James A. FitzPatrick
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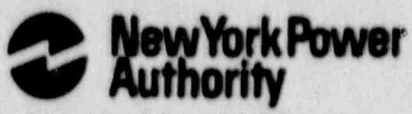

William Fernandez II
Resident Manager

April 27, 1990
JAFP-90-0358

United States Nuclear Regulatory Commission
Region I
457 Allendale Road
King of Prussia, PA 19406

Attention: Thomas T. Martin
Regional Administrator

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT FACILITY OPERATING LICENSE DPR-59, DOCKET NO. 50-333

Gentlemen:

Enclosed please find the 1989 Annual Radiological Environmental Operating Report which covers the operating period of January 01, 1989 through December 31, 1989. This report is submitted in accordance with the requirements of Amendment 93, Section 7.3.d of the James A. FitzPatrick Nuclear Power Plant Technician Specifications. Distribution for this report is in accordance with the Regulatory Guide 10.1, Revision 4.

Very truly yours,

WILLIAM FERNANDEZ

WF:BG:ls

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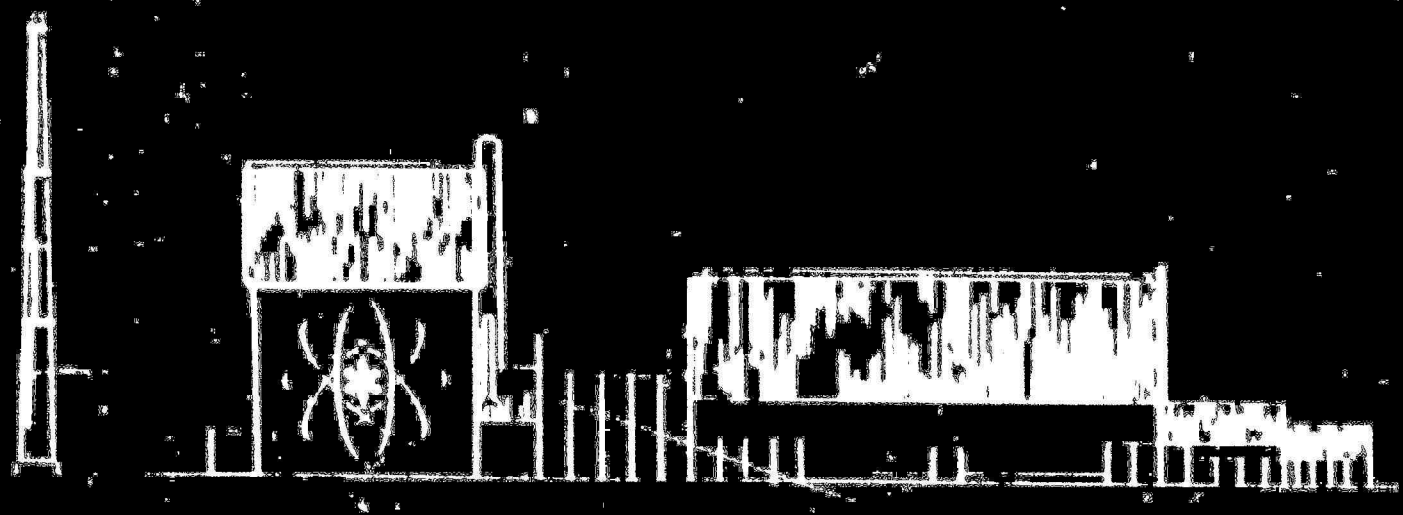
JANUARY 1, 1989 through DECEMBER 31, 1989



JAMES A. FITZPATRICK NUCLEAR POWER PLANT

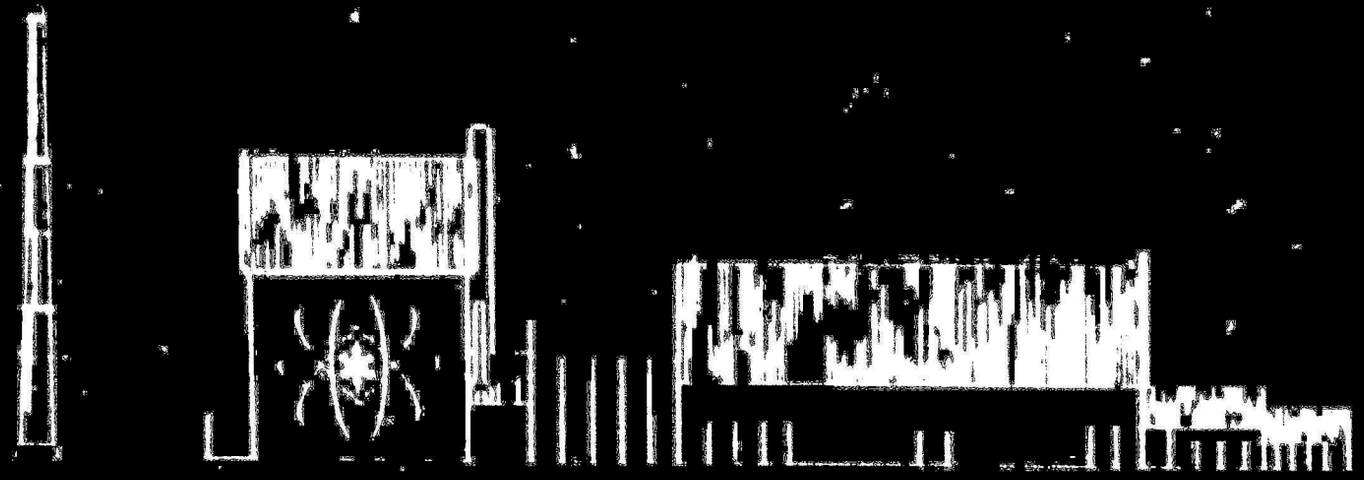
OPERATING LICENSE NO. DPR– 59
DOCKET NO. 50– 333

New York Power Authority

1989

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT

JANUARY 1, 1989 through DECEMBER 31, 1989



JAMES A. FITZPATRICK
NUCLEAR POWER PLANT

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

New York Power Authority

NEW YORK POWER AUTHORITY

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1, 1989 - DECEMBER 31, 1989

FOR

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

FACILITY OPERATING LICENSE DPR-59

DOCKET NUMBER 50-333

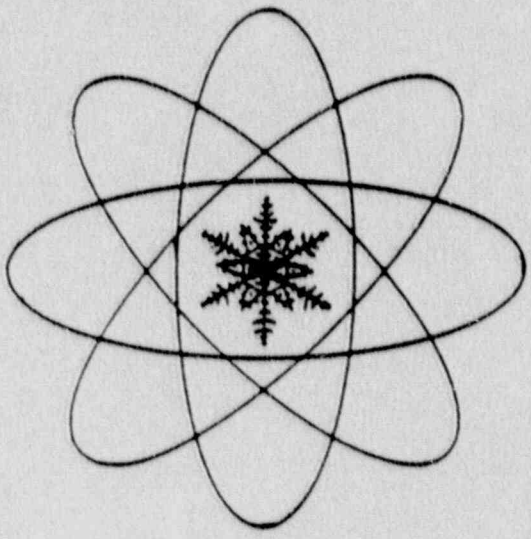
TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF FIGURES

1



INTRODUCTION

New York Power Authority

I-A EXECUTIVE SUMMARY

This report is published pursuant to Section 7.3.d of the Radiological Effluent Technical Specifications (RETS) which requires that the results from the Annual Radiological Monitoring Program be provided to the Commission. The report contains the analytical results for 1989 Sampling and Analysis Program. In addition to the results, the report must contain a program description, QA results, data summaries, data interpretation, environmental impact assessment and comparisons to historical data.

The following format has been used for the 1989 report:

Section	I	Introduction and program objectives
Section	II	Operational details of the monitoring program
Section	III	Summary of analytical data in the format specified by the NRC Branch Technical Position
Section	IV	Tables of Analytical Results for the 1989 program
Section	V	Analysis of Results
Section	VI	Historical Data (1972 - 1989)
Section	VII	Sample location maps and graphs of current and historical data
Section	VIII	Summary of QA results

Results for the 1989 sampling and analysis program showed the presence of radionuclides that were naturally occurring, the direct result of atmospheric nuclear testing and those radionuclides that can be related to operations at the Nine Mile Point site. Radionuclides falling into this last category include Cs-137, Co-60 and Zn-65. These radionuclides were detected at very low concentrations in several of the sample media collected.

Cesium-137 was detected in 1 of the 25 vegetation samples and 15 of the 24 fish samples collected during 1989. The presence of Cs-137 in the vegetation and fish samples is of little significance and is most likely the result of past nuclear weapons testing. These sample results are addressed in detail in section V of the report. Cesium-137 was also detected in the indicator shoreline sediment samples. The source of the Cs-137 in the sediment samples is not easily discerned and could possibly be the result of both past weapons testing and plant operations. The presence of Cs-137 in the sediment samples is insignificant with respect to the resulting dose to man. The calculated whole body dose for the measured concentrations was 0.0013 mrem per year whole body dose to the maximum exposed individual.

The analysis of samples collected from the air sampling stations showed the presence of Zn-65 and Co-60 in several on-site air particulate composites. These air sampling stations are located inside the site boundary. Neither of these radionuclides were detected in the samples from the off-site sample location collected during this same time period. Dose to man calculations were done for the measured concentrations of Zn-65 and Co-60 with the maximum dose to a child being 0.00019 mrem per year to the whole body and 0.0034 mrem per year to the lung which is the critical organ. These calculated doses are insignificant from the view point of the health and safety of the general public. Neither Zn-65 or Co-60 were detected in any of the other environmental media sampled as part of the 1989 monitoring program.

With the exception of the shoreline sediment and air particulate sample results noted above, the results of the 1989 Environmental Monitoring Program showed results which were consistent with previous years. In several cases such as air particulate gross beta and fish Cs-137 concentrations, the 1989 program results further documented a downward trend of the levels of manmade radionuclides in the environment.

In summary, the 1989 Environmental Monitoring Program demonstrated the routine operation of the James A. FitzPatrick Nuclear Power Plant had no significant inpact on the environment.

I-B INTRODUCTION

The New York Power Authority (NYPA) is the owner and licensee of the James A. FitzPatrick Nuclear Power Plant (JAFNPP). The FitzPatrick Plant is located on the eastern portion of the Nine Mile Point promontory approximately one-half mile due east of the Niagara Mohawk Power Corporation (NMPC) Nine Mile Point Nuclear Power Stations (NMPNPS). NMPNPS #1, a 620 MWe (net) boiling water reactor located on the western portion of the site, has been in operation since 1969. Located between the JAFNPP and NMPNPS #1, is Nine Mile Point #2. NMPNPS #2 began commercial operation in March of 1988 and has generation capacity of 1,100 MWe (net). 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 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. The JANFPP is located at coordinates north 4,819, 545.012 m, east 386, 968.945 m, on the Universal Transverse Mercator System. 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.

Responsibility for the JAFNPP Radiological Environmental Monitoring Program (REMP) is shared jointly by NYPA and NMPNC. Similar Technical Specifications for NMPNPS #1, NMPNPS #2 and JAFNPP 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 three facilities with review and publication of the data undertaken through each organization.

This report is submitted in accordance with Section 7.3.d of the Radiological Effluent Technical Specifications (RETS) to DPR-59, Docket 50-333.

I-C PROGRAM OBJECTIVES

The objectives of the Radiological Environmental Monitoring Program are to:

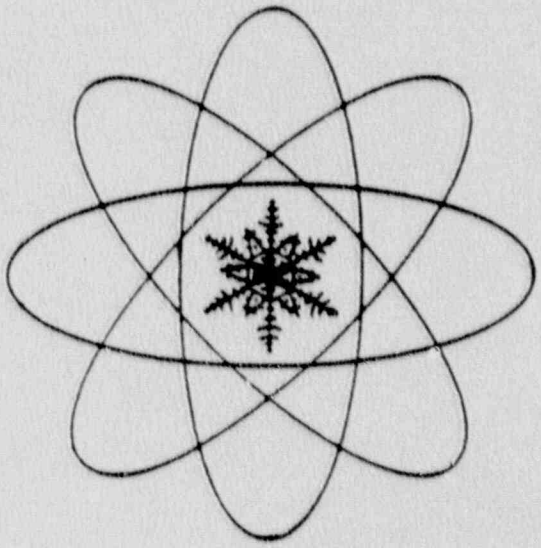
1. Determine and evaluate the effects of plant operation on the environs and to verify the effectiveness of the controls on radioactive material sources.

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

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

4. 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

New York Power Authority

II PROGRAM IMPLEMENTATION AND DESIGN

The JAFNPP Radiological Environmental Monitoring Program (REMP), consists of sampling and analysis of various media that include:

- o Shoreline Sediment
- o Fish
- o Surface Waters
- o Airborne Particulate and Iodine
- o Milk
- o Food Products

In addition, direct radiation measurements are performed using thermoluminescent dosimeters (TLDs). These sampling programs are described in Table I. The adequacy of the JAFNPP REMP sampling is verified by an annual land use census. The accuracy of the program is assured by participation in The United States Environmental Protection Agency (USEPA) Environmental Radioactivity Laboratory Intercomparison Program.

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, EA Science and Technology, Inc. (EA).

A. SAMPLE COLLECTION METHODOLOGY

1. Surface Water

Surface water samples are taken from the respective inlet canals of JAFNPP and Niagara Mohawk's Oswego Steam Station (OSS) located in the City of Oswego. The JAFNPP removes water from Lake Ontario on a continuous basis and generally represents a "down-current" sampling point for the Nine Mile Point Site. The OSS inlet canal removes water from Lake Ontario at a point approximately 7.6 miles west of the site. This "up-current" location is considered a control location because of the distance from the site as well as lake current patterns and current patterns from the Oswego River located nearby.

Samples from the JAFNPP are composited from automatic sampling equipment which discharges into a compositing tank. Samples are obtained from the tank monthly and analyzed for gamma emitters. Samples from the OSS are also composited from automatic sampling equipment and discharged to a compositing tank. Samples from this location are obtained weekly and composited to form monthly composite samples. Monthly samples are analyzed for gamma emitters.

A portion of the monthly samples from each of the locations is saved and composited to form quarterly composite samples for calendar quarter. Quarterly composite samples are analyzed for tritium.

In addition to the FitzPatrick and Oswego Steam Station facilities, data is presented for the Nine Mile Point Unit 1 and Unit 2 facility inlet canals and city water from the City of Oswego. The latter three locations are not required by the Technical Specifications, but are optional samples. Monthly composite samples from these three locations are analyzed for gamma emitters and quarterly composite samples are analyzed for tritium.

Surface water sample locations are shown in Section VII on Figure 1A.

2. Air Particulate/Iodine

The air sampling stations required by the Radiological Effluent Technical Specifications (RETS) are located in the general area of the site boundary (within 0.7 miles) in sectors of highest calculated meteorological deposition factors (D/Q) based on historical data. These stations (R-1, R-2, and R-3) are located in the east, east-southeast, and southeast sectors as measured from the center of the Nine Mile Point Nuclear Station Unit 2 reactor building. The RETS also require that a fourth

air sampling station be located in the vicinity of a year round community having the highest calculated dispersion factor (D/Q) again based on historical meteorological data. This station is located in the southeast sector (R-4). A fifth station required by the RETS is located at a site 16.4 miles from the site in a least prevalent wind direction of east-northeast (R-5) and is considered a control location.

In addition to the RETS required locations, there are six other sampling stations located within the site boundary (D1, G, H, I, J, and K). These locations generally surround the area occupied by the three generating facilities, but are well within the site boundary. One other air sampling station is located off-site in the southwest sector and is in the vicinity of the City of Oswego (G off). Three remaining air sampling stations (D2, E, F) are located in the ESE, SSE, and S sectors and range in distance from 7.2 to 9.0 miles.

At each station, airborne particulates are collected by glass fiber filters (47 millimeter diameter) and radioiodine by charcoal cartridges (2 x 1 inch). The samplers run continuously and the charcoal cartridges and particulate filters are changed on a weekly basis. Sample volume is determined by use of calibrated gas flow meters located at the sample discharge. Gross beta analysis is performed for each particulate filter. Charcoal cartridges are analyzed weekly for radioiodine using a Ge(Li) or HPGe detector.

The particulate filters are composited for gamma analyses on a monthly basis by location after all weekly particulate filters have been counted for gross beta activity.

Air sampling stations are shown in Figures 1A, 1B, and 2.

3. Milk

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 half and second half of each month from each of the selected locations within ten miles of the site and from a control location. The samples are chilled and shipped to the analytical laboratory within thirty-six hours of collection in insulated shipping containers.

Milk sample location selection is based on maximum deposition factors (D/Q). Deposition factors are generated from average historical meteorological data and effluent parameters for each of the licensed site

reactors. The Technical Specifications require three sample locations within 5.0 miles of the site with the highest calculated deposition factors. During 1989, there were no milk sample locations within 5.0 miles that could be sampled. However, there were a number of locations beyond five miles that were sampled.

A fourth sample location required by the RETS is located in a least prevalent wind direction from the site. This location is in the southwest sector and serves as a control location. Milk samples are collected and analyzed twice per month during the local grazing season (April - December) for gamma emitters and I-131. Additional samples would be collected January - March in the event I-131 is detected in November and December of the preceding year. No such samples were required for 1989.

The milk sampling locations are found in Section VII on Figure 4.

4. Food Products (Vegetation)

Food products are collected once per year during the late summer harvest season. A minimum of three different kinds of broad leaf vegetation (edible or inedible) are collected from two different indicator garden locations. Sample locations are selected from gardens identified during the annual census which have the highest estimated deposition factors (D/Q) based on historical site meteorological data. Control samples are also collected from available locations greater than 9.3 miles distance from the site in a least prevalent wind direction. Control samples are of the same or similar type of vegetation when available.

Food product samples are analyzed for gamma emitters using gamma isotopic analysis.

Food product locations are shown in section VII on Figure 3.

5. Fish Samples

Available fish species are selected 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 on-site sample transects and one off-site sample transect (see Section VII, Figure 1A). 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.

b) Samples composed of more than 1 kilogram of single species from the same location are divided into samples of 1 kilogram each. 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. Edible portions of each sample are analyzed for gamma emitting radionuclides. Fish collection locations are shown in Section VII on Figure 1.

6. Shoreline Sediments

One kilogram of shoreline sediment is collected at one area of existing or potential recreational value and from one area beyond the influence of the site. Samples are collected as surface scrapings to a depth of approximately 1 inch. The samples are placed in plastic bags, sealed and shipped for analysis in insulated containers. Sediment samples are analyzed for gamma emitting radionuclides.

Shoreline sediment locations are shown in Section VII on Figure 1A.

7. TLD (direct radiation)

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. TLDs are supplied and processed by Teledyne Isotopes of Westwood, New Jersey on a quarterly basis. Shipment control TLDs (at least two) accompany each shipment to and from the vendor's laboratory. Shipment control TLDs also accompany the TLDs when they are being placed or collected and are shielded by lead when they are not being used. TLD data results are corrected for a transit dose by use of the data from the shipment control TLDs.

Five different types of areas are evaluated by environmental TLDs. These areas include;

- o On-site areas (areas within the site boundary not required by the RETS)
- o Site boundary area in each of the sixteen meteorological sectors
- o An outer ring of TLDs (located four to five miles from the site in eight available land based meteorological sectors)
- o Special interest TLDs (located at sites of high population density)

- o Control TLDs located at sites beyond significant influence of the site.

Special interest TLDs are located at or near large industrial sites, schools, or proximal towns or communities. Control TLDs are located to the southwest, south and east-northeast of the site at distances of 12.6 to 19.8 miles.

TLDs used during 1989 were composed of rectangular teflon wafers impregnated with 25 percent $CaSO_4$:Dy phosphor. These were placed in a polyethylene package to ensure dosimeter integrity. TLD packages were placed in open webbed plastic holders and were attached to supporting structures, usually trees or utility poles.

Environmental TLD locations are shown in Section VII Figures 1A, 1B, and 2.

8. Land Use Census

A land use census is conducted during the beginning of the grazing season to determine the utilization of land within the vicinity of the site. The land use census consists of three types of census. A milk animal census is conducted to identify all milk animals within a distance of ten miles from the site. This census is conducted by using road surveys, contacting local agricultural authorities, post cards, and investigating references from other owners.

A second type of census is a residence census. This census is conducted in order to identify the closest residence in each of the sixteen, 22½ degree meteorological sectors. A residence, for the purpose of this census, is a residence that is occupied on a part time basis (such as a summer camp) or on a full time, year round basis. For the residence census, several of the meteorological sectors are over Lake Ontario because the site is located at the shoreline. No residences are located in these sectors. There are only eight sectors over land where residences are located within five miles.

A third census is conducted each year to identify the gardens near the site to be used for the collection of food product samples. The results of this census are not included in this report, as the findings from this census are used only to identify appropriate sample locations. A garden census is not required by the Technical Specifications if broad leaf vegetation sampling and analysis is performed.

9. Interlaboratory Comparison Program

An interlaboratory comparison program is conducted with reference samples originating from the Environmental Protection Agency (EPA). As required by the Technical Specifications, participation in this program includes media for which environmental samples are routinely collected and for which intercomparison samples are available.

B. ANALYSIS PERFORMED

The analysis of the majority of environmental samples is performed by the James A. FitzPatrick Environmental Counting Laboratory (JAFECL). TLD and milk I-131 analysis are performed by Teledyne Isotopes (TI). 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 Monthly Composites - gamma spectral analysis
- Surface Water Quarterly Composites - tritium
- Special Samples (soil, etc.) - gamma spectral analysis (as collected)
- Fish - gamma spectral analysis
- Shoreline Sediment - gamma spectral analysis
- Milk - gamma spectral analysis

Quality assurance samples are analyzed by Teledyne Isotopes and the Yankee Atomic Environmental Counting Laboratory.

C. CHANGES TO THE 1989 SAMPLE PROGRAM

1. A change in the Environmental Monitoring Sample Locations was required as a result of Technical Specification Amendment No. 127, issued on May 9, 1989. Amendment No. 127 removed the requirement to sample and analyze vegetation at the site boundary and added the requirement to sample and analyze food products in the form of broad leaf vegetation, from two off-site locations having the highest predicted site average D/Q value. In addition, a control sample from a location having a low predicted site average D/Q value is also required.

   Pursuant to Table 6.1-1 Amendment No. 127, food product samples were collected during the 1989 harvest season.

D. EXCEPTIONS TO THE 1989 SAMPLE PROGRAM

Exceptions to the 1989 sample program concern those sampling or monitoring requirements which are required by the JAF Technical Specifications.

1. The air sampler at the R-4 off-site Environmental Sampling Station was inoperable from February 16, 1989 (1830 hrs) to February 17, 1989 (1530 hrs). The inoperability was caused by a mechanical pump failure.

2. The air sampler at the R-2 off-site Environmental Sampling Station was inoperable from March 9, 1989 (1400 hrs) to March 13, 1989 (1310 hrs). The inoperability was caused by a mechanical pump failure.

3. The air sampler at the R-4 off-site Environmental Sampling Station was inoperable from March 20, 1989 (2300 hrs) to March 21, 1989 (0930 hrs). The inoperability was caused by a mechanical pump failure.

4. The air sampler at the R-4 off-site Environmental Sampling Station was inoperable from March 21, 1989 (1600 hrs) to March 22, 1989 (0905 hrs). The inoperability of the pump was caused by human error. The pump was not returned to service after maintenance on the cabinet blower system.

5. The air sampler at off-site Environmental sampling Station R-4 was inoperable from September 12, 1989 (0815 hrs) to September 13, 1989 (0715 hrs). The inoperability was caused by a pump mechanical failure.

6. The air sampler at off-site Environmental Sampling Station R-4 was inoperable from November 11, 1989 (1630 hrs) to November 14, 1989 (0830 hrs). The inoperability was caused by a pump electrical/mechanical failure.

A determination of the air sampling equipment reliability can be made based on the sample system outages noted above. The five air sampling stations were in operation a total of 43,449 hours out of a possible 43,680 hours. This calculates to a total percent down time of 0.53% due to mechanical failure and human error.

E. COMPLIANCE WITH LLD REQUIREMENT

Section 7.3.d of the Radiological Effluent Technical Specification (RETS), requires that all analyses in which the LLDs required by Table 6.1-3 (see report Table II) were not routinely achievable, be discussed in the Annual Radiological Environmental Operating Report.

1. All sample analyses required by the RETS achieved the Lower Limit of Detection (LLD) specified by RETS Table 6.1-3.

F. OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Table I describes the requirements of the Radiological Environmental Monitoring Program as specified by the James A. FitzPatrick Nuclear Power Plant Radiological Effluent Technical Specifications.

TABLE 1

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
AIRBORNE			
Radioiodine and Particulates	Samples from 5 locations: a. 3 samples from off-site locations in different sectors of the highest calculated site average D/Q (based on all licensed site reactors). b. 1 sample from the vicinity of a community having the highest calculated site average D/Q (based on all licensed site reactors). c. 1 sample from a control location 9 to 20 miles distant and in the least prevalent wind direction[d].	Continuous sample operation with sample collection weekly or as required by dust loading, whichever is more frequent.	Radioiodine Canisters: Analyze weekly for 131. Particulate Samples: Gross beta radioactivity following filter change[b] composite (by location) for gamma isotopic quarterly (as a minimum).
Direct Radiation[e]	32 stations with two or more dosimeters placed as follows: An inner ring of stations in the general area of the site boundary and an outer ring in the 4 to 5 mile range from the site with a station in each of the land based sectors of each ring. There are 16 land based sectors in the inner ring, and 8 land based sectors in the outer ring. The balance of the stations (8) are placed in special interest areas such as population centers, nearby residences, schools, and in 2 or 3 areas to serve as control stations.	Quarterly	Gamma dose monthly or quarterly.

TABLE 1 (CONTINUED)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
WATERBORNE			
Surface[f]	a. 1 sample upstream. b. 1 sample from the site's most downstream cooling water intake[d].	Composite sample over one month period[g].	Gamma isotopic analysis monthly. Composite for Tritium analysis quarterly[c].
Sediment from Shoreline	1 sample from a downstream area with existing or potential recreational value.	Twice per year.	Gamma isotopic analysis semiannually[c].
INGESTION			
Milk	a. Samples from milch animals in 3 locations within 3.5 miles distant having the highest calculated site average D/Q. If there are none, then 1 sample from milch animals in each of 3 areas 3.5 to 5.0 miles distant having the highest calculated site average D/Q (based on all licensed site reactors)[h]. b. 1 sample from milch animals at a control location (9 to 20 miles distant and in a less prevalent wind direction)[d].	Twice per month, April through December (samples will be collected in January through March if I-131 is detected in November and December of the preceding year).	Gamma isotopic and I-131 analysis twice per month when milch animals are on pasture (April through December); monthly (January through March), if required[c].

TABLE 1 (CONTINUED)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
FISH			
	a. 1 sample of each of 2 commercially or recreationally important species in the vicinity of a site discharge point.	Twice per year.	Gamma isotopic[c] analysis. of edible portions.
	b. 1 sample of each of 2 species (same as in a. above or of a species with similar feeding habits) from an area at least 5 miles distant from the site[d].		
FOOD PRODUCTS			
	a. In lieu of the garden census as specified in 6.2, samples of at least 3 different kinds of broad leaf vegetation (such as vegetables) grown nearest each of two different off-site locations of highest predicted site average D/Q (based on all licensed site Reactors).	Once during harvest season.	Gamma isotopic[c]. analysis of edible portions. (Isotopic to include I-131.
	One (1) sample of each of the similar broad leaf vegetation grown at least 9.3 miles distant in a least prevalent wind direction sector[d].		

NOTES FOR TABLE I

(a) It is recognized that, at times, it may not be possible or practical to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question. Actual locations (distance and directions) from the site shall be provided in the Annual Radiological Environmental Operating Report. Calculated site averaged D/Q values and meteorological parameters are based on historical data (specified in the ODCM) for all licensed site reactors.

(b) Particulate sample filters should be analyzed for gross beta 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air is greater than 10 times a historical yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(c) Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the plant.

(d) The purpose of these samples is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites which provide valid background data may be substituted.

(e) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purpose of this table, a thermoluminescent dosimeter may be considered to be one phosphor and two or more phosphors in a pocket may be considered as two or more dosimeters. Film badges shall not be used for measuring direct radiation.

(f) The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream sample" shall be taken in an area beyond, but near, the mixing zone, if practical.

(g) Composite samples should be collected with equipment (or equivalent) which is capable of collecting an aliquot at time intervals which are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure that a representative sample is obtained.

(h) A milk sampling location, as required in Table 1 is defined as a location having a least 10 milking cows present at a designated milk sample location. It has been found from past experience, and as a result of conferring with local farmers, that a minimum of 10 milking cows is necessary to guarantee an adequate supply of milk twice per month for analytical purposes. Locations with less than 10 milking cows are usually utilized for breeding purposes which eliminates a stable supply of milk for samples as a result of suckling calves and periods when the adult animals are dry. In the event that 3 milk sample locations cannot meet the requirement for 10 milking cows, then a sample location having less than 10 milking cows can be used if an adequate supply of milk can reasonable and reliably be obtained based on communications with the farmer.

G. STATISTICAL METHODOLOGY

There are a number of statistical calculation methodologies used in evaluating the data from the environmental monitoring program. These methodologies include determination of standard deviation, the mean and associated error for the mean and the lower limit of detection (LLD).

1. Estimation of the Mean and Standard Deviation.

The mean, ($\bar{X}_m$), and standard deviation, (s), were used in the reduction of the data generated by the sampling and analysis of the various media in the J. A. FitzPatrick N.P.P. Radiological Environmental Monitoring Program. The following equations were utilized to estimate the mean ($\bar{X}_m$) and the standard deviation (s):

a. Mean

$$\bar{X}_m = \frac{\sum_{i=1}^{N} x_i}{N},$$

where,

$\bar{X}_m$ = estimate of the mean.
i = individual sample, i.
N = total number of samples with positive indications.
x_i = value for sample i above the lower limit of detection.

b. Standard Deviation

$$s = \left(\frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N-1} \right)^{1/2}$$

where,

s = standard deviation for the sample population.

2. Estimation of the Mean and the Estimated Error for the Mean

In accordance with program policy, recounts of samples are often performed. When the initial count indicates the presence of radioactivity, two recounts are performed. When a radionuclide is positively identified in two or more counts, the analytical result for the radionuclide is reported as the mean of the positive detections and the associated propagated error for that mean. In cases where more than one positive sample result is available, the mean of the sample results and the estimated error for the mean are reported in the Annual Report.

The following equations were utilized to estimate the mean ($\bar{X}_m$) and the associated propagated error.

a. Mean

$$\bar{X}_m = \frac{\sum_{i=1}^{N} x_i}{N},$$

where,

$\bar{X}_m$ = estimate of the mean.
i = individual sample, i.
N = total number of samples with positive indications.
x_i = value for sample i above the lower limit of detection.

b. Error of the Mean

$$\text{ERROR MEAN} = \frac{\left(\sum_{i=1}^{N} (\text{ERROR})^2\right)^{1/2}}{N}$$

where,

ERROR MEAN = propagated error.
ERROR = 2 sigma errors of the individual analysis
N = number of samples with positive indications.

3. Lower Limits of Detection (LLD)

The LLD predetermined concentration or activity level used to establish a detection limit for the analytical procedures.

The LLDs are specified by the Nuclear Regulatory Commission for each radionuclide in specific media and are determined by taking into account overall measurement methods. The equation used to calculate the LLD is:

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD is the a priori lower limit of detection, as defined above (in picocurie per unit mass or volume);

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample, as appropriate (in counts per minute);

E is the counting efficiency (in counts per transformation);

V is the sample size (in units of mass or volume);

2.22 is the number of transformations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

Δt is the elapsed time between sample collection (or end of the sample collection period) and time of counting.

In the RETS program, LLDs are used to ensure that minimum acceptable detection capabilities are met with specified statistical confidence levels (95% detection probability with 5% probability of a false negative). Table II presents the RETS program required LLDs for specific media and radionuclides as specified by the NRC. The LLDs actually achieved are usually much lower since the "required LLDs" represent the maximum allowed.

TABLE II

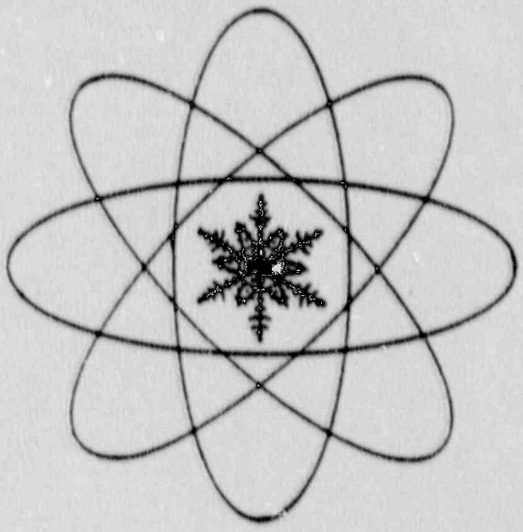
REQUIRED DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

LOWER LIMIT OF DETECTION (LLD)

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m³)	Fish (pCi/kg, wet)	Milk (pCi/l)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
gross beta	4	0.0i				
H-3	3,000					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr/Nb-95	15					
I-131(a)	15	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba/La-140	15			15		

(a) No drinking water pathway exists at the Nine Mile Point Site under normal operating conditions due to the direction and distance of the nearest drinking water intake. Therefore, an LLD value of 15 pCi/liter is used.

III



SAMPLE SUMMARIES

New York Power Authority

III SAMPLE SUMMARIES

All sample data is summarized in table form. The tables are titled "Radiological Monitoring Program Annual Summary" and use the following format:

Column

1 Sample medium.

2 Type and number of analyses performed.

3 Required Lower Limits of Detection (LLD), see Table II (page II-17). This wording indicates that inclusive data is based on 4.66 sigma of background (see section II, 6, C).

4 The mean and range of the positive measured values of the indicator locations.

5 The mean, range, and location of the highest indicator annual mean. Location designations are keyed to Table IV-16.

6 The mean and range of the positive measured values of the control locations.

7 The number of nonroutine reports sent to the Nuclear Regulatory Commission.

NOTE: Only positive measured values are used in statistical calculations. The use of LLDs in these calculations would result in means being based high.

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1989

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Location & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Shoreline Sediment (pCi/g-dry)	GSA (4):						
	Cs-134	0.15	<LLD	<LLD		<LLD	0
	Cs-137	0.18	0.28 (2/2) 0.25-0.32	No. 5 1.5@80°	0.28 (2/2) 0.25-0.32	<LLD	0
Fish (pCi/g-wet)	GSA (24):						
	Mn-54	0.13	<LLD	<LLD		<LLD	0
	Fe-59	0.26	<LLD	<LLD		<LLD	0
	Co-58	0.13	<LLD	<LLD		<LLD	0
	Co-60	0.13	<LLD	<LLD		<LLD	0
	Zn-65	0.26	<LLD	<LLD		<LLD	0
	Cs-134	0.13	<LLD	<LLD		<LLD	0
	Cs-137	0.15	0.034 (10/16) 0.020-0.044	No. 3 0.6@55°	0.035 (6/8) 0.025-0.044	0.034 (5/8) 0.028-0.043	0
Food Products (pCi/g-wet)	GSA (20):						
	I-131	0.06	<LLD	<LLD		<LLD	0
	Cs-134	0.06	<LLD	<LLD		<LLD	0
	Cs-137	0.08	0.011 (1/17) 0.011	K 1.7@96°	0.011 (1/2) 0.011	<LLD	0

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1989

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Location & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Surface (Lake) Water (pCi/liter)	H-3 (8):	3000	225 (3/4) 135-288	No. 3 0.5@70°	255 (3/4) 135-288	186 (3/4) 143-217	0
	GSA (24):						
	Mn-54	15	<LLD		<LLD	<LLD	0
	Fe-59	30	<LLD		<LLD	<LLD	0
	Co-58	15	<LLD		<LLD	<LLD	0
	Co-60	15	<LLD		<LLD	<LLD	0
	Zn-65	30	<LLD		<LLD	<LLD	0
	Zr-95	15	<LLD		<LLD	<LLD	0
	Nb-95	15	<LLD		<LLD	<LLD	0
	I-131	15	<LLD		<LLD	<LLD	0
	Cs-134	15	<LLD		<LLD	<LLD	0
	Cs-137	18	<LLD		<LLD	<LLD	0
	Ba/La-140	15	<LLD		<LLD	<LLD	0

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1989

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Location & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Milk (f) (pCi/liter)	GSA (126):						
	Cs-134	15	<LLD		<LLD	<LLD	0
	Cs-137	18	<LLD		<LLD	<LLD	0
	Ba/La-140	15	<LLD		<LLD	<LLD	0
	I-131(126):	1	<LLD		<LLD	<LLD	0

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1989

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Location & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Air Particulates and Radioiodine (d) (pCi/m^3)	G.B. (260):	0.01	0.017 (208/208) 0.007-0.041	R-4 0.018 (52/52) 1.8@143°	0.009-0.038	0.017 (52/52) 0.007-0.039	0
	I-131(260):	0.07	<LLD	<LLD		<LLD	0
	GSA (60):						
	Cs-134	0.05	<LLD	<LLD		<LLD	0
	Cs-137	0.06	<LLD	<LLD		<LLD	0
TLD (mrem per standard month)	Gamma Dose (130):	N/A	5.2 (118/118) (c) 2.1 - 15.4	No.85 14.0 (4/4) (e) 0.2@294°	12.0-15.4	4.8 (12/12) 2.9-6.4	0

ANNUAL SUMMARY TABLE NOTES

* = Data for the Annual Summary Tables is based on RETS required samples only, except for TLD locations #99-101 which are included but are not RETS locations.

N/A = Not applicable.

(a) = Fraction of detectable measurement to total measurement.

(b) = Location is distance in miles, and direction in compass degrees.

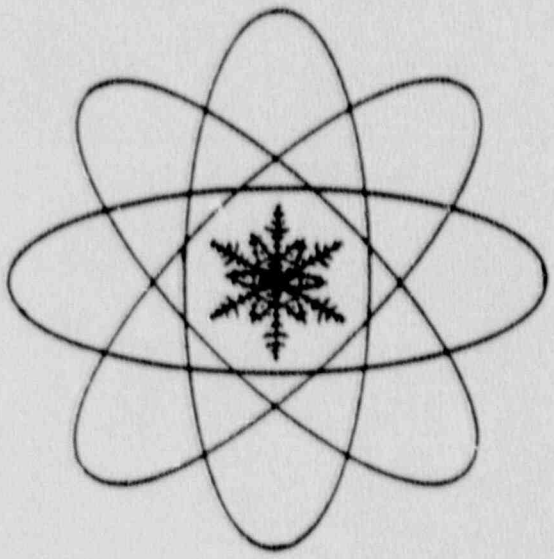
(c) = Indicator TLD locations are: #7, 23, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 8, 15, 18, 56, and 58 Control TLDs are all TLDs located beyond the influence of the site (#14, 49). (All are RETS locations except #9-101.)

(d) = Indicator samples from environmental stations R1 off-site, R2 off-site, R3 off-site, and R4 off-site. Control samples are samples from R5 off-site environmental station.

(e) = This dose is not representative of doses to a member of the public since this area is located near the north shoreline which is in close proximity to the generating facility and is not accessible to members of the public (see Section V.4-TLDs).

(f) = The RETS criteria for indicator milk sample locations includes locations within 5.0 miles of the site. There are no milk sample locations within 5.0 miles of the site. Therefore, milk samples are collected from locations greater than 5.0 miles from the site based on site D/Q values.

IV



ANALYTICAL RESULTS

New York Power Authority

IV ANALYTICAL RESULTS

A. Environmental Sample Data

1. Environmental sample data is summarized in table format. Tables are provided for select sample media and contain data based on actual values obtained over the year. These values are comprised of both positive values and LLD values where applicable.

2. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability and with 5% probability of falsely concluding that a blank observation represents a "real" signal (see Section II-C for detailed explanation).

3. When the initial count of a sample indicates the presence of radioactivity, two recounts are normally performed. When a radionuclide is positively identified in two or more counts, the analytical results for that radionuclide is reported as the mean of the positive detections and the associated error for that mean (see Section II-B for methodology).

4. Many of the tables are footnoted with the term "Plant Radionuclides". Plant related radionuclides are radionuclies that are produced in the reactor as a result of plant operation either through the activation or fission process.

