POWER AUTHORITY OF THE STATE OF NEW YORK

ANNUAL ENVIRONMENTAL OPERATING REPORT
PART B: RADIOLOGICAL REPORT

JANUARY 1, 1982 - DECEMBER 31, 1982

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

FACILITY OPERATING LICENSE DPR-59

DOCKET NUMBER 50-333

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INTRODUCTION

I-A INTRODUCTION

The Power Authority of the State of New York (PASNY) 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 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, 1982 to December 31, 1982.

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 1982 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 1982 milk samples were collected from six locations. Five of these locations are considered indicator samples and the sixth 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 five 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 24 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 1980. Soil samples were taken at each of the 15 air monitoring stations at this time. No soil samples were collected during 1982.

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 6). 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 1982 TLD program.

Each TLD set is made up of two $CaSO_4$ dosimeters (two chips per dosimeter), sealed in a polyethylene package to insure dosimeter integrity. The TLD packages are further protected by placement in Plexiglas "birdhouses", or by tape sealing to supporting surfaces. The dosimeters are collected, replaced and evaluated on a quarterly basis.

M. Special Samples

Additional samples were collected during the 1982 sample period to enlarge the data base for farm related sample media.

The following additional sample media was collected during 1982:

1) Pasture Grass - Pasture grass was collected three times during the 1982 grazing season. Samples were taken at each of the seven routine milk sample locations and were collected in conjunction with the monthly milk samples in July, August and September. Each sample was analyzed for gamma emitters using gamma spectral analysis.

2. ANALYSIS PERFORMED

The analysis of the environmental radiological samples are performed by the Radiation Management Corporation (RMC) 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 (pasture grass, 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 Radiation Management Corporation.

3. CHANGES TO THE 1982 SAMPLE PROGRAM

A. Milk sample location number 45 was added to the milk sampling program in July of 1982. The new sample location was added as a result of the 1982 spring milch animal census which identified this farm as being in a critical downwind sector. The new sampling station is located in a SE direction (125 degrees) at a distance of approximately 8.0 miles from the site. The addition of milk sample location number 45 brings the total number of milk sample stations to seven for the 1982 sampling program.

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 tablé 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	0.59	0.04	0.61	0.56	0.05
	K-40	2	NONE	1.8	0.85	2.4	1.2	1.2
	Mn-54	2	0.007 0.007	ALL LLD	-	-	-	-
	Co-60	2	0.007 0.008	ALL LLD	-	-	-	-
	Zr-95	2	0.01 0.02	ALL LLD	-	-	-	-
	Nb-95	2	0.01 0.02	ALL LLD	-	-	-	-
	Ru-106	2	0.05 0.06	ALL LLD	-	-	-	-
	Cs-137	2	NONE	0.05	0.01	0.06	0.04	0.02
	Ce-144	2	0.07 0.07	0.04	A	0.04	0.04	0.0
	Ra-226	2	NONE	0.96	0.03	0.08	0.04	0.04
	Th-232	2	NONE	0.06	0.04	0.08	0.03	0.05
	Cs-134	2	0.006 0.007	ALL LLD	-	-	-	-
	Ru-103	2	0.01 0.01	ALL LLD	-	-	-	-
	Co-58	2	0.008 0.009	ALL LLD	-	-	-	-
	Fe-59	2	0.02 0.03	ALL LLD	-	-	-	-
	Indicator							
	Be-7	4	NONE	0.71	0.33	1.2	0.53	0.67
	K-40	4	NONE	1.98	0.47	2.6	1.5	1.1
	Mn-54	4	0.006 0.01	0.02	A	0.02	0.02	0.0
	Co-60	4	NONE	0.03	0.02	0.06	0.02	0.04
	Zr-95	4	0.01 0.03	ALL LLD	-	-	-	-
	Nb-95	4	0.01 0.03	ALL LLD	-	-	-	-
	Ru-106	4	0.05 0.12	ALL LLD	-	-	-	-
	Cs-137	4	NONE	0.14	0.16	0.38	0.05	0.33
	Ce-144	4	0.05 0.07	0.05	A	0.05	0.05	0.0
	Ra-226	4	NONE	0.1	0.07	0.19	0.03	0.16
	Th-232	4	NONE	0.08	0.06	0.17	0.03	0.14
	Cs-134	4	0.006 0.01	0.03	A	0.03	0.03	0.0
	Ru-103	4	0.009 0.02	ALL LLD	-	-	-	-
	Co-58	4	0.007 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	0.02 0.02	ALL LLD	-	-	-	-
	Zn-65	2	0.03 0.04	ALL LLD	-	-	-	-
	K-40	2	0.03 0.03	0.2	A	0.2	0.2	0.0
	Mn-54	2	0.02 0.02	ALL LLD	-	-	-	-
	Co-60	2	0.02 0.03	ALL LLD	-	-	-	-
	Ra-226	2	0.02 0.04	ALL LLD	-	-	-	-
	Co-58	2	0.02 0.02	ALL LLD	-	-	-	-
	Cs-137	2	0.02 0.02	ALL LLD	-	-	-	-
	Cs-134	2	0.01 0.02	ALL LLD	-	-	-	-
	Fe-59	2	0.02 0.04	ALL LLD	-	-	-	-
	Indicator							
	Nb-95	4	0.03 0.09	ALL LLD	-	-	-	-
	Zn-65	4	0.04 0.07	ALL LLD	-	-	-	-
	K-40	4	0.4 0.4	0.4	A	0.4	0.4	0.0
	Mn-54	4	NONE	0.24	0.7	0.31	0.15	0.16
	Co-60	4	NONE	0.06	0.1	0.07	0.04	0.03
	Ra-226	4	0.06 0.06	0.13	0.03	0.16	0.11	0.05
	Co-58	4	0.02 0.04	ALL LLD	-	-	-	-
	Cs-137	4	0.02 0.02	ALL LLD	-	-	-	-
	Cs-134	4	0.02 0.03	ALL LLD	-	-	-	-
	Fe-59	4	0.04 0.1	ALL LLD	-	-	-	-
Lake Mollusk pCi/g (wet)	Sr-89, Sr-90							
	Control							
	Sr-89	2	0.02 0.02	ALL LLD	-	-	-	-
	Sr-90	2	NONE	0.03	0.01	0.04	0.02	0.02
	Indicator							
	Sr-89	4	0.02 0.03	ALL LLD	-	-	-	-
	Sr-90	4	NONE	0.1	0.02	0.12	0.07	0.05

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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	0.50 0.90	ALL LLD	-	-	-	-
	K-40	2	NONE	10.2	1.2	11.0	9.3	1.7
	Co-60	2	0.06 0.10	ALL LLD	-	-	-	-
	Nb-95	2	0.008 0.200	ALL LLD	-	-	-	-
	Cs-137	2	NONE	0.52	0.33	0.75	0.29	0.46
	Cs-134	2	0.040 0.070	ALL LLD	-	-	-	-
	Ra-226	2	NONE	0.36	0.07	0.41	0.31	0.10
	Mn-54	2	0.046 0.066	ALL LLD	-	-	-	-
	Sr-90	2	0.008 0.040	ALL LLD	-	-	-	-
	Indicator							
	Be-7	4	0.33 0.60	ALL LLD	-	-	-	-
	K-40	4	2.0	13.9	4.8	18.0	8.6	9.4
	Co-60	4	0.03	0.113	0.09	0.19	0.009	0.181
	Nb-95	4	0.050 0.100	ALL LLD	-	-	-	-
	Cs-137	4	NONE	0.203	0.11	0.30	0.05	0.25
	Cs-134	4	0.04	ALL LLD	-	-	-	-
	Ra-226	4	NONE	0.180	0.06	0.26	0.13	0.13
	Mn-54	4	0.037 0.045	ALL LLD	-	-	-	-
	Sr-90	4	0.008 0.040	0.037	0.03	0.06	0.013	0.047

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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	1	0.3	ALL LLD	-	-	-	-
	Mn-54	1	0.1	ALL LLD	-	-	-	-
	Cs-137	1	0.1	ALL LLD	-	-	-	-
	Cs-134	1	0.1	ALL LLD	-	-	-	-
	Zn-65	1	0.2	ALL LLD	-	-	-	-
	Sr-89	1	0.02	ALL LLD	-	-	-	-
	Sr-90	1	NONE	0.09	A	0.09	0.09	0.0
	Co-58	1	0.1	ALL LLD	-	-	-	-
	Fe-59	1	0.3	ALL LLD	-	-	-	-
	Indicator							
	Co-60	2	0.2 1.1	ALL LLD	-	-	-	-
	Mn-54	2	0.08 0.8	ALL LLD	-	-	-	-
	Cs-137	2	0.2 0.7	ALL LLD	-	-	-	-
	Cs-134	2	0.2 0.7	ALL LLD	-	-	-	-
	Zn-65	2	0.4 2.3	ALL LLD	-	-	-	-
	Sr-89	2	0.03 0.2	ALL LLD	-	-	-	-
	Sr-90	2	NONE	0.23	0.10	0.30	0.16	0.14
	Co-58	2	0.2 0.9	ALL LLD	-	-	-	-
	Fe-59	2	0.5 1.8	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	7	NONE	2.83	0.26	3.1	2.5	0.6
	Mn-54	7	0.007 0.02	ALL LLD	-	-	-	-
	Cs-137	7	NONE	0.047	0.01	0.055	0.027	0.028
	Cs-134	7	0.006 0.01	ALL LLD	-	-	-	-
	Co-58	7	0.01 0.03	ALL LLD	-	-	-	-
	Sr-89	7	0.004 0.01	0.004	0.001	0.005	0.003	0.002
	Sr-90	7	0.001 0.003	0.006	0.006	0.013	0.002	0.011
	Co-60	7	0.008 0.02	ALL LLD	-	-	-	-
	Fe-59	7	0.03 0.1	ALL LLD	-	-	-	-
	Zn-65	7	0.02 0.05	ALL LLD	-	-	-	-
	Indicator							
	K-40	14	NONE	3.06	0.60	4.5	2.1	2.4
	Mn-54	14	0.006 0.02	ALL LLD	-	-	-	-
	Cs-137	14	NONE	0.05	0.01	0.064	0.034	0.03
	Cs-134	14	0.005 0.02	ALL LLD	-	-	-	-
	Co-58	14	0.008 0.03	ALL LLD	-	-	-	-
	Sr-89	14	0.002 0.01	0.004	0.001	0.004	0.003	0.001
	Sr-90	14	0.001 0.006	0.003	0.001	0.005	0.002	0.003
	Co-60	14	0.007 0.02	ALL LLD	-	-	-	-
	Fe-59	14	0.02 0.1	ALL LLD	-	-	-	-
	Zn-65	14	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 Water Analysis pCi/l	Gross Beta							
	Control	12	NONE	2.4	0.43	3.2	1.8	1.4
	Indicator	24	NONE	2.7	0.73	4.7	1.3	3.4
Lake Water Analysis pCi/l	Tritium							
	Control	4	NONE	165	94.7	307	112	195
	Indicator	8	NONE	641	891.1	2,780	194	2,586
Lake Water Analysis pCi/l	Sr-89							
	Control	4	0.43 2.23	ALL LLD	-	-	-	-
	Indicator	[illegible]	0.40 1.36	0.606	A	0.606	0.606	0.0
Lake Water Analysis pCi/l	Sr-90							
	Control	4	NONE	2.04	2.18	5.30	0.75	4.55
	Indicator	8	NONE	1.08	0.88	3.07	0.40	2.67

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	4.83 7.18	ALL LLD	-	-	-	-
	Cs-134	12	0.92 1.47	ALL LLD	-	-	-	-
	Cs-137	12	0.98 1.62	ALL LLD	-	-	-	-
	Zr-95	12	2.85 5.67	ALL LLD	-	-	-	-
	Nb-95	12	1.40 3.59	ALL LLD	-	-	-	-
	Co-58	12	1.10 2.33	ALL LLD	-	-	-	-
	Mn-54	12	1.07 1.81	ALL LLD	-	-	-	-
	Fe-59	12	1.38 3.46	ALL LLD	-	-	-	-
	Co-60	12	1.15 2.33	ALL LLD	-	-	-	-
	Indicator							
	Ce-144	23	4.62 6.91	ALL LLD	-	-	-	-
	Cs-134	24	0.72 1.55	0.72	A	0.72	0.72	0.0
	Cs-137	24	0.94 1.79	2.47	1.78	3.72	0.43	3.29
	Zr-95	24	2.13 5.17	ALL LLD	-	-	-	-
	Nb-95	24	1.45 3.83	ALL LLD	-	-	-	-
	Co-58	24	0.99 2.51	ALL LLD	-	-	-	-
	Mn-54	24	0.74 1.94	ALL LLD	-	-	-	-
	Fe-59	24	0.96 3.66	ALL LLD	-	-	-	-
	Co-60	24	1.11 3.53	2.77	1.57	2.91	1.58	1.33
Airborne Particulate Analysis pCi/m^3	Gross Beta Activity							
	Control	317	NONE	0.033	0.012	0.078	0.011	0.067
	Indicator	476	NONE	0.031	0.012	0.113	0.001	0.112

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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/m^3 x 10^{-3}	Gamma Isotopic								
	Control								
	Co-60	12	0.24	0.43	0.31	0.26	0.49	0.12	0.37
	Mn-54	12	0.13	0.35	ALL LLD	-	-	-	-
	Co-58	12	0.12	0.56	ALL LLD	-	-	-	-
	Nb-95	12	0.20	1.24	0.46	0.13	0.61	0.36	0.25
	Zr-95	12	0.34	1.45	ALL LLD	-	-	-	-
	Cs-137	12	0.20	0.29	0.31	0.09	0.45	0.17	0.28
	Cs-134	12	0.12	0.29	ALL LLD	-	-	-	-
	Ce-141	12	0.23	1.17	ALL LLD	-	-	-	-
	Ce-144	12	0.68	1.03	1.47	0.65	2.43	0.86	1.57
	Ru-103	12	0.16	0.36	ALL LLD	-	-	-	-
	Be-7	12	NONE		107.6	22.8	140.0	74.6	65.4
	Indicator								
	Co-60	12	0.14	0.35	0.29	0.16	0.58	0.14	0.44
	Mn-54	12	0.10	0.24	0.1	A	0.1	0.1	0.0
	Co-58	12	0.11	0.28	ALL LLD	-	-	-	-
	Nb-95	12	0.12	0.43	0.59	0.06	0.65	0.54	0.11
	Zr-95	12	0.23	0.63	ALL LLD	-	-	-	-
	Cs-137	12	0.20	0.60	0.35	0.13	0.60	0.16	0.44
	Cs-134	12	0.10	0.19	ALL LLD	-	-	-	-
	Ce-141	12	0.20	0.44	ALL LLD	-	-	-	-
	Ce-144	12	0.51	0.96	1.32	0.54	2.30	0.68	1.62
	Ru-103	12	0.13	0.30	ALL LLD	-	-	-	-
	Be-7	12	NONE		102.2	31.2	180.0	60.3	119.7
Airborne Iodine Analysis pCi/m^3	Gamma Analysis I-131								
	Control	317	0.033	0.080	0.039	A	0.039	0.039	0.0
	Indicator	476	0.007	0.069	0.016	0.011	0.042	0.002	0.040

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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	22	NONE	4.24	0.40	5.53	3.79	1.74
	Second Quarter	21	NONE	5.42	0.44	6.24	4.50	1.74
	Third Quarter	22	NONE	5.55	0.53	6.95	4.20	2.75
	Fourth Quarter	23	NONE	5.29	0.47	6.51	4.44	2.07
	Year	88	NONE	5.12	0.69	6.95	3.79	3.16
	Onsite Monitor TLD's (Excluding D-1 Onsite)							
	First Quarter	8	NONE	4.53	0.41	5.08	3.87	1.21
	Second Quarter	8	NONE	6.35	1.22	9.13	5.37	3.76
	Third Quarter	8	NONE	6.55	1.04	8.70	5.68	3.02
	Fourth Quarter	8	NONE	5.86	1.13	8.50	4.67	3.83
	Year	32	NONE	5.82	1.24	9.13	3.87	5.26
Continuous Radiation Monitors mR/hr (Average Monthly Value)	Exposure Rate Location							
	Offsite							
	C	13	NONE	0.016	0.003	0.020	0.012	0.008
	Onsite							
	D-1	13	NONE	0.021	0.004	0.025	0.011	0.014
	D-2	13	NONE	0.016	0.003	0.025	0.013	0.012
	E	13	NONE	0.017	0.003	0.022	0.013	0.009
	F	13	NONE	0.015	0.003	0.018	0.011	0.007
	G	13	NONE	0.020	0.004	0.025	0.014	0.011
	H	13	NONE	0.026	0.004	0.033	0.020	0.013
	I	13	NONE	0.025	0.006	0.033	0.011	0.022
	J	13	NONE	0.018	0.006	0.028	0.013	0.015
	K	13	NONE	0.015	0.003	0.019	0.012	0.007

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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	0.09 0.28	ALL LLD	-	-	-	-
	No. 7	8	0.09 0.29	ALL LLD	-	-	-	-
	No. 12	8	0.12 0.30	ALL LLD	-	-	-	-
	No. 14	8	0.09 0.29	ALL LLD	-	-	-	-
	No. 16	8	0.14 0.34	ALL LLD	-	-	-	-
	No. 45	6	0.11 0.29	ALL LLD	-	-	-	-
	No. 40 (Control)	8	0.13 0.38	ALL LLD	-	-	-	-
Milk Analysis pCi/l	Gamma Isotopic Sr-90							
	Location							
	No. 4							
	K-40	8	NONE	1450	192.7	1700	1100	600
	Cs-137	8	3.5 5.3	5.9	A	5.9	5.9	0.0
	Cs-134	8	2.9 3.8	ALL LLD	-	-	-	-
	La-140	8	4.7 23.	ALL LLD	-	-	-	-
	Ba-140	8	31. 110.	ALL LLD	-	-	-	-
	Sr-90	8	2.73 4.78	3.67	0.96	5.53	2.91	2.62
	No. 7							
	K-40	8	NONE	1388	99.1	1500	1300	200
	Cs-137	8	3.3 5.1	3.3	A	3.3	3.3	0.0
	Cs-134	8	0.34 3.3	ALL LLD	-	-	-	-
	La-140	8	3.3 21.	ALL LLD	-	-	-	-
	Ba-140	8	27. 110.	ALL LLD	-	-	-	-
	Sr-90	8	NONE	5.04	2.86	9.76	2.01	7.75

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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. 12							
	K-40	8	NONE	1425	128.2	1600	1300	300
	Cs-137	8	4.0 5.9	9.9	7.5	18.0	3.4	14.6
	Cs-134	8	2.8 4.2	ALL LLD	-	-	-	-
	La-140	8	4.7 31.0	ALL LLD	-	-	-	-
	Ba-140	8	35.0 120.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	4.60	1.51	6.68	2.66	4.02
	No. 14							
	K-40	8	NONE	1400	141.4	1600	1200	400
	Cs-137	8	3.1 4.7	4.6	A	4.6	4.6	0.0
	Cs-134	8	2.3 3.8	ALL LLD	-	-	-	-
	La-140	8	4.3 14.0	ALL LLD	-	-	-	-
	Ba-140	8	29.0 110.0	ALL LLD	-	-	-	-
	Sr-90	8	1.49	5.05	2.54	9.24	2.20	7.04
	No. 16							
	K-40	8	NONE	1463	150.6	1600	1200	400
	Cs-137	8	3.8 5.8	4.2	0.96	4.9	3.1	1.8
	Cs-134	8	2.6 4.0	ALL LLD	-	-	-	-
	La-140	8	4.0 35.0	ALL LLD	-	-	-	-
	Ba-140	8	34.0 140.0	ALL LLD	-	-	-	-
	Sr-90	8	NONE	4.03	2.41	8.59	0.76	7.83

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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	6	NONE	1417	172.2	1600	1100	500
	Cs-137	6	3.6 6.1	6.9	A	6.9	6.9	0.0
	Cs-134	6	2.5 4.3	ALL LLD	-	-	-	-
	La-140	6	4.0 35.0	ALL LLD	-	-	-	-
	Ba-140	6	32.0 140.0	ALL LLD	-	-	-	-
	Sr-90	6	NONE	5.57	1.30	7.47	4.35	3.12
	No. 40 (Control)							
	K-40	8	NONE	1413	99.1	1500	1300	200
	Cs-137	8	3.3 5.1	ALL LLD	-	-	-	-
	Cs-134	8	2.3 3.4	ALL LLD	-	-	-	-
	La-140	8	2.2 25.0	ALL LLD	-	-	-	-
	Ba-140	8	9.5 120.0	ALL LLD	-	-	-	-
	Sr-90	8	3.3 15.9	2.96	1.20	4.20	0.93	3.28

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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	0.018 0.034	ALL LLD	-	-	-	-
	K-40	4	NONE	4.55	1.39	5.90	2.80	3.10
	Cs-134	4	0.01 0.02	ALL LLD	-	-	-	-
	Cs-137	4	0.02 0.03	ALL LLD	-	-	-	-
	Co-58	4	0.022 0.03	ALL LLD	-	-	-	-
	Mn-54	4	0.017 0.025	ALL LLD	-	-	-	-
	Ce-144	4	0.11 0.13	ALL LLD	-	-	-	-
	Be-7	4	0.20 0.30	ALL LLD	-	-	-	-
	Indicator							
	Co-60	12	0.015 0.052	ALL LLD	-	-	-	-
	K-40	12	NONE	4.59	1.95	8.4	2.4	6.0
	Cs-134	12	0.01 0.03	ALL LLD	-	-	-	-
	Cs-137	12	0.01 0.03	0.034	0.03	0.08	0.02	0.06
	Co-58	12	0.017 0.047	ALL LLD	-	-	-	-
	Mn-54	12	0.012 0.034	ALL LLD	-	-	-	-
	Ce-144	12	0.077 0.25	ALL LLD	-	-	-	-
	Be-7	12	0.16 0.50	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							
	<u>Control</u>							
	Co-60	2	0.015 0.029	ALL LLD	-	-	-	-
	K-40	2	NONE	2.90	1.27	3.8	2.0	1.8
	Cs-134	2	0.01 0.02	ALL LLD	-	-	-	-
	Cs-137	2	0.02	ALL LLD	-	-	-	-
	Co-58	2	0.017 0.03	ALL LLD	-	-	-	-
	Mn-54	2	0.014 0.025	ALL LLD	-	-	-	-
	Ce-144	2	0.11 0.12	ALL LLD	-	-	-	-
	Be-7	2	0.20 0.30	ALL LLD	-	-	-	-
	<u>Indicator</u>							
	Co-60	6	0.013 0.06	ALL LLD	-	-	-	-
	K-40	6	NONE	2.40	1.11	3.5	1.2	2.3
	Cs-134	6	0.01 0.04	ALL LLD	-	-	-	-
	Cs-137	6	0.01 0.04	ALL LLD	-	-	-	-
	Co-58	6	0.013 0.05	ALL LLD	-	-	-	-
	Mn-54	6	0.01 0.04	ALL LLD	-	-	-	-
	Ce-144	6	0.051 0.27	ALL LLD	-	-	-	-
	Be-7	6	0.10 0.50	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	5.95	4.74	9.3	2.6	6.7
	Cs-134	2	0.003 0.01	ALL LLD	-	-	-	-
	Cs-137	2	0.004 0.01	ALL LLD	-	-	-	-
	Be-7	2	0.04	A	A	0.12	0.12	0.0
	Ce-144	2	0.02 0.07	ALL LLD	-	-	-	-
	Nb-95	2	0.008 0.015	ALL LLD	-	-	-	-
	Indicator							
	K-40	6	NONE	2.85	2.25	7.4	1.5	5.9
	Cs-134	6	0.002 0.01	ALL LLD	-	-	-	-
	Cs-137	6	0.003 0.01	ALL LLD	-	-	-	-
	Be-7	6	0.03 0.07	A	A	0.14	0.14	0.0
	Ce-144	6	0.01 0.07	ALL LLD	-	-	-	-
	Nb-95	6	0.005 0.014	ALL LLD	-	-	-	-
Produce pCi/g (wet)	I-131							
	Control	1	0.02 0.02	ALL LLD	-	-	-	-
	Indicator	3	0.008 0.02	ALL LLD	-	-	-	-

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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 1982	AUGUST 1982
Fitzpatrick (03)	Be-7	0.54±0.07	1.2±0.2
	K-40	1.8±0.2	2.0±0.2
	Mn-54	<0.006	0.03±0.01
	Co-58	<0.007	<0.02
	Fe-59	<0.02	<0.04
	Co-60	0.018±0.006	0.06±0.02
	Zn-65	<0.01	<0.03
	Cs-134	<0.006	0.033±0.007
	Cs-137	0.056±0.006	0.38±0.04
	Ra-226	0.03±0.01	0.19±0.02
	Th-232	0.03±0.02	0.17±0.04
	Others	All<LLD	All<LLD
Nine Mile Point (02)	Be-7	0.56±0.08	0.53±0.08
	K-40	2.6±0.3	1.5±0.2
	Mn-54	<0.01	<0.007
	Co-58	<0.01	<0.007
	Fe-59	<0.03	<0.02
	Co-60	0.017±0.009	0.027±0.006
	Zn-65	<0.03	<0.01
	Cs-134	<0.01	<0.006
	Cs-137	0.050±0.008	0.089±0.009
	Ra-226	0.12±0.02	0.05±0.01
	Th-232	0.08±0.02	0.05±0.01
	Others	All<LLD	All<LLD

TABLE 1 (cont.)

CONCENTRATIONS OF GAMMA EMITTERS IN PERIPHYTON SAMPLES

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

COLLECTION SITE	NUCLIDES FOUND	JUNE 1982	AUGUST 1982
Oswego (Control - 00)	Be-7	0.56±0.08	0.61±0.09
	K-40	2.4±0.2	1.2±0.1
	Mn-54	<0.007	<0.007
	Co-58	<0.008	<0.009
	Fe-59	<0.02	<0.03
	Co-60	<0.007	<0.008
	Zn-65	[illegible]	<0.02
	Cs-134	<0.006	<0.007
	Cs-137	0.062±0.006	0.042±0.008
	Ce-144	0.04±0.02	<0.07
	Ra-226	0.08±0.01	0.04±0.01
	Th-232	0.08±0.02	0.03±0.02
	Others	All<LLD	All<LLD

TABLE 2

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

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

COLLECTION CODE	COLLECTION DATE	Sr-90	K-40	GAMMA EMITTERS Co-60	Cs-134	Cs-137	Ra-226	Th-232	Others
Fitzpatrick (03)	6-14-82	<0.008	<2.0	<0.03	<0.04	0.05±0.03	0.13±0.06	0.22±0.09	All<LLD
	9-30-82	<0.04	8.6±0.9	0.09±0.03	<0.04	0.20±0.03	0.13±0.05	0.25±0.07	All<LLD
Nine Mile Point (02)	6-14-82	0.013±0.004	18±2	0.19±0.05	<0.04	0.22±0.05	0.2±0.1	0.3±0.1	All<LLD
	10-05-82	0.06±0.03	15±2	0.14±0.04	<0.04	0.24±0.04	0.26±0.07	0.35±0.09	All<LLD
Oswego (Control - 00)	6-18-82	<0.008	11±1	<0.1	<0.07	0.75±0.08	0.31±0.09	0.4±0.2	All<LLD
	10-08-82	<0.04	9.3±0.9	<0.06	<0.04	0.29±0.06	0.41±0.09	0.4±0.1	All<LLD

TABLE 3

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

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

COLLECTION SITE	COLLECTION DATE	Sr-89	Sr-90	GAMMA EMITTERS K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	Ra-226	Others
Fitzpatrick (03)	6-14-82	<0.03	0.067±0.007	0.4±0.2	0.28±0.03	<0.02	<0.04	0.06±0.02	<0.04	<0.02	<0.02	<0.06	All<LLD
	9-30-82	<0.02	0.11±0.01	<0.4	0.18±0.03	<0.03	<0.1	0.05±0.02	<0.07	<0.03	<0.02	0.11±0.05	All<LLD
Nine Mile Point (02)	6-09-82	<0.03	0.089±0.009	0.4±0.2	0.31±0.03	<0.02	<0.05	0.07±0.02	<0.05	<0.02	<0.02	0.12±0.04	All<LLD
	10-05-82	<0.02	0.12±0.01	<0.4	0.15±0.03	<0.04	<0.1	0.04±0.02	<0.07	<0.03	<0.02	0.16±0.04	All<LLD
Oswego (Control - 00)	6-18-82	<0.02	0.036±0.004	<0.3	<0.02	<0.02	<0.02	<0.03	<0.03	<0.02	<0.02	<0.04	All<LLD
	10-08-82	<0.02	0.018±0.007	0.2±0.1	<0.02	<0.02	<0.04	<0.02	<0.04	<0.01	<0.02	<0.03	All<LLD

TABLE 4

CONCENTRATIONS OF Sr-89 AND Sr-90 AND GAMMA EMITTERS IN *GAMMARUS* SAMPLES

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

COLLECTION SITE	COLLECTION DATE	Sr-89	Sr-90	GAMMA EMITTERS Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	Others
Fitzpatrick (03)	8-17-82 to 9-10-82	<0.2	0.3±0.1	<0.8	<0.9	<1.8	<1.1	<2.3	<0.7	<0.7	All<LLD
Nine Mile Point (02)	8-17-82 to 9-10-82	<0.03	0.16±0.02	<0.08	<0.2	<0.5	<0.2	<0.4	<0.2	<0.2	All<LLD
Oswego (Control - 00)	8-17-82 to 9-10-82	<0.02	0.09±0.01	<0.1	<0.1	<0.3	<0.3	<0.2	<0.1	<0.1	All<LLD

TABLE 5

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

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

SAMPLE DATE	SAMPLE TYPE	Sr-89	Sr-90	K-40	GAMMA EMITTERS Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	Others
					FITZPATRICK							
June 1982	Brown Trout	0.004±0.002	<0.002	3.1±0.3	<0.01	<0.01	<0.04	<0.02	<0.03	<0.01	0.048±0.008	All<LLD
	Lake Trout #1	<0.003	0.004±0.002	2.5±0.3	<0.007	<0.01	<0.03	<0.008	<0.02	<0.007	0.044±0.009	All<LLD
	Lake Trout #2	<0.003	0.004±0.002	3.6±0.4	<0.009	<0.01	<0.03	<0.01	<0.03	<0.008	0.05±0.01	All<LLD
October 1982	Brown Trout	<0.004	<0.002	2.9±0.3	<0.009	<0.01	<0.04	<0.01	<0.02	<0.008	0.053±0.008	All<LLD
	Lake Trout #1	<0.01	<0.006	2.1±0.2	<0.008	<0.01	<0.03	<0.01	<0.03	<0.008	0.045±0.007	All<LLD
	Lake Trout #2	<0.007	0.005±0.004	2.5±0.3	<0.01	<0.02	<0.09	<0.01	<0.03	<0.008	0.034±0.007	All<LLD
	White Sucker	<0.006	<0.002	3.6±0.4	<0.01	<0.02	<0.08	<0.02	<0.03	<0.01	0.039±0.008	All<LLD
					NINE MILE POINT							
June 1982	Brown Trout	0.003±0.002	<0.001	3.2±0.3	<0.01	<0.01	<0.03	<0.02	<0.03	<0.009	0.064±0.008	All<LLD
	Lake Trout #1	<0.002	0.004±0.001	3.3±0.3	<0.01	<0.01	<0.04	<0.01	<0.03	<0.009	0.05±0.01	All<LLD
	Lake Trout #2	<0.002	0.003±0.001	3.1±0.3	<0.006	<0.008	<0.02	<0.007	<0.02	<0.005	0.051±0.006	All<LLD
October 1982	Brown Trout	<0.005	<0.003	3.2±0.3	<0.01	<0.02	<0.04	<0.02	<0.03	<0.01	0.049±0.009	All<LLD
	Lake Trout #1	<0.004	0.002±0.002	2.7±0.3	<0.009	<0.01	<0.04	<0.01	<0.03	<0.008	0.043±0.007	All<LLD
	Lake Trout #2	<0.004	0.002±0.002	2.5±0.3	<0.009	<0.01	<0.04	<0.01	<0.03	<0.009	0.044±0.008	All<LLD
	White Sucker	<0.006	<0.001	4.5±0.5	<0.02	<0.03	<0.1	<0.02	<0.04	<0.02	0.06±0.01	All<LLD
CONTROL					OSWEGO							
June 1982	Brown Trout	<0.004	0.013±0.002	3.1±0.3	<0.01	<0.02	<0.05	<0.02	<0.03	<0.01	0.049±0.008	All<LLD
	Lake Trout #1	0.005±0.002	<0.001	2.8±0.3	<0.007	<0.01	<0.03	<0.008	<0.02	<0.006	0.047±0.007	All<LLD
	Lake Trout #2	0.003±0.002	<0.002	3.1±0.3	<0.008	<0.01	<0.04	<0.01	<0.02	<0.008	0.051±0.009	All<LLD
October 1982	Brown Trout	<0.004	<0.003	3.0±0.3	<0.009	<0.01	<0.03	<0.01	<0.02	<0.008	0.047±0.008	All<LLD
	Lake Trout #1	<0.004	0.002±0.002	2.5±0.3	<0.008	<0.01	<0.03	<0.01	<0.03	<0.007	0.050±0.007	All<LLD
	Lake Trout #2	<0.005	0.004±0.003	2.5±0.3	<0.009	<0.01	<0.03	<0.01	<0.02	<0.007	0.055±0.008	All<LLD
	White Sucker	<0.01	<0.002	2.8±0.3	<0.02	<0.03	<0.1	<0.02	<0.05	<0.01	0.027±0.009	All<LLD

TABLE 6

CONCENTRATIONS OF BETA EMITTERS IN LAKE WATER SAMPLES

Results in Units of pCi/l ± 2 sigma

Station Code	January	February	March	April	May	June
JAF Inlet	2.78 ± 0.6	3.47 ± 0.6	2.62 ± 0.7	3.00 ± 0.7	2.85 ± 0.7	2.31 ± 0.7
NMP Inlet	2.32 ± 0.6	2.78 ± 0.6	3.16 ± 0.7	2.77 ± 0.6	1.27 ± 0.6	1.74 ± 0.6
Raw City Water (control)	2.54 ± 0.6	3.20 ± 0.6	2.99 ± 0.7	2.68 ± 0.6	2.66 ± 0.7	2.04 ± 0.7

Station Code	Nuclide	July	August	September	October	November	December
JAF Inlet		2.74 ± 0.7	3.53 ± 0.7	2.69 ± 0.7	2.71 ± 0.7	2.40 ± 0.7	1.98 ± 0.4
NMP Inlet		2.43 ± 0.7	3.22 ± 0.7	4.72 ± 0.8	3.89 ± 0.8	1.79 ± 0.7	2.23 ± 0.4
Raw City Water (control)		2.06 ± 0.7	2.16 ± 0.7	1.79 ± 0.6	2.47 ± 0.7	2.00 ± 0.7	2.39 ± 0.4

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	12/31/81 to 03/31/82	311 ± 140	<0.722	1.55 ± 0.42
	Second Quarter	03/31/82 to 07/02/82	247 ± 120	<0.603	1.07 ± 0.38
	Third Quarter	07/02/82 to 10/01/82	311 ± 110	<0.580	0.718± 0.31
	Fourth Quarter	10/01/82 to 01/03/83	194 ± 98	<0.396	0.691± 0.31
NMP INLET	First Quarter	12/31/81 to 03/31/82	229 ± 130	<1.36	3.07 ± 0.77
	Second Quarter	03/31/82 to 07/02/82	202 ± 120	<0.502	0.501± 0.34
	Third Quarter	07/02/82 to 10/01/82	859 ± 120	<0.592	0.67 ± 0.34
	Fourth Quarter	10/01/82 to 01/03/83	2,780 ± 280	0.606 ± 0.38	0.40 ± 0.30
RAW CITY WATER (Control)	First Quarter	12/31/81 to 03/31/82	307 ± 140	<2.23	5.30 ± 1.3
	Second Quarter	03/31/82 to 07/02/82	123 ± 120	<0.586	1.10 ± 0.37
	Third Quarter	07/02/82 to 10/01/82	112 ± 110	<0.628	1.01 ± 0.32
	Fourth Quarter	10/01/82 to 01/03/83	118 ± 97	<0.433	0.75 ± 0.32

TABLE 8
CONCENTRATIONS OF GAMMA EMITTERS IN LAKE WATER SAMPLES
Results in Units of pCi/l ± 2 sigma

