOIL

Results in Units of pCi/g (dry) ± 2 sigma

SAMPLE CODE*	SAMPLE DATE	Sr-90	K-40	GAMMA EMITTERS Cs-137	Ra-226	Th-228	OTHERS
				ONSITE			
D-1	11/10/83	<0.037	13.6 ±1.4	<0.045	<0.71	0.54±0.05	ALL<LLD
D-2	11/10/83	<0.038	16.3 ±1.6	0.096±0.044	1.19±0.53	0.73±0.07	ALL<LLD
E	11/10/83	0.41±0.04	7.2 ±0.9	0.603±0.058	<0.99	0.52±0.10	ALL<LLD
F	11/10/83	0.049±0.020	10.1 ±1.0	<0.043	1.22±0.34	0.70±0.07	ALL<LLD
G	11/10/83	0.034±0.018	13.9 ±1.4	0.095±0.016	1.13±0.30	0.67±0.07	ALL<LLD
H	11/10/83	0.030±0.018	19.4 ±1.9	0.067±0.024	1.52±0.37	0.94±0.09	ALL<LLD
I	11/10/83	0.11±0.02	11.6 ±1.2	0.254±0.048	<0.90	0.60±0.06	ALL<LLD
J	11/10/83	0.47±0.05	13.3 ±1.3	1.19±0.81	<0.84	0.59±0.06	ALL<LLD
K	11/10/83	0.17±0.03	11.3 ±1.1	0.618±0.069	2.15±0.85	0.92±0.07	ALL<LLD
				OFFSITE			
C	11/09/83	0.13±0.04	18.1 ±1.8	1.46±0.15	1.77±0.84	0.94±0.09	ALL<LLD
D-1	11/09/83	0.17±0.03	9.0 ±0.9	0.20±0.04	1.30±0.70	0.83±0.08	ALL<LLD
D-2	11/09/83	0.27±0.06	10.4 ±1.0	0.66±0.07	1.35±0.71	0.59±0.06	ALL<LLD
E	11/09/83	0.32±0.04	10.3 ±1.3	1.03±0.12	<1.40	0.55±0.08	ALL<LLD
F	11/09/83	0.11±0.03	12.3 ±1.2	0.45±0.06	<0.96	0.72±0.06	ALL<LLD
G	11/09/83	0.10±0.03	14.8 ±1.5	0.20±0.06	<1.10	0.69±0.07	ALL<LLD

* Sample locations were at each air monitoring station, see Figures 1 and 3, Section VII.

V

DATA SUMMARIES AND CONCLUSIONS

V DATA SUMMARIES AND CONCLUSIONS

The results of the 1983 Radiological Environmental Monitoring Program are evaluated considering the natural processes of the environment and the aggregate of past data. A number of factors are considered in the course of this radiological data evaluation and interpretation. The interpretation of data can be made at several levels including trend analysis, population dose, risk estimates to the general population based on environmental concentrations, effectiveness of plant effluent controls and specific research areas, among others. An attempt has been made in this report not only to report the data collected during the 1983 sample program but also to assess the significance of the radionuclides detected in the environment. It is important to note that detection of an isotope is not of itself an indication of its environmental significance. Evaluation of the impact of the radionuclide in terms of potential increased dose to man, in relation to natural background, is necessary.

Three specific groups of radionuclides exist in the environment. The first of these groups is naturally occurring. It must be recognized that our environment contains a broad inventory of natural background radiation of primordial and daily origin. The background radiation is in a constant state of flux, influenced by a myriad of daily phenomena including solar activity, snow cover, barometric pressure and meteorological conditions. The natural background radiation in the general area of the site is assessed on a quarterly basis and is found to be the most significant contributor to man's radiation exposure.

The radiation resulting from the detonation of thermonuclear devices in the earth's atmosphere has produced a second group of radionuclides generally found in the environment. The inventory of fallout radionuclides found worldwide is the result of atmospheric testing conducted in the years 1945 through 1963. In 1963 a ban was placed on the testing of thermonuclear devices in the atmosphere greatly reducing the inventory of short half-life radionuclides in the environment. Since 1963 several atmospheric nuclear tests have been conducted by the People's Republic of China. The most recent of these tests took place in October of 1980. The resulting fallout from these tests has influenced the background radiation in the vicinity of site and is evident in many of the sample media analyzed during 1983. Calculations of the resulting dose to man from fallout nuclides in the environment show that the contribution from such nuclides in some cases (Sr-90 and Cs-137) is significant and second in intensity only to natural background radiation.

The third group of radionuclides detected in the local environment is those resulting from the operation of the plant. The detection of plant related radionuclides is one of the main objectives of the environmental surveillance program. The dose to man as a result of plant operation is small and much less than the radiation exposure from naturally occurring sources of radiation and in most cases from fallout exposure.

In Section V each sample medium is discussed. Concentrations of radionuclides detected and exposure to man are presented and scrutinized.

Section VI, titled HISTORICAL DATA, contains sample statistics from previous environmental sampling. The process of determining the impact (or lack of impact) of plant operation on the environment includes the scrutiny of past analytical data, a tool by which trends are discerned. The interpretation of historical data in this report is done to a limited degree. Because of the constant change in analytical sensitivities, as state-of-the-art detection capabilities improve, data comparisons become difficult. For example, minimum detection capabilities for the 1969 and 1974 analyses of environmental samples would be considered anomalous by 1983 standards.

LAKE PROGRAM

Tables 1 through 8 list the 1983 analytical results for the aquatic/lake water media sampled during the 1983 sampling program. Aquatic samples were obtained at a combination of four onsite locations. The transect designations used for the onsite sampling locations are NMPW (01), NMPP (02), JAF (03) and NMPE (04). Due to limited availability of certain required sample media, samples could not be obtained consistently at each of the same onsite transects sampled for other media. Offsite samples were collected in the vicinity of the Oswego Harbor (offsite - 00).

1. PERIPHYTON SAMPLES - TABLE 1

Periphyton is a common fresh water algae found throughout the Great Lakes and in almost all underwater aquatic systems. Periphyton in its simplest form is a single celled organism which colonizes the natural and artificial substrates found in the shore and near shore waters. Colonies of periphyton can be found from the shore zone to water depths which can be sufficiently penetrated by sunlight to support photosynthesis. Periphyton is dependent on sunlight and inorganic materials found in the lake to support life therefore putting it in the classification of a primary producer. Periphyton in its simplest form is the slimy coating which is found on most underwater surfaces and has a brown to green coloration. This organism is used as an indicator organism to help evaluate the possible effects of plant operation on the local aquatic environment on the lowest level of the food chain.

The collection and analysis of periphyton samples was performed twice during the 1983 sample program.

The first collection of periphyton was completed on June 20, 1983 and the second collection was completed on August 23-24, 1983. The gamma spectral analysis of periphyton samples showed detectable concentrations of Cs-134, Cs-137, Mn-54, Co-60, Be-7, Ra-226, Th-228 and K-40. The eight radionuclides detected in periphyton samples can be attributed to several sources. Each of the radionuclides detected can be placed in one of three groups. The first group of radionuclides is the result of plant operation. The second group of radionuclides is naturally occurring and is found in many living organisms as noted throughout this report. The third group of radionuclides is the result of past atmospheric nuclear weapons testing. Radionuclides with relatively long half-lives which fall into this third group are the result of atmospheric tests conducted over the past decades. The only fallout related radionuclide detected in 1983 periphyton samples was Cs-137. Cs-137 requires special consideration as this radioisotope of cesium is a common constituent of the background radiation due to fallout but can also be attributed to the operation of the plant. In 1981 six fallout radionuclides were detected in the periphyton samples. Of the six radionuclides detected in 1981, two, Ce-144 and Cs-137, were detected in 1982, and one, Cs-137, was detected in the 1983 samples. The other fallout radionuclides were not detected in 1982-83 because of their short half-lives (3.5 days to 368 days) which resulted in their decaying away to concentrations below that of the lower limits of detection (LLD) and as a result of ecological cycling.

The first set of periphyton samples collected on June 20, 1983 contained detectable concentrations of Be-7, K-40, Mn-54, Cs-134, Cs-137, Co-60, Ra-226 and Th-228. The maximum detectable concentrations for plant related radionuclides were 0.048 pCi/g (wet) for Cs-134, 0.024 pCi/g (wet) for Mn-54, 0.24 pCi/g (wet) for Co-60, and 0.69 pCi/g (wet) for Cs-137. Cs-137 was detected in both the control (offsite) sample and the two indicator (onsite) samples with the maximum concentration, as noted above, present in the indicator sample.

The second collection of periphyton samples completed on August 24, showed a small increase in the concentrations of two plant related radionuclides, with a slight decrease of concentration in the third. The maximum detectable concentrations of plant related radionuclides in the second or summer collection were 0.047 pCi/g (wet) for Mn-54, 0.25 pCi/g (wet) for Co-60, and 0.33 pCi/g (wet) for Cs-137. Cs-134 which was found in the June samples was not detected in the August samples. As in the June samples, Cs-137 was detected at all three sample locations including the control location.

Four naturally occurring radionuclides were detected in each of the six 1983 samples. Be-7, K-40, Ra-226 and Th-228 were found in both the onsite and the offsite samples. The concentration of the naturally occurring radionuclides was consistent with levels detected in previous years' samples. A general increase in the concentrations of radionuclides in the second or late summer collection compared to the June collection was noted for the 1983 samples at the indicator locations. A similar increase in concentration in samples collected in late summer was also noted in 1980, 1981, and 1982. This increase in sample concentration may be due to the higher metabolic rate or increased growth of the periphyton community between the first and second collections. Each of the plant related radionuclides detected in the 1983 samples were trace amounts and are attributed to plant effluents.

A dose to man calculation from the level of activity found in lake periphyton samples in the vicinity of the plant is difficult to make as periphyton is not directly in the human food chain. To best determine the resulting dose to man from the activity found in periphyton samples, calculations were made based on concentrations found in fish samples as fish represent the upper level of the food chain in which periphyton is a primary producer. Dose to man calculations based on concentrations found in fish and consumption rates are contained in Section V.5.

A review of past data shows Cs-137 concentrations in both indicator and control periphyton samples increased slightly since the 1982 samples, but show a decrease from a secondary peak in 1981 which was the result of fallout from a nuclear weapons test conducted in October of 1980. Co-60 concentration in periphyton also showed a slight increase in concentration at the indicator stations. Ce-144 shows a leveling effect from 1982 samples, with a marked decrease in concentration from 1981. This return of Ce-144 concentrations to background levels (LLD) at both the indicator and control sample locations is due to the radiological decay of Ce-144. Both the 1977 and 1981 peaks represented on the graph of Ce-144 concentration in Section VII are attributed to fallout from atmospheric testing. Graphs depicting concentrations of Cs-137 and Co-60 are also present in Section VII.

2. BOTTOM SEDIMENT - TABLE 2

Bottom sediment samples were collected twice during the 1983 sampling program. Gamma spectral analyses and Sr-90 analyses were performed on each of the six samples and the results are presented in Table 2. Samples were collected in June and October in 1983 with the Oswego Harbor area (transect [00]) serving as the control location, Nine Mile Point Plant (transect [02]) and the FitzPatrick Plant (transect [03]) serving as the indicator or onsite sample locations. As in past years the most abundant fission radionuclide detected was Cs-137 which was found in each of the six samples collected in 1983, which included both the onsite and offsite samples. Co-60 was detected in four of the six samples and Sr-90 was detected in two of the six 1983 samples.

The presence of Cs-137 in the lake bottom sediment can be attributed to the accumulation of fallout in the aquatic environment as a result of the detonation of nuclear devices in the atmosphere. The origin of Cs-137 in atmosphere testing can be demonstrated by sample results which show the presence of Cs-137 in control location sediment samples. The Cs-137 concentrations for the control station ranged from 0.29 pCi/g (dry) to 0.18 pCi/g (dry), and 0.43 pCi/g (dry) to 0.18 pCi/g (dry) for the indicator samples.

Co-60 was detected in all four of the indicator samples collected in 1983. Positive detections of Co-60 ranged from a minimum of 0.10 pCi/g (dry) to a maximum of 0.16 pCi/g (dry). The detected levels of Co-60 are relatively the same as the concentrations detected in 1982 when the minimum concentration was 0.09 pCi/g (dry) and the maximum value was 0.19 pCi/g (dry). The detection of Co-60 in sediment can be attributed to the operation of the plant. Co-60 was not detected in the control samples collected in 1983. The levels of Co-60 detected in the onsite samples are very small, and are near the lower limits of detection.

Strontium-90 was detected in two of the six Bottom Sediment samples collected in 1983. One positive detection was made at the Oswego Harbor (00) transect, and the other at the Nine Mile Point (02) transect. Sr-90 was not detected at the second onsite sample location. The presence of Sr-90 at the control and indicator locations is considered to be the result of weapons fallout. Sr-90 was also detected at both control and indicator sample locations during 1978, 1979, 1980, and 1981, which is evidence that Sr-90 is attributable to weapons testing fallout. The mean 1983 control concentration for Sr-90 was 0.14 pCi/g (dry). The mean 1983 indicator concentration for Sr-90 was 0.05 pCi/g (dry). Both these positive detections of Sr-90 were found during the first (June) bottom sediment collection. The Sr-90 concentration for the control and two indicator sample locations for the second (October) bottom sediment collection were all LLD values. Variations in Sr-90 concentrations can be influenced by several factors including sediment type and chemical make-up. The presence of Sr-90 in many of the other control samples supports the fact that Sr-90 is ubiquitous throughout the environment.

The dose to man from bottom sediment is not of concern and cannot be directly calculated. Bottom sediment is not accessible to man and the radioactivity found in the sediment is shielded by the overlaying water column. To illustrate the impact of radioactivity in sediment samples with respect to the dose to man concept, the assumption can be made that at some future time bottom sediment could be introduced into the shoreline sediment through re-suspension and deposition. Assuming that the density of the sediment is 40 kg/m^2 (dry) and using the average residence time on the shore of 47 hours per year for a teenager, the annual dose rate from a maximum indicator sample Cs-137 concentration of 0.43 pCi/g (dry) is calculated to be 0.0034 mrem per year whole body dose. The whole body dose from a Co-60 concentration of 0.16 pCi/g (dry) would be equal to 0.0051 mrem per year. The resulting total whole body dose would be equal to 0.0085 mrem per year whole body. The contribution to the total whole body dose due to Sr-90 would be infinitesimal due to the fact that Sr-90 decays by a beta emission and has no associated strong gamma energy.

A review of past Cs-137 data illustrates that the mean concentration values for the indicator stations have dropped significantly from 1976 to 1979 with the general trend downward continuing from 1979 through 1982. The 1983 mean concentration of Cs-137 was slightly higher than the 1982 value. Since 1979, the mean value for the control station has been greater than the indicator stations with 1982 showing a change in the downward trend for Cs-137 concentrations at the control locations. However, the 1983 concentrations show a reverse in this situation. This change in trending for the Cs-137 concentrations may be the effect of the control location's close proximity to the Oswego River Outlet and a possible source of Cs-137 from deposition of Cs-137 from atmospheric nuclear testing onto the river watershed. The concentration of Co-60 in sediment samples has shown a similar downward trend to that of Cs-137 since 1977. The maximum Co-60 concentration in the indicator samples (mean) shows a consistent downward trend since 1977 that continued through 1981 with a slight increase in mean concentrations for 1982-83. This increase is not significant and is within the bounds of statistical variation. Historical trends for concentrations of Cs-137 and Co-60 are presented in graphic form in Section VII.

3. MOLLUSK SAMPLES - TABLE 3

A total of six mollusk samples were collected in 1983 from a total of three general locations. Each sample was analyzed for gamma emitters using gamma spectral analysis and for Sr-90 using chemical separations and beta particle analysis. The results of the 1983 samples are presented on Table 3. As in past years the effort to collect mollusk samples of sufficient size has been of limited success in terms of sample volume collected. The collections in 1983 were productive and resulted in sample volumes in the 500 gram range which in some cases resulted in good sensitivities for the gamma spectral analysis, in particular for the indicator samples. Mollusk samples were successfully collected at the offsite (00) or control location and at the Nine Mile Point Plant (02) transect and the FitzPatrick (03) transect, for the indicator samples.

The results of the isotopic analysis of mollusk tissue detected the presence of five radionuclides. The nuclides detected consisted of two naturally occurring radionuclides (K-40 and Ra-226), two plant related radionuclides (Mn-54 and Co-60), and one radionuclide related to fallout from atmospheric nuclear testing (Sr-90). Detectable concentrations of Sr-90 were measured in each of six samples collected at both the onsite and offsite locations. The presence of Sr-90 in all the mollusk samples collected for the sample year was also observed in 1979, 1980, 1981, and 1982. The 1983 Sr-90 concentrations ranged from a maximum of 0.14 pCi/g (wet) to a minimum of 0.03 pCi/g (wet) with the control station mean equal to 0.035 pCi/g (wet) and the indicator mean equal to 0.11 pCi/g (wet). As in other sample media the presence of Sr-90 is considered to be the result of fallout from atmospheric nuclear testing. This determination is based on the fact that Sr-90 is consistently detected in control samples in previous years as noted above. Mn-54 and Co-60 were detected in each of the four onsite or indicator samples collected in 1983. The presence of Mn-54 and Co-60 in mollusk tissue can be attributed to the operation of the plant. Manganese-54 was detected in only the indicator samples with concentrations ranging from a maximum of 0.18 pCi/g (wet) to a minimum of 0.10 pCi/g (wet). Co-60 concentrations ranged from a maximum of 0.068 pCi/g (wet) to a minimum of 0.030 pCi/g (wet).

The relatively high frequency for the detection of Co-60 and particularly Mn-54 in mollusk samples can be attributed to the phenomenon of bioaccumulation or concentration factors. The level of an element in a particular organism relative to the level or concentration of the same element in the organism's environment is known as the concentration factor. Fresh water mollusk have an extremely high concentration factor of 300,000 (mean) for Mn-54 and 32,408 (mean) for Co-60*. Such high concentration factors would result in a rapid accumulation of manganese and cobalt activity in mollusk that are indigenous to the off shore area of the site.

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* Eisenbud (1973)

Fresh water mollusk found in the vicinity of the site are not consumed by humans and are not a major component or level in the food chain if for no other reason other than the small population due to the unfavorable physical makeup of the lake bottom in the area. Because these fresh water mollusk are not considered edible there is no dose to man from the presence of the Mn-54 or Co-60 concentrations. As in past years an estimate can be made using substituted parameters for the purpose of putting into perspective the possible significance of Mn-54 and Co-60 concentrations detected in the mollusk samples. Using the average individual consumption of seafood of 1.0 kg/year for an adult, the dose resulting from ingestion of mollusks would be 0.0002 mrem/year to the whole body and 0.0025 mrem/year to the gastrointestinal tract for the maximum Mn-54 concentration of 0.18 pCi/g (wet). The dose resulting from the Co-60 concentration of 0.068 pCi/g (wet) would be 0.0003 mrem/year to the whole body and 0.0027 mrem/year to the gastrointestinal tract. The total maximum dose that would be received from the consumption of 1.0 kg of fresh water mollusk would be 0.0005 mrem to the whole body and 0.0052 mrem to the gastrointestinal tract. This calculated dose is extremely small and as noted above in reality would be equal to no dose, because of the zero consumption rate.

The concentrations of Mn-54 and Co-60 have shown a significant decline since 1976 when both radionuclides were detected at their maximum level. The concentration of Mn-54 detected in the 1983 samples shows a slight decrease from the 1982 values. The Co-60 concentration in the indicator samples also showed a small decrease from the levels detected in 1982. Co-60 concentrations in mollusk samples have remained relatively constant since 1977. Sr-90 concentrations in mollusk samples have remained stable since 1978 after a peak in 1976, with little change in the 1983 samples. Graphs of previous mollusk sample results for Mn-54, Co-60 and Sr-90 are presented in Section VII. Also found in Section VII is a physical description of the lake bottom in the vicinity of the site for reference to the suitability of the area for mollusk habitat.

4. GAMMARUS - TABLE 4

GAMMARUS samples were collected twice during the 1983 sample period in conjunction with mollusk, periphyton and bottom sediment. GAMMARUS are benthic or demersal dwelling organisms found in the general vicinity of the site and throughout Lake Ontario. GAMMARUS are sampled as an indicator organism whose major predator is the local fish population. GAMMARUS are generally found in periphyton and cladophora growth areas and are limited in their territorial ranges. Samples were successfully collected at the control (00) location and at the NMPP (02) and JAF (03) transects for the spring and summer sampling. Sample collections were made over a two week period in order to collect sufficient samples for acceptable analyses. The first collection of GAMMARUS in the spring of 1983 (June 1, 1983 through June 15, 1983) yielded sample weights of only 22.2 g, 15.6 g, and 6.1 g respectively for the Oswego, NMPP, and JAF transects. It should be noted that GAMMARUS are normally less than 10 mm in size and require a large number to obtain a biomass of one gram of sample. The spring collection of GAMMARUS is also usually impeded by the cold lake water temperatures resulting in few GAMMARUS inhabiting the shoreline shallows. The analytical sensitivities were adequate for the spring samples with the exception of the JAF (03) transect sample which is most probably due to its small sample size. The JAF sample resulted in sensitivities of less than 0.80 pCi/g (wet) for Co-60, less than 0.90 pCi/g (wet) for Cs-137, and less than 0.40 pCi/g (wet) for Sr-90. These sensitivities are acceptable, but several times higher than those achieved for the control and the NMPP samples. The control sample resulted in sensitivities of less than 0.20 pCi/g (wet) for Co-60, less than 0.10 pCi/g (wet) for Cs-137, and a positive concentration of 0.096 pCi/g (wet) for Sr-90. The NMPP sample resulted in a sensitivity of less than 0.20 pCi/g (wet) for Co-60, and positive concentrations for both Cs-137 and Sr-90 of 0.36 pCi/g (wet) and 0.21 pCi/g (wet) respectively.

The summer (August 15, 1983 through August 29, 1983) collection of GAMMARUS provided sufficient quantities of this organism for good analytical sensitivities. The analyses of the summer GAMMARUS collected in August showed measurable concentrations of Co-60, Cs-137, K-40, and Sr-90. K-40 was detected in all three of the sample locations. K-40 is a naturally occurring radionuclide. Co-60 was detected at only one of the indicator locations JAF (03) with a concentratic value of 0.049 pCi/g (wet). Cs-137 was also only detected at the JAF (03) location with a concentration value of 0.057 pCi/g (wet). The levels of Co-60 and Cs-137 detected in the one onsite sample are very small and are near the lower limits of detection. Strontium-90 was detected in each of the samples collected in 1983 in both the indicator and control samples. As noted previously, similar detections of Sr-90 were made in mollusk samples. Strontium-90 is considered to be a background radionuclide because its origin is not related to the operation of the plant, but is attributed to fallout from atmospheric nuclear testing.

The absence of plant related radionuclides in GAMMARUS samples from the previous years of 1980, 1981 (second collection only), and 1982 indicate that the presence of these nuclides in GAMMARUS organisms is not routine nor chronic, the dose to man as a direct result of concentrations of cobalt and cesium would be zero as GAMMARUS is not consumed by man. The importance of the activity in these organisms is only significant with respect to the passage of any radionuclides through the food chain to a trophic level which may impact man.

The 1983 GAMMARUS sample results show a mean positive concentration for Cs-137 of 0.21 pCi/g (wet). This positive detection for Cs-137 is lower than the mean LLD value for Cs-137 in 1982 which was less than 0.45 pCi/g (wet), and many times less than the positive detection of 4.7 pCi/g (wet) for Cs-137 in 1981. Also the mean positive concentration for Co-60 in 1983 GAMMARUS samples was 0.049 pCi/g (wet) which was much lower than the mean LLD value for Co-60 in 1982 which was less than 0.65 pCi/g (wet), and many times less than the positive detection of 1.4 pCi/g (wet) for Co-60 in 1981. No definite trend can be determined for Co-60 or Cs-137 concentrations as positive detections have been random in past years. Previous GAMMARUS data (Cs-137, Sr-89, Sr-90) is presented in Section VI, HISTORICAL DATA.

5. FISH - TABLE 5

A total of 18 required fish samples were collected in the spring season (May 1983) and in the fall season (October 1983). Collections were made utilizing gill nets at one offsite location greater than five miles from the site (Oswego Harbor area), and at two onsite locations in the vicinity of the Nine Mile Point Unit #1 (02), and the James A. FitzPatrick (03) generating facilities. The Oswego Harbor samples served as control samples while the NMP (02) and JAF (03) samples served as indicator samples. Samples were analyzed for gamma emitters, Sr-89, and Sr-90. Data is presented in the ANALYTICAL RESULTS section of the report on Table 5.

Analysis of the 1983 fish samples contained detectable concentrations of radionuclides related to past weapons testing and natural origins (naturally occurring). Small detectable concentrations of Cs-137 were found in all fish samples (including control samples). Detectable concentrations of K-40, a naturally occurring radionuclide, were also found in all fish samples collected for the 1983 program.

Spring fish collections were comprised of two separate species and nine individual samples. The two species represented one feeding type. Lake trout and brown trout are highly predacious and feed on significant quantities of smaller fish such as smelt, alewife, and other smaller predacious species. Because of the limited availability of species present in the catches, no bottom feeder species were collected in the spring samples.

Cs-137 was detected in all onsite and offsite samples for both species collected. Onsite samples showed Cs-137 concentrations to be slightly greater than control levels for some samples and slightly less than control levels for other samples. The concentrations detected are not significantly different from the control results and are therefore considered background. Cs-137 in lake trout samples ranged from 0.033 to 0.056 pCi/g (wet) and averaged 0.045 pCi/g (wet) for the indicator samples. Cs-137 in the control samples ranged from 0.049 to 0.057 pCi/g (wet), and averaged 0.053 pCi/g (wet) for lake trout. Cs-137 in brown trout samples ranged from 0.042 to 0.046 pCi/g (wet) and averaged 0.044 pCi/g (wet). Cs-137 in the control samples was 0.046 pCi-g (wet) (one sample collected).

K-40 was detected in all of the spring samples collected. K-40 is a naturally occurring radionuclide and is not related to power plant operations. Detectable concentrations of K-40 in the indicator samples (lake trout and brown trout) ranged from 2.9 to 3.8 pCi/g (wet) and 3.0 to 3.1 pCi/g (wet) for the control samples. No other radionuclides were detected in any of the spring fish samples.

Fall sample collections were comprised of two separate species and nine individual samples. Six samples of lake trout and three samples of brown trout were collected at a combination of two onsite sample locations (NMP and JAF) and one offsite sample location (Oswego Harbor area). Samples were collected by gill net in October.

Cs-137 was detected in all nine samples including the three control samples. The detected concentrations were not significantly different from one another because of the extremely small quantities detected. Cs-137 in lake trout samples at the indicator locations ranged from 0.038 to 0.055 pCi/g (wet) and averaged 0.046 pCi/g (wet). Lake trout samples at the control location ranged from 0.041 to 0.044 pCi/g (wet) and averaged 0.042 pCi/g (wet). Brown trout samples from the indicator locations ranged from 0.041 to 0.050 pCi/g (wet) and averaged 0.046 pCi/g (wet). The associated control sample was 0.057 pCi/g (wet).

K-40 was detected in all of the fall samples collected. Detectable concentrations of K-40 in the indicator samples (lake trout and brown trout) ranged from 2.7 to 3.9 pCi/g (wet) and 2.8 to 3.8 pCi/g (wet) for the control samples. No other radionuclides were detected in any of the fall fish samples.

Sr-89 and Sr-90 concentrations for the spring and fall fish samples were all less than the minimum detectable level. Sr-89 and Sr-90 were not detected in any of the onsite or offsite locations.

Review of past environmental data indicates that the Sr-89 and Sr-90 concentrations have decreased steadily since 1976 for both the indicator and control locations to the present 1983 LLD levels. A general decline in detectable Sr-89 and Sr-90 results is most probably due to the result of the incorporation of these radionuclides with organic and inorganic substances through ecological cycling. In addition, Sr-89 has a relatively short half-life of 52 days.

The mean 1983 Cs-137 concentrations have decreased slightly from 1981 for the indicator samples and significantly from 1980 to 1976. Concentrations for these samples decreased from a level of 1.4 pCi/g (wet) in 1976 to a level of 0.045 pCi/g (wet) in 1983. Control sample results have also decreased from a level of 0.12 pCi/g (wet) in 1976 to a level of 0.049 pCi/g (wet) in 1983. Results from 1979 to 1983 have remained fairly consistent.

As noted for Sr-89 and Sr-90 above, the general decreasing trend for Cs-137 is most probably a result of ecological cycling. A significant portion of Cs-137 detected since 1976 in fish is a result for weapons testing fallout, and the general downward trend in concentrations will continue as a function of ecological cycling and nuclear decay.

Lake Ontario fish are considered an important food source by many, therefore, fish is an integral part of the human food chain. Based on the importance of fish in the local diet, a reasonable estimate of dose to man can be calculated. Assuming that the average adult consumes 6.9 kg of fish per year and the fish consumed contains an average Cs-137 concentration of 0.045 pCi/g (wet) (annual mean result of indicator samples for 1983), the whole body dose received would be 0.022 mrem per year. The critical organ in this case is the liver which would receive a calculated dose of 0.034 mrem per year.