TABLE IV-1

CONCENTRATIONS OF GAMMA EMITTERS IN SHORELINE SEDIMENT SAMPLES

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

COLLECTION SITE*	COLLECTION DATE	GAMMA EMITTERS				
		K-40	Co-60	Cs-134	Cs-137	OTHERS**
Sunset Beach (05)	04/24/89	16.0±1.1	<0.05	<0.04	0.32±0.04	<LLD
Lang's Beach (06, Control)	04/25/89	13.3±1.1	<0.04	<0.04	<0.04	<LLD
Recollections:						
Sample Location A	05/24/89	14.3±1.4	<0.11	<0.07	0.14±0.06	<LLD
Sample Location B	05/24/89	14.3±1.6	<0.08	<0.07	<0.10	<LLD
Sample Location C	05/24/89	15.4±1.9	<0.10	<0.08	0.10±0.05	<LLD
Sample Location D	05/24/89	17.2±0.6	<0.06	<0.10	0.34±0.03	<LLD
Sample Location E	05/24/89	17.5±0.6	<0.06	<0.10	0.31±0.03	<LLD
Sample Location F	05/24/89	16.8±1.3	<0.07	<0.05	0.24±0.05	<LLD
Sunset Beach (05)	10/30/89	18.0±1.3	<0.06	<0.04	0.25±0.05	<LLD
Lang's Beach (06, Control)	10/30/89	13.7±0.5	<0.05	<0.08	<0.05	<LLD

* Corresponds to sample locations noted on Figure 1A, Section VII.
** Plant Related Isotopes

TABLE IV-2

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

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					FITZPATRICK					
06/06/89	Lake Trout	4.38±0.49	<0.024	<0.034	<0.091	<0.022	<0.060	<0.024	0.039±0.024	<LLD
06/08/89	Brown Trout	4.64±0.47	<0.023	<0.030	<0.069	<0.024	<0.052	<0.024	0.030±0.015	<LLD
06/08/89	White Sucker	4.80±0.64	<0.037	<0.050	<0.122	<0.046	<0.093	<0.035	<0.040	<LLD
					NINE MILE POINT #1					
06/07/89	Lake Trout	4.57±0.51	<0.030	<0.040	<0.095	<0.018	<0.057	<0.025	0.043±0.015	<LLD
06/07/89	Brown Trout	3.99±0.21	<0.035	<0.039	<0.110	<0.036	<0.085	<0.032	0.020±0.010	<LLD
06/22/89	White Sucker	5.26±0.49	<0.025	<0.028	<0.069	<0.025	<0.055	<0.025	<0.028	<LLD
					OSWEGO HARBOR (Control)					
06/06/89	Lake Trout	4.57±0.24	<0.036	<0.047	<0.110	<0.032	<0.094	<0.031	0.032±0.010	<LLD
06/06/89	Brown Trout	5.14±0.65	<0.037	<0.054	<0.142	<0.026	<0.056	<0.035	0.043±0.012	<LLD
06/06/89	White Sucker	3.99±0.49	<0.032	<0.034	<0.077	<0.026	<0.057	<0.028	<0.031	<LLD

* Plant Related Radionuclides

TABLE IV-2 (CONTINUED)

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

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					FITZPATRICK					
09/19/89	Lake Trout #1	4.05±0.14	<0.039	<0.051	<0.13	<0.032	<0.102	<0.042	0.025±0.008	<LLD
09/19/89	Lake Trout #2	4.00±0.20	<0.031	<0.042	<0.12	<0.026	<0.061	<0.026	0.031±0.008	<LLD
09/19/89	White Sucker	3.97±0.46	<0.027	<0.037	<0.10	<0.027	<0.061	<0.022	<0.027	<LLD
09/22/89	Smallmouth Bass	4.96±0.34	<0.028	<0.037	<0.08	<0.028	<0.056	<0.024	0.042±0.014	<LLD
09/19/89	Walleye	5.66±0.32	<0.029	<0.040	<0.11	<0.029	<0.075	<0.027	0.044±0.011	<LLD
					NINE MILE POINT #1					
09/19/89	Lake Trout #1	4.49±0.58	<0.030	<0.060	<0.15	<0.039	<0.092	<0.032	<0.039	<LLD
09/19/89	Lake Trout #2	3.65±0.19	<0.028	<0.041	<0.12	<0.032	<0.07[illegible]	<0.027	0.040±0.018	<LLD
09/19/89	White Sucker	6.05±0.58	<0.027	<0.040	<0.09	<0.032	<0.068	<0.029	<0.032	<LLD
09/19/89	Brown Trout	5.64±0.60	<0.034	<0.043	<0.11	<0.024	<0.069	<0.031	<0.039	<LLD
10/23/89	Walleye	5.69±0.32	<0.023	<0.024	<0.06	<0.022	<0.054	<0.025	0.030±0.015	<LLD

* Plant Related Radionuclides

TABLE IV-2 (CONTINUED)

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

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					OSWEGO HARBOR (Control)					
09/19/89	Lake Trout #1	4.02±0.32	<0.037	<0.039	<0.12	<0.033	<0.075	<0.030	0.032±0.011	<LLD
09/19/89	Lake Trout #2	4.23±0.26	<0.025	<0.038	<0.08	<0.021	<0.046	<0.023	0.033±0.010	<LLD
09/22/89	White Sucker	4.90±0.52	<0.030	<0.039	<0.08	<0.025	<0.067	<0.028	<0.030	<LLD
09/22/89	Brown Trout	5.12±0.62	<0.043	<0.048	<0.15	<0.038	<0.102	<0.035	<0.046	<LLD
10/28/89	Walleye	4.83±0.27	<0.023	<0.024	<0.05	<0.022	<0.045	<0.024	0.028±0.009	<LLD

* Plant Related Radionuclides

TABLE IV-3

CONCENTRATIONS OF TRITIUM IN SURFACE WATER
(QUARTERLY COMPOSITE SAMPLES)
Results in Units of pCi/liter ± 2 sigma

STATION CODE	PERIOD	DATE	TRITIUM
FITZPATRICK* (03, INLET)	First Quarter	12/29/88-03/31/89	135±106
	Second Quarter	03/31/89-06/30/89	288±103
	Third Quarter	06/30/89-09/29/89	251±105
	Fourth Quarter	09/29/89-01/02/90	<172
OSWEGO STEAM* STATION (08, CONTROL)	First Quarter	12/31/88-03/31/89	217±107
	Second Quarter	03/31/89-06/30/89	199±102
	Third Quarter	06/30/89-09/29/89	143±104
	Fourth Quarter	09/29/89-01/02/90	<172

* Samples required by the Technical Specifications.

TABLE IV-3 (CONTINUED)

CONCENTRATIONS OF TRITIUM IN SURFACE WATER
(QUARTERLY COMPOSITE SAMPLES)
Results in Units of pCi/liter ± 2 sigma

STATION CODE	PERIOD	DATE	TRITIUM
NINE MILE POINT UNIT 1** (09, INLET)	First Quarter	12/31/88-03/31/89	179±107
	Second Quarter	03/31/89-06/30/89	214±102
	Third Quarter	06/30/89-09/29/89	302±106
	Fourth Quarter	09/29/89-01/02/90	<172
NINE MILE POINT UNIT 2** (11, INLET)	First Quarter	12/31/88-03/31/89	135±106
	Second Quarter	03/31/89-06/30/89	227±102
	Third Quarter	06/30/89-09/29/89	247±105
	Fourth Quarter	09/29/89-01/02/90	<172
OSWEGO CITY** WATER (10)	First Quarter	12/31/88-03/31/89	248±108
	Second Quarter	03/31/89-06/30/89	240±102
	Third Quarter	06/30/89-09/29/89	242±105
	Fourth Quarter	09/29/89-01/20/89	<172

** Optional samples.
Oswego City Water samples are composites of twice per week grab samples.

TABLE IV-4

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1989
Results in Units of pCi/liter ± 2 Sigma

STATION CODE*	NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
OSWEGO STEAM STATION (08, CONTROL)	I-131	<0.48	<0.35	<0.41	<0.26	<0.41	<0.30
	Cs-134	<3.02	<3.61	<2.71	<2.72	<3.10	<2.82
	Cs-137	<3.15	<3.65	<3.01	<2.88	<3.24	<2.76
	Zr-95	<8.80	<10.2	<8.39	<6.39	<8.87	<7.35
	Nb-95	<3.91	<4.49	<3.75	<3.66	<4.53	<3.47
	Co-58	<3.05	<4.70	<3.31	<2.73	<3.72	<2.83
	Mn-54	<3.00	<3.88	<2.59	<2.61	<3.47	<2.58
	Fe-59	<6.91	<7.67	<7.33	<5.58	<7.54	<6.54
	Zn-65	<5.98	<6.49	<5.63	<5.92	<6.98	<6.23
	Co-60	<2.93	<4.37	<2.76	<2.61	<3.75	<2.52
	K-40	234±34.1	188±49.3	202±31.1	229±35.4	215±39.8	236±40.7
	Ba/La-140	<5.08	<7.67	<6.86	<5.73	<7.74	<5.85
FITZPATRICK (03, INLET)	I-131	<0.46	<0.34	<0.30	<0.21	<0.47	<0.24
	Cs-134	<3.07	<3.60	<2.50	<3.05	<2.89	<3.39
	Cs-137	<3.56	<3.76	<2.75	<3.26	<3.01	<3.44
	Zr-95	<9.62	<9.51	<7.02	<7.95	<7.65	<8.85
	Nb-95	<4.83	<4.66	<3.46	<4.26	<3.79	<4.64
	Co-58	<4.30	<4.00	<2.80	<3.21	<3.02	<3.96
	Mn-54	<3.62	<3.97	<2.63	<2.84	<3.18	<4.08
	Fe-59	<9.02	<8.70	<5.36	<6.94	<7.58	<8.65
	Zn-65	<7.65	<7.88	<5.23	<6.37	<6.35	<7.60
	Co-60	<4.15	<3.67	<2.28	<3.05	<2.98	<3.09
	K-40	191±41.4	216±42.3	183±29.7	203±34.5	310±42.8	221±45.6
	Ba/La-140	<8.57	<6.28	<5.90	<6.79	<5.22	<6.31

* Corresponds to sample locations listed on Figure 1A, Section VII.

TABLE IV-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1989
Results in Units of pCi/liter ± 2 Sigma

STATION CODE*	NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
NINE MILE POINT UNIT 1** (09, INLET)	I-131	<8.23	<8.82	<7.28	<11.0	<9.31	<11.6
	Cs-134	<2.46	<2.78	<3.26	<3.58	<2.68	<4.08
	Cs-137	<2.47	<3.04	<3.09	<4.18	<2.70	<3.48
	Zr-95	<6.24	<7.23	<8.59	<9.49	<6.20	<8.45
	Nb-95	<3.31	<3.59	<4.03	<4.53	<3.17	<5.40
	Co-58	<2.70	<3.19	<3.17	<4.03	<3.14	<4.78
	Mn-54	<2.64	<2.59	<2.97	<3.46	<2.56	<3.64
	Fe-59	<6.36	<6.66	<7.70	<8.54	<7.69	<7.91
	Zn-65	<5.43	<5.40	<8.49	<7.48	<5.46	<11.3
	Co-60	<2.34	<3.09	<3.65	<3.09	<2.74	<4.25
	K-40	65.5±20.9	234±36.7	35.5±11.5	203±42.6	58.1±22.4	31.6±11.9
	Ba/La-140	<6.53	<7.02	<8.94	<7.36	<5.75	<12.3
NINE MILE POINT UNIT 2** (11, INLET)	I-131	<13.6	<7.64	<7.82	<6.76	<9.82	<8.81
	Cs-134	<4.30	<3.43	<2.41	<2.29	<4.11	<3.70
	Cs-137	<4.44	<2.68	<2.62	<2.60	<2.88	<3.45
	Zr-95	<11.1	<8.35	<5.95	<6.67	<8.79	<8.09
	Nb-95	<6.09	<4.22	<3.02	<3.27	<5.06	<4.41
	Co-58	<4.76	<3.62	<2.56	<2.83	<4.30	<4.11
	Mn-54	<4.38	<3.17	<2.49	<2.32	<4.04	<3.95
	Fe-59	<10.6	<7.50	<6.45	<5.42	<8.26	<6.74
	Zn-65	<10.2	<8.37	<5.24	<4.52	<10.7	<8.78
	Co-60	<4.28	<2.38	<2.77	<2.34	<4.54	<4.12
	K-40	172±39.9	48.1±11.3	100±25.8	53.2±21.2	50.5±15.4	63.2±12.4
	Ba/La-140	<11.3	<8.51	<6.06	<4.97	<11.3	<9.07

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specification.

TABLE IV-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1989
Results in Units of pCi/liter ± 2 Sigma

STATION CODE*	NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
OSWEGO CITY WATER** (10)	I-131	<8.37	<11.4	<8.53	<11.5	<12.7	<10.7
	Cs-134	<2.68	<3.43	<3.33	<3.86	<3.31	<3.75
	Cs-137	<2.80	<3.71	<2.68	<4.28	<4.22	<3.25
	Zr-95	<6.34	<8.72	<8.82	<9.48	<9.55	<8.70
	Nb-95	<4.37	<4.20	<4.09	<5.54	<4.76	<5.30
	Co-58	<2.84	<3.49	<3.38	<4.36	<3.71	<4.39
	Mn-54	<2.86	<3.38	<3.14	<4.39	<3.95	<3.61
	Fe-59	<6.00	<9.30	<8.15	<9.52	<10.3	<8.90
	Zn-65	<5.58	<7.23	<8.07	<8.63	<7.33	<9.14
	Co-60	<2.10	<3.34	<3.66	<3.91	<3.88	<3.80
	K-40	101±30.3	237±41.6	65.1±12.7	175±45.1	222±40.9	66.0±13.5
	Ba/La-140	<6.58	<6.41	<11.2	<9.34	<8.06	<10.4

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specification.

TABLE IV-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1989
Results in Units of pCi/liter ± 2 Sigma

STATION CODE*	NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
OSWEGO STEAM STATION (08, CONTROL)	I-131	<0.23	<0.22	<0.43	<0.31	<0.43	<0.16
	Cs-134	<3.87	<2.98	<2.70	<3.58	<3.66	<3.02
	Cs-137	<3.35	<3.02	<3.02	<4.29	<3.66	<2.94
	Zr-95	<8.42	<7.70	<7.86	<9.83	<8.70	<7.99
	Nb-95	<4.30	<3.84	<3.72	<4.88	<4.73	<4.29
	Co-58	<4.46	<3.56	<3.48	<3.76	<3.81	<3.26
	Mn-54	<3.59	<3.01	<2.64	<4.38	<4.02	<3.14
	Fe-59	<8.40	<7.02	<6.68	<9.67	<9.45	<6.31
	Zn-65	<9.99	<6.62	<5.29	<7.20	<7.07	<6.89
	Co-60	<3.87	<2.82	<2.65	<4.01	<3.82	<3.02
	K-40	38.5±13.0	334±48.8	236±38.9	151±38.1	216±44.4	265±38.1
	Ba/La-140	<9.65	<6.91	<4.72	<8.75	<7.46	<5.71
FITZPATRICK (03, INLET)	I-131	<0.24	<0.22	<0.30	<0.30	<0.40	<0.40
	Cs-134	<3.01	<4.60	<3.80	<2.79	<3.86	<3.09
	Cs-137	<3.10	<3.08	<3.99	<3.32	<3.54	<3.19
	Zr-95	<6.98	<8.72	<9.33	<6.82	<8.26	<8.51
	Nb-95	<3.90	<4.22	<4.97	<3.63	<5.05	<3.64
	Co-58	<3.11	<4.50	<4.09	<3.12	<4.38	<3.00
	Mn-54	<2.90	<3.41	<3.90	<2.49	<3.44	<2.82
	Fe-59	<6.52	<8.45	<9.09	<6.50	<8.05	<7.05
	Zn-65	<6.80	<9.50	<7.06	<5.71	<9.91	<6.32
	Co-60	<3.16	<4.54	<3.40	<2.38	<4.36	<2.86
	K-40	182±30.4	48.1±13.6	214±46	257±34.9	49.4±11.8	239±34.8
	Ba/La-140	<6.09	<10.4	<7.50	<4.39	<10.2	<6.32

* Corresponds to sample locations listed on Figure 1A, Section VII.

TABLE IV-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1989
Results in Units of pCi/liter ± 2 Sigma

STATION CODE*	NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
NINE MILE POINT UNIT 1** (09, INLET)	I-131	<12.9	<11.9	<7.84	<8.69	<13.5	<9.48
	Cs-134	<4.39	<3.70	<2.56	<2.51	<4.23	<3.00
	Cs-137	<4.80	<3.79	<2.52	<2.64	<4.79	<3.06
	Zr-95	<11.6	<9.18	<6.68	<6.82	<10.8	<7.93
	Nb-95	<6.04	<4.97	<3.01	<3.63	<4.89	<3.86
	Co-58	<4.90	<3.96	<3.05	<3.12	<4.56	<2.91
	Mn-54	<4.51	<4.00	<2.92	<2.49	<3.96	<3.15
	Fe-59	<10.1	<9.10	<6.99	<6.50	<12.1	<6.30
	Zn-65	<9.33	<7.63	<5.52	<5.71	<9.37	<6.45
	Co-60	<4.09	<3.25	<3.01	<2.38	<3.45	<3.21
	K-40	160±44.8	225±44.1	52.0±21.9	257±34.9	117±51.7	68.9±25.7
	Ba/La-140	<7.56	<8.71	<5.89	<4.39	<10.1	<6.89
NINE MILE POINT UNIT 2** (11, INLET)	I-131	<8.35	<9.08	<8.06	<9.92	<9.06	<11.6
	Cs-134	<2.80	<4.01	<4.07	<3.98	<2.66	<3.09
	Cs-137	<2.83	<2.95	<3.43	<2.98	<2.68	<3.25
	Zr-95	<6.76	<8.78	<7.94	<9.08	<6.37	<8.31
	Nb-95	<3.58	<4.67	<4.74	<4.61	<3.64	<4.26
	Co-58	<3.12	<4.45	<4.09	<4.34	<2.71	<3.42
	Mn-54	<2.95	<3.98	<3.50	<3.60	<2.80	<3.26
	Fe-59	<7.43	<8.45	<8.95	<7.80	<5.82	<6.45
	Zn-65	<5.45	<9.60	<9.31	<8.93	<5.89	<6.52
	Co-60	<2.56	<4.86	<4.25	<4.31	<2.38	<3.09
	K-40	101±28.9	48.9±13.6	45.8±13.4	84.3±13.8	262±38.3	259±36.3
	Ba/La-140	<7.42	<10.6	<9.90	<10.8	<5.65	<6.24

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specification.

TABLE IV-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1989
Results in Units of pCi/liter ± 2 Sigma

STATION CODE*	NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
OSWEGO CITY WATER** (10)	I-131	<14.3	<14.1	<10.7	<9.55	<13.2	<10.0
	Cs-134	<3.98	<4.57	<3.98	<2.38	<4.17	<3.60
	Cs-137	<4.41	<4.58	<2.88	<2.88	<4.50	<3.15
	Zr-95	<12.1	<11.4	<9.25	<7.18	<11.0	<8.42
	Nb-95	<5.79	<6.03	<5.03	<3.42	<5.35	<5.17
	Co-58	<4.43	<5.62	<4.08	<3.06	<4.51	<4.42
	Mn-54	<4.39	<4.43	<3.52	<2.63	<4.56	<3.78
	Fe-59	<10.2	<11.5	<7.47	<6.13	<9.82	<8.26
	Zn-65	<9.35	<9.35	<9.48	<6.03	<8.39	<8.37
	Co-60	<3.66	<3.88	<4.31	<2.48	<4.69	<4.13
	K-40	169±47.8	185±46.9	73.4±13.2	239±35.6	275±64.4	57.0±14.1
	Ba/La-140	<10.9	<10.3	<12.9	<5.45	<8.93	<11.1

* Corresponds to sample locations listed on Figure 1A, Section VII.

** Optional sample location. Sample not required by Technical Specification.

TABLE IV-5

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

LOCATION

WEEK END DATE	R-1 OFF*	R-2 OFF*	R-3 OFF*	R-4 OFF*	R-5 OFF*
89/01/09	0.020±0.002	0.018±0.002	0.018±0.002	0.017±0.002	0.020±0.002
89/01/16	0.019±0.002	0.019±0.002	0.018±0.002	0.021±0.002	0.018±0.002
89/01/23	0.021±0.002	0.018±0.002	0.018±0.002	0.018±0.002	0.020±0.002
89/01/30	0.024±0.002	0.021±0.002	0.023±0.002	0.024±0.002	0.022±0.002
89/02/06	0.022±0.002	0.022±0.002	0.018±0.002	0.021±0.002	0.023±0.002
89/02/13	0.016±0.002	0.016±0.002	0.015±0.002	0.017±0.002	0.016±0.002
89/02/21	0.021±0.002	0.020±0.002	0.019±0.002	0.026±0.003	0.018±0.002
89/02/27	0.019±0.002	0.017±0.002	0.019±0.002	0.018±0.002	0.019±0.002
89/03/06	0.020±0.002	0.017±0.002	0.016±0.002	0.018±0.002	0.018±0.002
89/03/13	0.021±0.002	0.023±0.004	0.017±0.002	0.015±0.002	0.019±0.002
89/03/20	0.018±0.002	0.017±0.002	0.015±0.002	0.025±0.003	0.016±0.002
89/03/27	0.015±0.002	0.016±0.002	0.018±0.002	0.018±0.002	0.020±0.002
89/04/03	0.014±0.002	0.013±0.002	0.012±0.002	0.014±0.002	0.011±0.002
89/04/10	0.012±0.002	0.012±0.002	0.011±0.002	0.019±0.003	0.012±0.002
89/04/17	0.016±0.002	0.016±0.002	0.016±0.002	0.019±0.002	0.016±0.002
89/04/24	0.018±0.002	0.016±0.002	0.015±0.002	0.015±0.002	0.018±0.002
89/05/01	0.012±0.002	0.010±0.002	0.012±0.002	0.013±0.002	0.011±0.002
89/05/08	0.007±0.001	0.009±0.002	0.008±0.001	0.009±0.002	0.007±0.001
89/05/15	0.008±0.002	0.008±0.001	0.007±0.001	0.009±0.001	0.008±0.002
89/05/22	0.014±0.002	0.015±0.002	0.014±0.002	0.014±0.002	0.016±0.002
89/05/30	0.014±0.002	0.014±0.002	0.014±0.002	0.016±0.002	0.015±0.002
89/06/05	0.013±0.002	0.012±0.002	0.012±0.002	0.012±0.002	0.013±0.002
89/06/12	0.011±0.002	0.011±0.002	0.010±0.002	0.011±0.002	0.011±0.002
89/06/19	0.009±0.002	0.009±0.002	0.008±0.002	0.009±0.002	0.009±0.002
89/06/26	0.012±0.002	0.017±0.002	0.015±0.002	0.017±0.002	0.015±0.002
89/07/03	0.019±0.003	0.019±0.002	0.018±0.002	0.018±0.002	0.020±0.003

* SAMPLE LOCATIONS REQUIRED BY TECHNICAL SPECIFICATIONS
** PUMP INOPERATIVE

TABLE IV-5 (CONTINUED)

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

LOCATION

WEEK END DATE	D-2 OFF	E-OFF	F-OFF	G-OFF
89/01/09	0.016±0.002	0.018±0.002	0.018±0.002	0.018±0.002
89/01/16	0.016±0.002	0.024±0.003	0.018±0.002	0.020±0.002
89/01/23	0.018±0.002	0.017±0.002	0.020±0.002	0.018±0.002
89/01/30	0.023±0.002	0.023±0.002	0.024±0.002	0.016±0.002
89/02/06	0.022±0.002	0.021±0.002	0.025±0.002	0.019±0.002
89/02/13	0.016±0.002	0.017±0.002	0.017±0.002	0.016±0.002
89/02/21	0.020±0.002	0.020±0.002	0.017±0.002	0.017±0.002
89/02/27	0.018±0.002	0.020±0.002	0.020±0.002	0.018±0.002
89/03/06	0.017±0.002	0.019±0.002	0.020±0.002	0.016±0.002
89/03/13	0.022±0.003	0.019±0.002	0.020±0.002	0.017±0.002
89/03/20	0.011±0.002	0.018±0.002	0.014±0.002	0.015±0.002
89/03/27	0.022±0.003	0.018±0.002	0.020±0.002	0.017±0.002
89/04/03	0.016±0.003	0.012±0.002	0.013±0.002	0.011±0.002
89/04/10	0.012±0.002	0.012±0.002	0.012±0.002	0.012±0.002
89/04/17	0.016±0.002	0.016±0.002	0.016±0.002	0.016±0.002
89/04/24	0.016±0.002	0.014±0.002	0.013±0.002	0.013±0.002
89/05/01	0.011±0.002	**	0.012±0.002	0.010±0.002
89/05/08	0.005±0.001	0.007±0.001	0.006±0.001	0.006±0.001
89/05/15	0.010±0.002	0.009±0.002	0.008±0.001	0.008±0.001
89/05/22	0.014±0.002	0.015±0.002	0.015±0.002	0.012±0.002
89/05/30	0.013±0.002	0.017±0.002	0.016±0.002	0.015±0.002
89/06/05	0.012±0.002	0.013±0.002	0.012±0.002	0.013±0.002
89/06/12	0.010±0.002	0.011±0.002	0.010±0.002	0.010±0.002
89/06/19	0.009±0.002	0.009±0.002	0.009±0.002	0.008±0.002
89/06/26	0.015±0.002	0.014±0.002	0.018±0.002	0.015±0.002
89/07/03	0.017±0.002	0.019±0.003	0.019±0.002	0.017±0.002

* SAMPLE LOCATIONS REQUIRED BY TECHNICAL SPECIFICATIONS
** PUMP INOPERATIVE

TABLE IV-5 (CONTINUED)

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

LOCATION

WEEK END DATE	R-1 OFF*	R-2 OFF*	R-3 OFF*	R-4 OFF*	R-5 OFF*
89/07/10	0.015±0.002	0.016±0.002	0.015±0.002	0.015±0.002	0.018±0.002
89/07/17	0.017±0.002	0.015±0.002	0.014±0.002	0.016±0.002	0.017±0.002
89/07/24	0.021±0.002	0.020±0.002	0.021±0.002	0.021±0.002	0.019±0.002
89/07/31	0.020±0.002	0.020±0.002	0.019±0.002	0.019±0.002	0.021±0.002
89/08/07	0.016±0.002	0.015±0.002	0.015±0.002	0.016±0.002	0.019±0.002
89/08/14	0.018±0.002	0.019±0.002	0.018±0.002	0.021±0.002	0.020±0.002
89/08/21	0.015±0.002	0.016±0.002	0.012±0.002	0.015±0.002	0.016±0.002
89/08/28	0.019±0.002	0.017±0.002	0.019±0.002	0.015±0.002	0.016±0.002
89/09/05	0.020±0.002	0.018±0.002	0.021±0.002	0.018±0.002	0.019±0.002
89/09/11	0.026±0.003	0.022±0.002	0.022±0.002	0.026±0.003	0.022±0.002
89/09/18	0.024±0.004	0.017±0.002	0.018±0.002	0.016±0.002	0.016±0.002
89/09/25	0.009±0.002	0.009±0.002	0.009±0.002	0.009±0.002	0.009±0.002
89/10/02	0.018±0.002	0.015±0.002	0.016±0.002	0.018±0.002	0.013±0.002
89/10/09	0.015±0.002	0.013±0.002	0.013±0.002	0.015±0.002	0.014±0.002
89/10/16	0.020±0.002	0.019±0.002	0.021±0.002	0.019±0.002	0.021±0.002
89/10/23	0.010±0.002	0.011±0.002	0.010±0.002	0.009±0.002	0.009±0.002
89/10/30	0.041±0.003	0.033±0.003	0.041±0.003	0.037±0.003	0.039±0.003
89/11/06	0.018±0.002	0.016±0.002	0.015±0.002	0.017±0.002	0.014±0.002
89/11/13	0.014±0.002	0.015±0.002	0.015±0.002	0.038±0.015	0.014±0.002
89/11/20	0.016±0.002	0.017±0.002	0.019±0.002	0.018±0.002	0.017±0.002
89/11/27	0.017±0.002	0.018±0.002	0.018±0.002	0.021±0.002	0.017±0.002
89/12/04	0.016±0.002	0.019±0.002	0.016±0.002	0.018±0.002	0.019±0.002
89/12/11	0.022±0.002	0.019±0.002	0.021±0.002	0.019±0.002	0.022±0.002
89/12/18	0.022±0.002	0.022±0.002	0.020±0.002	0.021±0.002	0.023±0.002
89/12/26	0.022±0.002	0.023±0.002	0.021±0.002	0.025±0.003	0.021±0.002
90/01/02	0.017±0.002	0.019±0.002	0.018±0.002	0.020±0.002	0.021±0.002

* SAMPLE LOCATIONS REQUIRED BY TECHNICAL SPECIFICATIONS
** PUMP INOPERATIVE

TABLE IV-5 (CONTINUED)

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

LOCATION

WEEK END DATE	D-2 OFF	E-OFF	F-OFF	G-OFF
89/07/10	0.017±0.002	0.018±0.002	0.017±0.002	0.015±0.002
89/07/17	0.015±0.002	0.017±0.002	0.020±0.002	0.011±0.002
89/07/24	0.019±0.002	0.022±0.002	0.024±0.002	0.016±0.002
89/07/31	0.022±0.002	0.023±0.002	0.021±0.002	0.016±0.002
89/08/07	0.015±0.002	0.016±0.002	0.015±0.002	0.014±0.002
89/08/14	0.017±0.002	0.021±0.002	0.020±0.002	0.015±0.002
89/08/21	0.014±0.002	0.017±0.002	0.015±0.002	0.013±0.002
89/08/28	0.017±0.002	0.019±0.002	0.018±0.002	0.017±0.002
89/09/05	0.019±0.002	0.019±0.002	0.019±0.002	0.017±0.002
89/09/11	0.020±0.002	0.025±0.002	0.023±0.002	0.020±0.002
89/09/18	0.014±0.002	0.015±0.002	0.015±0.002	0.014±0.002
89/09/25	0.010±0.002	0.009±0.002	0.009±0.002	0.009±0.002
89/10/02	0.015±0.002	0.016±0.002	0.016±0.002	0.016±0.002
89/10/09	0.013±0.002	0.016±0.002	0.016±0.002	0.015±0.002
89/10/16	0.020±0.002	0.020±0.002	0.018±0.002	0.018±0.002
89/10/23	0.008±0.001	0.008±0.002	0.011±0.002	0.010±0.002
89/10/30	0.038±0.003	0.037±0.003	0.036±0.003	0.031±0.003
89/11/06	0.015±0.002	0.016±0.002	0.014±0.002	0.015±0.002
89/11/13	0.013±0.002	0.014±0.002	0.012±0.002	0.015±0.002
89/11/20	0.018±0.002	0.017±0.002	0.017±0.002	0.016±0.002
89/11/27	0.015±0.002	0.019±0.002	0.017±0.002	0.016±0.002
89/12/04	0.016±0.002	0.019±0.002	0.017±0.002	0.015±0.002
89/12/11	0.019±0.002	0.018±0.002	0.020±0.002	0.017±0.002
89/12/18	0.022±0.002	0.023±0.002	0.021±0.002	0.019±0.002
89/12/26	0.024±0.002	0.022±0.002	0.022±0.002	0.020±0.002
90/01/02	0.021±0.002	0.022±0.002	0.020±0.002	0.020±0.002

* SAMPLE LOCATIONS REQUIRED BY TECHNICAL SPECIFICATIONS
** PUMP INOPERATIVE

TABLE IV-6

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

LOCATION

WEEK END DATE	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
89/01/10	0.015±0.002	0.017±0.002	0.015±0.002	0.017±0.003	0.015±0.002	0.018±0.002
89/01/17	0.019±0.002	0.019±0.002	0.019±0.002	0.023±0.003	0.018±0.002	0.020±0.002
89/01/24	0.017±0.002	0.018±0.002	0.018±0.002	0.026±0.003	0.012±0.002	0.017±0.002
89/01/31	0.034±0.006	0.023±0.002	0.024±0.002	0.024±0.002	0.019±0.002	0.026±0.003
89/02/07	0.018±0.002	0.019±0.002	0.017±0.002	0.019±0.002	0.019±0.002	0.022±0.002
89/02/14	0.018±0.002	0.020±0.002	0.018±0.002	0.019±0.002	0.019±0.002	0.019±0.002
89/02/21	0.019±0.002	0.020±0.002	0.019±0.002	0.020±0.002	0.013±0.001	0.020±0.002
89/02/28	0.021±0.002	0.021±0.002	0.021±0.002	0.019±0.002	0.016±0.002	0.020±0.002
89/03/07	0.018±0.002	0.018±0.002	0.018±0.002	0.018±0.002	0.015±0.002	0.018±0.002
89/03/14	0.019±0.002	0.022±0.002	0.021±0.002	0.019±0.002	0.016±0.002	0.017±0.002
89/03/21	0.017±0.002	0.018±0.002	0.020±0.002	0.016±0.002	0.016±0.002	0.014±0.002
89/03/28	0.018±0.002	0.017±0.002	0.017±0.002	0.019±0.002	0.018±0.002	0.017±0.002
89/04/04	0.014±0.002	0.014±0.002	0.015±0.002	0.015±0.002	0.014±0.002	0.015±0.002
89/04/11	0.011±0.002	0.010±0.002	0.013±0.002	0.012±0.002	0.012±0.002	0.013±0.002
89/04/18	0.017±0.002	0.017±0.002	0.018±0.002	0.017±0.002	0.017±0.002	0.017±0.002
89/04/25	0.017±0.002	0.019±0.002	0.014±0.002	0.017±0.002	0.017±0.002	0.018±0.002
89/05/02	0.013±0.002	0.015±0.002	0.012±0.002	0.012±0.002	0.013±0.002	0.013±0.002
89/05/09	0.010±0.002	0.011±0.002	0.007±0.001	0.011±0.002	0.010±0.002	0.010±0.002
89/05/16	0.008±0.002	0.008±0.002	0.008±0.001	0.009±0.002	0.008±0.002	0.006±0.001
89/05/23	0.015±0.002	0.015±0.002	0.015±0.002	0.014±0.002	0.011±0.002	0.014±0.002
89/05/30	0.016±0.002	0.015±0.002	0.016±0.002	0.017±0.002	0.016±0.002	0.015±0.002
89/06/06	0.013±0.002	0.016±0.005	0.014±0.002	0.014±0.003	0.012±0.002	0.012±0.002
89/06/13	0.011±0.002	0.012±0.002	0.011±0.002	0.010±0.003	0.010±0.002	0.010±0.002
89/06/20	0.008±0.002	0.009±0.002	0.009±0.002	0.008±0.002	0.008±0.002	0.008±0.002
89/06/26	0.014±0.002	0.015±0.002	0.016±0.002	0.012±0.002	0.014±0.002	0.013±0.002
89/07/03	0.017±0.002	0.017±0.002	0.016±0.002	0.015±0.002	0.020±0.002	0.016±0.002

TABLE IV-6 (CONTINUED)

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

LOCATION

WEEK END DATE	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
89/07/11	0.017±0.002	0.016±0.002	0.017±0.002	0.019±0.002	0.019±0.002	0.013±0.002
89/07/18	0.017±0.002	0.013±0.002	0.013±0.002	0.015±0.002	0.016±0.002	0.013±0.002
89/07/25	0.016±0.002	0.017±0.002	0.017±0.003	0.018±0.002	0.020±0.002	0.016±0.002
89/08/01	0.019±0.002	0.018±0.002	0.020±0.002	0.022±0.002	0.024±0.003	0.018±0.002
89/08/08	0.016±0.002	0.015±0.002	0.014±0.002	0.014±0.002	0.016±0.002	0.016±0.002
89/08/15	0.014±0.002	0.015±0.002	0.015±0.002	0.016±0.002	0.016±0.002	0.016±0.002
89/08/22	0.016±0.002	0.017±0.002	0.019±0.002	0.017±0.002	0.017±0.002	0.016±0.002
89/08/29	0.017±0.002	0.019±0.002	0.016±0.002	0.018±0.002	0.016±0.002	0.014±0.002
89/09/05	0.018±0.002	0.019±0.002	0.018±0.002	0.018±0.002	0.017±0.002	0.017±0.002
89/09/12	0.019±0.003	0.021±0.003	0.018±0.002	0.017±0.002	0.018±0.002	0.018±0.002
89/09/19	0.014±0.002	0.014±0.002	0.012±0.002	0.010±0.002	0.014±0.002	0.013±0.002
89/09/26	0.010±0.002	0.008±0.002	0.008±0.002	0.008±0.002	0.007±0.001	0.009±0.002
89/10/03	0.016±0.002	0.017±0.002	0.005±0.001	0.016±0.002	0.018±0.002	0.017±0.002
89/10/10	0.013±0.002	0.013±0.002	0.012±0.002	0.013±0.002	0.014±0.002	0.013±0.002
89/10/17	0.021±0.002	0.020±0.002	0.019±0.002	0.022±0.002	0.016±0.002	0.017±0.002
89/10/24	0.010±0.002	0.009±0.002	0.011±0.002	0.010±0.002	0.008±0.002	0.009±0.002
89/10/31	0.038±0.003	0.038±0.003	0.032±0.003	0.040±0.003	0.038±0.003	0.034±0.003
89/11/07	0.021±0.002	0.022±0.002	0.021±0.002	0.020±0.002	0.021±0.002	0.019±0.002
89/11/14	0.017±0.002	0.013±0.002	0.013±0.002	0.014±0.002	0.012±0.002	0.012±0.002
89/11/21	0.015±0.002	0.020±0.002	0.023±0.002	0.020±0.002	0.018±0.002	0.018±0.002
89/11/28	0.017±0.003	0.018±0.002	0.030±0.002	0.019±0.002	0.018±0.002	0.020±0.002
89/12/05	0.021±0.003	0.021±0.002	0.022±0.002	0.018±0.002	0.018±0.002	0.017±0.002
89/12/12	0.016±0.002	0.022±0.002	0.024±0.002	0.020±0.002	0.019±0.002	0.019±0.002
89/12/19	0.019±0.002	0.022±0.002	0.019±0.002	0.021±0.002	0.019±0.002	0.022±0.002
89/12/26	0.007±0.001	0.022±0.002	0.025±0.002	0.022±0.002	0.025±0.002	0.020±0.002
90/01/02	0.019±0.002	0.020±0.002	0.020±0.002	0.015±0.002	0.018±0.002	0.016±0.002

TABLE IV-7

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

WEEK END DATE	LOCATION R-1*	R-2*	R-3*	R-4*	R-5*	D-2	E	F	G
89/01/09	<0.009	<0.007	<0.008	<0.010	<0.010	<0.008	<0.008	<0.007	<0.006
89/01/16	<0.008	<0.007	<0.007	<0.009	<0.009	<0.008	<0.012	<0.006	<0.007
89/01/23	<0.008	<0.006	<0.008	<0.010	<0.007	<0.009	<0.006	<0.010	<0.012
89/01/30	<0.010	<0.009	<0.008	<0.008	<0.008	<0.009	<0.008	<0.011	<0.009
89/02/06	<0.012	<0.007	<0.007	<0.010	<0.007	<0.007	<0.010	<0.004	<0.008
89/02/13	<0.009	<0.007	<0.006	<0.008	<0.009	<0.006	<0.008	<0.007	<0.007
89/02/21	<0.010	<0.011	<0.007	<0.015	<0.008	<0.010	<0.007	<0.006	<0.009
89/02/27	<0.013	<0.007	<0.008	<0.006	<0.010	<0.007	<0.009	<0.007	<0.009
89/03/06	<0.011	<0.011	<0.007	<0.008	<0.007	<0.013	<0.007	<0.007	<0.009
89/03/13	<0.008	<0.019	<0.008	<0.005	<0.010	<0.011	<0.007	<0.011	<0.008
89/03/20	<0.009	<0.006	<0.008	<0.010	<0.007	<0.009	<0.008	<0.008	<0.008
89/03/27	<0.011	<0.007	<0.008	<0.008	<0.010	<0.012	<0.010	<0.010	<0.011
89/04/03	<0.007	<0.008	<0.007	<0.008	<0.006	<0.016	<0.007	<0.010	<0.008
89/04/10	<0.008	<0.006	<0.006	<0.013	<0.012	<0.008	<0.007	<0.009	<0.009
89/04/17	<0.009	<0.009	<0.008	<0.007	<0.007	<0.007	<0.007	<0.010	<0.011
89/04/24	<0.009	<0.009	<0.010	<0.008	<0.008	<0.008	<0.009	<0.007	<0.008
89/05/01	<0.010	<0.008	<0.010	<0.005	<0.009	<0.007	**	<0.010	<0.008
89/05/08	<0.007	<0.009	<0.009	<0.006	<0.009	<0.008	<0.006	<0.008	<0.009
89/05/15	<0.012	<0.009	<0.008	<0.009	<0.011	<0.008	<0.007	<0.007	<0.014
89/05/22	<0.011	<0.010	<0.005	<0.013	<0.008	<0.010	<0.009	<0.014	<0.009
89/05/30	<0.009	<0.010	<0.007	<0.009	<0.012	<0.010	<0.009	<0.009	<0.011
89/06/05	<0.009	<0.011	<0.008	<0.009	<0.009	<0.013	<0.007	<0.009	<0.011
89/06/12	<0.012	<0.012	<0.009	<0.009	<0.010	<0.008	<0.010	<0.008	<0.013
89/06/19	<0.008	<0.008	<0.011	<0.007	<0.009	<0.011	<0.006	<0.011	<0.009
89/06/26	<0.011	<0.008	<0.010	<0.010	<0.007	<0.013	<0.007	<0.006	<0.007
89/07/03	<0.008	<0.010	<0.006	<0.009	<0.009	<0.008	<0.010	<0.008	<0.008