Station Code	Nuclide	January	February	March	April	May	June
OSWEGO CITY WATER (00, CONTROL)	Ce-144	< 5.04	< 4.83	< 7.18	< 6.23	< 5.64	< 6.73
	Cs-134	< 0.95	< 1.04	< 1.29	< 1.43	< 1.14	< 1.17
	Cs-137	< 1.15	< 1.06	< 1.59	< 1.59	< 1.41	< 1.53
	Zr-95	< 3.43	< 2.85	< 5.47	< 5.02	< 3.60	< 5.51
	Nb-95	< 1.67	< 1.40	< 3.42	< 2.62	< 2.48	< 3.59
	Co-58	< 1.48	< 1.19	< 2.05	< 1.92	< 1.72	< 2.18
	Mn-54	< 1.17	< 1.26	< 1.7	< 1.58	< 1.30	< 1.59
	Fe-59	< 1.38	< 1.56	< 3.03	< 3.46	< 2.57	< 3.32
	Co-60	< 1.15	< 1.20	< 2.33	< 1.78	< 1.66	< 1.89
	K-40	<12.4	<15.0	<19.6	<20.3	<17.30	<17.40
NINE MILE POINT (02, INLET)	Ce-144	< 5.10	< 4.90	< 6.85	< 6.35	< 6.43	< 6.18
	Cs-134	< 0.95	< 1.17	< 1.27	< 1.41	< 1.24	< 1.55
	Cs-137	< 1.10	< 0.98	< 1.4	< 1.37	< 1.38	< 1.53
	Zr-95	< 3.92	< 3.11	< 5.17	< 4.77	< 4.61	< 5.09
	Nb-95	< 2.14	< 1.63	< 3.25	< 2.96	< 2.65	< 3.16
	Co-58	< 1.48	< 1.21	< 2.41	< 2.00	< 1.65	< 2.51
	Mn-54	< 1.14	< 0.99	< 1.59	< 1.72	< 1.45	< 1.49
	Fe-59	< 1.38	< 1.96	< 3.37	< 3.18	< 3.16	< 3.27
	Co-60	< 1.41	< 1.64	< 2.02	< 1.85	< 1.66	< 1.91
	K-40	<14.7	< 9.7	<21.7	16.9±9.6	<15.9	<17.6
FITZPATRICK (03, INLET)	Ce-144	< 3.18	< 4.62	< 6.88	< 6.91	< 6.19	< 5.82
	Cs-134	< 0.72	< 1.07	< 1.42	< 1.42	< 1.35	< 1.30
	Cs-137	0.43±0.29	< 1.52	< 1.79	< 1.69	< 1.41	< 1.50
	Zr-95	< 2.13	< 3.66	< 4.98	< 5.16	< 4.38	< 4.59
	Nb-95	< 1.45	< 1.55	< 3.45	< 3.83	< 2.50	< 3.33
	Co-58	< 0.99	< 1.29	< 2.19	< 2.13	< 2.02	< 2.02
	Mn-54	< 0.74	< 1.46	< 1.94	< 1.66	< 1.83	< 1.49
	Fe-59	< 1.35	< 1.92	< 3.21	< 3.66	< 3.07	< 2.85
	Co-60	1.58±0.56	< 1.03	2.37±1.13	< 2.30	< 2.26	< 2.27
	K-40	4.5 ±3.3	<11.5	<18.7	<23.3	<21.60	<17.9

TABLE 8 (cont.)
CONCENTRATIONS OF GAMMA EMITTERS IN LAKE WATER SAMPLES
Results in Units of pCi/l ± 2 sigma

Station Code	Nuclide	July	August	September	October	November	December
OSWEGO CITY WATER (00, CONTROL)	Ce-144	< 5.97	< 6.47	< 6.76	< 5.79	< 5.29	< 6.96
	Cs-134	< 1.07	< 1.26	< 1.37	< 0.917	< 1.07	< 1.47
	Cs-137	< 1.47	< 1.41	< 1.46	< 0.996	< 0.98	< 1.62
	Zr-95	< 3.92	< 3.97	< 4.64	< 4.31	< 3.22	< 5.67
	Nb-95	< 2.64	< 2.32	< 3.24	< 2.43	< 1.55	< 3.29
	Co-58	< 1.84	< 1.96	< 2.24	< 1.32	< 1.10	< 2.33
	Mn-54	< 1.13	< 1.58	< 1.70	< 1.07	< 1.67	< 1.81
	Fe-59	< 2.15	< 2.83	< 3.05	< 2.28	< 1.76	< 3.40
	Co-60	< 1.50	< 1.78	< 2.01	< 1.26	< 1.18	< 2.20
	K-40	<18.4	<16.3	<20.5	14.3±8.9	14.8±7.9	<22.9
NINE MILE POINT (02, INLET)	Ce-144	< 5.02	< 6.24	< 5.63	< 5.83	< 4.79	< 6.05
	Cs-134	< 0.946	< 1.13	< 1.14	< 1.11	< 1.03	< 1.28
	Cs-137	< 0.989	< 1.62	3.72±1.13	3.25±0.10	< 1.10	< 1.39
	Zr-95	< 3.47	< 3.97	< 3.72	< 4.20	< 3.11	< 4.18
	Nb-95	< 2.09	< 2.08	< 2.82	< 2.42	< 1.71	< 2.52
	Co-58	< 1.36	< 1.63	< 1.69	< 1.34	< 1.11	< 1.89
	Mn-54	< 1.16	< 1.22	< 1.40	< 1.02	< 1.18	< 1.39
	Fe-59	< 1.98	< 2.97	< 2.56	< 2.27	< 2.01	< 2.29
	Co-60	< 1.20	< 1.70	< 1.62	< 1.70	< 1.11	< 1.62
	K-40	<14.2	<14.4	<12.4	<11.5	<13.1	16.3±8.7
FITZPATRICK (03, INLET)	Ce-144	< 5.35	< 5.97	< 5.71	< 5.70	< 4.97	< 5.97
	Cs-134	< 1.07	< 1.10	< 1.16	< 1.19	< 0.96	< 1.13
	Cs-137	< 1.26	< 1.21	< 1.18	< 1.27	< 1.04	< 1.09
	Zr-95	< 4.12	< 4.26	< 4.47	< 4.43	< 2.90	< 3.54
	Nb-95	< 2.11	< 2.30	< 2.93	< 3.07	< 1.87	< 2.11
	Co-58	< 1.46	< 1.84	< 1.70	< 1.53	< 1.16	< 1.69
	Mn-54	< 1.25	< 1.38	< 1.31	< 1.28	< 0.93	< 1.22
	Fe-59	< 2.47	< 2.19	< 2.62	< 2.60	< 1.49	< 2.06
	Co-60	< 1.67	1.61±0.78	< 1.54	< 1.46	< 1.14	< 1.18
	K-40	<14.9	<15.0	16.5±7.8	<15.2	14.2±7.9	<16.2

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
82/01/05	0.032±0.004	0.036±0.004	0.034±0.005	0.031±0.005	0.033±0.004	0.035±0.005
82/01/13	0.038±0.004	0.042±0.004	0.041±0.005	0.034±0.005	0.042±0.004	0.033±0.004
82/01/19	0.034±0.004	0.036±0.005	0.036±0.005	0.036±0.006	0.043±0.005	0.047±0.006
82/01/26	0.042±0.004	0.041±0.005	0.040±0.005	0.037±0.005	0.043±0.005	0.045±0.005
82/02/03	0.039±0.004	0.040±0.004	0.045±0.005	0.043±0.005	0.041±0.004	0.047±0.005
82/02/09	0.039±0.005	0.040±0.005	0.044±0.006	0.030±0.006	0.041±0.005	0.038±0.006
82/02/17	0.050±0.005	0.054±0.005	0.051±0.005	0.048±0.006	0.059±0.005	0.047±0.005
82/02/23	0.030±0.004	0.027±0.004	0.029±0.005	0.025±0.005	0.029±0.004	0.027±0.005
82/03/02	0.037±0.004	0.035±0.004	0.034±0.005	0.037±0.005	0.036±0.004	0.041±0.005
82/03/09	0.043±0.005	0.041±0.005	0.045±0.005	0.041±0.006	0.051±0.005	0.039±0.005
82/03/16	0.037±0.004	0.036±0.004	0.036±0.005	0.034±0.005	0.031±0.004	0.035±0.005
82/03/24	0.015±0.003	0.018±0.003	0.024±0.004	0.020±0.004	0.022±0.003	0.022±0.004
82/03/30	0.049±0.005	0.032±0.007	0.046±0.006	0.044±0.007	0.053±0.005	0.053±0.006
82/04/06	0.034±0.004	*	0.034±0.005	0.022±0.005	0.035±0.004	0.031±0.006
82/04/13	0.055±0.005	0.057±0.006	0.057±0.006	0.058±0.007	0.059±0.005	0.057±0.005
82/04/20	0.032±0.004	0.038±0.005	0.034±0.005	0.035±0.006	0.040±0.005	0.040±0.005
82/04/27	0.047±0.005	0.053±0.006	0.050±0.006	0.035±0.023	0.052±0.005	0.044±0.006
82/05/04	0.063±0.006	0.071±0.006	0.063±0.007	0.054±0.006	0.054±0.005	0.052±0.005
82/05/12	0.036±0.005	0.043±0.005	0.044±0.006	0.045±0.008	0.047±0.005	0.030±0.004
82/05/18	0.029±0.005	0.026±0.005	0.048±0.007	0.024±0.006	0.025±0.004	0.023±0.004
82/05/25	0.027±0.004	0.030±0.004	0.026±0.006	0.027±0.006	0.028±0.004	0.029±0.004
82/06/02	0.023±0.003	0.022±0.004	0.021±0.004	0.025±0.005	0.022±0.003	0.021±0.003
82/06/08	0.024±0.004	0.023±0.004	0.016±0.005	0.018±0.005	0.021±0.004	0.020±0.004
82/06/15	0.022±0.004	0.032±0.005	0.027±0.005	0.030±0.006	0.029±0.004	0.022±0.004
82/06/22	0.024±0.004	0.030±0.004	0.024±0.005	0.022±0.004	0.028±0.004	0.018±0.005
82/06/29	0.019±0.003	0.023±0.004	0.020±0.005	0.018±0.004	0.027±0.004	0.019±0.004
82/07/07	0.031±0.004	0.042±0.004	0.033±0.005	0.037±0.005	0.034±0.004	0.025±0.004
82/07/13	0.032±0.005	0.029±0.005	0.026±0.006	0.029±0.005	0.028±0.004	0.011±0.003
82/07/20	0.029±0.004	0.040±0.005	0.031±0.005	0.032±0.005	0.034±0.004	0.021±0.004
82/07/27	0.025±0.004	0.036±0.005	0.037±0.006	0.032±0.005	0.035±0.004	0.025±0.004
82/08/03	0.027±0.004	0.025±0.004	0.024±0.005	0.030±0.004	0.030±0.004	0.023±0.004
82/08/10	0.029±0.004	0.025±0.006	0.031±0.006	0.029±0.004	0.032±0.004	0.027±0.004
82/08/17	0.027±0.005	0.033±0.006	0.030±0.006	0.035±0.005	0.030±0.004	0.026±0.004
82/08/24	0.028±0.004	0.028±0.004	0.050±0.006	0.030±0.004	0.027±0.004	0.022±0.004
82/08/31	0.022±0.003	0.028±0.004	0.019±0.004	0.022±0.004	0.023±0.003	0.020±0.004
82/09/8	0.040±0.004	0.060±0.005	0.052±0.005	0.063±0.005	0.078±0.005	0.053±0.006
82/09/14	0.055±0.006	0.050±0.005	0.050±0.005	0.052±0.006	0.049±0.005	0.059±0.008
82/09/21	0.019±0.003	0.022±0.004	0.020±0.003	0.025±0.004	0.024±0.004	0.026±0.005
82/09/28	0.024±0.004	0.029±0.004	0.029±0.004	0.028±0.004	0.031±0.004	0.032±0.006
82/10/5	0.024±0.003	0.025±0.004	0.027±0.004	0.030±0.004	0.034±0.004	0.027±0.005
82/10/5	0.040±0.004	0.050±0.005	0.054±0.005	0.054±0.005	0.054±0.005	0.046±0.006
82/10/19	0.017±0.004	0.014±0.004	0.015±0.004	0.015±0.004	0.017±0.004	0.015±0.005
82/10/26	0.025±0.004	0.029±0.004	0.034±0.004	0.032±0.005	0.033±0.004	0.024±0.005
82/11/2	0.042±0.005	0.039±0.004	0.043±0.005	0.042±0.005	0.042±0.005	0.043±0.006
82/11/9	0.026±0.004	0.026±0.004	0.025±0.004	0.024±0.004	0.025±0.004	0.022±0.005
82/11/16	0.015±0.003	0.016±0.003	0.017±0.003	0.018±0.004	0.018±0.003	0.019±0.005
82/11/23	0.034±0.004	0.035±0.004	0.039±0.004	0.035±0.004	0.036±0.004	0.039±0.006
82/11/30	0.023±0.003	0.022±0.003	0.021±0.003	0.022±0.003	0.027±0.003	0.024±0.003
82/12/7	0.027±0.004	0.031±0.004	0.028±0.004	0.030±0.004	0.026±0.004	0.028±0.004
82/12/15	0.032±0.004	0.033±0.004	0.031±0.004	0.030±0.004	0.028±0.003	0.030±0.004
82/12/21	0.019±0.004	0.023±0.004	0.019±0.004	0.020±0.004	0.018±0.004	0.018±0.004
82/12/28	0.026±0.004	0.022±0.003	0.024±0.003	0.023±0.003	0.024±0.003	0.028±0.004
83/01/04	0.023±0.004	0.019±0.003	0.020±0.003	0.020±0.004	0.023±0.004	0.022±0.003

* PUMP NOT OPERATIONAL

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
82/01/04	0.033±0.006	0.036±0.005	0.036±0.005	0.033±0.006	0.025±0.004	0.036±0.004	0.029±0.006	0.036±0.005	0.032±0.004
82/01/12	0.040±0.005	0.034±0.005	0.039±0.004	0.037±0.005	0.032±0.004	0.034±0.004	0.029±0.005	0.028±0.003	0.037±0.004
82/01/18	0.036±0.007	0.033±0.006	0.038±0.005	0.033±0.006	0.026±0.004	0.037±0.005	0.025±0.006	0.019±0.004	0.033±0.005
82/01/25	0.043±0.006	0.049±0.006	0.051±0.005	0.044±0.006	0.044±0.005	0.006±0.002	0.019±0.004	0.042±0.004	0.041±0.005
82/02/02	0.042±0.005	0.045±0.005	0.038±0.004	0.047±0.006	0.040±0.004	0.017±0.003	0.003±0.003	0.025±0.003	0.033±0.004
82/02/08	0.045±0.007	0.039±0.006	0.045±0.006	0.038±0.007	0.041±0.006	0.043±0.005	0.006±0.004	0.041±0.005	0.042±0.006
82/02/16	0.045±0.006	0.047±0.005	0.048±0.005	0.049±0.006	0.046±0.005	0.050±0.004	0.052±0.006	0.049±0.005	0.037±0.005
82/02/22	0.027±0.006	0.041±0.006	0.033±0.005	0.023±0.006	0.031±0.005	0.031±0.004	0.023±0.005	0.026±0.004	0.020±0.004
82/03/01	0.044±0.006	0.041±0.005	0.045±0.005	0.042±0.006	0.038±0.005	0.038±0.004	0.036±0.005	0.014±0.003	0.042±0.005
82/03/08	0.040±0.006	0.035±0.005	0.040±0.005	0.038±0.006	0.041±0.005	0.042±0.004	0.038±0.006	0.044±0.005	0.036±0.004
82/03/15	0.034±0.006	0.038±0.005	0.039±0.005	0.037±0.006	0.041±0.005	0.037±0.004	0.030±0.005	0.034±0.004	0.028±0.004
82/03/22	0.014±0.005	0.016±0.004	0.016±0.004	0.012±0.005	0.017±0.004	0.018±0.003	0.018±0.004	0.014±0.003	0.014±0.004
83/03/29	0.040±0.006	0.037±0.005	0.042±0.005	0.041±0.008	0.040±0.005	0.034±0.004	0.048±0.006	0.047±0.005	0.043±0.005
82/04/05	0.031±0.006	0.028±0.004	0.030±0.004	0.030±0.005	0.031±0.005	0.030±0.004	0.031±0.005	0.030±0.004	0.030±0.005
82/04/12	*	0.057±0.005	0.053±0.006	0.057±0.005	0.049±0.005	0.050±0.005	0.058±0.007	0.051±0.005	0.054±0.005
82/04/19	0.043±0.005	0.043±0.005	0.045±0.005	0.046±0.005	0.043±0.005	0.041±0.004	0.043±0.006	0.042±0.005	0.045±0.005
82/04/26	0.060±0.006	0.052±0.006	0.070±0.007	0.063±0.007	0.061±0.006	0.047±0.005	0.062±0.006	0.058±0.005	0.052±0.005
82/05/03	0.052±0.005	0.051±0.006	0.054±0.006	0.064±0.010	0.052±0.006	0.045±0.005	0.052±0.006	0.047±0.005	0.045±0.005
82/05/11	0.046±0.005	0.025±0.003	0.046±0.005	0.042±0.005	0.051±0.005	0.046±0.004	0.044±0.005	0.047±0.005	0.048±0.005
82/05/17	0.022±0.004	0.027±0.005	0.028±0.005	0.024±0.006	0.019±0.004	0.023±0.004	0.024±0.005	0.025±0.004	0.025±0.005
82/05/24	0.030±0.005	0.030±0.005	0.030±0.005	0.030±0.006	0.025±0.005	0.025±0.004	0.028±0.005	0.026±0.004	0.034±0.005
82/06/01	0.016±0.003	0.020±0.004	0.019±0.004	0.026±0.005	0.017±0.004	0.016±0.003	0.016±0.004	0.017±0.003	0.016±0.003
82/06/07	0.016±0.004	0.016±0.004	0.014±0.004	0.015±0.005	0.017±0.004	0.014±0.003	0.010±0.004	0.016±0.004	0.018±0.004
82/06/14	0.022±0.004	0.024±0.004	0.020±0.004	0.027±0.005	0.022±0.004	0.019±0.003	0.021±0.005	0.019±0.003	0.021±0.004
82/06/21	0.024±0.004	0.023±0.004	0.023±0.004	0.027±0.005	0.019±0.004	0.021±0.003	0.023±0.005	0.015±0.003	0.020±0.004
82/06/28	0.019±0.004	0.020±0.004	0.021±0.004	0.019±0.004	0.019±0.005	0.019±0.003	0.023±0.004	0.015±0.003	0.015±0.003
82/07/06	0.032±0.004	0.032±0.004	0.033±0.004	0.033±0.005	0.030±0.005	0.039±0.004	0.035±0.005	0.035±0.003	0.034±0.004
82/07/12	0.027±0.005	0.031±0.005	0.031±0.005	0.031±0.006	0.031±0.007	0.027±0.004	0.033±0.006	0.030±0.004	0.027±0.004
82/07/19	0.035±0.005	0.027±0.005	0.032±0.005	0.035±0.006	0.027±0.006	0.037±0.005	0.031±0.005	0.027±0.004	0.031±0.005
82/07/26	0.024±0.004	0.024±0.004	0.020±0.005	0.023±0.005	0.021±0.005	0.020±0.003	0.021±0.004	0.019±0.003	0.019±0.004
82/08/02	0.027±0.004	0.028±0.005	0.020±0.004	0.030±0.005	0.032±0.006	0.024±0.003	0.029±0.005	0.026±0.003	0.029±0.004
82/08/09	0.031±0.004	0.113±0.008	0.058±0.006	0.035±0.005	0.020±0.005	0.030±0.003	0.070±0.007	0.077±0.005	0.045±0.005
82/08/16	0.030±0.004	0.034±0.005	0.032±0.004	0.035±0.005	0.030±0.006	0.031±0.004	0.022±0.005	0.037±0.004	0.028±0.004
82/08/23	0.02[illegible]±0.004	0.029±0.004	0.026±0.004	0.032±0.005	0.028±0.005	0.031±0.003	0.027±0.006	0.035±0.004	0.026±0.004
82/08/30	0.0[illegible]±0.003	0.025±0.004	0.023±0.004	0.023±0.004	0.024±0.004	0.025±0.003	0.034±0.005	0.027±0.003	0.022±0.003
82/09/07	0.027±0.003	0.032±0.004	0.033±0.004	0.028±0.004	0.026±0.005	0.034±0.004	0.042±0.004	0.023±0.003	0.040±0.004
82/09/13	0.050±0.008	0.057±0.008	0.047±0.006	0.041±0.006	0.050±0.007	0.048±0.006	0.015±0.004	0.053±0.006	0.037±0.005
82/09/20	0.031±0.004	0.029±0.004	0.030±0.004	0.028±0.005	0.026±0.005	0.025±0.005	0.027±0.004	0.036±0.005	0.027±0.004
82/09/27	0.033±0.004	0.037±0.005	0.054±0.005	0.035±0.005	0.029±0.005	0.001±0.003	0.030±0.004	0.032±0.005	0.015±0.004
82/10/4	0.021±0.003	0.030±0.004	0.026±0.004	0.021±0.004	0.026±0.005	0.021±0.004	0.019±0.003	0.021±0.005	0.025±0.005
82/10/12	0.036±0.004	0.034±0.004	0.036±0.005	0.031±0.005	0.033±0.005	0.034±0.005	0.037±0.004	0.026±0.008	0.039±0.006
82/10/18	0.017±0.003	0.019±0.004	0.020±0.005	0.020±0.005	0.017±0.005	0.017±0.005	0.016±0.003	0.014±0.004	0.012±0.004
82/10/25	0.017±0.005	0.019±0.004	0.023±0.004	0.024±0.005	0.026±0.005	0.024±0.005	0.030±0.004	0.021±0.005	0.018±0.003
82/11/1	0.045±0.005	0.046±0.005	0.050±0.006	0.050±0.006	0.048±0.006	0.044±0.006	0.041±0.005	0.038±0.005	0.037±0.004
82/11/8	0.024±0.004	0.024±0.004	0.025±0.004	0.024±0.005	0.021±0.005	0.022±0.005	0.024±0.004	0.019±0.004	0.021±0.004
82/11/15	0.025±0.003	0.021±0.003	0.024±0.004	0.018±0.004	0.020±0.004	0.024±0.005	0.020±0.003	0.017±0.004	0.020±0.003
82/11/22	0.032±0.004	0.030±0.004	0.035±0.004	0.034±0.005	0.031±0.005	0.037±0.005	0.034±0.004	0.031±0.005	0.029±0.004
82/11/29	0.035±0.004	0.035±0.004	0.036±0.004	0.035±0.005	0.043±0.006	0.036±0.004	0.032±0.004	0.038±0.004	0.036±0.004
82/12/6	0.027±0.003	0.025±0.004	0.033±0.004	0.024±0.005	0.026±0.005	0.028±0.004	0.025±0.004	0.024±0.003	0.025±0.004
82/12/14	0.026±0.003	0.026±0.004	0.023±0.004	0.027±0.005	0.025±0.004	0.025±0.004	0.020±0.003	0.025±0.003	0.032±0.004
82/12/20	0.028±0.004	0.024±0.004	0.025±0.005	0.020±0.005	0.024±0.006	0.020±0.004	0.016±0.004	0.023±0.004	0.025±0.004
82/12/27	0.020±0.003	0.021±0.003	0.017±0.004	0.019±0.004	0.018±0.004	0.020±0.004	0.020±0.003	0.020±0.003	0.020±0.003
83/01/03	0.018±0.003	0.017±0.003	0.015±0.003	0.016±0.004	0.020±0.005	0.022±0.004	0.018±0.003	0.021±0.004	0.015±0.003

* PUMP NOT OPERATIONAL

TABLE 11

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1982

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

Nuclides	January	February	March	April	May	June
OFFSITE COMPOSITE						
Ce-144	2.17± 0.5	1.72± 0.52	1.34± 0.57	2.43± 0.66	0.92± 0.39	0.87± 0.70
Ce-141	<0.32	<0.32	<0.45	<1.17	<0.33	<0.38
Be-7	107.0 ± 4.7	140.0 ± 5.8	112.0 ± 5.7	140.0 ± 8.1	121.0 ± 5.0	115.0 ± 6.0
Ru-103	<0.26	<0.25	<0.36	<0.27	<0.26	<0.32
Cs-134	<0.14	<0.20	<0.22	<0.29	<0.20	<0.26
Cs-137	0.23± 0.10	0.32± 0.14	<0.29	0.45± 0.19	0.30± 0.13	6.28± 0.14
Zr-95	<0.49	<0.57	<0.78	<1.45	<0.56	<0.75
Nb-95	0.36± 0.18	0.61± 0.21	0.42 ± 0.27	<1.24	<0.36	<0.36
Co-58	<0.18	<0.26	<0.31	<0.56	<0.26	<0.30
Mn-54	<0.15	<0.22	<0.25	<0.35	<0.22	<0.31
Co-60	<0.24	0.49± 0.20	<0.32	<0.40	<0.30	<0.36
ONSITE COMPOSITE						
Ce-144	1.12± 0.33	1.62± 0.43	1.51± 0.49	2.30± 0.55	1.10± 0.34	0.68± 0.31
Ce-141	<0.23	<0.27	<0.40	<0.44	<0.23	<0.39
Be-7	83.3 ± 3.6	128.0 ± 4.66	99.9 ± 4.6	180.0 ± 6.4	111.0 ± 4.0	102.0 ± 4.6
Ru-103	<0.18	<0.22	<0.30	<0.31	<0.20	<0.30
Cs-134	<0.10	<0.18	<0.19	<0.19	<0.12	<0.17
Cs-137	0.27± 0.09	0.37± 0.13	0.34± 0.13	0.60± 0.01	0.39± 0.10	0.35± 0.13
Zr-95	<0.31	<0.47	<0.63	<0.63	<0.40	<0.62
Nb-95	0.57± 0.22	0.54± 0.16	<0.43	0.65± 0.32	<0.28	<0.37
Co-58	<0.14	<0.19	<0.28	<0.23	<0.18	<0.26
Mn-54	0.10± 0.06	<0.22	<0.22	<0.24	<0.15	<0.23
Co-60	0.43± 0.13	0.58± 0.17	<0.35	<0.30	0.27± 0.13	<0.30

TABLE 11 (cont.)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF AIR PARTICULATE SAMPLES
1982

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

Nuclides	July	August	September	October	November	December
OFFSITE COMPOSITE						
Ce-144	0.86± 0.54	<1.03	<0.70	<0.93	<0.83	<0.68
Ce-141	<0.39	<0.32	<0.27	<0.34	<0.32	<0.23
Be-7	126.0 ± 5.0	107.0 ± 4.7	74.6 ± 3.8	76.6 ± 4.3	83.7 ± 4.5	87.8 ± 3.8
Ru-103	<0.28	<0.23	<0.20	<0.28	<0.22	<0.16
Cs-134	<0.15	<0.17	<0.14	<0.21	<0.16	<0.12
Cs-137	0.35± 0.12	<0.28	<0.20	<0.24	<0.24	0.17± 0.09
Zr-95	<0.56	<0.46	<0.36	<0.61	<0.50	<0.34
Nb-95	<0.34	<0.27	<0.22	<0.36	<0.28	<0.20
Co-58	<0.26	<0.24	<0.19	<0.28	<0.22	<0.12
Mn-54	<0.20	<0.21	<0.18	<0.21	<0.18	<0.13
Co-60	<0.27	<0.26	<0.23	<0.35	<0.28	0.12± 0.08
ONSITE COMPOSITE						
Ce-144	0.88± 0.29	<0.72	<0.54	<0.77	<0.74	<0.51
Ce-141	<0.27	<0.23	<0.22	<0.28	<0.26	<0.20
Be-7	118.0 ± 3.8	103.0 ± 3.8	60.3 ± 2.9	72.5± 3.7	85.8 ± 3.7	82.7 ± 3.2
Ru-103	<0.20	<0.16	<0.15	<0.25	<0.22	<0.13
Cs-134	<0.14	<0.13	<0.11	<0.18	<0.16	<0.10
Cs-137	0.47± 0.10	<0.20	0.16±0.07	<0.22	<0.20	0.20± 0.07
Zr-95	<0.41	<0.39	<0.29	<0.47	<0.46	<0.23
Nb-95	<0.23	<0.19	<0.17	<0.33	<0.28	<0.12
Co-58	<0.17	<0.12	<0.11	<0.25	<0.22	<0.11
Mn-54	<0.17	<0.16	<0.11	<0.19	<0.19	<0.10
Co-60	0.23± 0.11	0.17± 0.09	0.18±0.08	<0.30	<0.30	<0.14

TABLE 12

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

WEEK END DATE	LOCATION C--OFF	D1-OFF	D2-OFF	E--OFF	F--OFF	G--OFF
82/01/05	<0.020	<0.018	<0.019	<0.022	<0.018	<0.016
82/01/13	<0.013	<0.012	<0.021	<0.017	<0.016	<0.016
82/01/19	<0.020	<0.021	<0.021	<0.018	<0.023	<0.026
82/01/26	<0.012	<0.011	<0.021	<0.025	<0.017	<0.018
82/02/03	<0.009	<0.014	<0.010	<0.032	<0.012	<0.014
82/02/09	<0.019	<0.039	<0.059	<0.048	<0.017	<0.015
82/02/17	<0.014	<0.016	<0.023	<0.021	<0.017	<0.014
82/02/23	<0.014	<0.020	<0.021	<0.015	<0.020	<0.025
82/03/02	<0.010	<0.018	<0.020	<0.026	<0.015	<0.016
82/03/09	<0.011	<0.015	<0.025	<0.022	<0.019	<0.013
82/03/16	<0.017	<0.020	<0.029	<0.033	<0.017	<0.026
82/03/24	<0.016	<0.019	<0.029	<0.026	<0.019	<0.023
82/03/30	<0.022	<0.036	<0.027	<0.030	<0.018	<0.005
82/04/06	<0.017	*	<0.026	<0.021	<0.018	<0.026
82/04/13	<0.027	<0.028	<0.020	<0.036	<0.019	<0.021
82/04/20	<0.020	<0.020	<0.031	<0.025	<0.022	<0.029
82/04/27	<0.019	<0.028	<0.028	<0.080	<0.017	<0.031
82/05/04	<0.018	<0.016	<0.029	<0.023	<0.017	<0.020
82/05/12	<0.064	<0.052	<0.060	<0.042	<0.017	<0.019
82/05/18	<0.057	<0.043	<0.059	<0.035	<0.021	<0.018
82/05/25	<0.016	<0.022	<0.033	<0.030	<0.020	<0.019
82/06/02	<0.020	<0.019	<0.024	<0.031	<0.016	<0.020
82/06/08	<0.017	<0.026	<0.023	<0.034	<0.018	<0.007
82/06/15	<0.022	0.039±0.005	<0.034	<0.030	<0.018	<0.023
82/06/22	<0.024	<0.021	<0.029	<0.025	<0.018	<0.039
82/06/29	<0.011	<0.009	<0.030	<0.028	<0.021	<0.022
82/07/07	<0.018	<0.018	<0.026	<0.018	<0.017	<0.021
82/07/13	<0.017	<0.020	<0.028	<0.023	<0.016	<0.007
82/07/20	<0.022	<0.016	<0.041	<0.026	<0.024	<0.021
82/07/27	<0.018	<0.018	<0.024	<0.024	<0.020	<0.026
82/08/03	<0.023	<0.024	<0.020	<0.021	<0.017	<0.017
82/08/10	<0.017	<0.031	<0.030	<0.022	<0.019	<0.020
82/08/17	<0.021	<0.028	<0.034	<0.020	<0.016	<0.025
82/08/24	<0.020	<0.027	<0.010	<0.025	<0.026	<0.015
82/08/31	<0.020	<0.016	<0.019	<0.009	<0.017	<0.003
82/09/8	<0.014	<0.014	<0.020	<0.009	<0.021	<0.018
82/09/14	<0.017	<0.017	<0.023	<0.023	<0.023	<0.022
82/09/21	<0.019	<0.018	<0.019	<0.017	<0.018	<0.022
82/09/28	<0.017	<0.016	<0.016	<0.018	<0.023	<0.037
82/10/5	<0.014	<0.022	<0.023	<0.016	<0.012	<0.021
82/10/5	<0.015	<0.017	<0.015	<0.014	<0.017	<0.023
82/10/19	<0.017	<0.020	<0.020	<0.011	<0.019	<0.027
82/10/26	<0.020	<0.025	<0.021	<0.023	<0.022	<0.020
82/11/2	<0.020	<0.028	<0.019	<0.013	<0.021	<0.036
82/11/9	<0.015	<0.015	<0.015	<0.013	<0.018	<0.033
82/11/16	<0.020	<0.021	<0.016	<0.015	<0.017	<0.031
82/11/23	<0.014	<0.016	<0.010	<0.010	<0.013	<0.020
82/11/30	<0.015	<0.016	<0.021	<0.016	<0.011	<0.017
82/12/7	<0.018	<0.015	<0.020	<0.021	<0.013	<0.014
82/12/15	<0.014	<0.021	<0.022	<0.013	<0.012	<0.011
82/12/21	<0.021	<0.023	<0.010	<0.013	<0.018	<0.016
82/12/28	<0.024	<0.018	<0.023	<0.017	<0.025	<0.015
83/01/04	<0.015	<0.014	<0.022	<0.021	<0.013	<0.018

* PUMP NOT OPERATIONAL

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
82/01/04	<0.022	<0.023	<0.014	<0.030	<0.021	<0.016	<0.021	<0.020	<0.016
82/01/12	<0.021	<0.023	<0.016	<0.024	<0.014	<0.009	<0.019	<0.016	<0.017
82/01/18	<0.032	<0.016	<0.018	<0.028	<0.022	<0.012	<0.033	<0.019	<0.020
82/01/25	<0.031	<0.019	<0.022	<0.022	<0.021	<0.021	<0.027	<0.014	<0.017
82/02/02	<0.019	<0.025	<0.019	<0.024	<0.013	<0.008	<0.016	<0.017	<0.014
82/02/08	<0.026	<0.024	<0.062	<0.024	<0.025	<0.034	<0.032	<0.057	<0.020
82/02/16	<0.019	<0.018	<0.012	<0.023	<0.017	<0.014	<0.012	<0.014	<0.016
82/02/22	<0.026	<0.019	<0.027	<0.025	<0.018	<0.013	<0.024	<0.015	<0.018
82/03/01	<0.026	<0.014	<0.016	<0.031	<0.023	<0.015	<0.029	<0.023	<0.018
82/03/08	<0.023	<0.023	<0.017	<0.027	<0.015	<0.020	<0.027	<0.011	<0.020
82/03/15	<0.030	<0.027	<0.017	<0.022	<0.018	<0.019	<0.013	<0.018	<0.025
82/03/22	<0.037	0.024±0.004	<0.029	<0.043	<0.030	<0.019	<0.030	<0.027	<0.023
82/03/29	<0.025	<0.021	<0.024	<0.047	<0.021	<0.022	0.025±0.006	<0.025	<0.007
82/04/05	<0.033	<0.024	<0.022	<0.027	<0.033	<0.024	<0.031	<0.028	<0.035
82/04/12	*	<0.017	<0.028	<0.025	<0.028	<0.020	<0.032	<0.017	<0.020
82/04/19	<0.023	<0.021	<0.022	<0.031	<0.020	<0.026	<0.043	<0.028	<0.021
82/04/26	<0.029	<0.025	<0.024	<0.027	<0.026	<0.028	<0.030	<0.025	<0.022
82/05/03	<0.026	<0.026	<0.020	<0.038	<0.028	<0.026	<0.021	<0.026	<0.020
82/05/11	<0.046	<0.046	<0.017	<0.024	<0.018	<0.057	<0.066	<0.021	<0.014
82/05/17	<0.048	<0.065	<0.069	<0.063	<0.023	<0.016	<0.026	<0.018	<0.027
82/05/24	<0.028	<0.019	<0.027	<0.035	<0.024	<0.020	<0.024	<0.022	<0.023
82/06/01	<0.019	<0.035	<0.023	<0.031	<0.022	<0.019	<0.018	<0.021	<0.024
82/06/07	<0.019	<0.020	<0.025	<0.026	<0.024	<0.016	<0.021	<0.018	<0.020
82/06/14	<0.020	<0.023	<0.025	<0.029	<0.021	<0.016	<0.032	<0.018	<0.025
82/06/21	<0.032	<0.017	<0.024	<0.031	<0.026	<0.019	<0.018	<0.018	<0.016
82/06/28	<0.019	<0.021	<0.022	<0.032	<0.024	<0.018	<0.029	<0.016	<0.028
82/07/06	<0.024	<0.028	<0.023	<0.022	<0.038	<0.025	<0.028	<0.018	<0.024
82/07/12	<0.016	<0.008	<0.020	<0.018	<0.032	0.010±0.004	<0.035	<0.017	<0.020
82/07/19	<0.024	<0.022	<0.019	<0.047	<0.034	0.017±0.005	0.042±0.005	<0.021	<0.018
82/07/26	<0.026	0.013±0.004	<0.037	<0.037	<0.038	0.015±0.003	<0.033	<0.019	<0.026
82/08/02	<0.021	<0.022	<0.024	<0.036	<0.025	<0.009	<0.027	<0.013	<0.021
82/08/09	<0.022	<0.028	<0.030	<0.036	<0.031	<0.022	<0.033	<0.016	<0.023
82/08/16	<0.020	<0.025	<0.020	<0.029	<0.034	0.006±0.004	<0.031	0.011±0.004	<0.022
82/08/23	<0.018	<0.020	<0.020	<0.023	<0.024	<0.013	<0.036	<0.012	<0.019
82/08/30	<0.015	<0.019	<0.017	<0.026	<0.021	0.004±0.003	<0.023	0.002±0.003	<0.017
82/09/07	<0.013	<0.009	<0.014	<0.020	<0.024	<0.022	<0.010	<0.010	<0.013
82/09/13	<0.045	<0.037	<0.033	<0.037	<0.033	<0.025	<0.031	0.024±0.006	<0.025
82/09/20	<0.020	<0.025	<0.027	<0.026	<0.027	<0.024	<0.025	<0.026	<0.024
82/09/27	<0.021	<0.020	<0.027	<0.029	<0.027	<0.027	<0.018	<0.022	<0.024
82/10/4	<0.013	<0.022	<0.014	<0.022	<0.028	<0.028	<0.017	<0.032	<0.030
82/10/12	<0.017	<0.019	<0.027	<0.018	<0.022	<0.025	<0.019	<0.069	<0.018
82/10/18	<0.017	<0.013	<0.034	<0.024	<0.033	<0.021	<0.023	<0.026	<0.022
82/10/25	<0.041	<0.023	<0.019	<0.028	<0.033	<0.033	<0.021	<0.036	<0.023
82/11/1	<0.026	<0.029	<0.020	<0.027	<0.023	<0.036	<0.024	<0.030	<0.025
82/11/8	<0.013	<0.019	<0.017	<0.018	<0.031	<0.033	<0.018	<0.018	<0.019
82/11/15	<0.015	<0.018	<0.023	<0.012	<0.013	<0.020	<0.017	<0.020	<0.011
82/11/22	<0.021	<0.018	<0.015	<0.032	<0.030	<0.022	<0.014	<0.035	<0.016
82/11/29	<0.016	<0.022	<0.026	<0.025	<0.027	<0.017	<0.021	<0.019	<0.010
82/12/6	<0.017	<0.018	<0.026	<0.021	<0.018	<0.016	<0.019	<0.019	<0.021
82/12/14	<0.015	<0.016	<0.019	<0.024	<0.032	<0.016	<0.013	<0.023	<0.022
82/12/20	<0.015	<0.021	<0.025	<0.019	<0.033	<0.020	<0.020	<0.022	<0.021
82/12/27	<0.022	<0.018	<0.023	<0.024	<0.035	<0.019	<0.018	<0.022	<0.023
83/01/03	<0.012	<0.014	<0.007	<0.025	<0.030	<0.018	<0.021	<0.018	<0.023