The whole body and critical organ doses are conservative calculated doses associated with consuming fish from the Nine Mile Point area (indicator samples).

Conservative whole body and critical organ doses can be calculated for the consumption of fish from the control location as well. In this case the consumption rate is assumed to remain the same (6.9 kg per year) but the average annual Cs-137 mean concentration for the control samples is 0.049 pCi/g (wet). The calculated Cs-137 whole body dose is 0.024 mrem per year and the associated dose to the liver is 0.037 mrem per year.

In summary, the whole body and critical organ doses observed as a result of consumption of fish is small. Doses received from the consumption of indicator and control sample fish are approximately the same with the dose from control samples being slightly higher. Doses from both sample groups are considered in the range of background exposure rates.

Graphs of past Cs-137 and Sr-90 concentration can be found in Section VII.

6. LAKE WATER - TABLES 6, 7, AND 8

1983 lake water samples were analyzed monthly for gross beta and gamma emitters (using gamma spectral analysis). Sr-89, Sr-90, and tritium analyses were performed quarterly. Quarterly samples (i.e., Sr-89, Sr-90, and tritium) were composites of monthly samples.

The analytical results for the 1983 lake water sample program showed no evidence of plant related radionuclide buildup in the lake water in the vicinity of the site. Indicator samples were collected from the inlet canals at the Nine Mile Point Unit #1 and James A. FitzPatrick facilities. The control location samples were collected at the City of Oswego water treatment plant and consisted of raw lake water prior to treatment.

The gross beta annual mean activity for the indicator sample locations, Nine Mile Point Unit #1 and the James A. FitzPatrick inlet canals (3.34 pCi/liter), was slightly higher than the 1982 mean inlet canal results (2.73 pCi/liter). The Nine Mile Point Unit #1 canal samples were greater than the control samples for seven of the 12 monthly samples analyzed and ranged from 0.57 pCi/liter to 7.90 pCi/liter. The James A. FitzPatrick canal samples were greater than the control samples for six of the 12 monthly samples analyzed and ranged from 1.85 pCi/liter to 5.61 pCi/liter. The control sample results ranged from 1.47 pCi/liter to 7.92 pCi/liter. The fluctuation in the gross beta canal sample results is due to the natural variation in concentration of naturally occurring radionuclides.

A reduction in gross beta activity since 1974 is primarily the result of improved analytical procedures and equipment and not necessarily to changes in plant operations. Although the past elevated gross beta concentration may be due in part to past weapons testing, it is difficult to determine what portion was due to improved instrumentation and what part was due to weapons testing. There were no significant changes or trends in gross beta activity on a monthly basis for 1983. (See historical data graphs Section VII.)

Gamma spectral analysis was performed on 36 monthly composite samples required by the Environmental Technical Specifications. Only one radionuclide was detected in the inlet canal samples. This radionuclide is naturally occurring and not plant related.

K-40, a naturally occurring radionuclide, was detected once in 1983 during the month of December, in the James A. FitzPatrick inlet canal. The concentration detected during this month was 9.6 pCi/liter. No other radionuclides were detected in the James A. FitzPatrick inlet canal samples.

No radionuclides were detected in the Nine Mile Point inlet sample with the exception of naturally occurring K-40. K-40 was detected in the April and September inlet canal samples for 1983. The concentrations detected were 16.5 pCi/liter and 20.8 pCi/liter respectively.

Water samples of raw water prior to treatment at the City of Oswego water treatment plant showed no detectable concentrations of plant related radionuclides. K-40 was the only detectable radionuclide and was noted in May and August at concentrations of 6.9 pCi/liter and 10.4 pCi/liter respectively.

Quarterly samples for Sr-89 analysis were composites of the monthly samples. Sr-89 was not detected in any of the water samples taken from the City of Oswego water treatment plant, the James A. FitzPatrick inlet canal, or the Nine Mile Point inlet canal. The lower limit of detection values for the City of Oswego water treatment plant canal samples (control location) ranged from less than 0.76 pCi/liter to less than 2.00 pCi/liter (LLD). The lower limit of detection values for the indicator (James A. FitzPatrick inlet canal and Nine Mile Point inlet canal) locations ranged from less than 0.59 pCi/liter to less than 2.00 pCi/liter (LLD).

Quarterly samples for Sr-90 analysis were composites of the monthly samples as noted for the Sr-89 analysis. Sr-90 was detected in all the quarterly samples for the James A. FitzPatrick inlet canal, and in three of the four quarterly samples for both the Nine Mile Point inlet canal and the City of Oswego water treatment plant. At the City of Oswego water treatment plant or control location, Sr-90 ranged from 0.82 pCi/liter to 0.97 pCi/liter with a mean of 0.89 pCi/liter. Sr-90 in the Nine Mile Point inlet canal samples ranged from 0.72 pCi/liter to 1.10 pCi/liter and showed a mean value of 0.95 pCi/liter. The James A. FitzPatrick inlet canal samples showed Sr-90 ranging from 0.60 pCi/liter to 1.00 pCi/liter and a mean value of 0.75 pCi/liter. Sr-90, as detected in the 1983 water samples, is considered to be background Sr-90 as a result of past weapons testing.

Tritium samples, as noted above for Sr-89 and Sr-90, are quarterly samples that are a composite of the appropriate monthly samples. Tritium was detected in all samples taken at all three locations. The City of Oswego water treatment plant showed tritium concentrations ranging from 230 pCi/liter to 280 pCi/liter with a mean of 250 pCi/liter. Tritium concentrations for the James A. FitzPatrick inlet canal ranged from 249 pCi/liter to 560 pCi/liter and showed a mean concentration of 347 pCi/liter. Inlet canal samples taken at Nine Mile Point showed tritium concentrations ranging from 190 pCi/liter to 410 pCi/liter. The annual mean concentration was 288 pCi/liter.

Evaluation of past environmental data shows that gross beta concentrations in water samples have decreased significantly since 1977 at both the indicator sample locations (inlet canals) and at the control location (Oswego city water). As noted previously, however, the decrease is primarily a result of superior analytical instrumentation. Since 1978, gross beta levels have remained relatively constant at both indicator and control locations. Indicator annual means ranged from 15.8 pCi/liter in 1977 to 41.8 pCi/liter in 1976. For the period of 1978 through 1981, annual means ranged from 2.73 pCi/liter (1982) to 4.53 pCi/liter (1978). The indicator annual mean for 1983 was 3.34 pCi/liter. Control annual means also were relatively high during 1975 to 1977. During these years, the concentrations ranged form 45.33 pCi/liter (1975) to 10.9 pCi/liter (1977). Data from 1974 for the control location was deleted from this comparison because of questionable results. For the period 1978 through 1981, annual mean gross beta concentration ranged from 2.42 pCi/liter (1982) to 3.55 pCi/liter (1978). The control annual mean for 1983 was 2.98 pCi/liter.

Review of previous data for Sr-89 demonstrates that results have been variable since 1975. Sr-89 for the indicator samples has ranged from not detected (1976, 1977, 1979 and 1983) to 0.78 pCi/liter (1981) and has been at relatively constant levels when detected. At the control locations, Sr-89 ranged from not detected (1975-1978, 1981 and 1983) to 1.4 pCi/liter (1980). During 1983, Sr-89 showed an annual mean of less than 1.54 pCi/liter (LLD) at the control location and less than 1.47 pCi/liter (LLD) at the indicator location. Sr-90 annual means have remained relatively consistent at both indicator and control sample locations since 1975. Mean results for the indicator samples ranged from not detected (1975 and 1976) to 1.08 pCi/liter (1982). Mean results at the control sample location ranged from not detected (1975-1978) to 2.04 pCi/liter (1982). The 1983 annual mean Sr-90 results for the indicator samples and control samples were 0.83 pCi/liter and 0.89 pCi/liter respectively.

Previous annual mean results at the indicator sample location has decreased slightly since 1976, with the exception of 1982. Sample results were available since 1974 through 1982 and showed a peak value of 641.0 pCi/liter (1982) and a minimum value of 234.0 pCi/liter (1979). The annual mean tritium result at the indicator locations for 1983 was 317.0 pCi/liter. This is a decrease from the value detected in 1982 (641.0 pCi/liter).

Mean tritium results at the control location have also decreased slightly since 1976. Mean annual results were available for 1974 through 1982. These results show that tritium at the control location ranged from not detected (1974) to 651.7 pCi/liter (1976). The annual mean tritium result at the control location for 1983 was 250.0 pCi/liter. This is a slight increase from the 1982 value of 165.0 pCi/liter. The fact that tritium is a naturally occurring radioactive isotope of hydrogen which is produced in the upper atmosphere by cosmic radiation, as well as a product of reactor operation, accounts for the background level in the lake to vary slightly from year to year.

The impact, as expressed by a dose to man, is not assessed here since the primary pathway, in this case, is drinking water. The nearest source for drinking water is the City of Oswego water treatment plant which is the control location for the sampling program. The results of the control location are consistent with previous years' results and are representative of normal background radionuclide concentrations in lake water and regional drinking water that might be affected by the site.

Previous Lake Water data (tritium, Sr-89, Sr-90, and gross beta) is presented in Section VI, HISTORICAL DATA.

TERRESTRIAL PROGRAM

Tables 9 through 21 represent the analytical results for the terrestrial samples collected for the 1983 reporting period.

1. AIR PARTICULATE GROSS BETA - TABLES 9 and 10

Tables 9 and 10 contain the weekly air particulate gross beta results for the six offsite and nine onsite sample locations. The samples are counted at a minimum of twenty-four hours after collection to allow for the decay of naturally occurring radionuclides with short half-lives. A total of 312 offsite and 468 onsite samples were collected and analyzed during 1983. No significant levels of gross beta activity were observed in any of the samples. The offsite or control mean concentration for 1983 was 0.024 pCi/m^3 while the indicator or onsite sample mean was equal to 0.023 pCi/m^3. As noted, the onsite mean is about five percent lower than the offsite mean for the same sample period. This difference in mean concentration has been exhibited in the past eight years with the exception of 1977 when a higher annual mean gross beta activity was observed for the onsite sampling stations. In these seven years, the control stations' annual mean ranged from a minimum difference of 5.0 percent higher than the indicator observed in 1983 to a maximum difference of 28.6 percent higher, observed in 1978. The difference in offsite and onsite weekly and monthly mean values for gross beta could be the result of a combination of the many natural processes which can affect environmental concentrations. The most significant parameter that could possibly contribute to a depressed or lower concentration for the onsite stations would be location. The close proximity of onsite sampling stations to the lakeshore (Lake Ontario) would account for lower concentrations of naturally occurring radionuclides being collected on the sampling media. Surface winds from off the lake would contain less particulate matter and airborne gases than surface winds from adjacent land areas. The major component of gross beta concentrations are decay or daughter products of uranium and thorium and potassium-40. The concentrations of these nuclides in the ground level atmosphere are dependent upon the local geology and its chemical constituents. Thus surface winds of terrestrial origin have a potential for containing higher concentrations of naturally occurring radionuclides.

The observed increases and decreases in general gross beta activity can be attributed to changes experienced in the biosphere. As discussed above, the concentrations of the naturally occurring radionuclides in the lower limits of the atmosphere directly above the terrestrial portion of the earth are affected by time related processes such as wind direction, snow cover, soil temperature and soil moisture content. Very little change was noted in gross beta activity which corresponded with seasonal changes as has been observed in past years.

In general, gross beta activity in air samples has decreased significantly. The mean 1983 concentration for both offsite and onsite is six times lower than the mean concentration detected in 1981, and 26 percent lower than the mean concentration detected in 1982. This overall reduction in activity is directly attributable to the increased activity detected in 1981 as a result of fallout from an atmospheric nuclear test and subsequent return to background levels in 1983.

The trend of gross beta activity in the environment is that of reduced concentrations. The mean 1983 concentration is the lowest level of gross beta activity observed since sampling for the FitzPatrick program began in 1974. This general decrease could be the result of the reduction of atmospheric nuclear testing in recent years in comparison to the 1960's when such testing was prolific.

Graphs of air particulate gross beta concentrations on a weekly and yearly basis can be found in Section VII.

2. MONTHLY PARTICULATE COMPOSITES - TABLE 11

The air particulate filters collected weekly from each of the 15 air sampling stations are composited monthly by location (onsite/offsite). Each composite is analyzed for gamma emitter using gamma spectral analysis.

The results for the 24 monthly samples analyzed for the 1983 program showed positive detections for six radionuclides. Those radionuclides detected were Co-60, La-140, Cs-137, and Mn-54 in addition to Be-7 and K-40 which are both naturally occurring radionuclides. The six radionuclides measured in the 1983 composite samples can be divided into two categories, the first category is naturally occurring radionuclides. Be-7 was detected in each of the 24 composite samples both onsite and offsite. The mean value for Be-7 concentrations was ten percent higher in the offsite composite samples than the onsite samples. Potassium-40 was detected in eight of the offsite and 11 of the onsite monthly composite samples. The onsite annual mean was 10 percent higher than the offsite annual mean for K-40.

The second category of radionuclides detected are those which are plant related. Included here are Co-60, Mn-54, La-140 and Cs-137. Cs-137 was included here due to the fact that the Cs-137 may be a constituent of plant effluents. A review of 1983 Cs-137 sample data indicates that Cs-137 is most likely the result of past weapons testing and subsequent environmental levels of Cs-137 from fallout. Cs-137 was detected in four of the offsite composite samples and six of the onsite composite samples. The yearly mean concentration of Cs-137 was 0.00019 pCi/m^3 for the offsite sample results and 0.00019 pCi/m^3 for the onsite sample results. The maximum Cs-137 concentrations detected were 0.00026 pCi/m^3 and 0.00025 pCi/m^3 for the offsite and onsite composite samples respectively. The presence of Cs-137 in the offsite samples on a temporal distribution, consistent with detections of Cs-137 at the onsite locations, is an indication that the main source of Cs-137 in the environment is not due to the operation of the plant. The three remaining radionuclides are La-140, Mn-54, and Co-60. La-140 was detected in one of the onsite monthly samples and was not detected in the offsite samples. The one onsite La-140 detection was made in April of 1983 at a concentration of 0.0011 pCi/m^3. Mn-54 was also detected in one of the onsite monthly composite samples and was not detected in the offsite samples. The one onsite Mn-54 detection was made in March of 1983 at a concentration of 0.00027 pCi/m^3. Co-60 was detected in four of the twelve onsite monthly composite samples and four of the twelve offsite monthly composite samples. The onsite Co-60 concentrations ranged from a minimum of 0.00018 pCi/m^3 in May and a maximum concentration of 0.00071 pCi/m^3 in December of 1983. The mean Co-60 concentration for the onsite samples was 0.00035 pCi/m^3 for 1983.

Dose to man calculations can be made using inhalation rates and air concentrations based on air sample results. Using the average adult inhalation rate of 8,000 m^3/yr (667 m^3/standard month) and the mean concentration measured at the onsite sample stations, the following yearly doses can be calculated based on the amount of time the radionuclide was detected during the year:

Nuclide	Concentration (pCi/m^3)	No. Months Detected	Origin	Dose* (mrem/yr)
Cs-137	0.00019	6	Fallout/Plant	0.00001
Co-60	0.00035	4	Plant	0.00070
Mn-54	0.00027	1	Plant	0.00003
La-140	0.0011	1	Plant	0.00001
			Totals	0.00075
			Plant	0.00074
			Fallout/Plant	0.00001

*Dose to the lung.

The above table illustrates that the average calculated dose to man from plant related radionuclides is very small and of little biological significance.

For the purpose of illustration, the significance of the above doses can be brought into perspective by a comparison to the average annual population lung dose received from the combustion of natural gas used in cooking ranges and unvented heaters. This average annual population lung dose ranges from 2.0 mrem/yr to 5.0 mrem/yr (NCRP, No. 56). This represents a dose approximately 3,000 times that received from plant effluents as noted above.

The presence of elevated concentrations of Co-60 were noted in the month of December 1983 and also in the month of January and the first week of February 1984. The elevated concentrations were determined to be contamination of the air particulate filters and not a result of plant effluents. A review of plant gaseous effluent data for this period showed that the Co-60 release rates were well within four percent of the design objective of the plant as outlined in Section 2.3.B.2 of the Environmental Technical Specifications. These limits were consistent with past effluent rates when Co-60 was not detected.

An investigation of the cause for these elevated concentrations revealed cross contamination from the sample preparation area to the "clean" air particulate filters (those filters used prior to being placed in the field). Two separate analyses of the "clean" particulate filters revealed Co-60 concentrations consistent with the levels detected in the monthly air particulate composites. This problem was immediately corrected.

If the Co-60 concentrations are solely attributed to plant effluents and not to cross contamination, the annual mean Co-60 concentration would be 0.00073 pCi/m^3. The resultant dose to the lung from this concentration of Co-60, in addition to the doses calculated in the above table, would be 0.0015 mrem/yr.

This dose is insignificant and, as noted above, represents in comparison only 0.075 percent of the average annual population lung dose received from the combustion of natural gas used in cooking ranges and unvented heaters.

Graphic representations of air particulate composite Co-60 and Cs-137 concentrations are presented in Section VII.

3. AIRBORNE RADIOIODINE (I-131) - TABLES 12 AND 13

The results for Iodine-131 (charcoal cartridge) sampling and analyses are presented in Table 12 (Offsite) and Table 13 (Onsite).

During the 1983 sampling program airborne radioiodine was not detected in any of the 312 weekly samples collected from the six offsite sampling stations. In the 1,559 weekly offsite I-131 samples collected in 1979 through 1983, I-131 was only detected once (June 16, 1982). Offsite I-131 detections were made in 1977 and 1978.

I-131 was detected in four of the 468 onsite samples analyzed in 1983. These samples which contained radioiodine covered a total of four sample weeks or periods. The environmental I-131 concentrations detected in 1983 are outlined as follows:

Sample End Date	Onsite Sample Station	Concentration I-131, pCi/m^3	Dose (mrem) Thyroid/Whole Body
02/01/83	H	0.0219±0.0151	0.0052/0.000009
06/07/83	H	0.0315±0.0169	0.0075/0.000013
06/14/83	H	0.0350±0.0160	0.0084/0.000014
12/20/83	H	0.0228±0.0126	0.0054/0.000009
		TOTAL	0.0265/0.000045

The spacial distribution of the I-131 concentrations show that the four positive detections were observed at H onsite air monitoring station.

The onsite air monitoring station showing positive I-131 detections in 1983 is located, in reference to the FitzPatrick reactor centerline, at approximately 1,900 ft/60° (H onsite). A meaningful dose estimate is difficult to make for the I-131 concentrations at the onsite sampling station as there are no residencies or individuals in the immediate vicinity of the sample location. As noted on Figure 3 in Section VII, the H monitoring station is within the site boundary or controlled area. The above table illustrates the doses that can be calculated using the assumption that a critical individual was present at the monitoring location simultaneously for the total period of time for which the I-131 was collected. Such an individual does not exist but the calculated dose can be used for the purpose of illustration. The critical organ for this example is the thyroid gland. The calculated total dose for the above mentioned critical individual would be 0.0265 mrem to the thyroid and 0.000045 mrem to the whole body assuming a seven day sample period and an inhalation rate of 160 m^3 per sample period. The resulting calculated dose due to onsite I-131 concentration is extremely small and can be compared to a similar dose from natural or background radiation that an individual could receive as a result of changing elevation. An individual residing 100 meters higher in altitude for a period of 4.8 days would receive an additional radiation dose of 0.0265 mrem which is equal to the total calculated dose to the thyroid from environmental I-131 concentrations.

A review of plant gaseous effluent data for the sample periods in which I-131 was detected in the environment was performed. This data shows that the I-131 release rates are well within the 4% design objective of the plant as outlined in the appropriate sections of the Environmental Technical Specifications. Calculations show that the detectable levels of I-131 in the environment are consistent with the measured source terms at the plant for the same sample period.

The end result of the 1983 I-131 sampling effort showed no significant impact due to the operation of the plant. During 1983, I-131 was not detected in any other environmental sample media including milk and green leafy vegetables.

4. TLD (ENVIRONMENTAL DOSIMETRY) - TABLE 14

TLD's were collected once per quarter during the sample year. The TLD results are an average of four independent readings at each location and are reported in mrem per standard month. In 1983, TLD's for the most part were collected on March 31, 1983, June 30, 1983, September 30, 1983, and January 6, 1984.

TLD results are organized into three groups for reporting purposes. The groups are onsite TLD's (defined as TLD's in the immediate proximity of the individual facilities, at points of interest), environmental station TLD's (a ring of TLD's surrounding the generating facilities as a group), and offsite TLD's (TLD's located off the site property or controlled area and ranging up to 20 miles from the site).

A net dose at the environmental station TLD's can be calculated simply by subtracting the mean standard month offsite doses from the mean standard month onsite environmental station doses*. Environmental station TLD's are arranged in a concentric circle and range in distance from the individual facilities from 1,500 to 2,000 feet. The net dose per mean standard month for each quarter is as follows:

Quarter	Net Environmental Station Dose**
1	0.46
2	0.62
3	0.35
4	0.99

The annual site property boundary dose for 1983 cannot be determined from the net environmental station dose since the property boundary extends out to approximately 0.75 miles from the site (i.e., beyond the concentric circle of environmental station TLD's). A general estimate can be made based on two available TLD's located at the site boundary. The net dose per standard month for each quarter can be calculated for these two locations (TLD numbers 19 and 15) east and west of the site. This calculation is conservative since it represents the shortest distance to populated areas.

Quarter	Net Site Property Boundary Dose**
1	- 0.32
2	+ 0.37
3	- 0.30
4	- 0.20

*Location numbers 5, 6, 7, 23, 24, 25, and 26.
**Dose in mrem per standard month.

As observed, the site boundary dose based on two available TLD locations was less than the average offsite dose for three of the four quarters in 1983. This is probably due to the difference in ground dose rates which are indicative of variable concentrations of naturally occurring radionuclides in soil and rock such as radium, uranium, thorium, and potassium. The difference could also result from statistical variation in the TLD readings, as the site boundary dose is based on a population of only eight individual readings per quarter (two TLD's).

TLD numbers 31 and 39 are located within the Nine Mile Point #1 restricted area near the radwaste facility and are influenced by the close proximity to the building. TLD numbers 27 through 30 and 47 are located within the restricted area of the James A. FitzPatrick radwaste facility and are influenced by the radwaste buildings. TLD number 59 is located near the restricted area of the FitzPatrick Plant stack and is influenced by the proximity to this structure. TLD numbers 3 and 4 are located at the construction site of Nine Mile Point #2. TLD's are subject to radiography at the Unit #2 site and to a much lesser extent the FitzPatrick facility.

Offsite TLD results remained fairly consistent for most TLD locations each quarter. Any slight variations in natural background radiation levels that were observed are most probably a result of increasing or decreasing emission rates for radon and thoron gases emanating from the ground. These emission rates are related to ground moisture content and other natural parameters.

Onsite TLD results remained fairly consistent except for TLD's located near radwaste facilities which may be affected by the frequency of radwaste processing and shipment. These TLD's include numbers 23, 24, 27, 28, 29, 30, 47, 48, and 61 at the James A. FitzPatrick facility and number 39 at the Nine Mile Point #1 facility. TLD numbers 3, 4, 41, and 62 are located at the Nine Mile Point #2 facility and were affected by the frequency of radiography at the construction site. Radiography is a common practice at construction sites in order to determine the quality of equipment welds such as pipes. TLD's located in areas near radiography work will show fluctuating doses as the amount of radiography performed is not consistent. TLD number 59 results were variable as a result of the operating mode of the James A. FitzPatrick facility. This TLD is located near the James A. FitzPatrick facility exhaust stack.

The results of 1983 showed no detectable impact from direct radiation measured outside the site boundary.

5. RADIATION MONITORS - TABLE 15

Environmental radiation monitors are located in 10 of the 15 air monitoring environmental stations. Each of the on site environmental monitoring stations contains a radiation monitor and, in addition, the C off site monitoring station contains a similar monitor. The radiation monitors consist of a GM detector with an associated power supply, chart recorder, and trip unit. The monitor has an operating and recording range from 0.01 to 100 mrem/hr. Each radiation monitor has a small radioactive source mounted inside the detector casing to produce an on scale reading. The design intent of the monitors is to detect possible dose rates resulting from plume releases from the site. The monitors are not considered to be capable of high sensitivity environmental monitoring and do not detect minute fluctuation in levels of background radiation. Because of the relatively low sensitivity of the monitors (environmentally speaking) no comparisons are made between the radiation monitor readings and the readings from environmental TLD's.

6. MILK - TABLES 16, 17, AND 18

Milk samples were collected from a combination of ten farms during the first month of the 1983 grazing season, and from eight farms during the remainder of the 1983 grazing season and the following months of November and December. The grazing season is considered to be May through October. Two of the sample locations, numbers 14 and 60, were deleted from the milk sampling program as a result of the 1983 spring milch animal census. These locations were deleted in June. Sample location descriptions are listed below.

Location No.	Direction from Site	Distance from Site (miles)
4	ESE	7.7
5	SSE	7.2
7	ESE	5.5
14	ESE	9.8
16	SSW	5.2
40	SW	15.3
45	SE	5.5
50	E	8.25
55	E	9.00
60	E	9.50

Milk samples were collected from each of the locations in the first half of the month and analyzed for I-131. At approximately mid month, a second milk collection was made at the same locations. The second collection was composited with an equal aliquot from each location sampled during the first collection. The composite samples were analyzed for gamma emitters and Sr-90. I-131, gamma isotopic, and Sr-90 results are found in the analytical results section.

The gamma spectral analysis of the monthly composite samples showed K-40 to be the most abundant radionuclide detected in the milk samples collected in 1983. K-40 was detected in every sample analyzed and ranged in concentration from 1,520 pCi/liter to 923 pCi/liter at the indicator locations and 1,600 pCi/liter to 1,070 pCi/liter at the control location. K-40 is a naturally occurring radionuclide and is found in many of the environmental medias sampled.

Sr-90 was also detected in all of the 66 milk samples collected during 1983. The mean Sr-90 concentration for the control location was 1.91 pCi/liter. The mean for all indicator locations (within 10 miles of the site) was 2.81 pCi/liter. The control and indicator sample means are similar. Sr-90 results for the indicator locations ranged from 5.05 pCi/liter to 1.00 pCi/liter. Control sample results ranged from 2.60 pCi/liter to 1.00 pCi/liter. The detection of Sr-90 in indicator and control locations at similar concentrations is indicative of background Sr-90 as a result of past weapons testing.

Milk samples were collected and analyzed monthly for I-131. Iodine-131 was not detected during 1983 in any of the indicator or control samples. All 1983 I-131 milk results are reported as LLD.

Cs-137 was the detected in only one of the 66 monthly samples analyzed. This single detection of Cs-137 was made at indicator location number 5 during the month of June, 1983. Annual means for the detection of Cs-137 at all locations are presented below.

Location No.	Annual Mean (Cs-137)
4	<4.8 pCi/l (LLD)
5	5.1 pCi/l (positive)
7	<5.5 pCi/l (LLD)
14	<4.4 pCi/l (LLD)
16	<5.2 pCi/l (LLD)
40 (control)	<5.3 pCi/l (LLD)
45	<5.9 pCi/l (LLD)
50	<6.2 pCi/l (LLD)
55	<4.9 pCi/l (LLD)
60	<4.5 pCi/l (LLD)

Annual mean Cs-137 values for each sampling location are not significantly different from one another. Location number 40 (control location) showed no detectable Cs-137 during 1983. This was also true for every indicator location with the exception of indicator number 5 (see above). The concentration of this one positive detection for Cs-137 was 5.1 pCi/liter. This number is very small and near the LLD as can be seen when compared to the control location's (location number 40) annual mean for Cs-137 of less than 5.3 pCi/liter (LLD). Because there was only one positive detection of Cs-137 and because of the minute quantity detected, it is difficult to assess whether the concentration detected is a result of operations at the site or whether part or all of the detected cesium is due to weapons testing fallout. The impact in any case is extremely small (see below).

No other radionuclides were detected in milk samples during 1983 using gamma spectral analysis.

Examination of previous Cs-137 levels in milk samples shows that the annual mean for the indicator samples has decreased steadily since 1974. 1976 did show a decrease (7.8 pCi/liter) that was less than 1975 and 1977 (1975 was 20.6 pCi/liter and 1977 was 17.1 pCi/liter). 1974 through 1981 showed Cs-137 concentrations ranging from 26.1 pCi/liter in 1974 to 7.57 pCi/liter in 1981. As noted above, the indicator mean for 1983 was 5.1 pCi/liter. Previous Cs-137 concentrations at the control location is only available from 1978 to 1982. Concentrations range from 3.73 pCi/liter in 1979 to 7.0 pCi/liter in 1981. The mean control result for 1983 was less than 5.3 pCi/liter (LLD result).

Presented below is a table taken from NCRP Report No. 45 (National Council On Radiation Protection And Measurements), "NATURAL BACKGROUND RADIATION IN THE UNITED STATES", November 15, 1975.