* SAMPLE LOCATIONS REQUIRED BY TECHNICIAL SPECIFICATIONS
** PUMP INOPERATIVE

TABLE IV-7 (CONTINUED)

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

LOCATION

WEEK END DATE	R-1*	R-2*	R-3*	R-4*	R-5*	D-2	E	F	G
89/07/10	<0.007	<0.007	<0.007	<0.011	<0.008	<0.006	<0.006	<0.011	<0.009
89/07/17	<0.008	<0.012	<0.006	<0.010	<0.009	<0.007	<0.012	<0.012	<0.010
89/07/24	<0.014	<0.009	<0.010	<0.011	<0.012	<0.006	<0.009	<0.011	<0.008
89/07/31	<0.008	<0.011	<0.008	<0.008	<0.007	<0.009	<0.008	<0.010	<0.010
89/08/07	<0.010	<0.008	<0.010	<0.009	<0.013	<0.009	<0.008	<0.008	<0.009
89/08/14	<0.008	<0.008	<0.010	<0.013	<0.010	<0.010	<0.010	<0.009	<0.007
89/08/21	<0.009	<0.013	<0.010	<0.008	<0.013	<0.008	<0.009	<0.012	<0.007
89/08/28	<0.009	<0.010	<0.010	<0.010	<0.011	<0.011	<0.013	<0.010	<0.013
89/09/05	<0.014	<0.012	<0.009	<0.013	<0.009	<0.009	<0.010	<0.009	<0.008
89/09/11	<0.022	<0.008	<0.010	<0.016	<0.012	<0.009	<0.008	<0.010	<0.009
89/09/18	<0.030	<0.011	<0.007	<0.009	<0.011	<0.009	<0.010	<0.007	<0.012
89/09/25	<0.010	<0.009	<0.009	<0.009	<0.010	<0.011	<0.011	<0.008	<0.011
89/10/02	<0.012	<0.008	<0.012	<0.007	<0.012	<0.012	<0.007	<0.008	<0.009
89/10/09	<0.010	<0.011	<0.009	<0.009	<0.012	<0.006	<0.008	<0.007	<0.011
89/10/16	<0.011	<0.010	<0.013	<0.008	<0.008	<0.007	<0.011	<0.009	<0.007
89/10/23	<0.008	<0.008	<0.008	<0.010	<0.007	<0.007	<0.006	<0.009	<0.007
89/10/30	<0.008	<0.010	<0.008	<0.007	<0.009	<0.009	<0.009	<0.014	<0.008
89/11/06	<0.008	<0.011	<0.011	<0.012	<0.010	<0.010	<0.009	<0.010	<0.011
89/11/13	<0.011	<0.008	<0.010	<0.039	<0.013	<0.009	<0.008	<0.011	<0.009
89/11/20	<0.006	<0.007	<0.010	<0.007	<0.008	<0.011	<0.009	<0.007	<0.009
89/11/27	<0.011	<0.011	<0.011	<0.009	<0.010	<0.011	<0.012	<0.009	<0.011
89/12/04	<0.008	<0.011	<0.009	<0.010	<0.012	<0.008	<0.009	<0.010	<0.009
89/12/11	<0.012	<0.015	<0.013	<0.015	<0.011	<0.011	<0.009	<0.012	<0.015
89/12/18	<0.013	<0.012	<0.013	<0.014	<0.013	<0.008	<0.011	<0.010	<0.016
89/12/26	<0.012	<0.010	<0.008	<0.011	<0.011	<0.012	<0.010	<0.015	<0.011
90/01/02	<0.012	<0.011	<0.010	<0.013	<0.011	<0.009	<0.012	<0.011	<0.013

* SAMPLE LOCATIONS REQUIRED BY TECHNICAL SPECIFICATIONS

TABLE IV-8

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

LOCATION

WEEK END	D1--ON	G--ON	[illegible]ON	I--ON	J--ON	K--ON
89/01/10	<0.009	<0.011	<0.012	<0.012	<0.008	<0.014
89/01/17	<0.011	<0.008	<0.006	<0.009	<0.007	<0.008
89/01/24	<0.008	<0.009	<0.007	<0.013	<0.008	<0.010
89/01/31	<0.028	<0.006	<0.006	<0.008	<0.007	<0.011
89/02/07	<0.008	<0.007	<0.007	<0.007	<0.008	<0.008
89/02/14	<0.010	<0.008	<0.007	<0.006	<0.010	<0.008
89/02/21	<0.012	<0.006	<0.006	<0.008	<0.006	<0.007
89/02/28	<0.013	<0.007	<0.010	<0.008	<0.006	<0.014
89/03/07	<0.006	<0.009	<0.011	<0.007	<0.009	<0.008
89/03/14	<0.011	<0.008	<0.009	<0.010	<0.011	<0.011
89/03/21	<0.011	<0.009	<0.008	<0.008	<0.012	<0.007
89/03/28	<0.008	<0.006	<0.009	<0.008	<0.008	<0.009
89/04/04	<0.010	<0.008	<0.009	<0.011	<0.008	<0.007
89/04/11	<0.007	<0.007	<0.009	<0.007	<0.008	<0.009
89/04/18	<0.009	<0.005	<0.013	<0.009	<0.015	<0.009
89/04/25	<0.013	<0.006	<0.008	<0.009	<0.009	<0.008
89/05/02	<0.009	<0.008	<0.004	<0.009	<0.006	<0.010
89/05/09	<0.009	<0.011	<0.008	<0.011	<0.012	<0.009
89/05/16	<0.006	<0.007	<0.010	<0.007	<0.009	<0.012
89/05/23	<0.012	<0.008	<0.008	<0.010	<0.010	<0.009
89/05/30	<0.012	<0.008	<0.008	<0.009	<0.009	<0.007
89/06/06	<0.010	<0.042	<0.009	<0.015	<0.012	<0.013
89/06/13	<0.013	<0.007	<0.008	<0.015	<0.013	<0.008
89/06/20	<0.008	<0.010	<0.009	<0.008	<0.009	<0.011
89/06/26	<0.010	<0.009	<0.008	<0.011	<0.009	<0.007
89/07/03	<0.012	<0.011	<0.014	<0.009	<0.011	<0.010

TABLE IV-8 (CONTINUED)

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

LOCATION

WEEK END	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
89/07/11	<0.011	<0.010	<0.011	<0.010	<0.014	<0.011
89/07/18	<0.007	<0.009	<0.008	<0.007	<0.010	<0.008
89/07/25	<0.008	<0.011	<0.017	<0.008	<0.011	<0.011
89/08/01	<0.015	<0.009	<0.011	<0.011	<0.011	<0.012
89/08/08	<0.013	<0.010	<0.013	<0.011	<0.013	<0.010
89/08/15	<0.010	<0.009	<0.006	<0.007	<0.009	<0.006
89/08/22	<0.013	<0.010	<0.014	<0.009	<0.011	<0.008
89/08/29	<0.012	<0.005	<0.010	<0.010	<0.009	<0.009
89/09/05	<0.013	<0.006	<0.008	<0.009	<0.009	<0.010
89/09/12	<0.011	<0.009	<0.009	<0.008	<0.009	<0.010
89/09/19	<0.009	<0.009	<0.010	<0.009	<0.009	<0.014
89/09/26	<0.012	<0.007	<0.007	<0.009	<0.008	<0.012
89/10/03	<0.011	<0.011	<0.012	<0.012	<0.009	<0.011
89/10/10	<0.006	<0.009	<0.008	<0.012	<0.009	<0.011
89/10/17	<0.010	<0.007	<0.007	<0.009	<0.010	<0.008
89/10/24	<0.007	<0.009	<0.010	<0.008	<0.011	<0.007
89/10/31	<0.007	<0.008	<0.010	<0.010	<0.011	<0.008
89/11/07	<0.009	<0.009	<0.009	<0.008	<0.011	<0.006
89/11/14	<0.012	<0.008	<0.007	<0.006	<0.008	<0.009
89/11/21	<0.006	<0.011	<0.008	<0.009	<0.008	<0.009
89/11/28	<0.015	<0.006	<0.007	<0.009	<0.011	<0.008
89/12/05	<0.010	<0.010	<0.012	<0.008	<0.011	<0.007
89/12/12	<0.013	<0.010	<0.014	<0.013	<0.015	<0.011
89/12/19	<0.012	<0.008	<0.010	<0.011	<0.009	<0.013
89/12/26	<0.012	<0.010	<0.008	<0.012	<0.009	<0.012
90/01/02	<0.011	<0.010	<0.011	<0.012	<0.013	<0.012

TABLE IV-9

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
R1 OFFSITE COMPOSITE*						
Ce-144	<5.77	<4.56	<4.03	<5.24	<5.46	<2.98
Ce-141	<1.98	<1.42	<1.30	<1.51	<1.55	<6.41
Be-7	102±16.7	67.0±12.5	94.9±12.9	62.7±13.3	82.4±13.2	91.8±15.7
Zn-65	<3.24	<1.90	<1.06	<2.52	<1.36	<2.74
Cs-134	<1.11	<0.94	<0.94	<1.01	<0.99	<1.02
Cs-137	<1.21	<1.05	<1.01	<1.33	<1.04	<1.19
Zr-95	<3.47	<2.49	<2.08	<2.76	<2.30	<2.58
Nb-95	<1.83	<1.38	<1.13	<1.38	<1.50	<1.18
Co-58	<1.13	<1.05	<0.70	<1.12	<0.93	<1.48
Mn-54	<1.03	<0.94	<0.83	<1.24	<0.94	<1.24
Co-60	<1.66	<0.78	<0.76	<0.96	<0.91	<0.92
K-40	<24.1	13.4±8.4	<21.4	10.7±8.7	22.7±11.3	13.5±10.5
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
R2 OFFSITE COMPOSITE *						
Ce-144	<4.42	<4.43	<4.41	<5.96	<4.74	<3.99
Ce-141	<1.28	<1.57	<1.28	<1.66	<1.70	<1.40
Be-7	80.7±12.0	72.1±11.7	80.0±13.4	78.2±14.4	57.8±12.1	94.2±12.6
Zn-65	<1.68	<1.73	<1.19	<1.94	<1.86	<2.22
Cs-134	<0.88	<1.02	<0.89	<1.26	<1.08	<0.81
Cs-137	<0.70	<0.96	<0.89	<1.16	<0.92	<0.68
Zr-95	<1.90	<2.85	<2.51	<3.33	<2.98	<1.57
Nb-95	<1.10	<1.16	<1.22	<1.68	<1.39	<0.84
Co-58	<0.99	<1.06	<1.08	<1.45	<1.32	<0.65
Mn-54	<0.97	<1.06	<0.84	<1.18	<1.03	<0.93
Co-60	<1.06	<1.02	<0.84	<0.66	<0.77	<0.79
K-40	30.9±12.1	32.1±13.5	<15.4	22.1±13.5	36.1±13.8	36.8±11.7
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required By Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
R3 OFFSITE COMPOSITE*						
Ce-144	<3.75	<5.93	<3.50	<4.04	<6.84	<4.49
Ce-141	<1.27	<1.78	<1.28	<1.39	<2.08	<1.44
Be-7	67.8±11.8	64.2±13.6	78.3±10.6	68.3±10.9	86.8±17.0	82.0±12.6
Zn-65	<1.74	<2.16	<1.45	<2.14	<3.36	<1.33
Cs-134	<0.89	<1.28	<0.73	<0.89	<1.29	<0.86
Cs-137	<0.74	<1.11	<0.80	<0.72	<1.51	<1.01
Zr-95	<2.41	<2.26	<1.78	<1.68	<4.00	<2.13
Nb-95	<0.89	<1.46	<1.00	<0.98	<1.90	<0.81
Co-58	<1.15	<1.47	<0.74	<0.75	<1.40	<1.25
Mn-54	<1.13	<1.06	<0.62	<0.92	<1.15	<0.95
Co-60	<0.87	<1.42	<1.00	<1.11	<1.05	<0.78
K-40	<12.0	22.4±13.6	30.0±10.0	38.9±12.4	17.5±12.7	24.8±11.6
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
R4 OFFSITE COMPOSITE*						
Ce-144	<5.78	<4.26	<4.69	<4.51	<6.35	<5.17
Ce-141	<1.89	<1.51	<1.66	<1.57	<2.31	<1.95
Be-7	93.0±15.7	77.6±12.6	84.9±14.6	82.2±14.1	77.6±16.1	97.9±15.5
Zn-65	<1.12	<2.45	<2.40	<1.70	<3.81	<2.98
Cs-134	<0.84	<0.90	<0.85	<0.82	<0.94	<0.87
Cs-137	<1.32	<0.96	<0.85	<0.75	<0.88	<1.26
Zr-95	<2.17	<2.54	<2.85	<2.05	<3.68	<3.32
Nb-95	<1.45	<1.24	<1.32	<1.08	<1.80	<0.86
Co-58	<1.48	<1.02	<0.92	<0.80	<1.59	<1.46
Mn-54	<1.12	<0.58	<0.96	<0.89	<1.33	<0.95
Co-60	<0.69	<0.64	<1.14	<0.82	<1.28	<1.50
K-40	29.8±14.8	46.1±15.9	22.7±12.0	40.6±15.8	39.2±16.5	15.5±10.6
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required By Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
R5 OFFSITE COMPOSITE (CONTROL)*						
Ce-144	<4.89	<5.79	<3.69	<4.75	<4.72	<4.55
Ce-141	<1.55	<1.83	<3.50	<1.59	<1.54	<1.64
Be-7	86.0±13.1	65.4±13.2	70.2±10.9	76.0±13.0	94.8±13.6	84.1±6.7
Zn-65	<1.24	<3.10	<1.48	<1.59	<1.85	<2.70
Cs-134	<0.89	<0.96	<0.92	<0.97	<0.93	<1.11
Cs-137	<1.02	<1.53	<0.88	<0.93	<0.81	<1.06
Zr-95	<2.47	<3.39	<2.10	<3.00	<2.21	<2.29
Nb-95	<1.24	<1.64	<1.13	<1.52	<1.21	<1.61
Co-58	<1.29	<1.27	<0.89	<0.85	<0.95	<1.59
Mn-54	<0.86	<1.35	<0.78	<1.24	<0.81	<1.50
Co-60	<1.36	<1.58	<0.85	<0.92	<1.07	<1.25
K-40	34.2±14.6	24.5±13.6	11.6±8.20	10.1±8.50	46.6±14.9	<13.9
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
D2 OFFSITE COMPOSITE**						
Ce-144	<5.31	<4.77	<5.77	<5.55	<4.97	<4.50
Ce-141	<1.78	<1.41	<1.63	<1.58	<1.64	<1.47
Be-7	93.9±14.6	56.7±11.1	77.5±14.0	70.4±13.7	79.0±13.4	99.2±14.2
Zn-65	<2.64	<2.60	<2.95	<2.63	<1.99	<0.82
Cs-134	<0.98	<0.81	<1.15	<1.21	<1.00	<0.78
Cs-137	<0.96	<0.99	<1.09	<1.34	<1.08	<0.70
Zr-95	<1.95	<2.62	<2.28	<3.19	<2.16	<2.86
Nb-95	<1.45	<1.11	<1.32	<1.75	<2.17	<1.19
Co-58	<1.26	<0.75	<1.36	<0.99	<0.73	<1.31
Mn-54	<1.38	<0.96	<1.15	<1.05	<1.10	<0.54
Co-60	<0.95	<1.08	<1.28	<1.55	<0.90	<0.81
K-40	24.5±12.1	29.2±12.0	<31.7	25.0±12.8	28.0±12.6	<18.0
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required By Technical Specifications.
** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			E OFFSITE COMPOSITE**			
Ce-144	<5.65	<4.21	<3.89	<5.62	<4.55	<4.16
Ce-141	<1.88	<1.48	<1.25	<1.67	<1.57	<1.41
Be-7	77.3±15.1	69.2±11.3	82.0±11.1	76.3±14.0	76.3±12.5	85.0±11.8
Zn-65	<3.45	<2.66	<1.15	<2.38	<2.53	<1.71
Cs-134	<1.22	<0.89	<0.75	<1.08	<1.23	<0.75
Cs-137	<1.18	<0.85	<0.71	<0.76	<1.13	<0.90
Zr-95	<2.72	<1.53	<1.86	<2.09	<2.52	<2.40
Nb-95	<1.21	<1.09	<1.01	<1.66	<1.37	<0.94
Co-58	<1.64	<1.11	<0.85	<1.59	<1.15	<0.96
Mn-54	<1.26	<0.94	<0.86	<1.07	<1.15	<0.73
Co-60	<1.62	<0.58	<0.33	<1.17	<0.63	<1.05
K-40	<29.9	30.8±13.3	27.1±10.1	33.7±15.2	48.4±14.2	38.3±11.9
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			F OFFSITE COMPOSITE**			
Ce-144	<4.35	<5.52	<4.97	<3.65	<5.34	<4.36
Ce-141	<1.45	<1.79	<1.90	<1.46	<1.84	<1.61
Be-7	69.7±12.0	75.4±14.6	78.8±13.2	59.6±11.0	87.7±14.2	78.9±12.4
Zn-65	<2.11	<1.63	<1.61	<1.93	<2.63	<2.13
Cs-134	<0.72	<1.14	<0.92	<0.89	<1.13	<1.00
Cs-137	<0.71	<1.34	<0.91	<0.84	<0.92	<1.03
Zr-95	<2.14	<2.61	<2.71	<2.18	<3.01	<2.64
Nb-95	<2.12	<1.72	<1.33	<1.85	<1.53	<1.14
Co-58	<0.78	<1.42	<1.23	<0.66	<1.22	<1.26
Mn-54	<0.37	<1.13	<1.09	<0.84	<1.00	<0.73
Co-60	<1.23	<1.35	<0.94	<0.92	<1.24	<1.05
K-40	32.2±11.9	<28.8	31.9±14.0	11.7±7.3	50.9±15.5	28.7±11.9
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			G OFFSITE COMPOSITE**			
Ce-144	<5.43	<4.91	<3.39	<5.61	<4.62	<5.04
Ce-141	<1.70	<1.96	<1.09	<1.67	<1.58	<1.58
Be-7	87.0±14.0	56.3±12.5	70.1±11.2	76.4±13.9	87.6±13.0	94.5±7.0
Zn-65	<2.48	<2.19	<2.07	<3.10	<1.47	<3.58
Cs-134	<1.16	<1.26	<0.87	<1.33	<0.79	<1.03
Cs-137	<1.16	<1.32	<0.74	<1.08	<1.14	<0.80
Zr-95	<2.99	<2.96	<1.86	<2.81	<2.35	<2.93
Nb-95	<1.40	<1.92	<1.28	<1.31	<1.13	<1.35
Co-58	<1.27	<1.00	<0.89	<1.19	<0.98	<1.45
Mn-54	<0.77	<1.15	<0.78	<1.00	<0.92	<1.11
Co-60	<0.55	<1.44	<0.95	<1.82	<1.05	<1.38
K-40	31.5±14.2	21.7±13.6	20.5±9.3	20.6±13.5	32.0±12.7	10.5±4.1
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

Results in Units of 10^{-3}pCi/m^3 + 2 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			D1 ONSITE COMPOSITE**			
Ce-144	<5.32	<3.39	<4.64	<5.44	<4.96	<5.75
Ce-141	<2.18	<1.06	<1.59	<1.70	<1.68	<2.00
Be-7	76.8±15.4	65.5±5.9	84.9±11.3	63.4±12.4	80.1±13.4	98.0±17.2
Zn-65	<1.72	<2.76	<1.86	<2.53	<1.91	<3.67
Cs-134	<1.53	<1.10	<0.80	<0.94	<0.99	<1.14
Cs-137	<1.03	<1.08	<0.75	<0.98	<0.91	<1.13
Zr-95	<3.52	<3.26	<2.25	<2.30	<2.85	<3.04
Nb-95	<1.57	<1.59	<1.11	<1.66	<1.15	<1.97
Co-58	<1.43	<1.26	<0.83	<1.29	<0.87	<1.61
Mn-54	<1.12	<1.19	<0.83	<1.17	<1.02	<1.13
Co-60	<1.58	<1.11	<0.90	<1.12	<0.78	<1.35
K-40	25.8±14.5	13.1±5.5	40.9±12.0	41.1±15.4	30.0±13.3	19.0±12.6
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			G ONSITE COMPOSITE**			
Ce-144	<4.38	<3.23	<3.59	<4.83	<5.11	<4.95
Ce-141	<1.37	<0.98	<1.12	<1.62	<1.70	<1.67
Be-7	93.7±14.4	81.8±6.1	83.1±12.8	71.9±12.1	85.9±14.2	91.6±15.3
Zn-65	<2.24	<3.09	<1.03	<2.23	<2.37	<2.37
Cs-134	<0.97	<1.05	<0.69	<0.87	<1.01	<0.96
Cs-137	<0.93	<0.89	<0.66	<0.99	<1.01	<1.28
Zr-95	<2.39	<2.78	<2.18	<2.13	<1.73	<2.77
Nb-95	<1.18	<1.05	<1.00	<1.35	<1.29	<1.41
Co-58	<0.76	<1.47	<0.99	<1.09	<1.33	<1.01
Mn-54	<0.97	<1.09	<0.95	<0.84	<1.10	<0.73
Co-60	<1.19	<2.30	<0.84	<1.04	<0.91	<1.11
K-40	21.0±10.7	15.0±4.6	12.1±8.0	39.2±13.6	28.6±12.4	<20.6
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			H ONSITE COMPOSITE**			
Ce-144	<5.02	<5.60	<3.53	<5.13	<4.10	<4.23
Ce-141	<1.61	<1.62	<1.20	<1.60	<1.55	<1.28
Be-7	77.8±12.7	61.4±12.8	78.2±13.0	63.7±11.7	78.6±12.1	85.4±12.6
Zn-65	<1.91	<2.64	<2.52	<2.19	<2.22	<2.21
Cs-134	<0.93	<1.10	<0.94	<0.91	<0.97	<0.91
Cs-137	<0.99	<1.34	<0.50	<1.04	<0.72	<0.83
Zr-95	<2.52	<2.92	<2.02	<2.96	<2.72	<2.28
Nb-95	<1.71	<1.88	<1.22	<1.21	<1.09	<1.07
Co-58	<1.21	<1.17	<0.83	<1.16	<1.32	<0.87
Mn-54	<1.05	<1.20	<0.79	<0.99	<0.92	<0.69
Co-60	<1.13	<1.09	<0.65	<1.39	<0.71	<0.93
K-40	30.9±12.2	14.4±11.6	<16.8	37.0±14.4	36.1±14.0	35.4±11.3
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			I ONSITE COMPOSITE**			
Ce-144	<5.62	<3.81	<4.04	<4.77	<4.16	<5.60
Ce-141	<1.91	<1.20	<1.39	<1.74	<1.52	<1.85
Be-7	88.4±16.4	64.8±11.6	89.9±12.7	61.1±10.9	73.1±13.8	73.5±13.2
Zn-65	<3.14	<1.65	<2.51	<2.40	<2.24	<2.96
Cs-134	<1.17	<0.90	<0.76	<0.99	<0.88	<1.24
Cs-137	<1.37	<0.91	<0.63	<0.77	<1.17	<1.09
Zr-95	<3.28	<1.61	<2.78	<2.20	<2.18	<2.96
Nb-95	<2.11	<1.14	<1.10	<0.96	<1.33	<1.53
Co-58	<1.56	<0.97	<1.10	<1.19	<0.73	<1.04
Mn-54	<1.48	<0.76	<0.60	<0.83	<1.31	<0.78
Co-60	<1.83	<1.52	<1.19	<0.81	<1.16	<1.54
K-40	<14.1	8.36±7.9	21.7±10.0	45.0±13.6	<17.9	29.0±13.4
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
J ONSITE COMPOSITE**						
Ce-144	<4.61	<3.20	<3.69	<5.27	<5.58	<5.14
Ce-141	<1.48	<1.03	<1.33	<1.77	<1.68	<1.75
Be-7	60.9±12.0	52.6±5.1	67.5±10.6	51.7±11.7	49.5±11.5	85.0±7.4
Zn-65	<1.92	<3.19	<1.13	<2.15	<3.18	<3.18
Cs-134	<1.09	<1.00	<0.74	<0.84	<1.05	<1.47
Cs-137	<1.07	<0.97	<0.76	<0.84	<1.24	<1.30
Zr-95	<2.73	<2.29	<1.85	<2.84	<3.41	<3.66
Nb-95	<1.44	<1.14	<0.88	<1.30	<1.45	<1.67
Co-58	<1.21	<1.28	<0.69	<1.18	<1.25	<1.90
Mn-54	<0.84	<1.03	<0.79	<1.23	<1.18	<1.36
Co-60	<1.34	<1.07	<0.65	<1.60	<1.69	<1.95
K-40	32.8±13.6	13.8±4.46	33.8±10.8	35.4±14.3	42.8±16.3	10.6±5.04
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
K ONSITE COMPOSITE**						
Ce-144	<4.96	<6.16	<4.75	<5.23	<7.10	<5.43
Ce-141	<2.07	<1.91	<1.56	<1.62	<2.19	<1.82
Be-7	83.1±14.2	74.2±15.1	73.5±12.8	61.7±11.3	82.4±16.3	99.8±16.3
Zn-65	<1.99	<2.69	<1.86	<2.66	<3.17	<3.38
Cs-134	<1.17	<1.06	<1.12	<1.09	<1.19	<1.29
Cs-137	<1.24	<1.24	<0.99	<0.95	<1.56	<1.30
Zr-95	<2.81	<4.13	<2.02	<2.67	<2.94	<2.95
Nb-95	<1.89	<2.24	<1.10	<1.13	<1.77	<1.30
Co-58	<1.15	<1.10	<1.18	<1.19	<1.84	<0.94
Mn-54	<1.33	<1.34	<0.97	<1.18	<1.86	<1.32
Co-60	<1.44	<1.22	<0.76	<0.74	<1.70	<0.93
K-40	40.2±16.2	40.4±16.4	26.3±11.9	33.1±12.4	<26.5	23.3±13.6
Others†	<LLD	<LLD	<LLD.	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			R1 OFFSITE COMPOSITE*			
Ce-144	<4.97	<5.54	<6.37	<4.89	<4.14	<5.24
Ce-141	<1.69	<1.69	<1.97	<1.88	<1.55	<1.90
Be-7	103±14.4	80.9±14.9	89.6±7.85	75.7±13.0	61.3±5.85	61.5±12.2
Zn-65	<1.73	<4.09	<7.23	<3.08	<3.34	<2.26
Cs-134	<0.85	<1.22	<3.62	<1.12	<1.01	<1.00
Cs-137	<1.09	<1.23	<1.52	<1.05	<0.91	<1.18
Zr-95	<2.37	<1.94	<3.17	<2.50	<2.97	<2.69
Nb-95	<1.39	<1.02	<3.03	<1.50	<1.55	<1.75
Co-58	<0.97	<1.22	<1.98	<0.87	<1.47	<1.16
Mn-54	<0.92	<1.07	<2.06	<0.87	<1.14	<1.02
Co-60	<0.90	<1.55	<2.47	<1.09	<1.35	<1.07
K-40	44.5±15.4	<29.2	<19.3	44.2±15.3	9.02±4.04	34.0±14.6
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R2 OFFSITE COMPOSITE *			
Ce-144	<5.40	<4.79	<4.87	<5.54	<3.47	<6.55
Ce-141	<1.56	<1.64	<1.54	<1.77	<1.22	<2.25
Be-7	98.2±14.9	85.3±13.3	72.9±12.0	70.8±13.4	51.9±10.3	75.0±16.5
Zn-65	<2.91	<2.77	<2.39	<3.13	<3.06	<3.63
Cs-134	<0.95	<0.95	<0.87	<1.03	<0.72	<1.45
Cs-137	<1.03	<0.96	<1.02	<1.01	<0.84	<1.51
Zr-95	<2.10	<2.35	<3.06	<2.35	<1.24	<3.15
Nb-95	<1.32	<1.55	<1.25	<1.95	<1.39	<2.56
Co-58	<0.85	<1.12	<0.78	<0.88	<0.96	<1.41
Mn-54	<1.13	<0.58	<0.93	<1.26	<0.84	<1.05
Co-60	<1.08	<1.41	<0.44	<0.78	<0.46	<1.68
K-40	24.2±13.5	33.1±13.6	20.4±9.99	35.7±15.1	11.0±8.29	<25.3
Others†	<LLD	<LLD	<LLD.	<LLD	<LLD	<LLD

* Sample Locations Required By Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			R3 OFFSITE COMPOSITE*			
Ce-144	<4.66	<5.21	<5.23	<5.48	<4.33	<4.74
Ce-141	<1.49	<1.77	<1.64	<1.73	<1.44	<1.79
Be-7	98.6±13.6	82.8±16.4	64.3±5.94	86.7±13.3	53.1±5.84	55.9±11.3
Zn-65	<2.06	<2.28	<4.64	<2.26	<2.76	<2.52
Cs-134	<0.96	<1.08	<2.07	<1.10	<1.13	<0.92
Cs-137	<1.00	<1.17	<1.25	<1.18	<1.22	<0.95
Zr-95	<2.04	<2.26	<3.02	<2.36	<3.02	<2.67
Nb-95	<1.02	<1.69	<2.16	<1.22	<1.60	<1.44
Co-58	<0.92	<1.33	<1.61	<1.21	<1.40	<1.08
Mn-54	<0.73	<0.98	<1.54	<1.03	<1.13	<0.98
Co-60	<0.84	<0.95	<1.51	<0.75	<1.33	<0.90
K-40	34.7±13.2	32.5±13.2	12.5±5.11	32.2±12.7	11.1±3.84	39.8±12.7
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R4 OFFSITE COMPOSITE*			
Ce-144	<5.57	<5.50	<6.32	<5.32	<4.96	<4.98
Ce-141	<1.76	<1.71	<2.35	<1.75	<1.91	<2.07
Be-7	99.1±14.7	80.8±12.8	82.6±15.1	68.9±13.4	65.8±7.69	76.7±14.5
Zn-65	<2.02	<2.16	<2.92	<3.20	<1.99	<2.54
Cs-134	<1.18	<1.03	<1.29	<1.17	<0.96	<1.10
Cs-137	<1.13	<1.05	<1.18	<0.99	<0.88	<1.44
Zr-95	<2.46	<2.02	<3.21	<2.92	<2.67	<2.89
Nb-95	<1.43	<1.08	<2.10	<1.45	<1.70	<1.78
Co-58	<1.24	<1.32	<2.02	<1.34	<1.26	<1.23
Mn-54	<0.89	<0.87	<1.15	<1.13	<1.01	<1.09
Co-60	<1.06	<1.17	<1.57	<0.54	<0.80	<1.21
K-40	<27.3	35.6±15.2	22.0±13.4	28.0±13.5	43.9±9.46	31.9±13.7
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required By Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
R5 OFFSITE COMPOSITE (CONTROL)*						
Ce-144	<4.94	<5.73	<5.12	<5.19	<4.29	<5.71
Ce-141	<1.58	<1.92	<1.71	<1.85	<1.32	<2.32
Be-7	101±15.7	87.0±8.38	68.5±11.7	87.6±13.7	66.0±10.6	61.4±13.7
Zn-65	<2.02	<5.22	<2.43	<2.02	<1.80	<3.19
Cs-134	<1.01	<1.83	<0.95	<1.01	<0.74	<1.29
Cs-137	<1.09	<1.63	<1.09	<1.22	<0.81	<1.27
Zr-95	<2.20	<4.54	<2.88	<2.67	<2.17	<2.96
Nb-95	<1.42	<2.26	<1.60	<1.23	<1.02	<2.05
Co-58	<1.41	<1.63	<1.17	<1.18	<0.81	<1.74
Mn-54	<1.08	<1.73	<1.03	<0.82	<0.82	<1.08
Co-60	<1.17	<1.92	<1.10	<0.98	<0.77	<1.87
K-40	<19.2	18.4±4.96	31.4±12.6	41.0±14.4	35.2±11.2	<33.6
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
D2 OFFSITE COMPOSITE**						
Ce-144	<4.68	<5.00	<5.07	<6.23	<4.07	<4.90
Ce-141	<1.53	<1.66	<1.66	<1.96	<1.38	<1.55
Be-7	103±13.3	84.2±13.9	74.2±6.43	70.1±14.0	57.3±9.58	67.3±12.2
Zn-65	<2.35	<2.57	<4.99	<3.09	<1.59	<2.19
Cs-134	<0.83	<1.08	<2.10	<1.46	<0.78	<0.88
Cs-137	<0.91	<0.94	<1.15	<1.42	<0.69	<1.07
Zr-95	<2.08	<2.70	<3.63	<3.51	<1.95	<3.02
Nb-95	<1.32	<0.92	<1.45	<1.98	<0.96	<1.45
Co-58	<1.15	<1.12	<1.44	<1.37	<0.55	<0.94
Mn-54	<0.93	<0.95	<1.31	<1.21	<0.79	<1.01
Co-60	<0.71	<0.75	<1.77	<1.81	<0.56	<1.15
K-40	30.9±12.5	25.1±12.6	10.0±5.45	<25.2	34.2±10.4	27.4±12.1
Others†	<LLD	<LLD	<LLD.	<LLD	<LLD	<LLD

* Sample Locations Required By Technical Specifications.
** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
E OFFSITE COMPOSITE**						
Ce-144	<5.60	<5.72	<5.39	<5.20	<3.84	<6.24
Ce-141	<1.69	<1.57	<1.89	<1.86	<1.41	<2.14
Be-7	98.1±14.8	74.2±12.4	86.3±15.1	76.5±14.0	65.7±12.5	51.4±12.7
Zn-65	<2.29	<2.93	<3.80	<2.66	<1.38	<2.19
Cs-134	<0.86	<1.12	<1.07	<1.04	<0.84	<1.25
Cs-137	<1.01	<0.98	<1.26	<1.21	<0.88	<1.51
Zr-95	<2.91	<2.29	<3.07	<3.28	<2.09	<2.77
Nb-95	<1.05	<1.09	<2.01	<1.70	<1.22	<1.97
Co-58	<1.39	<0.99	<1.33	<1.36	<1.16	<1.87
Mn-54	<1.10	<1.22	<1.51	<1.14	<1.00	<1.33
Co-60	<1.22	<1.29	<0.61	<1.30	<1.02	<1.86
K-40	23.7±12.0	46.8±15.4	25.2±13.6	25.0±11.8	9.28±7.28	<22.5
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
F OFFSITE COMPOSITE**						
Ce-144	<5.53	<5.90	<3.92	<5.64	<4.26	<3.49
Ce-141	<1.94	<1.60	<1.41	<1.77	<1.53	<1.70
Be-7	103±14.5	84.1±14.9	68.8±10.9	75.2±13.6	64.0±11.0	72.4±14.0
Zn-65	<2.67	<1.83	<1.09	<2.32	<2.38	<2.41
Cs-134	<1.08	<1.25	<0.71	<0.75	<0.77	<1.02
Cs-137	<1.05	<1.42	<0.72	<0.93	<0.68	<1.23
Zr-95	<3.12	<2.95	<2.58	<2.64	<2.35	<3.10
Nb-95	<1.65	<1.39	<1.28	<1.19	<1.13	<1.28
Co-58	<1.10	<1.06	<0.68	<1.13	<0.76	<0.95
Mn-54	<1.05	<0.90	<0.67	<0.93	<0.57	<1.06
Co-60	<0.89	<0.61	<0.51	<0.78	<0.70	<1.27
K-40	35.7±13.5	<22.4	34.4±11.9	58.4±19.0	42.6±12.9	<21.7
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			G OFFSITE COMPOSITE**			
Ce-144	<4.72	<5.73	<4.19	<5.49	<4.86	<5.01
Ce-141	<1.57	<1.86	<1.68	<2.05	<2.08	<1.58
Be-7	98.3±14.4	82.0±7.54	81.7±7.18	69.1±13.1	65.9±13.4	44.7±11.7
Zn-65	<1.94	<4.83	<3.65	<2.69	<2.71	<2.49
Cs-134	<0.93	<1.75	<1.44	<1.22	<0.95	<12.7
Cs-137	<1.11	<1.22	<1.30	<1.30	<0.98	<11.2
Zr-95	<2.34	<4.69	<2.89	<2.32	<2.89	<2.26
Nb-95	<1.41	<2.11	<2.23	<1.72	<1.68	<1.33
Co-58	<1.23	<1.62	<1.59	<1.25	<1.38	<0.98
Mn-54	<0.73	<1.77	<1.18	<1.15	<1.06	<0.94
Co-60	<0.95	<1.31	<1.46	<0.47	<1.19	<1.17
K-40	31.0±12.7	10.4±6.31	<17.8	54.3±16.7	<25.4	<13.8
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
D1 ONSITE COMPOSITE**						
Ce-144	<5.83	<5.84	<5.07	<5.17	<4.92	<3.69
Ce-141	<1.95	<1.99	<1.85	<1.52	<1.81	<1.39
Be-7	86.7±14.2	83.0±14.4	88.6±15.5	62.8±12.2	67.6±11.5	46.8±9.98
Zn-65	<2.50	<2.64	<2.27	<2.95	<2.42	<2.00
Cs-134	<1.03	<1.15	<1.07	<0.88	<0.76	<0.87
Cs-137	<1.11	<1.21	<1.11	<1.03	<0.68	<0.64
Zr-95	<3.02	<3.12	<1.72	<2.60	<2.67	<2.56
Nb-95	<1.54	<1.49	<1.86	<1.26	<1.29	<0.980
Co-58	<1.10	<1.16	<1.26	<1.09	<1.20	<0.701
Mn-54	<1.34	<0.89	<0.84	<0.98	<1.07	<0.44
Co-60	<1.28	<1.28	<1.15	<1.26	<0.86	<0.94
K-40	57.4±18.1	54.2±17.0	26.7±14.4	49.6±15.3	30.3±12.3	17.1±10.4
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
G ONSITE COMPOSITE**						
Ce-144	<5.36	<4.73	<3.45	<5.01	<3.86	<4.52
Ce-141	<1.56	<1.86	<1.19	<1.60	<1.44	<1.83
Be-7	76.1±13.9	88.1±14.2	73.2±11.2	69.6±12.6	71.0±11.5	75.4±12.4
Zn-65	<0.93	<2.96	<1.83	<2.89	<2.07	<1.75
Cs-134	<0.99	<1.17	<0.73	<0.94	<0.78	<1.02
Cs-137	<1.09	<1.17	<0.83	<0.99	<0.78	<1.0
Zr-95	<3.09	<2.78	<1.82	<2.22	<2.52	<2.68
Nb-95	<1.45	<1.40	<1.26	<1.31	<1.28	<1.11
Co-58	<1.14	<1.21	<0.82	<1.50	<0.93	<1.15
Mn-54	<1.24	<0.49	<0.83	<1.13	<0.86	<0.94
Co-60	<0.77	<1.10	<0.50	<0.93	<0.85	<0.71
K-40	41.0±15.1	38.4±15.2	38.9±12.0	29.8±12.8	20.1±9.95	30.0±11.9
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			H ONSITE COMPOSITE**			
Ce-144	<7.65	<6.54	<2.58	<5.06	<3.90	<4.90
Ce-141	<2.02	<1.82	<4.30	<1.44	<1.50	<1.80
Be-7	75.1±16.8	70.4±6.70	56.8±11.0	61.1±7.01	58.3±6.15	54.3±6.44
Zn-65	<4.30	<4.37	<2.21	4.70±1.28	27.3±2.42	<2.65
Cs-134	<1.08	<2.31	<0.88	<0.82	<0.88	<1.64
Cs-137	<1.19	<1.47	<0.84	<0.89	<0.63	<1.22
Zr-95	<3.48	<3.53	<2.92	<2.69	<2.27	<3.45
Nb-95	<2.03	<2.30	<1.18	<1.18	<1.39	<1.75
Co-58	<1.36	<1.81	<0.93	<0.76	<1.52	<1.72
Mn-54	<1.42	<1.88	<1.00	<0.79	<1.14	<1.29
Co-60	<0.80	<2.26	<0.91	<1.05	1.20±0.56	<1.52
K-40	45.7±21.0	14.1±6.46	33.2±12.4	43.2±8.08	25.1±6.06	<16.8
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			I ONSITE COMPOSITE**			
Ce-144	<5.03	<5.83	<4.23	<5.33	<4.14	<4.33
Ce-141	<1.72	<1.94	<1.42	<1.68	<1.50	<1.60
Be-7	89.5±15.5	67.8±12.1	64.7±6.12	55.3±6.66	58.2±6.54	44.8±11.4
Zn-65	<1.83	<2.31	<3.47	2.52±1.08	5.36±1.21	<1.97
Cs-134	<1.47	<1.09	<1.28	<1.09	<0.84	<0.94
Cs-137	<1.14	<9.03	<0.86	<1.10	<0.86	<1.09
Zr-95	<3.24	<2.63	<2.88	<3.03	<2.57	<2.83
Nb-95	<1.63	<1.18	<1.38	<1.20	<1.18	<1.08
Co-58	<1.17	<1.29	<1.74	<1.16	<1.00	<1.12
Mn-54	<1.13	<1.13	<1.06	<0.99	<0.90	<1.44
Co-60	<1.50	<1.00	<1.40	<1.66	<0.87	<1.14
K-40	25.5±15.0	50.5±14.8	<13.8	38.4±10.7	34.6±6.79	<12.4
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1989

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

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			J ONSITE COMPOSITE**			
Ce-144	<6.02	<6.06	<3.87	<5.13	<4.24	<4.87
Ce-141	<1.90	<1.82	<1.64	<1.62	<1.50	<1.87
Be-7	87.9±13.6	57.3±15.4	71.5±12.6	68.9±13.2	58.0±5.98	53.8±14.3
Zn-65	<3.00	<3.24	<1.90	<2.57	2.86±0.88	<2.53
Cs-134	<1.17	<1.06	<0.88	<0.98	<0.78	<1.01
Cs-137	<1.23	<1.50	<0.72	<1.02	<0.92	<0.89
Zr-95	<3.36	<3.41	<2.78	<3.12	<2.03	<2.92
Nb-95	<1.77	<1.91	<1.10	<0.75	<1.06	<1.45
Co-58	<1.10	<1.26	<1.15	<1.18	<1.07	<1.39
Mn-54	<1.00	<1.26	<1.11	<1.11	<1.21	<1.37
Co-60	<1.08	<1.34	<1.46	<1.05	<0.90	<1.57
K-40	47.1±15.7	52.1±18.8	13.6±9.71	56.7±16.9	35.6±6.91	28.9±14.1
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			K ONSITE COMPOSITE**			
Ce-144	<5.58	<4.90	<4.06	<5.30	<3.98	<5.54
Ce-141	<1.65	<1.81	<1.61	<1.77	<1.44	<2.09
Be-7	73.7±13.6	85.1±18.1	70.5±11.2	44.0±11.7	49.2±9.90	50.7±12.6
Zn-65	<1.91	<2.95	<1.60	<2.31	<1.49	<3.04
Cs-134	<1.02	<1.20	<0.72	<1.09	<0.98	<0.89
Cs-137	<1.12	<0.76	<0.91	<1.14	<1.08	<1.21
Zr-95	<2.32	<3.06	<2.58	<3.14	<1.87	<3.16
Nb-95	<1.67	<1.28	<1.10	<1.65	<1.20	<1.88
Co-58	<1.04	<1.52	<0.84	<0.95	<1.09	<1.44
Mn-54	<0.87	<1.12	<0.65	<1.05	<0.78	<1.27
Co-60	<0.56	<1.48	<0.65	<0.78	<0.86	<1.16
K-40	27.3±12.6	<14.3	34.4±12.4	37.9±15.8	21.4±10.3	<33.2
Others†	<LLD	<LLD	<LLD.	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required By The Technical Specifications.
† Plant Related Radionuclides.