TABLE 14

DIRECT RADIATION MEASUREMENTS - QUARTERLY RESULTS (1982)

STATION NUMBER	LOCATION	JANUARY TO APRIL	APRIL TO JULY	JULY TO OCTOBER	OCTOBER TO DECEMBER	LOCATION (DIRECTION AND DISTANCE)
3	D1 on Site	5.58±0.25	12.27±0.46	13.04±0.21	10.81±1.54	0.25 miles @ 69°
4	D2 on Site	5.08±0.61	6.70±0.30	7.03±0.40	5.69±0.61	0.40 miles @ 140°
5	E on Site	4.63±0.50	5.59±0.12	5.70±0.41	5.83±0.50	0.40 miles @ 175°
6	F on Site	3.87±0.08	5.37±0.13	5.89±0.58	4.67±1.89	0.50 miles @ 210°
7	G on Site	4.15±0.48	5.61±0.08	5.68±0.63	5.68±0.63	0.70 miles @ 250°
8	C off Site	4.53±0.36	5.61±0.10	5.99±0.57	6.08±0.69	16.00 miles @ 42°
9	D1 off Site	4.06±0.64	6.24±0.17	5.71±0.47	5.05±0.22	11.40 miles @ 80°
10	D2 off Site	4.80±0.13	5.44±0.22	5.69±0.28	5.38±0.74	9.00 miles @ 117°
11	E off Site	4.02±0.56	5.93±0.11	5.68±0.58	4.83±0.08	7.20 miles @ 160°
12	F off Site	4.05±0.15	4.79±0.22	5.24±0.33	5.56±1.01	7.70 miles @ 190°
13	G off Site	4.66±0.23	5.42±0.19	5.95±0.28	5.13±0.34	5.30 miles @ 225°
14	DeMass Rd, SW Oswego-Control	4.55±0.29	5.17±0.06	5.66±0.18	5.20±0.42	12.80 miles @ 225°
15	Pole 66, W. Boundary-Bible Camp	3.85±0.45	4.50±0.18	4.20±0.27	4.44±0.56	0.90 miles @ 238°
18	Progress Center-Picnic Area	4.35±0.39	5.64±0.15	5.08±0.32	5.08±0.76	0.50 miles @ 268°
19	East Boundary-JAF, Pole 9	4.40±0.53	5.64±0.29	6.25±0.34	5.44±0.63	1.30 miles @ 81°
23	H on Site	5.03±0.34	9.13±0.14	8.70±0.54	8.50±0.98	0.80 miles @ 71°
24	I on Site	4.55±0.16	6.60±0.12	7.20±0.11	5.50±0.45	0.80 miles @ 98°
25	J on Site	4.57±0.39	5.88±0.08	6.13±0.45	5.63±0.88	0.90 miles @ 110°
26	K on Site	4.32±0.49	5.92±0.05	6.08±0.75	5.37±0.83	0.50 miles @ 132°
27	Nor. Fence-NNW Sector, JAF	9.71±0.77	23.18±0.29	20.98±0.98	17.24±2.15	0.40 miles @ 60°
28	Light Pole (E) JAF	29.33±2.91	41.79±0.16	53.26±3.11	47.44±6.42	0.50 miles @ 68°
29	Nor. Fence (E) JAF	40.99±2.24	90.56±1.73	75.89±4.93	72.72±8.84	0.50 miles @ 65°
30	Nor. Fence (NW) JAF	7.03±0.91	16.88±0.13	19.52±1.55	14.89±1.07	0.40 miles @ 57°
31	Nor. Fence (NW) NMP-1	10.15±1.16	10.76±0.11	11.60±0.62	(1)	0.20 miles @ 290°
39	East Fence, Rad. Waste-NMP-1	31.49±0.94	44.40±1.89	61.91±4.46	43.59±16.11	0.10 miles @ 292°
43	.9 mi Rt. 3 from Rt. 104B	4.26±0.30	5.92±0.07	5.01±0.52	5.02±0.34	9.40 miles @ 88°
44	Cor. Rt 3 and Kelly Drive	4.12±0.30	5.63±0.31	5.82±0.42	4.95±0.50	12.60 miles @ 64°
45	Cor. Rt 64 and Rt. 35	4.35±0.25	5.91±0.06	5.76±0.14	6.00±0.40	7.60 miles @ 130°
46	Cor. Rt. 176 and Black Creek Rd.	4.25±0.37	(1)	5.23±0.29	4.89±0.49	7.90 miles @ 178°
47	NE Shoreline (JAF)	16.16±3.36	46.87±0.98	51.12±0.30	43.33±3.41	0.60 miles @ 69°
48	.36 mi (N) on Access Rd. (JAF)	4.85±0.52	7.13±0.16	8.79±0.58	6.90±0.78	0.80 miles @ 92°
49	Phoenix, NY-Controll	3.80±0.23	4.97±0.03	5.02±0.57	4.87±0.42	20.00 miles @ 165°
50	Lake Rd. West of J On-Site	4.49±0.49	5.78±0.22	(1)	4.90±0.44	0.70 miles @ 115°
51	Oswego Steam Sta. N End of W Fence	4.18±0.36	5.86±0.13	5.39±0.58	5.25±0.37	7.50 miles @ 233°
52	East 11th St. Fitzhugh Park Sch.	(1)	(1)	4.88±0.15	5.29±1.11	5.80 miles @ 227°
53	Broadwell & Chestnut Sts. - Fulton H.S.	3.84±0.25	5.49±0.21	5.85±0.17	5.11±0.45	13.70 miles @ 183°
54	Liberty St. & Co. Rt. 16 - Mexico H.S.	4.11±0.45	5.18±0.13	5.50±0.46	5.01±0.81	9.30 miles @ 115°

TABLE 14 (cont.)

DIRECT RADIATION MEASUREMENTS - QUARTERLY RESULTS (1982)

STATION NUMBER	LOCATION	JANUARY TO APRIL	APRIL TO JULY	JULY TO OCTOBER	OCTOBER TO DECEMBER	LOCATION (DIRECTION AND DISTANCE)
55	Hinnmann Rd. & Co. Rt. 5 - Pulaski H.S.	3.79±0.47	4.84±0.16	5.69±0.36	5.23±0.45	13.70 miles @ 75°
56	Rt. 104 - New Haven H.S. (SE Corner)	4.10±0.37	4.95±0.24	5.84±0.30	5.00±0.65	5.40 miles @ 120°
57	Co. Rt. 29 & Miner Rd. (SE) - Lycoming, NY	4.24±0.41	5.35±0.26	5.53±0.35	5.54±0.69	1.90 miles @ 145°
58	Co. Rt. 1 - ALCAN (S of Entrance Rd.)	4.30±0.38	5.47±0.19	(1)	5.57±0.14	3.20 miles @ 220°
59	Environmental Lab - JAF	9.25±1.15	38.40±0.98	34.00±3.56	21.09±2.52	0.50 miles @ 95°
60	S. Shore (Fish Point) Little Sodus Bay, NY	5.53±0.51	5.73±0.07	6.95±0.43	6.51±0.75	21.00 miles @ 225°
61	700' N of #48 (On Access Rd.) - JAF	5.39±0.38	10.50±0.18	11.83±0.61	9.83±1.55	0.80 miles @ 83°
65	Dutch Ridge Rd. & Kerfien Rd. (SE)	3.81±0.32	5.34±0.06	5.40±0.58	5.29±1.13	7.80 miles @ 198°

(1) TLDs lost.

TABLE 15

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

FIRST HALF

LOCATION	PERIOD 1982	mR/hr MIN.	MAX.	AVG.
C Offsite	01/05 to 02/04	0.010	0.032	0.012
	02/04 to 03/02	0.010	0.019	0.012
	03/02 to 04/01	0.010	0.080	0.019
	04/01 to 04/30	0.011	0.020	0.017
	04/30 to 05/29	0.011	0.018	0.015
	05/29 to 06/29	0.010	0.020	0.014
D_1 Onsite	01/04 to 02/03	0.010	0.015	0.011
	02/03 to 03/01	0.010	0.017	0.011
	03/01 to 03/30	0.010	0.040	0.019
	03/30 to 04/30	0.015	0.060	0.023
	04/30 to 05/28	0.011	0.063	0.024
	05/28 to 06/28	0.010	0.058	0.022
D_2 Onsite	01/04 to 02/03	0.011	0.021	0.015
	02/03 to 03/01	0.011	0.031	0.015
	03/01 to 03/30	0.011	0.099	0.014
	03/30 to 04/30	0.011	0.050	0.016
	04/30 to 05/28	0.012	0.047	0.015
	05/28 to 06/28	0.011	0.091	0.014
E Onsite	01/04 to 02/03	0.011	0.022	0.014
	02/03 to 03/01	0.011	0.026	0.016
	03/01 to 03/30	0.010	0.051	0.014
	03/30 to 04/30	0.011	0.077	0.017
	04/30 to 05/28	0.013	0.053	0.019
	05/28 to 06/28	0.011	0.085	0.015
F Onsite	01/04 to 02/03	0.010	0.017	0.011
	02/03 to 03/01	0.010	0.022	0.012
	03/01 to 03/30	0.010	0.022	0.011
	03/30 to 04/30	0.010	0.025	0.016
	04/30 to 05/28	0.010	0.032	0.016
	05/28 to 06/28	0.010	0.040	0.012

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

TABLE 15 (cont.)

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

FIRST HALF

LOCATION	PERIOD 1982	MIN. (mR/hr)	MAX. (mR/hr)	AVG. (mR/hr)
G Onsite	01/04 to 02/03	0.012	0.028	0.014
	02/03 to 03/01	0.011	0.029	0.024
	03/01 to 03/30	0.012	0.036	0.014
	03/30 to 04/30	0.015	0.067	0.018
	04/30 to 05/28	0.010	0.053	0.019
	05/28 to 06/28	0.011	0.085	0.018
H Onsite	01/04 to 02/03	0.018	0.040	0.022
	02/03 to 03/01	0.010	0.048	0.030
	03/01 to 03/30	0.017	0.071	0.027
	03/30 to 04/30	0.010	0.080	0.030
	04/30 to 05/28	0.018	0.060	0.024
	05/28 to 06/28	0.015	0.088	0.027
I Onsite	01/04 to 02/03	0.010	0.013	0.011
	02/03 to 03/01	0.011	0.021	0.015
	03/01 to 03/30	0.012	0.099	0.028
	03/30 to 04/30	0.021	0.099	0.028
	04/30 to 05/28	0.011	0.062	0.029
	05/28 to 06/28	0.010	0.090	0.026
J Onsite	01/04 to 02/03	0.011	0.025	0.014
	02/03 to 03/01	0.010	0.034	0.015
	03/01 to 03/30	0.010	0.080	0.015
	03/30 to 04/30	0.017	0.072	0.025
	04/30 to 05/28	0.015	0.028	0.020
	05/28 to 06/28	0.013	0.089	0.022
K Onsite	01/04 to 02/03	0.010	0.023	0.012
	02/03 to 03/01	0.010	0.099	0.015
	03/01 to 03/30	0.010	0.050	0.018
	03/30 to 04/30	0.011	0.051	0.019
	04/30 to 05/28	0.011	0.049	0.014
	05/28 to 06/28	0.011	0.069	0.019

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

TABLE 15 (cont.)

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

SECOND HALF

LOCATION	PERIOD 1982	mR/hr MIN.	MAX.	AVG.
C Offsite	06/29 to 07/23	0.010	0.028	0.018
	07/23 to 08/20	0.013	0.021	0.018
	08/20 to 09/17	0.012	0.030	0.018
	09/17 to 10/19	0.010	0.023	0.018
	10/19 to 11/16	0.010	0.035	0.020
	11/16 to 12/15	0.010	0.025	0.018
	12/15 to 02/01/83	0.010	0.023	0.015
D_1 Onsite	06/28 to 07/22	0.010	0.060	0.021
	07/22 to 08/19	0.014	0.082	0.023
	08/19 to 09/17	0.013	0.600	0.022
	09/17 to 10/15	0.010	0.110	0.025
	10/15 to 11/12	0.010	0.063	0.022
	11/12 to 12/08	0.010	0.032	0.022
	12/08 to 01/06/83	0.010	0.033	0.022
D_2 Onsite	06/28 to 07/22	0.011	0.097	0.017
	07/22 to 08/19	0.011	0.094	0.013
	08/19 to 09/17	0.010	0.060	0.015
	09/17 to 10/15	0.010	0.047	0.015
	10/15 to 11/12	0.010	0.130	0.025
	11/12 to 12/08	0.010	0.030	0.013
	12/08 to 01/06/83	0.010	0.075	0.015
E Onsite	06/28 to 07/22	0.012	0.190	0.018
	07/22 to 08/19	0.013	0.121	0.019
	08/19 to 09/17	0.010	0.100	0.022
	09/17 to 10/15	0.010	0.075	0.020
	10/15 to 11/12	0.010	0.150	0.013
	11/12 to 12/08	0.010	0.032	0.018
	12/08 to 01/06/83	0.010	0.081	0.018
F Onsite	06/28 to 07/22	0.010	0.040	0.013
	07/22 to 08/19	0.010	0.071	0.014
	08/19 to 09/17	0.010	0.033	0.014
	09/17 to 10/15	0.010	0.070	0.016
	10/15 to 11/12	0.011	0.072	0.018
	11/12 to 12/08	0.010	0.041	0.018
	12/08 to 01/06/83	0.010	0.030	0.018

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

TABLE 15 (cont.)

CONTINUOUS RADIATION MONITORS* (GM)

mR/hr

SECOND HALF

LOCATION	PERIOD 1982	mR/hr MIN.	MAX.	AVG.
G Onsite	06/28 to 07/22	0.013	0.051	0.020
	07/22 to 08/19	0.019	0.052	0.024
	08/19 to 09/17	0.013	0.058	0.023
	09/17 to 10/15	0.013	0.041	0.023
	10/15 to 11/12	0.013	0.075	0.025
	11/12 to 12/08	0.013	0.032	0.022
	12/08 to 01/06/83	0.012	0.033	0.021
H Onsite	06/28 to 07/22	0.018	0.070	0.028
	07/22 to 08/19	0.014	0.092	0.033
	08/19 to 09/17	0.017	0.100	0.028
	09/17 to 10/15	0.015	0.080	0.022
	10/15 to 11/12	0.013	0.082	0.026
	11/12 to 12/08	0.013	0.037	0.025
	12/08 to 01/06/83	0.015	0.038	0.020
I Onsite	06/28 to 07/22	0.012	0.090	0.028
	07/22 to 08/19	0.014	0.110	0.033
	08/19 to 09/17	0.011	0.120	0.025
	09/17 to 10/15	0.012	0.060	0.028
	10/15 to 11/12	0.020	0.092	0.030
	11/12 to 12/08	0.015	0.035	0.025
	12/08 to 01/06/83	0.012	0.080	0.025
J Onsite	06/28 to 07/22	0.011	0.090	0.013
	07/22 to 08/19	0.010	0.080	0.013
	08/19 to 09/17	0.010	0.047	0.025
	09/17 to 10/15	0.012	0.051	0.028
	10/15 to 11/12	0.010	0.062	0.013
	11/12 to 12/08	0.010	0.028	0.013
	12/08 to 01/06/83	0.010	0.027	0.013
K Onsite	06/28 to 07/22	0.011	0.130	0.014
	07/22 to 08/19	0.012	0.081	0.014
	08/19 to 09/17	0.010	0.060	0.013
	09/17 to 10/15	0.010	0.065	0.018
	10/15 to 11/12	0.010	0.044	0.018
	11/12 to 12/08	0.010	0.022	0.013
	12/08 to 01/06/83	0.010	0.024	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
4	<0.17	<0.18	<0.28	<0.20	<0.18	<0.09	<0.13	<0.13
14	<0.17	<0.17	<0.29	<0.29	<0.17	<0.09	<0.10	<0.20
16	<0.16	<0.22	<0.34	<0.21	<0.18	<0.33	<0.14	<0.21
12	<0.17	<0.18	<0.30	<0.30	<0.19	<0.28	<0.13	<0.21
45	-	-	<0.29	<0.24	<0.18	<0.11	<0.13	<0.12
7	<0.14	<0.16	<0.23	<0.20	<0.14	<0.11	<0.14	<0.20
40 (Control)	<0.15	<0.22	<0.33	<0.25	<0.21	<0.38	<0.13	<0.17

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

\- Sampling station not in operation.

TABLE 17

CONCENTRATIONS OF GAMMA EMITTERS IN MILK

(MONTHLY COMPOSITE SAMPLES)

Results in Units of pCi/l ± 2 sigma

STATION *	NUCLIDES	5-03-82 to 5-17-82	6-07-82 to 6-21-82	7-12-82 to 7-26-82	8-09-82 to 8-23-82	9-13-82 to 9-20-82	10-04-82 to 10-18-82	11-08-82 to 11-29-82	12-06-82 to 12-20-82
No. 7	K-40	1300±130	1300±130	1500±150	1300±130	1300±130	1400±140	1500±150	1500±150
	Cs-134	<2.5	<3.1	<3.2	<2.4	<3.4	<3.3	<2.6	<3.1
	Cs-137	<5.1	<4.4	3.3±2.2	<3.5	<4.4	<4.0	<4.0	<3.3
	Ba-140	<41	<27	<50	<27	<37	<37	<110	<42
	La-140	<6.6	<7.1	<4.3	<4.0	<8.5	<3.3	<21	<12
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1500±150	1300±130	1400±140	1100±110	1700±170	1600±160	1400±140	1600±160
	Cs-134	<2.9	<3.3	<3.4	<3.5	<3.0	<3.8	<2.9	<3.4
	Cs-137	<5.3	<3.5	<4.9	<4.1	5.9±3.0	<4.0	<3.7	<4.8
	Ba-140	<41	<39	<51	<33	<31	<48	<110	<46
	La-140	<4.7	<5.8	<11	<7.9	<6.3	<8.1	<23	<8.3
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 45	K-40	- SEE NOTE -		1400±140(1)	1400±140	1100±110	1600±160	1500±150	1500±150
	Cs-134			<2.5	<2.8	<3.7	<4.0	<3.2	<4.3
	Cs-137			6.9±2.6	<4.5	<4.2	<5.8	<3.6	<6.1
	Ba-140			<36	<40	<32	<57	<140	<72
	La-140			<4.3	<7.9	<5.9	<11	<35	<12
	Others			<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 14	K-40	1400±140	1500±150	1400±140	1200±120	1200±120	1600±160	1500±150	1400±140
	Cs-134	<3.1	<3.1	<3.1	<2.3	<3.0	<3.8	<2.6	<3.3
	Cs-137	<4.3	<3.8	4.6±2.7	<3.4	<3.1	<4.7	<3.4	<4.3
	Ba-140	<53	<37	<55	<29	<34	<32	<110	<51
	La-140	<8.8	<7.3	<12	<4.3	<7.9	<5.3	<14	<10
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 12	K-40	1600±160	1300±130	1400±140	1300±130	1500±150	1600±160	1300±130	1400±140
	Cs-134	<3.5	<3.5	<4.2	<3.1	<3.0	<3.8	<2.8	<2.9
	Cs-137	<5.0	3.4±2.4	7.9±3.9	18±4	<4.8	<4.0	<5.9	<4.1
	Ba-140	<42	<110	<57	<49	<35	<48	<120	<45
	La-140	<8.8	<22	<7.3	<11	<11	<8.1	<31	<4.7
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

NOTE: No results - Sampling station not in operation.
Sampling began at farm No. 45 on 07/12/82.

* 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	5-03-82 to 5-17-82	6-07-82 to 6-21-82	7-12-82 to 7-26-82	8-09-82 to 8-23-82	9-13-82 to 9-20-82	10-04-82 to 10-18-82	11-08-82 to 11-29-82	12-06-82 to 12-20-82
No. 16	K-40	1400±140	1200±120	1600±160	1500±150	1500±150	1600±160	1600±160	1300±130
	Cs-134	<2.8	<3.9	<2.6	<2.7	<3.6	<4.0	<3.1	<3.2
	Cs-137	3.1±2.0	<4.9	<4.3	4.9±2.5	4.6±2.8	<5.8	<3.8	<4.8
	Ba-140	<34	<42	<41	<39	<47	<57	<140	<52
	La-140	<7.6	<12	<7.8	<7.0	<4.7	<11	<35	<11
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 40 (Control)	K-40	1400±140	1300±130	1500±150	1500±150	1300±130	1300±130	1500±150	1500±150
	Cs-134	<2.3	<2.8	<2.4	<3.3	<3.4	<2.3	<3.0	<3.1
	Cs-137	<3.3	<3.3	<3.9	<4.7	<4.4	<5.1	<3.7	<3.6
	Ba-140	<37	<20	<46	<58	<9.5	<41	<120	<110
	La-140	<7.7	<6.6	<9.1	<4.6	<2.2	<8.5	<25	<14
	Others	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

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

TABLE 18

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

Results in Units of pCi/l ± 2 sigma

Station*	May	June	July	August
4	<2.73	<4.78	3.02 ± 1.4	2.91 ± 0.71
14	5.45 ± 1.7	<1.49	2.66 ± 2.1	7.28 ± 3.0
16	2.77 ± 2.2	0.76 ± 0.67	1.93 ± 0.92	5.68 ± 0.85
12	4.16 ± 0.83	5.78 ± 1.1	3.98 ± 1.1	6.49 ± 1.3
45	-	-	6.89 ± 2.4	4.35 ± 0.88
7	9.76 ± 4.7	7.91 ± 1.5	3.43 ± 0.96	6.95 ± 1.4
40 (Control)	<3.3	0.925± 0.67	3.27 ± 2.0	4.20 ± 0.84

Station*	September	October	November	December
4	5.53 ± 1.0	3.68 ± 1.0	3.49 ± 2.6	3.38 ± 0.97
14	9.24 ± 8.7	4.93 ± 0.99	3.56 ± 1.3	2.20 ± 0.80
16	8.59 ± 2.2	4.30 ± 0.89	3.62 ± 1.9	4.58 ± 1.1
12	3.76 ± 1.2	6.68 ± 0.99	3.29 ± 1.1	2.66 ± 1.2
45	4.49 ± 1.2	5.19 ± 1.2	7.47 ± 1.6	5.00 ± 0.81
7	3.10 ± 2.1	2.33 ± 0.59	4.81 ± 1.3	2.01 ± 1.5
40 (Control)	2.17 ± 1.2	3.58 ± 0.69	3.61 ± 1.0	<15.9

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

\- Sampling station not in operation.

TABLE 19

MILCH ANIMAL CENSUS

SPRING 1982

TOWN	NUMBER ON CENSUS MAP [1]	NUMBER OF MILCH ANIMALS
Scriba	1	2 G
	16*	39 C
	2	20 C
	3	1 C
	6	2 C
New Haven	8	35 C
	9	45 C
	4*	55 C
	15*	18 C
	10	24 C
	5*	40 C
	11	34 C
	7*	51 C
Mexico	12	62 C
	13	2 C
	14*	65 C
	17	38 C
	18	46 C
	19	43 C
	20	37 C
	21	5 C
	22	35 C
	23	150 C
	24	35 C
	25	82 C
Richland	26	42 C
	27	58 C
Oswego	28	30 C
Hannibal	45**	33 C
Volney	29	2 C
	TOTALS	1,129 Cows
		2 Goats

C = Cows
G = Goats
* = Milk Sample Locations
** = Milk Sample Control Location
1 = Figure 5, Section VII

TABLE 19 (cont.)

MILCH ANIMAL CENSUS

SUMMER 1982

TOWN	NUMBER ON CENSUS MAP [1]	NUMBER OF MILCH ANIMALS
Scriba	1	2 G
	16*	39 C
	2	20 C
	3	1 C
	6	1 C
New Haven	8	30 C
	9	40 C
	4*	70 C
	15*	20 C, 1 G
	10	26 C
	5*	45 C
	11	40 C
	7*	52 C
Mexico	12	70 C
	13	2 C
	14*	60 C
	17	34 C
	18	42 C
	19	45 C
	20	40 C
	21	8 C
	22	40 C
	23	114 C
	24	37 C
	25	75 C
Richland	26	37 C
	27	60 C
Oswego	28	29 C
Hannibal	45**	34 C
Volney	29	30 C
	TOTALS	1,141 Cows
		3 Goats

C = Cows
G = Goats
* = Milk Sample Locations
** = Milk Sample Control Location
1 = Figure 5, Section VII

TABLE 26

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	4-23-82	Beef	<0.5	5.2±0.5	<3.7	<0.03	<0.03	All<LLD
B (Control)	5-03-82	Beef	<0.2	5.9±0.6	<0.9	<0.02	<0.02	All<LLD
I	5-05-82	Chicken	<0.3	6.8±0.7	<0.8	<0.02	<0.02	All<LLD
I	5-05-82	Eggs	<0.3	3.5±0.4	<0.7	<0.02	<0.02	All<LLD
K	5-06-82	Eggs	<0.3	3.2±0.4	<0.8	<0.02	<0.02	All<LLD
J	5-06-82	Chicken	<0.3	6.5±0.7	<0.8	<0.02	<0.03	All<LLD
J	5-06-82	Eggs	<0.5	3.5±0.5	<1.0	<0.04	<0.04	All<LLD
K	5-07-82	Chicken	<0.3	8.4±0.8	<0.9	<0.02	0.03±0.02	All<LLD
D	5-10-82	Pork	<0.2	2.4±0.3	<0.4	<0.01	0.02±0.01	All<LLD
C	5-10-82	Beef	<0.3	6.0±0.6	<0.8	<0.02	0.08±0.02	All<LLD
L (Control)	5-12-82	Chicken	<0.3	5.4±0.5	<0.5	<0.02	<0.03	All<LLD
L (Control)	5-12-82	Eggs	<0.3	3.8±0.5	<0.4	<0.02	<0.02	All<LLD
Q	9-07-82	Swiss Chard	0.14±0.07	7.4±0.7	<0.02	<0.01	<0.01	All<LLD
T (Control)	9-07-82	Swiss Chard	0.12±0.07	9.3±0.9	<0.02	<0.01	<0.01	All<LLD
P	9-07-82	Tomatoes	<0.03	2.1±0.2	<0.04	<0.003	<0.003	All<LLD
R	9-07-82	Cabbage	<0.07	2.4±0.2	<0.01	<0.008	<0.009	All<LLD
R	9-07-82	Tomatoes	<0.04	1.8±0.2	<0.06	<0.003	<0.004	All<LLD
S (Control)	9-07-82	Tomatoes	<0.04	2.6±0.3	<0.06	<0.003	<0.004	All<LLD
N	9-07-82	Cabbage	<0.04	1.5±0.2	<0.008	<0.004	<0.005	All<LLD
N	9-07-82	Zucchini	<0.04	1.9±0.2	<0.1	<0.002	<0.003	All<LLD
E	11-05-82	Beef	<0.2	2.9±0.3	<0.4	<0.01	<0.01	All<LLD
F	11-10-82	Beef	<0.2	2.5±0.3	<0.4	<0.02	0.02±0.01	All<LLD

* Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 20 (cont.)

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
L (Control)	11-10-82	Chicken	<0.2	4.1±0.4	<0.4	<0.01	<0.02	All<LLD
L (Control)	11-10-82	Eggs	<0.2	2.0±0.2	<0.2	<0.01	<0.02	All<LLD
M	11-10-82	Chicken	<0.3	3.6±0.4	<0.5	<0.02	<0.02	All<LLD
M	11-10-82	Eggs	<0.2	1.4±0.2	<0.3	<0.01	<0.01	All<LLD
G (Control)	11-10-82	Beef	<0.2	2.8±0.3	<0.4	<0.02	<0.02	All<LLD
H	11-11-82	Beef	<0.2	3.5±0.4	<0.4	<0.01	0.02±0.01	All<LLD
I	11-11-82	Chicken	<0.2	3.1±0.3	<0.3	<0.01	<0.02	All<LLD
I	11-11-82	Eggs	<0.1	1.2±0.2	<0.2	<0.01	<0.01	All<LLD
J	11-11-82	Chicken	<0.2	4.2±0.4	<0.4	<0.01	<0.02	All<LLD
J	11-11-82	Egg	<0.2	1.6±0.2	<0.3	<0.01	<0.02	All<LLD

* Corresponds to sample locations noted on Figure 4, Section VII.

TABLE 21

CONCENTRATION OF GAMMA EMITTERS IN PASTURE GRASS

Results in Units of pCi/g (wet)

Station Code *	Sample Type	Sample Date	Ra-226	Be-7	Cs-134	Ru-106	Cs-137	Nb-95	Co-58	Mn-54	Co-60	K-40	Ce-144
40	Pasture Grass	07/26/82	2.61±1.70	< 8.86	<0.255	<3.13	<0.273	<2.36	<0.586	<0.341	<0.363	12.9 ±3.40	<1.41
4	Pasture Grass	07/26/82	<3.98	< 7.80	<0.259	<2.43	<0.236	<2.01	<0.545	<0.297	<0.294	17.0 ±3.47	<1.30
14	Pasture Grass	07/26/82	2.87±1.40	4.28±2.57	<0.159	<1.82	<0.159	<1.57	<0.447	<0.211	<0.197	17.7 ±2.39	<0.896
12	Pasture Grass	07/26/82	3.07±3.97	< 8.00	<0.22	<2.46	<0.224	<1.92	<0.775	<0.288	<0.322	18.1 ±4.03	<1.50
16	Pasture Grass	07/26/82	<2.91	< 5.95	<0.146	<1.87	<0.160	<1.43	<0.455	<0.204	<0.234	15.1 ±2.95	<0.944
7	Pasture Grass	07/26/82	<4.38	< 7.85	<0.291	<3.03	<0.280	<2.07	<0.740	<0.362	<0.358	21.3 ±4.20	<1.39
45	Pasture Grass	07/26/82	4.50±3.06	< 9.84	<0.291	<2.75	<0.329	<2.24	<0.824	<0.390	<0.376	30.4 ±4.93	<1.56
40	Pasture Grass	08/23/82	<3.21	9.22±7.09	<0.175	<2.02	0.347±0.133	<2.36	<0.733	<0.232	<0.168	23.4 ±3.16	<1.32
4	Pasture Grass	08/23/82	<3.72	<11.2	<0.233	<2.45	<0.206	<2.79	<0.744	<0.282	<0.248	22.2 ±3.44	<1.38
14	Pasture Grass	08/23/82	2.28±1.53	< 9.43	<0.179	<1.78	<0.198	<2.93	<0.641	<0.215	<0.119	27.1 ±3.61	<0.949
12	Pasture Grass	08/23/82	<2.85	6.91±5.07	<0.177	<2.11	<0.160	<3.07	<0.733	<0.260	<0.187	27.4 ±3.48	<1.20
16	Pasture Grass	08/23/82	<2.60	< 8.58	<0.141	<1.76	<0.167	<2.54	<0.627	<0.208	<0.200	9.31±2.18	<0.936
7	Pasture Grass	08/23/82	4.76±1.86	10.9 ±6.27	<0.192	<2.00	<0.238	<2.62	<0.699	<0.258	<0.314	19.7 ±3.45	<1.23
45	Pasture Grass	08/23/82	<3.12	8.28±5.26	<0.201	<1.98	<0.182	<3.36	<0.639	<0.206	<0.244	23.7 ±3.31	<1.26
40	Pasture Grass	09/20/82	<3.70	< 8.89	<0.219	<2.16	<0.236	<2.26	<0.722	<0.279	<0.305	19.8 ±3.43	<1.13
4	Pasture Grass	09/20/82	<2.52	< 6.83	<0.162	<1.84	<0.146	<1.87	<0.522	<0.180	<0.167	20.4 ±3.31	<0.910
14	Pasture Grass	09/20/82	2.11±1.54	<10.00	<0.235	<2.41	<0.239	<2.07	<0.780	<0.317	<0.246	22.4 ±3.65	<1.42
12	Pasture Grass	09/20/82	2.64±1.71	< 8.01	<0.211	<1.84	<0.180	<1.80	<0.617	<0.188	<0.185	12.2 ±2.06	<1.29
16	Pasture Grass	09/20/82	2.36±1.47	< 8.05	<0.208	<1.82	<0.184	<2.11	<0.479	<0.261	<0.230	17.3 ±3.08	<1.04
7	Pasture Grass	09/20/82	1.73±0.847	< 5.26	<0.127	<1.29	<0.141	<1.32	<0.337	<0.158	<0.183	29.9 ±2.87	<0.775
45	Pasture Grass	09/20/82	3.73±1.70	8.86±5.18	<0.229	<2.09	<0.181	<1.77	<0.557	<0.240	<0.261	12.9 ±3.01	<1.13

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

V

DATA SUMMARIES AND CONCLUSIONS

V DATA SUMMARIES AND CONCLUSIONS

The results of the 1982 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 1982 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 1982. 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 1982 standards.

LAKE PROGRAM

Tables 1 through 8 list the 1982 analytical results for the aquatic/lake water media sampled during the 1982 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 1982 sample program.

The first collection of periphyton was completed on June 17, 1982 and the second collection was completed on August 16, 1982. The gamma spectral analysis of periphyton samples showed detectable

concentrations of Cs-134, Cs-137, Mn-54, Co-60, Be-7, Ra-226, Ce-144, Th-232 and K-40. The nine 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 radionuclides detected in 1982 periphyton samples were Cs-137 and Ce-144. 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 the 1982 samples. The other fallout radionuclides were not detected in 1982 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 17, 1982 contained detectable concentrations of Be-7, K-40, Co-60, Cs-137, Ce-144, Ra-226 and Th-232. The maximum detectable concentrations for plant related radionuclides were 0.018 pCi/g (wet) for Co-60 and 0.062 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 control sample. Ce-144, a fallout radionuclide, was also detected in the control sample collected in June. Ce-144 was detected in only one of the six periphyton samples collected in 1982 and its presence is attributed to past nuclear weapons testing. Ce-144 was also detected in air particulate samples collected during 1982 at both the onsite and offsite sample locations.