USPHS Network Data for ^{90}Sr and ^{137}Cs concentrations in milk (pCi/l)[a]

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
^{90}Sr															
New York	6	8	9	8	14	28	25	18	14	11	12	10	10	7	8
Cincinnati	8	13	10	8	14	25	22	15	12	10	9	8	7	7	6
St. Louis	13	22	18	8	13	21	22	17	16	10	9	8	8	6	6
Salt Lake City	4	7	6	5	9	22	25	19	11	6	5	8	4	5	3
Sacramento	5	5	3	4	4	10	8	6	6	3	2	1	2	1	1
Atlanta	11[b]	15	15	10	18	29	31	24	15	16	14	10	11	10	9
Austin	3[b]	6	4	3	7	9	9	7	5	4	3	2	3	1	2
Chicago	8[b]	9	9	6	11	20	19	14	10	9	9	7	7	6	5
Spokane	9[b]	12	11	8	12	25	26	22	14	10	6	7	5	6	4
^{137}Cs															
New York	60	55	25	15	51	147	146	71	35	16	15	12	17	8	8
Cincinnati	65	50	20	<5	30	84	86	42	20	10	6	3	3	2	4
St. Louis	80	80	30	15	32	82	74	34	24	7	7	2	4	5	3
Salt Lake City	50	40	30	5	52	145	165	85	29	11	12	4	8	12	3
Sacramento	60	45	10	5	14	58	42	27	11	4	5	0	0	0	0
Atlanta	90[b]	85	35	10	57	137	130	68	32	24	20	19	14	16	10
Austin	50[b]	45	15	<5	20	44	38	23	11	4	2	4	3	0	0
Chicago	80[b]	60	30	10	39	101	109	59	25	14	10	9	11	9	9
Spokane	80[b]	70	35	15	49	132	132	71	34	17	10	4	2	6	5

[a] 1958–60, Raw Milk Network; 1961 on, Pasteurized Milk Network.

[b] Data not collected for the entire year.

This table illustrates the levels of Sr-90 and Cs-137 detected in milk samples in the United States in the years 1958 through 1972 as measured by the Public Health Service Milk Networks. The presence of Cs-137 and Sr-90 in milk is not unique and is a situation common in the northern hemisphere. The levels detected in 1983 milk samples are similar to those detected in the years 1971 and 1972 as might be expected, considering the long radiological half-lives for Sr-90 and Cs-137 (29 years and 30 years respectively), and the fact that several atmospheric nuclear tests have been conducted since 1972, one as recent as 1980.

Previous Sr-90 data from the indicator locations shows that the annual mean Sr-90 concentrations have decreased slightly since 1974. Sr-90 ranged from 2.81 pCi/liter in 1983 to 7.16 pCi/liter in 1976. The 1983 annual mean for Sr-90 was 2.81 pCi/liter, which shows a slight decrease from the 1982 annual mean for Sr-90 of 4.60 pCi/-liter. Strontium-90 concentrations at the control location are only available since 1978. The annual mean concentration ranged from 1.91 pCi/liter in 1983 to 5.88 pCi/liter in 1978. The 1983 annual mean for Sr-90 (control location) was 1.91 pCi/liter, and also shows a slight decrease from the 1982 annual mean for Sr-90 of 2.96 pCi/-liter.

The impact as a result of Cs-137 in 1983 milk samples is very minimal. With respect to Cs-137, the dose resulting from Sr-90 ingestion to the bone is much more significant. Cs-137 was detected in only one of the indicator samples during 1983. The control samples showed no detectable Cs-137. As noted above, it is difficult to assess whether Cs-137 in the indicator milk samples is a result of background cesium levels, totally as a result of site operations, or partially as a result of plant operations. The difficulty arises because of the minute quantities detected that are at or just above the lower limit of detection.

The impact can be assessed by calculating doses to man as a result of consumption of milk with detectable quantities of Cs-137. For the purposes of a calculated dose, the mean indicator sample Cs-137 concentration is used (5.1 pCi/liter). Assuming a consumption rate of 330 liters (87.18 gallons) per year for an infant (Regulatory Guide 1.109 maximum exposed individual), the whole body dose would be 0.049 mrem and a critical organ dose would be 0.686 mrem to the liver. The calculated doses are based on eight months of consumption (eight months of milk sample results). Since Cs-137 was not detected at the control location in 1983, a dose calculation cannot be performed. For a limited comparative purpose, the calculated dose to an infant as a result of consuming milk from the control location during 1981 would be 0.067 mrem whole body dose and 0.94 mrem critical organ dose (dose to the liver). The annual mean Cs-137 concentration for the 1981 control location was 7.0 pCi/liter.

The calculated dose to an adult can be determined assuming a consumption rate of 110 liter (29.06 gallons) per year (Regulatory Guide 1.109) and a mean Cs-137 concentration of 5.1 pCi/liter for the indicator locations. The resultant doses are 0.027 mrem to the whole body and 0.041 mrem to the liver (critical organ). The calculated doses are based on eight months of consumption. As noted above, Cs-137 was not detected at the control location, therefore no whole body or critical organ doses can be calculated. Using the example above, the dose to an adult based on the 1981 control sample results would be 0.037 mrem to the whole body and 0.056 mrem to the liver (critical organ).

For the purpose of illustration, the significance of the above doses can be brought into perspective by comparison to background doses due to cosmic radiation with changes in altitude. Assuming the above calculated whole body dose, as a result of the consumption of milk, is 0.049 mrem to an infant and is totally a result of plant operations at the site, a comparison can be made to the incremental increase in dose due to cosmic radiation at sea level. A dose of 0.049 mrem whole body is equal to residing at a location 100 meters (328 feet) higher in altitude for 8.9 days.

An additional comparison can be made to naturally occurring K-40. K-40 has been noted in almost all environmental samples at significant levels. A 70 kg adult weighs approximately 154 pounds and contains approximately 0.1 microcuries of K-40 as a result of normal life functions (inhalation, consumption, etc.). The dose to the bone tissue is about 20 mrem per year as a result of the internal deposited K-40. For comparison purposes, an adult bone dose can be calculated that results from the consumption of milk from the 1983 indicator location. The mean Cs-137 concentration of 5.1 pCi/liter is used. The resulting bone dose is 0.045 mrem per year (an average milk Cs-137 concentration of 5.1 pCi/liter is applied over the entire year). This dose is 0.002 of the bone dose as a result of naturally occurring K-40 in a 154 pound adult.

The impact, as a result of Sr-90 in milk, due to plant operation, is extremely small if any since the mean result of the indicator results and the control results are approximately equal considering fluctuations in the background levels. The levels of Sr-90 detected in indicator as well as control samples is considered to be representative of background concentrations. In this regard, the resultant calculated doses would be approximately equal.

Iodine-131 was not detected in the 66 monthly milk samples analyzed for the 1983 program. No doses to man have been calculated due to the lack of positive detection. The detection of I-131 in milk samples has not been routine in the past. In past sampling programs, I-131 has been detected in milk samples in conjunction with fresh fallout from atmospheric nuclear testing.

Graphs of yearly milk sample results for Cs-137, Sr-90 and I-131, along with monthly (1983) Cs-137 results by station, are presented in Section VII.

7. MILCH ANIMAL CENSUS - TABLE 19

The milch animal census is an estimation of the number of cows and goats within a 10 mile radius of the Nine Mile Point Site. A census is conducted twice per year, once in the spring and once in the summer. The census is conducted by sending questionnaires to previous milch animal owners and also by road surveys to locate any possible new owners. Questionnaires not responded to are followed up by telephone calls.

The number of milch animals located within the 10 mile radius of the site was estimated to be 1,213 cows and no goats for the spring 1983 census. No new locations were found since the summer 1982 census. The number of cows increased by 72 and the number of goats decreased by two with respect to the 1982 summer census.

The 1983 summer census showed a total of 1,145 cows and two goats. This represents a decrease of 68 cows and an increase of two goats with respect to the spring 1983 census.

8. HUMAN FOOD PRODUCTS - TABLE 20

Human food product samples were comprised of meat, eggs, poultry, and vegetables. Collections for meat, poultry, and eggs were made in the spring and fall seasons. Samples of produce included vegetables with an attempt to sample at least one green leafy vegetable from each location. The collection of produce was performed in late summer or early fall. Three indicator locations were sampled for each type of media collected, in addition, a control location was sampled during each collection period. Indicator samples were collected within a 10 mile radius of the site in areas which would have a high potential for demonstrating possible effects of site operations. The ultimate factor controlling sample locations was the availability of required samples. Attempts were made to maintain prior sample locations where possible.

Meat

Spring meat collections were made at one offsite location (greater than 10 miles from the site) and at three onsite locations (less than 10 miles from the site). Spring meat collections showed detectable concentrations of K-40 in all samples. K-40 concentrations ranged from 2.3 pCi/g (wet) to 2.9 pCi/g (wet). K-40 is a naturally occurring radionuclide. Only one of the four spring meat samples showed detectable concentrations of Cs-137. The detected Cs-137 concentration was in the indicator or onsite sample. The Cs-137 result for this sample was 0.023 pCi/g (wet). Cs-137 was not detected in the control sample.

Cs-137 is detected in many environmental samples and was most prevalent in meat and fish, with respect to all the sample media collected. Cs-137 in meat samples is essentially a result of past weapons testing. Cesium is incorporated into meat tissue from feed sources. The results detected in the spring meat samples are very low concentrations and thus can appear in some samples and not in others. By review of the 1981 spring meat sample data, it is noted that Cs-137 appeared in the control samples (0.017 pCi/g [wet] and 0.024 pCi/g [wet]). Cs-137 was also found in the control sample during 1980 (0.01 pCi/g [wet]).

The one meat sample that showed a detectable concentration of Cs-137 (0.023 pCi/g [wet]) was approximately equal to detected concentrations in control sample results during the spring of 1981. Because this result (0.023 pCi/g [wet]) is small, the impact or dose as a result of this concentration is insignificant and is addressed below.

No other radionuclides were detected in the spring meat samples using gamma spectral analysis.

Fall meat collections were made at one offsite and at three onsite sample locations. The fall samples showed detectable concentrations of K-40 in all samples. K-40 concentrations ranged from 2.4 pCi/g (wet) to 3.4 pCi/g (wet).

Cs-137 was detected in three of the four fall meat samples. The three positive results were the three indicator samples (less than 10 miles from the site). The three results showed small concentrations of Cs-137. The results were 0.044 pCi/g (wet), 0.023 pCi/g (wet) and 0.014 pCi/g (wet) as compared to the control sample result of less than 0.01 pCi/g (wet). These results are very small concentrations and, as noted above for the spring samples, are comparable to concentrations detected at control locations during 1981. These 1981 samples showed control Cs-137 concentrations of 0.017 and 0.024 pCi/g (wet) respectively. The impact of these small concentrations is discussed below.

No other radionuclides were detected in the fall meat samples using gamma spectral analysis.

The detection of Cs-137 in meat samples has been noted for all years since 1978 for indicator samples and since 1980 for control locations (control samples were not collected prior to 1980). The detected concentrations since 1978 at the indicator locations have been fairly consistent. These samples ranged from 0.021 to 0.036 pCi/g (wet). At the control locations, Cs-137 ranged from 0.01 to 0.021 pCi/g (wet). The indicator sample annual mean results have been slightly higher than the control sample annual mean results.

The historical detection of Cs-137 in meat at control and indicator sample locations is an indication of cesium production from weapons testing. During 1983, Cs-137 was not detected at the control sample locations although Cs-137 has been detected in the past (1981 for example) at control sample locations. As noted above, the concentrations detected are very small and the impact or dose to man is insignificant. An average annual dose to man can be calculated as a result of meat consumption from within 10 miles of the site (indicator sample results).

The average Cs-137 concentration in meat during 1983 was 0.024 pCi/g (wet). Assuming an adult consumption rate of 95 kg per year, the annual dose to the whole body is 0.163 mrem per year. The critical organ dose is 0.249 mrem per year to the liver. This calculated dose is small and can be compared to an annual dose of 20 mrem per year to the critical organ (the gonads in this case) as a result of naturally occurring K-40 in the environment. The calculated whole body dose (0.163 mrem per year) and the calculated critical organ dose (0.249 mrem per year to the liver) can also be compared to the dose received from control sample results during 1981. During 1981, the annual mean concentration for the control meat samples was 0.02 pCi/g (wet). Using the same consumption factor of 95 kg per year, the annual whole body dose was 0.136 mrem per year and 0.207 mrem per year to the liver (critical organ dose). As noted above, the 1983 control samples did not show any Cs-137 above the lower limits of detection. However, Cs-137 in meat has historically been present. Because of the small concentrations noted here, cesium can be noted in some samples and not in other samples.

Eggs

Egg samples were collected in the spring (May 10-19, June 3, 1983) and in the fall (November 1-30, 1983). Samples were collected at three onsite locations (within 10 miles of the site) and at one offsite location (greater than 10 miles from the site). The only radionuclide detected during 1983 in egg samples was K-40. K-40 was detected in the spring samples at concentrations that ranged from 0.8 pCi/g to 1.2 pCi/g (wet). The fall samples showed K-40 concentrations that ranged from 1.0 pCi/g to 1.1 pCi/g (wet). For both the spring and fall samples, the control samples had the highest K-40 concentrations.

Poultry

Poultry samples were taken during the spring (May 10-19, June 3, 1983) and during the fall (November 1-30, 1983) at three onsite locations and one offsite location. K-40 was detected in all spring and fall samples both onsite and offsite. K-40 in the spring samples ranged from 1.7 pCi/g to 2.9 pCi/g (wet). The control sample had the lower concentration (1.7 pCi/g). K-40 in the fall samples ranged from 3.1 pCi/g to 3.3 pCi/g (wet). The control sample showed a concentration of 3.3 pCi/g (wet).

Cs-137 was detected in one of the onsite poultry sample locations during 1983. The concentration detected was very small and was approximately at the lower limit of detection (LLD) level for all the 1983 poultry samples. The detected Cs-137 concentration was 0.018 pCi/g (wet). The LLD levels for the other samples ranged from 0.007 pCi/g to 0.018 pCi/g (wet). Historically, the control samples for poultry have not demonstrated detectable concentrations of Cs-137. Although this sample is an onsite sample (i.e., within 10 miles of the site), it is difficult to assess whether the detected cesium is plant related or a minute background cesium concentration. In regards to background Cs-137, poultry can be compared to beef (meat) samples in the sense that Cs-137 can become incorporated in tissue through the ingestion pathway. Thus, poultry have the potential to ingest Cs-137 through the purchased feed they consume (possible weapons testing source) but conversely they also have the potential to incorporate Cs-137 through ingestion of local deposition (plant related source).

The impact, as a result of consumption of poultry, can be assessed by projecting a whole body and critical organ dose to an adult. A maximum and therefore very conservative dose can be calculated based on the one positive detection of Cs-137. Assuming a Cs-137 concentration of 0.018 pCi/g (wet), and a consumption rate of 95 kg per year, a conservative dose to man can be calculated. The adult whole body dose is 0.061 mrem per year and the adult critical organ dose is 0.093 mrem per year to the liver. These doses were calculated for a six month period since Cs-137 was detected only during the first half of the year. As noted in the assessment of the meat sample data, these doses are small when compared to an annual dose of 20 mrem per year to the critical organ (the gonads in this case) as a result of naturally occurring K-40 in the environment.

An additional comparison can be made to natural background cosmic radiation and the resulting increase in dose with an increase in altitude. Using the incremental increase in dose due to cosmic radiation at sea level, a conservative dose calculation can be made. The dose due to consumption of poultry to the whole body is 0.061 mrem per year, as noted above. This dose is equal to an increase in dose due to cosmic radiation that one would receive by residing at a location 100 meters (328 feet) higher in altitude for 11.1 days. It is assumed that by residing at this location one would remain at this altitude for the full 11.1 days.

Fruits and Vegetables

Fruits and vegetables were obtained during the harvest season. Collections were made during September at three indicator locations and one control location. A successful attempt was made to collect one broadleaf and one non-broadleaf fruit or vegetable at each location. Broadleaf vegetables of Swiss chard and cabbage and non-broadleaf fruits and vegetables of tomatoes, cucumbers, squash, and zucchini were collected.

K-40 was detected in all broadleaf and non-broadleaf vegetables and fruits. Broadleaf vegetables (Swiss chard and cabbage) showed concentrations of K-40 ranging from 1.8 pCi/g to 4.6 pCi/g (wet). The indicator sample had the highest concentration (4.6 pCi/g [wet]). Non-broadleaf fruits and vegetables showed concentrations of K-40 ranging from 1.2 pCi/g to 2.3 pCi/g (wet). Again the indicator location had the highest K-40 concentration (2.3 pCi/g [wet]).

No other radionuclides were detected in the 1983 collection of fruits and vegetables.

Review of past environmental data indicates that K-40 has been consistently detected in food crop samples. K-40 concentrations have fluctuated from one sample to another but the annual ranges have remained relatively consistent from year to year. Be-7 has been detected occasionally during the past on leafy vegetables (1978 through 1982).

Dose estimates are not performed here for fruits and/or vegetables since no other radionuclides with the exception of naturally occurring K-40 were detected.

9. SOIL - TABLE 21

Soil samples are required once every three years. Samples were collected during 1983 at each of the 15 air monitoring stations (see Section VII, Figures 1 and 3). The radiological analysis of the soil samples showed detectable concentrations of Sr-90, Cs-137, K-40, Ra-226, and Th-228. Each of the radionuclides detected can be placed into one of two groups. The first group of radionuclides is the result of past atmospheric nuclear weapons testing. The second group of radionuclides is naturally occurring. Radionuclides with relatively long half-lives which fall into the first group are the result of atmospheric tests conducted over the past decades. The fallout related radionuclides detected in 1983 soil samples were Sr-90 and Cs-137. Sr-90 and Cs-137 require special consideration as these radionuclides are a common constituent of the background radiation due to fallout, but can also be attributed to the operation of the plant. The three naturally occurring radionuclides (K-40, Ra-226, and Th-228) were found in both the onsite and offsite samples. The concentrations of the naturally occurring radionuclides was consistent from station to station during 1983, and consistent with levels detected in previous soil sample collections (1977 and 1980).

Strontium-90 was detected in seven of the nine onsite soil samples collected in 1983. The concentration of Sr-90 in the onsite (indicator) samples ranged from 0.03 pCi/g (dry) to 0.47 pCi/g (dry). Strontium-90 was detected in all six of the offsite (control) soil samples. The concentration of Sr-90 in the offsite samples ranged from 0.10 pCi/g (dry) to 0.32 pCi/g (dry).

Cesium-137 was also detected in seven of the nine onsite soil samples and all six of the offsite soil samples. The Cs-137 concentration in the onsite samples ranged from 0.07 pCi/g (dry) to 1.19 pCi/g (dry). The Cs-137 concentration in the offsite samples ranged from 0.20 pCi/g (dry) to 1.46 pCi/g (dry). The above results show that the highest Sr-90 concentration was found at the indicator location, and the highest Cs-137 concentration was found at the control location.

The 1983 mean Sr-90 concentration for both the indicator and control soil samples is identical (0.18 pCi/g [dry]). The detection of Sr-90 in similar concentrations at both the control and indicator locations is indicative of past weapons testing.

The 1983 mean Cs-137 concentration was slightly higher in the control samples (0.67 pCi/g [dry]) than in the indicator samples (0.42 pCi/g [dry]). As noted above for Sr-90, the detection of Cs-137 in similar concentrations at both the control and indicator locations is also indicative of past weapons testing.

A review of past environmental data shows that the mean Sr-90 concentration for both the indicator and control locations shows a slight increase over the 1980 mean Sr-90 results. However, the 1983 mean

Sr-90 results are slightly lower than the levels detected in 1977. This variability in the Sr-90 level may be due in part to the ecological cycling of Sr-90 in soils, and in part to the additional deposition of Sr-90 as a result of the Chinese nuclear test in October 1980.

Review of previous environmental data shows that the mean Cs-137 concentration for both the indicator and control locations shows a slight decrease from 1977 and 1980 Cs-137 results. Again, this slight decrease in Cs-137 concentrations is most likely due to the ecological cycling of cesium in soils. Previous soil sample data (Cs-137, Sr-90) is presented in Section VI, HISTORICAL DATA.

CONCLUSION

The Radiological Environmental Monitoring Program is conducted each year to determine the radiological impact of the James A. FitzPatrick Nuclear Power Plant on the local environment. As demonstrated by the analytical results of the 1983 program, the major radiological impact on the environment was the result of fallout from atmospheric nuclear testing.

Levels of natural background and the associated fluctuation in intensity are much more significant in terms of dose to man (normal background in the vicinity of the site is equal to 60 mrem/yr) than radiation levels in the environment associated with the operation of the plant.

Using the data presented in this report, and earlier reports as a basis, it can be concluded that no appreciable radiological environmental impact has resulted from the operation of the James A. FitzPatrick Nuclear Power Plant.

EXCEPTIONS TO THE PROGRAM

1. The air sampling pump at the D-2 onsite environmental sampling station was inoperable from January 17, 1983 (1406 hours) to January 20, 1983 (1310 hours). Inoperability was caused by pump mechanical problems.

2. Environmental radiation monitor C offsite was inoperable from March 29, 1983 (0930 hours) to April 7, 1983 (1010 hours). Inoperability was caused by an electrical malfunction.

3. The air sampling pump at the J onsite environmental sampling station was inoperable from April 15, 1983 (0400 hours) to April 18, 1983 (1320 hours). Inoperability was caused by an electrical short circuit in the cord.

4. Environmental radiation monitor F onsite was inoperable from May 25, 1983 (2040 hours) to May 27, 1983 (1145 hours). Inoperability was caused by an electrical malfunction.

5. The air sampling pump at the G offsite environmental sampling station was inoperable from June 14, 1983 (1130 hours) to June 15, 1983 (1530 hours). Inoperability was caused by a blown fuse.

6. The air sampling pump at the J onsite environmental sampling station was inoperable from June 16, 1983 (1100 hours) to June 20, 1983 (1350 hours). Inoperability was caused by pump mechanical problems.

7. Environmental sampling station F onsite was inoperable from June 30, 1983 (1600 hours) to July 5, 1983 (1500 hours), as a result of an automobile accident on June 30, 1983. On June 30, a car collided with the utility pole that F onsite environmental sampling station was mounted on. The crash caused damage to the cabinet, the vacuum pump, and the radiation monitor.

8. The air sampling pump at the D-1 offsite environmental sampling station was inoperable from July 19, 1983 (0820 hours) to July 20, 1983 (1046 hours). Inoperability was caused by pump mechanical problems.

9. The air sampling pump at the I onsite environmental sampling station was inoperable from July 22, 1983 (0845 hours) to July 25, 1983 (1330 hours). Environmental radiation monitor I onsite was also inoperable from July 22, 1983 (0845 hours) to July 26, 1983 (1010 hours). Inoperability of the pump and monitor was caused by an electrical malfunction to the power supply to the environmental cabinet.

10. Environmental radiation monitor G onsite was inoperable from July 26, 1983 (1328 hours) to August 3, 1983 (1505 hours). Inoperability was caused by an electrical malfunction.

11. Environmental radiation monitor H onsite was inoperable from August 22, 1983 (1430 hours) to August 25, 1983 (0800 hours). Inoperability was caused by an electrical malfunction.

12. Environmental radiation monitor I onsite was inoperable from August 24, 1983 (0940 hours) to August 25, 1983 (1445 hours). Inoperability was caused by an electrical malfunction.

13. Environmental radiation monitor C offsite was inoperable from September 1, 1983 (0725 hours) to September 13, 1983 (0922 hours). Inoperability was caused by an electrical malfunction.

14. The air sampling pump at the H onsite environmental sampling station was inoperable from September 21, 1983 (0414 hours) to September 22, 1983 (1041 hours). Inoperability was caused by pump mechanical problems.

15. The air sampling pump at the J onsite environmental sampling station was inoperable from September 26, 1983 (1335 hours) to September 30, 1983 (1040 hours). Inoperability was caused by a blown fuse.

16. The air sampling pump at the J onsite environmental sampling station was inoperable from September 30, 1983 (1910 hours) to October 3, 1983 (1025 hours). Inoperability was caused by a blown fuse.

17. The air sampling pump at the H onsite environmental sampling station was inoperable from December 1, 1983 (1000 hours) to December 5, 1983 (1000 hours). Inoperability was caused by the technician's failure to turn the pump on after the weekly onsite environmental station inspection.

18. Environmental radiation monitor I onsite was inoperable from December 5, 1983 (1000 hours) to December 16, 1983 (1320 hours). Inoperability was caused by an electrical malfunction.

19. Environmental radiation monitor I onsite was inoperable from December 27, 1983 (1005 hours) to December 29, 1983 (1025 hours). Inoperability was caused by an electrical malfunction.

20. One Environmental Technical Specification (ETS) milk sample collected during October (October 10, 1983) and analyzed for iodine-131 had this analysis performed within 9.40 days instead of 8.041 days (one half-life of iodine-131). The analysis time was well within 10.05 days (one half-life of iodine-131 plus or minus 25 percent), and the LLD sensitivity for I-131 (less than 0.5 pCi/l) was satisfied as is required by the ETS.

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VI

HISTORICAL DATA

VI HISTORICAL DATA

Sample Statistics from Previous Environmental Sampling

The mean, standard deviation, minimum value, maximum value, and range, were calculated for selected sample mediums and isotopes.

Special Considerations:

1. Sample data listed as 1969 was taken from the NINE MILE POINT, PREOPERATION SURVEY, 1969 and ENVIRONMENTAL MONITORING REPORT FOR NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT NUCLEAR STATION, NOVEMBER, 1970.

2. Sample data listed as 1974 was taken from the NINE MILE POINT NUCLEAR STATION, ENVIRONMENTAL OPERATING REPORT. The 1974 data is pre-operational to the James A. FitzPatrick Nuclear Power Plant, which started commercial operation in November, 1974.

3. Sample data listed as 1975, 1976, 1977, 1978, 1979, 1980, 1981, and 1982 was taken from the respective environmental operating reports for Nine Mile Point Nuclear Station and James A. FitzPatrick Nuclear Power Plant.