TABLE IV-10

DIRECT RADIATION MEASUREMENT RESULTS (1989)
Results in Units of mrem/std. Month ± 2 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
3	D1 Onsite	12.0±0.6	14.5±2.9	13.1±2.0	9.1±1.0	0.2 miles @ 69°
4	D2 Onsite	6.2±0.6	5.9±0.5	6.8±0.6	4.8±0.7	0.4 miles @ 140°
5	E Onsite	4.9±0.6	5.4±0.5	6.6±0.5	4.8±0.5	0.4 miles @ 175°
6	F Onsite	4.4±0.9	4.8±0.4	5.7±0.8	3.7±0.6	0.5 miles @ 210°
7*	G Onsite	4.6±0.3	5.0±0.2	5.8±0.2	3.8±0.5	0.7 miles @ 250°
8*	R-5 Offsite-Control	4.8±0.4	5.2±0.3	6.4±0.4	4.7±0.6	16.4 miles @ 42°
9	D1 Offsite	4.6±0.4	5.4±0.3	5.3±0.2	4.0±0.5	11.4 miles @ 80°
10	D2 Offsite	4.4±0.3	5.0±0.3	5.0±0.2	3.4±0.4	9.0 miles @ 117°
11	E Offsite	3.2±0.2	5.2±0.3	5.4±0.2	3.2±0.6	7.2 miles @ 160°
12	F Offsite	4.2±0.2	4.8±0.3	4.8±0.2	2.8±0.2	7.7 miles @ 190°
13	G Offsite	4.7±0.3	5.1±0.2	4.8±0.2	3.7±0.5	5.3 miles @ 225°
14*	DeMass Rd., SW Oswego-Control	4.8±0.5	5.6±0.4	5.4±0.4	2.9±0.4	12.6 miles @ 226°
15*	Pole 66, W. boundary-Bible Camp	4.2±0.1	4.4±0.2	5.2±0.1	2.1±0.3	0.9 miles @ 237°
18*	Energy Info. Center-Lamp Post, SW	3.8±0.3	5.6±0.4	5.6±0.2	3.8±0.4	0.4 miles @ 265°
19	East Boundary-JAF, Pole 9	5.2±0.3	5.1±0.2	6.3±0.5	3.3±0.3	1.3 miles @ 81°
23*	H Onsite	6.2±0.5	6.6±0.4	7.7±0.4	4.0±0.4	0.8 miles @ 70°
24	I Onsite	5.1±0.4	5.4±0.5	6.2±0.5	5.2±0.7	0.8 miles @ 98°
25	J Onsite	4.9±0.5	6.1±0.2	5.2±0.5	4.2±0.7	0.9 miles @ 110°
26	K Onsite	4.5±0.4	5.8±0.5	6.0±0.6	2.7±0.6	0.5 miles @ 132°
27	N. Fence, N. of Switchyard, JAF	22.2±3.8	25.0±4.1	22.8±3.5	14.9±3.5	0.4 miles @ 60°
28	N. Light Pole, N. of Screenhouse, JAF	42.1±6.1	38.6±7.6	41.2±6.8	32.5±4.2	0.5 miles @ 68°
29	N. Fence, N. of W. Side	26.8±6.7	29.2±8.2	29.2±6.0	21.3±4.6	0.5 miles @ 65°
30	N. Fence (NW) JAF	17.4±1.7	18.7±2.2	17.7±1.8	11.8±1.6	0.4 miles @ 57°
31	N. Fence (NW) NMP-1	6.9±0.8	7.5±0.6	8.4±0.8	6.0±0.6	0.2 miles @ 276°
39	N. Fence, Rad. Waste-NMP-1	10.6±1.4	11.6±0.1	13.0±1.2	10.2±1.4	0.2 miles @ 292°
47	N. Fence, (NE) JAF	10.5±1.4	10.8±1.9	10.3±1.4	7.0±1.5	0.6 miles @ 69°
49*	Phoenix, NY-Control	3.7±0.2	5.0±0.2	5.2±0.4	4.2±0.4	19.8 miles @ 170°
51	Liberty & Bronson Sts., E of OSS	4.0±0.2	5.0±0.3	6.2±0.5	4.0±0.7	7.4 miles @ 233°
52	East 12th & Cayuga Sts., Osw. School	4.6±0.4	4.8±0.2	5.4±0.7	3.3±0.3	5.8 miles @ 227°

TABLE IV-10 (CONTINUED)

DIRECT RADIATION MEASUREMENT RESULTS (1989)
Results in Units of mrem/std. Month ± 2 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
53	Broadwell & Chestnut Sts. - Fulton H.S.	4.4±0.3	5.4±0.4	5.5±0.3	3.6±0.4	13.7 miles @ 183°
54	Liberty St. & Co. Rt. 16 - Mexico H.S.	4.4±0.2	4.8±0.3	5.3±0.2	3.0±0.2	9.3 miles @ 115°
55	Gas Substation Co. Rt. 5-Pulaski	3.4±0.2	4.8±0.2	5.6±0.2	3.0±0.3	13.0 miles @ 75°
56*	Rt. 104-New Haven SCH. (SE Corner)	4.6±0.3	4.8±0.2	5.4±0.3	4.5±0.5	5.3 miles @ 123°
58*	Co. Rt. 1A-ALCAN (E. of Entrance Rd.)	4.3±0.2	5.0±0.4	5.4±0.2	3.4±0.5	3.1 miles @ 220°
75*	Unit 2, N. Fence, N. of Reactor Bldg.	4.9±0.2	6.1±0.6	7.3±0.6	4.6±0.5	0.1 miles @ 5°
76*	Unit 2, N. Fence, N. of Change House	4.7±0.3	6.6±0.4	6.6±0.3	4.5±0.5	0.1 miles @ 25°
77*	Unit 2, N. Fence, N. of Pipe Bldg.	6.4±0.5	8.2±0.6	8.1±0.9	5.6±0.8	9.2 miles @ 45°
78*	JAF, E. of E. Old Lay Down Area	5.3±0.3	6.0±0.4	6.0±0.5	3.6±0.6	1.0 miles @ 90°
79*	Co. Rt. 29, Pole #63, 0.2 mi. S. of Lake Rd.	4.4±0.2	5.0±0.3	5.8±0.5	2.8±0.6	1.1 miles @ 115°
80*	Co. Rt. 29, Pole #54, 0.7 mi. S. of Lake Rd.	4.6±0.4	5.6±0.4	5.6±0.3	3.2±0.4	1.4 miles @ 133°
81*	Miner Rd., Pole #16, 0.5 mi. W. of Rt. 29	4.4±0.2	5.4±0.5	5.2±0.2	3.0±0.5	1.6 miles @ 159°
82*	Miner Rd., Pole #1 1/2, 1.1 mi. W. of Rt. 29	4.6±0.3	4.8±0.2	6.0±0.4	2.9±0.5	1.6 miles @ 181°
83*	Lakeview Rd., Tree 0.45 mi. N. of Miner Rd.	4.6±0.2	(1)	6.3±0.4	4.2±0.3	1.2 miles @ 200°
84*	Lakeview Rd., N., Pole #6117, 200 ft. N. of Lake Rd.	4.5±0.2	5.7±0.3	6.0±0.3	3.2±0.4	1.1 miles @ 225°
85*	Unit 1, N. Fence, N. of W. Side Screen House	14.4±1.6	14.2±1.4	15.4±1.9	12.0±1.2	0.2 miles @ 294°
86*	Unit 2, N. Fence, N. of W. Side of Screen House	6.0±0.4	7.4±1.0	8.4±0.8	6.2±1.1	0.1 miles @ 315°

TABLE IV-10 (CONTINUED)

DIRECT RADIATION MEASUREMENT RESULTS (1989)
Results in Units of mrem/std. Month ± 2 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
87*	Unit 2, N. Fence, N. of E. Side of Screen House	5.6±0.4	6.4±0.8	7.8±1.0	4.6±0.7	0.1 miles @ 341°
88*	Hickory Grove Rd., Pole #2. 0.6 mi. N. of Rt. 1	4.4±0.2	5.0±0.3	6.2±0.4	5.2±0.7	4.5 miles @ 97°
89*	Leavitt Rd., Pole #16, 0.4 mi. S. of Rt. 1	4.8±0.3	5.6±0.2	6.5±0.5	3.7±0.5	4.1 miles @ 111°
90*	Rt. 104, Pole #300, 150 Ft. E. of Keefe Rd.	4.8±0.2	4.9±0.3	6.0±0.2	3.5±0.5	4.2 miles @ 135°
91*	Rt. 51A, Pole #59, 0.8 mi. W. of Rt. 51	4.4±0.2	4.8±0.3	5.8±0.2	2.5±0.2	4.8 miles @ 156°
92*	Maiden Lane Rd., Power Pole, 0.6 mi. S. of Rt. 104	4.8±0.4	6.2±0.4	6.8±0.3	4.0±0.5	4.4 miles @ 183°
93*	Rt. 53, Pole 1-1, 120 ft. S. of Rt. 104	4.6±0.2	5.3±0.2	6.0±0.2	3.0±0.3	4.4 miles @ 205°
94*	Rt. 1, Pole #82, 250 ft. E. of Kocher Rd. (Co. Rt. #63)	4.2±0.4	5.8±0.4	5.8±0.3	2.7±0.2	4.7 miles @ 223°
95*	Lakeshore Camp Site, from Alcan W. access Rd. Pole #21, 1.2 mi. N. of Rt. 1	4.4±0.2	6.0±0.2	5.9±0.2	2.6±0.2	4.1 miles @ 237°
96*	Creamery Rd., 0.3 mi. S. of Middle Rd. Pole 1 1/2	4.5±0.4	5.6±0.3	6.2±0.4	3.6±0.2	3.6 miles @ 199°
97*	Rt. 29, Pole #50, 200 ft. N. of Miner Rd.	4.8±0.2	5.5±0.2	6.4±0.3	3.6±0.2	1.8 miles @ 143°
98*	Lake Rd., Pole #145, 0.15 mi. of Rt. 29	5.0±0.3	5.4±0.3	7.0±0.2	3.5±0.3	1.2 miles @ 101°
99	NMP Rd., 0.4 mi. N. of Lake Rd., Env. Station R1 Offsite	4.4±0.3	5.8±0.3	6.4±0.3	4.0±0.4	1.8 miles @ 88°
100	Rt. 29 and Lake Rd., Env. Station R2 Offsite	4.3±0.2	6.0±0.3	5.8±0.2	3.8±0.3	1.1 miles @ 104°
101	Rt. 29, 0.7 mi. S. of Lake Rd., Env. Station R3	3.8±0.3	5.1±0.4	6.0±0.4	3.9±0.1	1.5 miles @ 132°

TABLE IV-10 (CONTINUED)

DIRECT RADIATION MEASUREMENT RESULTS (1989)
Results in Units of mrem/std. Month ± 2 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
102	EOF/Env. Lab, Oswego Co. Airport (fulton airport, Rt. 176)	3.6±0.2	5.5±0.3	6.0±0.2	4.0±0.5	11.9 miles @ 175°
103	EIC, East Garage Rd., Lamp Post R3 Offsite	3.9±0.2	6.2±0.3	6.0±0.2	4.1±0.6	0.4 miles @ 267°
104	Parkhurst Road, Pole #148 1/2-A, 0.1 miles South of Lake Rd.	4.5±0.1	5.4±0.2	5.0±0.2	3.8±0.5	1.4 miles @ 102°
105	Lakeview Rd., Pole #6125, 0.6 mi. South of Lake Rd.	4.4±0.2	6.0±0.4	5.4±0.3	4.2±0.4	1.4 miles @ 198°
106	Shoreline cove, East of NMP-1, Tree on West Edge	5.0±0.2	5.6±0.4	6.7±0.4	4.6±0.6	0.3 miles @ 274°
107	Shoreline Cove, East of NMP-1	5.4±0.4	6.2±0.3	6.8±0.3	4.8±0.5	0.3 miles @ 272°
108	Pole #143, South of Lake Road, 300 ft. East of Route 29	4.7±0.5	5.8±0.4	6.4±0.4	4.4±0.5	1.1 miles @ 104°
109	Tree North of Lake Road, 300 ft. East of Route 29	3.9±0.3	5.6±0.2	6.2±0.7	4.0±0.5	1.1 miles @ 103°
110	Control, Baldwinsville, NY	3.4±0.1	5.2±0.5	5.2±0.2	4.4±0.5	26.4 miles @ 166°
111	Control, Sterling, NY	3.6±0.2	5.4±0.7	5.2±0.3	3.7±0.5	21.8 miles @ 214°

* Technical Specification Location

** Direction and distance based on NMP-2 reactor centerline and sixteen 22.5 sector grids.

(1) TLD lost in field

TABLE IV-11

CONCENTRATIONS OF IODINE-131 IN MILK
Results in Units of pCi/liter ± 2 Sigma

STATION*	04/03/89	04/17/89	05/08/89	05/22/89	06/05/89	06/19/89
No. 60	<0.15	<0.18	<0.19	<0.15	<0.13	<0.14
No. 55	<0.26	<0.16	<0.19	<0.15	<0.13	<0.16
No. 50	<0.13	<0.15	<0.30	<0.16	<0.19	<0.19
No. 7	<0.16	<0.16	<0.28	<0.14	<0.13	<0.16
No. 4	<0.14	<0.17	<0.31	<0.20	<0.12	<0.20
No. 16	<0.17	<0.16	<0.17	<0.16	<0.14	<0.18
No. 65 (Control)	<0.13	<0.16	<0.17	<0.22	<0.14	<0.21

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

TABLE IV-11 (CONTINUED)

CONCENTRATIONS OF IODINE-131 IN MILK
Results in Units of pCi/liter ± 2 Sigma

STATION*	07/05/89	07/17/89	08/07/89	08/21/89	09/05/89	09/18/89
No. 60	<0.13	<0.13	<0.23	<0.19	<0.16	<0.15
No. 55	<0.12	<0.12	<0.15	<0.11	<0.15	<0.14
No. 50	<0.15	<0.15	<0.18	<0.12	<0.18	<0.15
No. 7	<0.18	<0.11	<0.15	<0.10	<0.19	<0.15
No. 4	<0.26	<0.13	<0.22	<0.11	<0.17	<0.13
No. 16	<0.20	<0.15	<0.15	<0.12	<0.18	<0.21
No. 65 (Control)	<0.29	<0.11	<0.15	<0.10	<0.15	<0.17

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

TABLE IV-11 (CONTINUED)

CONCENTRATIONS OF IODINE-131 IN MILK
Results in Units of pCi/liter ± 2 Sigma

STATION*	10/02/89	10/16/89	11/06/89	11/20/89	12/04/89	12/18/89
No. 60	<0.15	<0.14	<0.41	<0.33	<0.50	<0.34
No. 55	<0.17	<0.18	<0.40	<0.37	<0.29	<0.22
No. 50	<0.19	<0.19	<0.42	<0.38	<0.49	<0.32
No. 7	<0.16	<0.17	<0.21	<0.44	<0.21	<0.19
No. 4	<0.13	<0.15	<0.40	<0.19	<0.50	<0.17
No. 16	<0.15	<0.15	<0.31	<0.50	<0.23	<0.26
No. 65 (Control)	<0.14	<0.15	<0.35	<0.30	<0.20	<0.36

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

TABLE IV-12

CONCENTRATIONS OF GAMMA EMITTERS IN MILK
Results in Units of pCi/liter ± 2 Sigma

STATION*	NUCLIDES	04/03/89	04/17/89	05/08/89	05/22/89	06/05/89	06/19/89
No. 60	K-40	1450±134	1440±156	1490±184	1555±144	1610±166	1510±65.5
	Cs-134	<3.88	<7.53	<7.41	<4.08	<5.85	<7.60
	Cs-137	<4.27	<7.09	<9.40	<6.09	<6.64	<6.03
	Ba/La-40	<2.98	<5.45	<9.10	<3.63	<5.74	<10.1
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1650±167	1580±161	1680±201	1620±171	1600±135	1430±140
	Cs-134	<6.30	<6.37	<9.02	<7.10	<5.18	<5.04
	Cs-137	<8.34	<6.90	<7.63	<7.13	<5.36	<6.09
	Ba/La-40	<4.48	<7.09	<8.94	<6.59	<5.68	<4.45
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1540±185	1400±60	1570±137	1580±188	1670±12	1650±168
	Cs-134	<7.09	<5.92	<5.35	<7.71	<7.30	<6.35
	Cs-137	<7.95	<5.57	<5.90	<9.74	<8.18	<6.53
	Ba/La-40	<7.95	<5.95	<3.10	<8.94	<9.47	<4.66
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1390±131	1580±134	1570±164	1680±144	1650±138	1640±137
	Cs-134	<4.84	<5.28	<6.02	<5.35	<5.02	<5.17
	Cs-137	<5.44	<6.18	<7.42	<5.72	<6.01	<6.17
	Ba/La-40	<3.42	<4.07	<5.71	<3.78	<5.61	<4.66
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1520±177	1720±191	1460±139	1440±176	1590±136	1480±180
	Cs-134	<3.83	<7.18	<4.90	<7.30	<5.36	<8.21
	Cs-137	<3.58	<8.88	<5.71	<9.85	<6.33	<8.43
	Ba/La-40	<4.77	<7.02	<4.03	<8.00	<4.26	<8.98
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 16	K-40	1480±129	1530±181	1600±165	1520±66.0	1730±174	1660±148
	Cs-134	<4.80	<7.39	<5.40	<5.82	<6.59	<5.03
	Cs-137	<5.52	<9.53	<6.21	<5.46	<7.14	<5.79
	Ba/La-40	<4.26	<7.37	<6.51	<7.23	<5.41	<5.08
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1570±161	1440±125	1630±145	1650±139	1460±183	1500±65
	Cs-134	<6.30	<4.80	<6.23	<4.82	<8.68	<8.88
	Cs-137	<7.36	<5.24	<6.16	<5.95	<9.96	<6.41
	Ba/La-40	<4.98	<3.83	<5.76	<5.39	<7.03	<8.32
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Corresponds to sample locations noted on Figure 4, Section VII.
† Plant related radionuclides

TABLE IV-12 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MILK
Results in Units of pCi/liter ± 2 Sigma

STATION*	NUCLIDES	07/05/89	07/17/89	08/08/89	08/21/89	09/05/89	09/18/89
No. 60	K-40	1720±171	1620±191	1530±161	1540±145	1600±190	1470±66
	Cs-134	<6.66	<6.38	<6.58	<4.69	<7.92	<6.13
	Cs-137	<6.64	<8.69	<7.87	<6.38	<7.91	<5.87
	Ba/La-40	<7.30	<6.70	<4.04	<3.65	<6.75	<5.83
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1480±67.2	1550±166	1670±147	1520±138	1490±144	1470±140
	Cs-134	<7.91	<6.27	<4.08	<5.23	<4.55	<5.17
	Cs-137	<6.98	<7.69	<6.38	<5.38	<6.59	<6.13
	Ba/La-40	<7.44	<6.10	<5.12	<5.02	<4.74	<5.18
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1510±184	1540±143	1680±70	1500±65.7	1560±188	1620±169
	Cs-134	<6.38	<5.17	<7.37	<6.98	<8.11	<6.81
	Cs-137	<8.17	<4.85	<6.84	<6.18	<8.81	<7.13
	Ba/La-40	<4.26	<6.23	<5.83	<7.93	<6.76	<5.16
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1720±141	1540±67	1540±134	1520±165	1550±165	1470±183
	Cs-134	<4.61	<7.68	<5.67	<6.50	<7.37	<7.30
	Cs-137	<5.30	<6.41	<6.49	<7.96	<7.96	<8.93
	Ba/La-40	<5.10	<6.43	<5.58	<6.12	<7.29	<5.99
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1550±65.3	1600±187	1490±141	1740±420	1460±140	1590±67.8
	Cs-134	<6.46	<6.85	<4.62	<5.58	<5.17	<7.27
	Cs-137	<6.84	<9.29	<5.94	<6.17	<5.86	<6.18
	Ba/La-40	<6.38	<9.03	<2.68	<5.33	<3.15	<9.03
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 16	K-40	1620±168	1970±151	1580±67	1640±139	1810±143	1530±66.4
	Cs-134	<7.10	<4.22	<6.57	<5.80	<6.04	<6.30
	Cs-137	<7.87	<5.55	<7.05	<5.95	<6.17	<5.53
	Ba/La-40	<6.54	<4.84	<7.91	<5.60	<4.05	<8.33
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1440±181	1570±67	1300±171	1380±174	1370±174	1610±137
	Cs-134	<7.30	<8.46	<7.62	<7.72	<7.20	<6.08
	Cs-137	<7.19	<5.61	<9.96	<10.2	<9.29	<5.72
	Ba/La-40	<5.99	<9.07	<6.34	<6.31	<7.74	<5.34
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Corresponds to sample locations noted on Figure 4, Section VII.
† Plant related radionuclides

TABLE IV-12 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MILK
Results in Units of pCi/liter ± 2 Sigma

STATION*	NUCLIDES	10/02/89	10/16/89	11/06/89	11/20/89	12/04/89	12/18/89
No. 60	K-40	1660±139	1610±144	1610±137	1550±191	1750±142	1610±169
	Cs-134	<5.16	<5.84	<4.82	<8.76	<5.27	<7.17
	Cs-137	<6.12	<6.16	<7.08	<9.41	<5.72	<5.98
	Ba/La-40	<5.34	<5.66	<3.24	<11.4	<4.29	<6.11
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1430±137	1670±139	1630±139	1730±142	1440±188	1600±196
	Cs-134	<5.04	<5.07	<5.46	<5.62	<8.14	<9.33
	Cs-137	<5.12	<5.67	<5.17	<4.91	<9.29	<9.41
	Ba/La-40	<2.66	<5.95	<4.19	<4.66	<8.34	<9.40
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1520±134	1570±191	1470±138	1670±171	1450±189	1550±191
	Cs-134	<4.22	<3.52	<5.93	<6.35	<8.36	<8.14
	Cs-137	<5.78	<4.47	<5.64	<7.87	<7.74	<8.76
	Ba/La-40	<4.09	<5.41	<4.64	<6.17	<7.39	<8.04
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1560±143	1740±203	1560±138	1460±139	1590±191	1690±141
	Cs-134	<5.66	<8.44	<4.45	<5.10	<9.24	<4.97
	Cs-137	<6.02	<7.99	<6.17	<5.72	<10.0	<4.17
	Ba/La-40	<6.03	<8.05	<6.44	<5.43	<10.0	<3.10
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1360±175	1530±143	1730±172	1590±144	1510±141	1530±163
	Cs-134	<7.82	<4.77	<6.89	<4.84	<5.87	<7.17
	Cs-137	<8.31	<5.38	<8.21	<5.56	<6.17	<7.69
	Ba/La-40	<7.39	<4.74	<5.92	<5.16	<5.45	<4.65
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 16	K-40	1820±174	1640±169	1760±152	1670±197	1610±146	1520±68
	Cs-134	<6.19	<6.27	<5.04	<9.05	<4.98	<7.59
	Cs-137	<7.13	<6.84	<7.52	<10.5	<4.98	<6.10
	Ba/La-40	<7.35	<3.42	<5.14	<6.27	<4.63	<10.1
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1630±168	1670±174	1510±186	1790±147	1760±142	1580±144
	Cs-134	<6.10	<6.02	<8.04	<5.27	<5.17	<4.70
	Cs-137	<6.84	<7.96	<10.7	<5.67	<5.24	<5.87
	Ba/La-40	<6.12	<6.17	<6.59	<5.11	<2.69	<6.05
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Corresponds to sample locations noted on Figure 4, Section VII.
† Plant related radionuclides

TABLE IV-13

MILCH ANIMAL CENSUS 1989

TOWN OR AREA(a)	NUMBER OF CENSUS MAP(1)	DEGREES(2)	DISTANCE(2)	NUMBER OF MILCH ANIMALS
Scriba	1	220°	3.0 miles	None
	16*	190°	5.2	39C
	2	195°	8.0	ND
	3	190°	4.5	4C
	6	62°	2.2	1C
	26	115°	1.6	ND
	61	140°	3.0	1C, 12G
	62	183°	6.7	6G
	63	185°	8.0	33C
New Haven	8	130°	9.2	None
	9	95°	5.2	40C
	4*	113°	7.8	100C
	45†	125°	8.0	10C
	10	130°	2.6	28C
	5	146°	7.2	49C
	11	130°	8.5	30C
	7*	107°	5.5	62C
	64	107°	7.9	52C
Mexico	12	107°	11.5	20C
	13	114°	11.2	None
	14	120°	9.8	68C
	15	100°	10.8	None
	17	115°	10.2	1C
	18	110°	10.0	None
	19	132°	10.5	40C
	20	123°	11.2	None
	60*	90°	9.5	30C
	50*	93°	8.2	165C
	55*	95°	9.0	55C
	21	112°	10.5	72C
	68††	108°	11.6	28C
	49	88°	7.9	3G
Richland	22	85°	10.2	45C
Pulaski	23	92°	10.5	92C
Oswego	24	214°	8.8	None

TABLE IV-13 (CONTINUED)

MILCH ANIMAL CENSUS 1989

TOWN OR AREA(a)	NUMBER OF CENSUS MAP(1)	DEGREES(2)	DISTANCE(2)	NUMBER OF MILCH ANIMALS
Hannibal	40	220°	15.2	None
Sterling	65**	220°	17.0	45C
Volney	25	182°	9.5	None
	70	147°	9.4	25C, 2G
	66	158°	7.8	70C, 1G
	67	152°	8.3	3G

C = Cows
G = Goats
* = Milk sample location
** = Milk sample control location
† = Reactivated farm
†† = New location
ND = Did not wish to participate in the survey
(1) = References Figure 4
(2) = Based on Nine Mile Point Unit 2 Reactor Centerline
None = No cows or goats at that location. Location was a previous location with cows or goats.
(a) = Census performed out to a distance of approximately ten miles.

TABLE IV-14

CONCENTRATIONS OF GAMMA EMITERS 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	Ra-226
(T)	08/28/89	Beet Greens	0.1[illegible]±0.05	5.43±0.16	<0.013	<0.019	<0.017	0.37±0.11
	08/28/89	Squash Leaves	0.32±0.08	5.03±0.31	<0.014	<0.015	<0.014	0.25±0.15
	08/28/89	Cabbage	<0.13	3.40±0.31	<0.015	<0.014	<0.016	0.30±0.13
(K)	08/28/89	Squash Leaves	0.56±0.04	4.09±0.13	<0.010	<0.009	0.011±0.004	0.29±0.08
	08/28/89	Strawberry Leaves	0.78±0.12	4.42±0.35	<0.018	<0.015	<0.017	0.37±0.20
(L)	08/28/89	Bean Leaves	0.36±0.07	3.02±0.25	<0.012	<0.011	<0.012	0.14±0.11
	08/28/89	Cucumber Leaves	0.77±0.05	2.97±0.11	<0.011	<0.013	<0.011	0.30±0.09
	08/28/89	Squash Leaves	0.61±0.11	5.77±0.42	<0.018	<0.018	<0.018	0.35±0.16
(P)	08/28/89	Collard Greens	0.19±0.04	4.44±0.16	<0.015	<0.019	<0.016	0.34±0.12
	08/28/89	Swiss Chard	0.11±0.05	6.40±0.35	<0.011	<0.013	<0.012	0.17±0.10
	08/29/89	Beet Greens	0.16±0.07	3.93±0.32	<0.015	<0.015	<0.014	0.36±0.15
(M) (Control)	08/30/89	Swiss Chard	<0.10	5.49±0.33	<0.013	<0.012	<0.014	0.22±0.12
	08/30/89	Squash Leaves	0.22±0.06	4.35±0.28	<0.013	<0.011	<0.012	0.28±0.15
	08/30/89	Cabbage	<0.12	2.96±0.13	<0.013	<0.017	<0.016	0.38±0.12
(Q)	09/05/89	Cabbage	<0.09	3.48±0.24	<0.011	<0.012	<0.012	0.27±0.10
	09/05/89	Squash Leaves	0.43±0.10	4.37±0.36	<0.015	<0.015	<0.016	0.40±0.17
	09/05/89	Cucumber Leaves	1.56±0.12	5.15±0.31	<0.015	<0.013	<0.014	0.32±0.19
(Y)	09/05/89	Squash Leaves	0.54±0.05	4.39±0.15	<0.013	<0.019	<0.014	0.34±0.12
	09/05/89	Pepper Leaves	0.08±0.05	7.42±0.38	<0.011	<0.011	<0.011	0.30±0.15
	09/05/89	Egg Plant Leaves	0.28±0.08	5.84±0.38	<0.015	<0.013	<0.016	0.40±0.16

NOTE: Other Isotopes <LLD

TABLE IV-15

1989 RESIDENCE CENSUS

LOCATION	MAP DESIGNATION(b)	METEOROLOGICAL SECTOR	DEGREES(a)	DISTANCE(a)
w		N	-	-
w		NNE	-	-
w		NE	-	-
w		ENE	-	-
Sunset Bay	A	E	82°	0.9 miles
Lake Road	B	ESE	119°	0.7 miles
Parkhurst Road	C	SE	127°	1.2 miles
County Route 29	D	SSE	149°	1.2 miles
Miner Road	E	S	173°	1.6 miles
Lakeview Road	F	SSW	210°	1.7 miles
Lakeview Road	G	SW	233°	1.5 miles
Bible Camp Retreat	H	WSW	249°	1.3 miles
w		W	-	-
w		WNW	-	-
w		NW	-	-
w		NNW	-	-

w This meteorological sector is over Lake Ontario. There are no residences within three miles.

(a) Based on J. A. FitzPatrick Nuclear Power Plant Reactor Centerline.

(b) See Figure 3, Section VII.

TABLE IV-16

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Shorline Sediment	05*	Sunset Bay	80° at 1.5 miles
	06	Langs Beach, Control	230° at 5.8 miles
Fish	02*	Nine Mile Point Transect	315° at 0.3 miles
	03*	FitzPatrick Transect	55° at 0.6 miles
	00*	Oswego Transect	235° at 6.2 miles
Surface Water	03*	FitzPatrick Inlet	70° at 0.5 miles
	08*	Oswego Steam Station	235° at 7.6 miles
	09	Nine Mile Point Unit 1 Inlet	305° at 0.3 miles
	10	Oswego City Water	240° at 7.8 miles
	11	Nine Mile Point Unit 2 Inlet	304° at 0.1 miles
Air Radioiodine and Particulates	R-1*	R-1 Station, Nine Mile Pt. Rd.	88° at 1.8 miles
	R-2*	R-2 Station, Lake Road	104° at 1.1 miles
	R-3*	R-3 Station, Co. Rt. 29	132° at 1.5 miles
	R-4*	R-4 Station, Co. Rt. 29	143° at 1.8 miles
	R-5*	R-5 Station, Montario Point Rd.	42° at 16.4 miles
	D1	D1 Onsite Station, Onsite	69° at 0.2 miles
	D2	D2 Offsite Station, Co. Rt. 64	117° at 9.0 miles
	E	E Offsite Station, Co. Rt. 4	160° at 7.2 miles
	F	F Offsite Station, Dutch Ridge Rd.	190° at 7.7 miles
	G	G Onsite Station, Onsite	250° at 0.7 miles
	H	H Onsite Station, Onsite	71° at 0.8 miles
	I	I Onsite Station, Onsite	98° at 0.8 miles
	J	J Onsite Station, Onsite	110° at 0.9 miles
	K	K Onsite Station, Onsite	132° at 0.5 miles
	G	G Offsite Station, St. Paul St.	225° at 5.3 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Reactor Centerline

TABLE IV-16 (CONTINUED)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-luminescent Dosimeters (TLDs)	3	D1 Onsite Station	69° at 0.2 miles
	4	D2 Onsite Station	140° at 0.4 miles
	5	E Onsite Station	175° at 0.4 miles
	6	F Onsite Station	210° at 0.5 miles
	7*	G Onsite Station	250° at 0.7 miles
	8*	R-5 Offsite Station	42° at 16.4 miles
	9	D1 Offsite Location	80° at 11.4 miles
	10	D2 Offsite Location	117° at 9.0 miles
	11	E Offsite Location	160° at 7.2 miles
	12	F Offsite Location	190° at 7.7 miles
	13	G Offsite Location	225° at 5.3 miles
	14*	SW Oswego - Control	226° at 12.6 miles
	15*	West Site Boundary	237° at 0.9 miles
	18*	Energy Information Center	265° at 0.4 miles
	19	East Site Boundary	81° at 1.3 miles
	23*	H Onsite Station, Onsite	70° at 0.8 miles
	24	I Onsite Station, Onsite	98° at 0.8 miles
	25	J Onsite Station, Onsite	110° at 0.9 miles
	26	K Onsite Station, Onsite	132° at 0.5 miles
	27	North Fence, JAFNPP	60° at 0.4 miles
	28	North Fence, JAFNPP	68° at 0.5 miles
	29	North Fence, JAFNPP	65° at 0.5 miles
	30	North Fence, JAFNPP	57° at 0.4 miles
	31	North Fence, NMP-1	276° at 0.2 miles
	39	North Fence, NMP-1	292° at 0.2 miles
	47	North Fence, JAFNPP	69° at 0.6 miles
	49*	Phoenix, NY - Control	170° at 19.8 miles
	51	Oswego Steam Station, East	233° at 7.4 miles
	52	Oswego Elementary School, East	227° at 5.8 miles
	53	Fulton High School	183° at 13.7 miles
	54	Mexico High School	115° at 9.3 miles
	55	Pulaski Gas Substation, Route 5	75° at 13.0 miles
	56*	New Haven Elementary School	123° at 5.3 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE IV-16 (CONTINUED)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-luminescent Dosimeters (TLDs)	58*	County Route 1 and Alcan	220° at 3.1 miles
	75*	North Fence, NMP-2	5° at 0.1 miles
	76*	North Fence, NMP-2	25° at 0.1 miles
	77*	North Fence, NMP-2	45° at 0.2 miles
	78*	East Boundary, JAFNPP	90° at 1.0 miles
	79*	County Route 29	115° at 1.1 miles
	80*	County Route 29	133° at 1.4 miles
	81*	Miner Road	159° at 1.6 miles
	82*	Miner Road	181° at 1.6 miles
	83*	Lakeview Road	200° at 1.2 miles
	84*	Lakeview Road	225° at 1.1 miles
	85*	North Fence, NMP-1	294° at 0.2 miles
	86*	North Fence, NMP-1	315° at 0.1 miles
	87*	North Fence, NMP-1	341° at 0.1 miles
	88*	Hickory Grove Road	97° at 4.5 miles
	89*	Leavitt Road	111° at 4.1 miles
	90*	Route 104 and Keefe Road	135° at 4.2 miles
	91*	County Route 51A	156° at 4.8 miles
	92*	Maiden Lane Road	183° at 4.4 miles
	93*	County Route 53	205° at 4.4 miles
	94*	County Route 1 and Kocher Road (Co. Rt. 63)	223° at 4.7 miles
	95*	Lakeshore Camp Site	237° at 4.1 miles
	96*	Creamery Road	199° at 3.6 miles
	97*	County Route 29	143° at 1.8 miles
	98*	Lake Road	101° at 1.2 miles
	99	Nine Mile Point Road	88° at 1.8 miles
	100	County Route 29 and Lake Road	104° at 1.1 miles
	101	County Route 29	132° at 1.5 miles
	102	Oswego County Airport	175° at 11.9 miles
	103	Energy Information Center, East	267° at 0.4 miles
	104	Parkhurst Road	102° at 1.4 miles
	105	Lakeview Road	198° at 1.4 miles
	106	Shoreline Cove, East of NMP-1	274° at 0.3 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE IV-16 (CONTINUED)

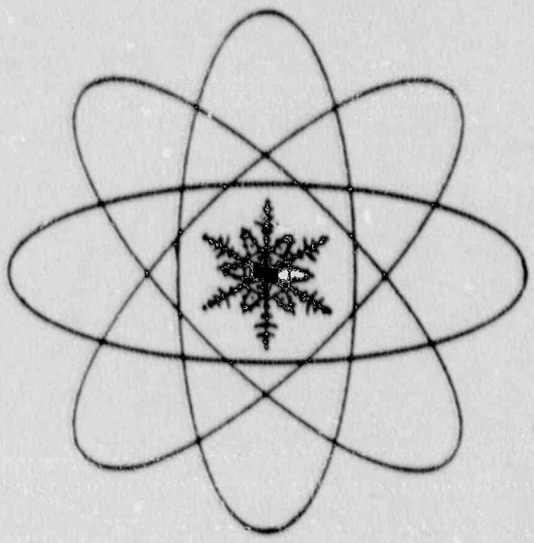
ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-luminescent Dosimeters (TLDs)	107	Shoreline Cove, East of NMP-1	272° at 0.3 miles
	108	Lake Road	104° at 1.1 miles
	109	Lake Road	103° at 1.1 miles
	110	Baldwinsville-Control	166° at 26.4 miles
	111	Sterling-Control	214° at 21.8 miles
Cows Milk	7*	Indicator Location	107° at 5.5 miles
	16*	Indicator Location	190° at 5.9 miles
	50*	Indicator Location	93° at 8.2 miles
	55	Indicator Location	95° at 9.0 miles
	60	Indicator Location	90° at 9.5 miles
	4	Indicator Location	113° at 7.8 miles
	65*	Control Location	220° at 17.0 miles
Food Products	K	Indicator Location	96° at 1.7 miles
	L	Indicator Location	82° at 1.7 miles
	Y	Indicator Location	110° at 2.1 miles
	P	Indicator Location	101° at 1.9 miles
	T	Indicator Location	84° at 1.6 miles
	Q	Indicator Location	136° at 1.7 miles
	M	Control Location	225° at 15.6 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

V



DATA SUMMARIES AND CONCLUSIONS

New York Power Authority

V DATA SUMMARIES AND CONCLUSIONS

Each year the results of the Annual Radiological Environmental Monitoring Program are evaluated considering the natural processes of the environment and the array of past data. A number of factors are considered in the course of evaluating and interpreting the annual Environmental Radiological Data. 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. This report not only presents the data collected during the 1989 sample program but also to assess the significance of the radionuclides detected in the environment. It is important to note that detection of an radionuclide is not of itself an indication of this environmental significance. Evaluation of the impact of the radionuclide in terms of potential increased dose to man, in relation to natural background, is necessary to determine the true significance of the detection.