The second collection of periphyton samples completed on August 16, showed a small increase in the concentrations of plant related radionuclides. The maximum concentrations of plant related radionuclides in the second or summer collection were 0.38 pCi/g (wet) for Cs-137, 0.033 pCi/g (wet) for Cs-134, 0.06 pCi/g (wet) for Co-60 and 0.02 pCi/g (wet) for Mn-54. Cs-134 and Mn-54 which were detected in the August samples were not found in the June 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 1982 samples. Be-7, K-40, Ra-226 and Th-232 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 1982 samples at the indicator locations. A similar increase in concentration in samples collected in late summer was also noted in 1980 and 1981. 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 1982 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 have decreased in 1982 from a secondary peak in 1981 which was the result of fallout from a nuclear weapons test conducted in October of 1980. The downward trend of Cs-137 concentrations should continue in the following years if no future atmospheric nuclear testing is conducted. Co-60 concentration in periphyton showed a general reduction in concentration at the indicator stations but remains slightly above control station values for the six years between 1974 and 1980. Ce-144 also showed a marked decrease in concentration from 1981, as did Cs-137 with levels returning close to background (LLD) at both the indicator and control sample locations. Both the 1977 and 1981 peaks represented on the graph in Section VII are attributed to fallout from atmospheric testing with the 1982 concentration representing the general reduction of Ce-144 concentrations in the environment due to radiological decay of Ce-144. Graphs depicting concentrations of Cs-137, Co-60 and Ce-144 are present in Section VII.

2. BOTTOM SEDIMENT - TABLE 2

Bottom sediment samples were collected twice during the 1982 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 September/October in 1982 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 1982, which included both the onsite and offsite

samples. Co-60 was detected in three of the six samples and Sr-90 was detected in two of the six 1982 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 level of Cs-137 detected in the June offsite or control sample exceeds the concentrations of any one of the four onsite or indicator stations collected during the year. The maximum control station value was 0.75 pCi/g (dry) which was greater than two times the concentration detected at either of the indicator stations during the same sample period. The Cs-137 concentrations ranged from 0.75 to 0.29 pCi/g (dry) for the control samples and from 0.30 to 0.05 pCi/g (dry) for the indicator samples. The control sample values for Cs-137 showed similar trends in 1979, 1980 and 1981 when the control concentrations exceeded those that were detected at the indicator locations.

Co-60 was detected in three of the four indicator samples collected in 1982. Positive detections of Co-60 ranged from a minimum of 0.09 pCi/g (dry) to a maximum of 0.19 pCi/g (dry). The detected levels of Co-60 are lower than the concentrations detected in 1981 when the minimum concentration was 0.11 pCi/g (dry) and the maximum value was 0.27 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 1982. 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 four onsite samples collected in 1982. Both positive detections were made at the Nine Mile Point (02) transect. Sr-90 was not detected at the second onsite sample location or the control sample location. The presence of Sr-90 at the indicator location is considered to be the result of weapons fallout even though Sr-90 was not detected at the control location. Sr-90 was detected in the control station samples during 1979, 1980 and 1981 which is evidence that Sr-90 is attributable to weapons testing fallout. The LLD value for the control location samples are near the detected concentrations of Sr-90 and in one case (October) is above the detected concentration of 0.013 pCi/g (dry). 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 mean 1982 indicator concentration for Sr-90 was 0.037 pCi/g (dry).

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 0.24 pCi/g (dry) is calculated to be 0.0019 mrem per year whole body dose. The whole body dose from a Co-60 concentration of 0.19 pCi/g (dry) would be equal to 0.0061 mrem per year. The resulting total whole body dose would be equal to 0.080 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. 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. This change in trend for the Cs-137 concentrations may be the effect of the sample location's close proximity to the Oswego River outlet and 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 was detected in 1977. The concentration of Co-60 in the indicator samples (mean) shows a consistent downward trend since 1977 that continued through 1981 with a slight increase in mean concentration for 1982. The increase noted in 1982 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 1982 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 1982 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 1982 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 and 1981. The 1982 Sr-90 concentrations ranged from a maximum of 0.12 pCi/g (wet) to a minimum of 0.018 pCi/g (wet) with the control station mean equal to 0.027 pCi/g (wet) and the indicator mean equal to 0.097 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 1982. 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 0.31 pCi/g (wet) to a minimum of 0.15 pCi/g (wet). Co-60 concentrations ranged from a maximum of 0.07 pCi/g (wet) to a minimum of 0.04 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.

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 0.0003 mrem/year to the whole body and 0.0043 mrem/year to the gastrointestinal tract for the maximum Mn-54 concentration of 0.31 pCi/g (wet). The dose resulting from the Co-60 concentration of 0.07 pCi/g (wet) would be 0.0003 mrem/year to the

* Eisenbud (1973)

whole body and 0.0028 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 0.0006 mrem to the whole body and 0.0071 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 drop since 1976 when both radionuclides were detected at their maximum level. The concentration of Mn-54 detected in the 1982 samples is a small increase from 1980 and 1981 but remains below the levels of 1978 and 1979. This small increase in Mn-54 concentration is not a direct indication of an upward trend for Mn-54 concentrations. The particular sample or samples collected will have an influence on the level of Mn-54 detected. Such factors as age, physical size or exact location of the sample with respect to the plant will result in small deviation from the true mean concentrations. The difference in concentrations between 1982 levels and those detected in 1980 and 1981 would probably be within the bounds of the associated sampling error or variability, though the exact values for such bounds would be difficult to determine. The Co-60 concentration in the indicator samples showed a small decrease from levels detected in 1981. 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 1982 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 as mollusk habitat.

4. GAMMARUS - TABLE 4

GAMMARUS samples were collected once during the 1982 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 location (00) and at the NMPP (02) and JAF (03) transects for the summer sampling. Three collections are normally required to collect sufficient samples for acceptable analyses. The first collection of GAMMARUS attempted in the spring of 1982 yielded sample weights of only 4.0 g, 0.1 g and 0.0 g respectively for the Oswego, NMPP and JAF transects. Three sampling attempts were made at each sample location during the period of June 15 through June 18, 1982. The sample sizes collected were insufficient for analysis. The difficulties in obtaining sufficient sample size is experienced each year. 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 samples was also impeded by the unusually cold water temperature experienced in the spring of 1982 resulting in few GAMMARUS inhabiting the shoreline shallows.

Sampling for GAMMARUS in the summer provided sufficient quantities of this organism for analysis. The analytical sensitivities were good for the summer samples with the exception of the JAF (03) transect sample. The JAF sample resulted in sensitivities of <1.1 pCi/g (wet) for Co-60 and <0.7 pCi/g (wet) for Cs-137. These sensitivities are acceptable, but several times higher than those achieved for the control and the NMPP samples.

The analyses of the summer GAMMARUS collected in August showed no measurable concentrations of Co-60, Cs-137, Cs-134 or any other plant related radionuclides. Strontium-90 was detected in each of the samples collected in 1982 in both the indicator and control samples. As noted previously similar detections of Sr-90 were made in mollusk samples. Sr-90 was also detected in many of the fish samples analyzed in 1982. Sr-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 collected in 1982 and the lack of detectable concentrations in 1980 and 1981 (second collection only) indicates that the presence of these nuclides is not routine. The dose to man as a result of plant related radionuclides would be zero as no such nuclides were detected in 1982. The importance of any activity detected in these organisms is only significant with respect to the passage of any radionuclides through the food chain to a tropic level which may impact man.

Historical data for GAMMARUS sample results shows a small increase in Cs-137 from 1981 sample concentrations for the indicator samples. The 1982 indicator mean concentration was approximately one third of the peak onsite concentration detected in 1980 [0.64 pCi/g (wet)]. The mean lower limit of detection for Cs-137 in 1982 was <0.45 pCi/g (wet) which was many times less than the positive detection of 4.7 pCi/g (wet) for Cs-137 in 1981. No definite trend can be determined for 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 (June 1982) and in the fall season (October 1982). 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.

Analysis of the 1982 fish samples indicated 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). Sr-89 and Sr-90 were also detected in control as well as indication samples. 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 0.044 to 0.054 pCi/g (wet) and averaged 0.050 pCi/g (wet) for the indicator samples. Cs-137 in the control samples ranged from 0.047 to 0.051 pCi/g (wet, and averaged 0.049 pCi/g (wet) for lake trout. Cs-137 in brown trout samples ranged from 0.048 to 0.064 pCi/g (wet) and averaged 0.056 pCi/g (wet). Cs-137 in the control samples was 0.049 pCi-g (wet) (one sample collected).

Sr-89 was detected in four of the nine samples collected. Two of the four samples were control samples. The remaining two samples were collected at the NMP (02) and the JAF (03) locations. Of the positive results, the highest concentration was found in the control sample. This concentration, however, was only slightly above the indicator sample results.

Sr-89 in lake trout samples ranged from 0.003 to 0.005 pCi/g (wet) and averaged 0.004 pCi/g (wet) in the control samples. Sr-89 was not detected in the indicator samples for lake trout. Brown trout samples showed detectable concentrations of Sr-89 in the indicator samples ranging from 0.0034 to 0.0036 pCi/g (wet) and a mean of 0.0035 pCi/g (wet). The control brown trout sample showed no detectable Sr-89. All positive Sr-89 results are considered to be representative of normal background Sr-89 concentrations in fish. Background levels are a result of past weapons testing in this case.

Sr-90 was detected in five of the nine samples collected. One of the five samples was a control sample. The remaining samples with positive Sr-90 results were at the NMP (02) and the JAF (03) locations.

Of the five positive results, the control result had the highest concentration. Lake trout samples for the indicator locations showed Sr-90 concentrations ranging from 0.0026 to 0.0043 pCi/g (wet) and a mean of 0.0036 pCi/g (wet). The lake trout control sample result showed no detectable Sr-90. However, the control sample result for brown trout was 0.013 pCi/g (wet), significantly greater than the indicator sample mean of 0.0036 pCi/g (wet) for the lake trout samples. Sr-90 was not detected in the indicator samples for brown trout. As noted above, the control sample result for brown trout was 0.013 pCi/g (wet).

All positive results are considered to be representative of normal background Sr-90 concentrations in fish. This is especially evident when considering the highest Sr-90 concentration in the spring fish collections for the indicator samples (0.004 pCi/g [wet]) and the highest concentration in the control samples (0.013 pCi/g [wet]). These background levels of Sr-90 are a result of past weapons testing.

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 2.1 to 3.6 pCi/g (wet) and 2.5 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. Control samples showed Cs-137 concentration to be greater than the indicator samples from the onsite locations. 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 0.034 to 0.045 pCi/g (wet) and averaged 0.042 pCi/g (wet). Lake trout samples at the control location ranged from 0.050 to 0.055 pCi/g (wet) and averaged 0.052 pCi/g (wet). Brown trout samples from the indicator locations ranged from 0.049 to 0.053 pCi/g (wet) and averaged 0.051 pCi/g (wet). The associated control sample was 0.047 pCi/g (wet).

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

Sr-90 was detected in five of the nine samples collected. Sr-90 was detected in indicator as well as control sample locations. Indicator samples for both lake trout and brown trout showed Sr-90 concentrations approximately equal to control sample locations. Indicator

samples ranged from 0.0021 to 0.0054 pCi/g (wet) and averaged 0.0033 pCi/g (wet). Control sample results ranged from 0.0021 to 0.0041 pCi/g (wet) and averaged 0.0028 pCi/g (wet). Sr-90 results at both indicator and control sample locations are indicative of background Sr-90 concentrations and are a result of past weapons testing.

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 2.1 to 3.2 pCi/g (wet) and 2.5 to 3.0 pCi/g (wet) for the control samples. No other radionuclides were detected in any of the fall fish samples.

In addition to the normal fall fish samples, extra samples were collected shortly after the lake trout and brown trout sample collections. White sucker samples were collected at this time. White sucker samples were not available at all locations during the schedule sample collections (i.e., when the lake trout and brown trout samples were collected). White sucker samples were analyzed because they represent a group of "bottom feeders" contrasting the predatory species of lake trout and brown trout.

Samples of white sucker were collected in the vicinity of the NMP and JAF discharges as well as from the inlet canal at the Oswego Steam Station (control sample). Gamma spectral analyses were performed on these three samples. Analyses for Sr-89 and Sr-90 were also performed. These samples are not considered Environmental Technical Specification (ETS) samples.

Cs-137 was detected in all three of the white sucker samples (control and indicator sample locations). Cs-137 in the two indicator samples was 0.61 pCi/g (wet) and 0.39 pCi/g (wet) respectively. Cs-137 in the control sample was 0.027 pCi/g (wet). Although the one indicator sample (NMP) had a detected concentration of 0.061 pCi/g (wet) or approximately two times the control result of 0.027 pCi/g (wet), this difference is not considered significant because of the minute amounts of Cs-137 measured in these two samples. In addition, control sample data in 1981 showed Cs-137 concentrations as high as 0.058 pCi/g (wet).

K-40 was detected in all three extra white sucker samples. Detected concentrations ranged from 3.6 to 4.5 pCi/g (wet). The control sample showed 2.8 pCi/g (wet). It is interesting to note here that the same pattern of concentration in the indicator and control samples for Cs-137 is present for K-40 (in fact the proportions are almost identical). That is, the K-40 and Cs-137 concentrations were approximately 200% of the control result at the JAF location and approximately 130% of the control result at the NMP location.

No other gamma emitting radionuclides were detected in the extra white sucker samples.

Sr-89 and Sr-90 concentrations for the fall extra white sucker samples were all less than the minimum detectable level. Sr-89 and Sr-90 was not detected in any of the control or indicator samples.

Review of past environmental data indicates that the Sr-89 concentrations have decreased steadily since 1976 for both indicator and control locations. The indicator sample mean results have decreased significantly since 1976. These results range from a mean of 0.27 pCi/g (wet) in 1976 to 0.0036 pCi/g (wet) in 1982. Control sample results have also decreased significantly from 0.24 pCi/g (wet) in 1976 to 0.0042 pCi/g (wet) in 1982. Sr-90 mean sample results have decreased significantly since 1976 as well. Indicator sample results have decreased from 0.28 pCi/g (wet) in 1976 to a low of 0.0035 pCi/g (wet) in 1982. 1981 and 1982 mean sample results are approximately the same. Control sample results have decreased as well, from 0.25 pCi/g (wet) in 1976 to 0.0026 pCi/g (wet) in 1982. Sr-90 was not detected in 1981, however, the LLD level and the 1982 detected level are approximately equal. 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 1982 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 0.048 pCi/g (wet) in 1982. Control sample results have also decreased from a level of 0.12 pCi/g (wet) in 1976 to a level of 0.050 pCi/g (wet) in 1982. Results from 1979 to 1982 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 0.048 pCi/g (wet) (annual mean result of indicator samples for 1982), the whole body dose received would be 0.024 mrem per year. The critical organ in this case is the liver which would receive a calculated dose of 0.036 mrem per year. Using the same above criteria, the calculated doses associated with Sr-89 are 0.003 mrem per year whole body dose and 0.102 mrem per year bone dose (critical organ). Calculated doses as a result of Sr-90 are 0.616 mrem per year whole body dose and 2.510 mrem per year bone dose (critical organ). These 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 0.050 pCi/g (wet). The calculated Cs-137 whole body dose is 0.025 mrem per year and the associated dose to the liver is 0.038 mrem per year. Doses as a result of Sr-89 are 0.003 mrem per year (whole body) and 0.106 mrem per year (bone). Sr-90 doses are 0.62 mrem per year (whole body) and 2.615 mrem per year (bone).

Calculated doses as a result of fish consumption (lake trout and brown trout) at the indicator and control locations are presented below.

	Indicator		Control	
	Whole Body*	Critical Organ*	Whole Body*	Critical Organ*
Cs-137	0.024	0.036 (liver)	0.025	0.038 (liver)
Sr-89	0.003	0.102 (bone)	0.003	0.106 (bone)
Sr-90	0.616	2.510 (bone)	0.642	2.615 (bone)

*Doses in mrem per year. Consumption assumed for all months.

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 background doses. Doses from the consumption of white sucker samples are not considered here since these fish are rarely if ever consumed.

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

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

1982 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 1982 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 Nine Mile Point Unit #1 and the James A. FitzPatrick inlet canals (3.00 pCi/liter) was approximately the same as the 1981 mean inlet canal results (3.0 pCi/liter), and was significantly less than the annual mean results for the years prior to 1981. The Nine Mile Point Unit #1 canal samples were greater than the control samples for six of the 12 monthly samples analyzed and ranged from 1.27 pCi/liter to 4.72 pCi/liter. The James A. FitzPatrick canal samples were greater than the control samples for 10 of the 12 monthly samples and ranged from 1.98 pCi/liter to 3.53 pCi/liter. The control sample results ranged from 1.79 pCi/liter to 3.20 pCi/liter. The fluctuation in the gross beta canal sample results is due to the natural variation in concentration of naturally occurring radionuclides. A slight increase in the gross beta activity was noted in the Nine Mile Point inlet canal samples for September and October. These two results (4.72 pCi/liter and 3.89 pCi/liter respectively) are most probably as a result of liquid waste discharges in September and October and the reverse flow mode of the circulating water system. The discharges and reverse flow mode are covered in more detail below.

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 1982. (See historical data graphs Section VII.)

Gamma spectral analysis was performed on 36 monthly composite samples required by the Environmental Technical Specifications. Three radionuclides were detected in the inlet canal samples. Two of these radionuclides were plant related and the remaining radionuclide was naturally occurring.

Co-60 was detected in the inlet canal samples for the Nine Mile Point and James A. FitzPatrick facilities. Co-60 was detected in the James A. FitzPatrick inlet canal samples in January, March, and August (1.58 pCi/liter, 2.37 pCi/liter, and 1.61 pCi/liter respectively). The detected quantity of Co-60 was possibly the result of intake tempering in January. On this occasion, a portion of the warm discharge water is circulated into the inlet canal. As a result of normal liquid discharges, a small portion of this discharge enters the inlet canal and may be sampled. The concentration detected is very small and is at the lower limit of detection. The March and August inlet canal samples, as noted above, also showed Co-60 (2.37 pCi/liter, 1.61 pCi/liter). The concentration detected here was most probably a result of instrument background. Co-60 has been

detected in environmental samples on a few occasions as a result of a minute Co-60 background at the onsite counting laboratory. Co-60 was not detected in the Nine Mile Point inlet canal samples during 1982, therefore any detection of Co-60 in the James A. FitzPatrick canal samples was most probably a result of tempering (January) and/or instrument background (March, August). It should be noted that a quality control sample split, for the FitzPatrick March 1982 inlet canal, was analyzed by an independent contractor. The analysis of the sample split showed no detectable Co-60. The reported lower limit of detection (LLD) for this sample was <0.57 pCi/l which is one quarter of the 2.37 pCi/l reported for the routine or in-house sample analysis. The lack of a positive Co-60 detection in the quality control sample indicates the presence of instrument or environmental background. Efforts are made to keep background levels at a minimum (below detectable levels), but because of the small quantity of material required to increase the background above detectable levels and variability of these small concentrations, background levels of plant radionuclides will at times be present.

Cs-137 was detected once during 1982 in the James A. FitzPatrick inlet canal samples for the month of January. The concentration detected here was 0.43 pCi/liter. The detection of Cs-137 in the January sample was again most probably the result of inlet canal tempering as noted above for the detection of Co-60 during January. This concentration is minute and is at the lower limit of detection for the other monthly samples.

No other radionuclides were detected in the James A. FitzPatrick inlet canal samples with the exception of naturally occurring K-40. K-40 was detected twice during 1982 for the months of September and November. The concentrations detected during these months were 16.5 pCi/liter and 14.2 pCi/liter respectively.

Co-60 was not detected during 1982 in the Nine Mile Point inlet canal samples. The lower limit of detection values for monthly samples ranged from 1.11 pCi/liter to 2.02 pCi/liter which was at the approximate detection limits for Co-60 in the James A. FitzPatrick samples. Two monthly samples did show Cs-137 concentrations for the months of September and October. The concentrations detected here were slightly above the lower limit of detection for Cs-137 in the other monthly samples. The September sample showed a Cs-137 concentration of 3.72 pCi/liter and the October sample showed a Cs-137 concentration of 3.25 pCi/liter.

The presence of Cs-137 in the Nine Mile Point inlet canal samples during September and October is a result of liquid discharges made during those months and the fact that the circulating water flow was in a reverse flow mode. In this case, a portion of the inlet canal becomes the pathway for the discharge flow and a portion of the discharge canal becomes a pathway for the intake flow. The liquid discharge pipe is located in the discharge canal vertical shaft which is part of the portion of the discharge canal that is affected by the

reverse flow mode (i.e., this part of the canal receives intake water in the reverse flow mode). The intake sample (taken at the discharge canal during reverse flow) is downstream of the liquid waste discharge pipe. It is not practical or possible to acquire an inlet water sample prior to (i.e., upstream) the liquid waste discharge pipe considering the present inlet/discharge canal system design. Therefore, as noted above, the intake water sample contained a portion of the liquid waste discharge. Liquid waste discharges were made in September and October of 1982 which were the same months that Cs-137 was detected in the monthly inlet canal samples. Liquid waste discharges were not made in November and December (with the exception of a very minor discharge in November). The corresponding inlet samples showed no detectable radionuclides with the exception of K-40.

No other radionuclides were detected in the Nine Mile Point inlet canal samples other than Cs-137 and K-40. K-40 was detected in the April and December inlet canal samples. The concentrations detected were 16.9 pCi/liter and 16.3 pCi/liter respectively.

Water samples of the 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 October at a concentration of 14.3 pCi/liter.

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 or the James A. FitzPatrick inlet canal. The lower limit of detection values for the City of Oswego water treatment plant and the James A. FitzPatrick inlet canal samples ranged from <0.43 pCi/liter to <1.80 pCi/liter (LLD). Sr-89 was detected once in the Nine Mile Point inlet canal composite samples at a concentration of 0.61 pCi/l in the fourth quarter of 1982. The presence of Sr-89 in the fourth quarter sample is attributed to the reverse flow mode for the inlet/discharge canal system as detailed above.

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 quarterly samples for 1982 at all three locations. At the City of Oswego water treatment plant or control location, Sr-90 ranged from 0.75 pCi/liter to 5.30 pCi/liter with a mean of 2.04 pCi/liter. Sr-90 in the Nine Mile Point inlet canal samples ranged from 0.40 pCi/liter to 3.07 pCi/liter and showed a mean of 1.16 pCi/liter. The James A. FitzPatrick inlet canal samples showed Sr-90 ranging from 0.69 pCi/liter to 1.55 pCi/liter and a mean value of 1.01 pCi/liter. As demonstrated, the control location showed the highest mean result (2.04 pCi/liter) which is a result of natural variation in the distribution of Sr-90. Sr-90, as detected in the 1982 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 112 pCi/liter to 307 pCi/liter with a mean of 165 pCi/liter. Tritium concentrations for the James A. FitzPatrick inlet canal ranged from 198 pCi/liter to 311 pCi/liter and showed a mean concentration of 267 pCi/liter. Inlet canal samples taken at Nine Mile Point showed tritium concentrations ranging from 202 pCi/liter to 4,620 pCi/liter. The annual mean concentration was 1,478 pCi/liter.

The maximum concentration (4,620 pCi/liter) and the mean concentration (1,478 pCi/liter) were significantly greater than the control results. As noted above for the detection of Cs-137 in the Nine Mile Point inlet canal samples during September and October, liquid waste discharges were made during September and October. These discharges contained concentrations of tritium. As a result of the reverse flow mode and the location of the liquid waste discharge pipe, a portion of this effluent was sampled (the sampling equipment is located slightly downstream of the liquid waste pipe). Since monthly samples are composited to quarterly samples, it stands to reason that the third and fourth quarter sample of the inlet canal should show tritium concentrations. Observation of the data shows that the third quarter sample was approximately four times the normal inlet canal concentrations and the fourth quarter result was approximately 23 times the normal canal concentrations. Since a significant portion of the September - October discharges were made in October, it is reasonable to expect that the fourth quarter (October - December) inlet canal sample would demonstrate the higher tritium concentration of the two. Although this sample represents intake water from Lake Ontario, the presence of tritium in this sample is indicative of the location of the liquid waste discharge pipe. During the third and fourth quarters, the James A. FitzPatrick inlet canal samples showed tritium concentrations consistent with the first half of the year and within the natural variability of tritium in lake water.

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 more 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 2.98 pCi/liter (1981) to 4.53 pCi/liter (1978). The indicator annual mean for 1982 was 3.00 pCi/liter. Control annual means also were relatively high during 1975 to 1977. During these years, the concentrations ranged from 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 2.60 pCi/liter (1980) to 3.55 pCi/liter (1978). The control annual mean for 1982 was 2.42 pCi/liter.

Review of previous data for Sr-89 and Sr-90 demonstrates that results have been variable since 1975. Sr-89 for the indicator samples has ranged from not detected (1976, 1977, and 1979) to 0.78 pCi/liter (1981) and has been relatively constant. At the control locations, Sr-89 ranged from not detected (1975 - 1978 and 1981) to 1.4 pCi/liter (1980). During 1982, Sr-89 showed an annual mean of <0.97 pCi/liter (LLD) at the control location and 0.61 pCi/liter (mean based on a single detection) at the indicator locations. 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 1.00 pCi/liter (1977 and 1980). Mean results at the control sample location ranged from not detected (1975 - 1978) to 1.10 pCi/liter (1980). The annual mean Sr-90 results for the indicator samples and control samples were 1.16 pCi/liter and 2.04 pCi/liter respectively.

Previous annual mean results for tritium at the indicator sample location has decreased slightly since 1976. Sample results were available since 1974 through 1981 and showed a peak value of 513.0 pCi/liter (1976) and a minimum value of 234 pCi/liter (1979). The annual mean tritium result at the indicator locations for 1982 was 740 pCi/liter. This result is higher than the annual mean for any of the previous years but this mean reflects the two elevated results at the Nine Mile Point location in the third and fourth quarters. The two elevated results are as a result of the September and October liquid waste discharges and the reverse flow mode at the Nine Mile Point facility, as noted above.

Mean tritium results at the control location have decreased slightly since 1976 as was noted for the indicator samples. Mean annual results were available for 1974 through 1981. These results showed that tritium at the control location ranged from not detected (1974) to 652 pCi/liter (1976). 1979 through 1981 mean results were consistent, as was also noted for the indicator results. The control peak concentration was greater than the peak concentration in the indicator samples of 513 pCi/liter.

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.

TERRESTRIAL PROGRAM

Tables 9 through 21 represent the analytical results for the terrestrial. samples collected for the 1982 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 317 offsite and 476 onsite samples were collected and analyzed during 1982. No significant levels of gross beta activity were observed in any of the samples. The offsite or control mean concentration for 1982 was 0.033 pCi/m^3 while the indicator or onsite sample mean was equal to 0.031 pCi/m^3. As noted, the annual mean is about ten 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 8.5 percent higher than the indicator observed in 1981 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.

Review of air particulate gross beta concentrations shows that no significant increases in concentration occurred during 1982. The standard deviation for sample results on an individual sample basis is 0.02 for both the onsite and offsite data base, representing small variations in analytical results for the year. Week #32 (August 2, 1982 through August 10, 1982) showed an onsite mean concentration of 0.51 pCi/m^3 which was 76 percent greater than the concurrent offsite weekly mean concentration. The onsite particulate filters for this week were analyzed for gamma emitter using a gamma spectral analysis. No plant related radionuclides were detected in this

sample, above the limits of detection, for the gamma isotopic analysis.

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, the gross beta activity in air samples has decreased significantly. The mean 1982 concentration for both offsite and onsite is five times lower than the mean concentration detected in 1981. This five-fold 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 1982. The trend of gross beta activity in the environment is that of reduced concentrations. The mean 1982 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 1982 program showed positive detections for seven radionuclides. Those radionuclides detected were Nb-95, Co-60, Cs-137, Mn-54, and Ce-144 in addition to Be-7 and K-40 which are both naturally occurring radionuclides. The total number of radionuclides detected was seven, with five identified in the offsite samples and seven identified in the onsite samples. The seven radionuclides measured in the 1982 composite samples can be divided into three categories, the first category in 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 five percent higher in the offsite composite samples than the onsite samples. Potassium-40 was detected in six of the offsite and 10 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 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 1982 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 seven of the offsite composite samples and nine of the onsite composite samples. The yearly mean concentration of Cs-137 was 0.00031 pCi/m^3 for the offsite sample results and 0.00035 pCi/m^3 for the onsite sample results. The maximum Cs-137 concentrations detected were 0.00045 pCi/m^3 and 0.00060 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 two remaining plant related radionuclides are Mn-54 and Co-60. Mn-54 was 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 January of 1982 at a concentration of 0.0001 pCi/m^3. Co-60 was detected in six of the twelve onsite monthly composite samples and two of the twelve offsite monthly composite samples. The onsite Co-60 concentrations ranged from a minimum of 0.00017 pCi/m^3 in August and a maximum concentration of 0.00058 pCi/m^3 in February of 1982. The mean Co-60 concentration for the onsite samples was 0.00029 pCi/m^3 for 1982. The total release of Co-60 from the FitzPatrick Plant in 1982 was 2.34×10^{-5} Ci for elevated releases and 1.43×10^{-3} Ci for ground level releases. The detected concentrations of Co-60 measured in the onsite air particulate filter composites are not above those expected from effluent release rates measured in 1982. Using a conservative, mean ground level X/Q value of 5.0×10^{-7} sec/m^3 for the nine onsite environmental air sampling stations and a measured ground level release rate of 1.43×10^{-3} Ci/year, the resulting environmental air concentrations would be less than 0.0014 pCi/m^3. The mean Co-60 concentration of 0.00029 pCi/m^3 measured at the onsite sample station is well below the calculated maximum value for mean air concentrations based on measured release rates.

The third category of radionuclides are those which are related to atmospheric nuclear testing. The specific fallout related radionuclides are Ce-144 and Nb-95. Both radionuclides were detected in the offsite and onsite composite samples. Nb-95 was detected in the early months of 1982 while Ce-144 was detected through July of 1982. Nb-95 has a half-life of 3.5 days and Ce-144 has a half-life of 284 days which could result in Ce-144 being detectable longer into the year. The maximum values for both Nb-95 and Ce-144 were detected in the onsite April 1982 sample. April of 1982 was also the month in which maximum values for Be-7 were detected. Be-7 is a naturally occurring radionuclide which is produced in the upper atmosphere (stratosphere). Studies have shown that bomb produced fission products in the upper atmosphere behave in a similar manner as Be-7 and Na-22 (both naturally occurring) which show seasonal

variations of spring peaks and fall and winter minimums for ground level concentrations. These seasonal variations in biosphere concentrations of cosmogenic and fallout nuclides, which are the result of physical removal through wet and dry deposition, appear to be more pronounced as latitude increases which may be a factor in the level of fallout nuclides detected, as the sampling locations are at approximately 43° 28' N. Graphs of 1980 and 1981 concentrations of Nb-95 and Ce-144 have been included in Section IV, along with the 1982 graphs of these radionuclides for the purpose of comparison and to demonstrate that the concentrations of these nuclides have decreased since the October 1980 Chinese atmospheric weapons test.

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	0.00035	8	Fallout/Plant	0.00002
Co-60	0.00029	6	Plant	0.00087
Mn-54	0.00010	1	Plant	0.00001
Nb-95	0.00059	3	Fallout	0.00007
Ce-144	0.00132	7	Fallout	0.00599
			Totals	0.00696
			Fallout	0.00606
			Plant	0.00088
			Fallout/Plant	0.00002

*Dose to the lung.

The above table illustrates that the average calculated dose to man from the plant related isotopes is insignificant. The dose to man as a result of weapons testing exceeds by six times the dose related to plant nuclides. In both cases the resulting dose to man is of little biological consequence.

Section VII contains four graphs illustrating the concentrations of radionuclides detected during the 1982 sample program. Also in Section VII are two graphs showing sample results for 1980 and 1981.

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 1982 sampling program airborne radioiodine was detected in one of the 317 weekly samples collected from the six offsite sampling stations. An I-131 concentration of 0.039 pCi/m³ was detected at the D-1 offsite sampling station for the sampling period of June 8, 1982 to June 15, 1982. The resulting dose to man can be calculated at this offsite location based on an inhalation rate of 160 m³ per week and the measured concentration. The dose received by man at sampling station D-1 offsite would be 0.00018 mrem to the thyroid and 0.00000031 mrem to the whole body for a one week exposure. The detections of I-131 at an offsite sampling location is not routine. In the 1,247 weekly offsite I-131 samples collected in 1979 through 1982 I-131 was only detected once and is noted above. Offsite I-131 detections were made in 1977 and 1978.

I-131 was detected in twelve of the 476 onsite samples analyzed in 1982. These samples which contained radioiodine covered a total of eight sample weeks or periods. The environmental I-131 concentrations detected in 1982 are outlined as follows:

Sample End Date	Onsite Sample Station	Concentration I-131, pCi/m³	Dose (mrem) Thyroid/Whole Body
03/22/82	D-2	0.0244±0.004	0.00011/0.00000019
03/29/82	I	0.0250±0.006	0.00012/0.00000010
07/12/82	H	0.0104±0.004	0.00005/0.00000008
07/19/82	H	0.0169±0.005	0.00008/0.00000013
	I	0.0424±0.005	0.00019/0.00000033
07/26/82	D-2	0.0131±0.004	0.00006/0.00000010
	H	0.0146±0.003	0.00007/0.00000012
08/16/82	H	0.0064±0.004	0.00003/0.00000006
	J	0.0105±0.004	0.00005/0.00000008
08/30/82	H	0.0036±0.003	0.00002/0.00000002
	J	0.0024±0.003	0.00001/0.00000002
09/13/82	J	0.0239±0.006	0.00011/0.00000019
		TOTAL	0.00090/0.00000142

The spacial distribution of the I-131 concentrations show that five of the positive detections were observed at H and three at J onsite air monitoring stations with two positive detections observed at both the D-2 and I onsite air monitoring stations.

The four onsite air monitoring stations showing positive I-131 detections in 1982 are located, in reference to the FitzPatrick reactor centerline, at approximately 1,900 ft/60° (H onsite); 1,600 ft/135° (I onsite); 2,400 ft/155° (J onsite); and 1,100 ft/270° (D-2 onsite).

A meaningful dose estimate is difficult to make for the I-131 concentrations at the four onsite sampling stations as there are no residencies or individuals in the immediate vicinity of the sample locations. As noted on Figures 2 and 3 in Section VII, the H, I, J and D-2 air monitoring stations are 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 all the monitoring locations 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 0.00090 mrem to the thyroid and 0.00000142 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 one meter higher in altitude for a period of 37.3 min. would receive an additional radiation dose of 0.00000142 mrem which is equal to the total calculated dose to the whole body 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 1982 I-131 sampling effort showed no significant impact due to the operation of the plant. During 1982, 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. Each location has two TLD's with each TLD containing two distinct calcium sulfate dosimeters. In 1982, TLD's for the most part were collected on March 31, 1982, July 1, 1982, September 30, 1982 and December 30, 1982.

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	0.21
2	0.88
3	0.94
4	0.61

The annual site property boundary dose for 1982 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	- 0.13
2	- 0.35
3	- 0.32
4	- 0.33

As observed, the site boundary dose based on two available TLD locations is less than the average offsite dose. 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 differ-

*Location numbers 5, 6, 7, 23, 24, 25, and 26.

**Dose in mrem per standard month.

ence 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 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.

TLD results remained fairly consistent for most TLD locations each quarter. A slight increase in natural background radiation levels were noted for offsite TLD's in the third quarter of the year. This is most probably a result of increased emission rates for radon and thoron gases emanating from the ground. The 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 1982 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 seven farms during the 1982 grazing season and the following months of November and December. The grazing season is considered to be May through October. One of the sample locations, number 45, was added to the milk sample locations as a result of the spring milch animal census. The location was added in July. Sample location descriptions are listed below.

Location No.	Direction from Site	Distance from Site (miles)
4	ESE	7.7
40	SW	15.3
14	ESE	9.8
16	SSW	5.2
12	SSE	7.2
7	ESE	5.5
45	SE	8.1

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 1982. K-40 was detected in every sample analyzed and ranged in concentration from 1,700 pCi/liter to 1,100 pCi/liter at the indicator locations and 1,500 pCi/liter to 1,300 pCi/liter at the control location. K-40 is a naturally occurring radionuclide and is found in many of the environmental medias sampled.