4. Only measured values were used for statistical calculations.

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Periphyton Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.10	0.06	0.14	0.06	0.08
1982	0.05	0.01	0.06	0.04	0.02
1981	0.19	0.07	0.24	0.14	0.10
1980	0.03	0.01	0.04	0.02	0.02
1979	0.07	0.08	0.13	0.02	0.11
1978	0.04	0.03	0.063	0.023	0.04
1977	<MDL	---	---	---	---
1976	5.00	ONLY	ONE	DATA	POINT
1975	<MDL	---	---	---	---
1974	0.10	0.02	0.12	0.09	0.03
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Periphyton Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.35	0.23	0.69	0.17	0.52
1982	0.14	0.16	0.38	0.05	0.33
1981	6.24	6.75	16.00	0.47	15.53
1980	0.09	0.05	0.15	0.04	0.11
1979	0.36	0.55	1.10	0.08	1.02
1978	0.11	0.06	0.19	0.05	0.14
1977	0.42	0.56	1.40	0.09	1.31
1976	2.60	1.38	4.10	1.40	2.70
1975	22.25	14.34	36.00	4.00	32.00
1974	5.18	3.73	8.44	1.72	6.72
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Mollusks Sr-89 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	0.02	ONLY	ONE	DATA	POINT
1977	<MDL	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Mollusks Sr-89 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	0.04	0.03	0.07	0.01	0.06
1978	0.05	0.03	0.07	0.03	0.04
1977	<MDL	---	---	---	---
1976	0.42	ONLY	ONE	DATA	POINT
1975	<MDL	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Mollusks Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.035	0.007	0.04	0.03	0.01
1982	0.03	0.01	0.04	0.02	0.02
1981	0.046	0.008	0.052	0.040	0.012
1980	0.07	0.06	0.11	0.03	0.08
1979	0.07	0.05	0.10	0.02	0.08
1978	0.14	0.02	0.15	0.12	0.03
1977	0.23	0.21	0.38	0.08	0.30
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Mollusks Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.11	0.03	0.14	0.07	0.07
1982	0.10	0.02	0.12	0.07	0.05
1981	0.094	0.060	0.132	0.005	0.127
1980	0.11	0.03	0.14	0.07	0.07
1979	0.10	0.04	0.17	0.05	0.12
1978	0.14	0.03	0.18	0.10	0.08
1977	0.10	0.02	0.11	0.07	0.04
1976	0.51	ONLY	ONE	DATA	POINT
1975	0.17	0.04	0.19	0.14	0.05
1974	0.32	ONLY	ONE	DATA	POINT
1969 (PRE-OPERATIONAL)	0.12	0.17	0.24	0.01	0.23

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Mollusks Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Mollusks Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	0.061	ONLY	ONE	DATA	POINT
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	0.99	0.80	2.10	0.24	1.86
1977	<MDL	---	---	---	---
1976	0.18	ONLY	ONE	DATA	POINT
1975	<MDL	---	---	---	---
1974	0.26	ONLY	ONE	DATA	POINT
1969 (PRE-OPERATIONAL)	0.08	ONLY	ONE	DATA	POINT

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Bottom Sediment Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.14	ONLY	ONE	DATA	POINT
1982	<LLD	---	---	---	---
1981	0.027	0.007	0.032	0.022	0.01
1980	0.12	ONLY	ONE	DATA	POINT
1979	0.02	ONLY	ONE	DATA	POINT
1978	0.05	0.01	0.06	0.04	0.02
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Bottom Sediment Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.05	ONLY	ONE	DATA	POINT
1982	0.037	0.03	0.06	0.013	0.047
1981	0.011	0.007	0.02	0.005	0.015
1980	0.01	0.003	0.015	0.011	0.004
1979	0.02	0.20	0.05	0.01	0.04
1978	0.015	ONLY	ONE	DATA	POINT
1977	<MDL	---	---	---	---
1976	0.04	0.00	0.04	0.04	0.00
1975	0.29	0.27	0.65	0.03	0.62
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	0.08	ONLY	ONE	DATA	POINT

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Bottom Sediment Cs-137 pCi/g (dry)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.24	0.08	0.29	0.18	0.11
1982	0.52	0.33	0.75	0.29	0.46
1981	0.26	0.23	0.42	0.10	0.32
1980	0.43	0.2	0.57	0.29	0.28
1979	0.47	0.10	0.54	0.40	0.14
1978	0.61	0.15	0.71	0.50	0.21
1977	0.68	0.08	0.73	0.62	0.11
1976	<MDL	---	---	---	---
1975	0.40	0.10	0.50	0.30	0.20
1974	0.11	ONLY	ONE	DATA	POINT
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Bottom Sediment Cs-137 pCi/g (dry)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.33	0.11	0.43	0.18	0.25
1982	0.20	0.11	0.30	0.05	0.25
1981	0.23	0.04	0.27	0.19	0.08
1980	0.34	0.40	0.94	0.12	0.82
1979	0.44	0.45	1.00	0.13	0.87
1978	0.99	0.80	2.10	0.24	1.86
1977	2.27	1.90	4.10	0.31	3.79
1976	2.45	0.64	2.90	2.00	0.90
1975	0.83	0.86	3.50	0.20	3.30
1974	0.40	0.26	0.58	0.21	0.37
1969 (PRE-OPERATIONAL)	0.38	0.09	0.44	0.31	0.13

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

GAMMARUS Sr-89 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	0.034	ONLY	ONE	DATA	POINT
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

GAMMARUS Sr-89 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	0.069	ONLY	ONE	DATA	POINT
1980	<LLD	---	---	---	---
1979	0.105	ONLY	ONE	DATA	POINT
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

GAMMARUS Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.07	0.03	0.10	0.05	0.05
1982	0.09	ONLY	ONE	DATA	POINT
1981	0.099	0.066	0.146	0.052	0.094
1980	0.102	ONLY	ONE	DATA	POINT
1979	0.10	0.02	0.11	0.08	0.03
1978	0.14	0.01	0.14	0.13	0.01
1977	0.32	ONLY	ONE	DATA	POINT
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

GAMMARUS Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.18	0.03	0.21	0.16	0.05
1982	0.23	0.10	0.30	0.16	0.14
1981	0.193	0.058	0.274	0.138	0.136
1980	0.64	0.86	1.64	0.14	1.5
1979	0.19	0.01	0.20	0.17	0.03
1978	0.14	0.04	0.21	0.13	0.08
1977	0.40	0.46	0.73	0.08	0.65
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

GAMMARUS Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	0.05	0.04	0.08	0.02	0.06
1978	0.028	ONLY	ONE	DATA	POINT
1977	<MDL	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

GAMMARUS Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.21	0.21	0.36	0.06	0.30
1982	<LLD	---	---	---	---
1981	4.7	4.67	8.0	1.4	6.6
1980	<LLD	---	---	---	---
1979	0.06	0.02	0.07	0.04	0.03
1978	0.05	0.00	0.05	0.05	0.00
1977	<MDL	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	0.21	ONLY	ONE	DATA	POINT
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Fish Samples Sr-89 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	0.004	0.001	0.005	0.003	0.002
1981	0.015	0.001	0.015	0.014	0.001
1980	<LLD	---	---	---	---
1979	0.07	0.04	0.09	0.04	0.05
1978	<MDL	---	---	---	---
1977	0.04	0.01	0.05	0.03	0.02
1976	0.24	0.08	0.33	0.19	0.14
1975	<MDL	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Fish Samples Sr-89 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	0.004	0.001	0.004	0.003	0.001
1981	0.061	0.021	0.10	0.027	0.073
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	0.01	0.001	0.015	0.014	0.001
1977	0.07	0.05	0.24	0.03	0.21
1976	0.27	0.15	0.41	0.12	0.29
1975	<MDL	---	---	---	---
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Fish Samples Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	0.006	0.006	0.013	0.002	0.011
1981	<LLD	---	---	---	---
1980	0.005	0.002	0.007	0.002	0.005
1979	0.018	0.012	0.033	0.008	0.025
1978	0.010	0.004	0.015	0.004	0.011
1977	0.07	0.03	0.14	0.02	0.12
1976	0.25	0.27	0.81	0.05	0.76
1975	0.07	0.06	0.10	0.04	0.06
1974	0.07	0.02	0.09	0.04	0.05
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Fish Samples Sr-90 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	0.003	0.001	0.005	0.002	0.003
1981	0.002	ONLY	ONE	DATA	POINT
1980	0.006	0.005	0.013	0.003	0.010
1979	0.019	0.01	0.04	0.01	0.03
1978	0.013	0.006	0.025	0.004	0.021
1977	0.07	0.05	0.24	0.03	0.21
1976	0.28	0.48	2.20	0.05	2.15
1975	0.08	0.03	0.13	0.02	0.11
1974	0.23	0.69	2.30	0.01	2.29
1969 (PRE-OPERATIONAL)	0.23	0.17	0.51	0.30	0.21

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Fish Samples Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.050	0.009	0.060	0.040	0.020
1982	0.047	0.009	0.055	0.027	0.028
1981	0.043	0.016	0.062	0.028	0.034
1980	0.059	0.032	0.110	0.029	0.081
1979	0.04	0.01	0.06	0.03	0.03
1978	0.09	0.05	0.20	0.04	0.16
1977	0.13	ONLY	ONE	DATA	POINT
1976	0.12	ONLY	ONE	DATA	POINT
1975	<MDL	---	---	---	---
1974	0.43	0.37	0.94	0.09	0.85
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Fish Samples Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.050	0.009	0.060	0.030	0.030
1982	0.050	0.008	0.064	0.034	0.030
1981	0.061	0.021	0.10	0.027	0.073
1980	0.061	0.029	0.100	0.030	0.070
1979	0.10	0.14	0.55	0.02	0.53
1978	0.08	0.02	0.10	0.03	0.07
1977	0.29	0.21	0.79	0.13	0.66
1976	1.4	1.67	3.90	0.50	3.40
1975	1.38	0.22	1.70	1.10	0.60
1974	0.57	0.82	4.40	0.08	4.32
1969 (PRE-OPERATIONAL)	0.06	0.04	0.13	0.01	0.12

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Lake Water Gross Beta pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	2.98	1.74	7.92	1.47	6.45
1982	2.4	0.43	3.2	1.8	1.4
1981	3.24	1.27	5.8	1.9	3.9
1980	2.60	0.50	3.48	1.87	1.61
1979	3.05	0.85	4.80	2.10	2.70
1978	3.55	1.58	6.10	0.50	5.60
1977	10.9	14.5	49.3	2.50	46.8
1976	42.48	50.62	189.00	4.90	184.10
1975	45.33	52.79	160.00	1.00	159.00
1974	4.85	0.07	4.90	4.80	0.10
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Lake Water Gross Beta pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	3.34	1.59	7.90	0.57	7.33
1982	2.7	0.73	4.7	1.3	3.4
1981	2.98	1.19	5.4	1.2	4.2
1980	3.10	0.63	5.10	2.35	2.75
1979	3.24	1.06	6.30	2.00	4.30
1978	4.53	2.62	11.10	0.60	10.50
1977	15.80	21.00	87.00	1.00	86.00
1976	41.76	55.23	192.00	1.10	190.90
1975	18.24	17.08	80.00	0.60	79.40
1974	31.71	20.22	60.00	6.30	53.70
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Lake Water Sr-89 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	1.4	0.07	1.4	1.3	0.1
1979	0.70	0.14	0.80	0.60	0.20
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Lake Water Sr-89 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	0.61	ONLY	ONE	DATA	POINT
1981	0.78	ONLY	ONE	DATA	POINT
1980	0.70	ONLY	ONE	DATA	POINT
1979	<LLD	---	---	---	---
1978	0.70	0.10	0.80	0.60	0.20
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	0.30	ONLY	ONE	DATA	POINT
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Lake Water Sr-90 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.89	0.08	0.97	0.82	0.15
1982	2.04	2.18	5.30	0.75	4.55
1981	0.68	0.176	0.868	0.484	0.384
1980	1.10	0.00	1.10	1.10	0.00
1979	0.80	0.26	1.10	0.60	0.50
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Lake Water Sr-90 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.83	0.21	1.10	0.60	0.50
1982	1.08	0.88	3.07	0.40	2.67
1981	0.74	0.08	0.805	0.597	0.208
1980	1.00	0.20	1.20	0.80	0.40
1979	0.84	0.34	1.30	0.40	0.90
1978	0.80	0.30	1.10	0.40	0.70
1977	1.00	ONLY	ONE	DATA	POINT
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Lake Water Tritium pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	250.0	21.8	280	230	50
1982	165.0	94.7	307	112	195
1981	293.3	49.3	357	211	146
1980	257.3	38.5	290	211	79
1979	258.7	73.7	308	174	134
1978	303.8	127.5	490	215	275
1977	407.5	97.4	530	300	230
1976	651.7	251.0	929	440	489
1975	362.5	72.8	414	311	103
1974	<MDL	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Lake Water Tritium pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	317.0	116.9	560	190	370
1982	641.0	891.1	2780	194	2586
1981	258.3	76.9	388	183	205
1980	263.0	95.4	457	150	307
1979	234.0	40.7	286	176	110
1978	389.4	119.9	560	253	307
1977	450.0	67.2	530	380	150
1976	513.0	250.3	889	297	592
1975	334.8	132.5	482	124	358
1974	440.0	84.9	500	380	120
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Air Particulate Gross Beta pCi/m^3	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.024	0.009	0.085	0.007	0.078
1982	0.033	0.012	0.078	0.011	0.067
1981	0.165	0.135	0.549	0.016	0.533
1980	0.056	0.04	0.291	0.009	0.282
1979	0.077	0.086	0.703	0.010	0.693
1978	0.14	0.13	0.66	0.01	0.650
1977	0.07	0.03	0.140	0.016	0.124
1976	0.051	0.031	0.240	0.004	0.236
1975	0.085	0.060	0.294	0.008	0.286
1974	0.121	0.104	0.808	0.001	0.807
1969 (PRE-OPERATIONAL)	0.334	0.097	0.540	0.130	0.410

INDICATOR

Air Particulate Gross Beta pCi/m^3	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.023	0.009	0.062	0.003	0.059
1982	0.031	0.012	0.113	0.001	0.112
1981	0.151	0.128	0.528	0.004	0.524
1980	0.045	0.03	0.207	0.002	0.205
1979	0.058	0.06	0.271	0.001	0.270
1978	0.10	0.09	0.34	0.01	0.33
1977	0.106	0.07	0.326	0.002	0.324
1976	0.047	0.032	0.191	0.002	0.189
1975	0.067	0.055	0.456	0.001	0.455
1974	0.111	0.114	0.855	0.003	0.852
1969 (PRE-OPERATIONAL)	0.320	0.090	0.520	0.130	0.390

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Environmental TLD's Quarterly Reading mrem/Standard Month Offsite*	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	5.54	0.364	7.17	4.21	2.96
1982	5.12	0.691	6.95	3.79	3.16
1981	4.72	0.685	6.63	3.24	3.39
1980	4.57	0.614	6.06	3.12	2.94
1979	REPORTED	AS	MREM/QTR	PRIOR TO	1980
1978					
1977					
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR

Environmental TLD's Quarterly Reading mrem/Standard Month Onsite Monitors*	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	6.23	0.91	8.97	5.03	3.94
1982	5.82	1.24	9.13	3.87	5.26
1981	5.24	0.73	7.45	4.09	3.36
1980	DATA	NOT	COMPARABLE	DUE TO	CHANGES
1979	IN TLD	LOCATIONS			
1978					
1977					
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)					

*See Clarification on Environmental Sample Statistical Analysis Table, Section III.

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Milk Samples Sr-90 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	1.91	0.50	2.60	1.00	1.60
1982	2.96	1.20	4.20	0.93	3.28
1981	4.85	1.91	8.00	2.41	5.59
1980	3.33	0.9	4.3	1.8	2.5
1979	4.44	1.33	5.80	1.70	4.10
1978	5.88	2.04	9.00	3.00	6.00
1977	NO DATA	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Milk Samples Sr-90 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	2.81	0.80	5.05	1.00	4.05
1982	4.60	2.29	9.76	0.76	9.00
1981	4.60	2.45	10.70	1.12	9.58
1980	4.3	2.6	11.0	1.1	9.9
1979	4.84	2.12	9.00	0.70	8.30
1978	5.93	1.81	10.00	2.50	7.50
1977	6.07	3.50	15.00	2.00	13.00
1976	7.16	3.41	14.80	1.50	13.30
1975	6.31	3.11	13.80	2.30	11.50
1974	5.66	2.89	14.00	1.00	13.00
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Milk Samples Cs-137 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	7.0	ONLY	ONE	DATA	POINT
1980	<LLD	---	---	---	---
1979	3.73	0.29	3.9	3.4	0.5
1978	5.83	1.98	7.8	2.4	5.4
1977	NO	CONTROL	DATA	PRIOR TO	1978
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Milk Samples Cs-137 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	5.10	ONLY	ONE	DATA	POINT
1982	6.26	4.41	18.0	3.1	14.9
1981	7.57	5.95	29.0	4.3	24.7
1980	9.7	4.9	21.0	4.0	17.0
1979	9.4	8.0	40.0	2.7	37.3
1978	9.9	7.1	33.0	3.4	29.6
1977	17.1	3.9	22.0	11.0	11.0
1976	7.8	3.7	13.2	4.0	9.2
1975	20.6	7.8	36.0	6.0	30.0
1974	26.1	10.5	61.0	13.0	48.0
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Milk Samples I-131 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	1.41	ONLY	ONE	DATA	POINT
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	NO DATA	---	---	---	---
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Milk Samples I-131 pCi/l	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	4.9	4.23	8.80	0.40	8.40
1979	<LLD	---	---	---	---
1978	0.19	ONLY	ONE	DATA	POINT
1977	0.20	0.14	0.22	-0.40	0.62
1976	3.20	7.81	45.00	0.02	44.98
1975	0.37	0.60	2.99	0.01	2.98
1974	1.23	0.44	2.00	0.70	1.30
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Human Food Crops Cs-137 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	NO	CONTROL	DATA	PRIOR TO	1980
1978					
1977					
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR

Human Food Crops Cs-137 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	0.033	2.26	0.06	0.004	0.056
1979	<LLD	---	---	---	---
1978	0.01	ONLY	ONE	DATA	POINT
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	0.142	0.09	0.34	0.04	0.30
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Human Food Crops I-131 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	NO	CONTROL	DATA	PRIOR TO	1980
1978					
1977					
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR

Human Food Crops I-131 pCi/g (wet) Produce	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Meat Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	0.021	0.005	0.024	0.017	0.007
1980	0.01	ONLY	ONE	DATA	POINT
1979	NO	CONTROL	DATA	PRIOR TO	1980
1978					
1977					
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR

Meat Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.02	0.01	0.04	0.01	0.03
1982	0.034	0.026	0.08	0.02	0.06
1981	0.036	0.021	0.068	0.023	0.045
1980	0.02	0.013	0.042	0.009	0.033
1979	0.03	0.021	0.07	0.01	0.06
1978	0.021	0.011	0.04	0.013	0.027
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	0.10	0.00	0.10	0.10	0.00
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Eggs Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	NO	CONTROL	DATA	PRIOR TO	1980
1978					
1977					
1976					
1975					
1974					
1969 (PRE-OPERATIONAL)					

INDICATOR

Eggs Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	<LLD	---	---	---	---
1982	<LLD	---	---	---	---
1981	<LLD	---	---	---	---
1980	<LLD	---	---	---	---
1979	<LLD	---	---	---	---
1978	<MDL	---	---	---	---
1977	<MDL	---	---	---	---
1976	<MDL	---	---	---	---
1975	<MDL	---	---	---	---
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Soil Samples Cs-137 pCi/g (dry)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.67	0.49	1.46	0.20	1.26
1982	NO	SAMPLES	REQUIRED	IN	1982
1981	NO	SAMPLES	REQUIRED	IN	1981
1980	1.20	0.91	2.90	0.41	2.49
1979	NO	SAMPLES	REQUIRED	IN	1979
1978	NO	SAMPLES	REQUIRED	IN	1978
1977	1.17	0.48	2.00	0.70	1.30
1976	NO DATA	---	---	---	---
1975	1.07	0.21	1.30	0.90	0.40
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Soil Samples Cs-137 pCi/g (dry)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.42	0.41	1.19	0.07	1.12
1982	NO	SAMPLES	REQUIRED	IN	1982
1981	NO	SAMPLES	REQUIRED	IN	1981
1980	1.26	0.61	2.1	0.29	1.81
1979	NO	SAMPLES	REQUIRED	IN	1979
1978	NO	SAMPLES	REQUIRED	IN	1978
1977	1.03	0.62	2.00	0.30	1.70
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	1.03	1.18	2.80	0.40	2.40
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Soil Samples Sr-90 pCi/g (dry)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.18	0.09	0.32	0.10	0.22
1982	NO	SAMPLES	REQUIRED	IN	1982
1981	NO	SAMPLES	REQUIRED	IN	1981
1980	0.063	0.065	0.19	0.008	0.182
1979	NO	SAMPLES	REQUIRED	IN	1979
1978	NO	SAMPLES	REQUIRED	IN	1978
1977	0.21	0.07	0.29	0.13	0.16
1976	NO DATA	---	---	---	---
1975	0.13	0.10	0.26	0.04	0.22
1974	NO DATA	---	---	---	---
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

INDICATOR

Soil Samples Sr-90 pCi/g (dry)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
1983	0.18	0.18	0.47	0.03	0.44
1982	NO	SAMPLES	REQUIRED	IN	1982
1981	NO	SAMPLES	REQUIRED	IN	1981
1980	0.074	0.052	0.140	0.008	0.132
1979	NO	SAMPLES	REQUIRED	IN	1979
1978	NO	SAMPLES	REQUIRED	IN	1978
1977	0.40	0.18	0.65	0.17	0.48
1976	NO DATA	---	---	---	---
1975	NO DATA	---	---	---	---
1974	0.27	0.06	0.34	0.23	0.11
1969 (PRE-OPERATIONAL)	NO DATA	---	---	---	---

VII

FIGURES AND MAPS

VII FIGURES AND MAPS

1. DATA GRAPHS

This section includes graphic representation of selected sample results.

For graphic representation, results less than the MDL or LLD were considered to be at the MDL or LLD level of activity. MDL and LLD values were indicated where possible.

2. SAMPLE LOCATIONS

Sample locations referenced as letters and numbers on analysis results tables are plotted on maps.

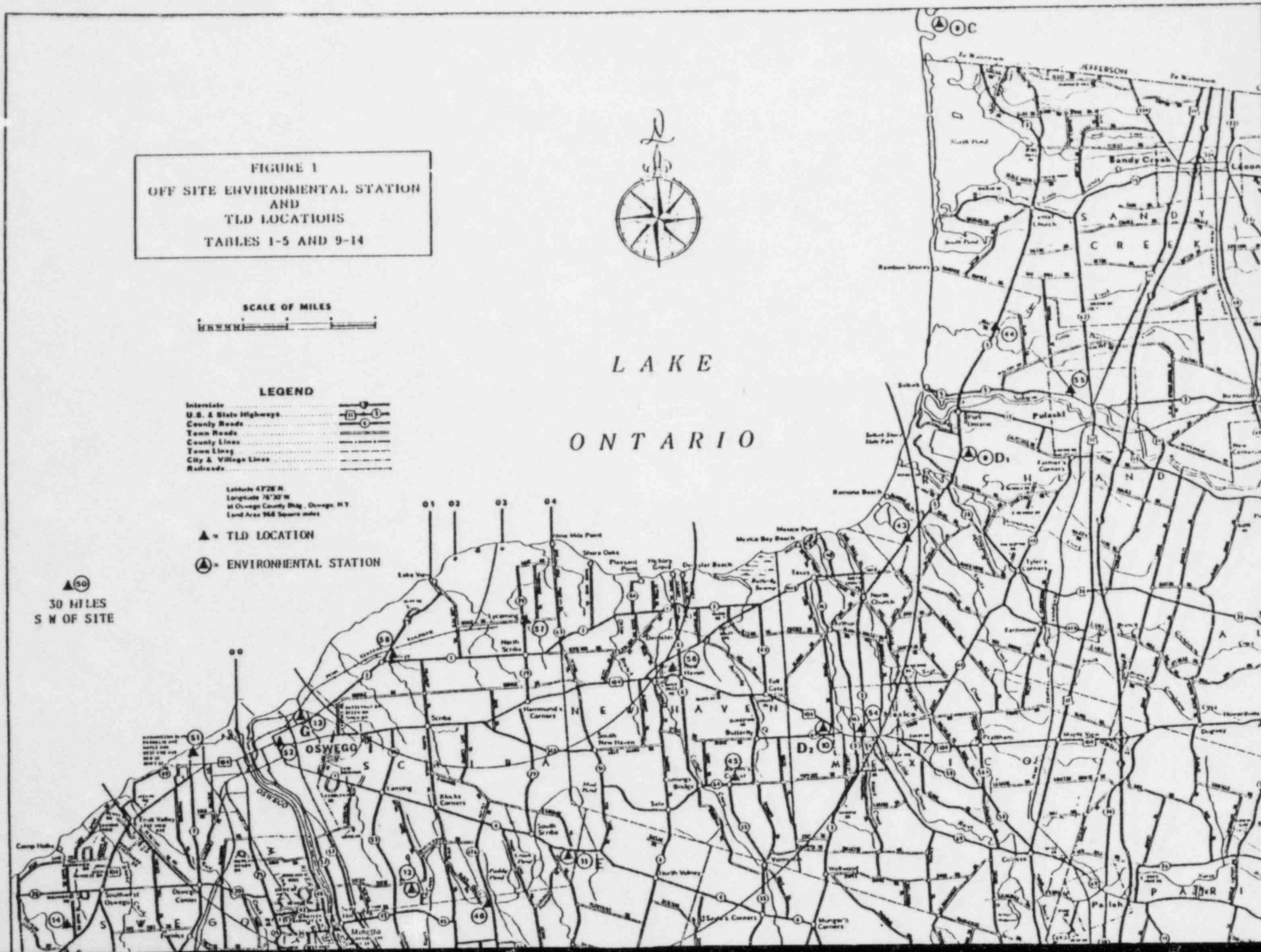
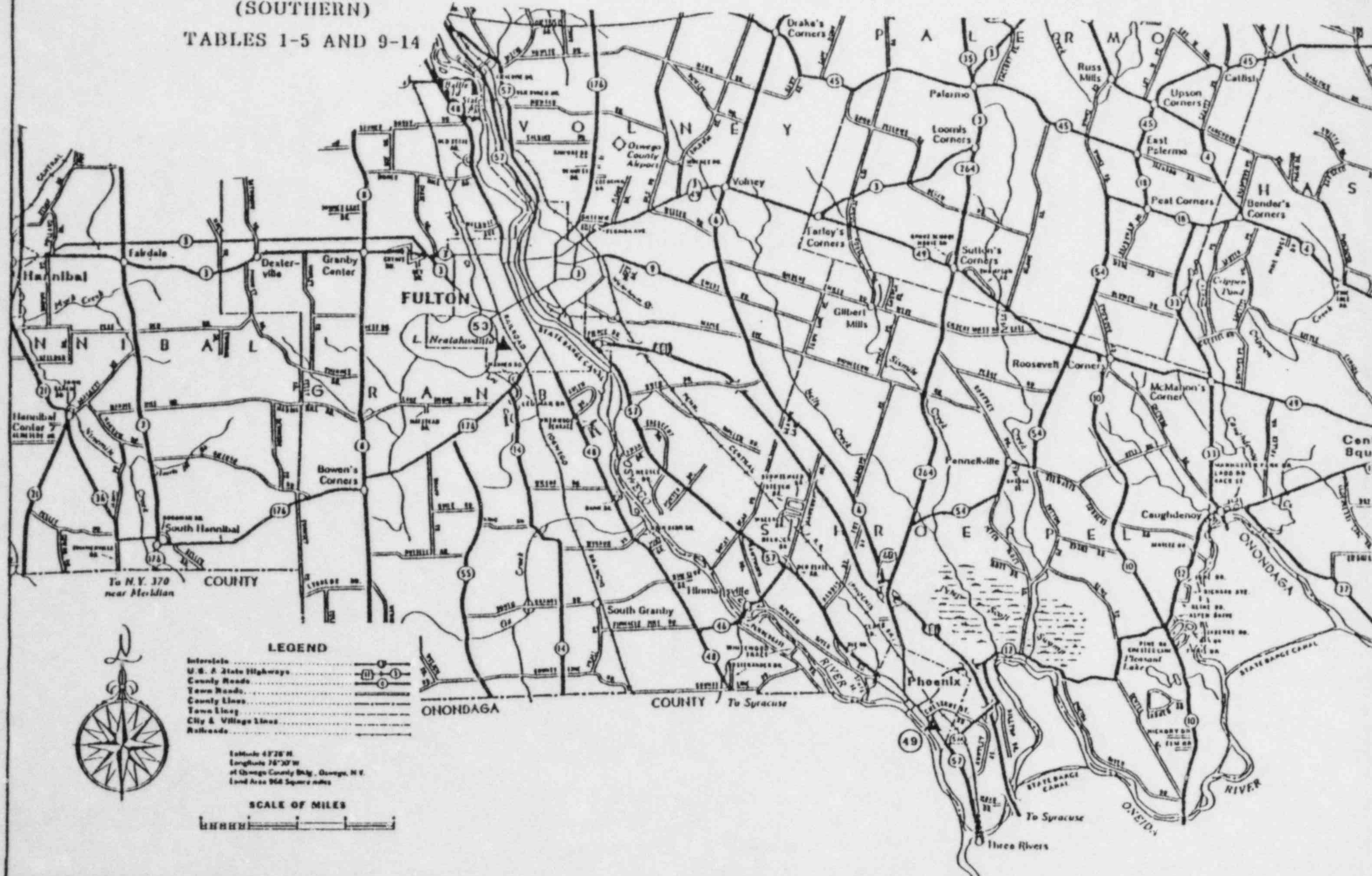


FIGURE 1
OFF SITE ENVIRONMENTAL STATION
AND
TLD LOCATIONS
TABLES 1-5 AND 9-14

FIGURE 1-A

OFF SITE ENVIRONMENTAL STATION
AND
TLD LOCATIONS
(SOUTHERN)