There are four separate groups of radionuclides that were detected in the environment during 1989. Several of these radionuclides could possibly fall into three of the four groups. The first of these groups is naturally occurring radionuclides. It must be realized that the environment contains a broad inventory of naturally occurring radioactive elements. Background radiation as a function of primordial radioactive elements and cosmic radiation of solar origin, offers a constant exposure to the environment and man. These radionuclides, such as Th-228, Ra-226, Be-7 and especially K-40, account for a majority of the annual per capita background dose which is equal to approximately 300 mrem per year (Reference No. 17).

A second group of radionuclides that were detected are a result of the detonation of thermonuclear devices in the earth's upper atmosphere. Atmospheric nuclear testing during the early

1950s produced a significant inventory of radionuclides found in the lower atmosphere as well as in ecological systems. The 1963 Atmospheric Test Ban Treaty greatly reduced the global inventory through the decay of short lived radionuclides, deposition, and the removal (by natural processes) of radionuclides from the food chain by such processes as weathering and sedimentation. This process is referred to in this report as ecological cycling. Since 1963, several atmospheric weapons tests have been conducted by the People's Republic of China. In each case, the usual radionuclides associated with nuclear detonations were detected for several months following the test and then after a peak detection period, diminished to a point where most could not be detected. The last such weapons test was conducted in October of 1980. The resulting fallout or deposition from this test has influenced the background radiation in the vicinity of the site and was very evident in many of the sample medias analyzed during the 1981 sample program. Quantities of Nb-95, Zr-95, Ce-141, Ce-144, Ru-106, Ru-103, La-140, Cs-137, Mn-54 and Co-60 were typical in air particulate samples during 1981 and were the direct result of the 1980 weapons test. Cs-137 is currently the major remnant for this testing and is still detected in a number of environmental media.

A third group of radionuclides was detected as a result of the Chernobyl accident which occurred in the Soviet Union in April 1986. The resulting fallout or deposition from this accident influenced the background radiation in the vicinity of the site and was very evident in many of the sample media analyzed during 1986. Quantities of Nb-95, Ru-103, Ru-106, I-131, La-140, Cs-134, and Cs-137 were detected in air particulate samples during May and June of 1986. Milk samples collected and analyzed after April, 1986 contained measurable concentrations of I-131 and Cs-137. The origin of these radionuclides was a direct result of fallout from the Chernobyl accident. During 1987, Cs-137 was detected in several milk samples collected during the first half of the grazing season. In 1988, Cs-137 was

detected in one milk sample. The presence of Cs-137 in the milk samples is attributed to the ubiquitous concentrations of Cs-137 from weapons testing and from the Chernobyl releases.

The fourth group of radionuclides detected in the environment during 1989 were those that could be related to operations at the site. These select radionuclides were detected in a few of the sample medias collected and at very low concentrations. Many of these radionuclides are a byproduct of nuclear detonations, the Chernobyl accident, and the operation of light water reactors thus making a distinction between the sources difficult, if not impossible. The dose to man as a result of these radionuclides is small and significantly less than the radiation exposure from naturally occurring sources of radiation, medical isotopes and consumer products.

Thus, a number of factors must be considered in the course of radiological data evaluation and interpretation. The evaluation and interpretation is made at several levels including trend analysis, dose to man, etc. An attempt has been made not only to report the data collected during 1989, but also to assess the significance of the radionuclides detected in the environment as compared to natural radiation sources. It is important to note that detected concentrations of radionuclides that are possibly related to operations at the site are very small and are not of environmental significance.

The 1987 per capita dose rate was determined to be 360 mrem per year from all sources, as noted in the NCRP Report No. 93 (Ref. No. 17). This average dose includes such exposure sources as natural, occupational, weapons testing, consumer products, medical, etc. The 1987 per capita dose rate due to natural sources was 300 mrem per year. The 1970 per capita dose rate due to the nuclear fuel cycle was 0.028 mrem per year. More recently, the nuclear fuel cycle dose was estimated by a USEPA

study to be less than 0.6 mrem per year by the year 2000 (Glasstone Reference #19).

Background gamma radiation around the Nine Mile Point Site, as a result of radionuclides in the atmosphere and the ground, accounts for approximately 60 - 65 mrem per year. This dose is a result of radionuclides of cosmic origin (for example, Be-7), of a primordial origin (Ra-226, K-40, and Th-232) and, to a much smaller extent, of a man-made origin from weapons testing. A dose of 66 mrem per year, as a background dose, is significantly greater than any possible doses as a result of operations at the site during 1989.

Each sample medium is discussed in section V. Concentrations of radionuclides detected and exposure to man are presented and scrutinized.

In the routine implementation of the Radiological Environmental Monitoring Program, additional or optional environmental pathway media are sampled and analyzed. These samples are obtained to monitor the secondary pathways and to maintain the analytical data base established in 1975 when the plant began commercial operation. These additional samples include; aquatic vegetation (cladophora), bottom sediment, mollusk, milk (Sr-90), meat/poultry and soil samples. In addition to the optional sample media, many additional locations are sampled and analyzed for those pathways required by Technical Specifications. These additional sample locations are obtained to insure that the important environmental pathways are monitored in a comprehensive manner. Data from additional sample locations common with Technical Specification required sample media are normally included in the data presentation and evaluation. When additional locations are included, the use of this data will be specifically noted in section V.

Section VI, titled HISTORICAL DATA, contains statistics from

previous environmental sampling. The process of determining the impact of plant operation on the environment includes the scrutiny of past analytical data, a tool by which trends are discerned. Due to the constant change in analytical sensitivities, as state-of-the-art detection capabilities improve, data comparisons is in some cases difficult. For example, minimum detection capabilities for the 1969 analyses of environmental samples would be considered unacceptable by current standards.

A. SURFACE WATER (LAKE) PROGRAM

Tables 1 through 4, in Section IV, list the 1989 analytical results for the aquatic/lake water media sampled during the 1989 sampling program. Fish samples were obtained at two on-site locations. The transect designations used for the on-site sampling locations are NMPP (02) and JAF (03). Off-site samples were collected in the vicinity of the Oswego Harbor (off-site - 00) area and, therefore, served as control samples.

Lake water samples were collected from the inlet canals of Nine Mile Point Unit #1, Nine Mile Point Unit #2, J. A. FitzPatrick N.P.P., and the Oswego Steam Station. In addition to power plant samples, a routine sample of the Oswego city drinking water inlet was also obtained. The Oswego Steam Station served as the control location. Shoreline sediment samples were obtained in an area downstream from the site which proved to have existing recreation value and a physical make up which was suitable for sampling. The control sample was collected from an area upstream from the site with a similar physical makeup.

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1. SHORELINE SEDIMENT - TABLE IV-1

Shoreline sediment samples are routinely collected twice per year along the shoreline of Lake Ontario. Samples are collected from one indicator location (Sunset Beach), and one control location (Lang's Beach). Three sample collections were made during 1989. The first sample collection was made in April at both the indicator and control locations. A recollection of the April indicator location was made in May. The sample recollection was made to verify sample results from the April collection. The third shoreline sample collection was made in October 1989 at both the indicator and the control locations. The results of these sample collections are presented in Table IV-1.

Several radionuclides were detected in sediment samples using gamma spectral analysis. Three of these radionuclides were naturally occurring. K-40 was detected at both the control location and indicator location. The results ranged from 14.3 pCi/g (dry) to 18.0 pCi/g (dry) at the indicator location, and 13.3 pCi/g (dry) to 13.7 pCi/g (dry) at the control location. Concentrations of AcTh-228 and Ra-226, which are also naturally occurring, were detected at both the indicator and control locations.

A fourth radionuclide, Cesium-137, was present in seven of the eight indicator samples collected for the 1989 program. Cs-137 was not present in the two control samples which were collected in conjunction with the indicator samples. The initial indicator sample collected on April 24, 1989 contained a Cs-137 concentration of 0.32 pCi/g (dry). This sample location was recollected to verify the presence of the measured Cs-137 concentration. A total of six samples were collected from the Sunset Beach location on May 24, 1989. Five of the six samples contained measurable levels

of Cs-137. The concentrations ranged from a minimum of 0.10 pCi/g (dry) to a maximum of 0.34 pCi/g (dry), with a mean of 0.23 pCi/g (dry). The fall sample from the Sunset Beach location contained a Cs-137 concentration of 0.25 pCi/g (dry). As noted above, neither the spring or fall samples collected from the control locations showed the presence of Cs-137.

The source of the Cs-137 detected in the indicator shoreline sediment samples is difficult to fully evaluate. The principle source of Cs-137 released to the environment has been the atmospheric testing of nuclear weapons. Cs-137 and Cs-134 are both produced in fission reactors, but only Cs-137 is found in weapons test debris. Since Cs-134 has a significantly shorter half-life, detected concentrations of Cs-137 attributable to plant operations (e.g., recent releases), should be accompanied by Cs-134. An absence of such collaborating Cs-134 concentrations, indicates that the presence of Cs-137 in these samples is not distinguishable from the existing background and should be attributed primarily to weapons testing. When Cs-137 is released to the environment, it exhibits a appreciable reconcentration in fresh water ecosystems. Bottom and shoreline sediments in a fresh water ecosystem can act as an ion exchange media which will concentrate soluble forms of Cs-137. These sediments over time, may become a source of Cs-137 when they are resuspended during periods of increased turbulence. It is most likely that the concentrations of Cs-137 in the indicator samples is the result of Cs-137 inventory from past atmospheric testing. The fact that Cs-137 was not detected in the control samples maybe the direct result of the sediment type found at this location and the amount of bottom sediment available from resuspention from the off-shore area. Due to the fact that few shoreline regions in the general area of the site (indicator and control) contain sediment and/or sand, it is difficult to obtain control

samples which are representative of the physical and chemical characteristics of the indicator samples. This inconsistency can further complicate evaluation of analytical results.

The radiological impact of the Cs-137 measured in the shoreline sediment can be evaluated on the basis of dose to man. In the case of shoreline sediments, the critical pathway is direct radiation to the whole body and skin. Using the parameters found in Regulatory Guide 1.109, the projected dose to man in mrem per year can be calculated. The following assumptions can be used in calculating the dose to man:

- A teenager spends 67 hours per year at the beach area or on the shoreline.
- The sediment has a mass of 40 kg/m^2 (dry) to a depth of 2.5 cm.
- The shoreline width factor is 0.3.
- The maximum measured concentration of 0.34 pCi/g (dry) remains constant for the year.

Using these conservative parameters, the resulting dose to the maximumly exposed individual (teenager) would be 0.0012 mrem/year to the whole body and 0.0013 mrem/year to the skin. This calculated dose is very small and is insignificant when compared to natural background doses.

No long term historical data exists to compare the shoreline sediment indicator sample results with previous results. The Technical Specification Requirement to collect and analyze shoreline sediment was first initiated in the second half of 1985. A review of sample results for 1985 - 1988 indicated only naturally occurring radionuclides present in shoreline sediment. The inventory of nuclide identified in

1989 is identical to that seen in 1985 through 1988. 1989 concentrations for these radionuclides are consistent with previous determinations.

Table VI-1 and VI-2 illustrates Historical Environmental for shoreline sediment samples.

2. FISH - TABLE IV-2

Fish samples are collected twice during the year, once in the spring and again in the fall. Collections were made utilizing gill nets at one off-site location greater than five miles from the site (Oswego Harbor area), and at two on-site 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 processed using edible portions only and were analyzed for gamma emitters. Data is presented in the ANALYTICAL RESULTS section of the report on Table IV-2.

A total of 24 fish samples were collected for the 1989 sample program. Analysis of the 1989 fish samples indicated detectable concentrations of radionuclides related to past weapons testing and natural origins (naturally occurring). Small concentrations of Cs-137 were detected in 15 of 24 or approximately 60% of the fish samples collected from both the on-site and off-site locations. The ratio of positive detection to total samples collected was approximately equal for both the indictor and control locations. The same ratio of positive detection to total samples collected was also consistent with results from 1988. Detectable concentrations of K-40, a naturally occurring radionuclide, were found in all fish samples collected for the 1989 program.

Spring fish collections were comprised of three separate species and nine individual samples. The two species representing 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 predacious species. White sucker samples, which represents bottom feeding species, were collected at each of the three sample

transets (control/indicator).
Cs-137 was detected in four of the six indicator samples and in two of the four control samples collected in the spring samples. Cesium-137 concentrations were not detected in any of the three white sucker samples. Positive detections of Cs-137 were found in each of the six trout samples. The lack of Cs-137 in the white sucker samples may be indicative of their feeding habits and level in the aquatic food chain. The control samples contained a mean Cs-137 concentration that was slightly higher than the indicator sample mean concentration. The Cs-137 concentrations detected in 1989 samples are not significantly different from past years and are considered to be representative of base line or background concentrations of Cs-137 found in Lake Ontario fish. Cs-137 in the spring indicator samples ranged from 0.020 pCi/g (wet) to 0.043 pCi/g (wet) and averaged 0.033 pCi/g. Control samples for this same period ranged from 0.032 pCi/g (wet) to 0.043 pCi/g (wet) and averaged 0.038 pCi/g (wet). 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 ranged from 3.99 to 5.26 pCi/g (wet) and 3.99 to 5.14 pCi/g (wet) for the control samples. Radium-226, a naturally occurring radionuclide was the only other gamma emitter detected in the spring fish samples.

Fall sample collections were comprised of five separate species and fifteen individual samples. Samples of lake trout, brown trout, small mouth bass, walleye and white sucker were collected at each of two on-site sample locations (NMP and JAF) and one off-site sample location (Oswego Harbor area). Samples were collected by gill net in September and October and included two species not found in the spring collection (walleye and smallmouth bass).

Cs-137 was detected in six of the ten fall indicator samples and in three of the five control samples. White sucker, the one species of bottom feeder collected at all three sample locations during the fall season, showed no detectable Cs-137, again most likely a result of the different feeding habits for this species which places it lower in the food chain than the other predacious species represented in the sample collection.

The absences of Cs-137 in the white sucker samples was also demonstrated in the 1988 and 1987 sample results.

K-40 was detected in all of the fall fish samples collected. Detectable concentrations of K-40 in the indicator samples ranged from 3.65 to 6.05 pCi/g (wet) and 4.02 to 5.12 pCi/g (wet) for the control samples. As noted for the spring sample collection, Ra-226 was the only other radionuclide detected in fish sample collected in the fall.

A review of historical data shows that since 1980 the Cs-137 concentration in Lake Ontario fish, in the vicinity of the Nine Mile Point promitory, has remained stable with a slight downward trend. The average Cs-137 concentration in fish for this historical time period is 0.041 pCi/g (wet) including both the indicator and control results. During this time period of 1980-1989, the measured concentration for the indicator and control sample locations demonstrate little significant difference in measured concentrations. This fact would strongly indicate that the source of Cs-137 found in the fish population is most likely residual cesium from the weapon testing. The specific data for 1989 is consistence with data from the previous five years. A review of the graph of historical concentration (figure 6, section VII) demonstrates the relative stability of Cs-137 concentrations from 1980 to the present. Figure 6 also shows that the current level of Cs-137 in the indicator fish

samples has decreased significantly since 1976 when a peak concentration of 1.4 pCi/g (wet) was detected. The current mean indicator concentration of 0.034 pCi/g (wet) shows a decrease in concentration from 1976 by a factor of approximately 40. Control sample results have also decreased from a maximum level of 0.12 pCi/g (wet) in 1976 to a level of 0.034 pCi/g (wet) in 1989. Fish results for the 1989 indicator samples show a decrease in concentration by a factor of 2 when compared to preoperational data.

The general decreasing trend for Cs-137 is most probably a result of the cesium being removed from the active environment. A significant portion of Cs-137 detected since 1978 in fish is a result of weapons testing fallout, and the general downward trend in concentrations will continue as a function of inventory reduction through natural processes such as ion exchange in sediment and radiological decay of the cesium. There was no significant effect from 1986 Chernobyl Nuclear Plant accident since 1987 relative to Cs-137 results in fish samples. The Chernobyl accident may have increased the Cs-137 inventory slightly in the area but the increase in fish Cs-137 concentration is most likely due to natural variables.

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 adult consumes 21.0 kg of fish per year (Regulatory Guide 1.109, maximum exposed age group) and the fish consumed contains an average Cs-137 concentration of 0.034 pCi/g (wet) (annual mean result of indicator samples for 1989), the whole body dose received would be 0.051 mrem per year. The critical organ in this case is the liver which would receive a calculated dose of 0.078 mrem per year. The calculated Cs-137 whole body and

critical organ doses are conservative doses associated with consumption of fish from the Nine Mile Point area (indicator samples). No radiological decay is assumed for the calculation of doses. The whole body and critical organ doses can be calculated for the consumption of fish from the control locations as well. In 1989 the mean control value is equal to the mean indicator which would result in annual dose which is equal to that calculated above.

In summary, the whole body and critical organ doses calculated as a result of consumption of fish is small. Doses received from the consumption of indicator and control sample fish are approximately the same. Doses from both sample groups are considered to be background exposure. A graph of past Cs-137 concentrations can be found in Section VII and Historical Data Tables are included in Section VI.

3. SURFACE WATER - TABLES IV-3 AND IV-4

Surface water samples are taken from the respective inlet canals of the James A. FitzPatrick N.P.P. and Niagara Mohawk's Oswego Steam Station. The FitzPatrick facility removes water from Lake Ontario on a continuous basis and generally represents a "down-current" sampling point from the Nine Mile Point Unit 1 and Unit 2 facilities. The Oswego Steam Station inlet canal removes water from Lake Ontario at a point approximately 7.6 miles west of the site. This "up-current" location is considered a control location because of the distance from the site as well as the result of the lake current patterns and current patterns from the Oswego River located nearby (see Figure 1A).

Samples from the FitzPatrick facility are composited from automatic sampling equipment which discharges into a compositing tank. Samples are obtained from the tank monthly and analyzed for gamma emitters. Samples from the Oswego Steam Station are also composited from automatic sampling equipment which discharge to a compositing tank. Samples from this location are obtained weekly and are composited to form monthly composite samples. Monthly samples are analyzed for gamma emitters.

A portion of the samples from each of the locations is saved and composited to form quarterly composite samples for each calendar quarter. Quarterly composite samples are analyzed for tritium.

Gamma spectral analysis was performed on 24 monthly composite samples (two locations) required by the RETS. With the exception of tritium, only two radionuclides were detected in samples from the five locations over the course

of the 1989 Sampling Program. Both these radionuclides are naturally occurring and are not plant related.

K-40 was detected intermittently in both Technical Specification required intake canals. The James A. FitzPatrick inlet canal samples showed K-40 was detected in ten of the twelve monthly samples and ranged from 48 to 310 pCi/liter. K-40 in the Oswego Steam Station inlet canal was detected in ten of the twelve samples and ranged from 38 to 236 pCi/liter. The Nine Mile Point Unit #1 Inlet Canal, Unit #2 Inlet Canal, and the Oswego City water samples showed K-40 detections in all of the twelve monthly samples from each location. The K-40 concentrations for these samples ranged 31-257 pCi/liter, 45-262 pCi/liter, and 57-275 pCi/liter respectively. Ra-226 was also detected intermittently in both locations required by Technical Specifications and at the other optional sample locations.

Tritium samples are quarterly samples that were a composite of the appropriate monthly samples. Tritium was detected in six of the eight samples taken at the two locations required by Technical Specifications. Tritium concentrations for the James A. FitzPatrick inlet canal ranged from 135 pCi/liter to 288 pCi/liter and showed a mean concentration of 225 pCi/liter. Both the indicator and control sample results for the fourth quarter had an LLD value of <172 pCi/liter. The Technical Specification control location (Oswego Steam Station inlet canal) showed tritium results which ranged from 143 pCi/liter to 217 pCi/liter with a mean concentration of 186 pCi/liter. Tritium was also detected in nine of the twelve optional samples taken, with the exception being the fourth quarter results which had an LLD value of 172 pCi/liter. These particular sample analyses indicated that the tritium concentration was below the Lower Limit of Detection (LLD) or the sensitivity of the analyses.

A summary of tritium results of the 1989 sample program is listed below:

Sample Location	Tritium Concentration pCi/liter Minimum	Maximum	Mean (Annual)
JAF Inlet	135	288	224
Oswego Steam Inlet	143	217	186
NMP #1 Inlet	<172	302	232
NMP #2 Inlet	135	247	203
City Water Intake	<172	248	243

A review of current data shows that the tritium concentrations in the lake are consistent between locations. The source of tritium detected in the lake water is past testing of thermonuclear devices in the atmosphere. It has been estimated that in the early 1960s the concentration of tritium of surface water in the United States was as high as 4000 pCi/liter. The levels of tritium in the environmental has been reduced over the years through physical process to the levels that are currently being measured. The tritium concentration measured during the 1989 sampling program are considered to be background levels and are not the result of the operation of the nuclear facilities at the Nine Mile Point Site.

Review of historical surface water data shows no long term impact from operations of the power plants on the surface water. Cs-137 results from 1979 through 1988 shows that this radionuclide was detected only once at the control location during 1979, at a concentration of 2.5 pci/liter. Cs-137 at the indicator location (JAF inlet canal) was detected only once, in 1982, at a concentration of 0.43 pCi/liter. The 1979 control sample result is suspect and may have been a result of contamination during handling or instrument background since Cs-137 was not detected in the indicator inlet canal. The one positive Cs-137 result from the indicator location (JAF inlet canal) during 1982 was

detected in a January composite sample and may have been a result of inlet canal tempering (the addition of discharge water to the inlet canal) or instrument background. Cs-137 was not detected during 1989 in surface water samples.

Review of previous environmental data for K-40 showed that the detectable concentrations found during 1989 were representative of concentrations found during 1979-1988. Gamma isotopic results for the 1989 surface water samples were consistent with results from the previous five years. No plant related radionuclides were detected in surface water samples collected during the period of 1984 - 1989. No comparison can be made with preoperational data due to the fact that surface water sampling was not initiated until 1978.

Previous annual mean results for tritium at the indicator sample location (FitzPatrick inlet canal) have been variable since 1976. Sample results were reviewed from 1976 through 1989 and showed a maximum annual mean value of 641 pCi/liter (1982) and a minimum annual mean value of 225 pCi/liter (1989). The annual mean tritium result at the indicator location for 1989 was 225 pCi/liter.

Mean tritium results of the control location (Oswego Steam Station) cannot be evaluated with regard to long term historical data since sampling was only initiated at this location in 1985. The maximum annual mean tritium value for the control station for the period of 1985-1989 was 373 pCi/liter. The minimum annual mean value for this same time period was 186 pCi/liter. Some idea of the variability of historical control sample data can be obtained by a review of previous data from the City of Oswego drinking water samples. The drinking water samples are likely to be representative of the current control location because of the effects of the distance, predominate lake currents, and

the discharge of the Oswego River. Therefore, this previous sample data represents acceptable control sample data for evaluation purposes. The Oswego City water intake is located in the same general vicinity as the Oswego Steam Station inlet.

Annual mean tritium results from previous city water samples from 1976 to 1989 show that the tritium concentrations have decreased. The maximum annual mean concentration was found in 1976 (652 pCi/liter) and the minimum in 1982 (165 pCi/liter). The 1989 City water annual mean results was calculated to be 243 pCi/liter. Mean annual results from 1979-1988 have remained relatively consistent. The 1985, 1986, 1987 and 1988 annual mean tritium results for the Oswego Steam Station were 287, 373, 210, and 320 pCi/liters respectively. These results were slightly higher than the drinking water samples (with the exception of 1987), but were within the natural variability range. Tritium results for the 1989 surface water samples were consistent with results from the previous five years for both the indicator and control locations. The tritium concentrations for the period of 1984 - 1988 range from 205 pCi/l to 373 pCi/l for the control and 282 pCi/l to 530 pCi/l for the indicator location. The mean 1989 tritium concentration for the control and indicator locations were 186 pCi/l and 225 pCi/l respectively. The 1989 tritium results show no significant variation from preoperational data.

The impact, as expressed as a dose to man, is not evaluated because no plant related radionuclides were detected in surface water samples with the exception of tritium. Any impact associated with the fluctuation of tritium levels is considered to be background and not a result of operations at the site. See Historical Data, Section VI and Annual Tritium Results, Graph Section VII.

B. TERRESTRIAL PROGRAM

The terrestrial program consists of samples from four environmental pathways. These pathways are:

- Airborne particulate and radioiodines
- Direct radiation
- Cow/milk
  and
- Food products

Tables 5 through 14 represent the analytical results for the terrestrial samples collected for the 1989 reporting period.

1. AIR PARTICULATE GROSS BETA - TABLES IV-5 and IV-6

Tables IV-5 and IV-6 contain the results for the weekly air particulate gross beta analysis for a total of nine off-site and six on-site sample locations. Five of the nine off-site locations are required by Technical Specifications. These sample locations are R-1, R-2, R-3, R-4, (all located near the site boundary) and R-5 (located at a control location beyond any significant influence from the site). Data contained on Tables IV-5 and IV-6 also shows the results from other optional air sampling locations not required by the RETS. These locations are designated as D-1 on-site, G on-site, H on-site, I on-site, J on-site, K on-site, D-2 off-site, E off-site, F off-site, and G off-site locations. A total of 52 samples were collected from the control location R-5 and 208 indicator samples were collected from indicator locations R-1, R-2, R-3, and R-4 during 1989.

The gross beta analysis requires that samples are counted a minimum of twenty-four hours after collection to allow for the decay of naturally occurring radionuclides with short half-lives. The average yearly gross beta indicator concentration was 0.017 pCi/m^3 in 1989. The average yearly control concentration was 0.017 pCi/m^3 for the same time period. The minimum, maximum, and average gross beta results for sample locations required by Technical Specification are:

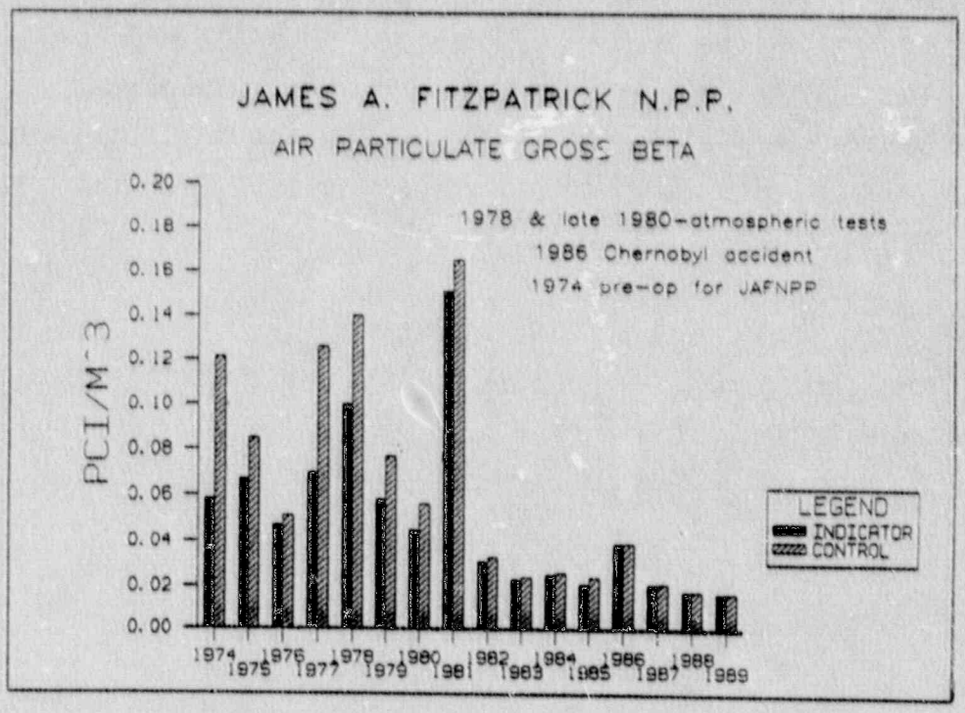
Location**	Minimum*	Maximum*	Average*
R-1	0.007	0.041	0.017
R-2	0.008	0.033	0.017
R-3	0.007	0.041	0.017
R-4	0.009	0.038	0.018
R-5 (control)	0.007	0.039	0.017

* - Concentration in pCi/m^3

** - Locations required by the Technical Specifications

The small fluctuations observed in the general gross beta activity can be attributed to changes in the environment, especially seasonal changes. The concentration of naturally occurring radionuclides in the lower levels of the atmosphere directly above land areas are affected by time related processes such as wind direction, precipitation, snow cover, soil temperature, and soil moisture content.

With the exception of the 1986 sample data, which was effected by the Chernobyl accident, the general trend in air particulate gross beta activity has been one of decreasing activity since 1978 as indicated by the graph below.



The trend for the previous five years is a sub set of the overall decline in gross beta concentrations, again with the exception of 1986 which was effected by the Chernobyl accident. The 1989 results are the lowest mean concentrations measured when compared to the previous five years for both the indicator and control locations. The 1989 air particulate filter gross beta results are a factor of 20 less than the concentrations measured in 1969 which is

considered to be preoperational results for the site. The mean annual gross beta concentration at the control station has decreased from a maximum concentration of 0.165 pCi/m^3 in 1981 to 0.017 pCi/m^3 in 1989. The mean annual concentration for the indicator stations ranged from a maximum of 0.151 pCi/m^3 in 1981 to a minimum of 0.017 pCi/m^3 in 1989. For both the indicator stations and control stations, the gross beta concentration during 1974 to 1982 fluctuated as a result of fallout from the detonation of thermonuclear weapons. The mean annual results for the years 1983, 1984, 1985, 1987 and 1988 from both the indicator and control locations have been similar and ranged from 0.017 to 0.026 pCi/m^3. This level of activity appears to be baseline range. The 1986 annual mean result was 0.039 pCi/m^3 for both the indicator and control stations. This concentration is slightly higher than 1983-85 and 1987-1989 levels, and is attributed to fallout from the Chernobyl accident.

Historical data and graphic representations of air particulate gross beta activity are presented in Sections VI and VII respectively.

2. MONTHLY PARTICULATE COMPOSITES (GAMMA EMITTERS) - TBL. IV-9

Weekly air particulate samples were grouped by location to form monthly composite samples. The monthly composite samples required by the Radiological Environmental Technical Specifications (RETS) include R-1, R-2, R-3, R-4, and R-5. Other sample locations not required by the Technical Specifications for which analytical results are presented include D-1 on-site, G on-site, H on-site, I on-site, J on-site, K on-site, D-2 off-site, E off-site, F off-site, and G off-site locations. The results of all monthly composite samples are included on Table 9.

The results for the monthly composite samples showed positive detections for Be-7, K-40, Ra-226 and AcTh-228. Each of these radionuclides are naturally occurring. Be-7 was detected in each of the monthly composite samples from all locations required by Technical Specifications. Be-7 concentrations ranged from 0.051 to 0.103 pCi/m^3 for the indicator locations (R-1, R-2, R-3, and R-4). The control location results (R-5) showed Be-7 concentrations ranging from 0.057 to 0.101 pCi/m^3. K-40 was found intermittently in the Technical Specification required monthly composite samples.

Historically, the naturally occurring radionuclides Ra-226, K-40, and Be-7 have shown fluctuations that are representative of naturally changing conditions. No significant trends were noted during 1989.

No plant related radionuclides were detected in any of the required or optional off-site air sampling locations. Two plant related activation product radionuclides were detected at three optional on-site air sampling stations in 1989. Zinc-65 (Zn-65) was detected in October at the H on-site and I on-site sampling locations and in November at the H on-

site, I on-site and J on-site sampling locations. Cobalt-60 (Co-60) was also detected in the H on-site November composite. The detected concentrations are summarized below:

COMPOSITE SAMPLE PERIOD	NUCLIDE	AIR SAMPLING LOCATION CONCENTRATION IN 10^{-3}pCi/m^3		
		H ON-SITE	I ON-SITE	J ON-SITE
October	Zn-65	4.7±1.3	2.5±1.1	<2.6
	Co-60	<1.1	<1.7	<1.1
November	Zn-65	27.3±2.4	5.4±1.2	2.9±0.9
	Co-60	1.2±0.6	<0.9	<0.9

The presence of Zn-65 or Co-60 was not detected in any of the other air monitoring stations, including the control station during this same sample period.

An evaluation of the presence of Zn-65 and Co-60 in the monthly air composite samples was made. The weekly samples which make up the monthly composites were analyzed separately. It was determined that the detected activity was present in the October composite on a sample which represents the sample period designated as week No. 41 (10/09/89 - 10/16/89). The detected activity in the November composite was on two filters which represent the sample periods designated as week No. 46 (11/13/89-11/20/89) and week No. 47 (11/20/89 - 11/27/89). Meteorological data was reviewed for these sample periods and it was determined that wind patterns during this time were such that the H, I and J on-site sampling locations could be affected by plant effluents.

Plant effluent records were also reviewed for the sample periods. The evaluation of effluent isotopic measurement showed that Zn-65 and Co-60 were present in plant effluents.

Based on the evaluation of meteorological data and plant effluents, the presence of Zn-65 and Co-60 in the October and November air particulate filter composite samples was the result of operations at the FitzPatrick Plant.

Due to the fact that Zn-65 and Co-60 were not detected at sample locations outside the site boundary, the dose to man is not significant. For the purpose of evaluation, the dose to man can be calculated based on the measured concentrations of Zn-65 and Co-60 at the on-site locations using the methodology found in Regulatory Guide 1.109. This calculated dose is conservative and is not representative of the dose to man beyond the site boundary but can be used to illustrate the significance of the resulting dose relative to background radiation. Using the inhalation rate for the maximum exposed individuals in each age group found in Regulatory Guide 1.109 and the maximum concentrations measured at the H on-site and I on-site air sampling stations, the following dose to man was calculated:

AGE GROUP	DOSE (mrem)	
	WHOLE BODY	LUNG
ADULT	0.00013	0.0029
TEEN	0.00016	0.0042
CHILD	0.00019	0.0034

The conservative whole body and critical organ (lung) doses calculated as a result of the Zn-65 and Co-60 air concentration measured on-site are very low when compared to background. Dose to man in the general area of the site is approximately 60 mrem/year. Because no airborne concentrations of Zn-65 or Co-60 were detected off-site, the actual dose to man from these effluents is probably zero but in any case much less than that calculated.

A review of historical data shows that Zn-65 has not been detected in air samples collected and analyzed during the previous years. Historical data on Co-60 shows that positive detections of this radionuclide were made in eight of the last thirteen years (1977-1989). Co-60 was detected in each of the years from 1977 through 1984 at both the indicator and control locations, with the exception of 1980 when Co-60 was not detected at the control location. The Co-60 concentration in air particulate samples has fluctuated as a result of previous weapons testing. Co-60 average concentrations at the indicator and control locations from 1977 to 1978 decreased from approximately 0.0176 to 0.0022 pCi/m^3. Average concentrations decreased significantly during 1979 and 1980 when compared to 1977. These results where 0.007 to 0.0016 pCi/m^3 respectively. In 1981 and 1982 the average Co-60 concentrations decreased to 0.0007 and 0.0006 pCi/m^3. Average indicator and control concentrations were approximately equal during 1979 to 1982. The 1983 indicator mean Co-60 concentration was 0.0007 pCi/m^3 or slightly greater than the 1982 concentration. The 1983 control mean Co-60 concentration was also 0.0007 pCi/m^3 which was slightly greater than 1982 control results. As noted in previous annual reports, however, a portion of the Co-60 detected during 1983 was attributed to contamination during handling of the unused filters prior to installation. Co-60 was detected during the first quarter of 1984 and averaged 0.0008 pCi/m^3 at the control stations and 0.0012 pCi/m^3 at the indicator stations. However, the 1984 Co-60 positive results were a result of contamination during handling and not a result of operations at the site. The general reduction in previous indicator and control Co-60 concentrations (1981 - 1983) was a result of nuclear decay and ecological cycling of Co-60 initially produced by the 1980 Chinese weapons test. Co-60 was not detected during 1985 - 1986 in air particulate samples from either indicator or control locations. During 1987, Co-60 was detected once

at a concentration of 0.0017 pCi/m^3 at an optional air monitoring station. However, the Co-60 detected during 1987 was a result of contamination from improper handling of the sample, and not as a result of effluents from the site. This evaluation is contained in the 1987 annual report. Results from 1988 showed that Co-60 was not detected at either control or indicator sample locations.

A further review of historical data shows that Cs-137 is the fission product radionuclide most frequently detected in the air particulate filter composites. Cs-137 was not however detected during the 1989 sampling program. Historically, Cs-137 has been variable during the past and has been present a number of times in air particulate samples since 1977. During 1977, both on-site (indicator) and off-site (control), Cs-137 average concentrations were approximately equal and averaged 0.039 pCi/m^3. Cs-137 average concentrations at the indicator and control locations decreased during 1978 and 1979 to 0.0017 and 0.0013 pCi/m^3 respectively. Average concentrations during 1980 and 1981 were approximately equal at control and indicator locations. Cs-137 during 1980 was approximately equal to 1979 and increased slightly in 1981 from 1979 levels. The 1980 and 1981 average concentrations were 0.0013 and 0.0015 pCi/m^3 respectively. The mean 1982 concentration for Cs-137 decreased to 0.0004 pCi/m^3. The 1983 mean Cs-137 concentration for the indicator and control composite samples were 0.0002 and 0.0002 pCi/m^3 which was a reduction from 1982 results. Cs-137 was not detected during 1984 in any of the indicator or control air particulate composite samples. The reduction in Cs-137 results is attributed to nuclear decay and ecological cycling of Cs-137 initially produced by the 1980 Chinese weapons test. Cs-137 was not detected during 1985 in air particular samples, but was detected in 1986 due to the fallout from the Chernobyl accident. Cs-137 was not detected during the 1987, 1988 or

1989 air monitoring program.

Prior to 1983 and 1984, several radionuclides were detected that were associated with the 1980 Chinese weapons test and other weapons tests prior to 1980. These radionuclides were not detected during 1984 and 1985 as a result of nuclear decay and natural environmental processes. These include Zr-95, Ce-141, Nb-95, Ce-144, Mn-54, Ru-103, Ru-106 and Ba-140. In addition, La-140 was detected once during 1983 and infrequently during 1978 and 1981. La-140 was not detected during 1984 and 1985. However, La-140, Nb-95, Ru-103, Ru-106, and I-131 were detected in air particulate composite samples during 1986 as a result of the fallout from the chernobyl accident. The above referenced radionuclides were not detected in the 1987, 1988 or 1989 air monitoring program.

Historical data for air particulate results are presented in Section VI. Graphic representation of air particulate composite Co-60 and Cs-137 concentrations are presented in Section VII.

3. AIRBORNE RADIOIODINE (I-131) - TABLES IV-7 AND IV-8

Airborne radioiodine is monitored at the air sampling stations that are also used to collect air particulate samples (see Section V.3). The air monitoring network is made up of fifteen sample locations. There are nine stations considered off-site locations. Of these nine, five are required by Technical Specifications and are designated as R-1, R-2, R-3, and R-4. These stations are located near the site boundary and are indicator stations. A fifth Technical Specification location designated as R-5 is located beyond any significant influence from the plant and is considered a control location. As noted under the air particulate gross beta section, ten additional air sampling locations are maintained in addition to those required by Technical Specification. Six of these stations are located within the site boundary and are designated as D1 on-site, G on-site, H on-site, I on-site, J on-site, and K on-site. The four remaining optional stations are located off-site and are designated as D2 off-site, E off-site, F off-site, and G off-site. The analytical data for each of these sample locations is included in this report.

During the 1989 sampling program, airborne radioiodine was not detected in any of the fifty-two weekly samples collected at the control location required by Technical Specifications. The LLD values for the control location ranged from <0.006 to <0.030 pCi/m^3. Iodine 131 (I-131) has been detected in the past at control locations. During 1976, the mean off-site I-131 concentration averaged 0.604 pCi/m^3. 1977 showed an I-131 concentration that decreased to 0.323 pCi/m^3 and for 1978 the concentration decreased by a factor of ten to 0.032 pCi/m^3. During 1979 - 1981 and 1983 - 1985, I-131 was not detected. I-131 was detected once during 1982 at a concentration of 0.039 pCi/m^3.

In 1989 Radioiodine-131 was not detected in any of the 208 indicator samples required by Technical Specifications. I-131 was also not detected in any of the 520 optional samples taken during 1989. The LLD values for the four indicator sample locations required by Technical Specifications ranged from 0.005 to 0.039 pCi/m^3.

A review of historical data shows that I-131 has been detected in the past at indicator or off-site stations. During 1976, the mean off-site I-131 concentration averaged 0.604 pCi/m^3. 1977 showed an I-131 concentration that decreased to 0.323 pCi/m^3 and for 1978, the concentration decreased by a factor to ten to 0.032 pCi/m^3. During 1979, 1980, 1981, 1983, 1984, and 1985, I-131 was not detected. I-131 was detected once during 1982 at a concentration of 0.039 pCi/m^3.

I-131 has been detected in the past at the on-site stations and was detected at a mean concentration of 0.328 and 0.309 pCi/m^3 during 1976 and 1977. The average concentration decrease to 0.041 pCi/m^3 during 1978 and was not detected during 1979. The 1980-82 average concentrations were 0.013, 0.029, and 0.016 pCi/m^3 which were reductions in view of previous I-131 concentrations. During 1983, the mean I-131 concentration was 0.028 pCi/m^3 which represented a slight increase compared to 1982. The concentrations detected during 1983 at the on-site sample stations were a result of operations at the site. I-131 was not detected in any of the 1984 or 1985 on-site samples. I-131 was detected in a total of 75 weekly samples collected during the 1986 sample program. The concentrations detected in 1986 ranged from a minimum of 0.011 pCi/m^3 to a maximum of 0.36 pCi/m^3. Each of the positive detections of I-131 in 1986 were a direct result of the Chernobyl Nuclear accident.