Cs-137 was the second most abundant radionuclide detected in the 1982 milk samples. Cs-137 was measured in 10 of the 54 monthly samples analyzed. Cs-137 was detected in milk samples at all locations at various times throughout the year except at location number 40 which is designated as the control. Cesium concentrations ranged

from 3.1 pCi/liter to 18.0 pCi/liter for all samples with a mean of 6.26 pCi/liter. Cesium was detected at a higher frequency at locations 12 and 16. Overall, Cs-137 was detected at a higher frequency during the months of July, August, and September at the milk sampling locations. A maximum concentration of 18.0 pCi/liter was detected at location number 12 during August. Annual means for the detection of Cs-137 at all locations are presented below.

Location No.	Annual Mean (Cs-137)
4	5.9 pCi/l
40 (control)	<4.0 pCi/l (LLD)
14	4.6 pCi/l
16	4.2 pCi/l
12	9.8 pCi/l
7	3.3 pCi/l
45	6.9 pCi/l

Annual mean Cs-137 values for each sampling location are variable but quantitatively the values are not significantly different from one another especially when the magnitude of these minute concentrations is considered. Location number 12 had an annual mean slightly higher than the other locations. Location number 40 (control location) showed no detectable Cs-137 during 1982. During 1981, location number 40 showed an annual mean Cs-137 concentration of 7.0 pCi/liter, and in 1980 the control location showed a Cs-137 concentration of 4.5 pCi/liter. Because of the minute quantities of Cs-137 detected, it is difficult to assess whether the concentrations detected are 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).

An evaluation of milch animal pasture feed, sampled during 1982, showed that Cs-137 was detected once in pasture grass collected from the milk sampling locations during 1982. Samples of pasture grass were collected in July, August, and September at each milk sampling location. Of the 21 samples collected, one sample showed Cs-137 at a concentration of 0.35 pCi/g (wet). The sample was taken from the control location (number 40) in July. The origin of Cs-137 in this sample was from past weapons testing fallout and probably became incorporated in the pasture grass as a result of plant uptake. As noted above, Cs-137 was not detected in any other pasture grass samples in 1982. Naturally occurring radionuclides, such as K-40, Ra-226, and Be-7, were also detected at varying concentrations in most pasture grass samples.

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

Sr-90 was detected in 48 of the 54 milk samples collected during 1982. Sr-90 was detected in all sample locations for at least 75% of

the time. The mean Sr-90 concentration for the control location was 2.96 pCi/liter. The mean for all indicator locations (within 10 miles of the site) was 4.90 pCi/liter. The control and indicator sample means are similar. Sr-90 results for the indicator locations ranged from 1.93 pCi/liter to 9.76 pCi/liter. Control sample results ranged from 4.20 pCi/liter to 0.93 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. I-131 was not detected during 1982 in any of the indicator or control samples. All 1982 I-131 milk results are reported as lower limits of detection (LLD).

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 1982 was 4.90 pCi/liter. Previous Cs-137 concentrations at the control location is only available from 1978 to 1981. Concentrations range from 5.83 pCi/liter in 1978 to 7.0 pCi/liter in 1981. As noted from this range, the Cs-137 concentration at the control location has increased since 1978. The mean control result for 1982 was <4.0 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	65	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 1982 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 from 1974. Sr-90 ranged from 4.3 pCi/liter in 1980 to 7.16 pCi/liter in 1976. The 1982 annual mean for Sr-90 was 4.90 pCi/liter and was at the same approximate concentration as results since 1979. Sr-90 concentrations at the control location is available since 1978. The annual mean concentration ranged from 3.33 pCi/liter in 1980 to 5.88 pCi/liter in 1978. The 1982 annual mean was 2.96 pCi/liter or approximately the same as the 1981 annual mean results.

The impact as a result of Cs-137 in 1982 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 all the indicator samples at varying times throughout the year. 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 (6.26 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 0.059 mrem and a critical organ dose would be 0.841 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 1982, 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 6.26 pCi/liter for the indicator locations. The resultant doses are 0.033 mrem to the whole

body and 0.050 mrem to the liver (critical organ). The calculated doses are based on eight weeks 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 0.059 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 0.059 mrem whole body is equal to residing at a location 100 meters (328 feet) higher in altitude for 10.8 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 1982 indicator locations. The mean Cs-137 concentration of 6.26 pCi/liter is used. The resulting bone dose is 0.041 mrem per year (an average milk Cs-137 concentration of 6.26 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 54 monthly milk samples analyzed for the 1982 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 (1982) 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 1,129 cows and two goats for the spring 1982 census. Five new locations were found since the summer 1981 census. The number of cows increased by 143 and the number of goats decreased by eight with respect to the 1981 summer census. As a result of this census, a new sampling location (number 45) was added).

The 1982 summer census showed a total of 1,141 cows and three goats. This represents an increase of 12 cows and an increase of one goat with respect to the spring 1982 census. Four milch locations were deleted as a result of this census when compared to the spring 1982 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.

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 2.4 pCi/g (wet) to 6.0 pCi/g (wet). K-40 is a naturally occurring radionuclide. Two of the four spring meat samples showed detectable concentrations of Cs-137. The two positive concentrations were in the indicator or onsite samples. Cs-137 in these two sample results were 0.023 pCi/g (wet) and 0.082 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 esentially 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]).

Of the two meat samples that showed detectable concentrations of Cs-137, one sample (0.023 pCi/g [wet]) was approximately equal to detected concentrations in control sample results during the spring of 1981. The other result was greater than control results over the past several years. Because this result (0.082 pCi/g [wet]) is small, the impact or dose as a result of this concentration is insignificant (see 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 2.5 pCi/g (wet) to 3.5 pCi/g (wet). K-40 is naturally occurring.

Cs-137 was detected in two of the four fall meat samples. The two positive results were two indicator samples (less than 10 miles from the site). The two results showed small concentrations of Cs-137 that was approximately at the lower limit of detection (LLD). The results were 0.019 pCi/g (wet) and 0.015 pCi/g (wet) as compared to the control sample result of <0.017 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 detection of Cs-137 in meat at control and indicator sample locations is an indication of cesium production from weapons testing. During 1982, 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 1982 was 0.035 pCi/g (wet). Assuming an adult consumption rate of 95 kg per year, the annual dose to the whole body is 0.237 mrem per year. The critical organ dose is 0.362 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 (0.237 mrem per year) and the calculated critical organ dose (0.362 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 1982 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.

Egg samples were collected in the spring (May 5-12, 1982) and in the fall (November 10-11, 1982). 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 1982 in egg samples was K-40. K-40 was detected in the spring samples at concentrations that ranged from 3.2 pCi/g to 3.8 pCi/g (wet). The fall samples showed K-40 concentrations that ranged from 1.2 pCi/g to 2.0 pCi/g (wet). For both the spring and fall samples, the control samples had the highest K-40 concentrations.

Poultry samples were taken during the spring (May 5-12, 1982) and during the fall (November 10-11, 1982) 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 5.5 pCi/g to 8.4 pCi/g (wet). The control sample had the lower concentration (5.5 pCi/g). K-40 in the fall samples ranged from 3.1 pCi/g to 4.2 pCi/g (wet). The control sample showed a concentration of 4.1 pCi/g (wet).

Cs-137 was detected in one of the onsite poultry sample locations during 1982. the concentration detected was very small and was approximately at the lower limit of detection (LLD) level for all the

1982 poultry samples. The detected Cs-137 concentration was 0.027 pCi/g (wet). The LLD levels for the other samples ranged from 0.02 pCi/g to 0.03 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 0.027 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 0.092 mrem per year and the adult critical organ dose is 0.140 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 0.092 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 16.8 days. It is assumed that by residing at this location one would remain at this altitude for the full 16.8 days.

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 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 1.5 pCi/g to 9.3 pCi/g (wet). The control sample had the highest concentration (9.3 pCi/g [wet]). Non-broadleaf fruits and vegetables (tomatoes and zucchini) showed

concentrations of K-40 ranging from 1.9 pCi/g to 2.6 pCi/g (wet). Again the control location had the highest K-40 concentration (2.6 pCi/g [wet]).

In addition to K-40, another naturally occurring radionuclide was detected. Be-7 is a naturally occurring radionuclide of cosmic origin in the upper atmosphere. Be-7 was detected in two of the four broadleaf vegetable samples. Be-7 was not detected in samples of non-broadleaf fruits and vegetables. Concentrations of Be-7 detected were 0.12 pCi/g (wet) and 0.14 pCi/g (wet). One of the positive results (0.12 pCi/g [wet]) was detected in the control sample.

No other radionuclides were detected in the 1982 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 1981).

Dose estimates are not performed here for fruits and/or vegetables since no other radionuclides with the exception of naturally occurring K-40 and Be-7 were detected.

9. SPECIAL STUDIES - TABLE 21

Since 1974, the detection of Cs-137 in milk samples analyzed for the Radiological Environmental Monitoring Program has been common. The specific source of the Cs-137 is not known as there are several possible source terms for this particular radionuclide. Cs-137 is a small component of plant effluents and is also a major fallout nuclide from the detonation of thermonuclear devices in the atmosphere. Because Cs-137 has a half-life of 30.2 years it remains a detectable component of environmental sample medial for many years. It is estimated that about 34 million curies (34 Megacuries) of Cs-137 have been produced in the atmosphere due to weapons testing. Cs-137 is present in many of the sample media collected for the environmental monitoring program. In the environment, cesium behaves much like potassium with regard to metabolism and elements found in living tissue.

In 1982, pasture grass samples were collected from the routine milk sample locations three times during the grazing season. Collections of pasture grass samples were made in July, August and September which resulted in a total of 21 samples. Each sample was analyzed for gamma emitters. A total of four radionuclides were detected in these pasture grass samples. Three of the four radionuclides detected are naturally occurring and include Ra-226, Be-7 and K-40.

K-40 was detected in each sample and ranged in concentration from 9.3 pCi/g (wet) to 30.4 pCi/g (wet). Ra-226 was detected in 11 samples and Be-7 was detected in six of the 21 samples analyzed. The fourth radionuclide detected was Cs-137. Cs-137 was detected once in the August sample at the control location with a measured concentration of 0.347 pCi/g (wet). The indicator locations showed no detectable concentrations of Cs-137. The lower limits of detection (LLD) for these samples ranged from a minimum of <0.141 pCi/g (wet) to a maximum of <0.329 pCi/g (wet).

The general lack of Cs-137 above detectable levels in the indicator samples demonstrates that fresh Cs-137 deposition as a result of plant effluents is not indicated in the grass-cow-milk pathway.

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 1982 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 spring collection of GAMMARUS as required by Table 4.3.1, Appendix B of the James A. FitzPatrick Nuclear Power Plant Environmental Technical Specifications was missed due to seasonal unavailability of the organism. As required by plant procedures, three attempts were made to obtain sufficient quantities of GAMMARUS for analysis. The unavailability of GAMMARUS is most probably due to the unseasonably cold temperature of Lake Ontario and the delay of the spring lake turnover. Few GAMMARUS were inhabiting the shoreline shallows during the spring sampling season.

2. Environmental Air Monitoring Station D-1 off-site was inoperable for one sample period due to electrical supply line failure. Dates of known inoperability were March 28, 1982 to April 7, 1982.

3. Environmental Radiation Monitoring Station G on-site was inoperable from June 14, 1982 (1330 hrs) to June 15, 1982 (1445 hrs). Inoperability was due to faulty high voltage power supply.

4. Environmental radiation monitor C offsite was inoperable from October 1, 1982 (1200 hours) to October 7, 1982 (0800 hours). Inoperability was due to vandalism. The radiation detector cable was cut and the detector itself was removed and stolen. As a result of the cut, the radiation monitor short circuited and was damaged.

5. The air sampling pump at the J onsite environmental sampling station was inoperable from October 7, 1982 (1000 hours) to October 12, 1982 (1330 hours). Inoperability was caused by an electrical malfunction.

6. Environmental sampling station D-1 was found off its normal mounting structure (utility pole). The station was de-energized on October 21, 1982 to prevent any safety hazards. The radiation monitor sustained damage during the fall and required repair. The sampling station was reactivated after the installation of a new support structure. The total inoperability period of the D-1 onsite station was October 20, 1982 (0940 hours) to October 29, 1982 (1500 hours).

7. The air sampling pump at the J onsite environmental sampling station was inoperable from November 12, 1982 (1000 hours) to November 15, 1982 (0945 hours). Inoperability was caused by pump mechanical problems.

8. The air sampling pump at the D-1 onsite environmental sampling station was inoperable from April 5, 1982 to April 12, 1982 due to pump failure.

9. The air sampling pump at the D-1 offsite environmental sampling station was inoperable from March 30, 1982 to April 6, 1982 due to pump failure.

REFERENCES

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2. U.S. Nuclear Regulatory Commission Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluent for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", October, 1977.

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4. National Council on Radiation Protection and Measurements (NCRP), Environmental Radiation Measurements, NCRP Report No. 50, 1976.

5. National Council on Radiation Protection and Measurements (NCRP), Natural Background Radiation in the United States, NCRP Report No. 45, 1975.

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8. U.S. Nuclear Regulatory Commission Branch Technical Position to Regulatory Guide 4.8, "An Acceptable Radiological Environmental Monitoring Program", November, 1979.

9. Eisenbud, Merril, Environmental Radioactivity, Second Edition, Academic Press, New York, New York, 1973.

10. Francis, C. W., Radiostrontium Movement in Soils and Uptake in Plants, Environmental Sciences Division, Oak Ridge National Laboratory, U.S. Department of Energy, 1978.

11. National Council on Radiation Protection and Measurements (NCRP), Radiation Exposure from Consumer Products and Miscellaneous Sources, NCRP Report No. 56, 1977.

12. Pochin, Edward E., Estimated Population Exposure from Nuclear Power Production and Other Radiation Sources, Organization for Economic Co-operation and Development, 1976.

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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 and 1981 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
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
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
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
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
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	1.00	0.02	0.98
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
1982	0.003	0.001	0.005	0.002	0.003
1981	0.0022	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)	0.17	0.19	0.51	0.00	0.51

HISTORICAL ENVIRONMENTAL SAMPLE DATA

CONTROL

Fish Samples Cs-137 pCi/g (wet)	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
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
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	0.10	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/1	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
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/1	MEAN	STANDARD DEVIATION	MAXIMUM	MINIMUM	RANGE
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
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
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
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
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
1982	165.0	94.7	307	112	195
1981	293.3	49.3	357	211	246
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
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
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
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
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
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
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
1982	4.60	2.29	8.59	0.76	7.83
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
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
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
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
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
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
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
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
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
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
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	1.35	0.042	0.009	0.033
1979	0.03	2.13	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
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
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
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
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
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
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. <u>DATA GRAPHS</u>

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. <u>SAMPLE LOCATIONS</u>

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

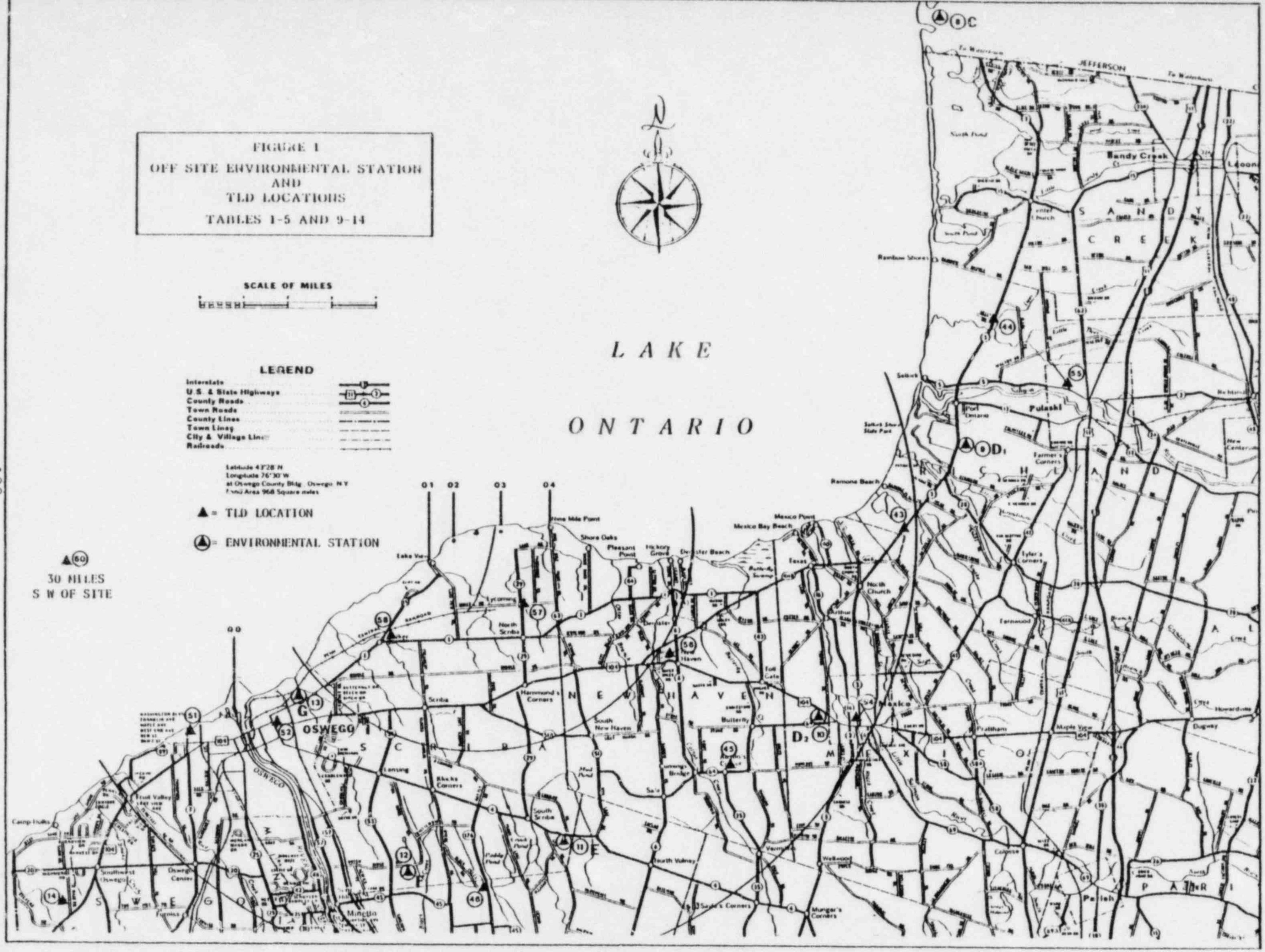
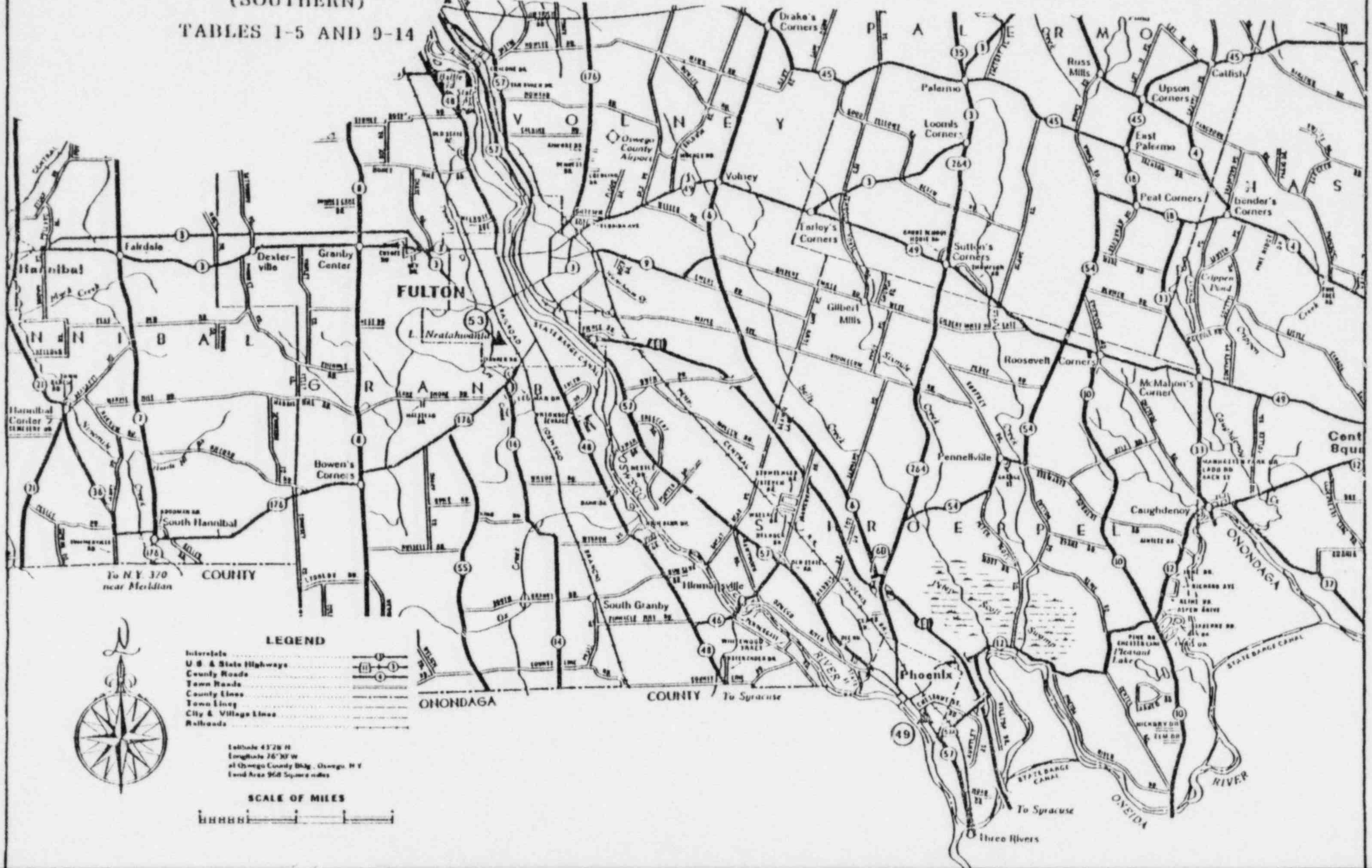


FIGURE 1
OFF SITE ENVIRONMENTAL STATION
AND
TLD LOCATIONS
TABLES 1-5 AND 9-14
SCALE OF MILES
LEGEND
Interstate
U.S. & State Highways
County Roads
Town Roads
County Lines
Town Lines
City & Village Lines
Railroads
Latitude 43°28' N
Longitude 76°30' W
at Oswego County Bldg. Oswego N.Y.
Land Area 968 Square miles
▲= TLD LOCATION
= ENVIRONMENTAL STATION
30 MILES
S W OF SITE
LAKE
ONTARIO
JEFFERSON
Sandy Creek
SANDY CREEK
Pulaski
RICHLAND
Mexico
MEXICO
NEW HAVEN
OSWEGO
SCRIBA
Mexico Point
Mexico Bay Beach
Ramona Beach
Rainbow Shores
Selkirk
Port Ontario
Farmer's Corners
Tyler's Corners
North Church
Texas
Demster Beach
Hickory Grove
Pleasant Point
Shore Oaks
Nine Mile Point
Lake View
Lycoming
North Scriba
Scriba
Hammond's Corners
South New Haven
New Haven
Butterfly
Fall Gate
South Scriba
South Valley
Vermillion
Wellwood
Munger's Corners
Prattham
Maple View
Dugway
Colosse
Parish
Minetto
Oswego Center
Southwest Oswego
Fruit Valley
Camp Dollis
Lansing
Klocks Corners
Seale's Corners
Howardville
Fernwood
Lake
Leone
New Centerville
0.1
0.2
0.3
0.4
0.0
D1
D2
C
E
G
13
51
52
58
57
56
43
44
55
45
10
11
12
14
46
60

FIGURE 1-A

OFF SITE ENVIRONMENTAL STATION
AND
TLD LOCATIONS
(SOUTHERN)

TABLES 1-5 AND 9-14



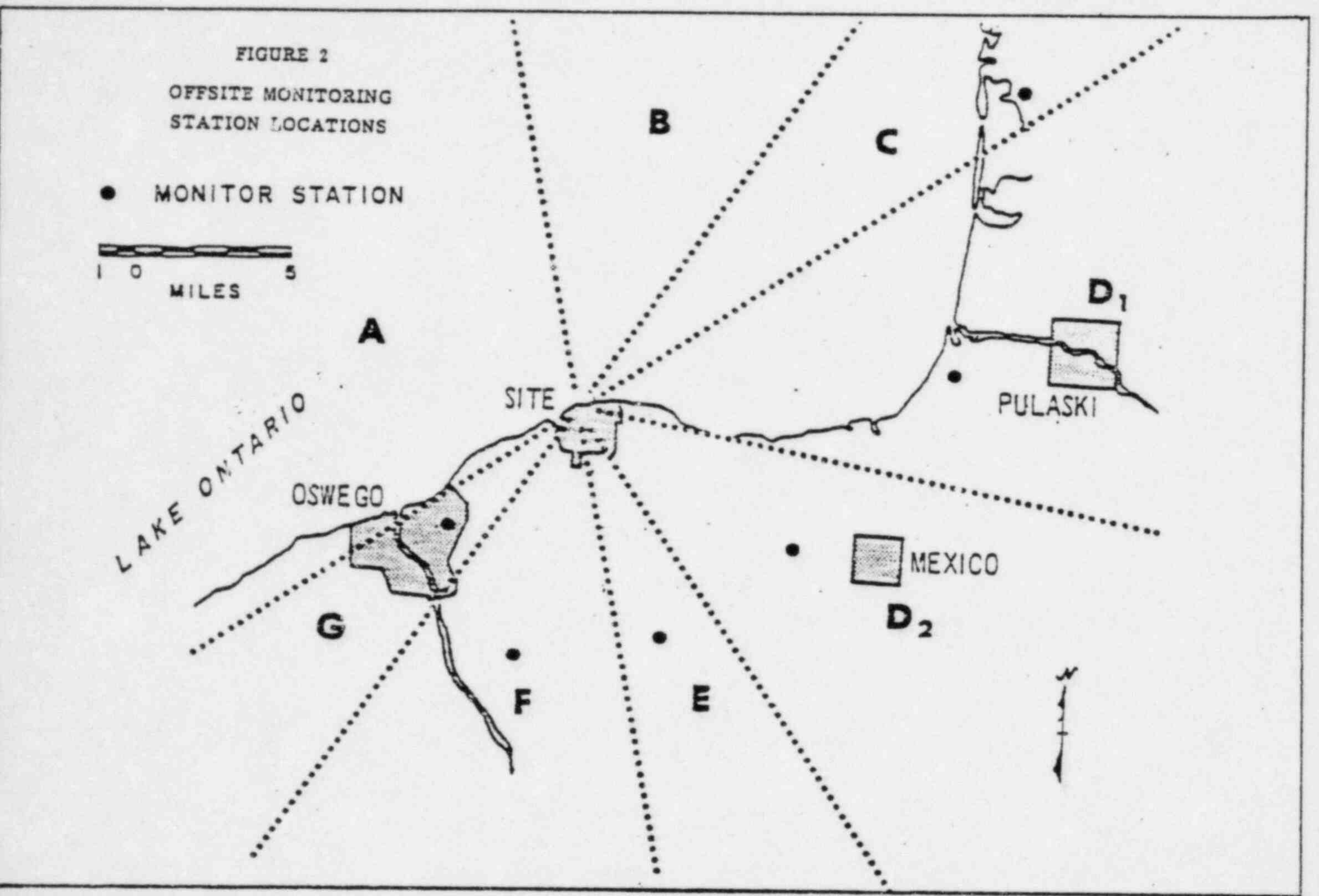
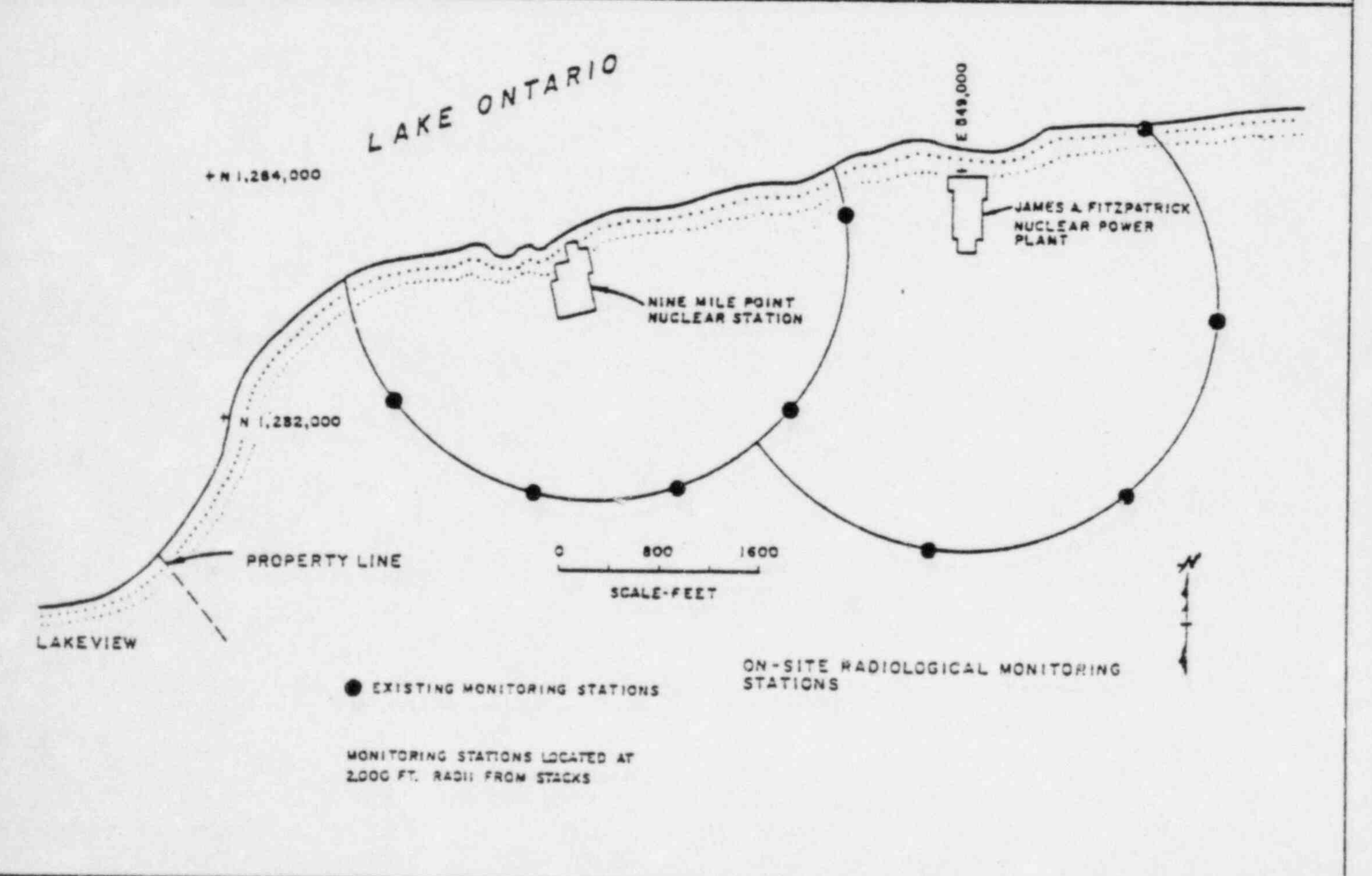


FIGURE 2
OFFSITE MONITORING
STATION LOCATIONS
MONITOR STATION
1 0 5
MILES
A
B
C
D1
D2
E
F
G
SITE
LAKE ONTARIO
OSWEGO
PULASKI
MEXICO
N


LAKE ONTARIO
N 1,284,000
E 549,000
JAMES A. FITZPATRICK
NUCLEAR POWER
PLANT
NINE MILE POINT
NUCLEAR STATION
N 1,282,000
PROPERTY LINE
0 800 1600
SCALE-FEET
LAKEVIEW
N
ON-SITE RADIOLOGICAL MONITORING
STATIONS
EXISTING MONITORING STATIONS
MONITORING STATIONS LOCATED AT
2,000 FT. RADII FROM STACKS