TABLES 1-5 AND 9-14



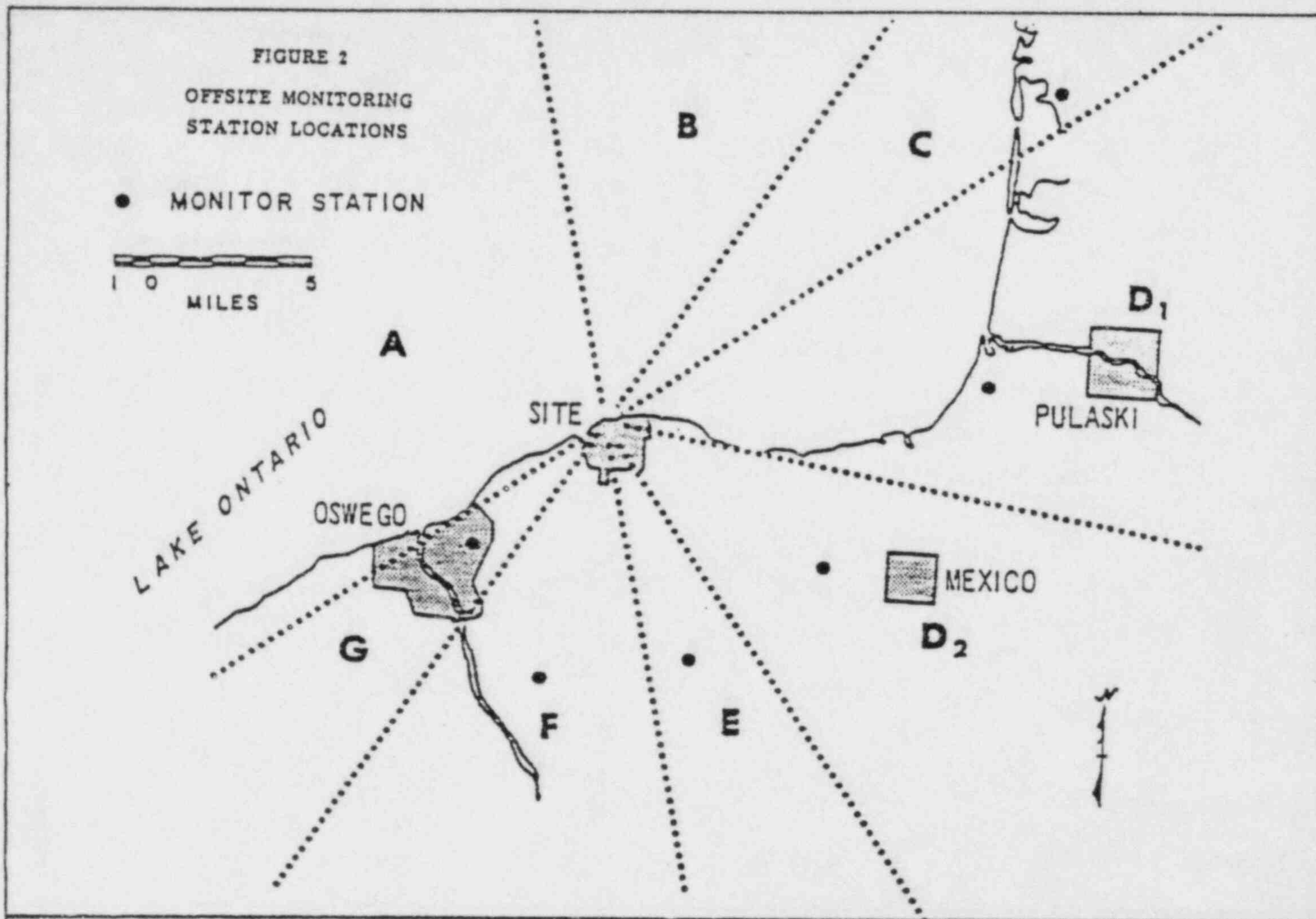
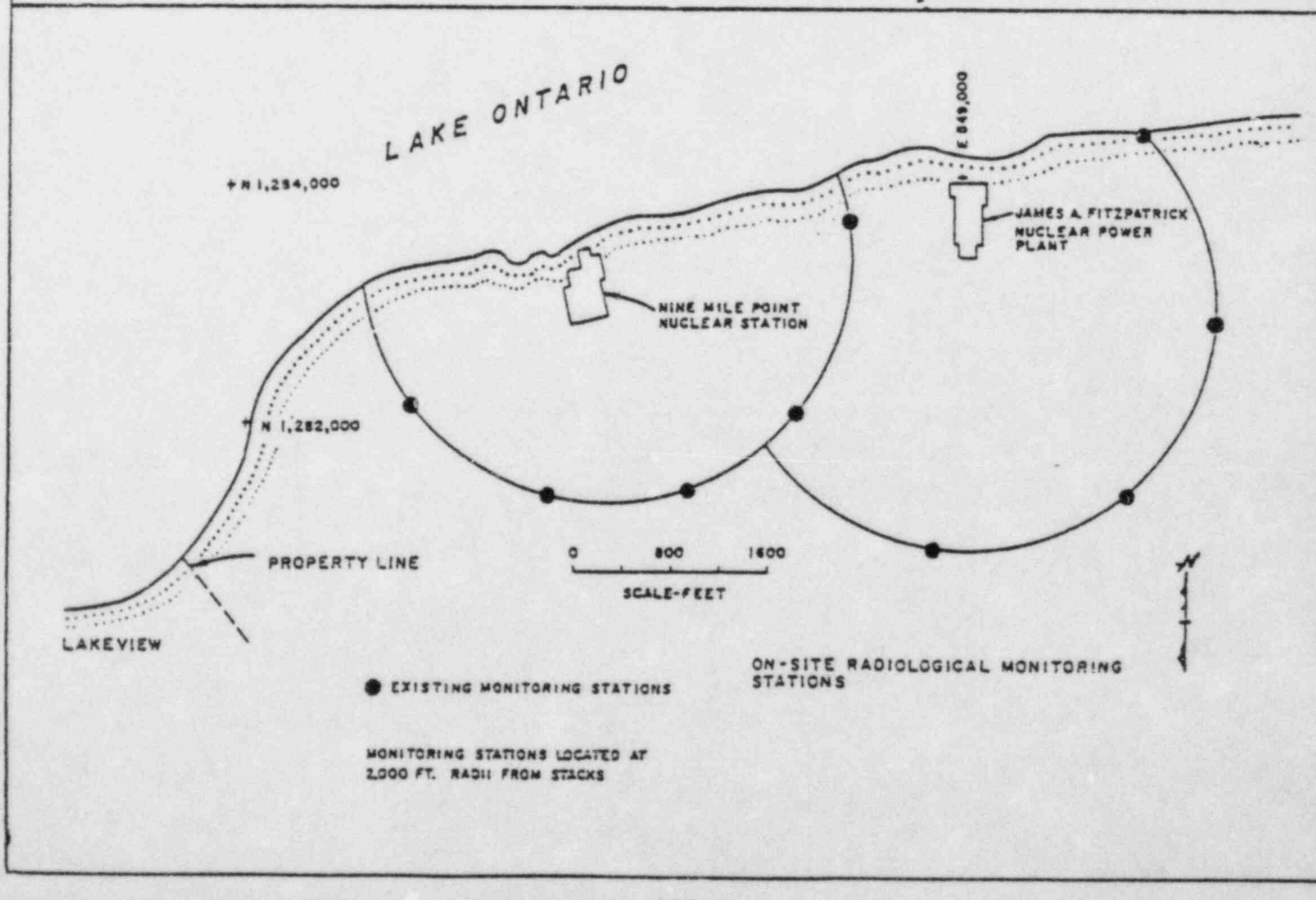
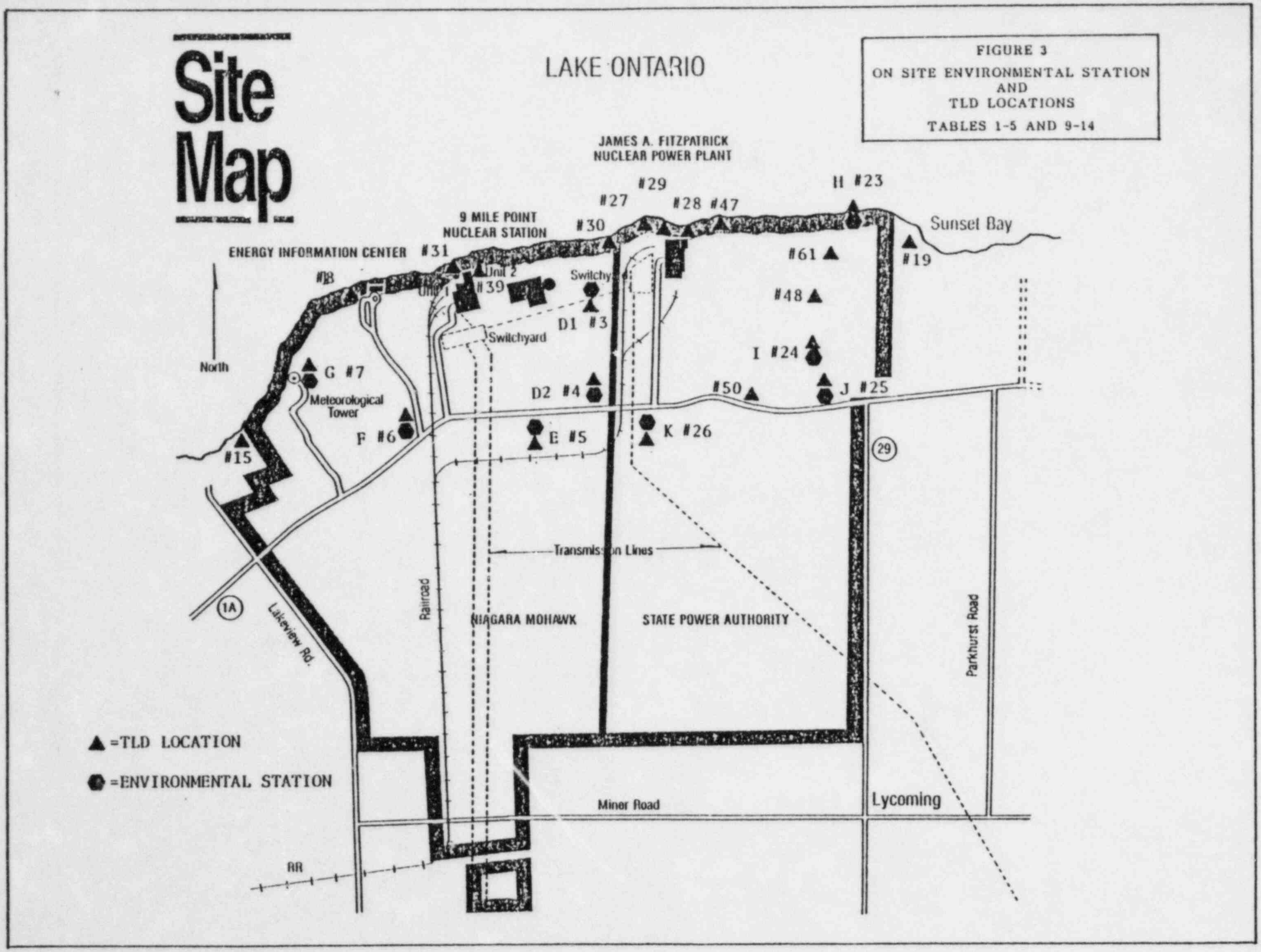


FIGURE 2
OFFSITE MONITORING
STATION LOCATIONS
MONITOR STATION
1 0 5
MILES
A
B
C
D_1
D_2
E
F
G
SITE
LAKE ONTARIO
OSWEGO
PULASKI
MEXICO
N


LAKE ONTARIO
+ N 1,284,000
E 849,000
JAMES A. FITZPATRICK
NUCLEAR POWER
PLANT
NINE MILE POINT
NUCLEAR STATION
+ N 1,282,000
PROPERTY LINE
0 800 1600
SCALE-FEET
LAKEVIEW
N
EXISTING MONITORING STATIONS
ON-SITE RADIOLOGICAL MONITORING
STATIONS
MONITORING STATIONS LOCATED AT
2,000 FT. RADII FROM STACKS



Site Map
LAKE ONTARIO
FIGURE 3
ON SITE ENVIRONMENTAL STATION AND TLD LOCATIONS
TABLES 1-5 AND 9-14
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
9 MILE POINT NUCLEAR STATION
ENERGY INFORMATION CENTER
#31
#30
#27
#29
#28
#47
H #23
Sunset Bay
#19
#61
#48
I #24
J #25
#50
Unit 1
Unit 2
#39
Switchyard
Switchyard
D1 #3
D2 #4
E #5
K #26
F #6
G #7
Meteorological Tower
North
#15
29
1A
Lakeview Rd.
Railroad
Transmission Lines
NIAGARA MOHAWK
STATE POWER AUTHORITY
Parkhurst Road
Miner Road
Lycoming
RR
▲ =TLD LOCATION
⬣ =ENVIRONMENTAL STATION

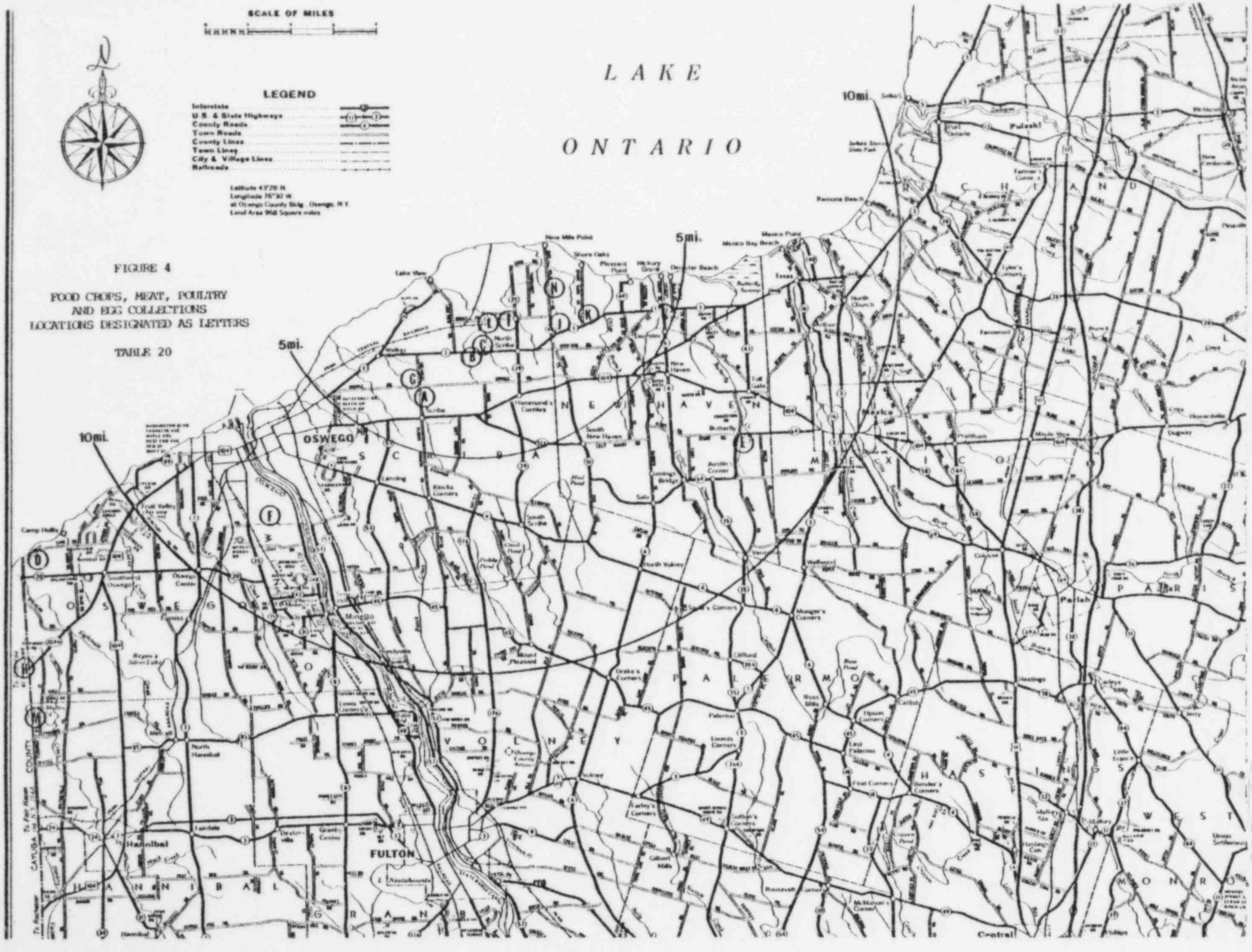


FIGURE 4

FOOD CROPS, MEAT, POULTRY
AND EGG COLLECTIONS
LOCATIONS DESIGNATED AS LETTERS

TABLE 20

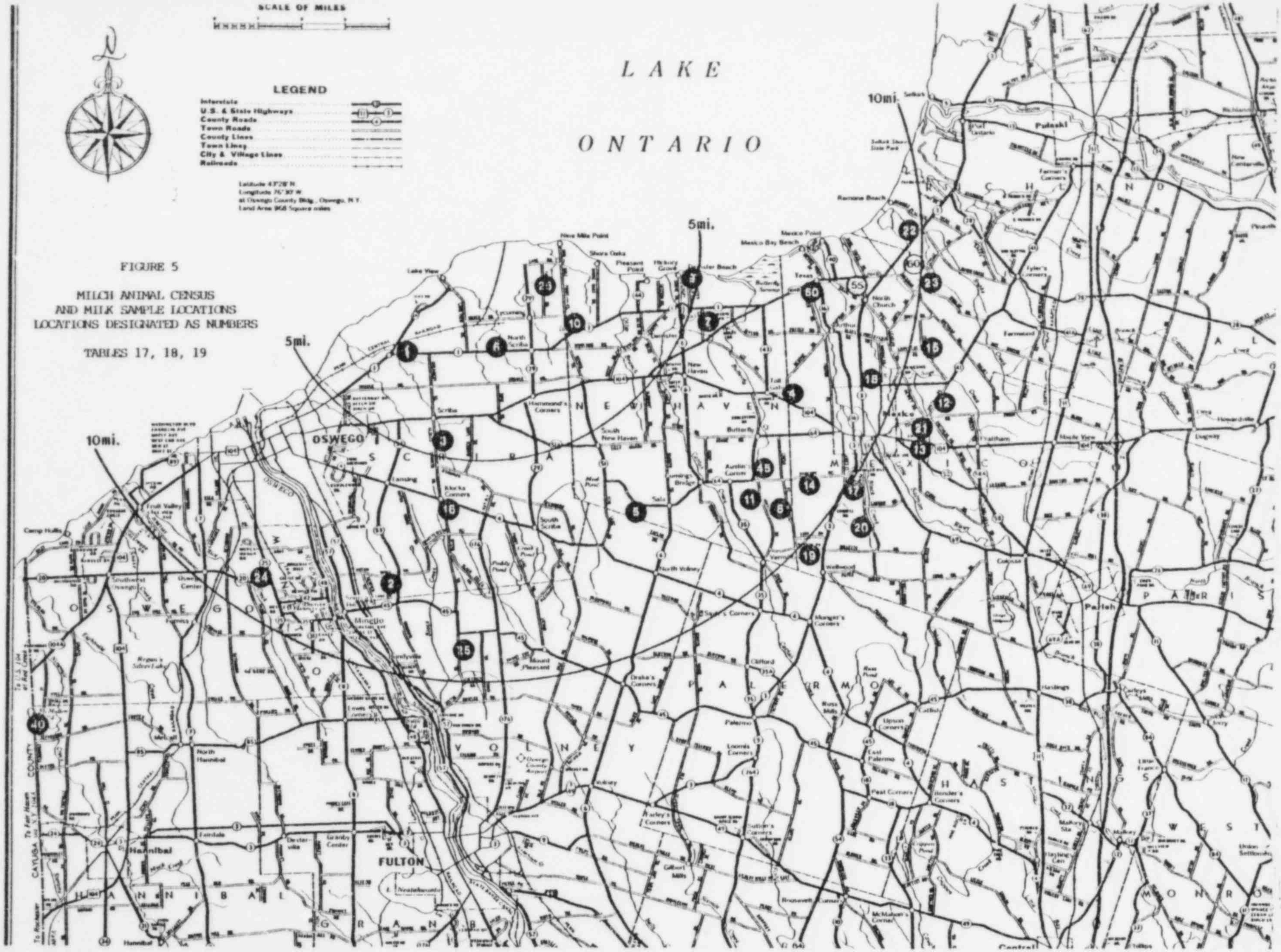
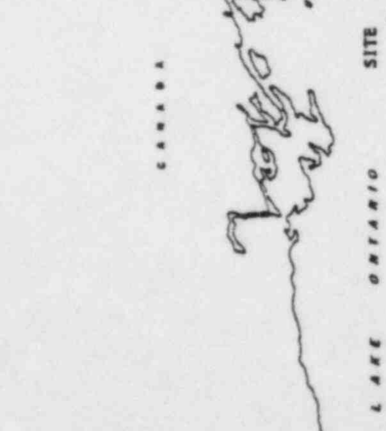


FIGURE 5

MILCH ANIMAL CENSUS
AND MILK SAMPLE LOCATIONS
LOCATIONS DESIGNATED AS NUMBERS

TABLES 17, 18, 19

FIGURE 6



NEW YORK STATE MAP WITH REGIONS

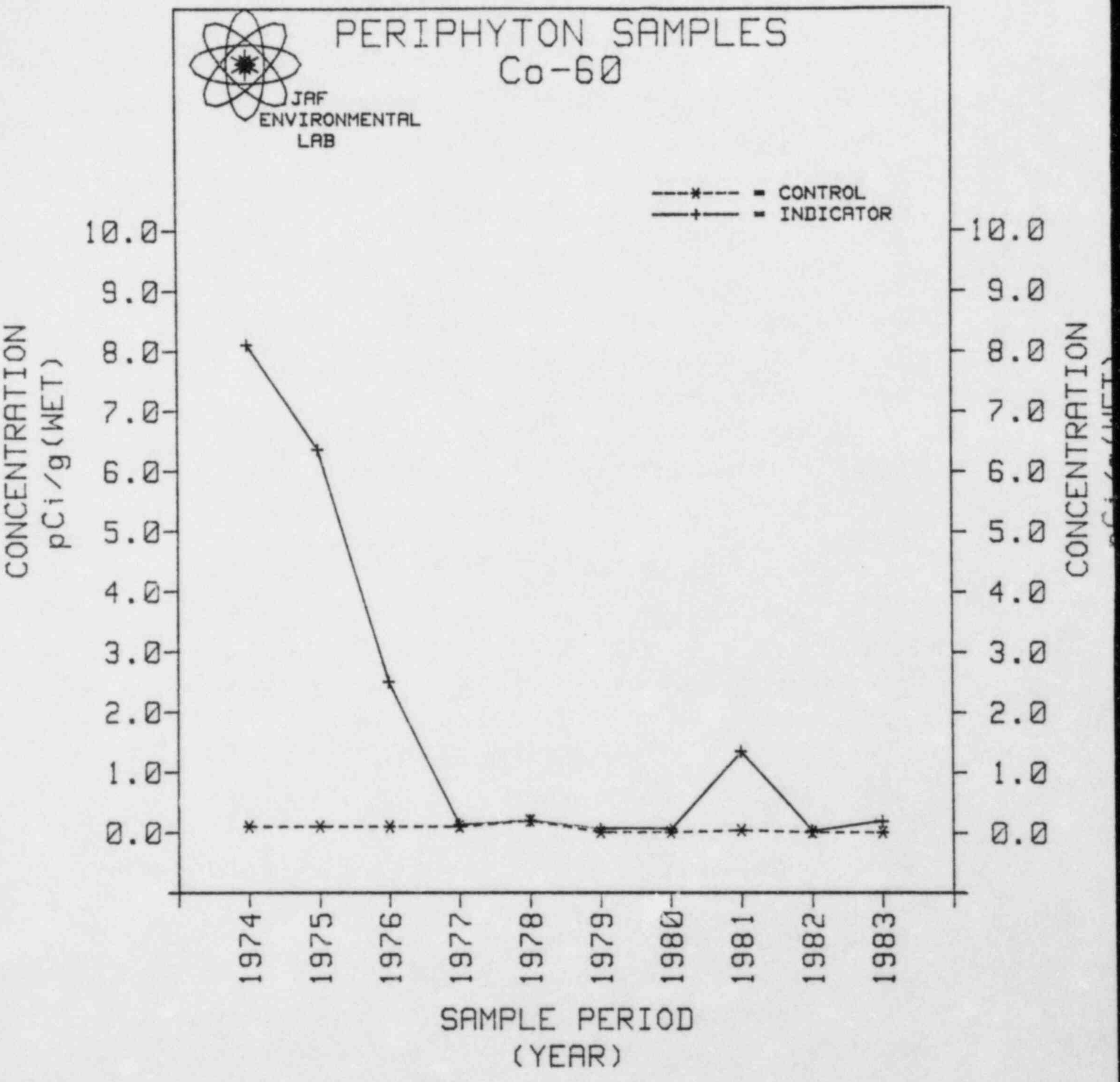
FIGURE 7

Composition of Bottom Sediment Determined by Visual Examination at Benthic Sampling Stations in the Vicinity of Nine Mile Point, 1978

Depth Contour (ft)	Transect	Description*	Comments
10	NMPW	100% bedrock	
	NMPP	70% boulders, 20% rubble, 10% gravel	Some algae on rocks
	FITZ	80% boulders, 10% gravel, 10% sand	Some algae
	NMPE	70% boulders, 20% gravel, 10% sand	Some algae
20	NMPW	50% bedrock, 50% rubble	
	NMPP	50% boulders, 30% rubble, 20% gravel	All lying on bedrock
	FITZ	50% boulders, 20% rubble, 20% gravel, 10% sand	
	NMPE	40% bedrock, 30% boulders, 25% gravel, 5% sand	
30	NMPW	100% bedrock	Some rubble
	NMPP	100% bedrock	Some boulders
	FITZ	80% bedrock	Some sand
	NMPE	100% bedrock	Some rubble and sand
40	NMPW	50% bedrock, 30% sand, 20% rubble	
	NMPP	80% boulders, 20% bedrock	
	FITZ	50% bedrock, 30% rubble, 20% boulders,	
	NMPE	100% bedrock	Some scattered sand
60	NMPW	100% bedrock	
	NMPP	80% boulders, 10% rubble, 10% gravel	
	FITZ	80% bedrock, 20% boulders	Some rubble
	NMPE	80% bedrock, 20% rubble	Some sand

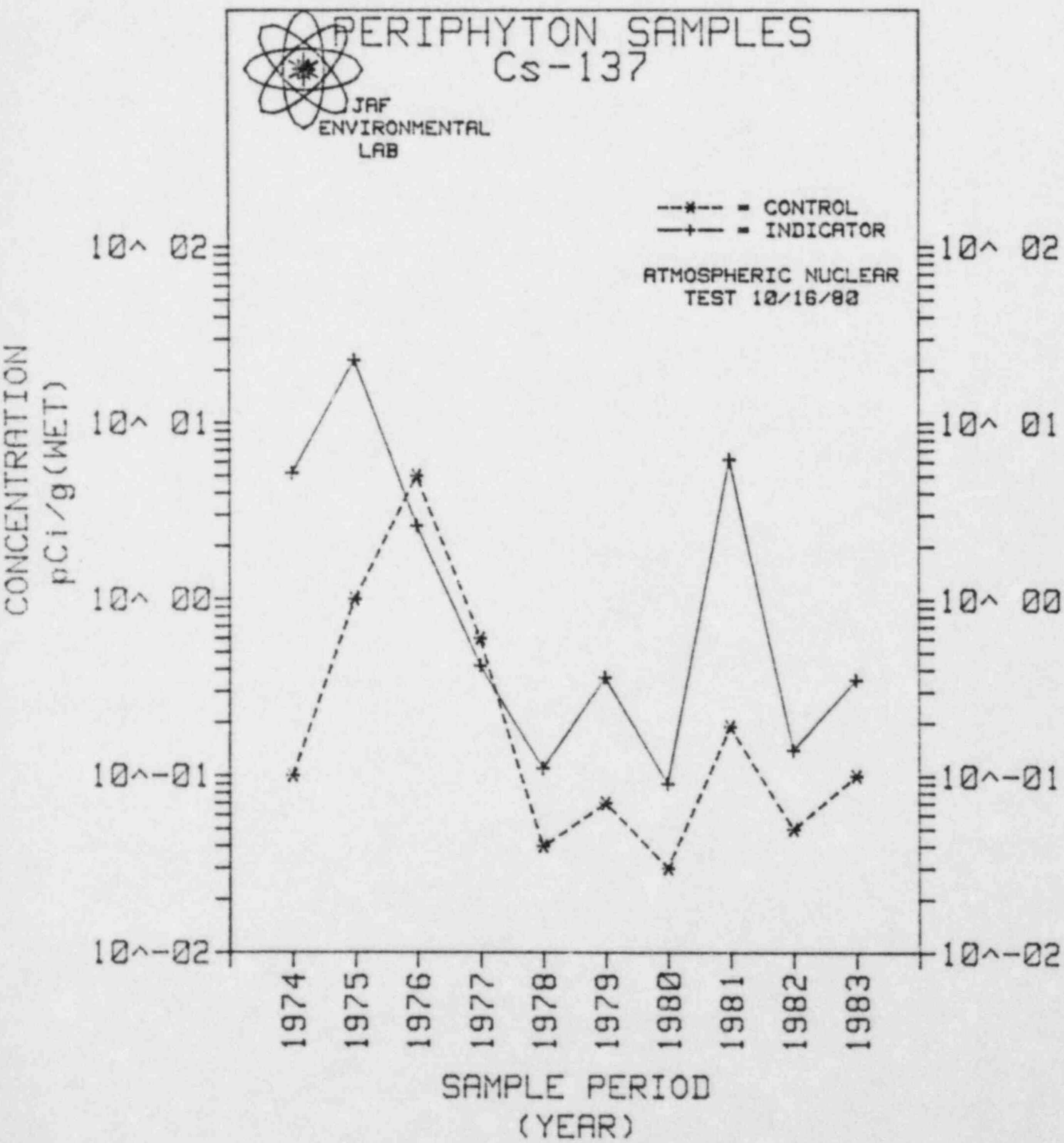
* Description based on USEPA (1973) field evaluation method for categorizing soils.