The end result of the 1989 I-131 sampling effort showed no significant impact due to the operation of the plant. During 1989, I-131 was not detected in any other environmental sample media including milk and green leafy vegetables.

4. DIRECT RADIATION (TLD, ENVIRONMENTAL DOSIMETRY) TABLE IV-10

Thermoluminescent dosimeters (TLDs) were collected and read once per quarter during the 1989 sample year. The TLD results are, for the most part, an average of eight independent readings at each location and are reported in mrem per standard month.

TLDs required by the Technical Specifications include two TLDs at each location with four independent readings per TLD. TLD results included in Table IV-10 are comprised of TLDs required by the Technical Specifications and special interest TLDs not required by the Technical Specifications. During 1989, TLDs were collected on approximately March 30, 1989, June 29, 1989, September 29, 1989 and December 29, 1989.

Overall TLD results are evaluated by organizing environmental TLDs into five different groups. These groups include: (1) on-site TLDs (TLDs within the site boundary not required by the Technical Specifications), (2) site boundary TLDs (one in each of the sixteen 22 1/2 degree meteorological sectors), (3) a ring of TLDs four to five miles from the site in each of the land based 22 1/2 degree meteorological sectors, (4) special interest TLDs in areas of high population density, and (5) control TLDs in areas beyond any significant influence of the generating facilities. Special interest TLDs are located at or near large industrial sites, schools, or proximal towns or communities. Control TLDs are located to the southwest, south, south-southeast, and northeast of the site at distances of 12.6 to 26.4 miles from the site.

Most of the TLDs required by the Technical Specifications during 1989 were initiated in 1985 as a result of the issue of new Technical Specifications by the NRC. Therefore, these TLDs can only be compared to 1985 - 1989 results.

Other TLDs which include several TLDs required by the Technical Specifications (i.e., numbers 7, 14, 15, 18, 23, 49, 56 and 58) and other optional TLDs, can be compared to results prior to 1985 since these TLDs were established prior to 1985.

On-site TLDs are TLDs at special interest areas and, with the exception of TLD numbers 7 and 23, are not required by the Technical Specifications. These are located near the generating facilities and at previous or existing on-site air sampling stations. TLDs located at the air sampling stations include number 3, 4, 5, 6, 7, 23, 24, 25 and 26. The results for these TLDs are generally consistent with previous years results although a slight increase was noted when compared to 1988. These results ranged from 2.7 to 14.5 mrem per standard month. TLD #3 is located in the vicinity of Nine Mile Point Unit 2 and is between the Unit 1 facility the FitzPatrick facility. The results for TLD #3 were approximately double the results of the other TLDs during 1989 because of the effects from the Unit 2 and the FitzPatrick facility. Other on-site TLDs include special interest TLDs located near the north shoreline of the Unit 1, Unit 2 and FitzPatrick facilities, but in close proximity to radwaste facilities and the Unit 1 reactor building. These TLDs include number 27, 28, 29, 30, 31, 39 and 47. Results for these TLDs during 1989 were variable and ranged from 6.0 to 42.1 mrem per standard month as a result of activities at the radwaste facilities and the operating modes of the generating facilities. Results for 1989 are consistent the ranges of variability noted in 1988 for TLDs at or near these locations. TLDs in this group ranged up to approximately seven times control TLD results. The on-site TLDs are located in controlled areas that are not accessible to the general public. These measured doses are not representative of dose measure off-site beyond the site boundary.

Additional on-site TLDs are located near the on-site Energy Information Center (EIC) and the associated northeast shoreline. These TLDs include numbers 18, 103, 106 and 107. TLDs numbered 103, 106 and 107 are located to the east of the Energy Center and to the west of the Unit 1 facility. TLD number 18 is located on the west side of the EIC. Results during 1989 showed these TLDs ranged from 3.8 - 6.8 mrem per standard month and were slightly less than the 1988 results. Slight increases were noted in the second and third quarter results as was noted for all TLDs, including control TLDs.

Site boundary TLDs are required by the Technical Specifications and are located in the approximate area of the site boundary with one in each of the sixteen 22 1/2 degree meteorological sectors. These TLDs include numbers 75, 76, 77, 23, 78, 79, 80, 81, 82, 83, 84, 7, 18, 85, 86 and 87. TLD numbers 78, 79, 80, 81, 82, 83, 84, 7 and 18 showed results that were consistent with control TLD results and ranged from 2.8 to 6.3 mrem per standard month. Site boundary TLDs during 1989 were consistent with 1985-1988 results. TLD numbers 75, 76, 77, 23, 85, 86 and 87 showed results that ranged up to three times the results of control TLDs. These results ranged from 4.2 to 15.4 mrem per standard month. This latter group of TLDs are located near the lake shoreline (approximately 100 feet from the shoreline), but are also located in close proximity of the reactor building and radwaste facilities of Nine Mile Point Unit 1 and Unit 2 reactors and the radwaste facilities of the FitzPatrick facility.

A net site boundary dose can be estimated from available TLD results and control TLD results. TLD results from TLDs located near the site boundary in sectors facing the land occupied by members of the public (excluding TLDs near the generating facilities and facing Lake Ontario) are compared

to control TLD results. The site boundary TLDs include numbers 78, 79, 80, 81, 82, 83, 84, 7 and 18. Control TLDs include numbers 8, 14, 49, 110 and 111. Net site boundary doses for each quarter in mrem per standard month are as follow:

Quarter	Net Site Boundary Dose*
1	+0.4
2	+0.1
3	+0.3
4	-0.6

* Dose in mrem per standard month

Site boundary TLD numbers 75, 76, 77, 23, 85, 86 and 87 were excluded from the net site boundary dose calculation since these TLDs are not representative of doses at areas where a member of the public may be located. These areas are near the north shoreline which are in close proximity to the generating facilities and are not accessible to members of the public.

The third group of environmental TLDs are those TLDs located four to five miles from the site in each of the land based 22.5 degree meteorological sectors. These TLDs are required by the Technical Specifications. At this distance, TLDs are not present in eight of the sixteen meteorological sectors that are located over Lake Ontario.

Results for this group of TLDs during 1989 fluctuated slightly as a result of changing naturally occurring conditions and the different concentrations of naturally occurring radionuclides in the ground at each of the locations. These TLDs were established in 1985 and include numbers 88, 89, 90, 91, 92, 93, 94 and 95. Results fluctuated from 2.5 to 6.8 mrem per standard month. These results are generally consistent with control TLD results during 1989. Results for this group of TLDs were consistent with the 1985 - 1988 results. Results were also consistent

with other off-site TLD results during 1989 and previous to 1989. Again, second and third quarter TLD results were slightly elevated along with all other groups of TLDs including control groups.

The fourth group of environmental TLDs are those TLDs located near the site boundary and at special interest areas such as industrial sites, schools, nearby communities, towns, off-site air sampling stations, the closest residence to the site, and the off-site environmental laboratory. Many of these TLDs are required by the Technical Specifications. Others are optional. This group of TLDs include numbers 9, 10, 11, 12, 13, 15, 19, 51, 52, 53, 54, 55, 56, 58, 96, 97, 98, 99, 100, 101, 102, 108 and 109. TLD numbers 108 and 109 are new TLD locations that were established during 1988 and were added to assist in the evaluation of the critical residence. Results ranged from 2.1 to 7.0 mrem per standard month. All the TLD results from this group were within the general variation noted for the control TLDs. Results during 1989 for TLDs established during previous years were consistent with results noted for those years. Overall, second and third quarter TLD results for this group were slightly elevated as were other TLD groups, including the control group.

The fifth group of TLDs include those TLDs considered as control TLDs. These TLDs are required by the Technical Specifications and include number 14 and 49. Optional control locations are TLD numbers 8, 110 and 111. TLD numbers 110 and 111 were added to the program during 1988 to expand the data base for control TLDs. Results for 1989 ranged from 2.9 to 6.4 mrem per standard month. Results from 1989 were consistent with previous years results. However, an annual average increase was noted in 1986. This increase may have been a result of the Chernobyl accident and was not noted during 1987 - 1989. Control TLDs results

in 1989 (second and third quarter) were slightly elevated as were other TLD groups.

Review of past TLD results required by the Technical Specifications show that these TLDs can be separated into four groups. These groups include site boundary TLDs in each meteorological sector (16 TLDs total), TLDs located off-site in each land based sector at a distance of 4 to 5 miles (8 TLDs total), TLDs located at special interest areas (6 TLDs total) and TLDs located at control locations (2 TLDs total). As noted previously, since the present Technical Specifications became effective in 1985, these TLDs, for the most part, can only be evaluated for 1985-1988.

TLDs located at the site boundary averaged 6.2 mrem per standard month during 1985. During 1986, 1987 and 1988 site boundary TLDs averaged 7.0, 6.1, and 6.4 mrem per standard month respectively. As noted previously, this group of TLDs can fluctuate because several of these TLDs are located in close proximity to the generating facilities. An increase was noted during 1986 although such an increase was noted for all TLDs including control TLDs. During 1989, site boundary TLDs averaged 5.9 mrem per standard month.

TLDs located off-site at a distance of 4 to 5 miles from the site in each of the land based meteorological sectors averaged 5.0 mrem during 1985. During 1986, 1987 and 1988 off-site sector TLDs averaged 6.0, 5.2 and 5.3 mrem per standard month respectively. The 1986 results demonstrated an increase for this group of TLDs. Results for 1989 for the group averaged 4.9 mrem per standard month. This is fairly consistent with previous years results. Again, 1989 second and third quarter TLDs showed slight increases.

Special interest TLDs are located at areas representative of high population density, such as major work sites, communities, schools, etc. and at residences near the site (critical receptor areas). This group of TLDs averaged 5.3 mrem per standard month during 1985. During 1986, this same group of TLDs averaged 6.1 mrem. The 1987 results showed a decease when compared to the 1985 and 1986 results and averaged 5.1 mrem per standard month. 1988 results averaged 5.3 mrem per standard month. 1989 results for this location averaged 4.8 mrem per standard month.

The final group of TLDs required by the Technical Specifications is the control group. This group utilized two TLD locations positioned well beyond the site. Results from 1985 for the control group averaged 5.4 mrem per standard month. During 1986, this same group of TLDs averaged 6.3 mrem per standard month. A marked increase was noted in the second quarter of 1986. The increase may have been a result of the Chernobyl accident. Results for 1987 and 1988 averages 5.2 and 5.4 mrem per standard month respectively. Results for 1989 averaged 4.6 mrem per standard month and showed levels slightly less than previous years. Slight increases were noted in second and third quarter results.

During 1989, all environmental TLD groups required by Technical Specifications were consistent with results observed during 1988. However, all TLD groups (including control) showed decreased levels for the fourth quarter of 1989. In general, second and third quarter results were higher than first and fourth quarter results. This may be explained by the fact that the second and third quarter are primarily dry, with little ground cover from rain or snow precipitation. This, in particular, may explain why the fourth quarter 1989 results were in fact, less than any fourth quarter results observed since 1985. The fourth

quarter 1989, experienced record snowfall in the month of December and subsequent decreased results for that period.

Tables VI-15 and VI-16 show the historical environmental sample data for environmental TLDs. A graph of historical TLD data is presented in Section VII.

Overall, environmental TLD results for 1989 showed no significant impact from direct radiation measured outside the site boundary.

5. MILK - TABLE IV-11 AND IV-12

Milk samples were collected from a total of six indicator locations (within 10 miles of the site), and one control location (beyond 10 miles from the site) during 1989. The RETS require that three locations be sampled for milk within 5.0 miles of the site. During 1989, there were no milk sample locations within 5.0 miles of the site. The locations that were sampled during 1989 are located from 5.5 to 9.5 miles from the site. Control milk samples were collected from location #65 which is located 17 miles from the site. Sample location descriptions for all milk sample locations utilized during 1989 are listed below. These locations are consistent with those sampled in 1988.

Location No.	Direction from Site	Distance from Site (miles)
7	ESE	5.5
16	S	5.9
50	E	8.2
55	E	9.0
60	E	9.5
4	ESE	7.8
65 (Control)	SW	17.0

During 1989, milk samples were collected at each of the six indicator locations and the control location in the first half and the second half of each month. Samples were collected during the months of April through December. Since I-131 was not detected during November and December of 1988, no additional samples were required for January through March of 1989. For each sample, analyses were performed for gamma emitters (analysis by GeLi, Ge detectors) and I-131 using a resin extraction/gamma spectral analysis. Sample analysis results for gamma emitters are found on Table IV-12. I-131 analytical results are found on Table IV-11.

The gamma spectral analysis of the bimonthly samples showed K-40 to be the most abundant radionuclide detected in the milk

samples collected during 1989. K-40 was detected in every sample analyzed and ranged in concentration from 1360 pCi/liter to 1970 pCi/liter at the indicator locations and 1300 pCi/liter to 1790 pCi/liter at the control location. K-40 is a naturally occurring radionuclide and is found in many of the environmental media sampled. Relatively high levels of K-40 are found in cows milk due to the biological concentration of potassium in the milk production process.

The dose to man which results from the concentrations of K-40 in milk and other environmental media can be calculated. This calculated dose illustrates the significance of the dose received from naturally occurring radionuclides when compared to the dose received due to exposure from plant related radionuclides. K-40 has been measured in many environmental samples at significant levels. A 70 kilogram (154 pound) adult 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 internally deposited K-40 (Eisenbud). By comparison, the adult bone dose calculated for the maximally exposed individual using 1989 plant effluent data for 1989 was 0.023 mrem. This dose was calculated using the methodology specified in the plants Off-site Dose Calculation Manual (ODCM). The calculated dose as a result of plant effluents is insignificant compared to the dose from potassium-40.

A review of historical data shows that Cs-137 is the only man made radionuclide detected in milk samples collected as part of the environmental surveillance program. Cs-137 was detected in milk sample during 1983 at a concentration of 5.1 pCi/liter. Results from 1986 showed a mean Cs-137 concentration of 8.6 pCi/liter at the indicator location. Cs-137 in 1986 milk samples was a result of the 1986 Chernobyl Nuclear Plant accident. During 1987, Cs-137 was found in two

indicator samples at a mean concentration of 6.8 pCi/liter and was also determined to be the result of the Chernobyl accident.

In addition to gamma spectral analysis, each of the milk samples collected in 1989 were analyzed for I-131. Iodine-131 was not detected during 1989 in any of the control or indicator samples. All I-131 milk results are reported as lower limits of detection (LLD). The LLD results ranged from <0.11 to <0.50 pCi/l for all milk samples.

A review of historical data shows that the detection of I-131 in milk samples has not been routine. In past sampling programs, I-131 has been detected in milk samples only in conjunction with fresh fallout from atmospheric testing or from the 1986 Chernobyl accident. Numerical evaluation shows that annual mean results ranged from 0.2 pCi/liter to 6.9 pCi/liter at the indicator locations during 1976-1978. I-131 during these years was a result of intermittent weapons testing. During 1979 - 1985, I-131 in milk samples at the indicator locations was not detected, with the exception of 1980. The mean result during 1980 was 0.4 pCi/liter and was a result of the 1980 Chinese atmospheric weapons test. Results from 1986 showed that I-131 was detected at a mean concentration of 5.2 pCi/liter as a result of the Chernobyl accident. I-131 was not detected in milk samples during 1987, 1988 and 1989.

Historical data for I-131 from the control locations showed that I-131 was detected during 1980 at a mean concentration of 1.4 pCi/liter. There was no detectable I-131 during the period of 1978-1985 with the exception of 1980. During 1986, I-131 from the control location showed a mean concentration of 13.6 pCi/liter as a result of the Chernobyl accident. I-131 was not detected during 1988 at the control location.

Historical data and graphic representations of milk sample results for Cs-137 and I-131 are presented in Section VI-and VII.

6. LAND USE CENSUS - TABLES IV-15 AND IV-16

A land use census is conducted to determine the utilization of land in the vicinity of the site. The land use census actually consists of two types of census. A milk animal census is conducted to identify all milk animals within a distance of 10 miles from the site. A census covering areas out to a distance of 10 mile exceeds the distance required by the Technical Specifications.

A second type of census is a residence census. The census is conducted in order to identify the closest residence in each of the 22.5 degree meteorological sectors. For the residence census, several of the meteorological sectors are over Lake Ontario because the site is located at the shoreline. Therefore, there are only eight sectors over land where residences are located within 3 miles.

In accordance with the Technical Specifications, a land use census was conducted during 1989 to identify within a distance of five miles the location of all milk animals (cows and goats) and the location of the nearest residence in each of the sixteen 22.5 degree meteorological sectors. The milk animal census was actually conducted out to a distance of ten miles in order to provide a more comprehensive census.

The milk animal census is an estimation of the number of cows and goats within an approximate ten mile radius of the Nine Mile Point Site. The annual census is conducted each spring by sending questionnaires to previous milk animal owners and also by road surveys to locate any possible new owners. In the event that questionnaires are not answered, the owners are contacted by telephone or in person. The local agricultural agency was also contacted as a further source of information concerning the milch animal population in the vacinity of the site.

The number of milk animals located within the ten mile radius of the site was estimated to be 1165 cows and 27 goats for the 1989 census. The number of cows decreased by 28 and the number of goats increased by 12 with respect to the 1988 census. One new milk location and one reactivated milk location were identified during the 1989 census. However, no changes were made to 1989 sampling program because the new locations were not qualified locations (Technical Specification), nor located such as to provide a higher D/Q value then the existing sampling locations. Therefore, there were no changes made to the milk sampling program. Most of the goats found on the census were milking goats. However, any milk produced was consumed by the owners and was not available for the sampling program. The results of the milk animal census are found on Table IV-15. Milk animal locations are shown on Figure 4.

A residence census was conducted during 1988 to identify the nearest residence in each of the sixteen 22.5 degree meteorological sectors within a distance of five miles form the site. At this distance, some of the meteorological sectors are over water. These sectors include: N, NNE, NE, ENE, W, WNW, NW and NNW. There are no residences in these sectors. The results of the 1989 residence census showing the applicable sectors and degrees and distance of each of the nearest residence are found on Table IV-16. The nearest residence are shown in Figure 3.

7. FOOD PRODUCTS - TABLE IV-14

Food product samples collected during 1989 were comprised of garden vegetables and other types of broad leaf vegetation.

Samples were collected during the late summer/fall harvest season. The collection of annual food product samples became a requirement as a result of Technical Specification Amendment 127. Food product samples were collected, analyzed and reported as optional samples in past reports (1985-1988).

Samples were collected from six indicator locations and one control location. The indicator locations were represented by nearby gardens in areas of highest D/Q (deposition factor) values based on historical meteorology. The control location was represented by a garden location 9-20 miles distant in a least prevalent wind direction. Garden vegetables were comprised of cabbage, beet greens, swiss chard and collard greens which are all considered broadleaf vegetables. Where broadleaf vegetable were not available, non-edible broadleaf vegetation was collected. Non-edible broadleaf vegetation collected in 1989 consisted of strawberry leaves, green bean leaves, egg plant leaves, cucumber leaves, pepper leaves, and squash leaves. One sample of each similar type of vegetable or vegetation was collected at the control location.

K-40 was detected in each broadleaf vegetable and broadleaf vegetation. Broadleaf vegetables and vegetation showed concentrations of K-40 ranging from 2.97 pCi/g to 7.42 pCi/g (wet). Be-7 was detected in all but two broadleaf vegetables/vegetation samples. The Be-7 concentrations in the samples ranged from 0.08 pCi/g (wet) to 1.56 pCi/g (wet).

Cs-137 was detected in one sample of non-edible broadleaf vegetation from the indicator locations. The detected

quantity was near the limit of detection and was 0.011 pCi/g (wet). LLD values for all other samples ranged from 0.011 to 0.018 pCi/g (wet). The detected quantity of Cs-137 was found at location "K". It is probable that the quantity of Cs-137 found is a result of root uptake by the squash plant and not leaf deposition. Cs-137 was also detected in one squash leaf sample collected in 1988. The source of the cesium is most likely from the soil. The ultimate source of Cs-137 is from weapons testing, the Chernobyl accident, operations at the site, or possibly all three. Cs-137 has been detected in soil samples from areas near the site and at areas well beyond the site as a result of past weapons testing. Cs-137 was not detected at the control location.

No other radionuclides were detected in the 1989 collection of food product vegetation.

The impact of detectable Cs-137 in food product samples can be evaluated by calculating a dose to the maximum exposed individual as a result of food consumption. Using standard methodology from NRC Regulatory Guide 1.109, the maximum exposed organ is the bone of a child. The maximum whole body dose would be to an adult. The Cs-137 concentration is 0.011 pCi/g (wet). The consumption rate is assumed to be a maximum consumption rate of 26 kg per year for a child. This comsumption rate is conservative due to the fact that squash leaves are normally consumed by humans. The calculated doses are 0.094 mrem per year to a child's bone tissue (maximum organ dose) and 0.013 mrem per year to the child's whole body. The maximum whole body dose occurs to the adult. Assuming a Regulatory Guide 1.109 maximum consumption rate of 64 kg per year for an adult, the maximum organ dose is 0.077 mrem to the liver and 0.053 mrem to the whole body. A maximum organ and whole body dose are small and insignificant when compared to dose from the natural radiation environment.

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 in leafy vegetables (1978 through 1982, 1984 and 1987).

Cs-137 has been detected intermittently during the years of 1976-1988 at the indicator locations and during the years of 1980-1986 at the control locations (control samples were not obtained prior to 1980). Review of indicator sample results from 1976-1988 showed that Cs-137 was not detected during 1976-1978, 1981-1984 and 1986. During 1979 and 1980, Cs-137 in fruits and/or vegetables showed annual mean concentrations of 0.004 and 0.036 pCi/g (wet) respectively. Cs-137 was found at one indicator location during 1985 at a concentration of 0.047 pci/g (wet). Control samples during 1980-1986 showed Cs-137 detected only during 1980 at a concentration of 0.02 pCi/g (wet).

Cs-137 detected during the past at both indicator and control locations is indicative of weapons testing.

During 1987, Cs-137 was found at the indicator locations at a mean concentration of 0.016 pCi/g (wet). Cs-137 was not detected at the control location during 1987.

8. ENVIRONMENTAL SAMPLE LOCATIONS - TABLE IV-16

Table 16 contains the locations of the environmental samples presented in the data tables of Section IV. The locations are given in degrees and distance in miles from the Nine Mile Point Nuclear Station Unit# 2 reactor centerline (middle site reactor). Table IV-16 also gives the figure (map) number as well as the map destination for each sample location by sample medium type.

9. INTERLABORATORY COMPARISON PROGRAM - SECTION VII

Section 6.3.a of the Radiological Effluent Technical Specifications for the James A. FitzPatrick Nuclear Power Plant requires that a summary of the results obtained as part of an interlaboratory comparison program be included in the Annual Radiological Environmental Operating Report. Presently, the only NRC approved interlaboratory comparison program is the USEPA Cross Check Program. Section VIII shows the results of the EPA's reference results and the licensee's results in tabular form. Some of the EPA reference samples have been analyzed by the site. Other EPA reference samples have been analyzed by a vendor who normally analyzes those types of sample media for the site. Participation in the EPA Cross Check Program includes sample media for which environmental samples are routinely collected, and for which intercomparison samples are available from the EPA.

C. CONCLUSION

The Radiological Environmental Monitoring Program is an ongoing effort to determine the radiological impact from the operation of the James A. FitzPatrick Nuclear Power Plant on the local environment. As demonstrated by the analytical results of the 1989 program, the major radiological impact on the environment was the result of fallout from atmospheric nuclear testing and the 1986 Chernobyl accident which created a ubiquitous inventory of background Cs-137 in the environment.

Samples representing food sources consumed at higher trophic levels, such as fish and milk, were reviewed closely to evaluate any impact to the general environment or to man. In addition, the data was reviewed for any possible historical trends. In regard to doses as a result of man-made radionuclides, a significant portion of the small doses received by a member of the public was from past nuclear weapons testing and fallout from the Chernobyl accident. It should be noted that most of the radionuclide detected in 1986, as a result of the Chernobyl accident, were not present in the sample media collected for the 1987, 1988 and 1989 programs. Doses as a result of naturally occurring radionuclides, such as K-40, contributed a major portion of the total annual dose to members of the public.

Any possible impact as a result of site operations is extremely minimal when compared to the radiological impact from natural background levels and sources other than plant operation. It has been demonstrated that almost all environmental samples contain traces of radionuclides which are a result of weapons testing, Chernobyl, or naturally occurring sources (primordial and/or cosmic related). Whole body doses to man as a result of natural sources (naturally occurring radionuclides in the soil and lower atmosphere) in

Oswego County account for approximately 67 mrem per year as demonstrated by control environmental TLDs. Possible doses due to site operations are a minute fraction of the annual exposure.

During 1989, the presence of several fission product nuclides was noted in four environmental sample media. These media included shoreline sediment, air, fish and food products in the form of broadleaf vegetation. The source of the fission product radionuclides is for the most part past weapons testing. One sample medium, airborne particulates, showed activity in two monthly on-site composite samples (October, November) that were the result of operations at the FitzPatrick plant. The impact, expressed in terms of the dose to man from the presence of Co-60 and Zn-65 and is insignificant when compared to natural background doses. The actual impact from presence of these radionuclide in the environment is not truly measurable because the positive results were obtained from on-site locations and no activity was detected at any of the off-site sampling locations.

Using the data presented in this report, and earlier reports as a basis, it is shown that no appreciable radiological environmental impact has resulted from the operation of the James A. FitzPatrick Nuclear Power Plant. The results of the 1989 Radiological Environmental program demonstrate that controls on radiological effluents both by the design and safe operation of the plant are effective in protecting the environment and the general public.

D. REFERENCES

1. 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 1", March, 1976.

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 1", October, 1977.

3. Eichholz, G., Environmental Aspects of Nuclear Power, First Edition, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1976.

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.

6. National Council on Radiation Protection and Measurements (NCRP), Cesium-137 from the Environment to Man: Metabolism and Dose, NCRP Report No. 52, 1977.

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

8. U.S. Nuclear Regulatory Commission Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", December 1975.

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

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

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

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

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

14. ICRP Publication Number 29, Radionuclide Releases into the Environment: Assessment of Dose to Man, 1979.

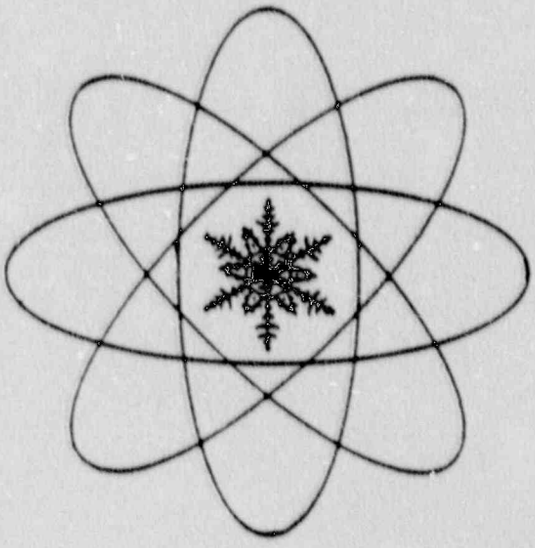
15. U.S. Department of Health and Human Services, Preparedness and Response in Radiation Accidents, National Center of Devices and Radiological Health, Rockville, MD 20857, August, 1983.

16. Kathren, Ronald E., RADIOACTIVITY IN THE ENVIRONMENT: SOURCES, DISTRIBUTION, AND SURVEILLANCE, First Edition, Harwood Academic Press, New York, NY, 1984.

17. National Council on Radiation Protection and Measurement (NCRP), Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 93, 1987

18. Glasstone, Samual and Jordan, Walter H., Nuclear Power and Its Environmental Effects, First Edition, American Nuclear Society, La Grange Park, Illinois, 1980.

VI



HISTORICAL DATA

New York Power Authority

VI HISTORICAL DATA

Sample Statistics from Previous Environmental Sampling

The mean, minimum value and maximum value 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, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986 and 1987 was taken from the respective environmental operating reports for Nine Mile Point Nuclear Station and James A. FitzPatrick Nuclear Power Plant.

3. Only measured values were used for statistical calculations.

4. The term MDL was used prior to 1979 to represent the concept of Lower Limit of Detection (LLD). MDL = Minimum Detectable Level.

TABLE VI-1

HISTORICAL ENVIRONMENTAL SAMPLE DATA
SHORELINE SEDIMENT
Results in pCi/g (dry)

LOCATION: CONTROL *

Isotope	Cs-134			Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
1969	**	**	**	**	**	**	**	**	**
1974	**	**	**	**	**	**	**	**	**
1975	**	**	**	**	**	**	**	**	**
1976	**	**	**	**	**	**	**	**	**
1977	**	**	**	**	**	**	**	**	**
1978	**	**	**	**	**	**	**	**	**
1979	**	**	**	**	**	**	**	**	**
1980	**	**	**	**	**	**	**	**	**
1981	**	**	**	**	**	**	**	**	**
1982	**	**	**	**	**	**	**	**	**
1983	**	**	**	**	**	**	**	**	**
1984	**	**	**	**	**	**	**	**	**
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Langs Beach - beyond influence of the site in a westerly direction.

** No data. Sample not required until new technical specifications implemented in 1985.

TABLE VI-2

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SHORELINE SEDIMENT

Results in pCi/g (dry)

LOCATION: INDICATOR *

Isotope	Cs-134			Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
1969	**	**	**	**	**	**	**	**	**
1974	**	**	**	**	**	**	**	**	**
1975	**	**	**	**	**	**	**	**	**
1976	**	**	**	**	**	**	**	**	**
1977	**	**	**	**	**	**	**	**	**
1978	**	**	**	**	**	**	**	**	**
1979	**	**	**	**	**	**	**	**	**
1980	**	**	**	**	**	**	**	**	**
1981	**	**	**	**	**	**	**	**	**
1982	**	**	**	**	**	**	**	**	**
1983	**	**	**	**	**	**	**	**	**
1984	**	**	**	**	**	**	**	**	**
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	0.25	0.32	0.28	<LLD	<LLD	<LLD

* Sunset Beach - closest off-site location with recreational value.

** No data. Sample not required until new technical specifications implemented in 1985.

TABLE VI-3

HISTORICAL ENVIRONMENTAL SAMPLE DATA

FISH

Results in pCi/g (wet)

LOCATION: CONTROL *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	No Data	No Data	No Data
1974†	0.09	0.94	0.43
1975	<MDL	<MDL	<MDL
1976	1.2	1.2	1.2
1977	0.13	0.13	0.13
1978	0.04	0.20	0.09
1979	0.03	0.06	0.04
1980	0.029	0.110	0.059
1981	0.028	0.062	0.043
1982	0.027	0.055	0.047
1983	0.040	0.060	0.050
1984	0.015	0.038	0.032
1985	0.026	0.047	0.034
1986	0.021	0.032	0.025
1987	0.017	0.040	0.031
1988	0.023	0.053	0.034
1989	0.028	0.043	0.034

* Control location was at an area beyond the influence of the site (westerly direction).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-4

HISTORICAL ENVIRONMENTAL SAMPLE DATA FISH Results in pCi/g (wet)			
LOCATION: INDICATOR * (NMP/JAF)			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	0.01	0.13	0.06
1974†	0.08	4.40	0.57
1975	1.10	1.70	1.38
1976	0.50	3.90	1.4
1977	0.13	0.79	0.29
1978	0.03	0.10	0.08
1979	0.02	0.55	0.10
1980	0.030	0.100	0.061
1981	0.027	0.10	0.061
1982	0.034	0.064	0.050
1983	0.030	0.060	0.050
1984	0.033	0.061	0.043
1985	0.018	0.045	0.030
1986	0.009	0.051	0.028
1987	0.024	0.063	0.033
1988	0.022	0.054	0.032
1989	0.020	0.044	0.034

* Indicator locations are in the general area of the NMP-1 and J. A. FitzPatrick cooling water discharge structures.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-5

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER

Results in pCi/liter

LOCATION: CONTROL †

Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969††	*	*	*	*	*	*
1974††	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	**	**	**	**	**	**
1978	<MDL	<MDL	<MDL	**	**	**
1979	2.5	2.5	2.5	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD	1.4	1.4	1.4
1982	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No gamma analysis performed (not required).

** Data showed instrument background results.

† Location was the City of Oswego Water Supply for 1969 - 1984 and the Oswego Steam Station inlet canal for 1985 - 1989.

†† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-6

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER

Results in pCi/liter

LOCATION: INDICATOR †

Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969††	*	*	*	*	*	*
1974††	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	**	**	**	**	**	**
1978	<MDL	<MDL	<MDL	**	**	**
1979	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1982	0.43	0.43	0.43	1.6	2.4	1.9
1983	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No gamma analysis performed (not required).

** Data showed instrument background results.

† Indicator location was the NMP 1 Inlet Canal for the period 1969 - 1973, and the JAf Inlet Canal for 1974 - 1989.

†† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-7

HISTORICAL ENVIRONMENTAL SAMPLE DATA
SURFACE WATER TRITIUM
Results in pCi/liter

LOCATION: CONTROL *

Isotope	Tritium		
Year	Min.	Max.	Mean
1969†	No Data	No Data	No Data
1974†	<MDL	<MDL	<MDL
1975	311	414	362
1976	440	929	652
1977	300	530	408
1978	215	490	304
1979	174	308	259
1980	211	290	257
1981	211	357	293
1982	112	307	165
1983	230	280	250
1984	190	220	205
1985	230	430	288
1986	250	550	373
1987	140	270	210
1988	240	460	320
1989	143	217	186

* Control location is the City of Oswego, drinking water for 1969 - 1984 and the Oswego Steam Station inlet canal for 1985 - 1989.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-8

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER TRITIUM

Results in pCi/liter

LOCATION: INDICATOR *

Isotope	Tritium		
Year	Min.	Max.	Mean
1969†	No Data	No Data	No Data
1974†	380	500	440
1975	124	482	335
1976	297	889	513
1977	380	530	450
1978	253	560	389
1979	176	286	234
1980	150	457	263
1981	183	388	258
1982	194	2780	641
1983	190	560	317
1984	110	370	282
1985	250	1200**	530
1986	260	500	380
1987	160	410	322
1988	430	480	460
1989	135	288	225

* Indicator location was the NMP-1 Inlet Canal during the period 1969-1973, and the JAF Inlet Canal for 1974-1989.

** Suspect sample contamination. Recollected samples showed normal levels of tritium.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-9

HISTORICAL ENVIRONMENTAL SAMPLE DATA
AIR PARTICULATE GROSS BETA
Results in pCi/m^3

LOCATION: CONTROL *			
Isotope	Gross Beta		
Year	Min.	Max.	Mean
1969†	0.130	0.540	0.334
1974†	0.001	0.808	0.121
1975	0.008	0.294	0.085
1976	0.004	0.240	0.051
1977	0.001	0.484	0.126
1978	0.010	0.650	0.144
1979	0.010	0.703	0.077
1980	0.009	0.291	0.056
1981	0.016	0.549	0.165
1982	0.011	0.078	0.033
1983	0.007	0.085	0.024
1984	0.013	0.051	0.026
1985	0.013	0.043	0.024
1986	0.008	0.272	0.039
1987	0.009	0.037	0.021
1988	0.008	0.039	0.018
1989	0.007	0.039	0.017

* Locations used for 1977 - 1984 were C off-site, D1 off-site, D2 off-site, E off-site, F off-site, and G off-site. Control location R-5 off-site was used for 1985 - 1989 (formerly C off-site location).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-10

HISTORICAL ENVIRONMENTAL SAMPLE DATA
AIR PARTICULATE GROSS BETA
Results in pCi/m^3

LOCATION: INDICATOR *

Isotope	Gross Beta		
Year	Min.	Max.	Mean
1969†	0.130	0.520	0.320
1974†	0.003	0.885	0.058
1975	0.001	0.456	0.067
1976	0.002	0.191	0.047
1977	0.016	0.140	0.070.
1978	0.006	0.340	0.102
1979	0.001	0.271	0.058
1980	0.002	0.207	0.045
1981	0.004	0.528	0.151
1982	0.001	0.113	0.031
1983	0.003	0.062	0.023
1984	0.000	0.058	0.025
1985	0.001	0.044	0.021
1986	0.007	0.289	0.039
1987	0.009	0.040	0.021
1988	0.007	0.040	0.018
1989	0.007	0.041	0.017

* Locations used for 1969 - 1973 were D1 on-site, D2 on-site, E on-site, F on-site and G on-site. Locations used for 1974 - 1984 were D1 on-site, D2 on-site, E on-site, F on-site, G on-site, H on-site, I on-site, J on-site and k on-site, as applicable. 1985 - 1989 locations were R-1 off-site, R-2 off-site, R-3 off-site, and R-4 off-site.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-11

HISTORICAL ENVIRONMENTAL SAMPLE DATA

AIR PARTICULATES

Results in pCi/m^3

LOCATION: CONTROL **

Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	*	*	*	*	*	*
1974†	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	0.0002	0.0112	0.0034	0.0034	0.0347	0.0172
1978	0.0008	0.0042	0.0018	0.0003	0.0056	0.0020
1979	0.0008	0.0047	0.0016	0.0005	0.0014	0.0009
1980	0.0015	0.0018	0.0016	<LLD	<LLD	<LLD
1981	0.0003	0.0042	0.0017	0.0003	0.0012	0.0008
1982	0.0002	0.0009	0.0004	0.0004	0.0007	0.0006
1983	0.0002	0.0002	0.0002	0.0007	0.0007	0.0007
1984	<LLD	<LLD	<LLD	0.0004	0.0012	0.0008
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	0.0075	0.0311	0.0193	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No data available (not required prior to 1977).

** Locations included composites of off-site air monitoring locations for 1977 - 1984. Sample Location included only R-5 air monitoring location for 1985 - 1989.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-12

HISTORICAL ENVIRONMENTAL SAMPLE DATA
AIR PARTICULATES
Results in pCi/m^3

LOCATION: INDICATOR **

Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	*	*	*	*	*	*
1974†	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	0.0001	0.0105	0.0043	0.0003	0.0711	0.0179
1978	0.0003	0.0026	0.0016	0.0003	0.0153	0.0023
1979	0.0003	0.0020	0.0010	0.0003	0.0007	0.0005
1980	0.0005	0.0019	0.0011	0.0016	0.0016	0.0016
1981	0.0002	0.0045	0.0014	0.0002	0.0017	0.0006
1982	0.0001	0.0006	0.0004	0.0003	0.0010	0.0005
1983	0.0002	0.0003	0.0002	0.0003	0.0017	0.0007
1984	<LLD	<LLD	<LLD	0.0007	0.0017	0.0012
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	0.0069	0.0364	0.0183	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No data available (not required prior to 1977).

** Locations included composites of on-site air monitoring locations for 1977 - 1984. Locations included R-1 through R-4 air monitoring locations for 1985 - 1989.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-13

HISTORICAL ENVIRONMENTAL SAMPLE DATA
AIR RADIOIODINE
Results in pCi/m^3

LOCATION: CONTROL *			
Isotope	Iodine-131		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975	<MDL	<MDL	<MDL
1976	0.01	5.88	0.60
1977	0.02	0.82	0.32
1978	0.03	0.04	0.03
1979	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD
1982	0.039	0.039	0.039
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD
1986	0.041	0.332	0.151
1987	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD

* Locations D1 off-site, D2 off-site, E off-site, F off-site, and G off-site used for 1976 - 1984. Location R-5 off-site used for 1985 - 1989.

** No results - I-131 analysis not required.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-14

HISTORICAL ENVIRONMENTAL SAMPLE DATA AIR RADIOIODINE Results in pCi/m^3			
LOCATION: INDICATOR *			
Isotope	Iodine-131		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975	0.25	0.30	0.28
1976	0.01	2.09	0.33
1977	0.02	0.73	0.31
1978	0.02	0.07	0.04
1979	<LLD	<LLD	<LLD
1980	0.013	0.013	0.013
1981	0.016	0.042	0.029
1982	0.002	0.042	0.016
1983	0.022	0.035	0.028
1984	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD
1986	0.023	0.360	0.119
1987	0.011	0.018	0.014
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD

* Locations used for 1976 - 1984 were D1 on-site, D2 on-site, E on-site, F on-site, G on-site, H on-site, I on-site, J on-site, and K on-site, as applicable. Locations used for 1985 - 1989 were R-1 off-site, R-2 off-site, R-3 off-site, and R-4 off-site.

** No results - I-131 analysis not required.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-15A

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem/standard month

LOCATION: CONTROL **

Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	6.0	7.3	6.7
1971	2.0	6.7	4.3
1972	2.2	6.2	4.4
1973	2.2	6.9	4.7
1974†	2.7	8.9	5.6
1975	4.8	6.0	5.5
1976	3.2	7.2	5.4
1977	4.0	8.0	5.3
1978	3.3	4.7	4.3
1979	3.3	5.7	4.7
1980	3.8	5.8	4.9
1981	3.5	5.9	4.8
1982	3.8	6.1	5.1
1983	4.9	7.2	5.8
1984	4.7	8.2	6.2
1985	4.5	7.6	5.6
1986	5.3	7.5	6.3
1987	4.6	6.6	5.4
1988	4.4	6.8	5.6
1989	2.9	6.4	4.7

* Data not available.