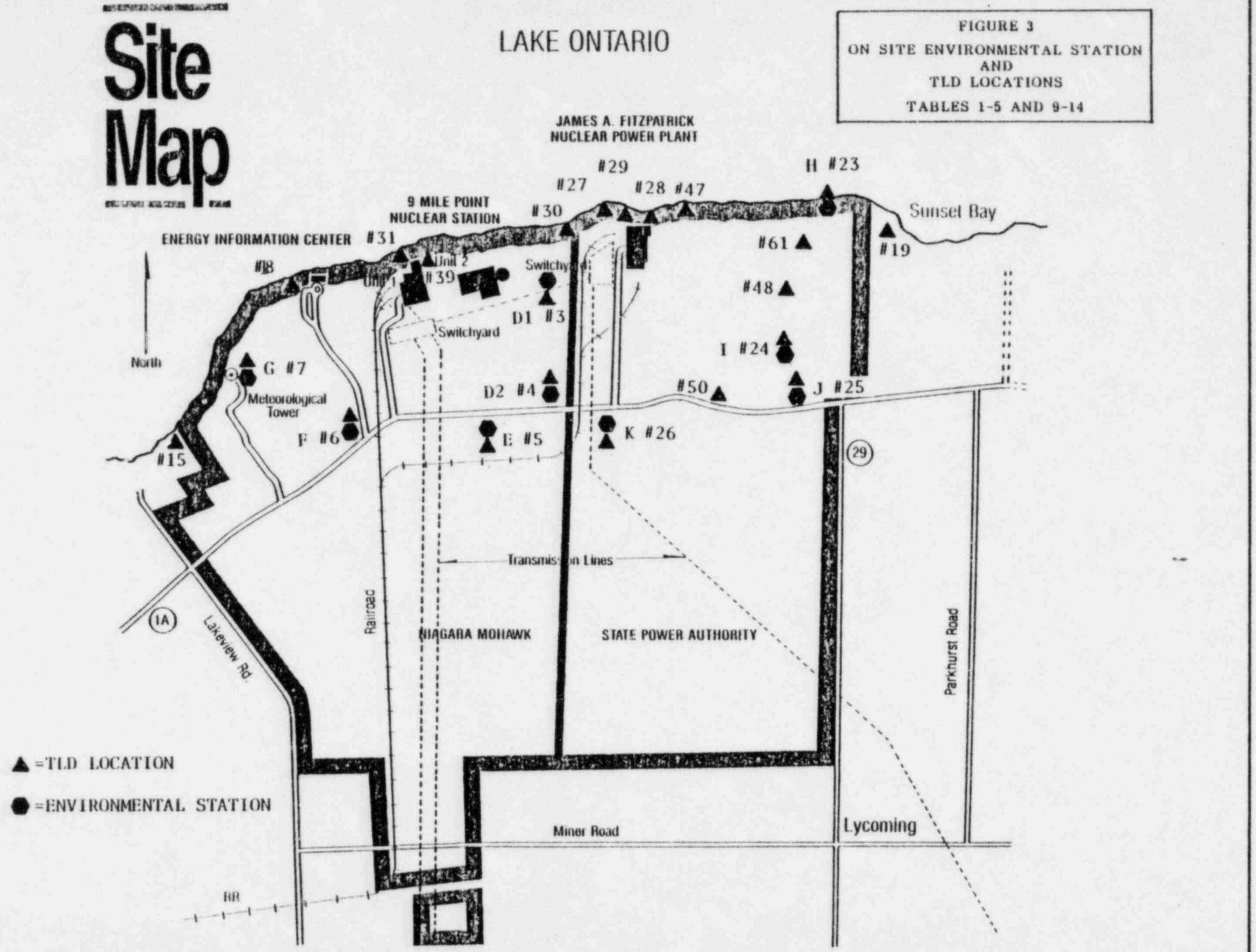


FIGURE 3
ON SITE ENVIRONMENTAL STATION
AND
TLD LOCATIONS
TABLES 1-5 AND 9-14

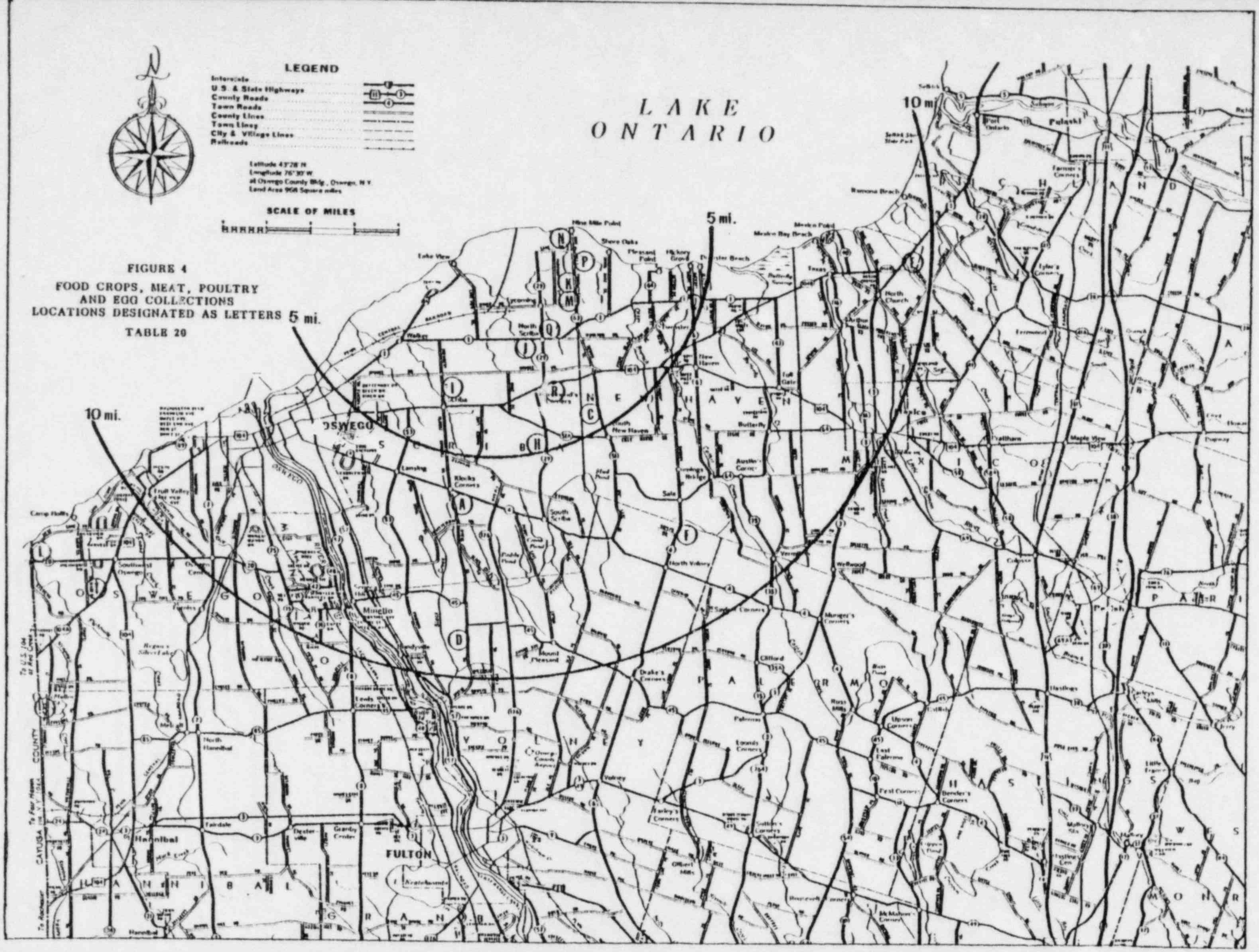


FIGURE 4
FOOD CROPS, MEAT, POULTRY
AND EGG COLLECTIONS
LOCATIONS DESIGNATED AS LETTERS
TABLE 20

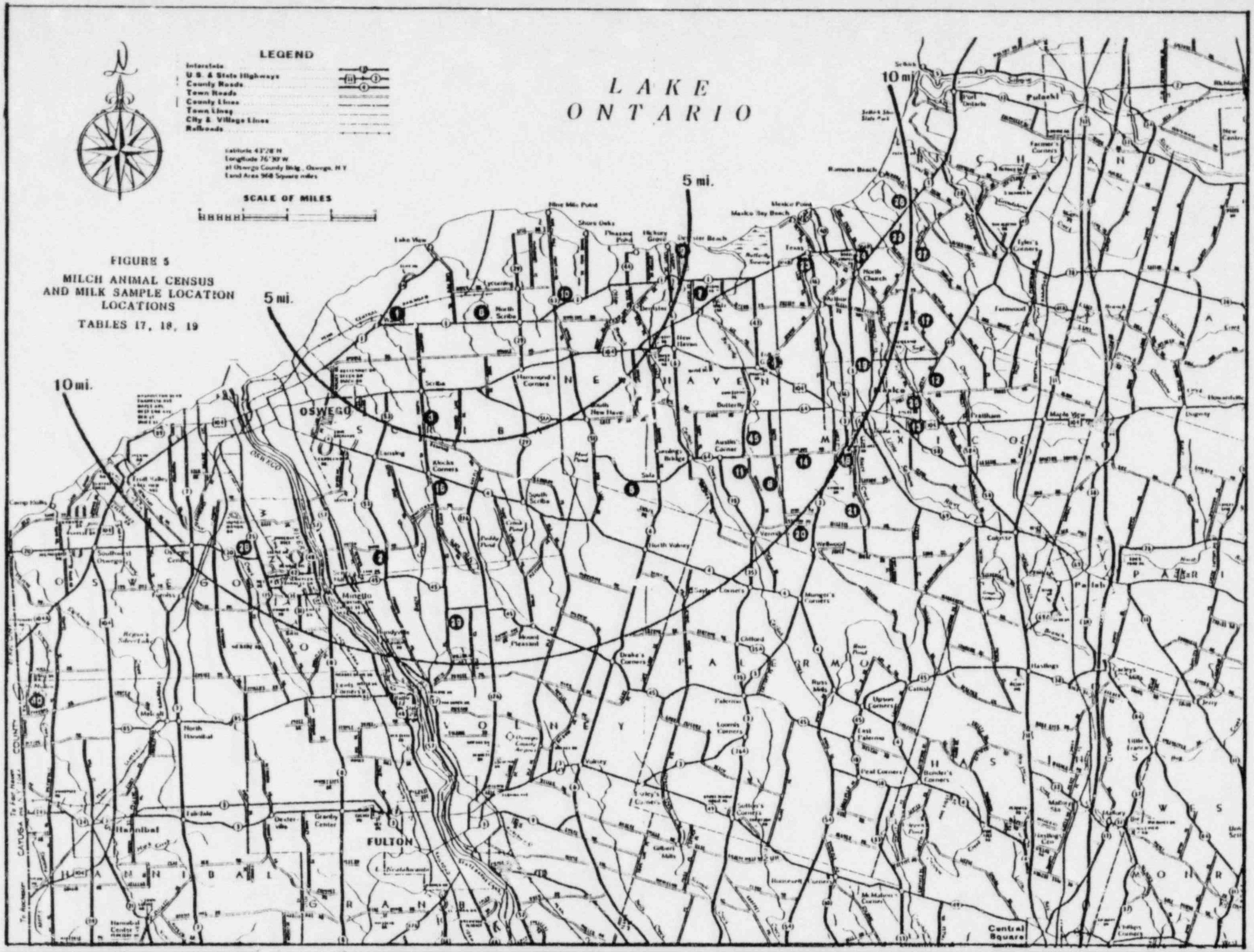
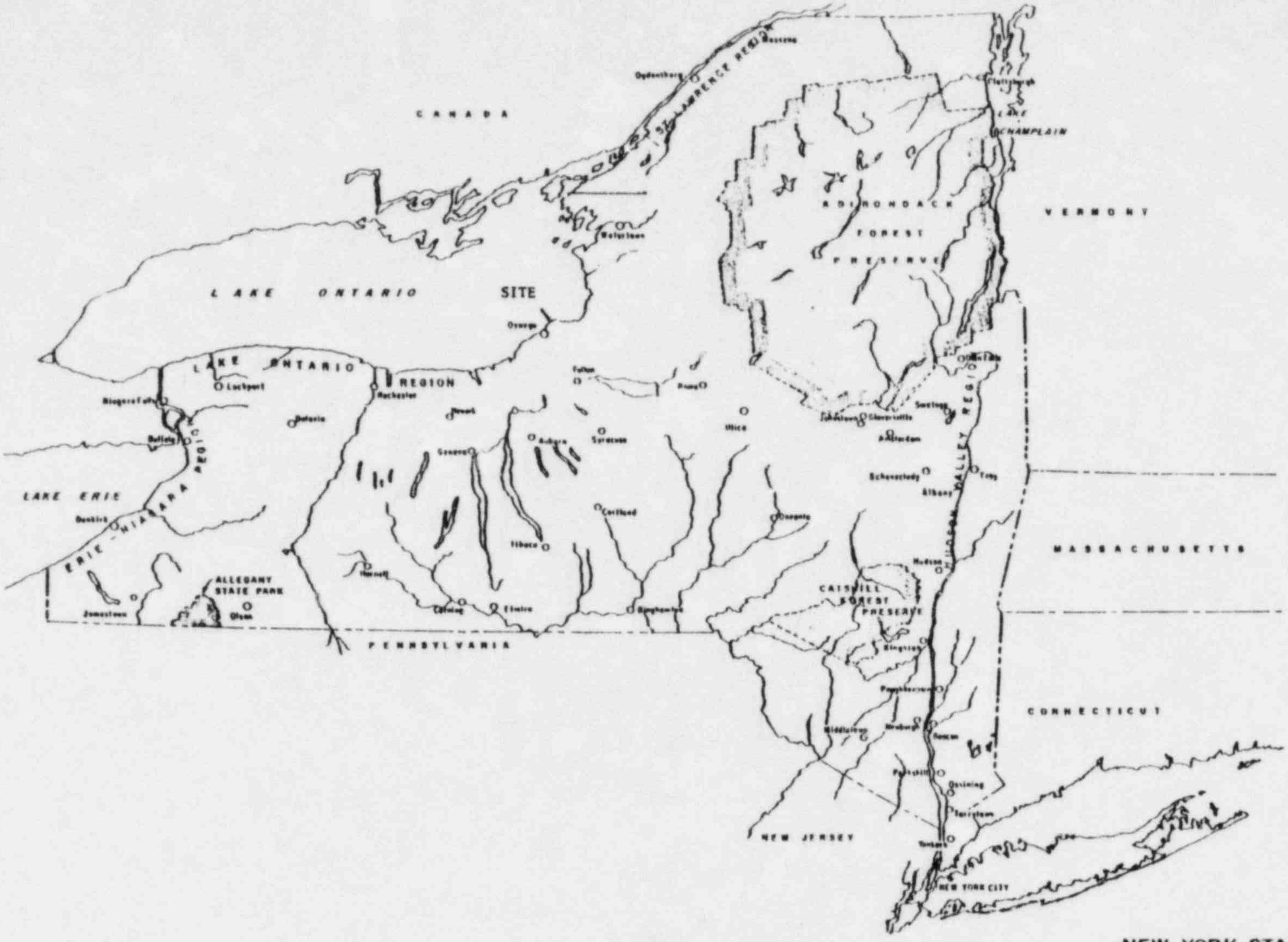


FIGURE 5

MILCH ANIMAL CENSUS AND MILK SAMPLE LOCATION LOCATIONS

TABLES 17, 18, 19

FIGURE 6



NEW YORK STATE MAP WITH REGIONS

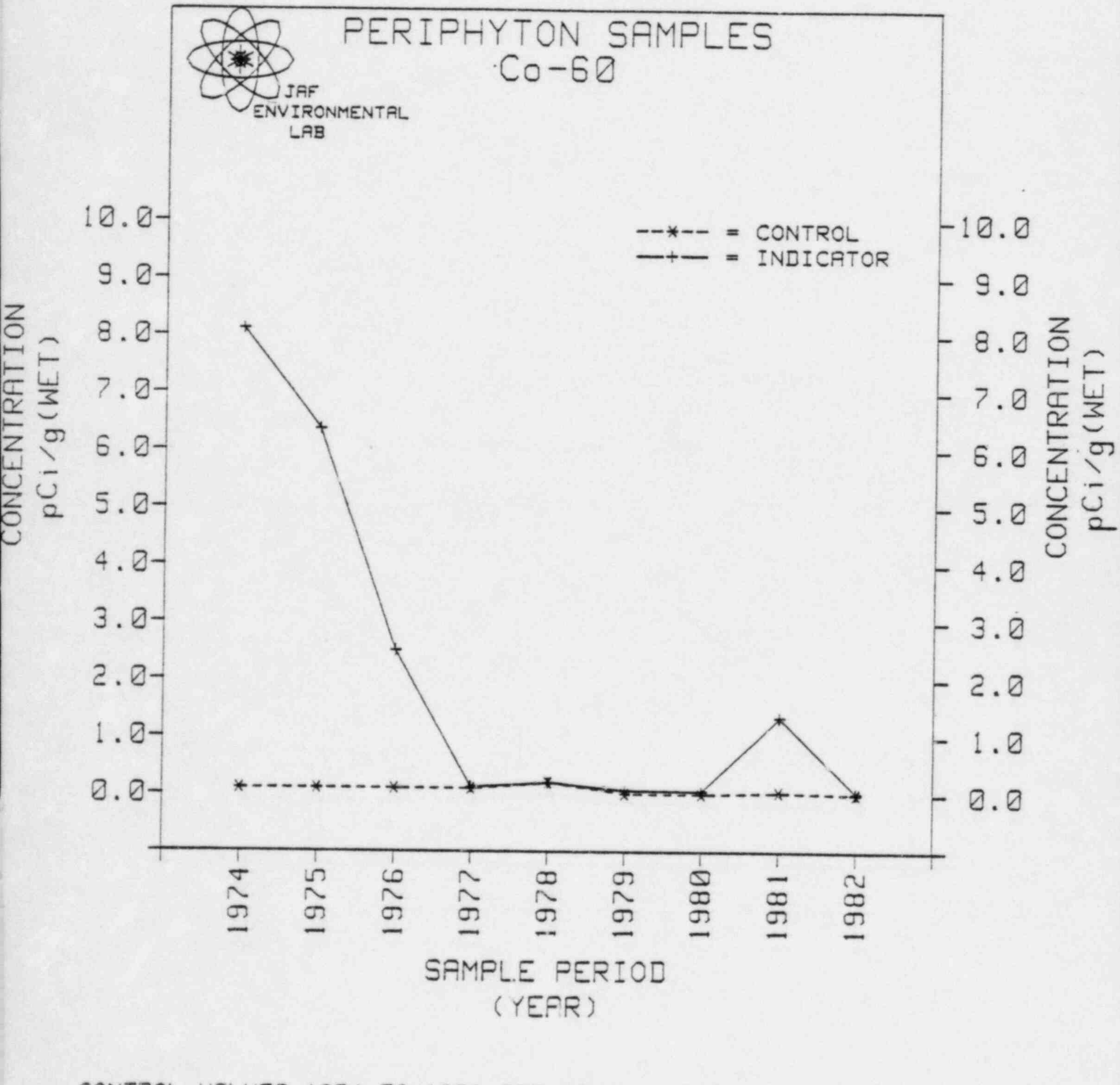
FIGURE 7

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

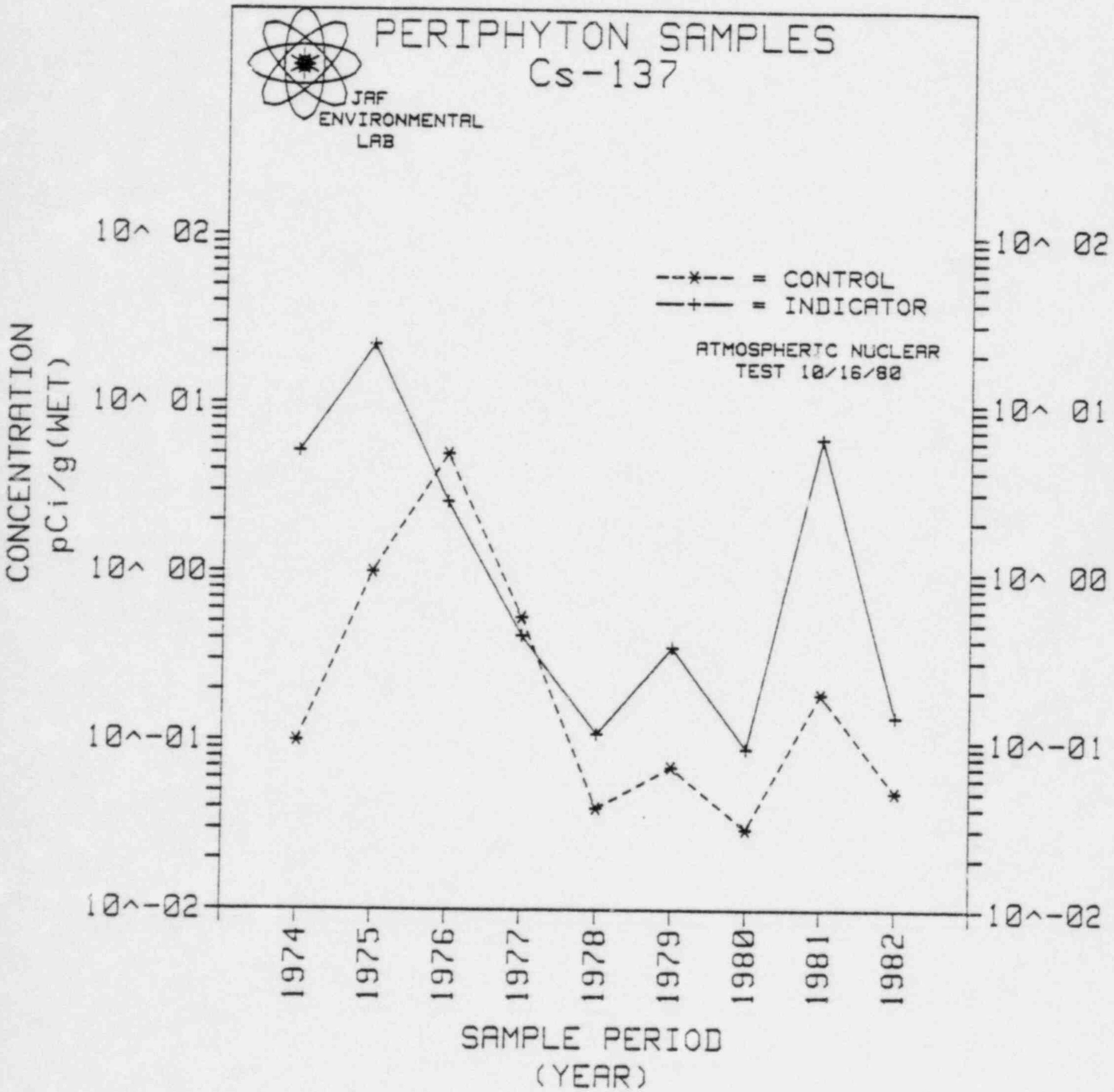
* Description based on USEPA (1973) field evaluation method for categorizing soils.

FIGURE 8



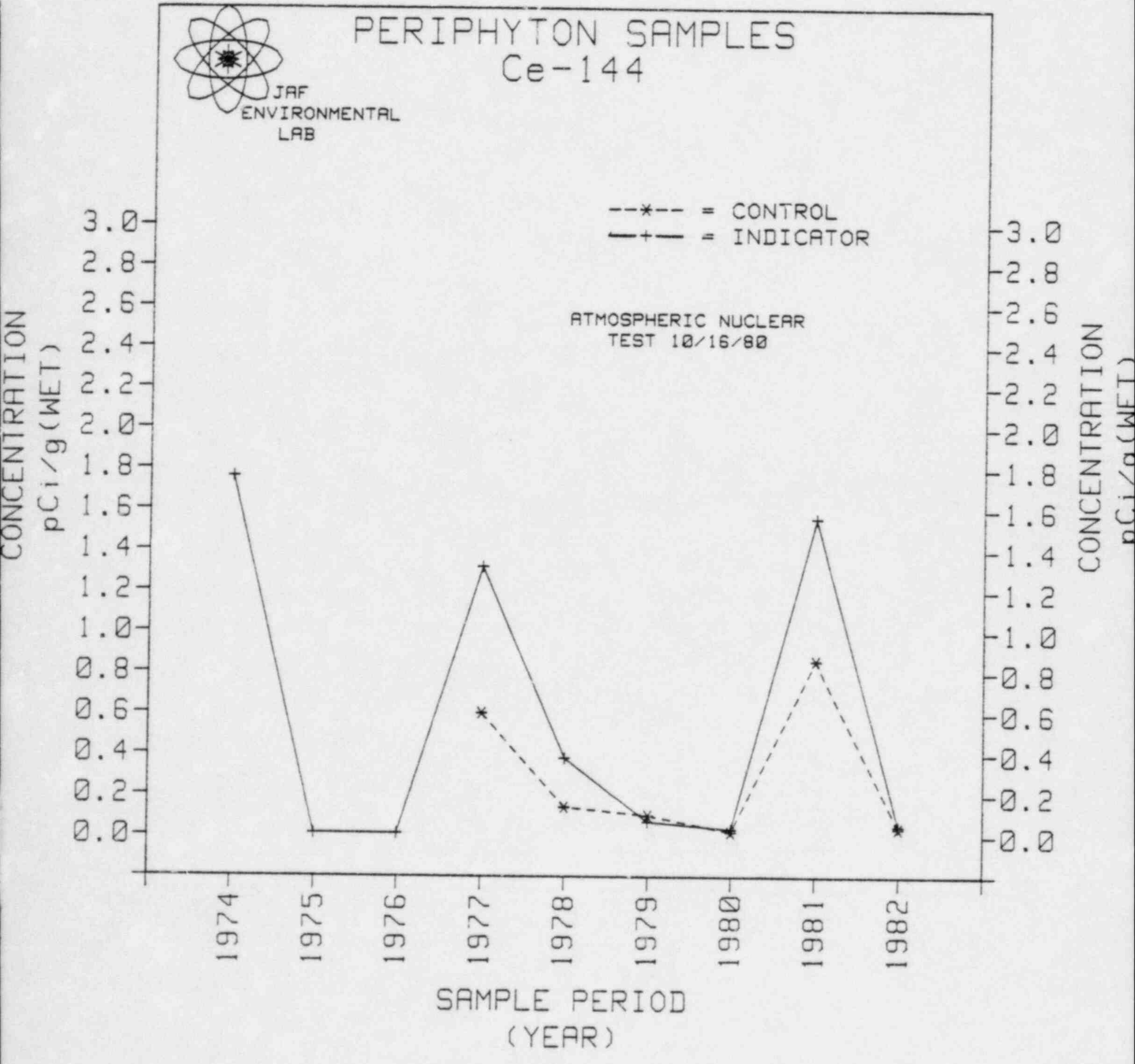
CONTROL VALUES 1974 TO 1979 ARE MDL's; 1980 TO 1982 ARE LLD's

FIGURE 9



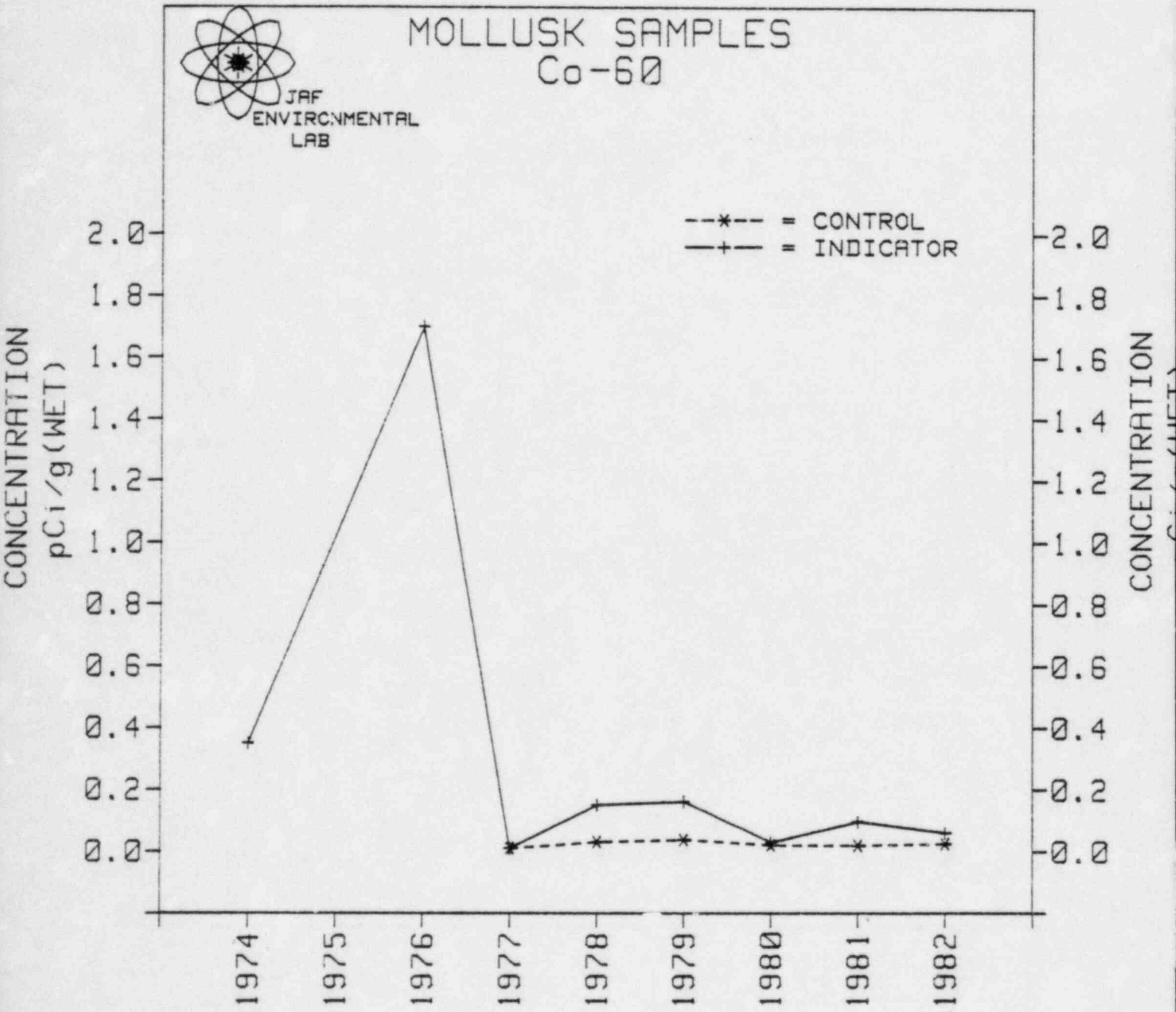
CONTROL VALUES 1975 & 1977 ARE MDL'S

FIGURE 10



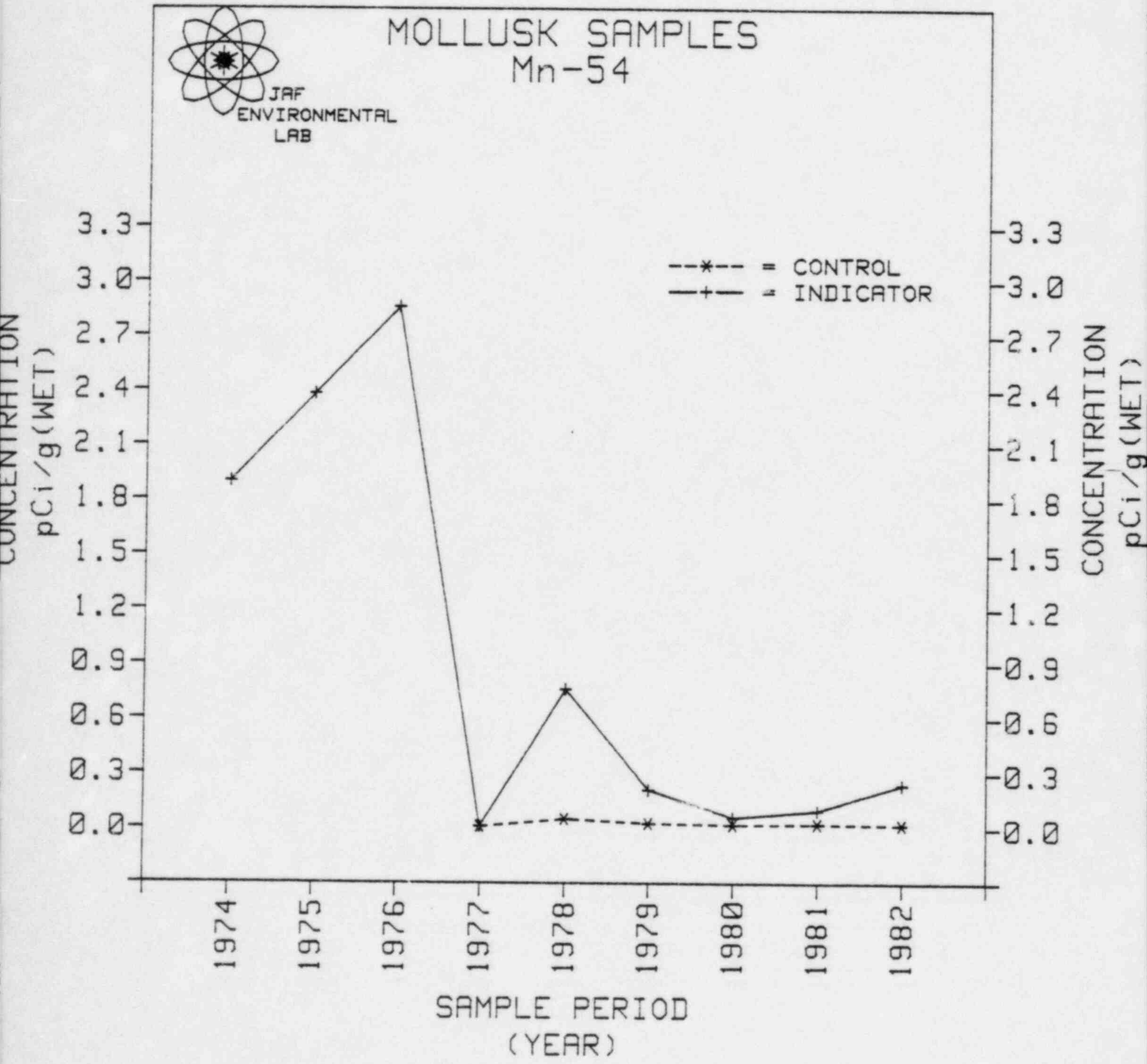
NO CONTROL DATA FOR 1974 & 1975
CONTROL YEARS 1976 ARE MDL's ; 1980 ARE LLD's
INDICATOR YEARS 1975,1976,1979 ARE MDL's; 1980 ARE LLD's

FIGURE 11



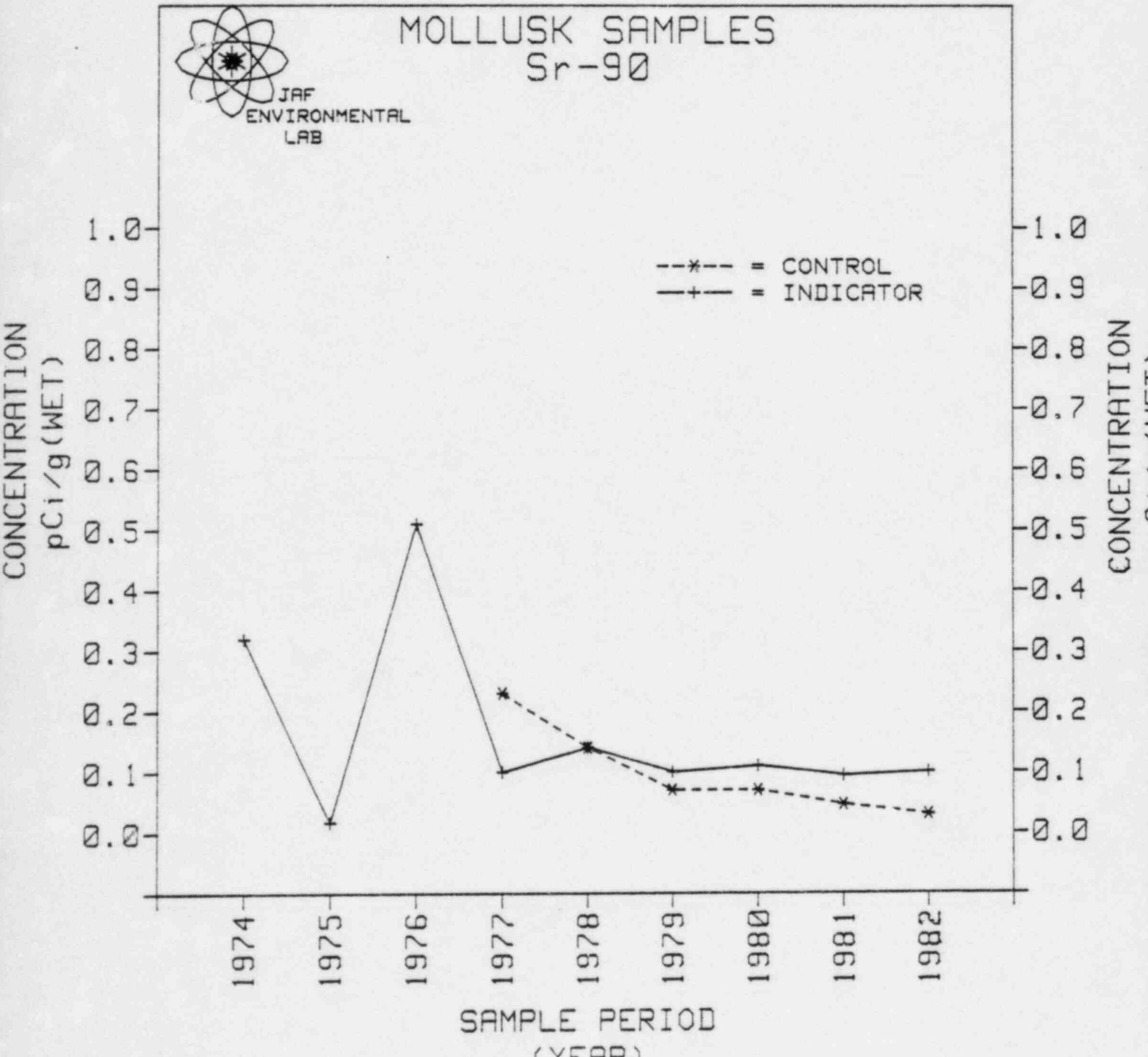
NO CONTROL DATA FOR 1974-1976
NO INDICATOR DATA FOR 1975
CONTROL YEARS 1977-1979 ARE MDL'S; 1980-1982 ARE LLD'S
INDICATOR YEAR 1977 IS MDL

FIGURE 12



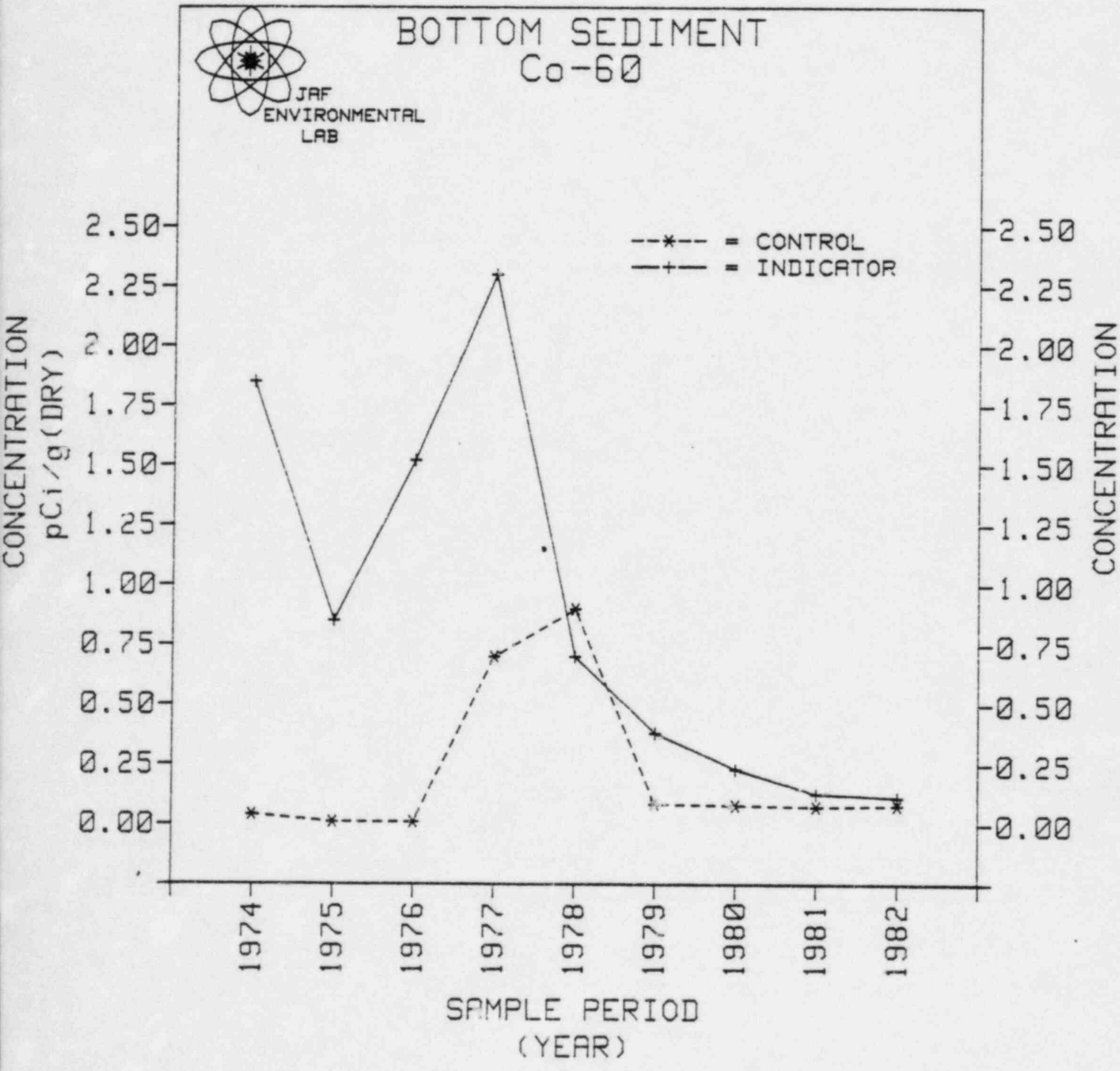
NO CONTROL DATA FOR 1974,1975,1976
CONTROL YEARS 1977-1979 ARE MDL'S; 1980-1982 ARE LLD'S
INDICATOR YEARS 1977,1979 ARE MDL'S