FIGURE 8



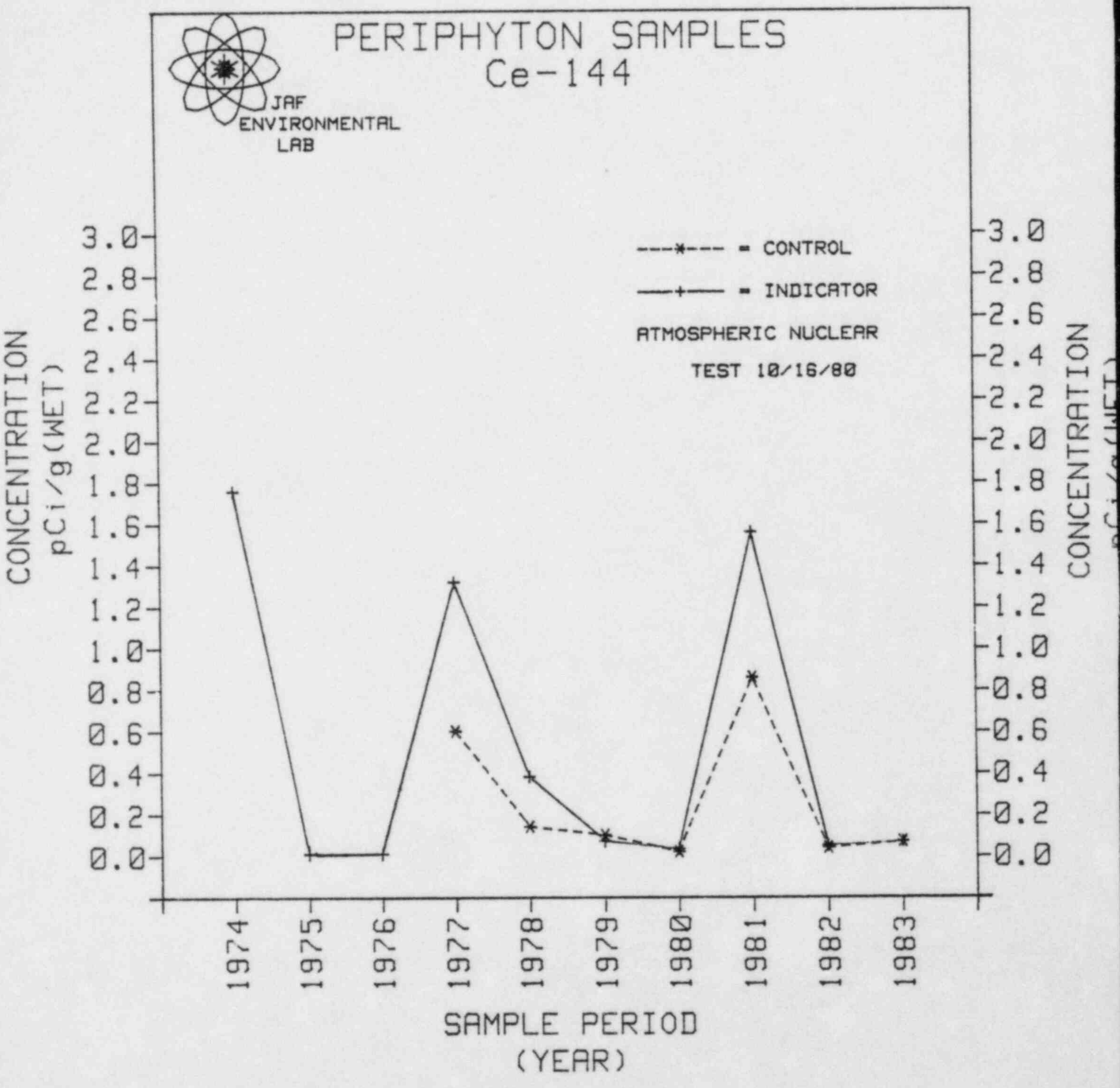
CONTROL VALUES 1974 TO 1979 ARE MDL's; 1980 TO 1983 ARE LLD's

FIGURE 9



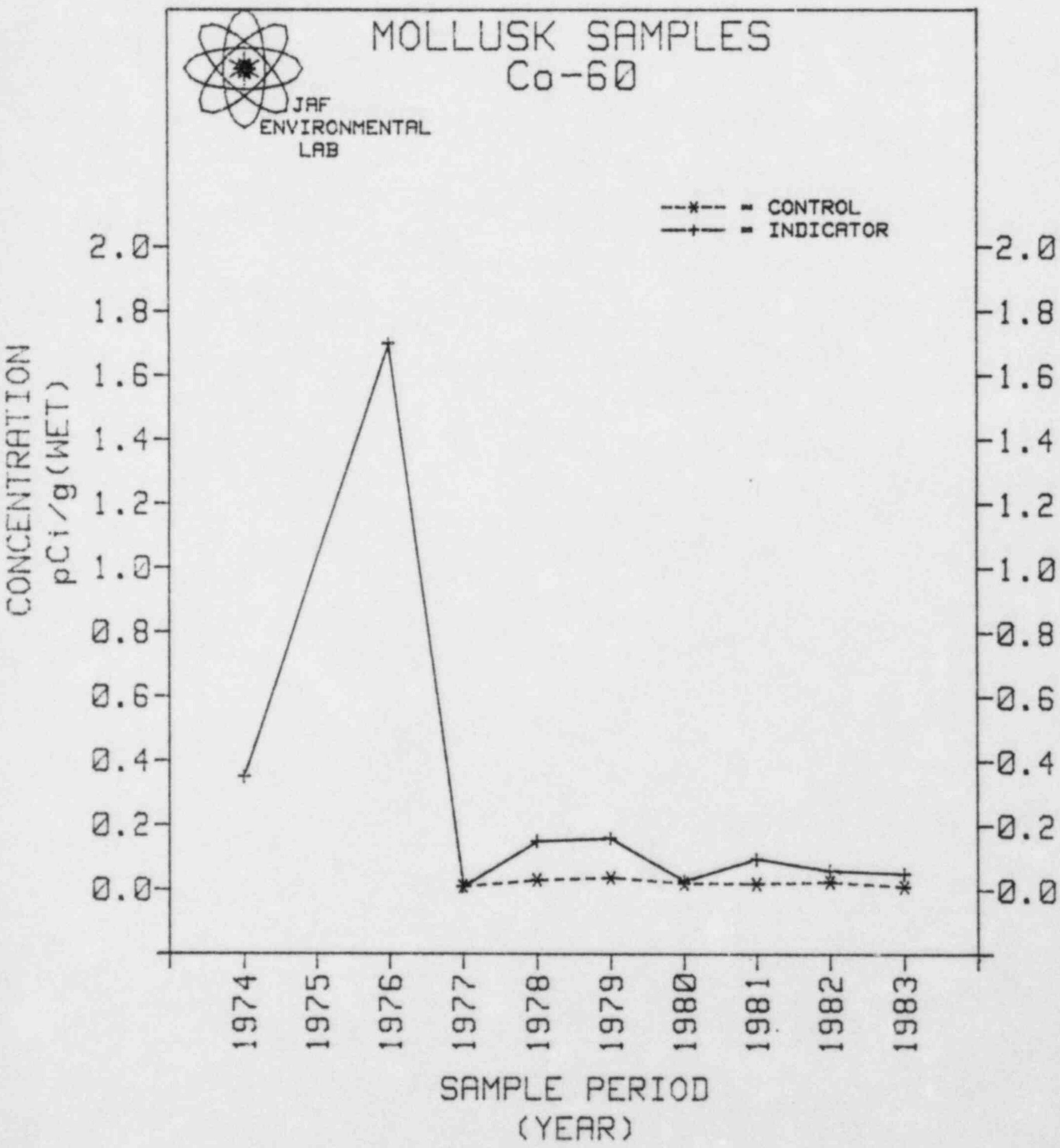
CONTROL VALUES 1975 & 1977 ARE MDL's

FIGURE 10



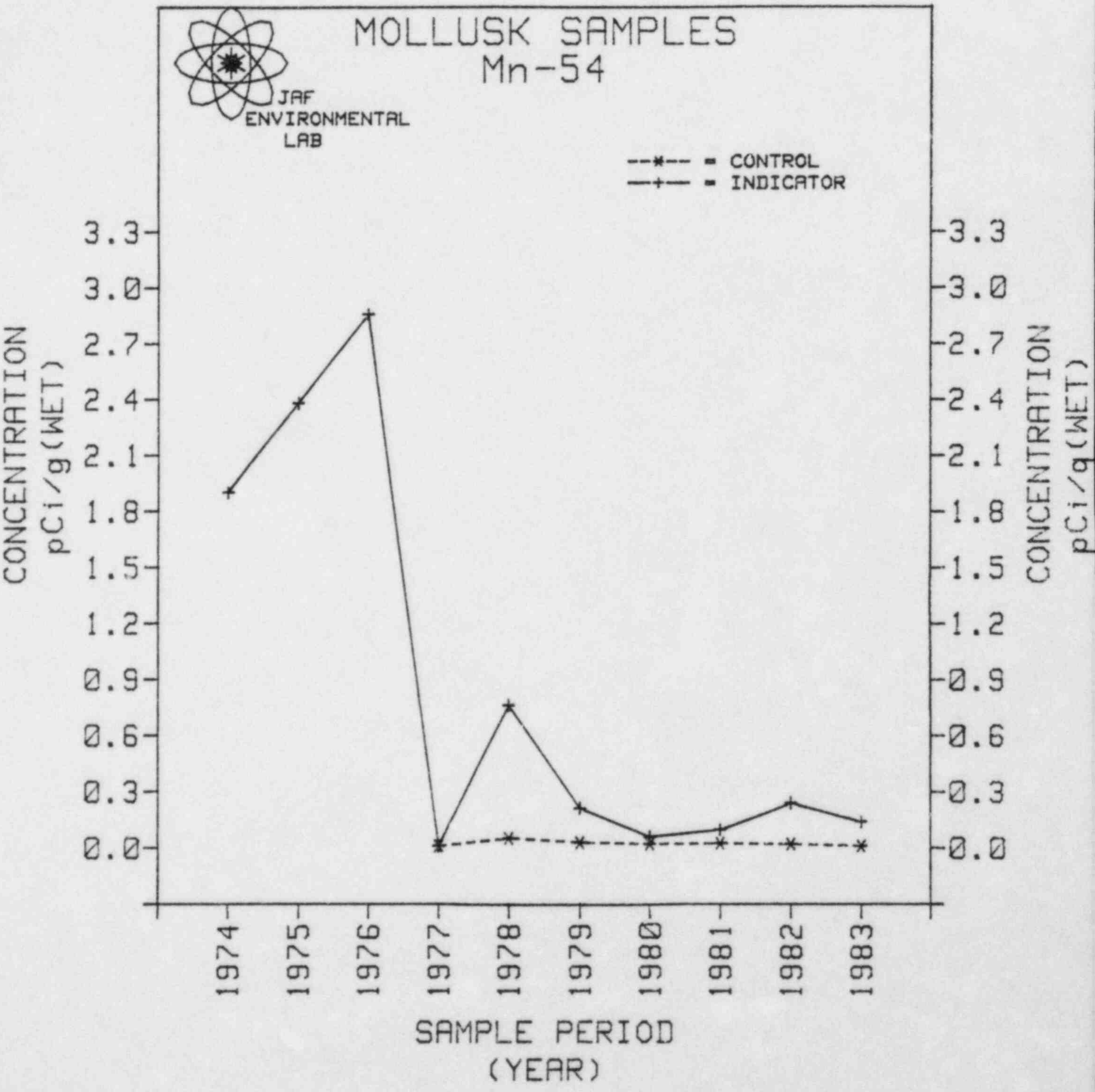
NO CONTROL DATA FOR 1974 & 1975
CONTROL YEARS 1976 ARE MDL's ; 1980 , 1983 ARE LLD's
INDICATOR YEARS 1975,1976,1979 ARE MDL's; 1980 , 1983 ARE LLD's

FIGURE 11



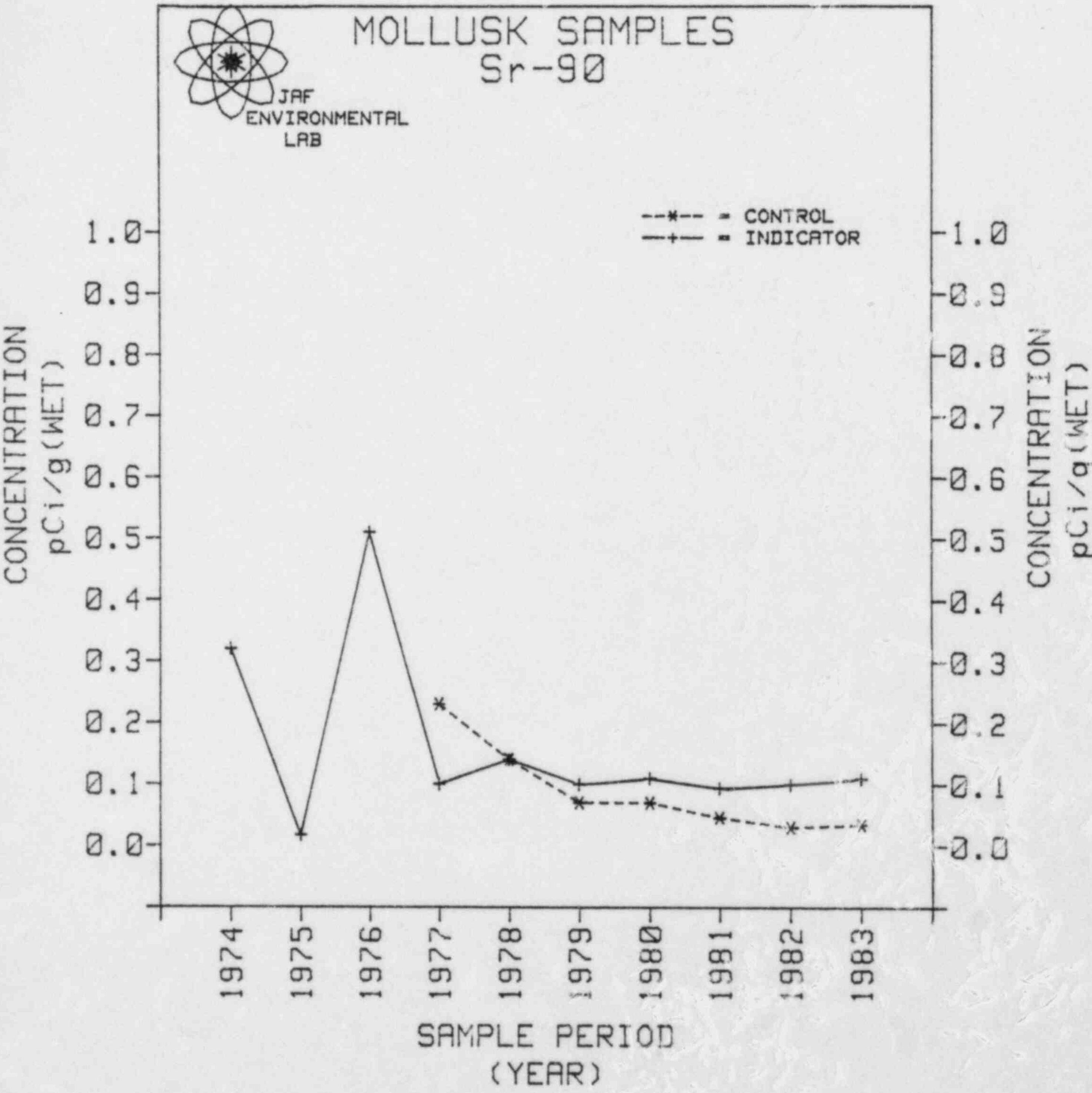
NO CONTROL DATA FOR 1974-1976
NO INDICATOR DATA FOR 1975
CONTROL YEARS 1977-1979 ARE MDL's; 1980-1983 ARE LLD's
INDICATOR YEAR 1977 IS MDL

FIGURE 12



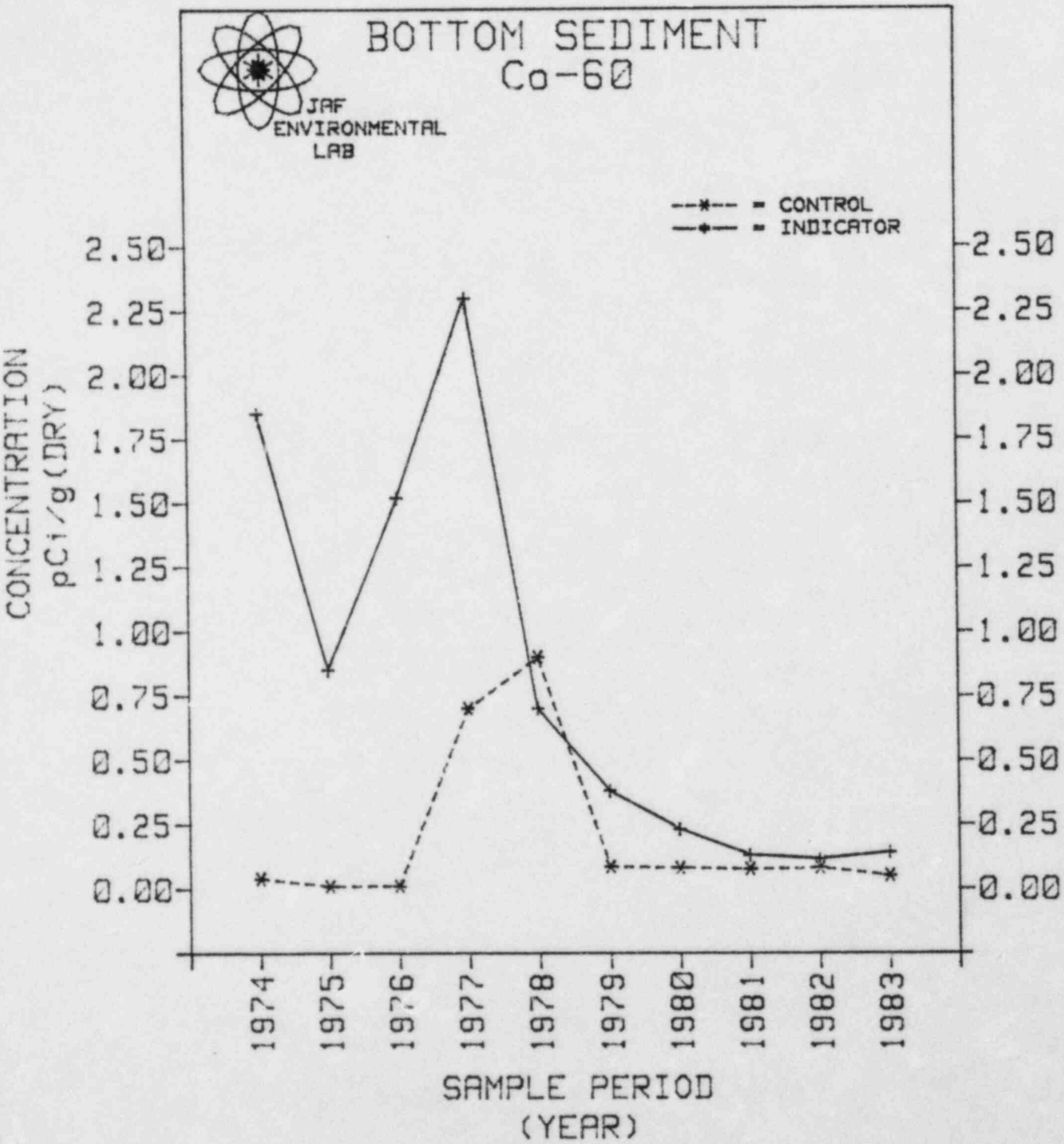
NO CONTROL DATA FOR 1974,1975,1976
CONTROL YEARS 1977-1979 ARE MDL's; 1980-1983 ARE LLD's
INDICATOR YEARS 1977,1979 ARE MDL's

FIGURE 13



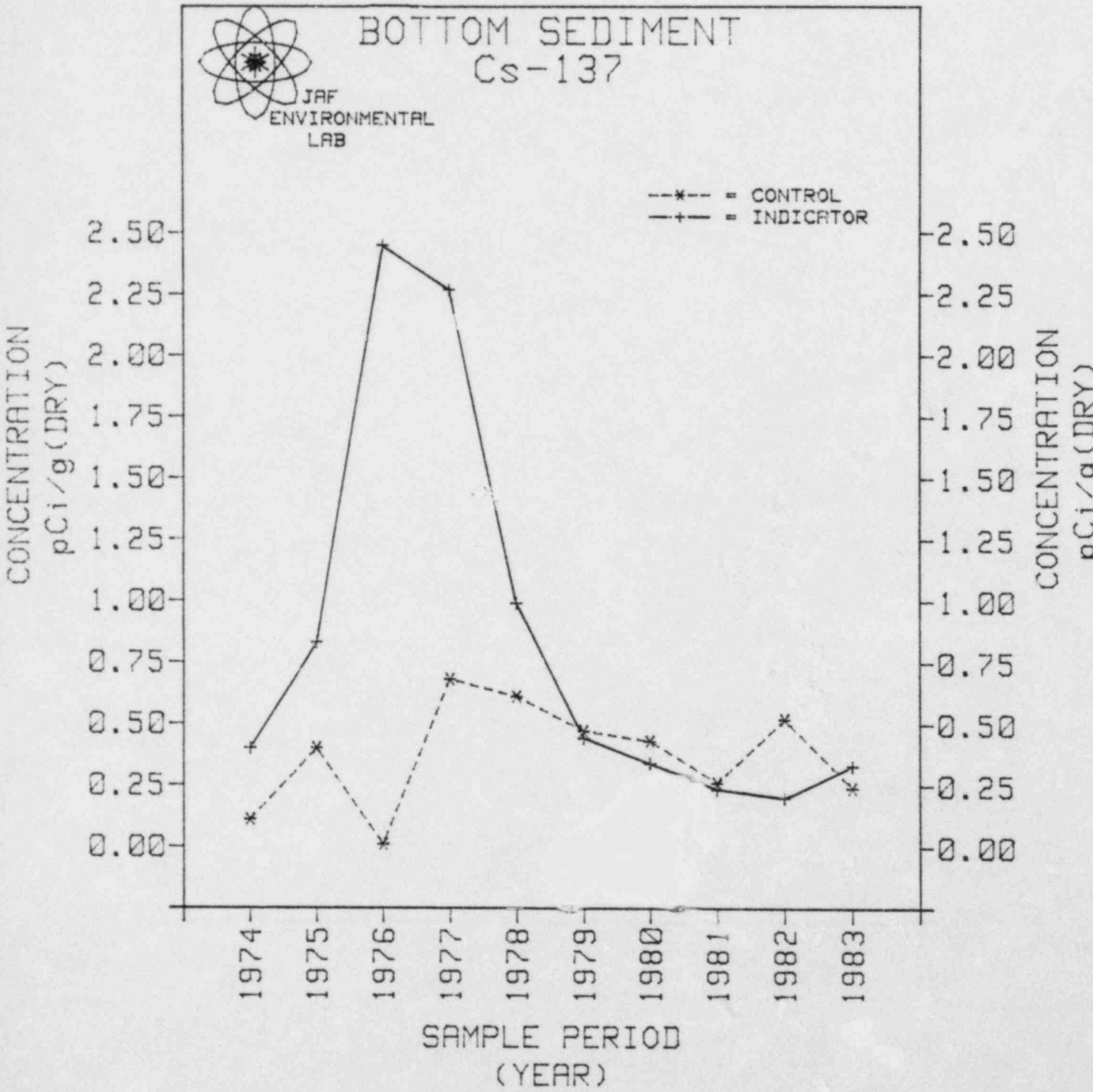
NO CONTROL DATA FOR YEARS 1974-1976

FIGURE 14



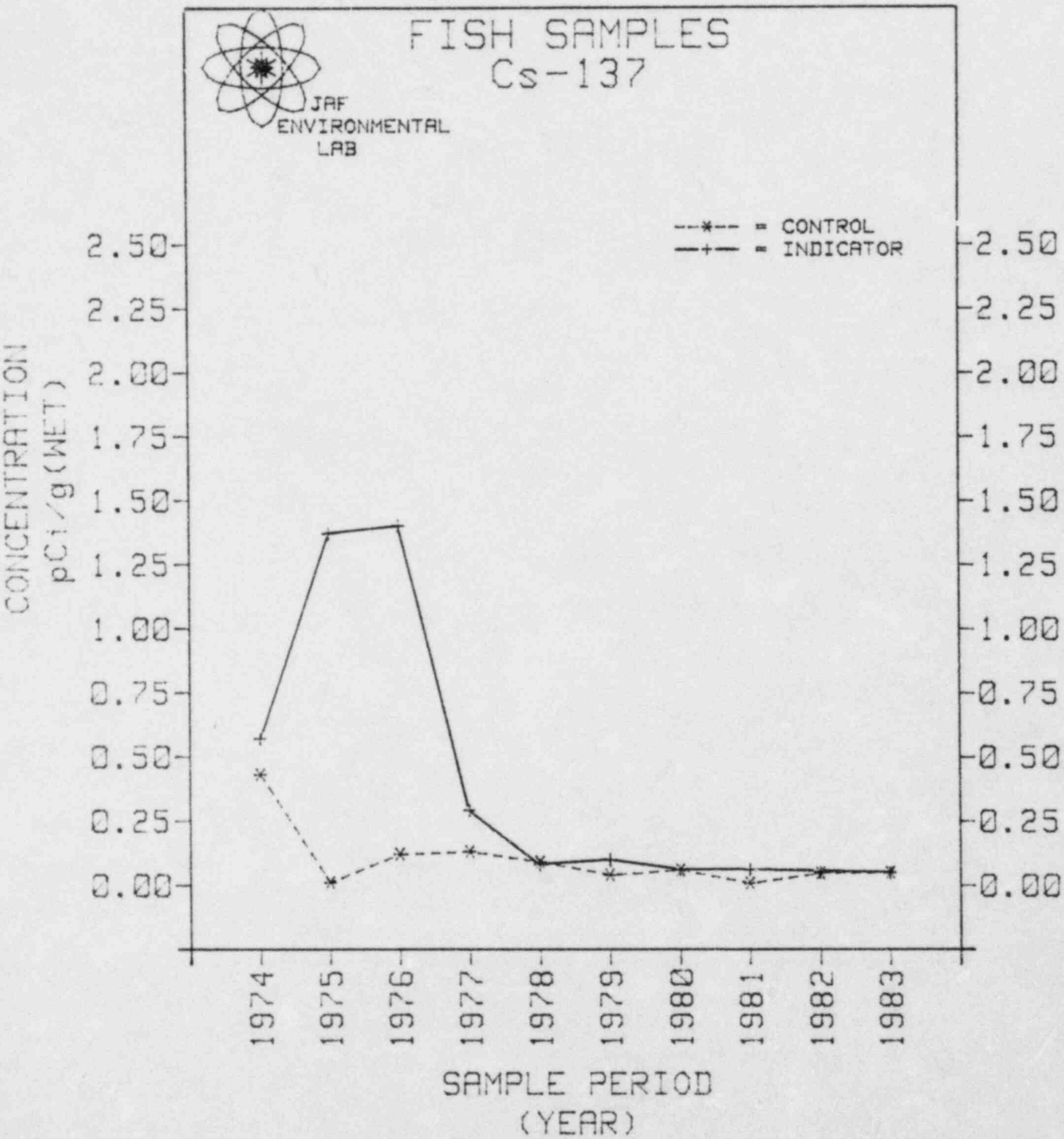
CONTROL DATA FOR YEARS 1975-76,1978-79 ARE MDL's; 1980-83 ARE LLD's