** TLD #8, 14, 49, 110, and 111.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-15B

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem/standard month

LOCATION: RETS CONTROL **

Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	6.0	7.3	6.7
1971	2.0	6.7	4.3
1972	2.2	6.2	4.4
1973	2.2	6.9	4.7
1974†	2.7	8.9	5.6
1975	4.8	6.0	5.5
1976	3.2	7.2	5.4
1977	4.0	8.0	5.3
1978	3.3	4.7	4.3
1979	3.3	5.7	4.7
1980	3.8	5.8	4.9
1981	3.5	5.9	4.8
1982	3.8	6.1	5.1
1983	4.9	7.2	5.8
1984	4.7	8.2	6.2
1985	4.4	6.8	5.4
1986	5.5	7.2	6.3
1987	4.6	5.8	5.2
1988	4.8	6.8	5.4
1989	2.9	6.4	4.1

* Data not available.

** TLD #8, 14 and 49 (RETS Control Locations).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-16A

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: SITE BOUNDARY **

Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	*	*	*
1971	*	*	*
1972	*	*	*
1973	*	*	*
1974†	*	*	*
1975	*	*	*
1976	*	*	*
1977	*	*	*
1978	*	*	*
1979	*	*	*
1980	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	4.1	12.6	6.2
1986	4.4	18.7	7.0
1987	4.4	14.3	6.1
1988	3.4	17.9	6.4
1989	2.8	15.4	5.9

* Data not available (not required prior to 1985).

** TLD locations initiated in 1985 as required by the New Technical Specifications. Includes TLD Numbers 7, 18, 23, and 75 - 87.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-16B

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: OFF-SITE SECTORS **

Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	*	*	*
1971	*	*	*
1972	*	*	*
1973	*	*	*
1974†	*	*	*
1975	*	*	*
1976	*	*	*
1977	*	*	*
1978	*	*	*
1979	*	*	*
1980	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	4.0	7.1	5.0
1986	4.6	8.6	6.0
1987	4.3	6.0	5.2
1988	3.8	7.0	5.3
1989	2.5	6.8	4.9

* No data available (not required prior to 1985).

** TLD locations initiated in 1985 as required by the new Technical Specifications. Includes TLD number 88, 89, 90, 91, 92, 93, 94, and 95.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to pre-operational for the JAFNPP.

TABLE VI-16C

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: Special Interest **

Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	*	*	*
1971	*	*	*
1972	*	*	*
1973	*	*	*
1974†	*	*	*
1975	*	*	*
1976	*	*	*
1977	*	*	*
1978	*	*	*
1979	*	*	*
1980	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	3.9	6.8	5.3
1986	4.8	8.2	6.1
1987	3.5	6.0	5.1
1988	3.9	6.6	5.3
1989	2.1	6.4	4.9

* No data available (not required prior to 1985).

** TLD locations initiated in 1985 as required by the new Technical Specifications. TLD's included are numbers 15, 56, 58, 96-105, 108 and 109, which are located near critical residences and populated areas near the site.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to pre-operational for the JAFNPP.

TABLE VI-16D

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: ON-SITE INDICATOR **			
Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	4.7	9.0	6.0
1971	1.5	7.7	4.7
1972	2.3	8.2	4.9
1973	3.0	24.4	6.6
1974†	3.1	10.6	5.7
1975	4.6	16.0	7.3
1976	3.7	18.8	6.9
1977	3.0	15.3	5.7
1978	3.0	9.0	4.3
1979	2.7	8.3	4.3
1980	3.9	12.0	5.3
1981	4.1	11.8	5.8
1982	3.9	13.0	6.3
1983	5.0	16.5	6.9
1984	4.6	13.2	7.0
1985	4.7	15.9	6.3
1986	4.7	16.1	7.0
1987	4.0	11.4	5.8
1988	4.4	11.9	6.0
1989	2.7	13.1	6.0

* No data available.

** Includes TLD numbers 3, 4, 5, 6, and 7 (1970 - 1973). Includes TLD numbers 3, 4, 5, 6, 7, 23, 24, 25, and 26 (1974 - 1989). Locations are existing or previous on-site environmental air monitoring locations.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to pre-operational for the JAFNPP.

TABLE VI-16E

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: OFF-SITE INDICATOR **			
Year	Min.	Max.	Mean
PREOP†	*	*	*
1970	5.0	8.0	6.7
1971	1.1	7.7	4.5
1972	1.8	6.6	4.4
1973	2.2	6.9	4.1
1974†	2.4	8.9	5.3
1975	4.5	7.1	5.5
1976	3.4	7.2	5.2
1977	3.7	8.0	5.3
1978	2.7	4.7	3.7
1979	3.0	5.7	4.0
1980	3.1	5.8	4.6
1981	3.6	5.9	4.7
1982	4.0	6.2	5.2
1983	4.6	7.2	5.6
1984	4.6	8.2	6.1
1985	4.6	7.7	5.5
1986	5.0	7.6	6.1
1987	4.4	6.6	5.2
1988	4.2	6.6	5.4
1989	2.8	6.4	4.6

* No data available.

** Includes TLD numbers 8, 9, 10, 11, 12, and 13 (off-site environmental air monitoring locations).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to pre-operational for the JAFNPP.

TABLE VI-17

HISTORICAL ENVIRONMENTAL SAMPLE DATA

MILK

Results in pCi/liter

LOCATION: CONTROL **

Isotope	Cs-137			I-131		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	*	*	*	*	*	*
1974†	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	*	*	*	*	*	*
1978	2.4	7.8	5.8	<LLD	<LLD	<LLD
1979	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD	1.4	1.4	1.4
1981	7.0	7.0	7.0	<LLD	<LLD	<LLD
1982	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	5.3	12.4	8.4	0.8	29.0	13.6
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No data available (sample not required)

** Location used was an available milk sample location in a least prevalent wind direction greater than ten miles from the site.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-18

HISTORICAL ENVIRONMENTAL SAMPLE DATA

MILK

Results in pCi/liter

LOCATION: INDICATOR *

Isotope	Cs-137			I-131		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	**	**	**	**	**	**
1974†	1.6	39	10.5	0.70	2.00	1.23
1975	6.0	22	16	0.01	2.99	0.37
1976	4.0	15.0	9.3	0.02	45.00	3.20
1977	11.0	22.0	17.1	0.40	0.22	0.02·
1978	3.4	33.0	9.9	0.19	0.19	0.19
1979	2.7	40.0	9.4	<LLD	<LLD	<LLD
1980	4.0	21.0	9.7	0.4	8.8	4.9
1981	4.3	29.0	7.6	<LLD	<LLD	<LLD
1982	3.1	18.0	6.3	<LLD	<LLD	<LLD
1983	5.1	5.1	5.1	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	6.1	11.1	8.6	0.3	30.0	5.2
1987	5.5	9.4	7.4	<LLD	<LLD	<LLD
1988	10.0	10.0	10.0	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Locations sampled were available downwind locations within ten miles with high deposition potential.

** No data available (control samples not required).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE VI-19

HISTORICAL ENVIRONMENTAL SAMPLE DATA

FOOD PRODUCTS ††

Results in pCi/g (wet)

LOCATION: CONTROL *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975	**	**	**
1976	**	**	**
1977	**	**	**
1978	**	**	**
1979	**	**	**
1980	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD
1982	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD

* Locations was an available food product sample location in a least prevalent wind direction greater than ten miles from the site.

** No data available (control samples not required).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to pre-operational for the JAFNPP.

†† Data comprised of broadleaf and non-broadleaf vegetation (1980-1984). Data comprised of broadleaf vegetation only (1985-1989).

TABLE VI-20

HISTORICAL ENVIRONMENTAL SAMPLE DATA
FOOD PRODUCTS ††
Results in pCi/g (wet)

LOCATION: INDICATOR *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	0.04	0.34	0.142
1975	<MDL	<MDL	<MDL
1976	<MDL	<MDL	<MDL
1977	<MDL	<MDL	<MDL
1978	0.01	0.01	0.01
1979	<LLD	<LLD	<LLD
1980	0.004	0.060	0.033
1981	<LLD	<LLD	<LLD
1982	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	0.047	0.047	0.047
1986	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD
1988	0.008	0.008	0.008
1989	0.011	0.011	0.011

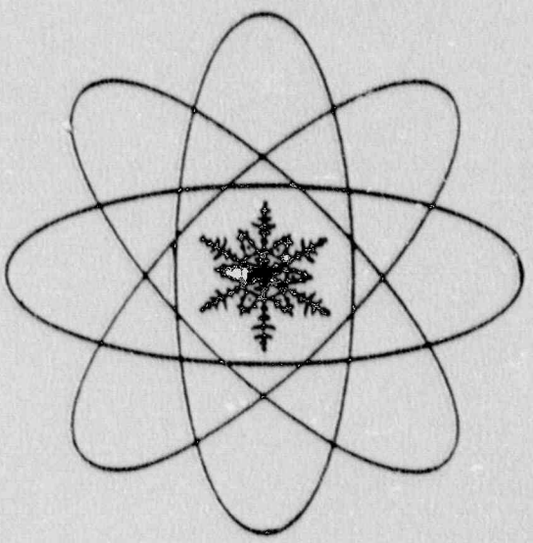
* Indicator locations were available downwind locations within ten miles of the site and with high deposition potential.

** No data available (control samples not required).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

†† Data comprised of broadleaf and non-broadleaf vegetation (1976-1984). Data comprised of broadleaf vegetation only (1985-1988).

VII



FIGURES AND MAPS

New York Power Authority

VII FIGURES AND MAPS

1. DATA GRAPHS

This section includes graphic representation of selected sample results.

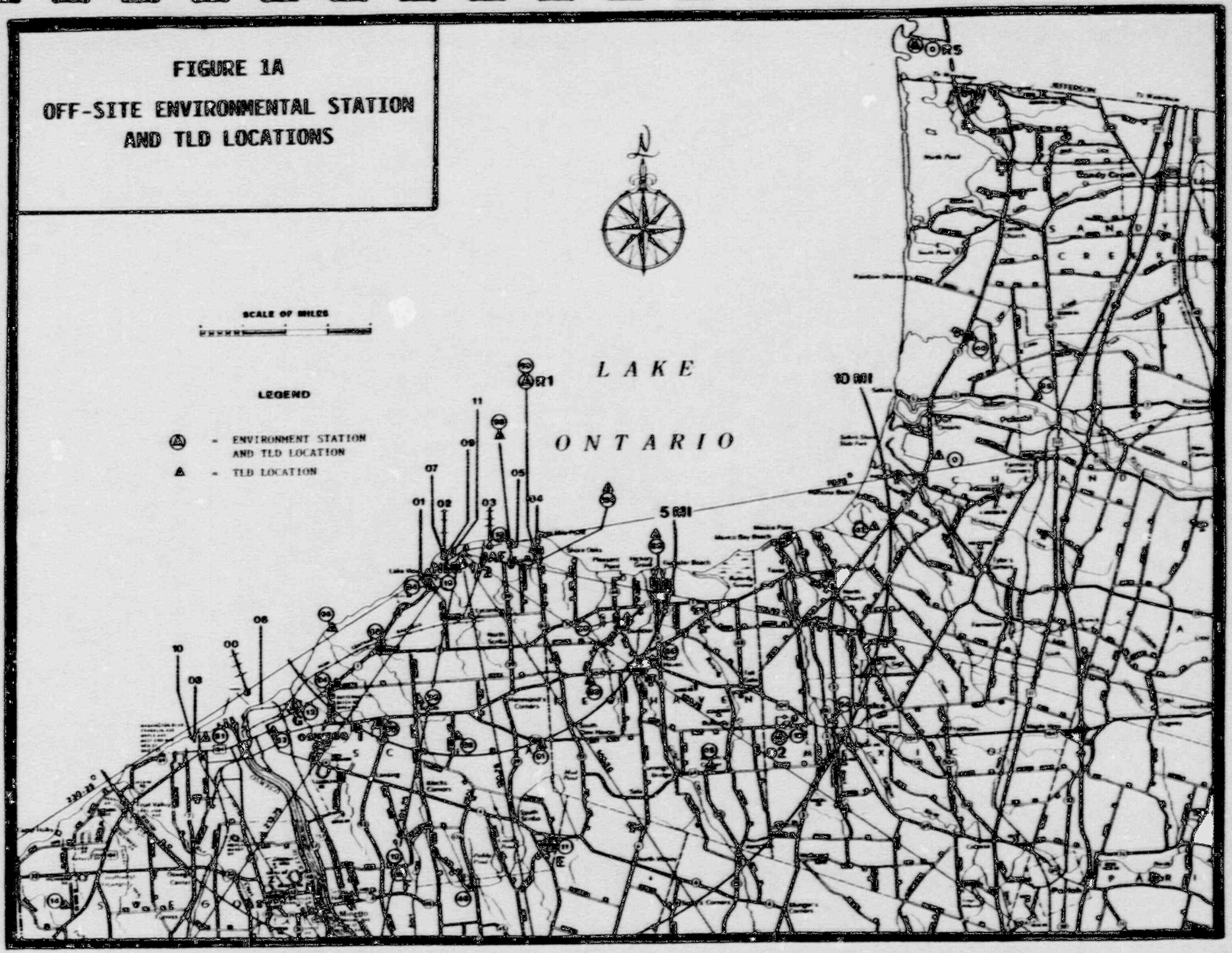
For graphic representation, results less than the MDL or LLD were considered to be at the MDL or LLD level of activity. MDL and LLD values were indicated where possible.

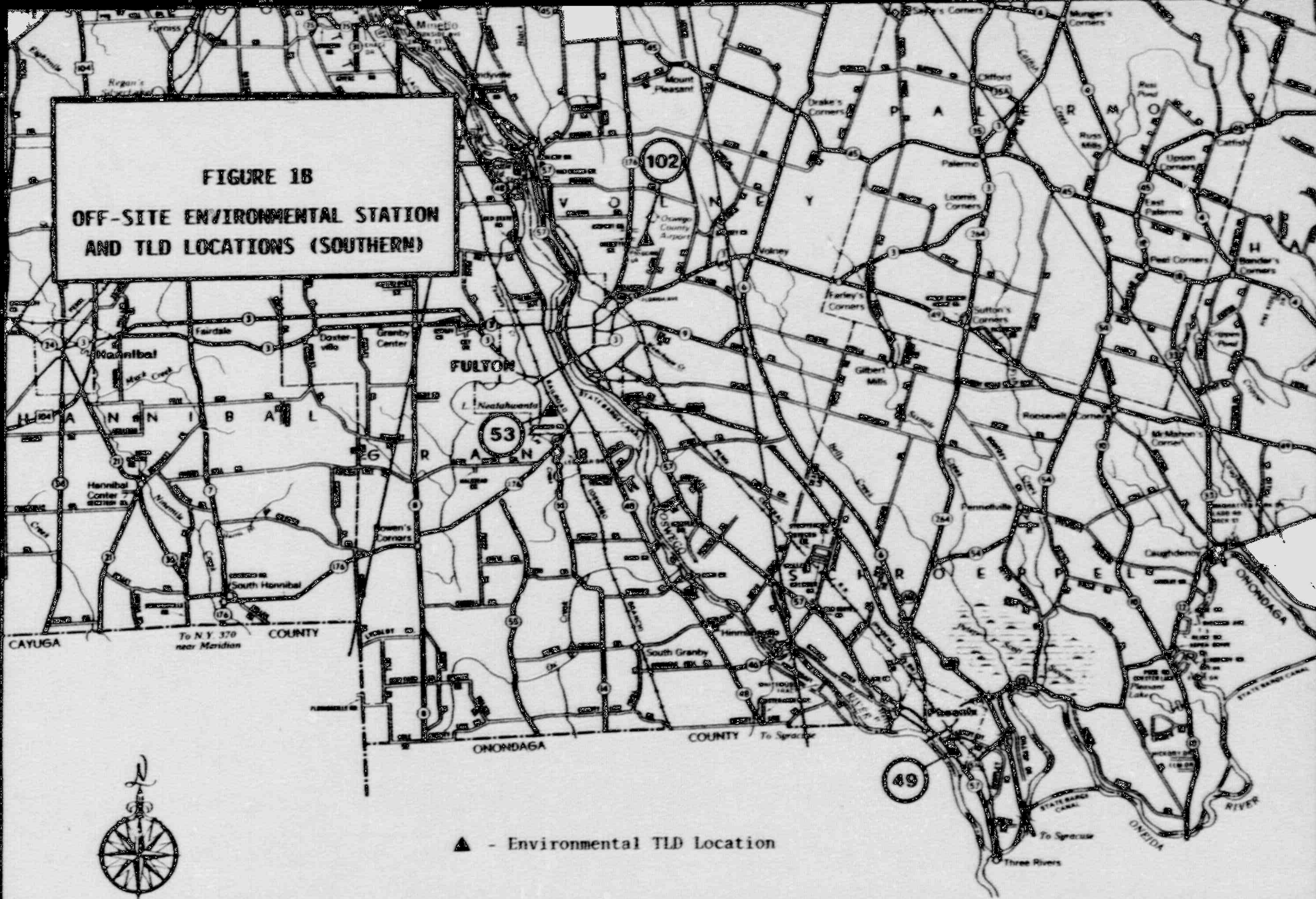
2. SAMPLE LOCATIONS

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

FIGURE 1A

OFF-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS





▲ - Environmental TLD Location

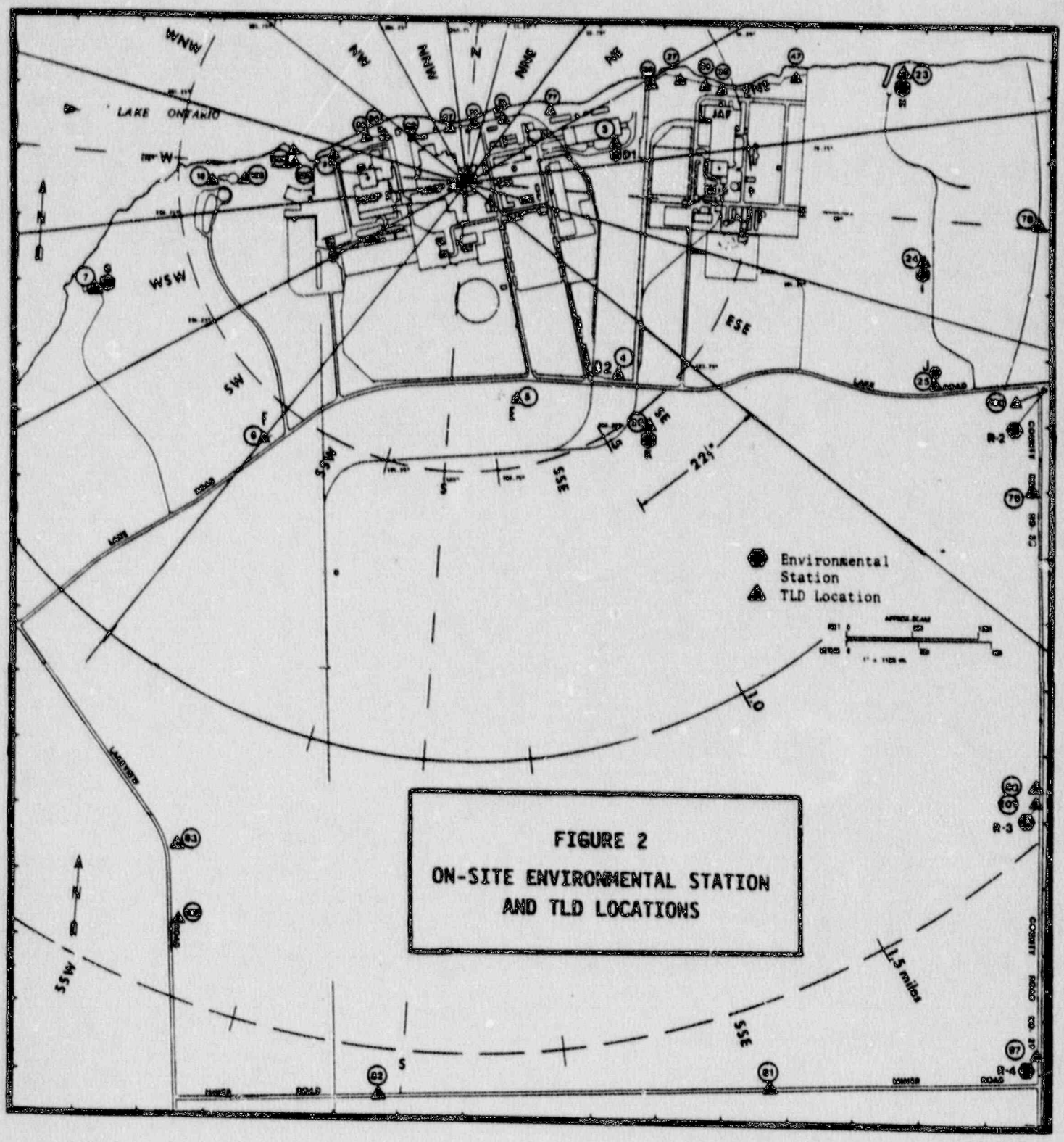


FIGURE 2

ON-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS

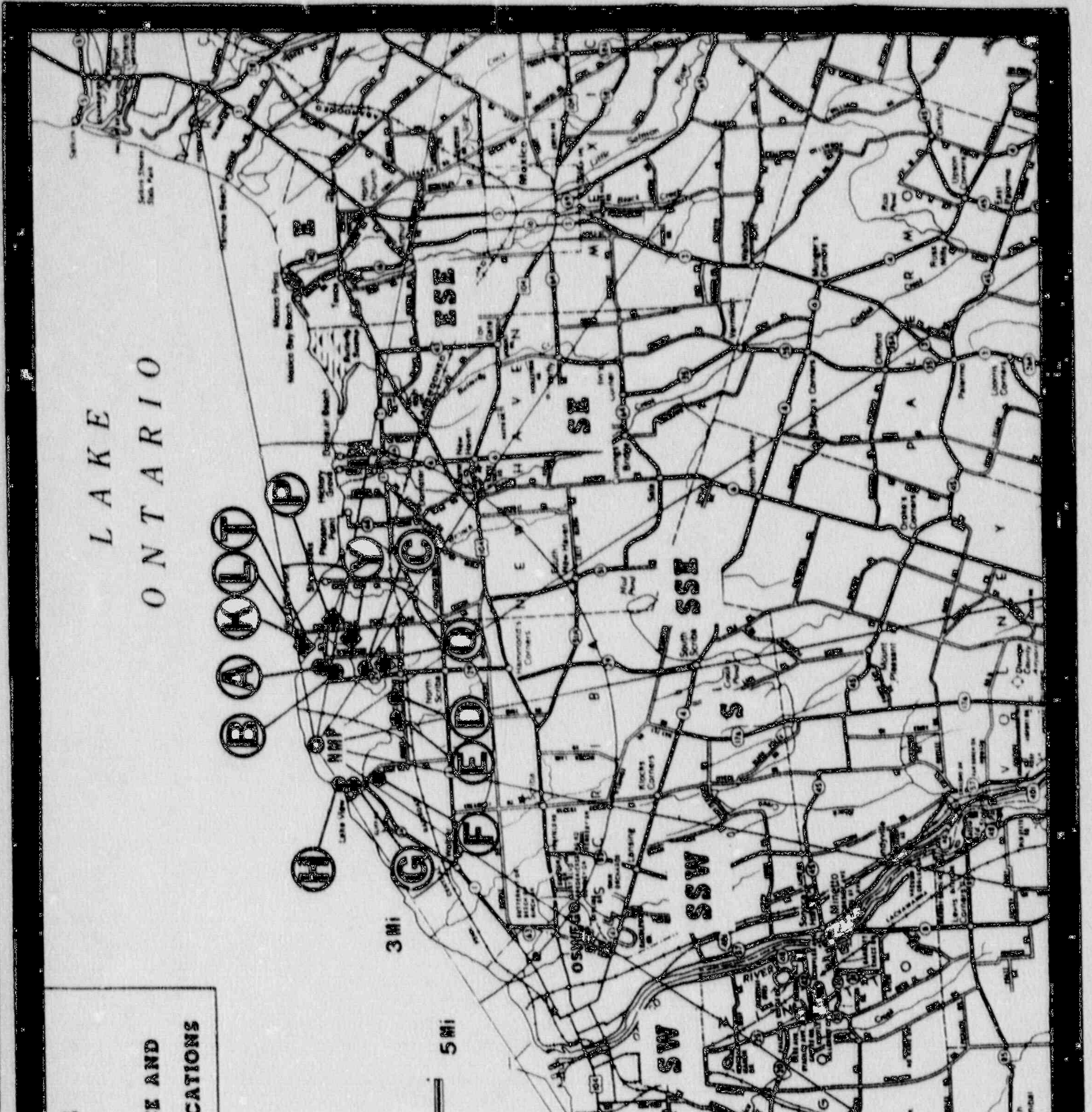


FIGURE 3

NEAREST RESIDENCE AND FOOD PRODUCT LOCATIONS

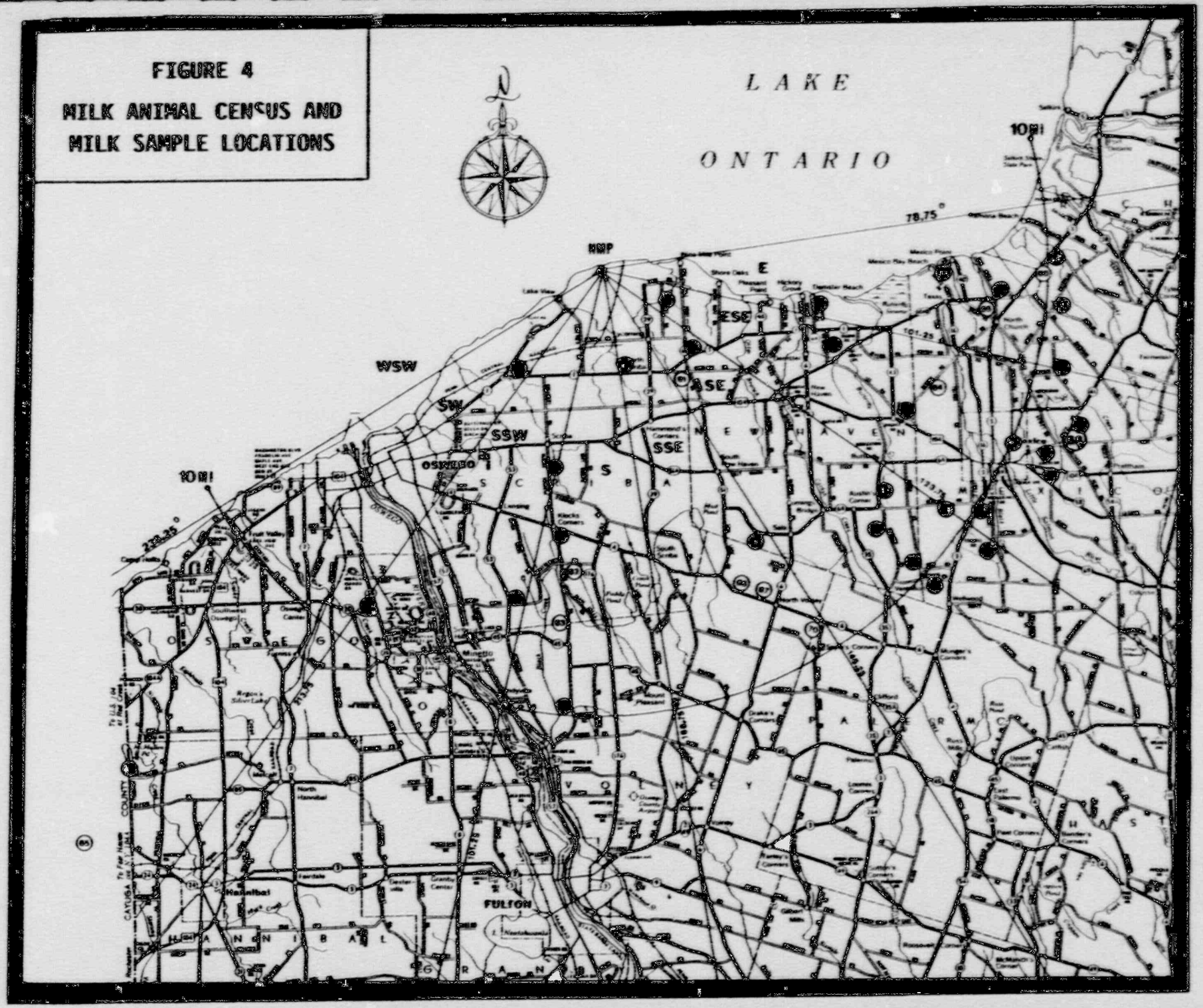


FIGURE 4
MILK ANIMAL CENSUS AND
MILK SAMPLE LOCATIONS
LAKE
ONTARIO
78.75°
NNE
E
ESE
SE
SSE
S
SSW
SW
WSW
OSWEGO
10 MI
FULTON
Hannibal
COUNTY

FIGURE 5

NEW YORK STATE MAP

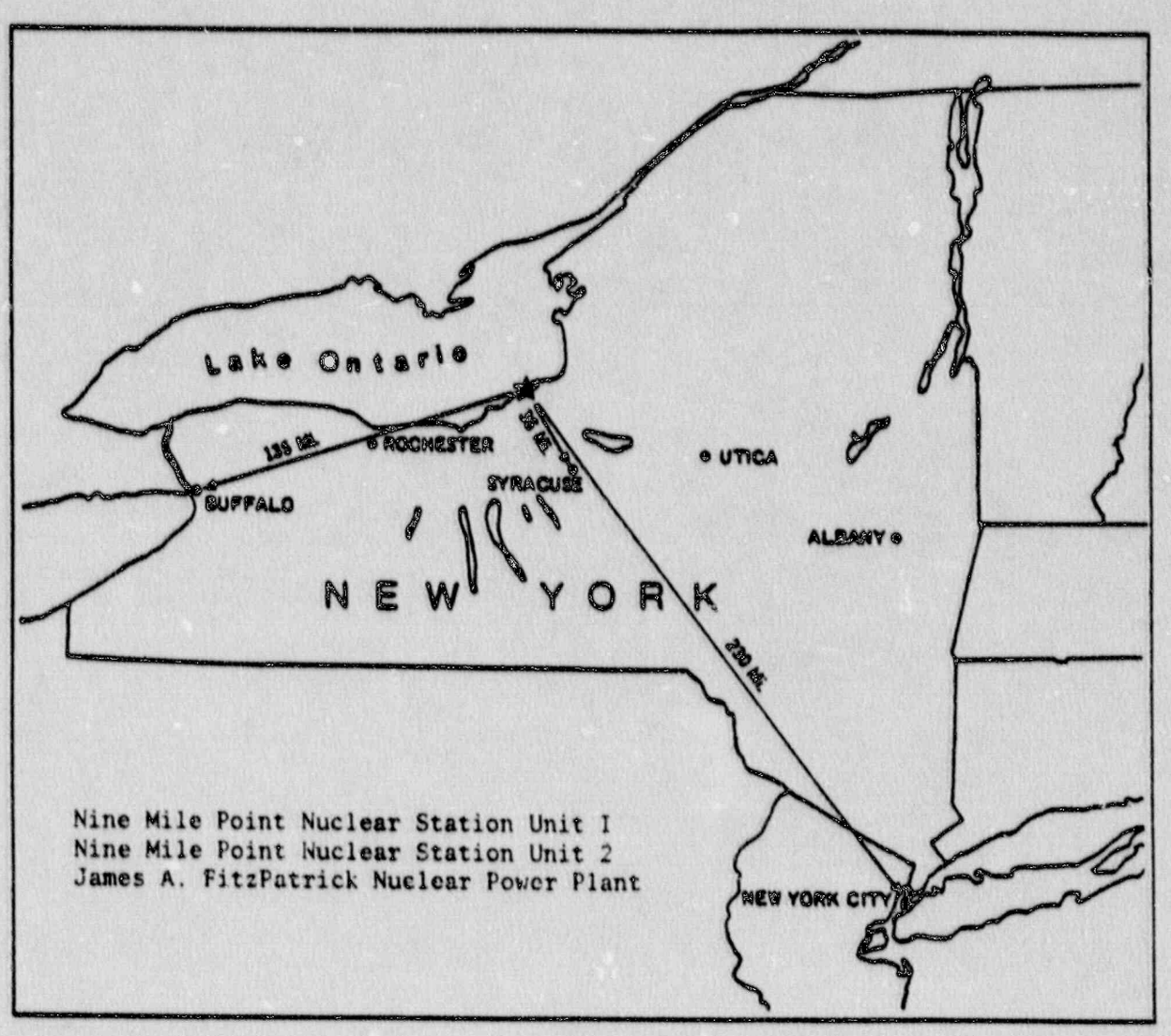


FIGURE 6

JAMES A. FITZPATRICK N.P.P.

FISH Cs-137

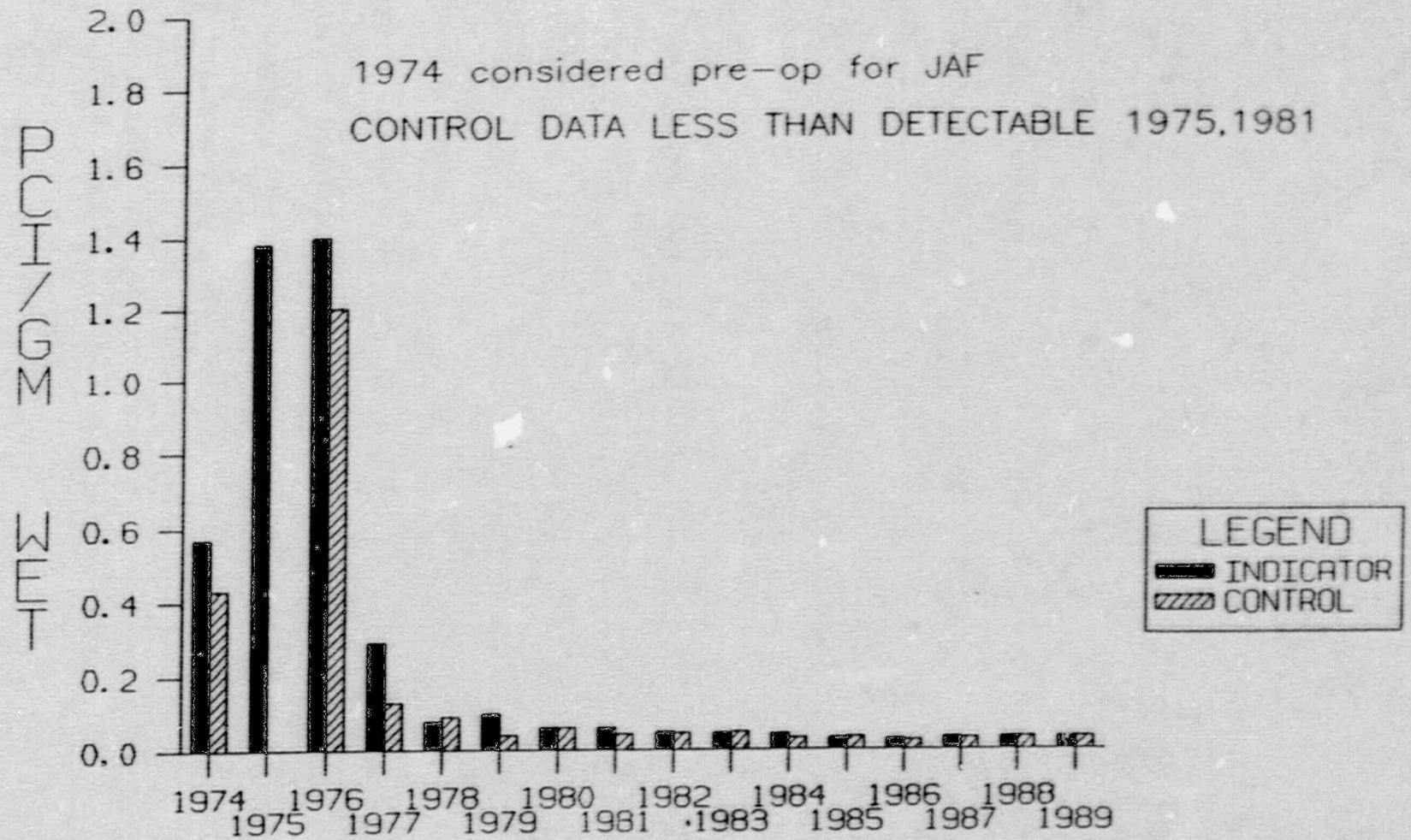


Figure 7

JAMES A. FITZPATRICK N.P.P.