FIGURE 13



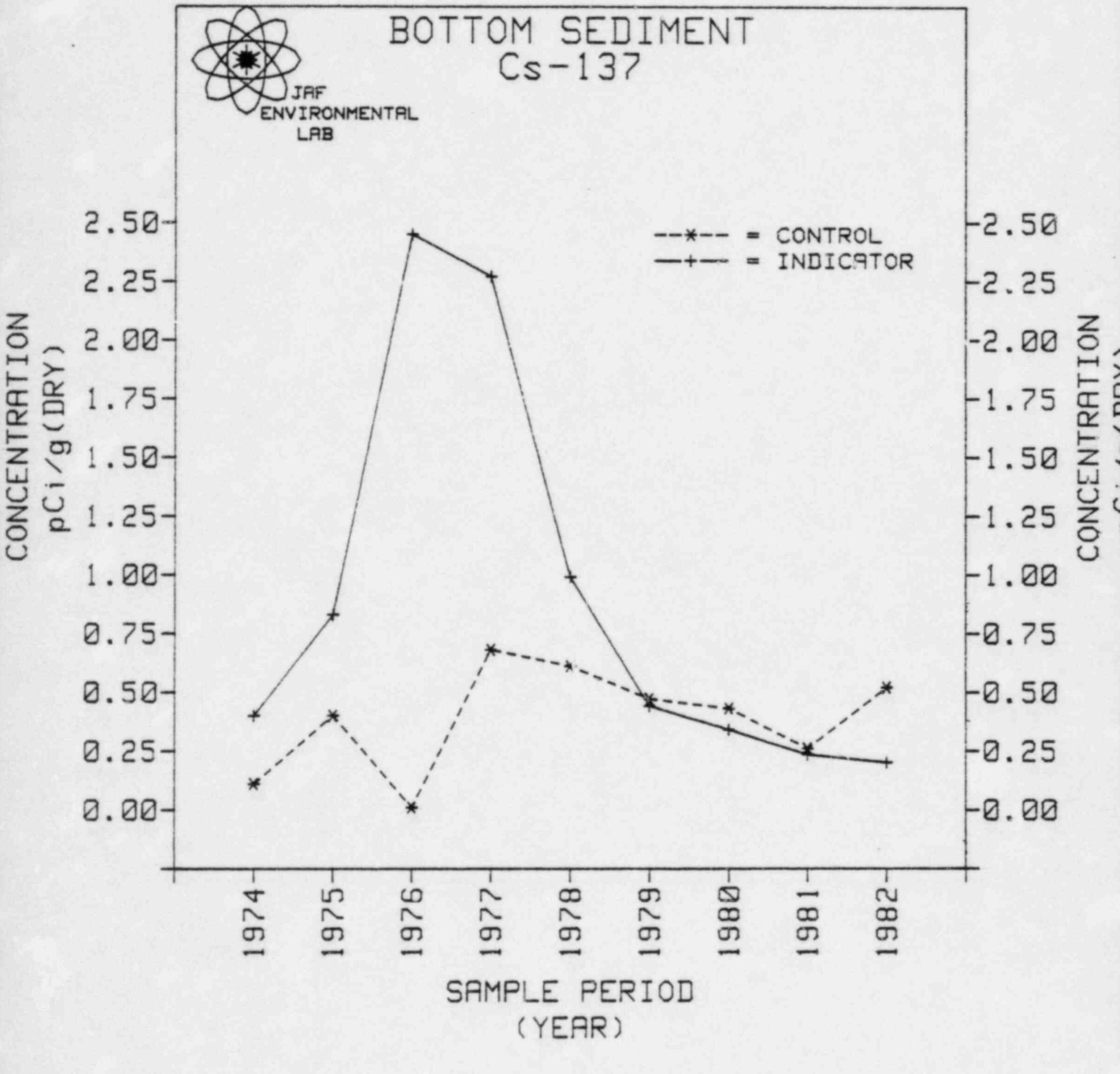
NO CONTROL DATA FOR YEARS 1974-1976

FIGURE 14



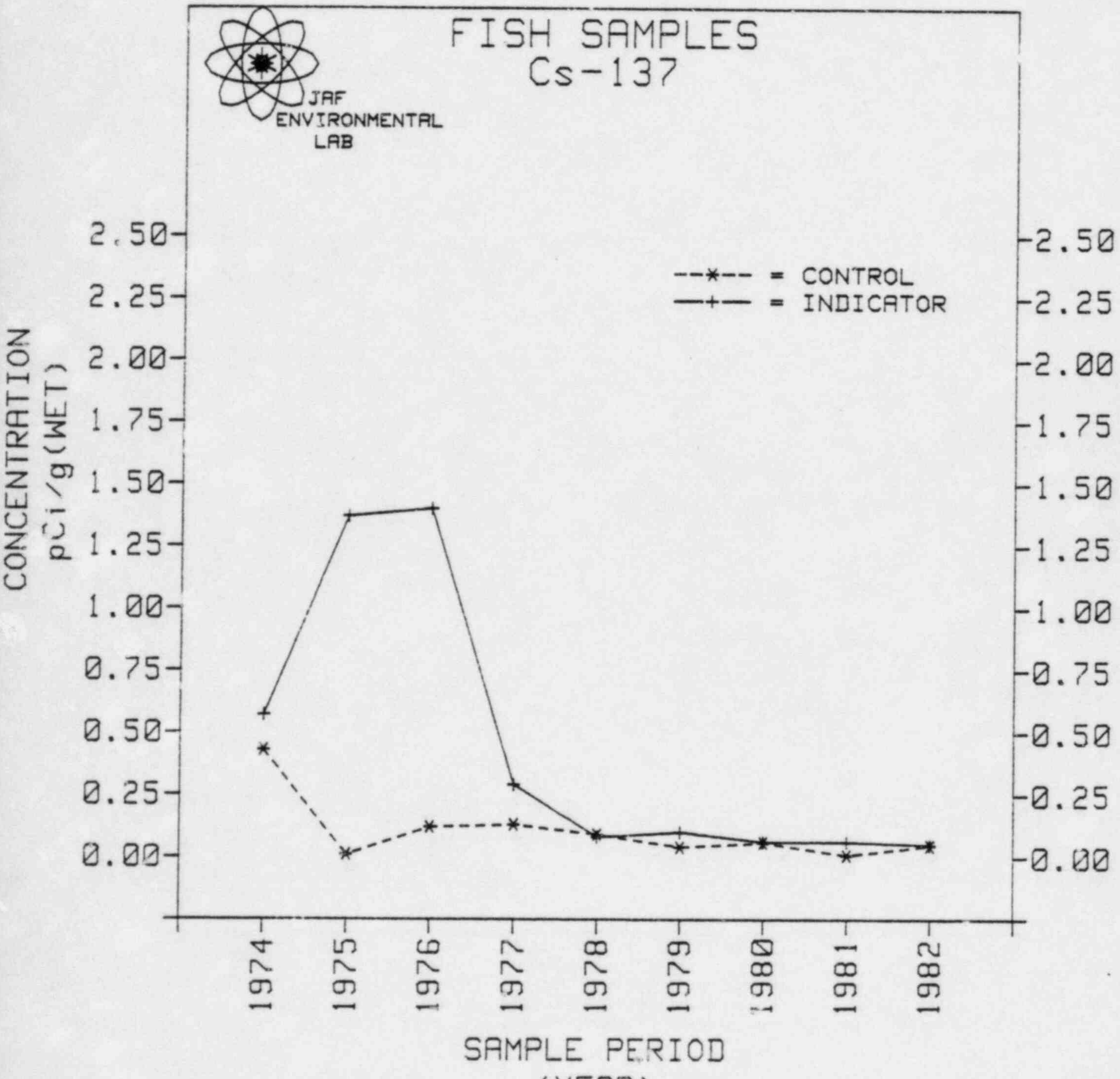
CONTROL DATA FOR YEARS 1975-76,1978-79 ARE MDL'S;1980-82 ARE LLD'S

FIGURE 15



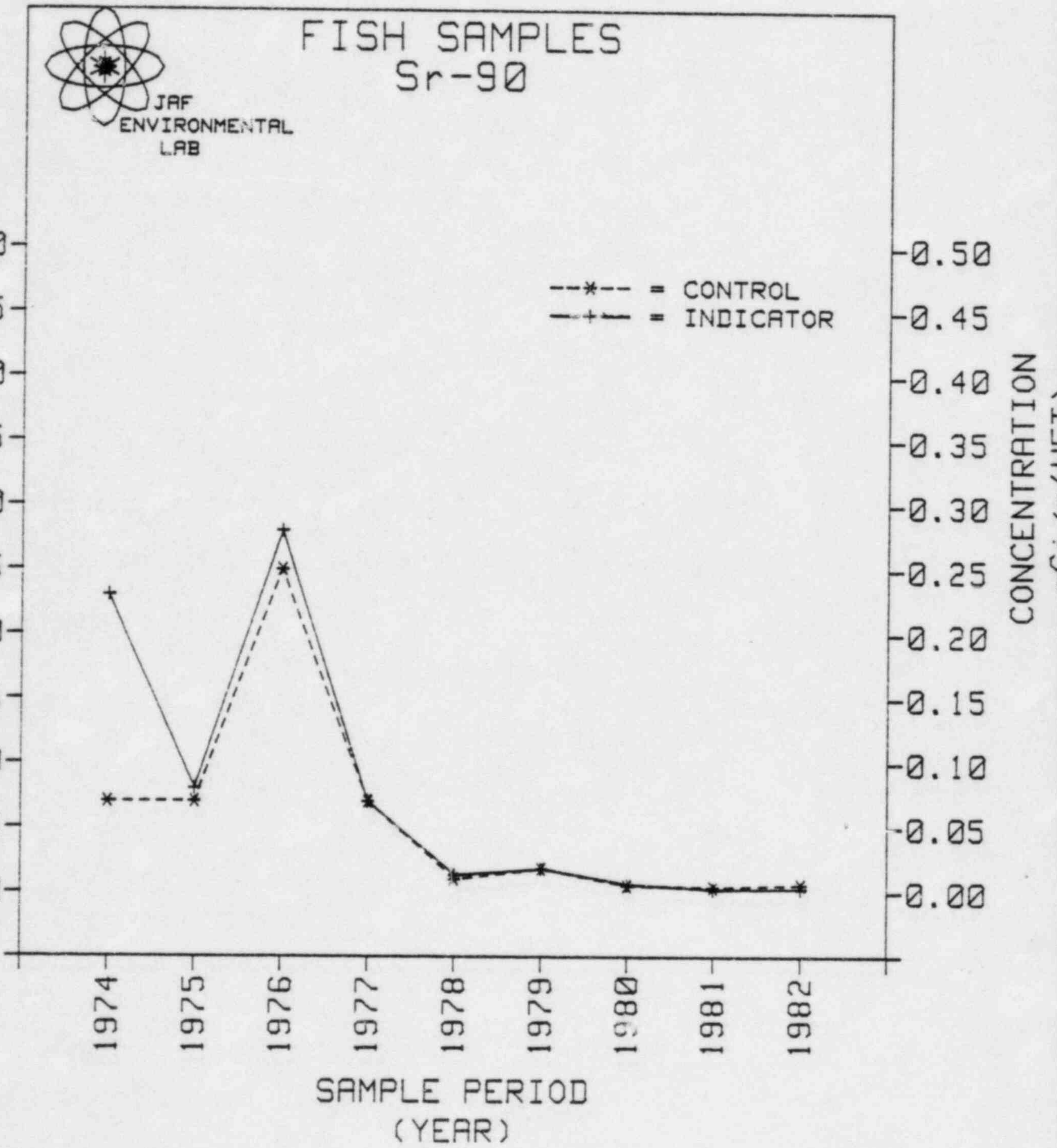
CONTROL DATA FOR 1976 IS MDL

FIGURE 16



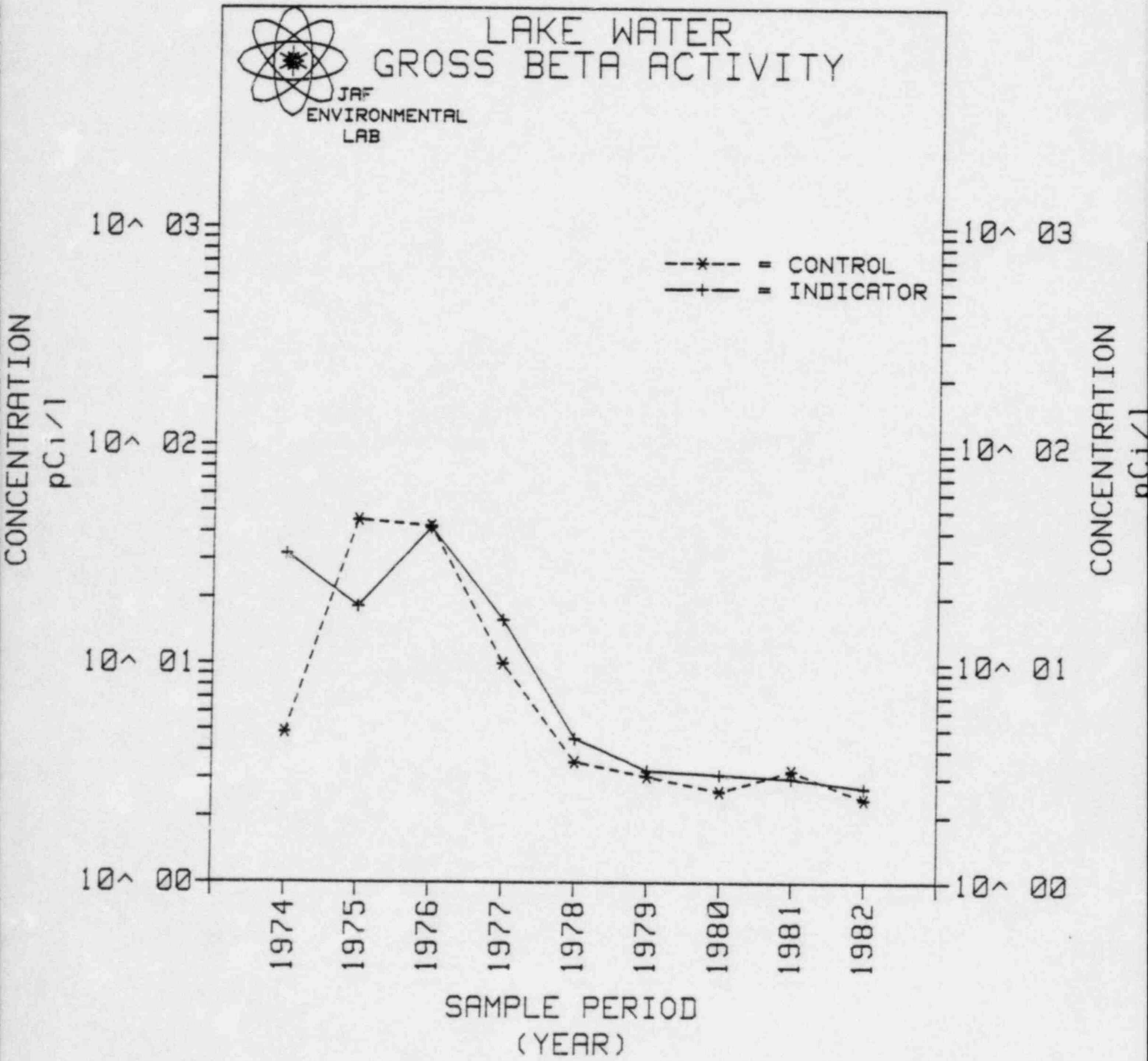
CONTROL DATA FOR 1975 IS MDL; 1981 IS LLD

FIGURE 17



CONTROL DATA FOR 1981 IS LLD

FIGURE 18



LAKE WATER
GROSS BETA ACTIVITY
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
SAMPLE PERIOD
(YEAR)

FIGURE 19

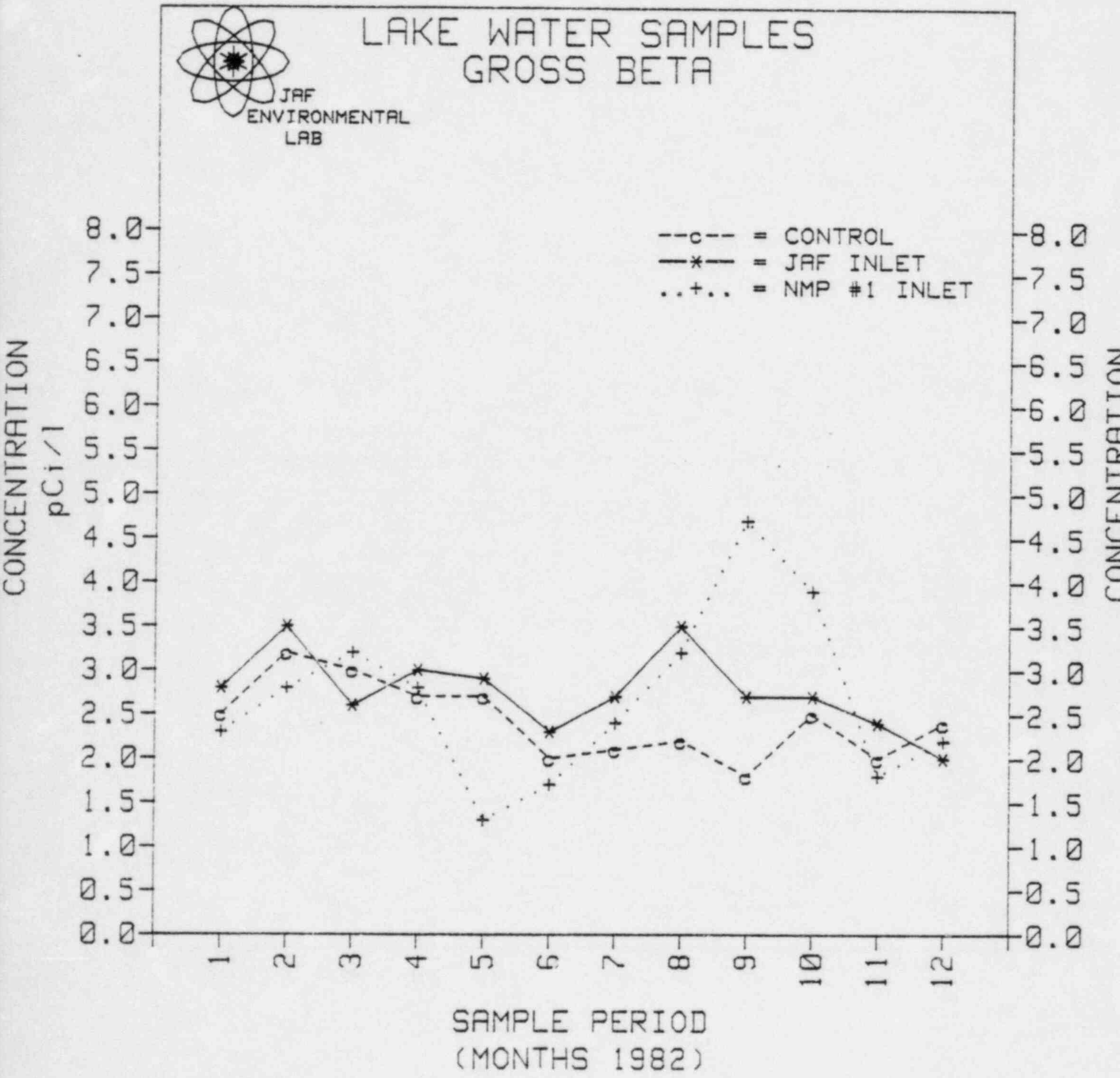
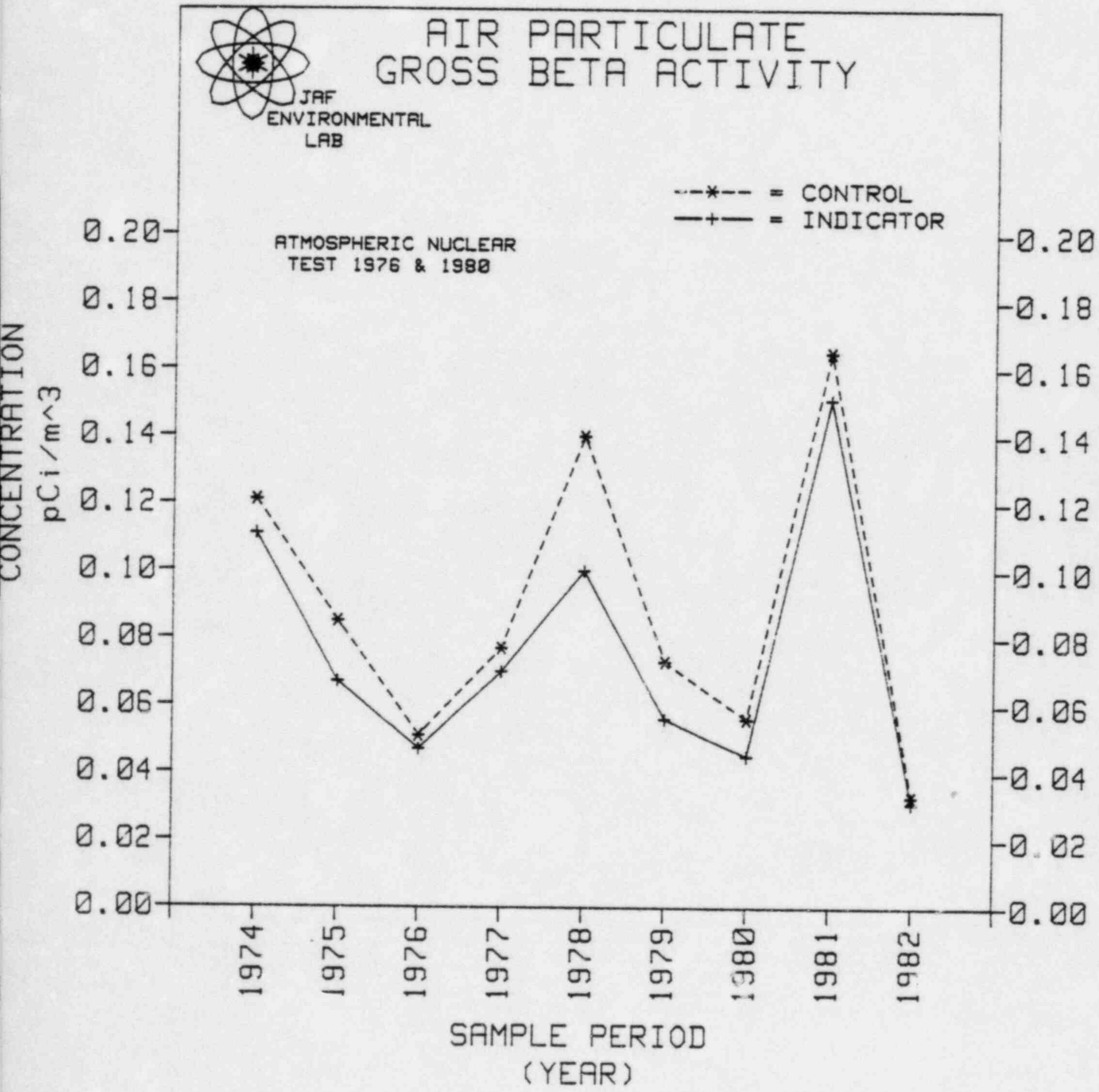
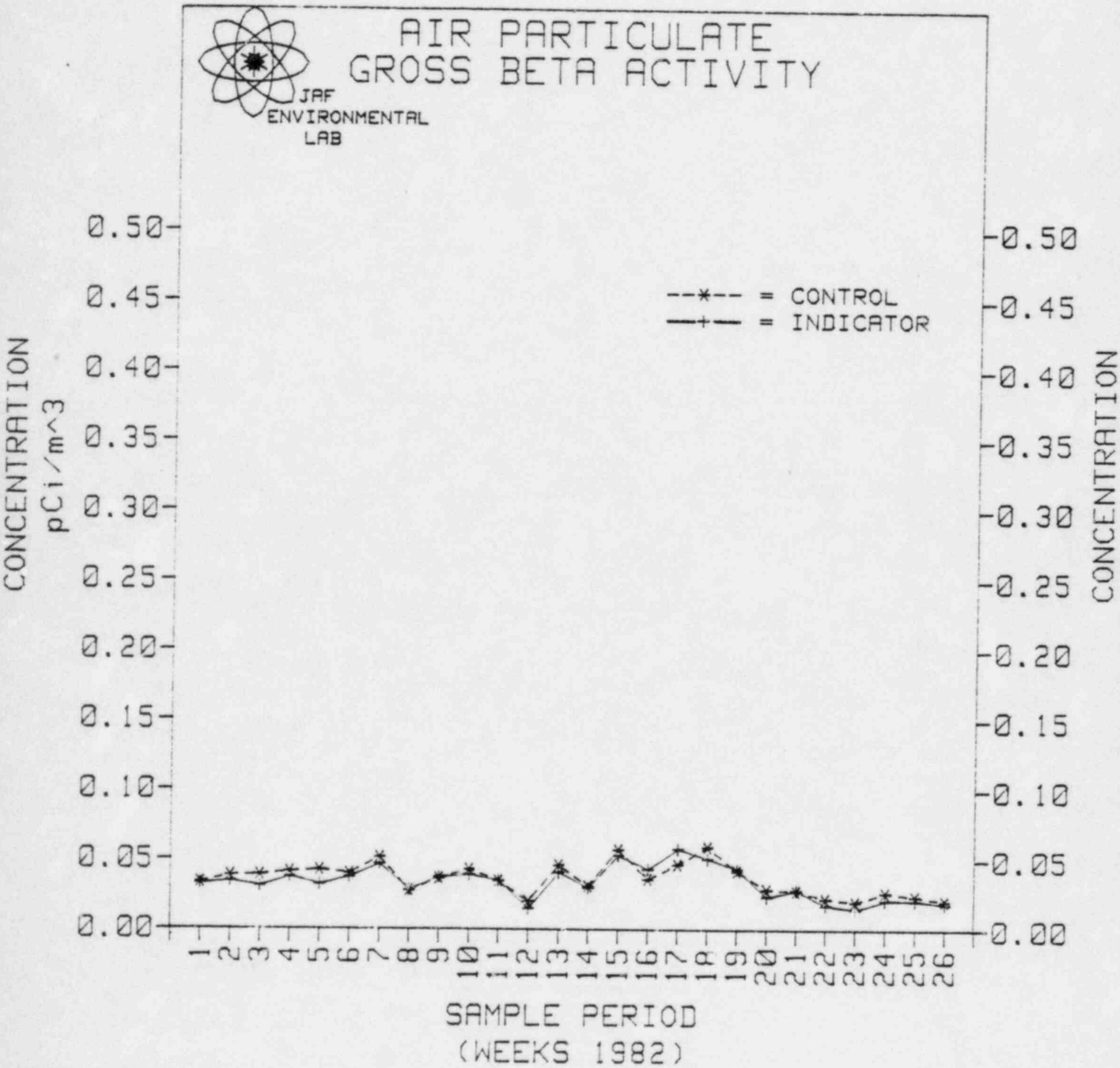

LAKE WATER SAMPLES
GROSS BETA
JAF
ENVIRONMENTAL
LAB
--c-- = CONTROL
—*— = JAF INLET
..+.. = NMP #1 INLET
CONCENTRATION
pCi/l
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
9
10
11
12
SAMPLE PERIOD
(MONTHS 1982)

FIGURE 20



AIR PARTICULATE
GROSS BETA ACTIVITY
JAF
ENVIRONMENTAL
LAB
--*-- = CONTROL
—+— = INDICATOR
ATMOSPHERIC NUCLEAR
TEST 1976 & 1980
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
SAMPLE PERIOD
(YEAR)

FIGURE 21



AIR PARTICULATE
GROSS BETA ACTIVITY
JAF
ENVIRONMENTAL
LAB
--*-- = CONTROL
—+— = INDICATOR
CONCENTRATION
pCi/m^3
CONCENTRATION
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 1982)

FIGURE 22

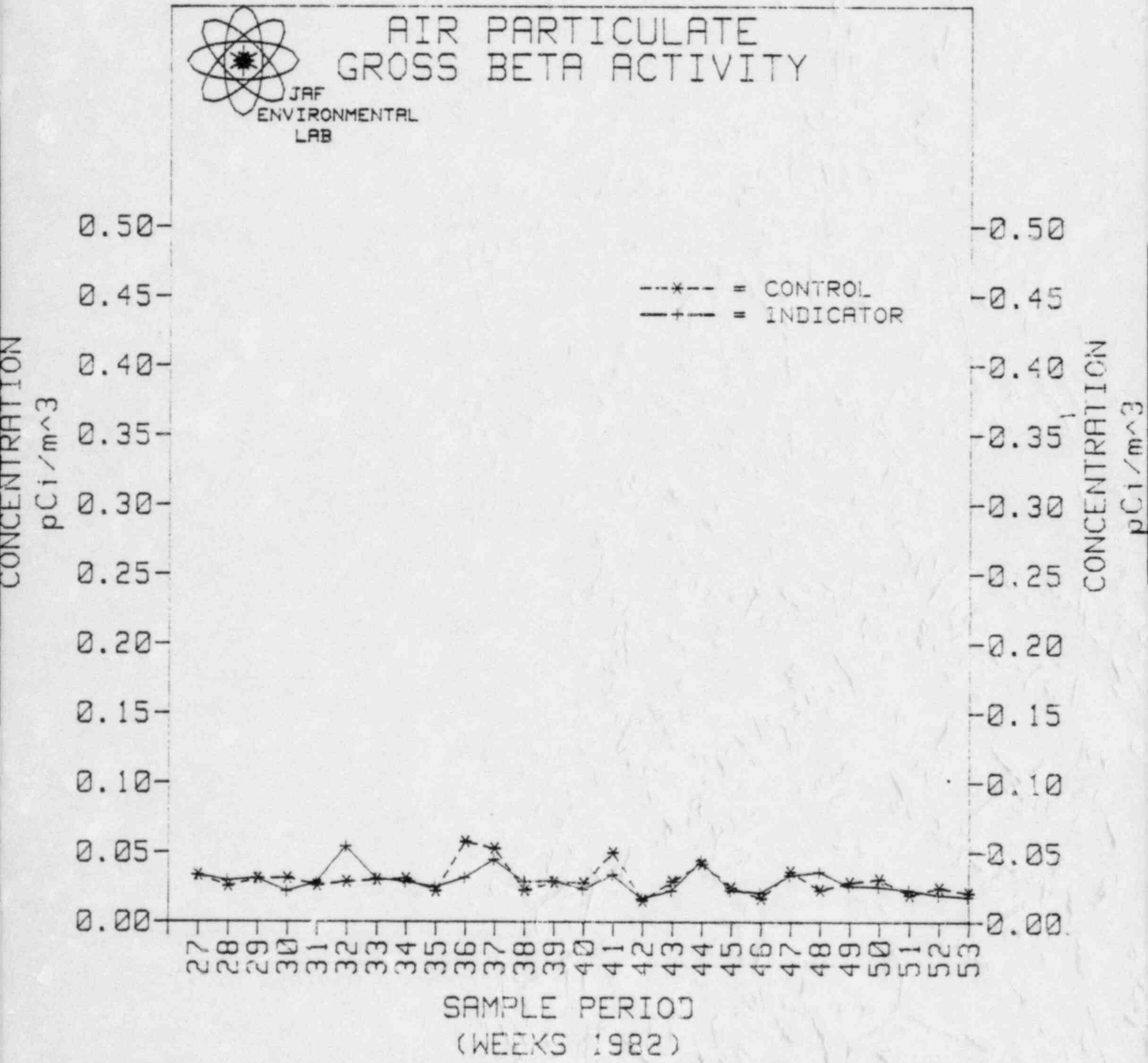
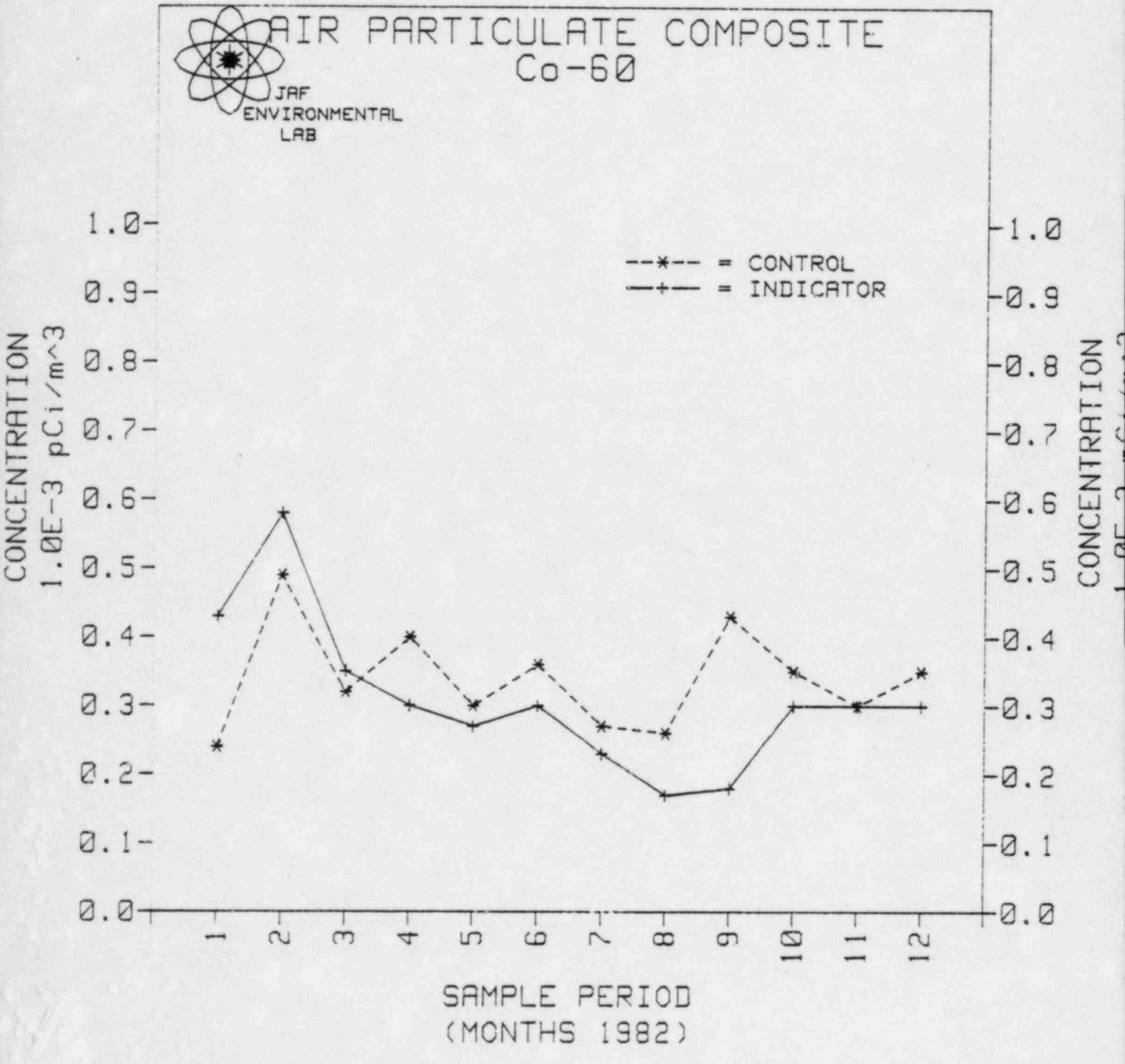
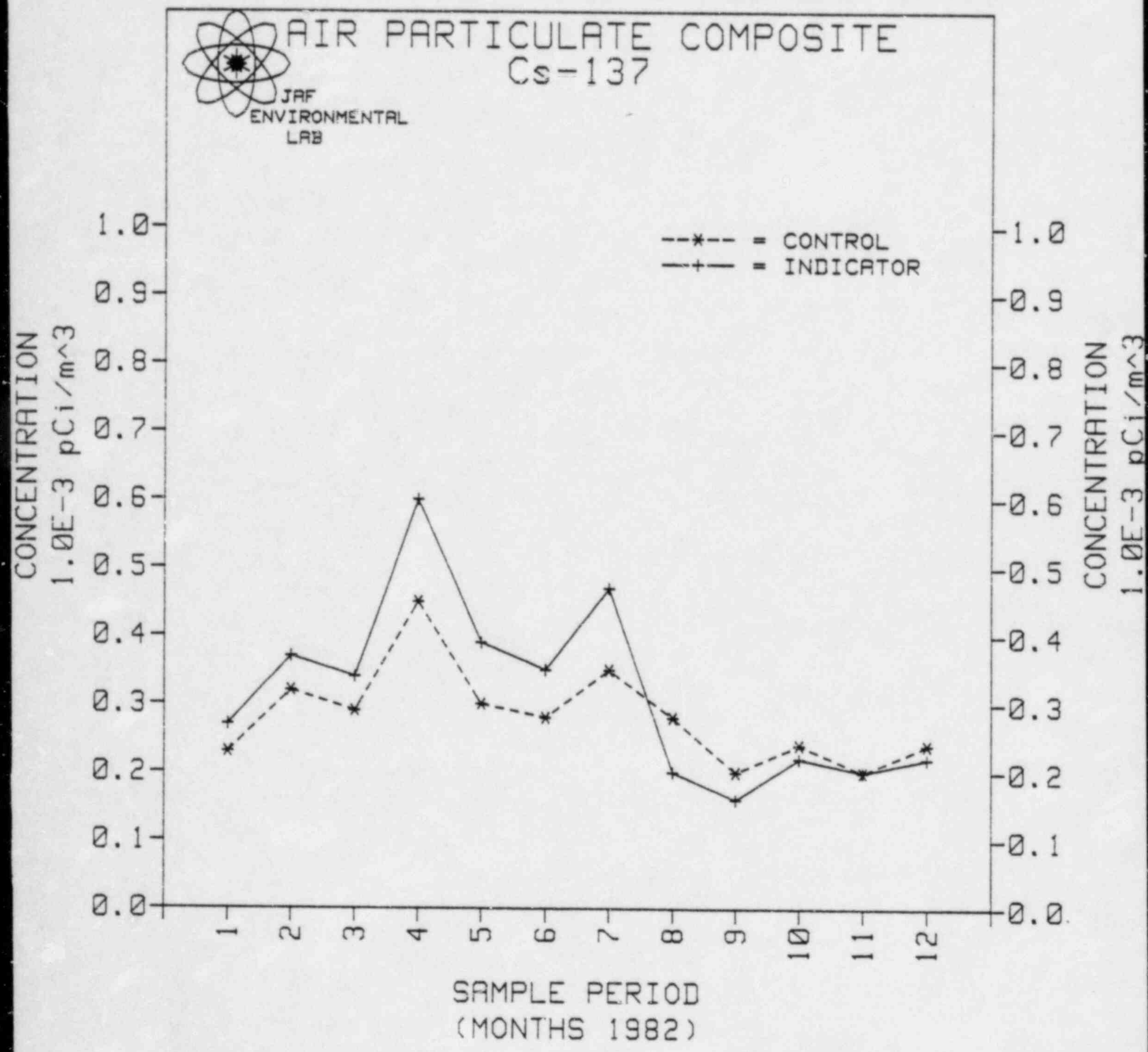