FIGURE 15



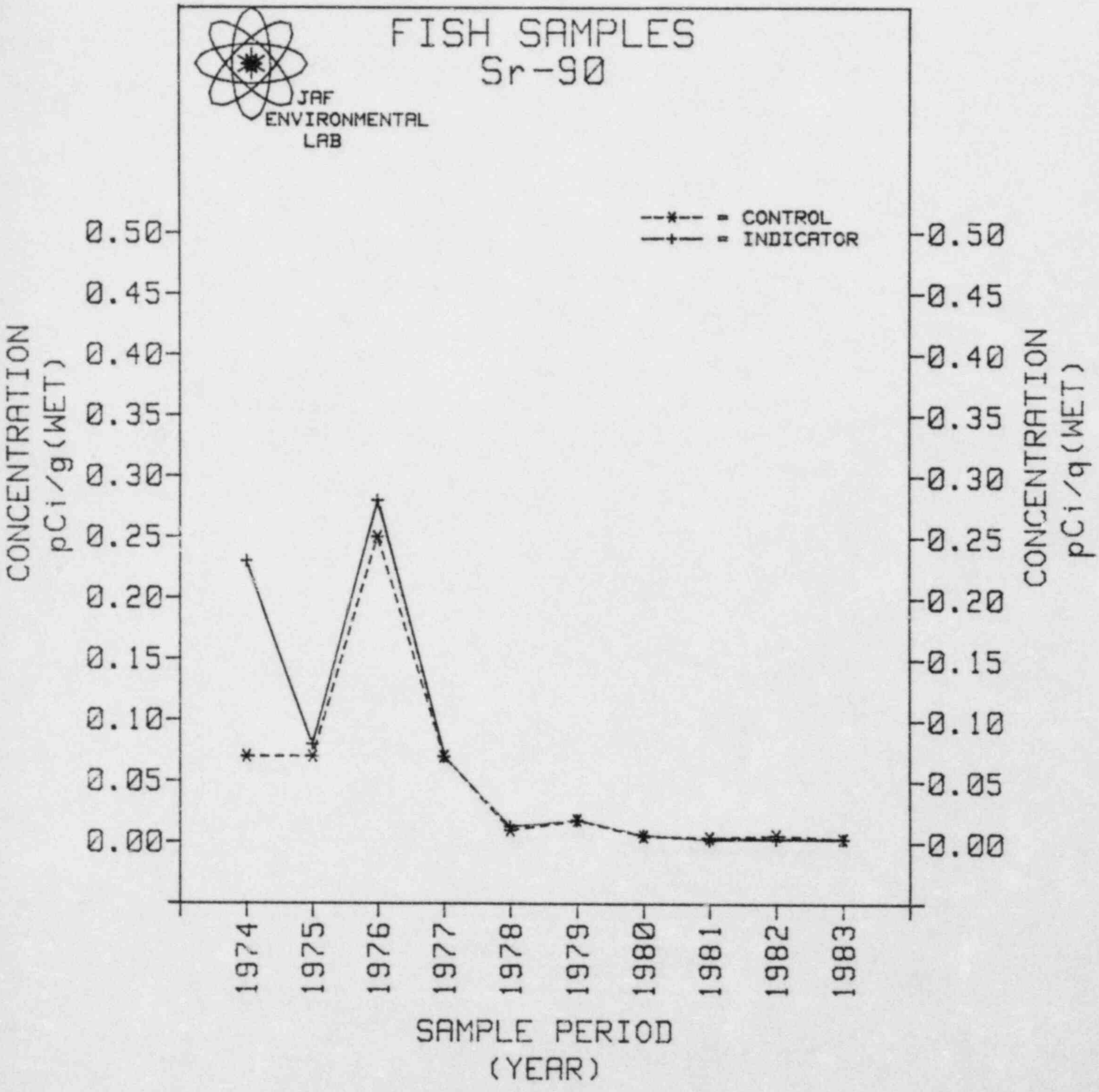
CONTROL DATA FOR 1976 IS MDL

FIGURE 16



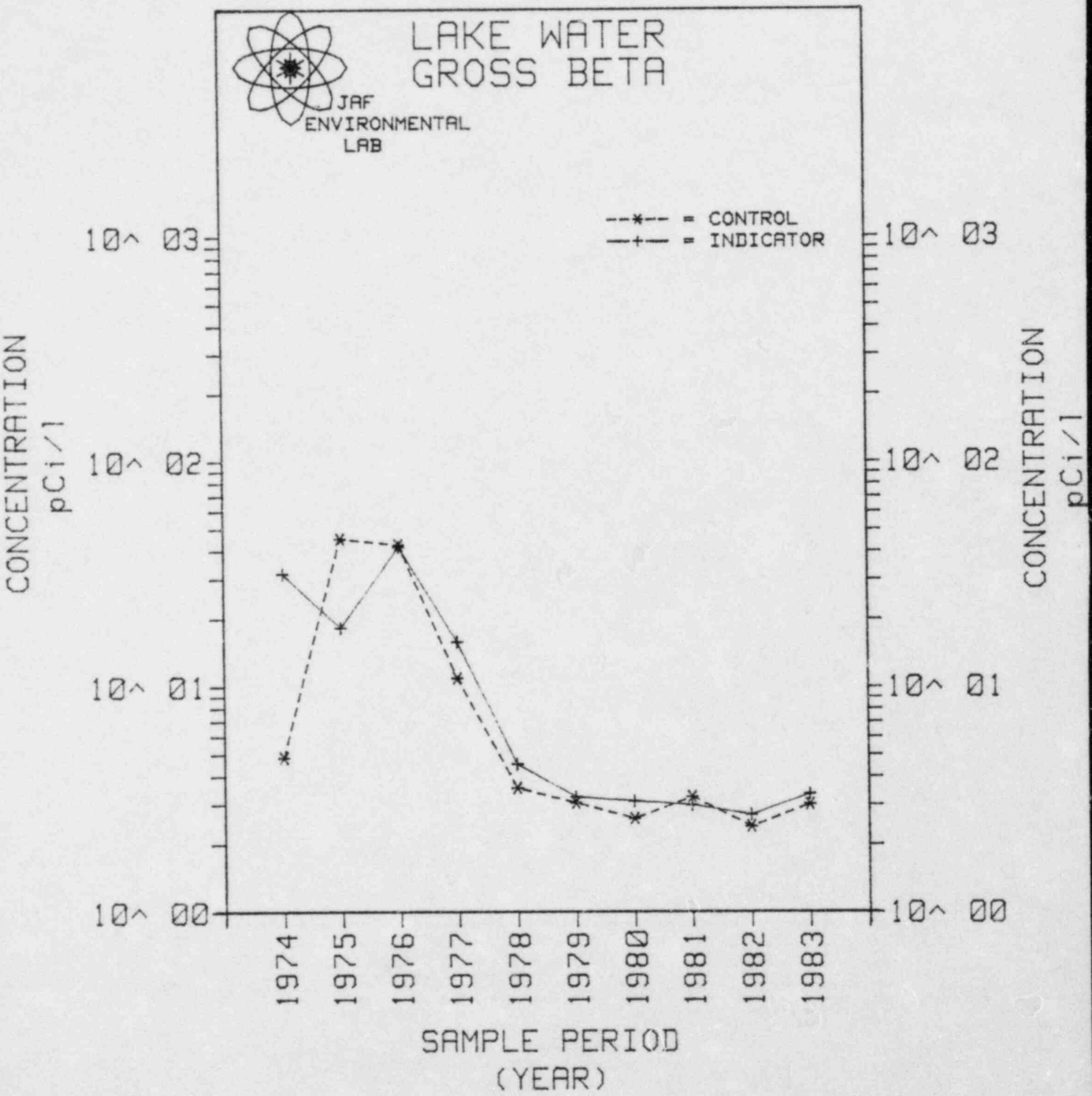
CONTROL DATA FOR 1975 IS MDL; 1981 IS LLD

FIGURE 17



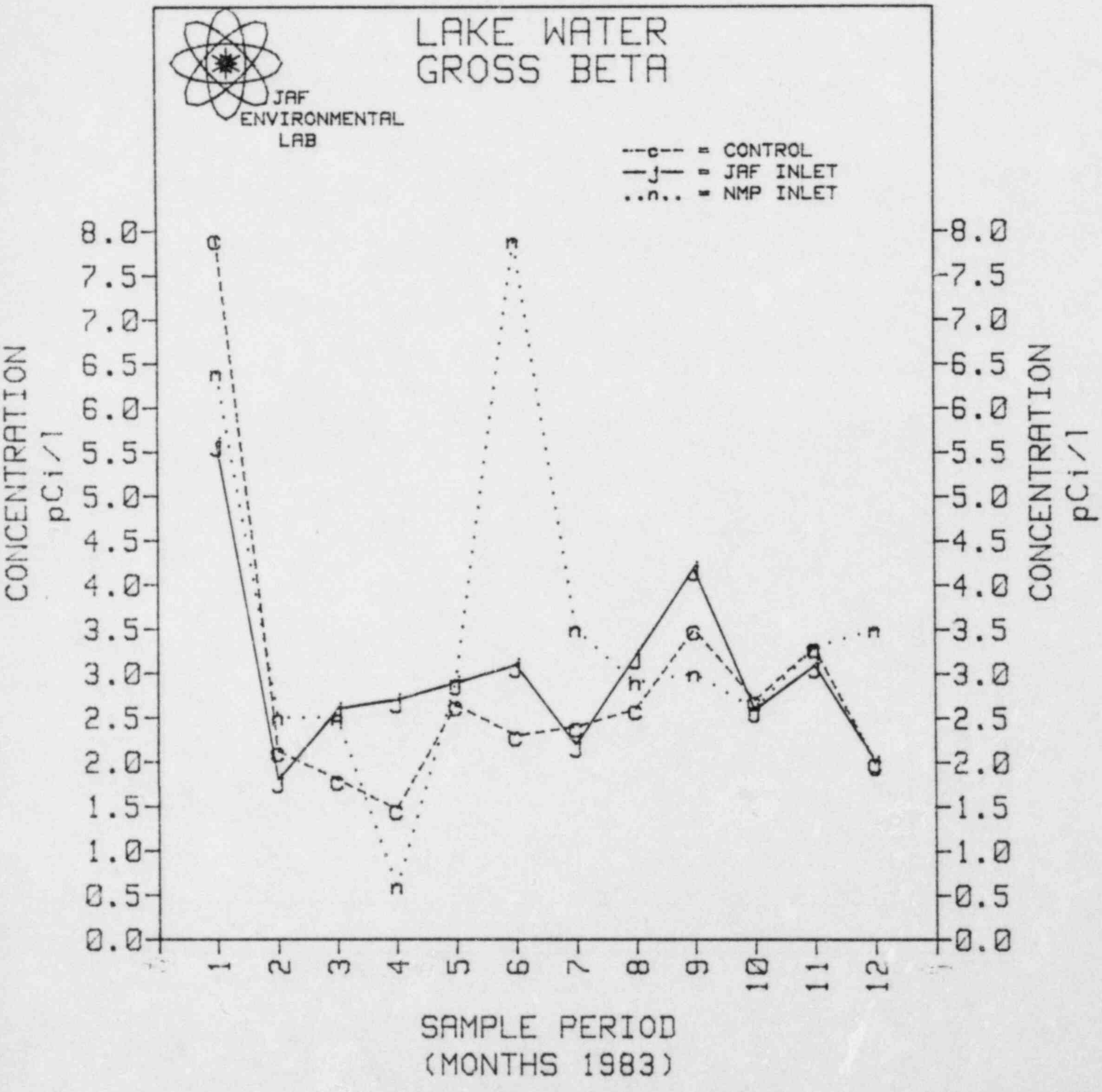
CONTROL DATA FOR 1981 & 1983 ARE LLD
INDICATOR DATA FOR 1983 IS LLD

FIGURE 18



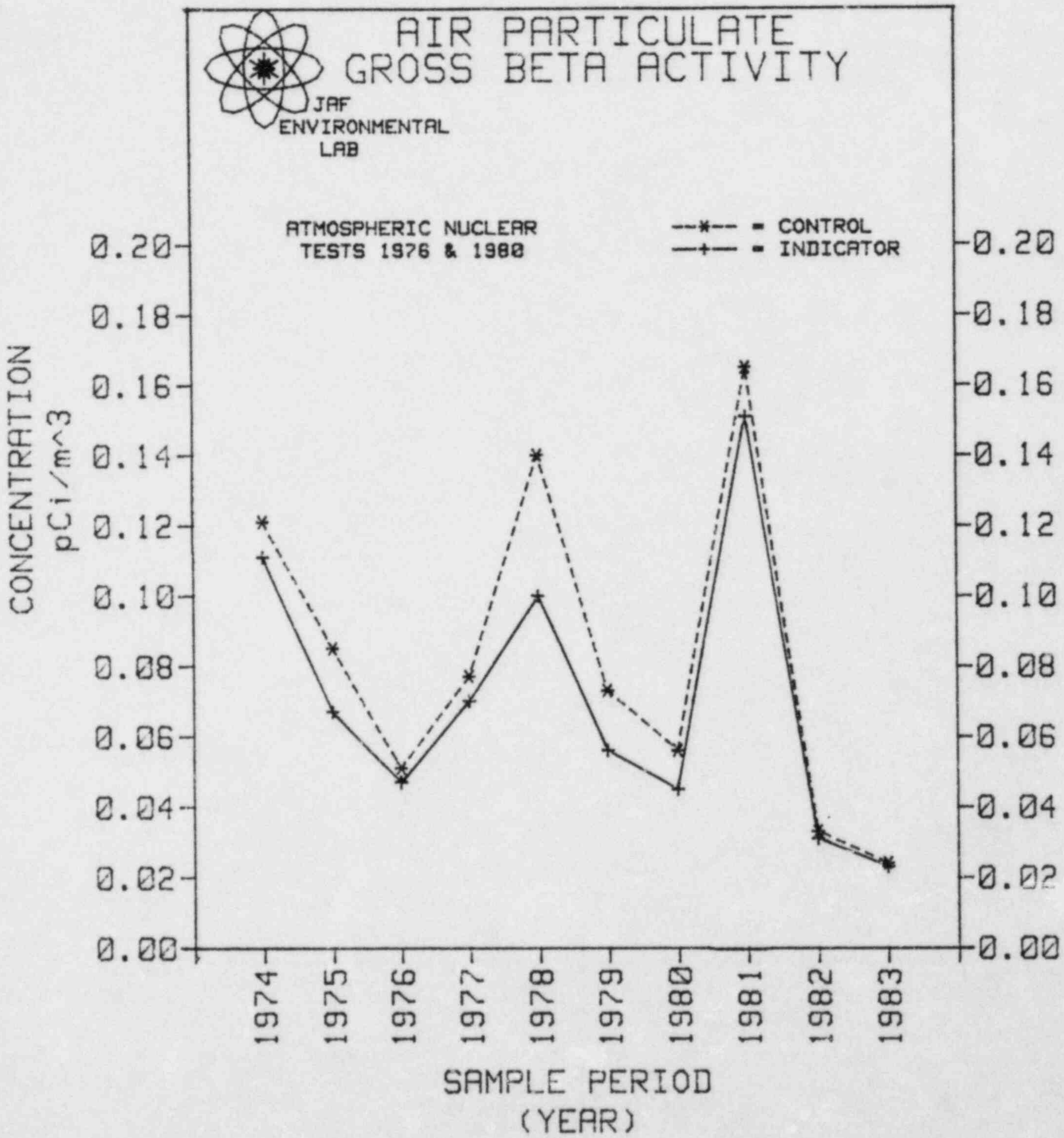
LAKE WATER
GROSS BETA
JAF
ENVIRONMENTAL
LAB
--*-- = CONTROL
—+— = INDICATOR
10^ 03
10^ 02
10^ 01
10^ 00
CONCENTRATION
pCi/l
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
SAMPLE PERIOD
(YEAR)

FIGURE 19



CONTROL VALUES c FOR MONTH 12 IS LLD
INDICATOR VALUES n FOR MONTH 10 IS LLD
INDICATOR VALUES j FOR MONTHS 10 & 12 ARE LLD

FIGURE 20



AIR PARTICULATE
GROSS BETA ACTIVITY
JAF
ENVIRONMENTAL
LAB
ATMOSPHERIC NUCLEAR
TESTS 1976 & 1980
--*-- = CONTROL
—+— = INDICATOR
CONCENTRATION
pCi/m^3
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
SAMPLE PERIOD
(YEAR)

FIGURE 21

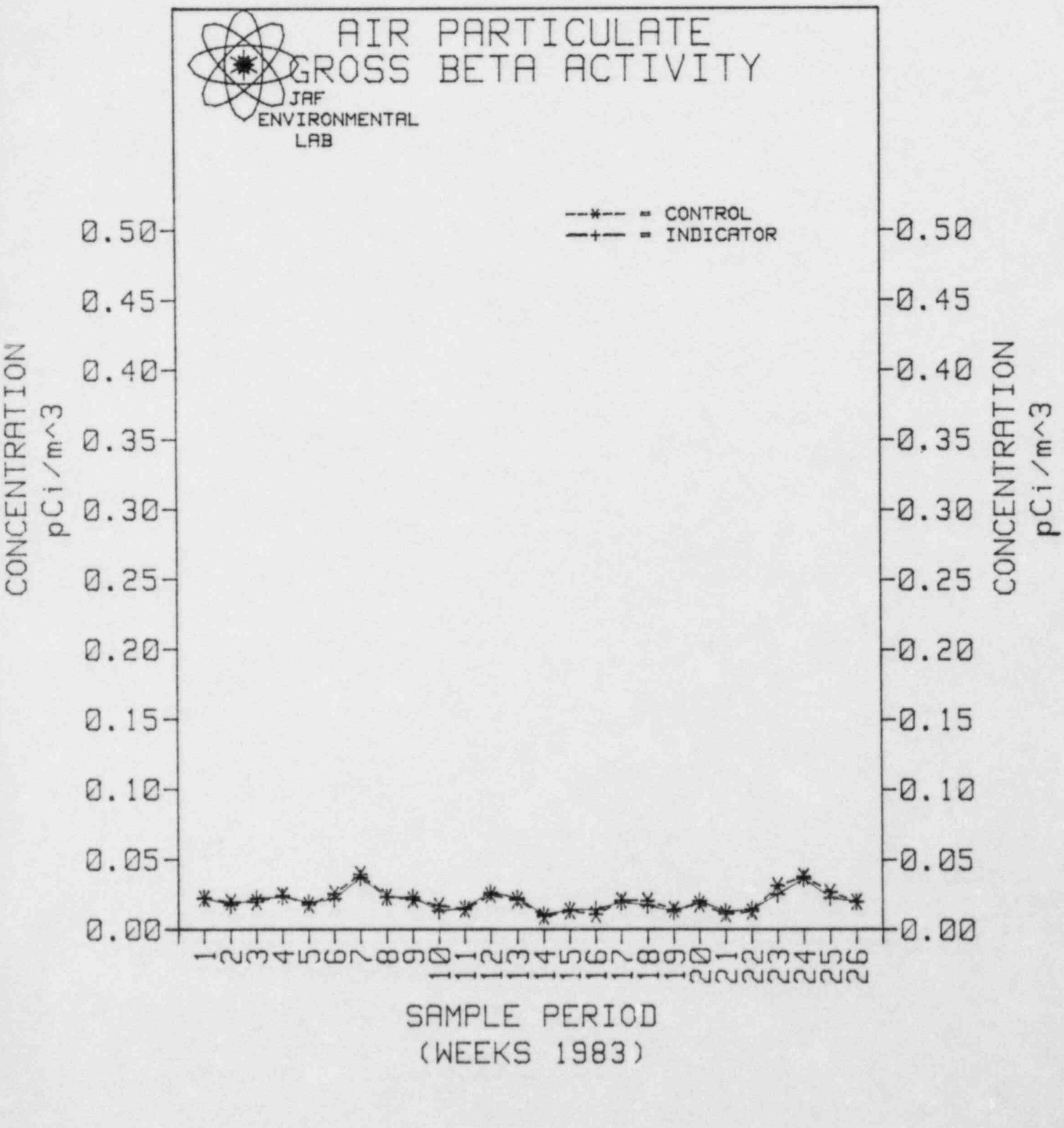

AIR PARTICULATE
GROSS BETA ACTIVITY
JAF
ENVIRONMENTAL
LAB
--*-- = CONTROL
—+— = INDICATOR
CONCENTRATION
pCi/m^3
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
SAMPLE PERIOD
(WEEKS 1983)

FIGURE 22

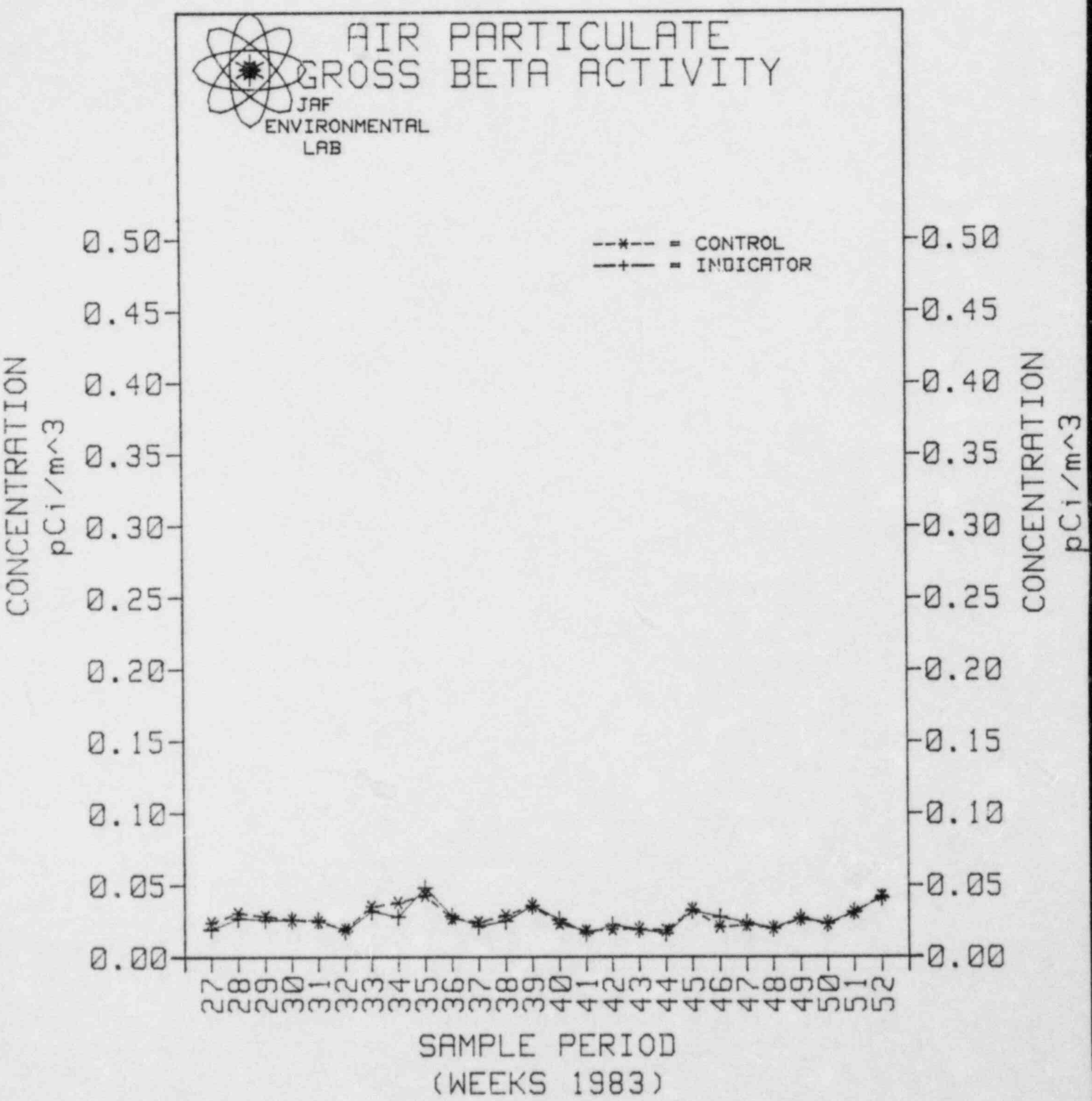
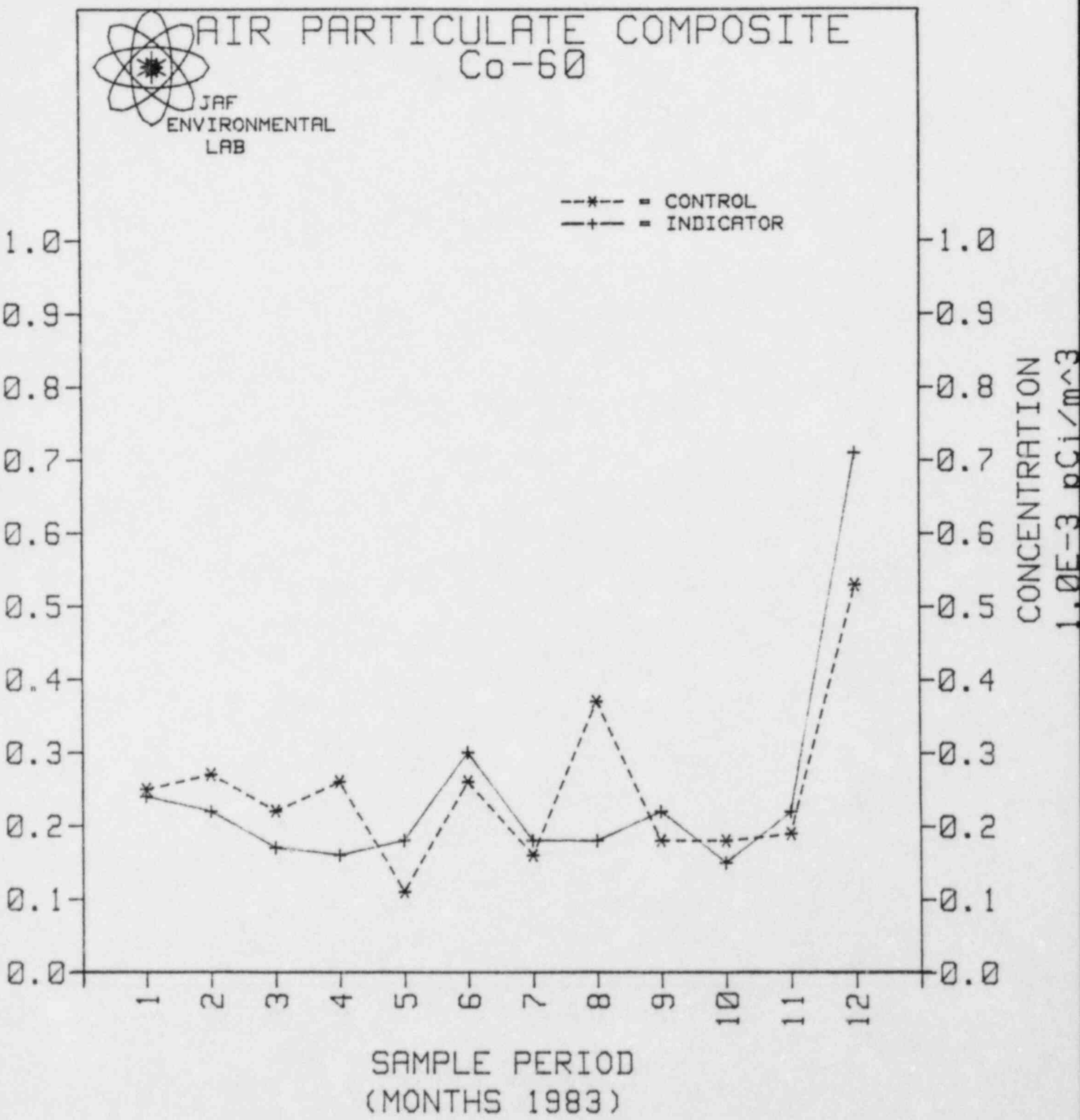
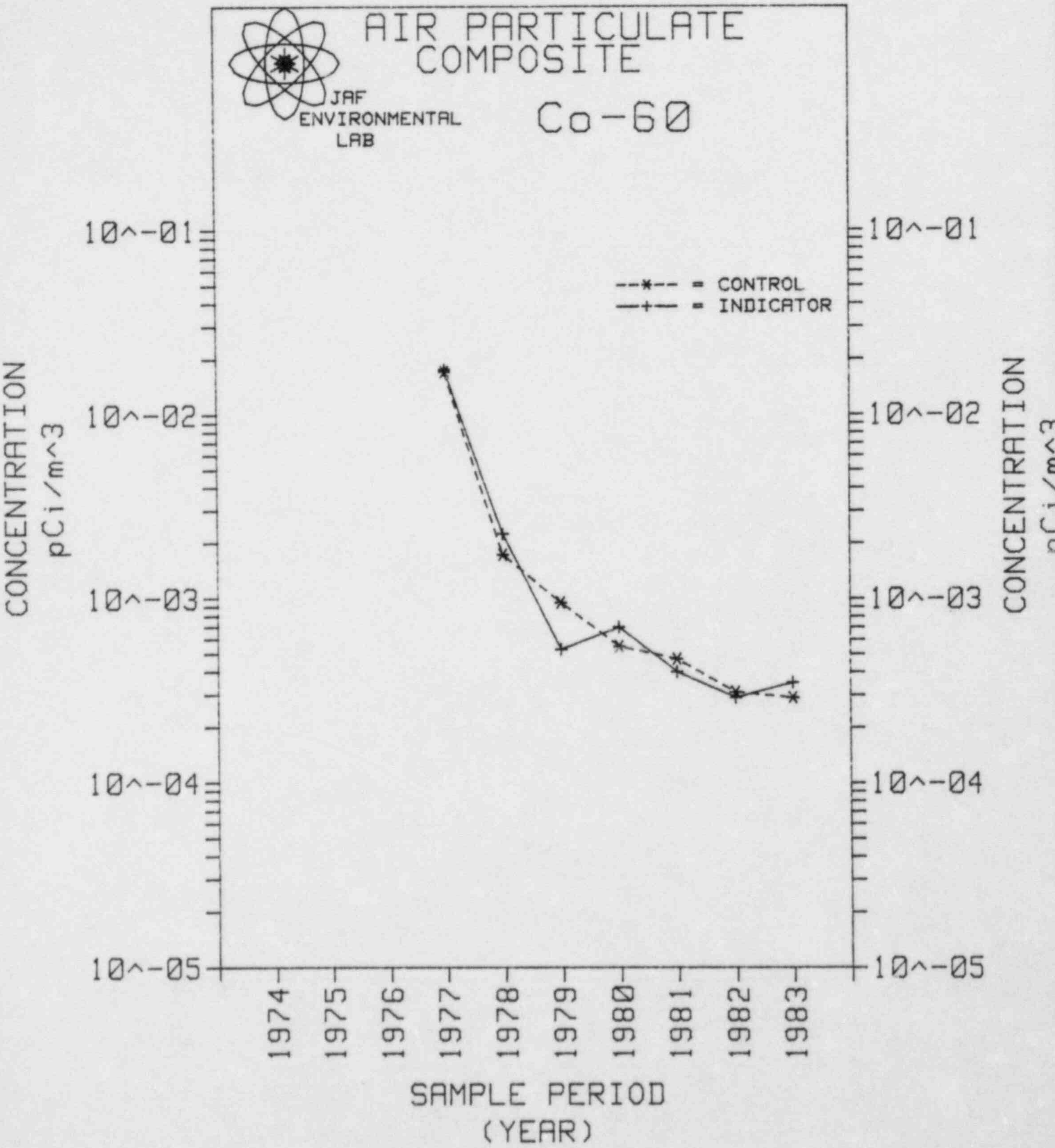