SURFACE WATER TRITIUM

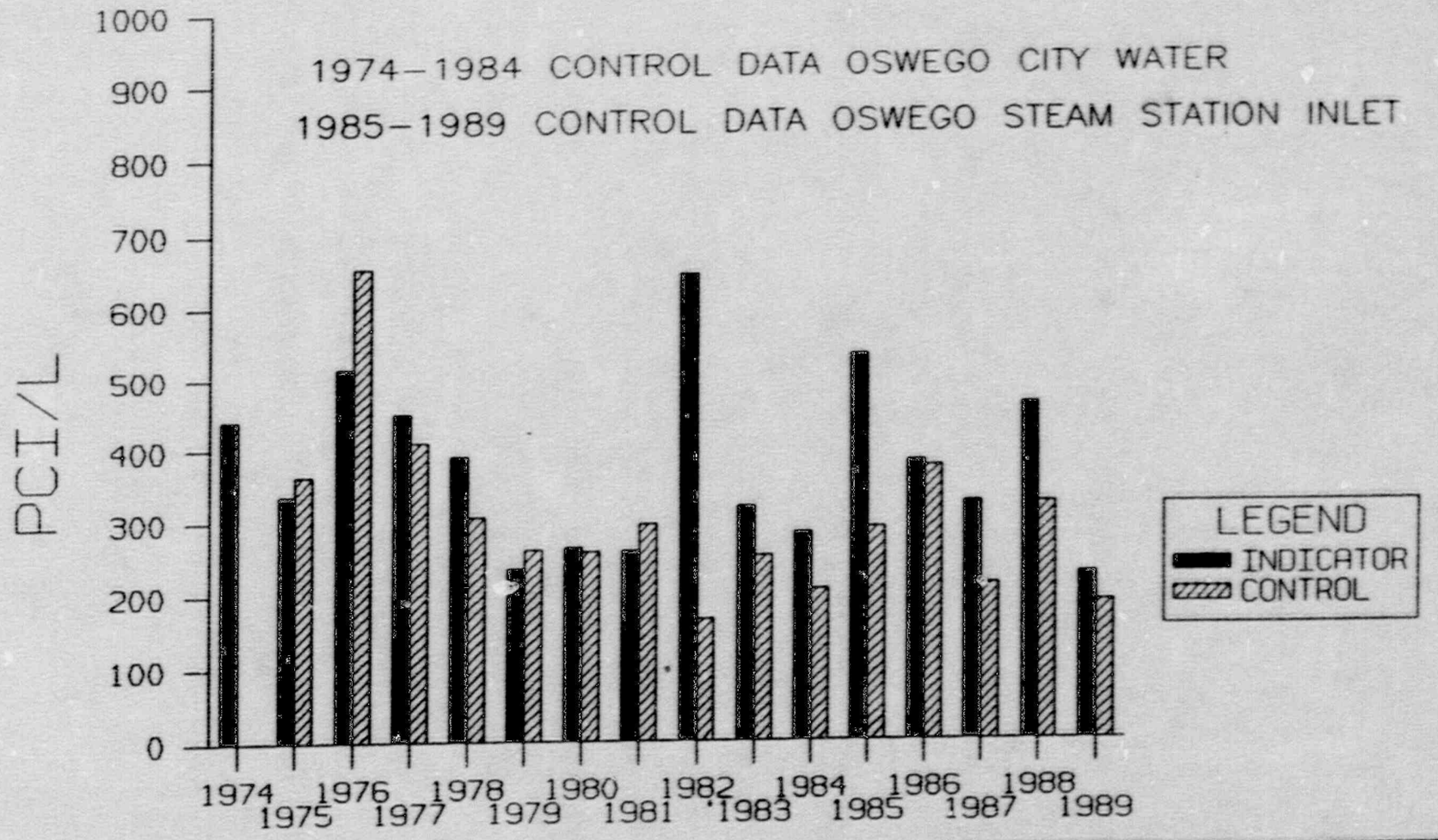


Figure 8

JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE GROSS BETA

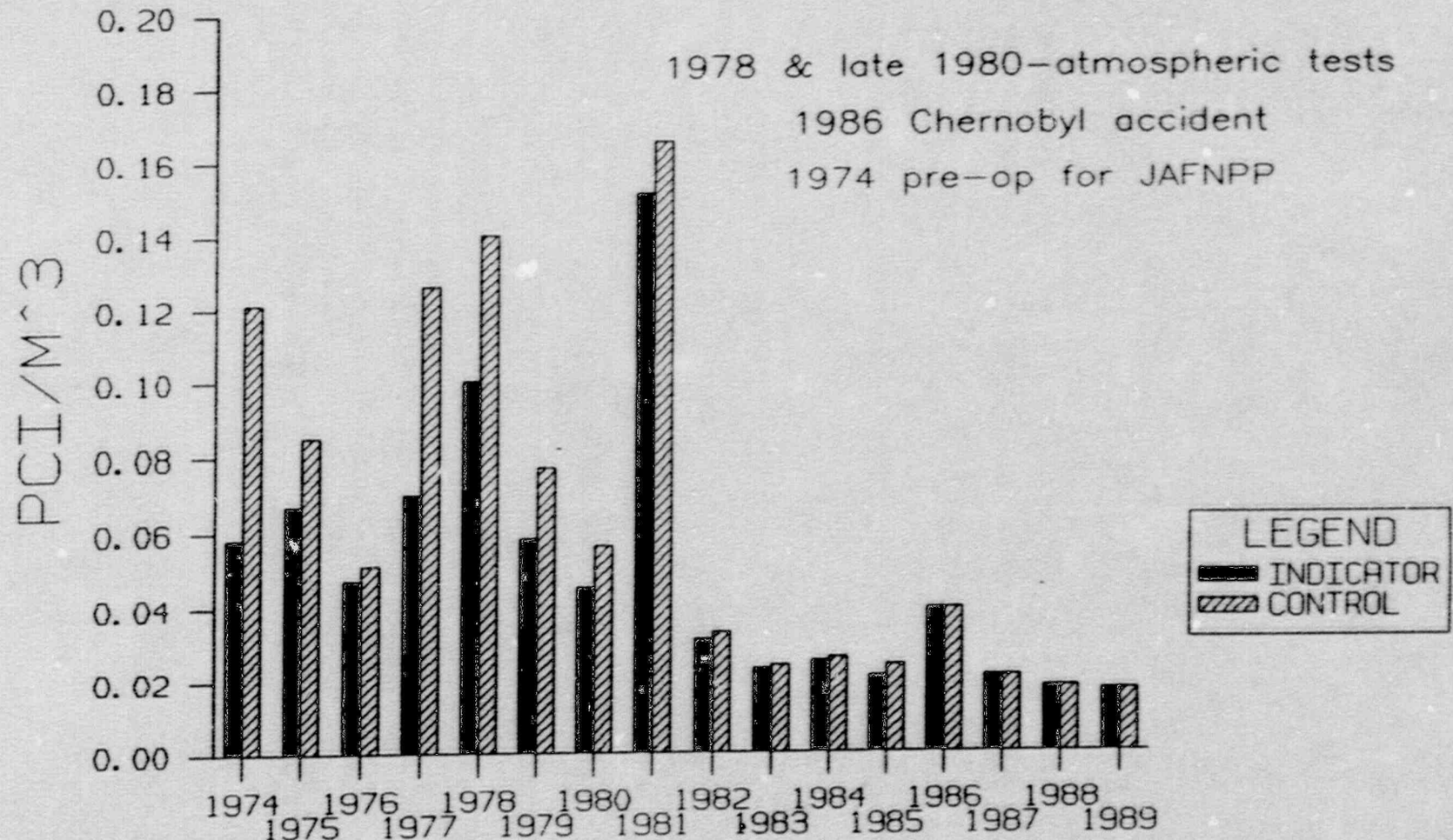


Figure 9

JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE GROSS BETA

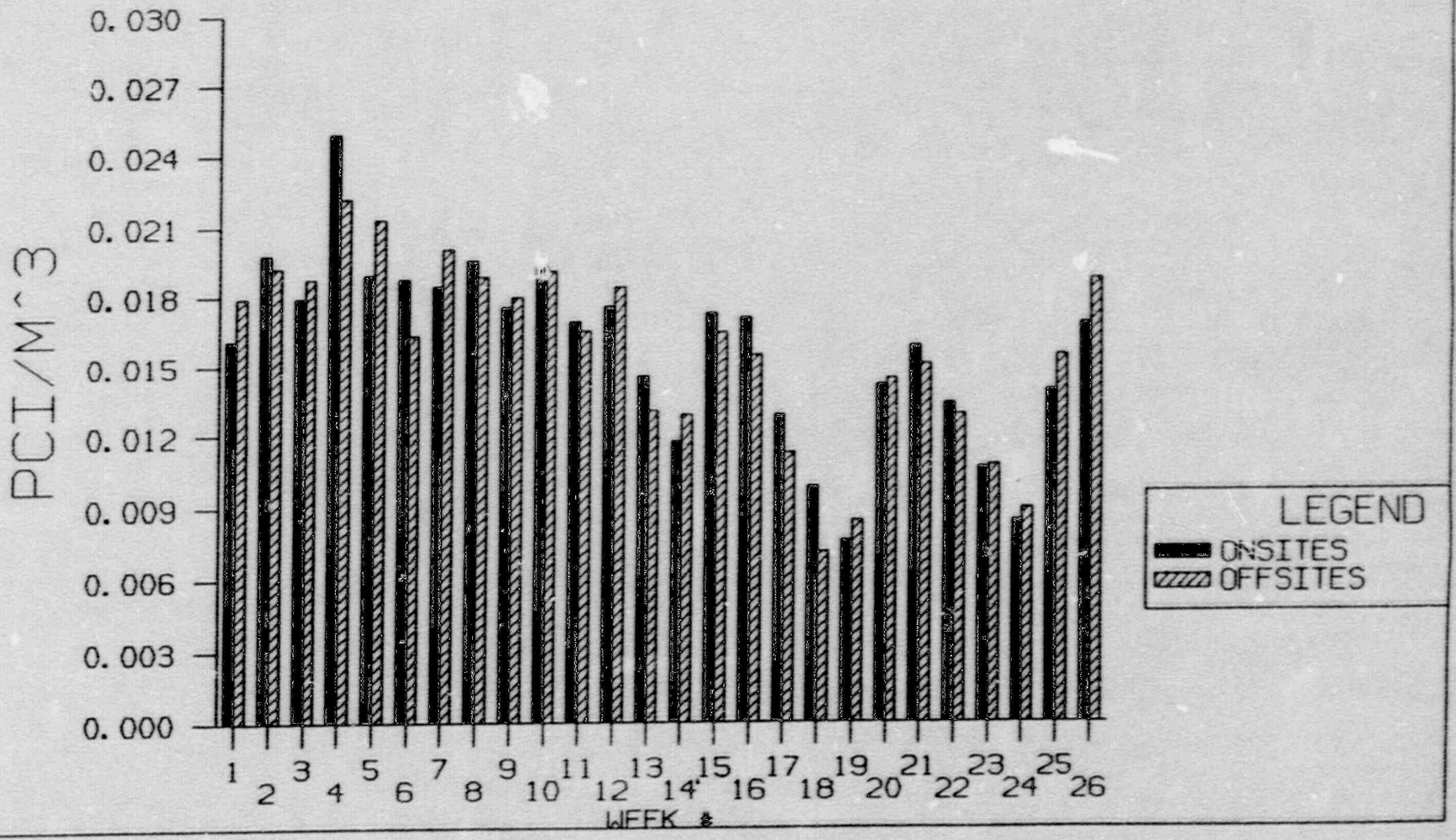


FIGURE 10

JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE GROSS BETA

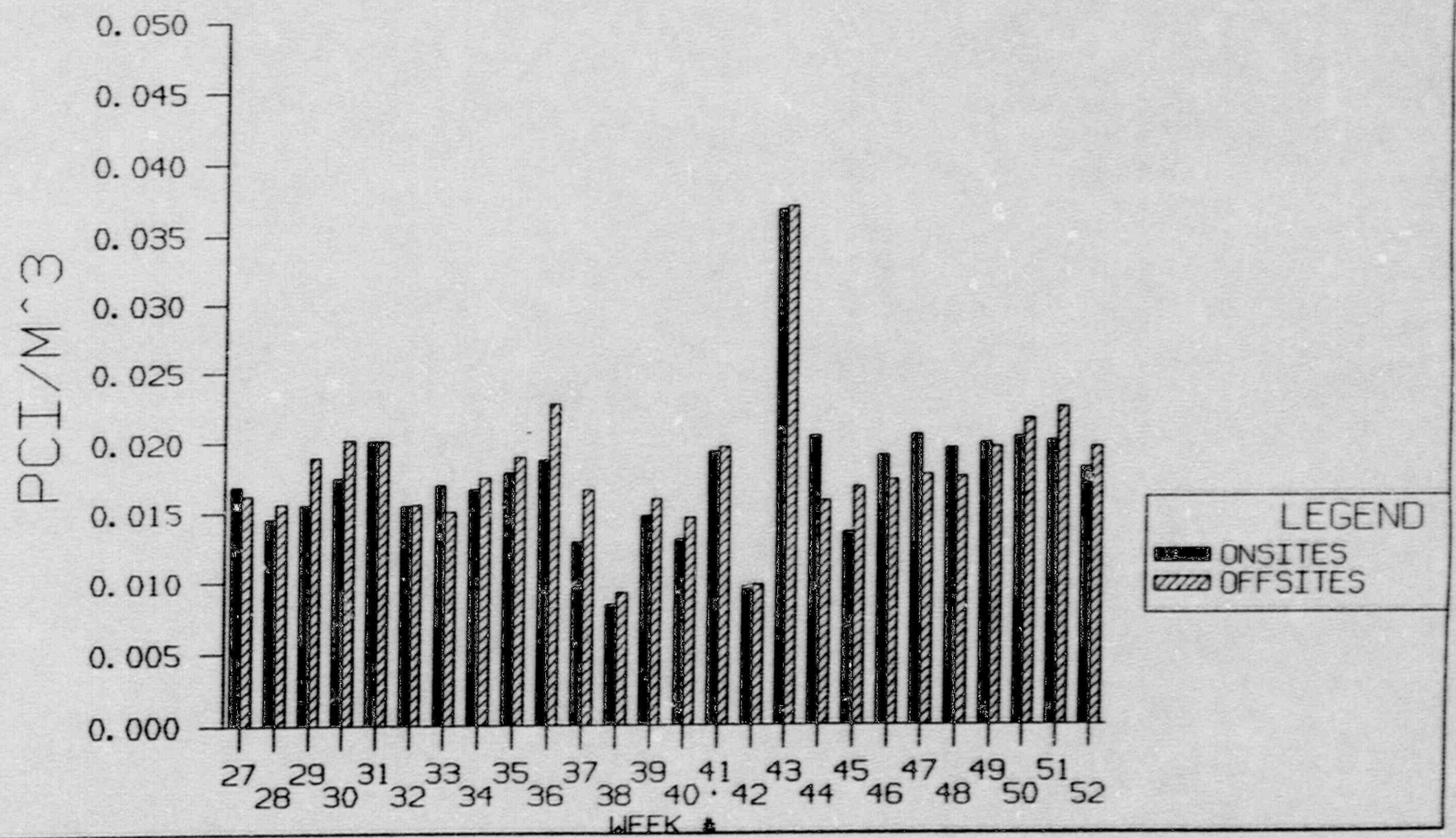


FIGURE 11

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AIR PARTICULATE COMPOSITE Co-60

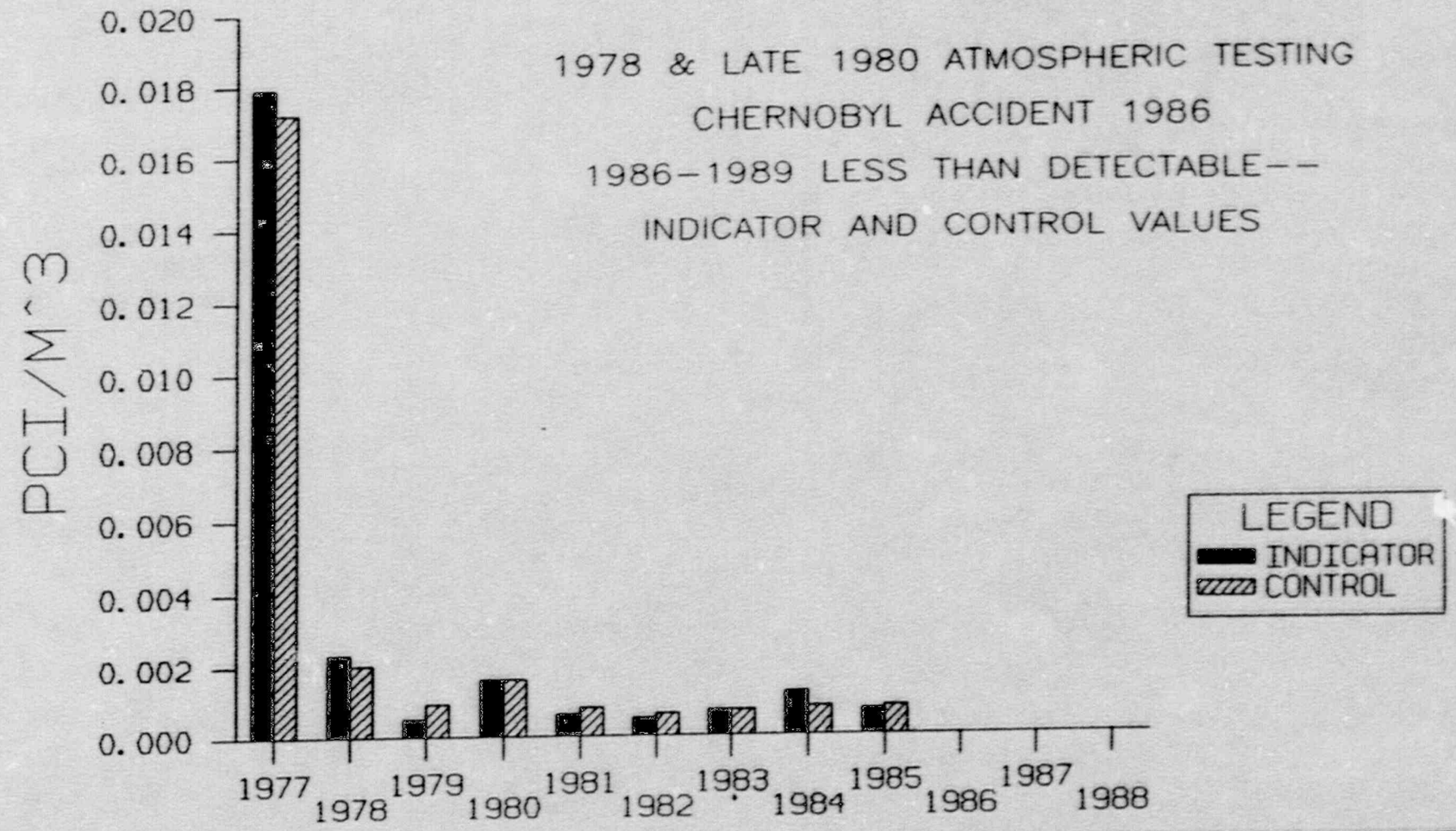


Figure 12

JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE COMPOSITE Cs-137

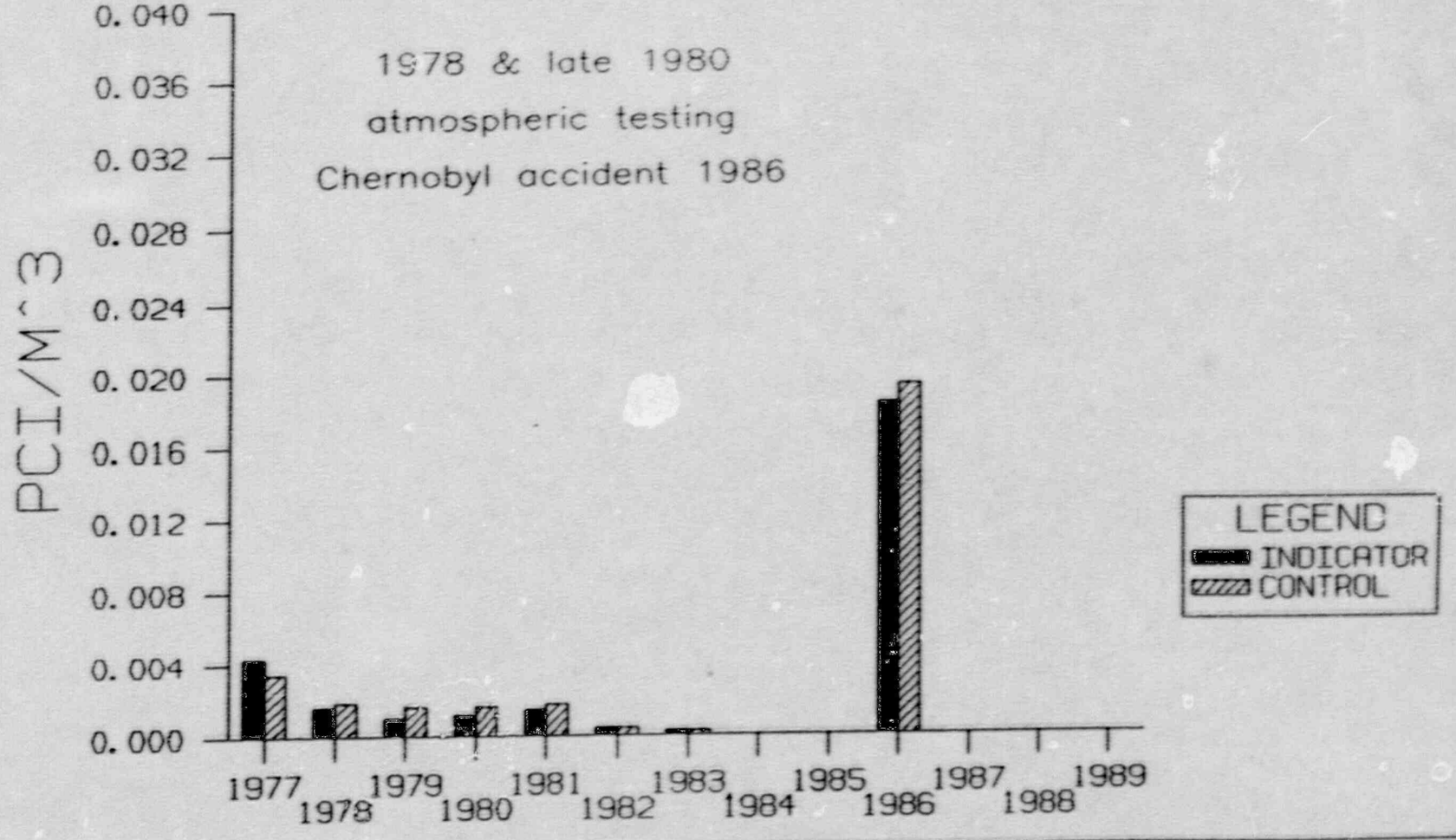


Figure 13

JAMES A. FITZPATRICK N.P.P.

AIR RADIOIODINE

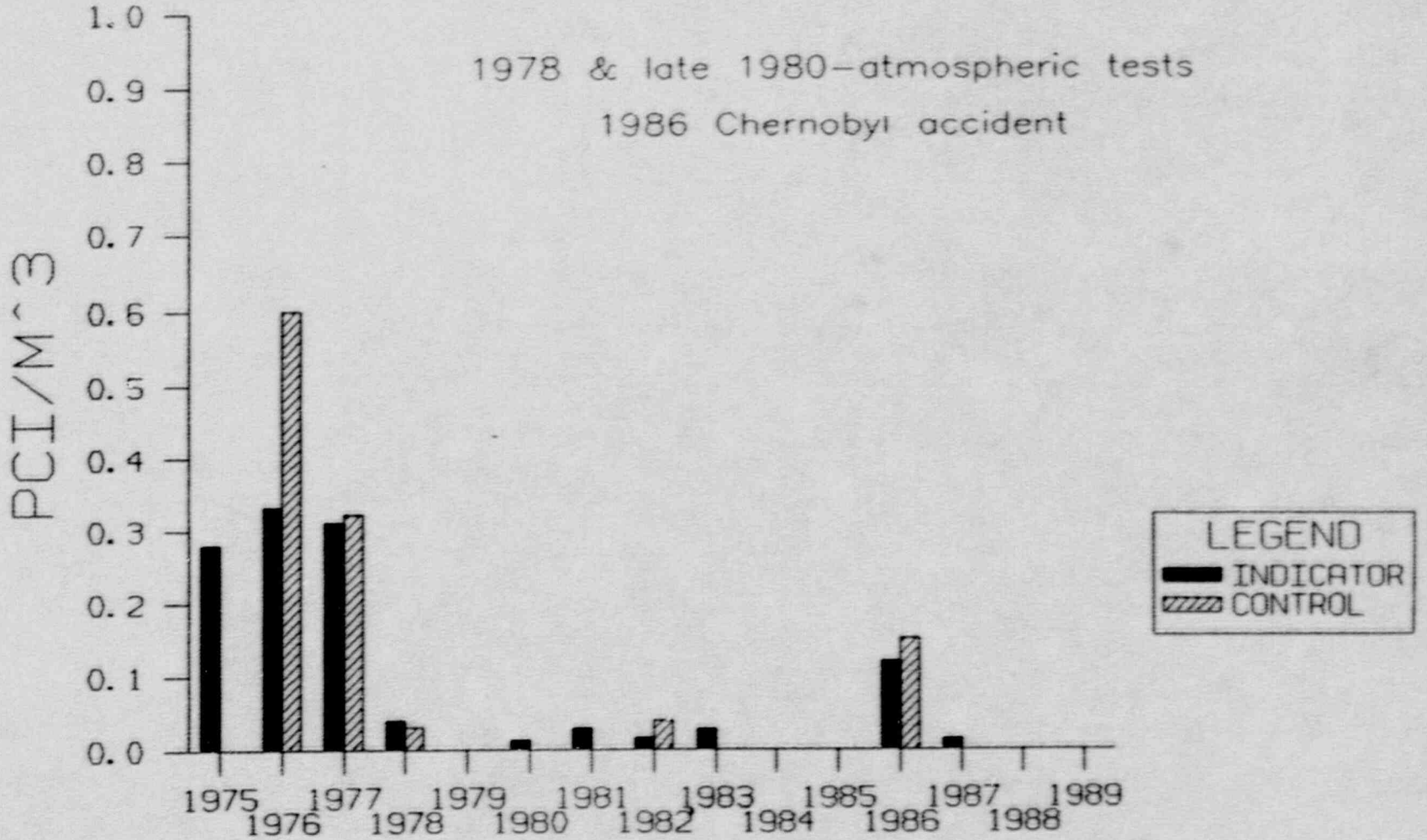


FIGURE 14

JAMES A. FITZPATRICK N.P.P.

MILK Cs-137

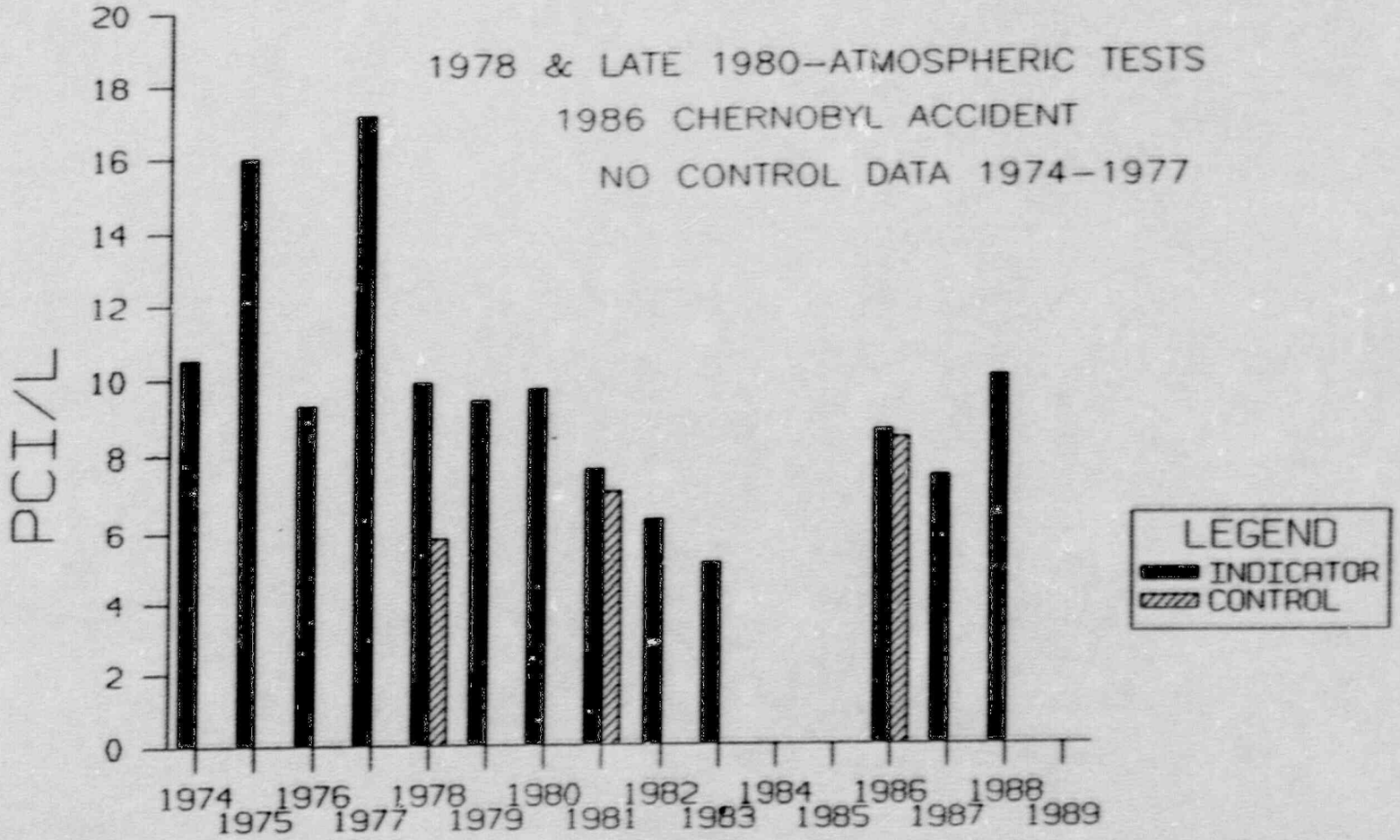


FIGURE 15

JAMES A. FITZPATRICK N.P.P.

MILK I-131

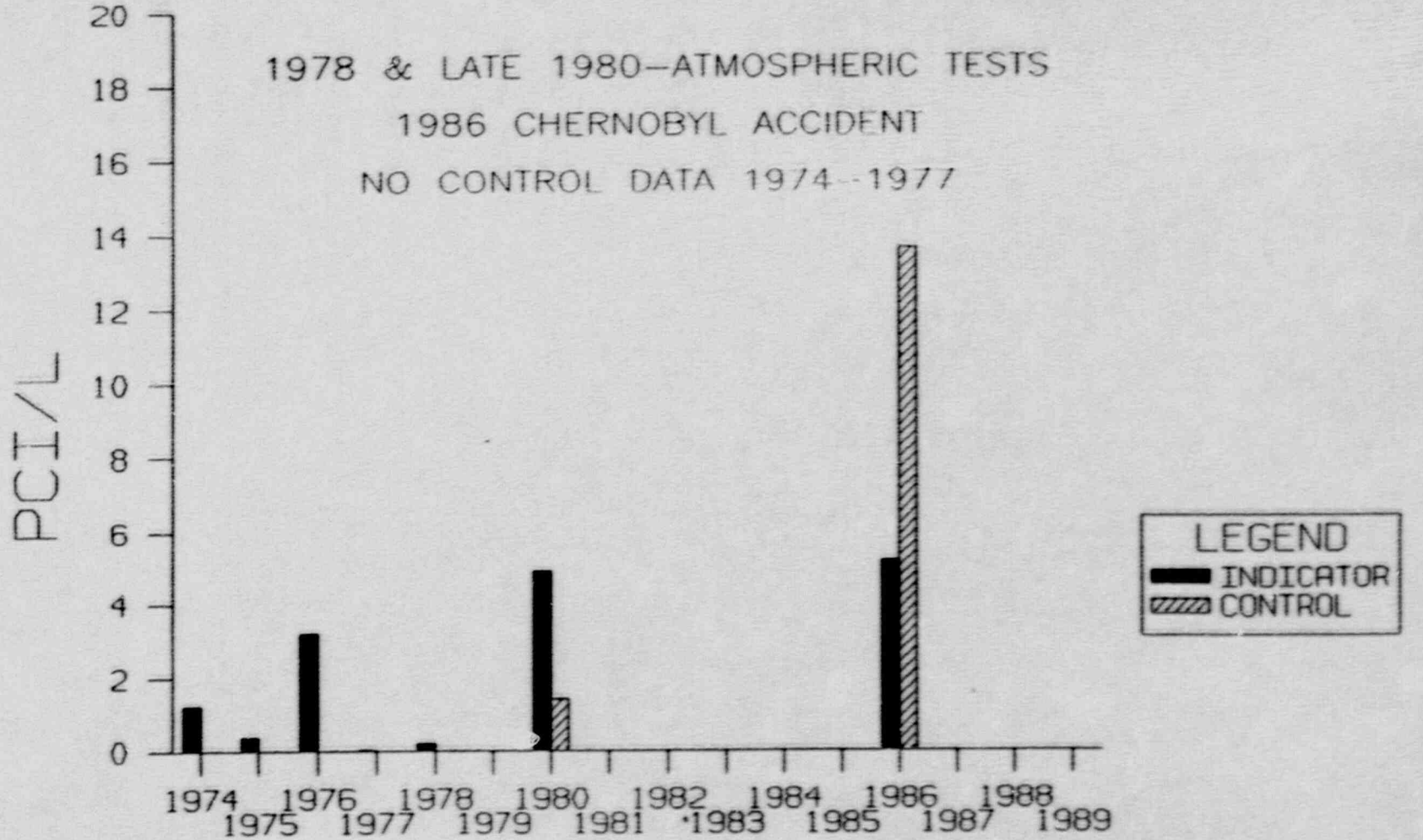
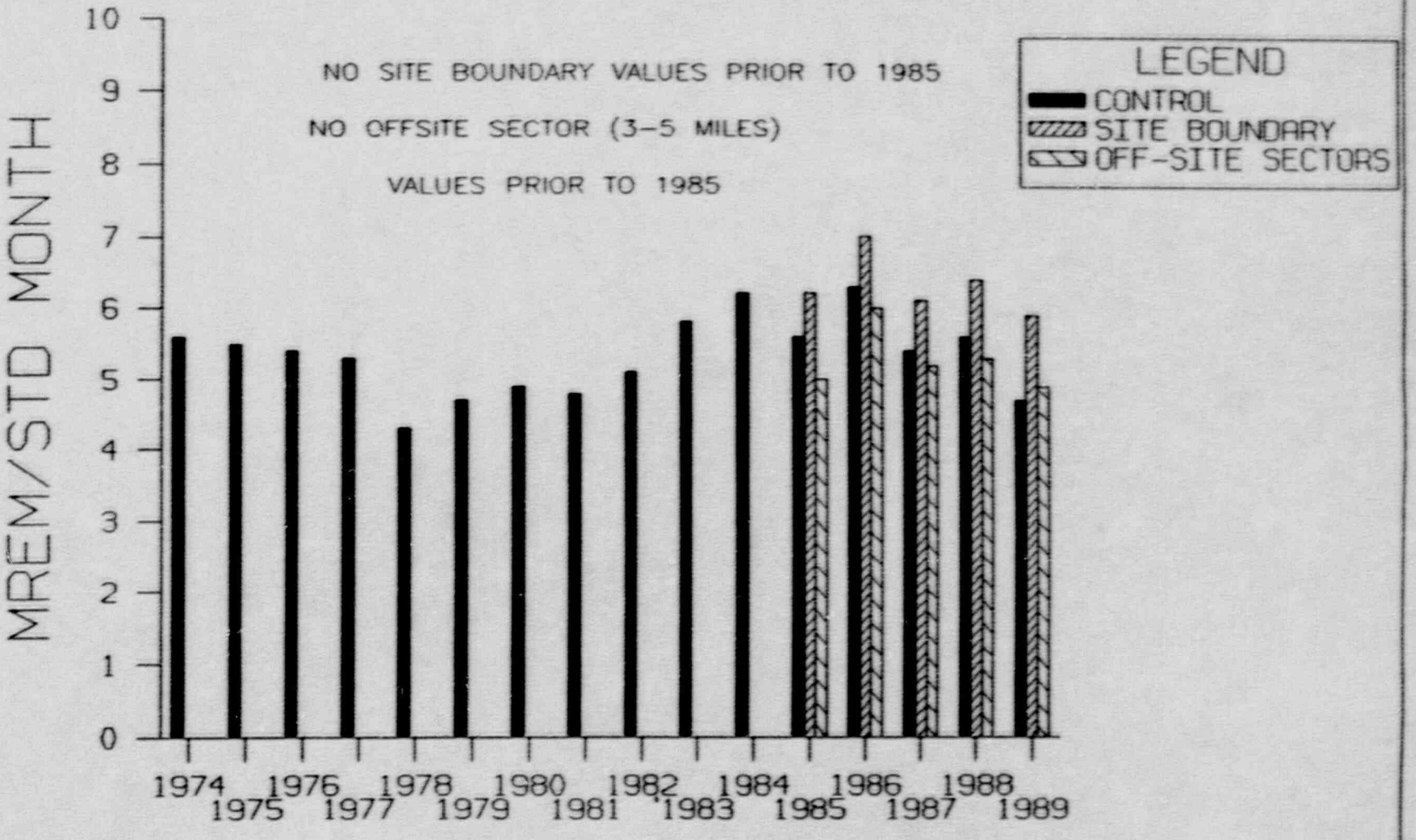


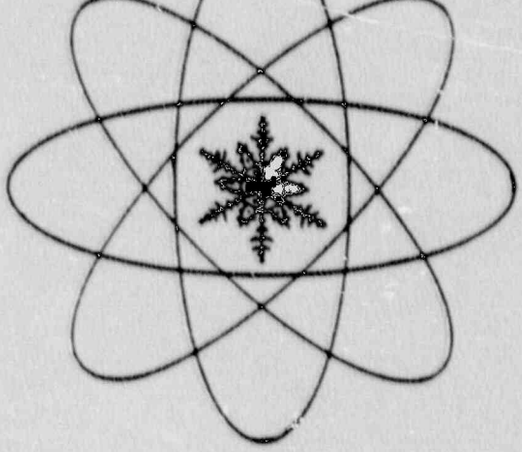
FIGURE 16

JAMES A. FITZPATRICK N.P.P.

TLD DATA



VIII



USEPA ENVIRONMENTAL RADIOACTIVITY

LABORATORY INTERCOMPARISON STUDY PROGRAM

New York Power Authority

VIII SUMMARY OF USEPA

ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDIES PROGRAM RESULTS

This section includes results of JAF analyses compared to reference samples originating from the United States Environmental Protection Agency (USEPA). As required by the Technical specifications, participation in this program includes media for which environmental samples are routinely collected.

All intercomparison data is summarized in table form. The tables are titled "USEPA Environmental Radioactivity Laboratory Intercomparison Study Program".

The USEPA reports interlaboratory results in terms of normalized deviations from a known value (NDKV). Interlaboratory results are considered acceptable by the EPA if the laboratory's NDKV for a sample is between plus 3 and minus 3. For example, the NDKV for QA 89-031 is 0.58. Since this value is less than plus 3 but greater than minus 3, the EPA considers this value acceptable. The laboratories's performance was acceptable: results within 3 normalized deviations were obtained for 38 of 39 analysis.

NONCONFORMITIES

QA-89-009 The JAF Laboratory gamma in water results for Ru-106 was outside the acceptance bounds for the NDKV. The efficiency calibration for Ru-106 was evaluated and found to be correct. A review of the analytical results showed no discrepancies in the analysis. The other five radionuclides measured in this sample, were within one standard deviation from the known, indicating that there is no systematic error. The sample was re-analyzed using new calibration factors. The re-analysis results were consistent with the original results. No cause for the conformity was determined. The Ru-106 results for QA-89-058 (6/89) which was a similar sample were acceptable.

TABLE VIII-1

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

Gross Beta Analysis of Air Particulate Filters (pCi/filter)
Gross Beta Analysis of Water (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
03/89	QA 89-031	APF	BETA	61±2 (3) 60±2 60±2	62±5	-0.58
04/89	QA 89-032	WATER	BETA	50±2 (3) 52±3 48±2	57±5	-2.42
05/89	QA 89-047	WATER	BETA	51±3 (3) 47±3 48±3	50±5	-0.46
08/89	QA 89-090	APF	BETA	(6)	(6)	(6)
09/89	QA 89-105	WATER	BETA	6±1 (3) 6±1 5±1	6±5	-0.12
10/89	QA 89-129	WATER	BETA	32±1 (3) 30±1 31±1	32±5	-0.35

TABLE VIII-2

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

TRITIUM ANALYSIS OF WATER (pCi/LITER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
02/89	QA 89-012	WATER	H-3	3066±140(3) 3181±141 3154±141	2754±356	1.85
				3300±100(4) 2900±100 2800±100	2754±356	1.20
06/89	QA 89-063	WATER	H-3	4961±155(3) 5036±156 5013±155	4503±450	1.93
				4300±100(4) 4400±100 4300±100	4053±450	-0.64
10/89	QA 89-119	WATER	H-3	3678±149(3) 3335±146 3549±148	3496±364	0.12
				3500±200(4) 3400±100 3400±100	3496±364	-0.30

TABLE VIII-3

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

Iodine Analysis of Water (pCi/liter) and Milk (pCi/liter)

DATE	ENV JAF ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
02/89	QA 89-011	WATER	I-131	107±5(3) 109±6 108±4	106±11	0.31
				94±20(4) 96±20 98±20	106±11	-1.58
08/89	QA 89-082	WATER	I-131	87±1(3) 88±3 90±3	83±8	1.15
				83±1(4) 80±3 75±3	83±8	-0.79

TABLE VIII-4

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER) AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
02/89	QA 89-009	WATER	Cr-51	216±18(3) 225±35 225±27	235±24	-0.94
			Co-60	10±1(3) 10±3 9±3	10±5	-0.12
			Zn-65	149±6(3) 154±11 151±12	159±16	-0.83
			Ru-106	143±16(3) 143±24 137±24	178±18	-3.56
			Cs-134	8±1(3) 9±2 10±2	10±5	-0.35
			Cs-137	9±2(3) 10±3 8±2	10±5	-0.35
03/89	QA 89-031	APF	Cs-137	27±5(3) 26±6 26±6	20±5	2.19
04/89	QA 89-032	WATER	Cs-134	18±2(3) 16±4 18±4	20±5	-0.92
			Cs-137	19±4(3) 19±4 20±5	20±5	-0.23

TABLE VIII-4 (CONTINUED)

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER) AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
04/89	QA 89-033	MILK	Cs-137	50±8(3) 50±8 49±9	50±5	-0.12
06/89	QA 89-058	WATER	Co-60	34±4(3) 33±2 29±4	31±5	0.35
			Zn-65	172±6(3) 198±14 175±13	165±17	1.70
			Ru-106	127±17(3) 127±28 122±27	128±13	-0.36
			Cs-134	37±2(3) 38±4 37±4	39±5	-0.58
			Cs-137	18±2(3) 20±4 22±3	20±5	0.00
08/89	QA 89-090	APF	Cs-137	10±4(3) 12±4 11±5	10±5	0.35

TABLE VIII-4 (CONTINUED)

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER) AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
10/89	QA 89-106	WATER	Ba-133	64±6(3) 55±6 58±7	59±5	0.00
			Co-60	28±5(3) 29±5 32±5	30±5	-0.12
			Zn-65	134±15(3) 136±14 135±16	129±13	0.80
			Ru-106	138±32(3) 138±36 155±43	161±16	-1.88
			Cs-134	26±4(3) 26±4 26±5	29±5	-1.15
			Cs-137	59±6(3) 59±6 60±6	59±5	0.12

TABLE VIII-4 (CONTINUED)

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER) AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	NUCLIDE	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
10/89	QA 89-129	WATER	Cs-134	5±2 (3) 4±2 5±2	5±5	-0.12
			Cs-137	5±1 (3) 4±2 5±2	5±5	-0.12

(1) - RESULTS REPORTED AS ACTIVITY ± THE ERROR (2 SIGMA).

(2) - RESULTS REPORTED AS ACTIVITY ± THE STANDARD DEVIATION OF THE ERROR.

(3) - ANALYZED AT THE SITE ENVIRONMENTAL LABORATORY.

(4) - ANALYZED AT A VENDOR LABORATORY.

(5) - NDKV IS THE NORMALIZED DEVIATION FROM KNOWN VALUE AS DETERMINED BY THE EPA. VALUES WITHIN THE RANGE OF +3 AND -3 INDICATE ACCEPTABLE RESULTS.

(6) - INTERCOMPARISON STUDY ON THIS SAMPLE WAS DETERMINED TO BE INVALID BY THE USEPA DUE TO A PROBLEM WITH THE I-131 WHICH WAS DEPOSITED ON THE FILTER.