AIR PARTICULATE
GROSS BETA ACTIVITY
JAF
ENVIRONMENTAL
LAB
CONCENTRATION
pCi/m^3
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
--*-- = CONTROL
--+-- = INDICATOR
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
SAMPLE PERIOD
(WEEKS 1982)

FIGURE 23



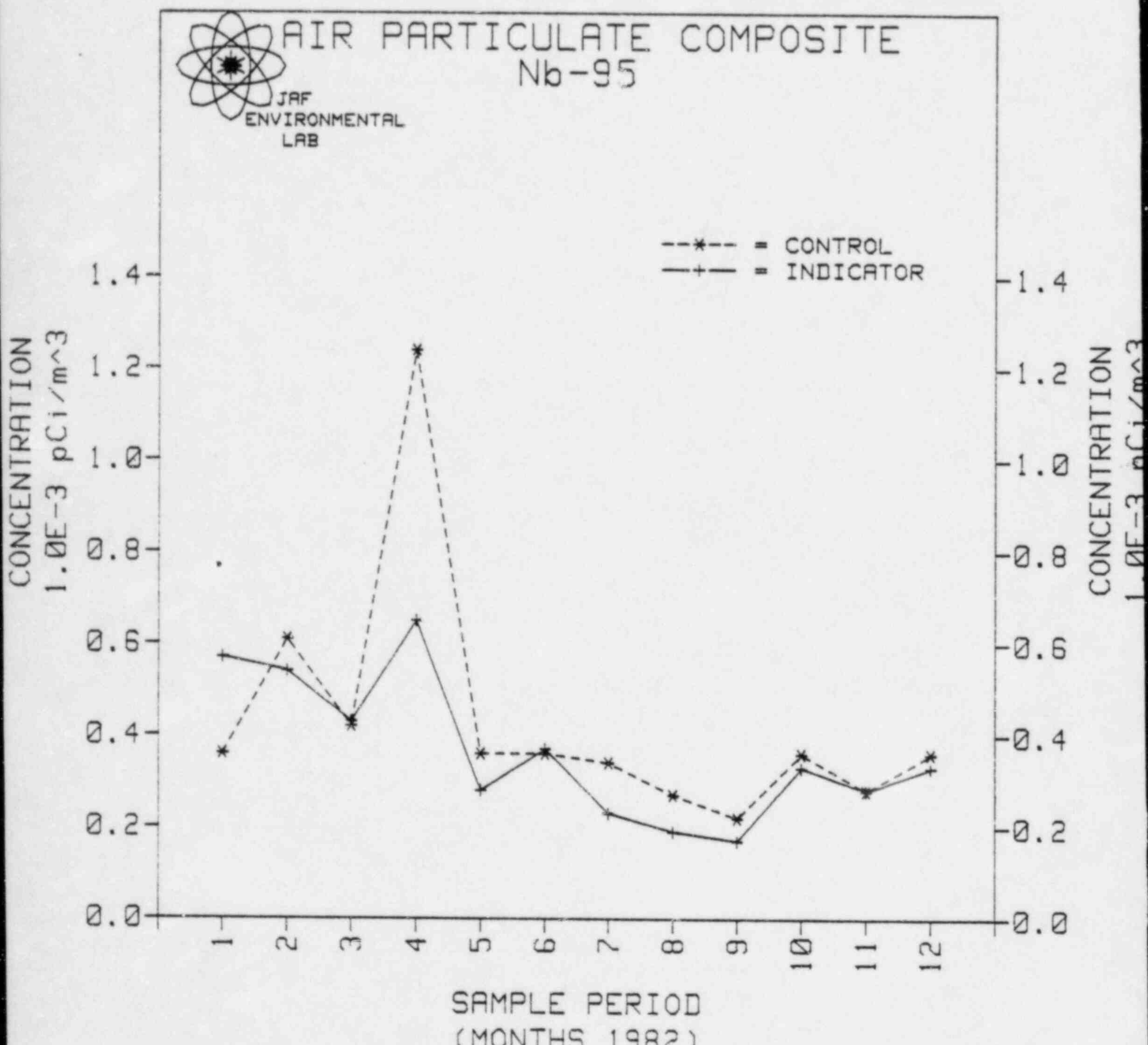
CONTROL MONTHS 1,3-12 ARE LLD'S
INDICATOR MONTHS 3,4,6,10,11,12 ARE LLD'S

FIGURE 24



CONTROL MONTHS 3,8-12 ARE LLD'S
INDICATOR MONTHS 4,8,10,11,12 ARE LLD'S

FIGURE 25



CONTROL MONTHS 4-12 ARE LLD'S
INDICATOR MONTHS 3,5-12 ARE LLD'S

FIGURE 26

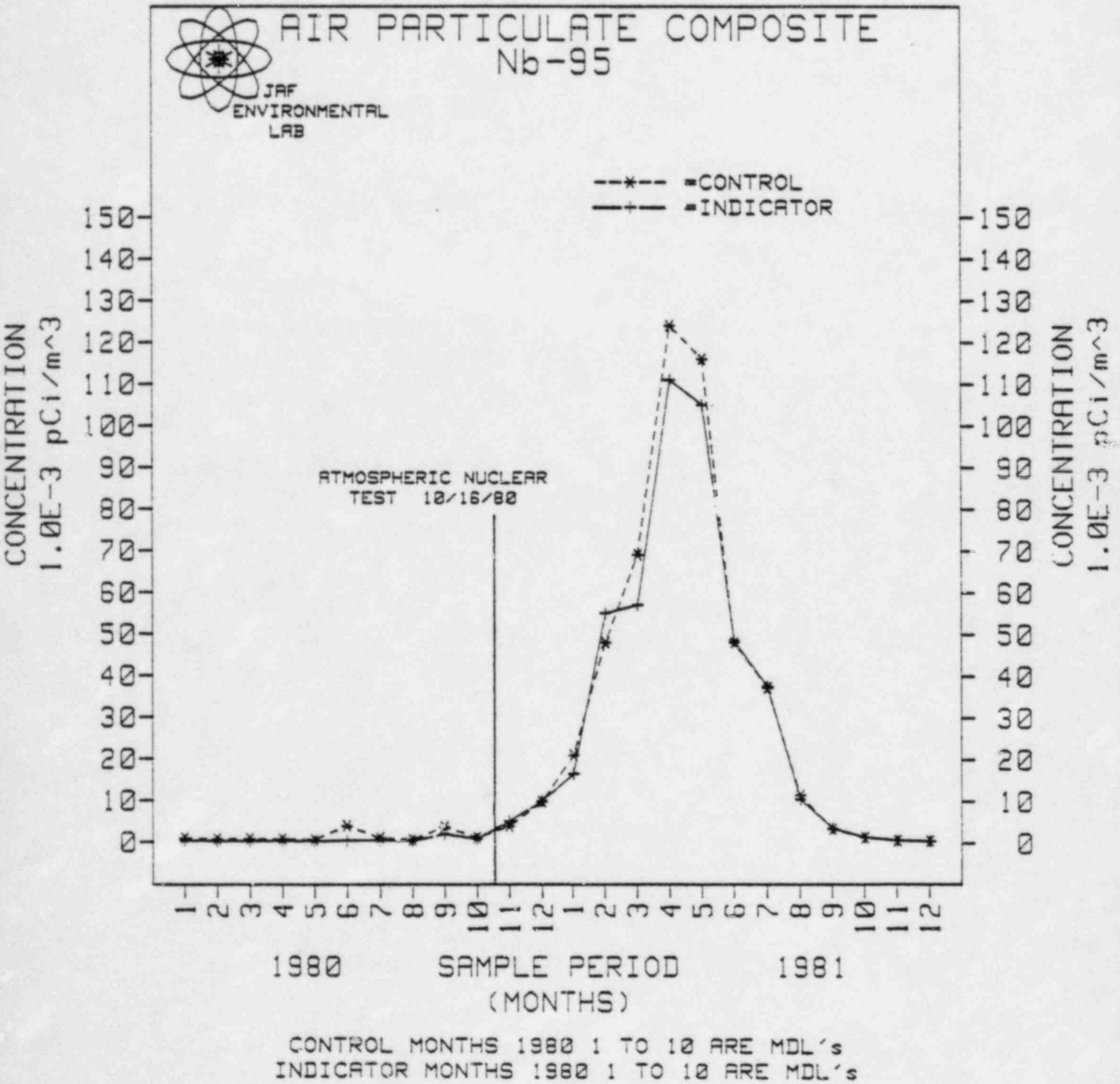
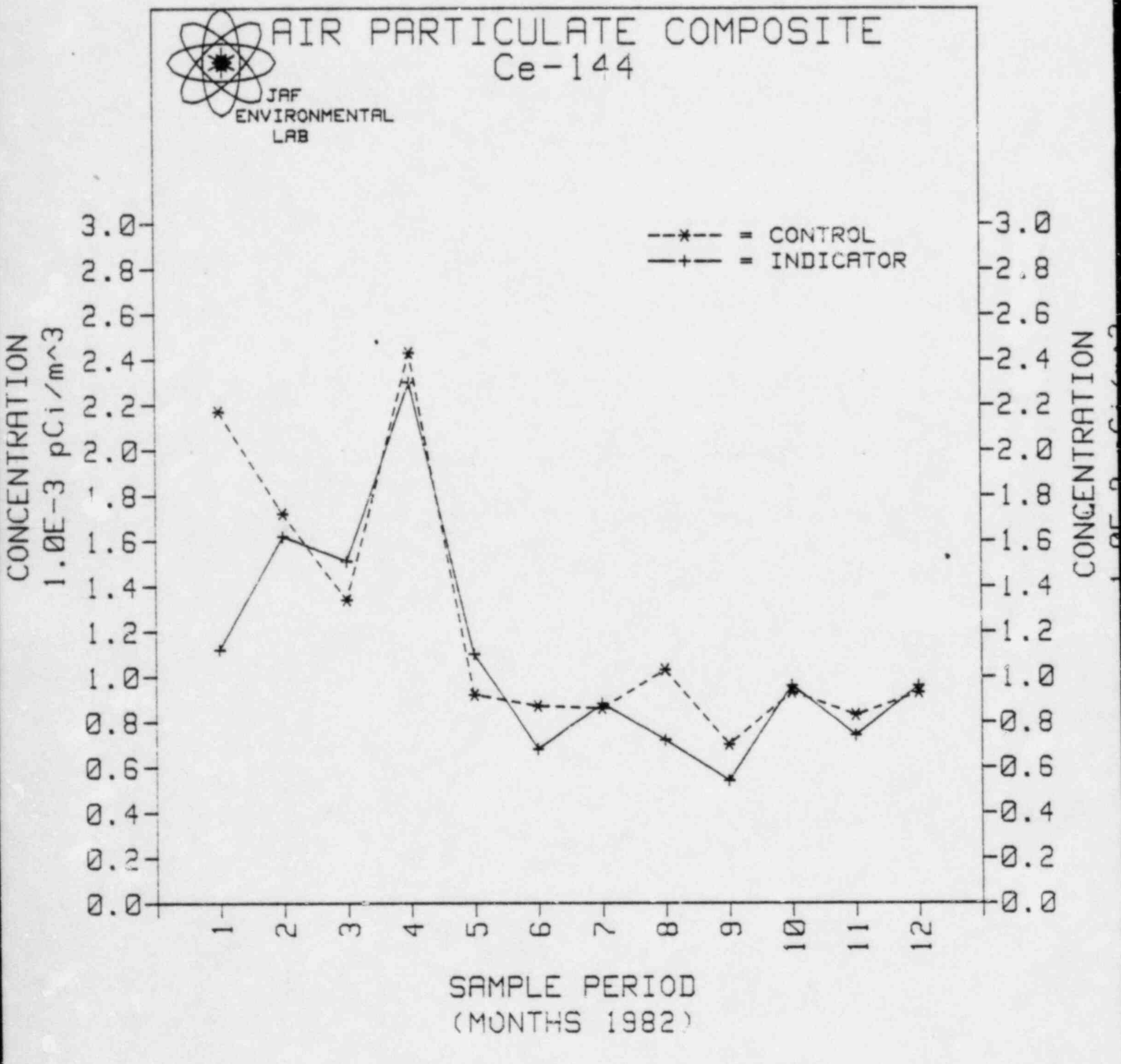
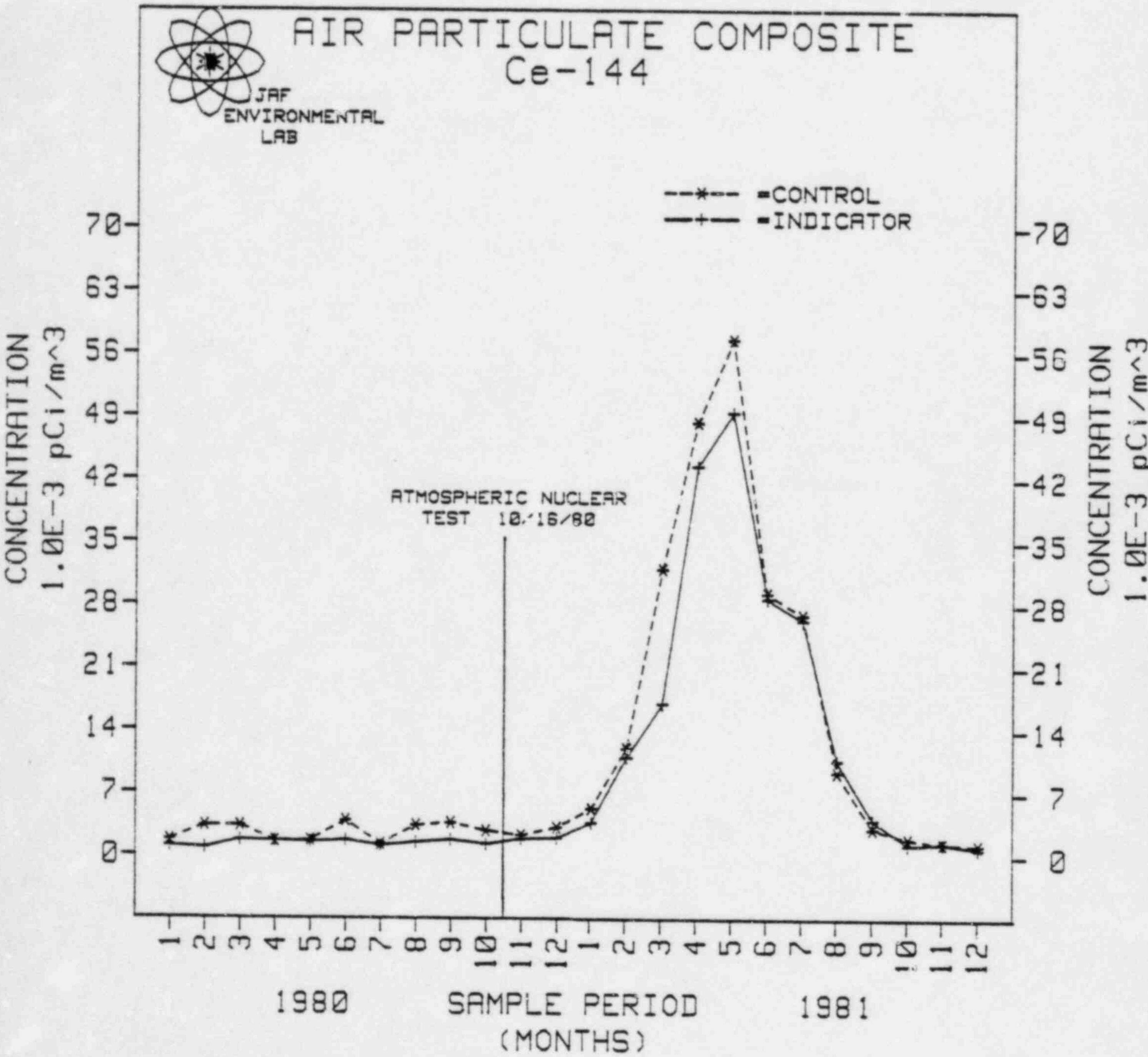

AIR PARTICULATE COMPOSITE
Nb-95
JAF
ENVIRONMENTAL
LAB
--*-- =CONTROL
—+— =INDICATOR
CONCENTRATION
1.0E-3 pCi/m^3
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ATMOSPHERIC NUCLEAR
TEST 10/16/80
1
2
3
4
5
6
7
8
9
10
11
12
1
2
3
4
5
6
7
8
9
10
11
12
1980
SAMPLE PERIOD
(MONTHS)
1981
CONTROL MONTHS 1980 1 TO 10 ARE MDL's
INDICATOR MONTHS 1980 1 TO 10 ARE MDL's

FIGURE 27



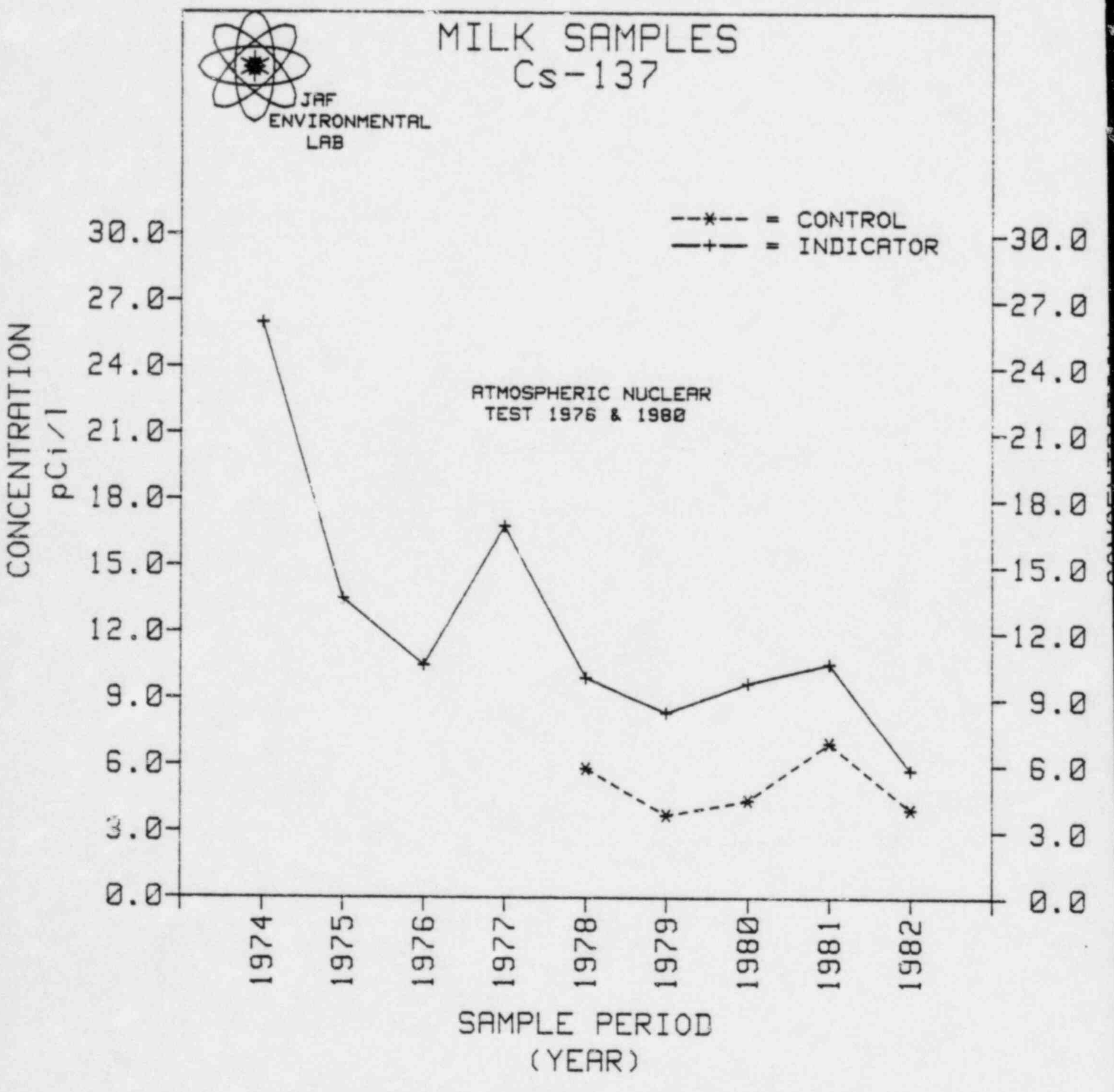
CONTROL MONTHS 8-12 ARE LLD'S
INDICATOR MONTHS 8-12 ARE LLD'S

FIGURE 28



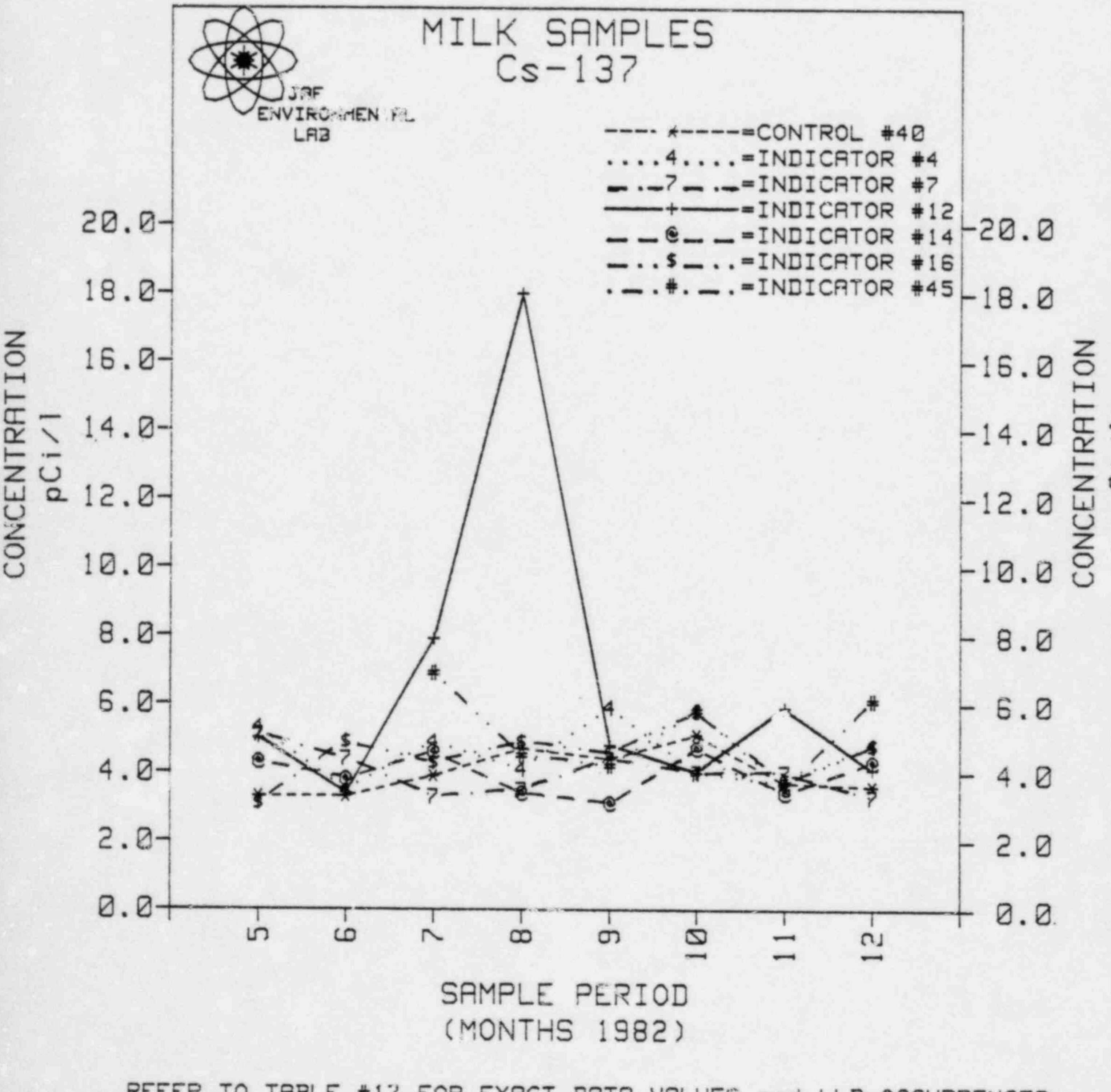
CONTROL MONTHS 1980 1 TO 11 ARE MDL's
INDICATOR MONTHS 1980 1 TO 11 ARE MDL's

FIGURE 29



NO CONTROL DATA FOR YEARS 1974-1977
CONTROL DATA FOR YEARS 1980 & 1982 ARE LLD'S

FIGURE 30



REFER TO TABLE #17 FOR EXACT DATA VALUES and LLD OCCURRENCES
SAMPLING BEGAN AT THE #45 FARM ON 7/82

FIGURE 31

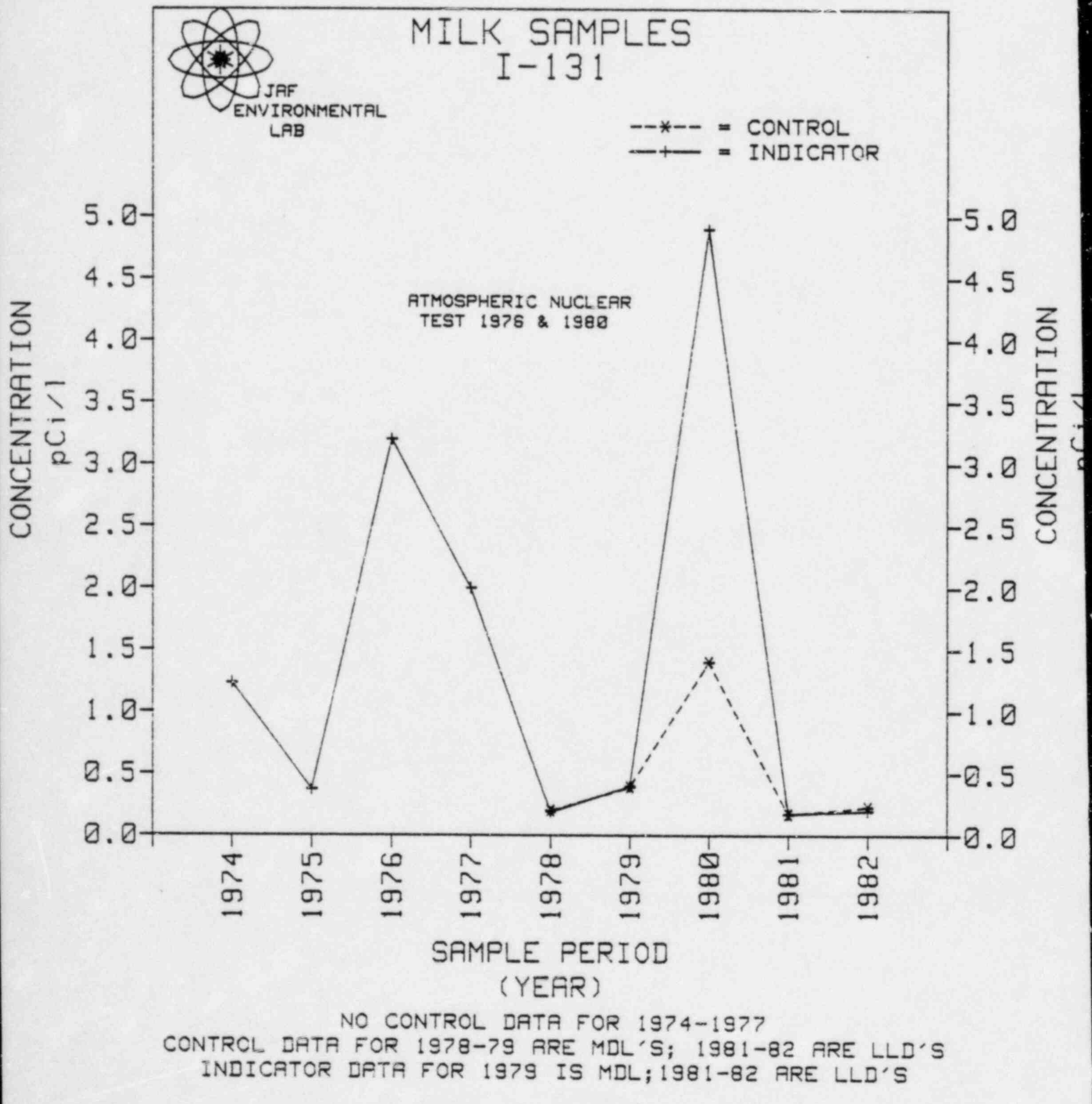
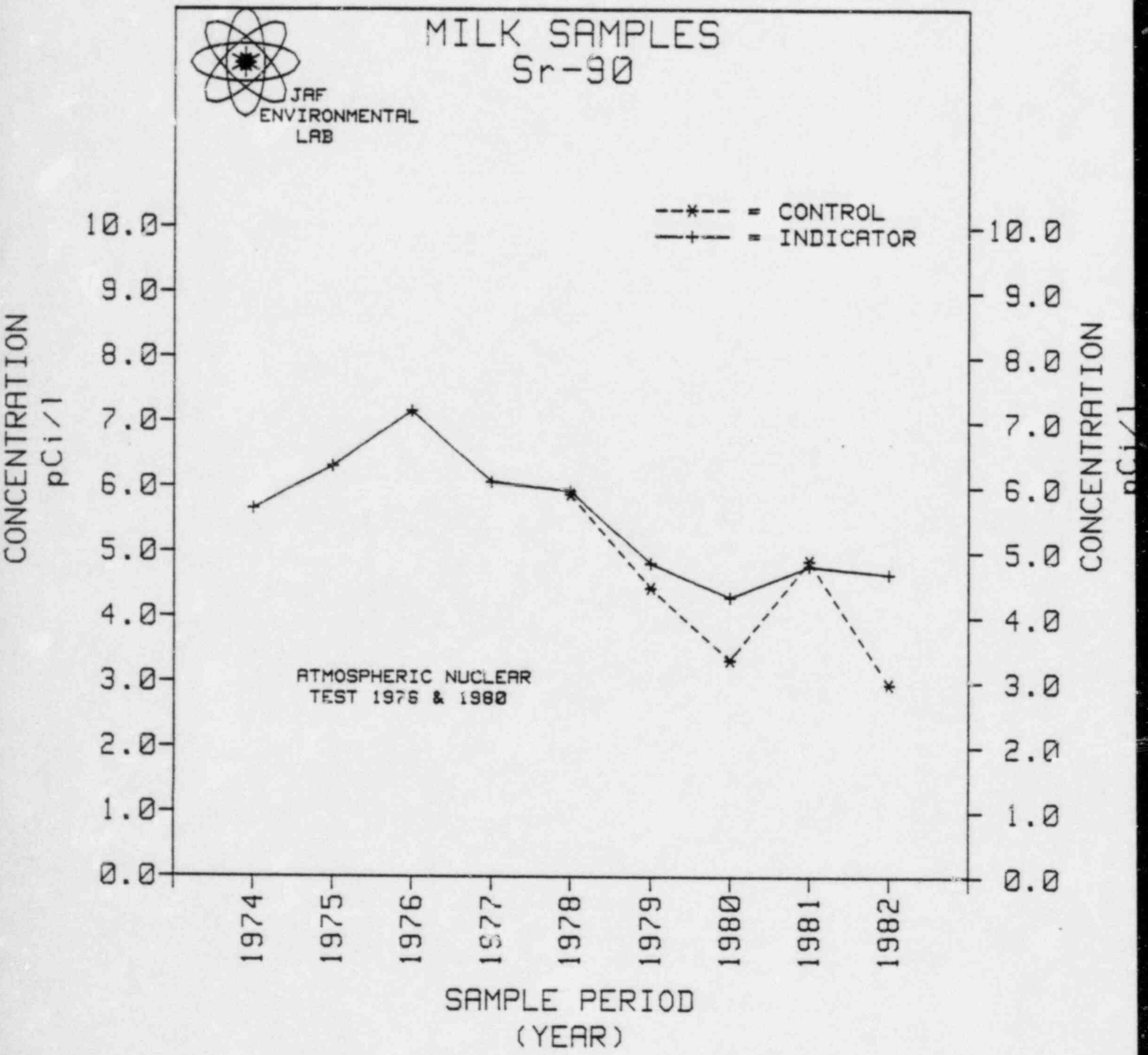

MILK SAMPLES
I-131
JAF
ENVIRONMENTAL
LAB
--*-- = CONTROL
—+— = INDICATOR
ATMOSPHERIC NUCLEAR
TEST 1976 & 1980
CONCENTRATION
pCi/l
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1974
1975
1976
1977
1978
1979
1980
1981
1982
SAMPLE PERIOD
(YEAR)
NO CONTROL DATA FOR 1974-1977
CONTROL DATA FOR 1978-79 ARE MDL'S; 1981-82 ARE LLD'S
INDICATOR DATA FOR 1979 IS MDL; 1981-82 ARE LLD'S

FIGURE 32



NO CONTROL DATA FOR 1974-1977