AIR PARTICULATE
GROSS BETA ACTIVITY
JAF
ENVIRONMENTAL
LAB
--*-- = CONTROL
—+— = INDICATOR
CONCENTRATION
pCi/m^3
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
SAMPLE PERIOD
(WEEKS 1983)

FIGURE 23



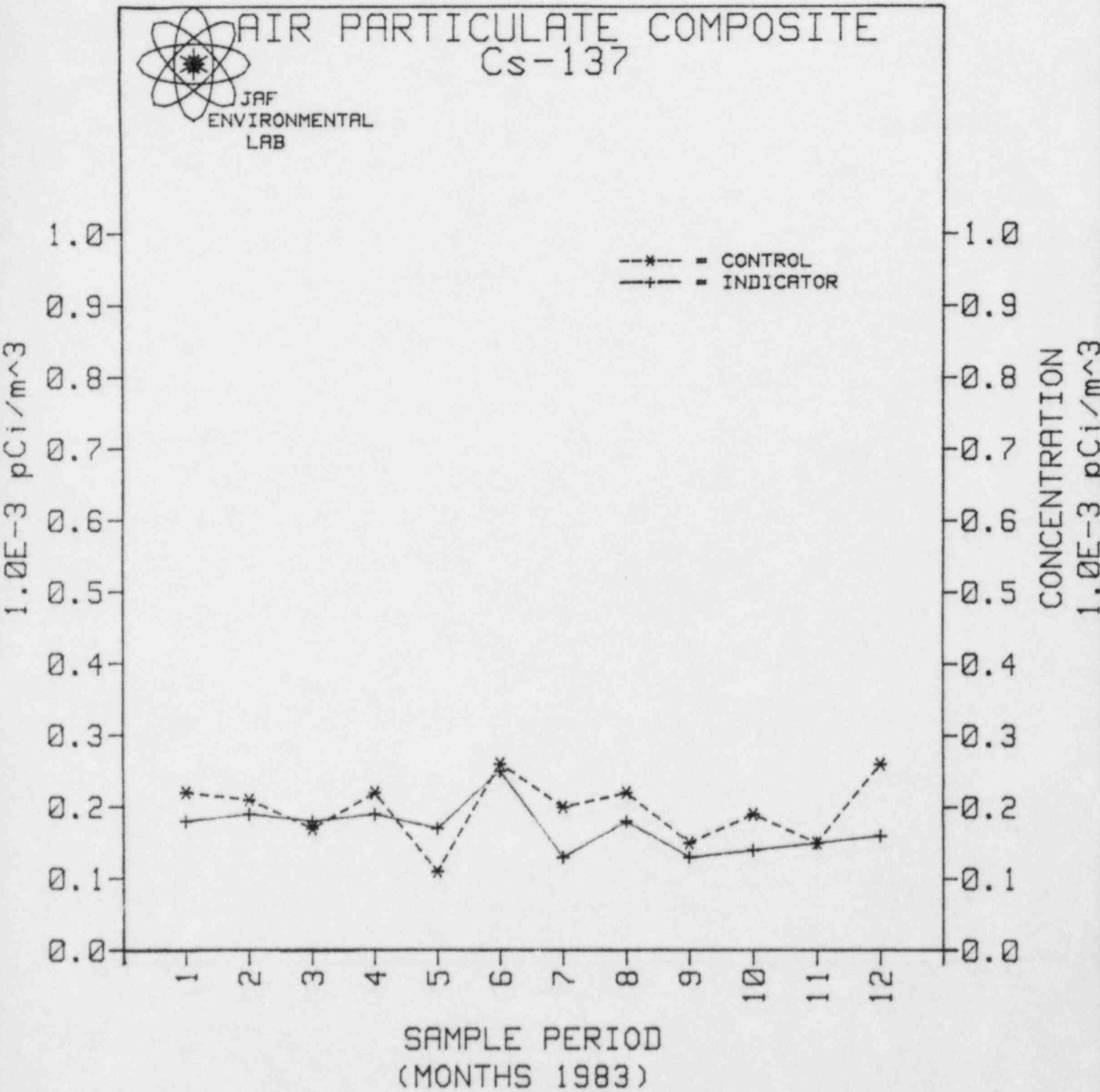
CONTROL MONTHS 1-4,6,8-11 ARE LLD's
INDICATOR MONTHS 1-4,7,8,10,11 ARE LLD's

FIGURE 24



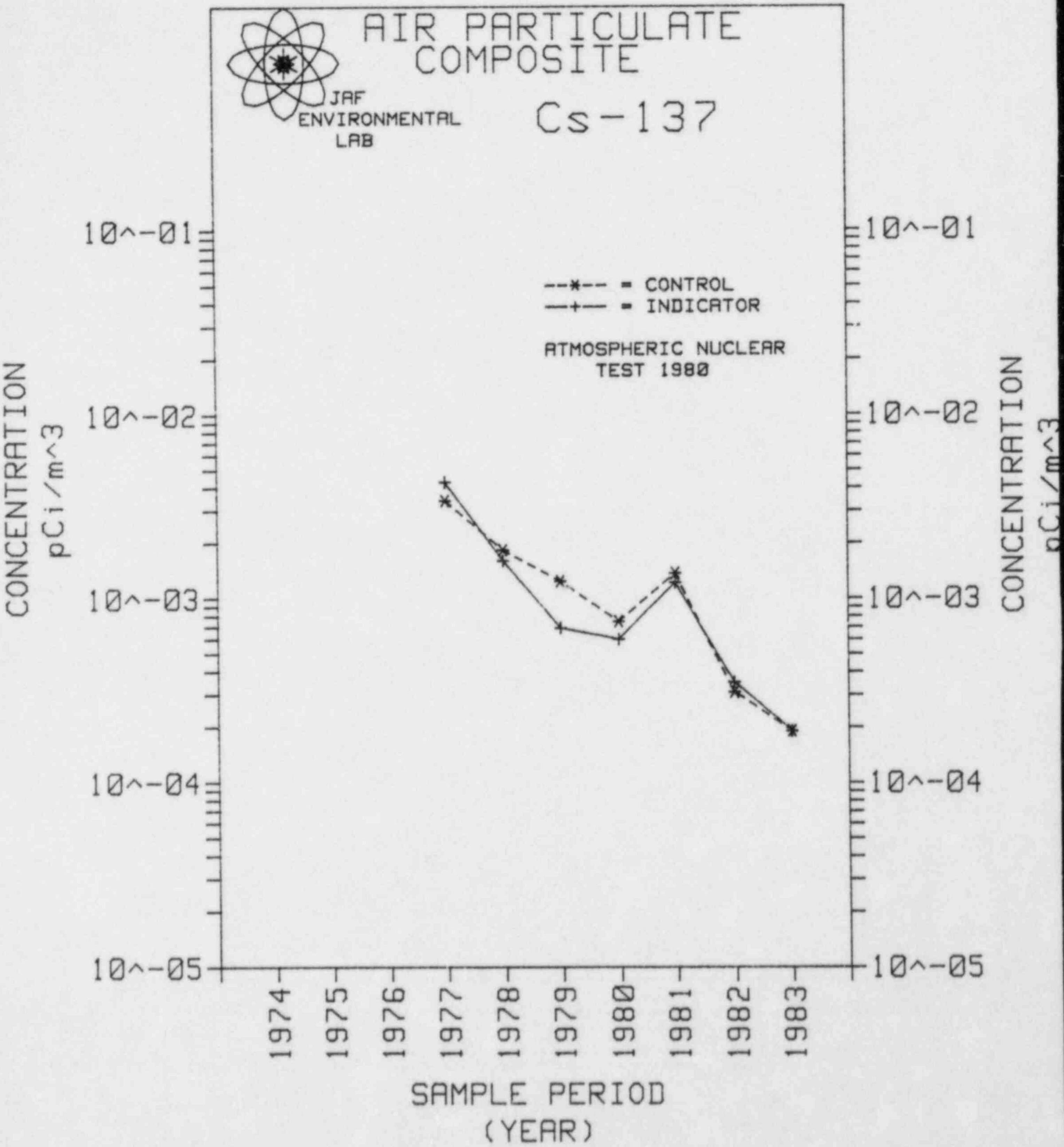
NO DATA FOR YEARS PRIOR TO 1977

FIGURE 25



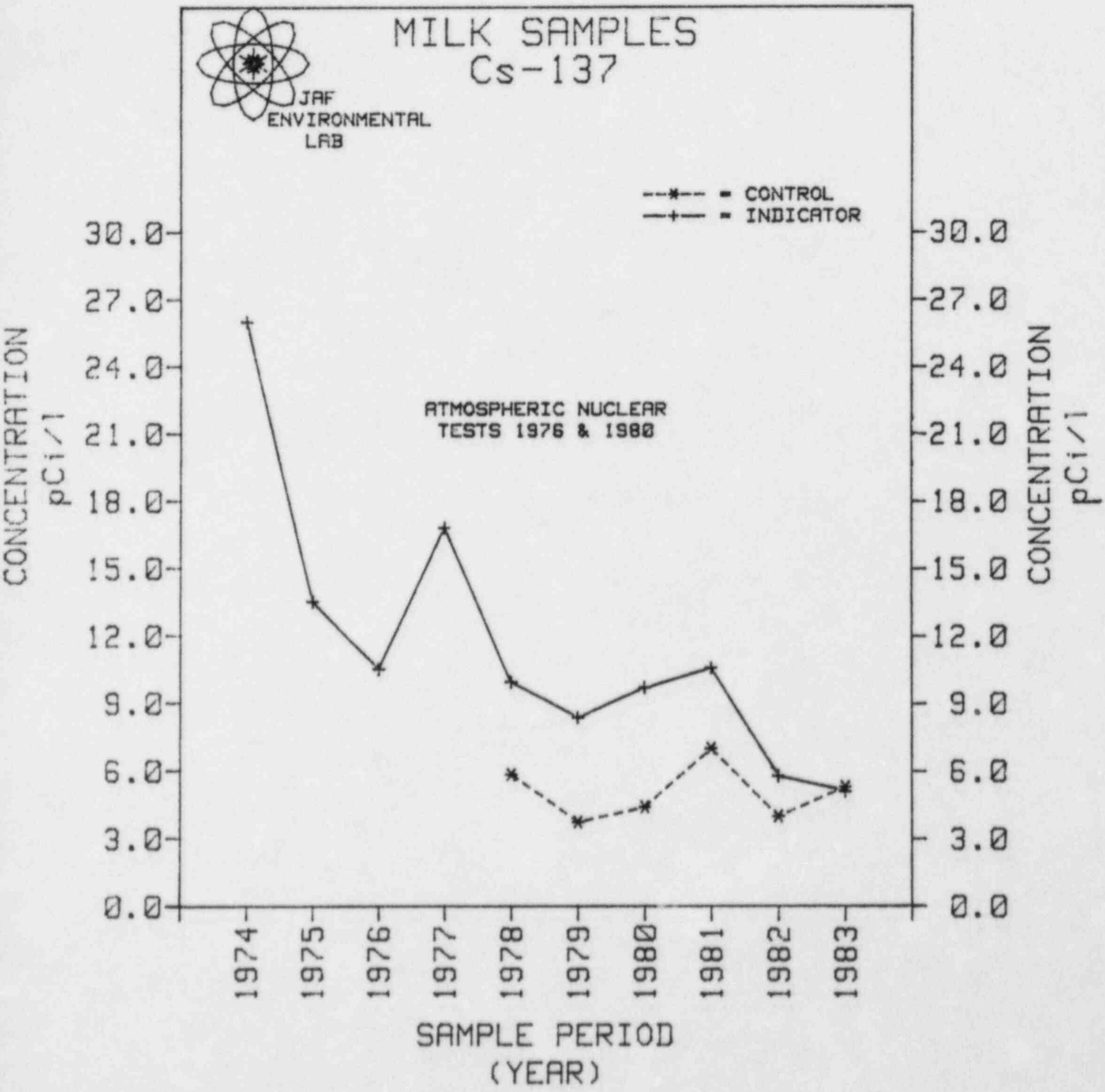
CONTROL MONTHS 1,4,7-12 ARE LLD's
INDICATOR MONTHS 1,5,9-12 ARE LLD's

FIGURE 26



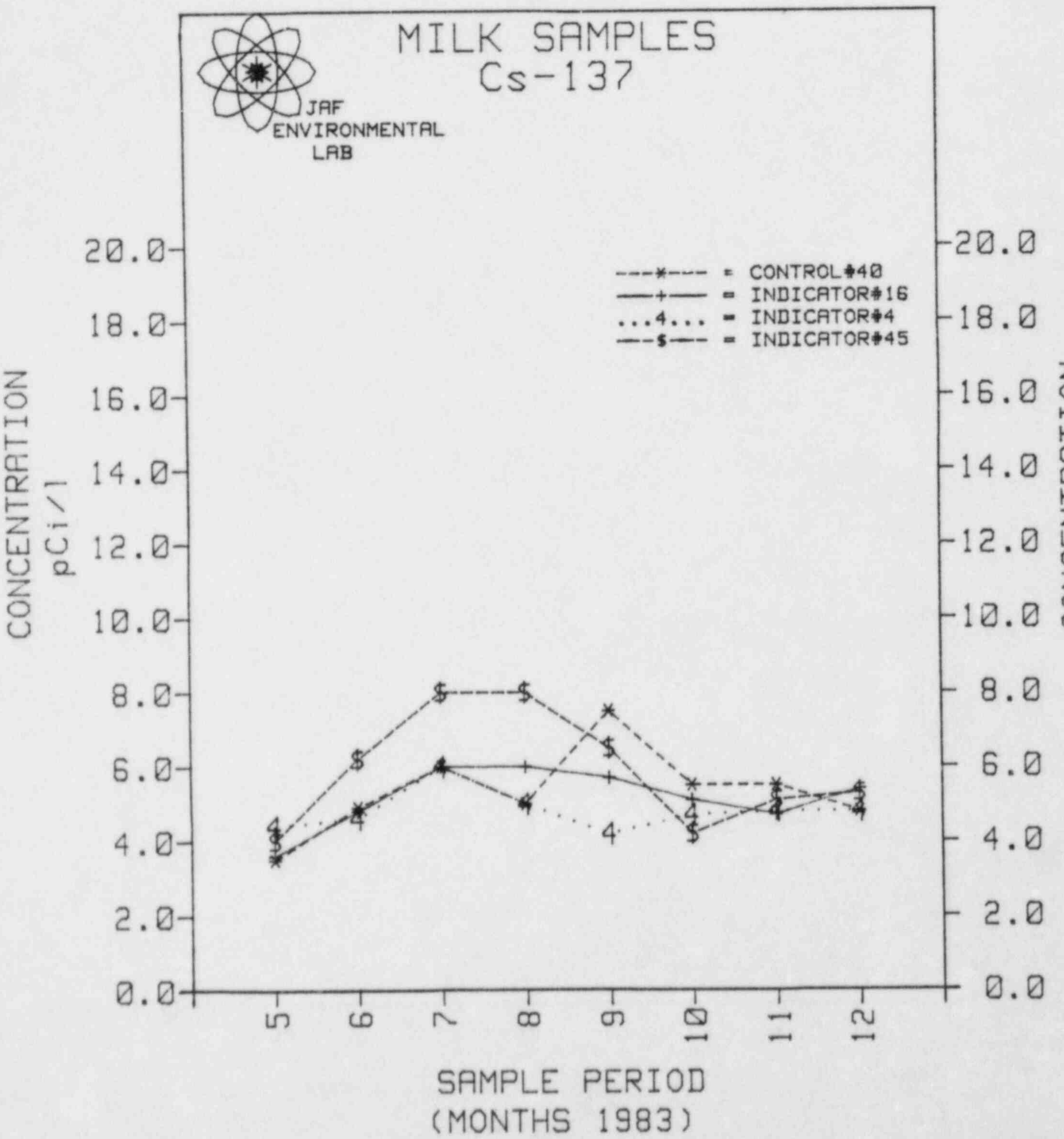
NO DATA FOR YEARS PRIOR TO 1977

FIGURE 27



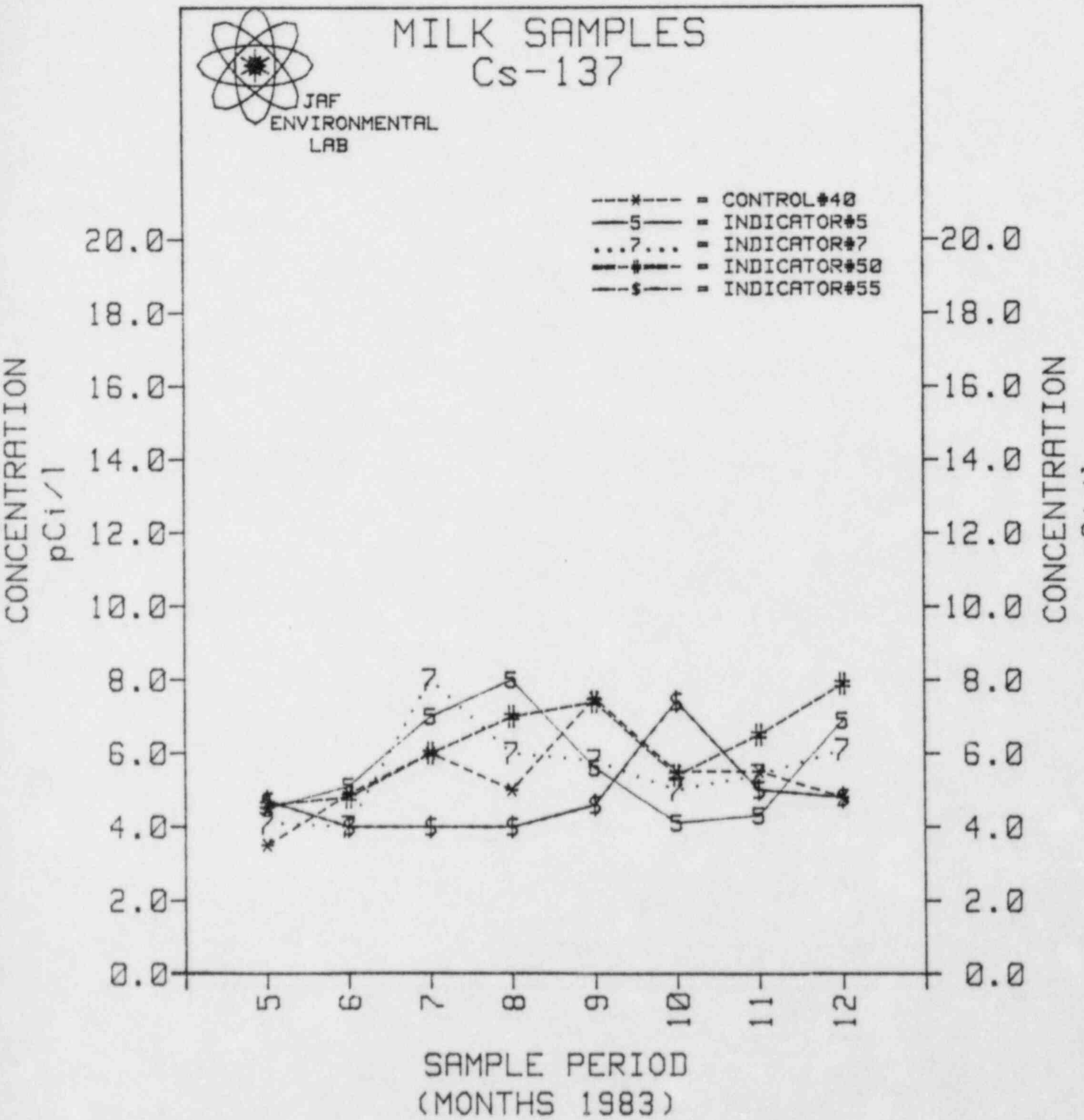
NO CONTROL DATA FOR YEARS 1974-1977
CONTROL DATA FOR YEARS 1980,1982-83 ARE LLD's

FIGURE 28



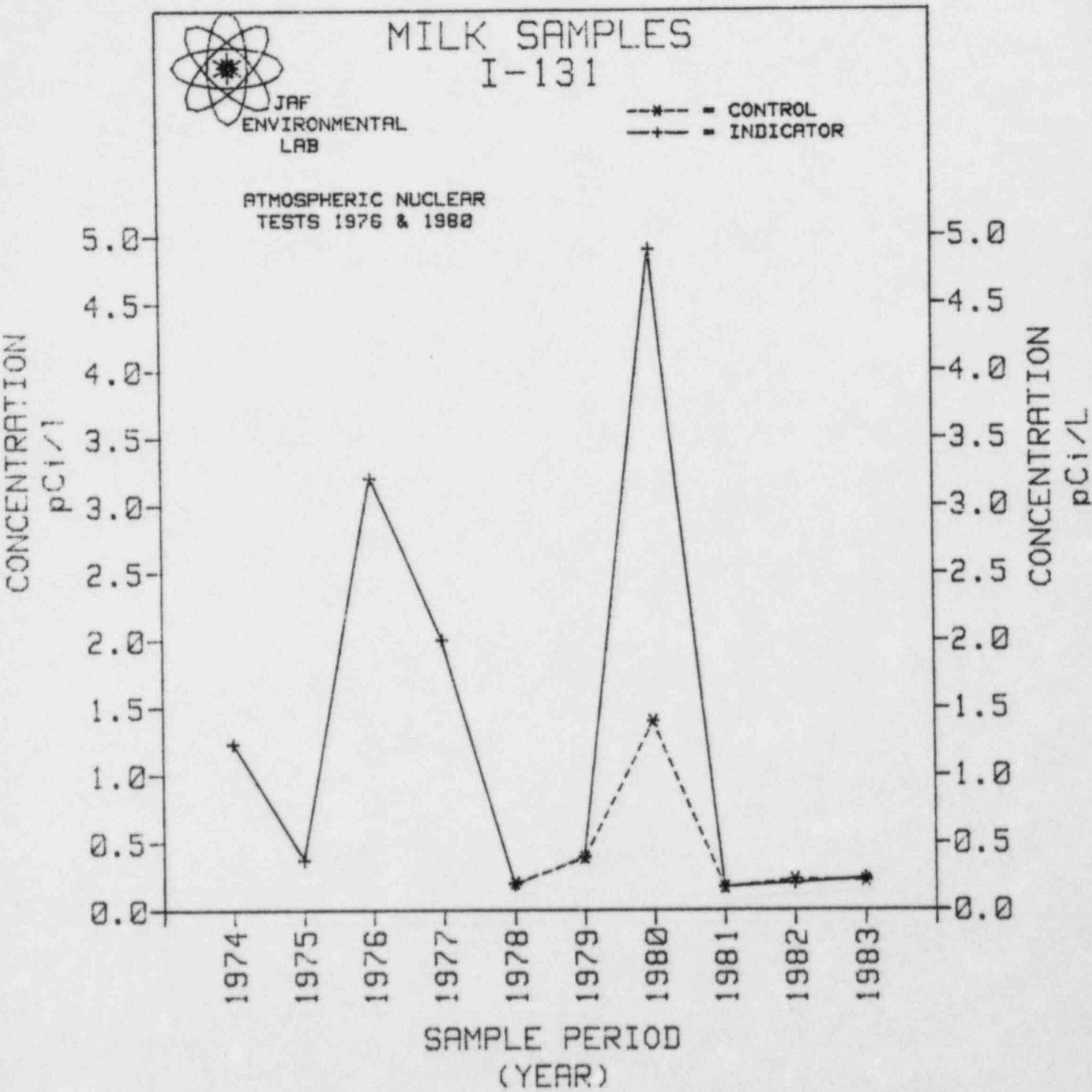
REFER TO TABLE #17 FOR EXACT DATA VALUES AND LLD OCCURRENCES

FIGURE 29



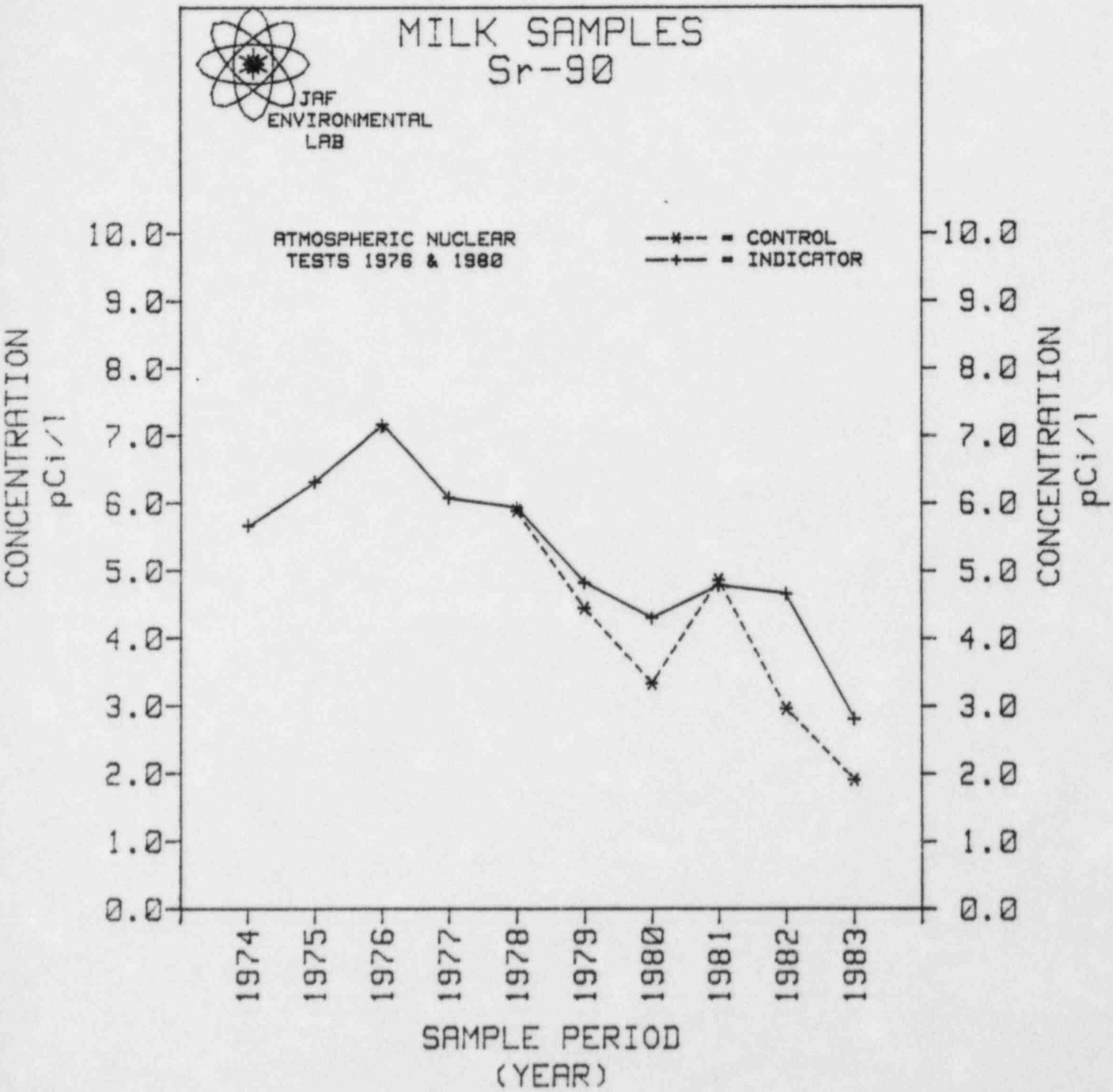
REFER TO TABLE #17 FOR EXACT DATA VALUES AND LLD OCCURRENCES

FIGURE 30



NO CONTROL DATA FOR 1974-1977
CONTROL DATA FOR 1978-79 ARE MDL's; 1981-83 ARE LLD's
INDICATOR DATA FOR 1979 IS MDL; 1981-83 ARE LLD's

FIGURE 31



NO CONTROL DATA FOR YEARS 1974-1977

James A. FitzPatrick
Nuclear Power Plant
P.O. Box 41
Lycoming, New York 13093
315 342 3840

New York Power Authority

Corbin McNeill
Resident Manager

March 28, 1984
JAFP-84-0338

United States Nuclear
Regulatory Commission
Region 1
631 Park Avenue
King Of Prussia, Pennsylvania 19406

Attention: Thomas E. Murley
Regional Administrator

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT FACILITY OPERATING LICENSE DPR-59, DOCKET #50-333

Gentlemen:

In accordance with the United States Nuclear Regulatory Commission Guide 10.1, we submit the 1983 Annual Environmental Operating Report, Part B: Radiological Report. Distribution for this report is in accordance with Regulatory Guide 10.1.

Very truly yours,

[signature]

CORBIN A. McNEILL, JR.

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