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Nuclear Power Plant
P.O. Box 41
Lycoming, New York 13093

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NewYork Power Authority

Michael J. Colomb
Site Executive Officer

April 27, 2000
JAFP-00-0100

United States Nuclear Regulatory Commission
Region 1
457 Allendale Road
King of Prussia, PA 19406

Attention: Hubert J. Miller
Regional Administrator

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

Gentlemen:

Enclosed please find the 1999 Radiological Environmental Operating Report which covers the operating period of January 1, 1999 through December 31, 1999. This report is submitted in accordance with the requirements of Amendment 93, Section 7.3.d of the James A. FitzPatrick Nuclear Power Plant Technical Specifications. Distribution for this report is in accordance with the Regulatory Guide 10.1, Revision 4.

Very truly yours,

MICHAEL J. COLOMB

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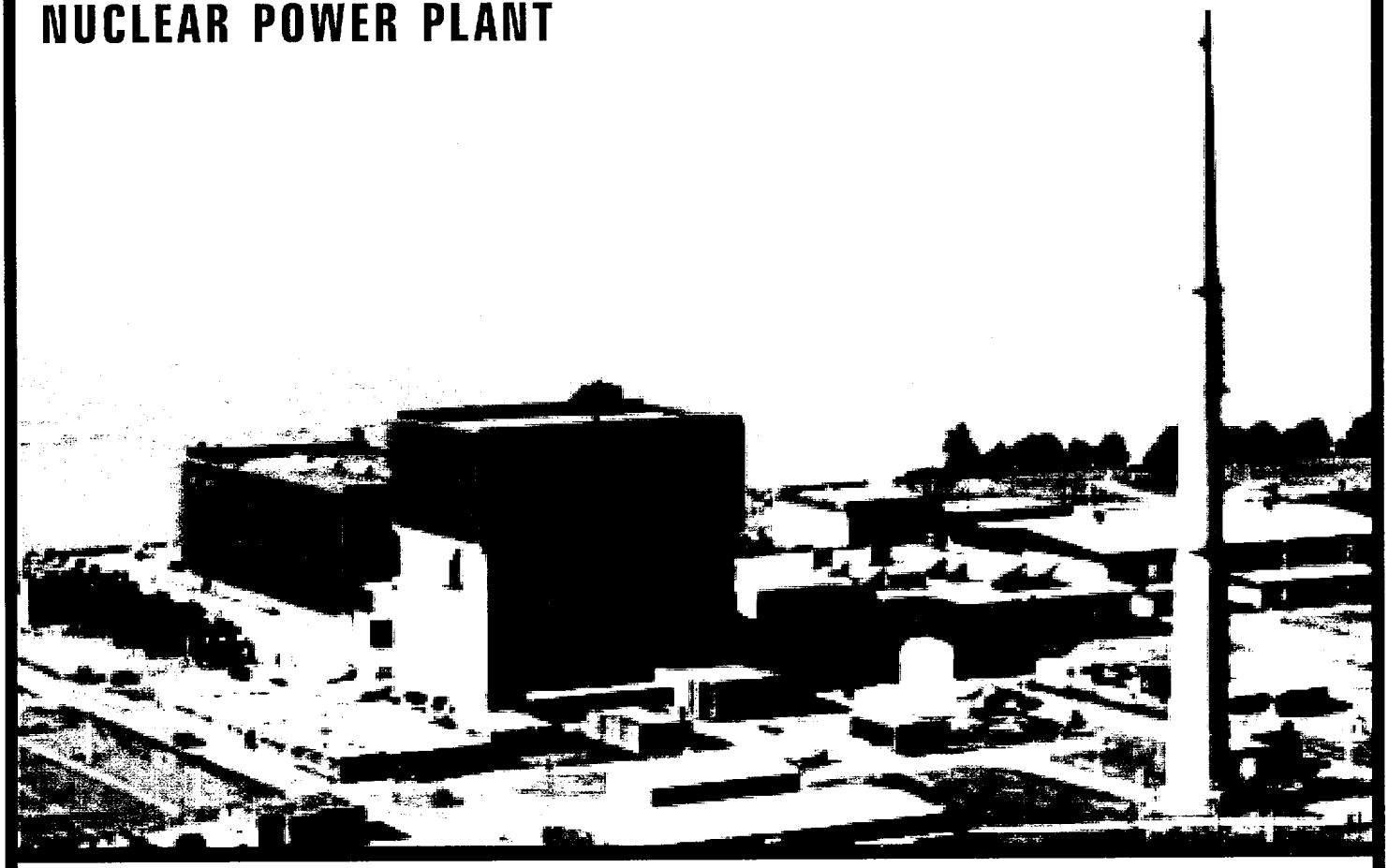
JAMES A. FITZPATRICK
NUCLEAR POWER PLANT



1999
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

New York Power Authority

NEW YORK POWER AUTHORITY

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1, 1999 - DECEMBER 31, 1999

FOR

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

FACILITY OPERATING LICENSE DPR-59

DOCKET NUMBER 50-333

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1.0 EXECUTIVE SUMMARY

The Annual Radiological Environmental Operating Report is published pursuant to Section 7.3.d of the Radiological Effluent Technical Specifications (RETS). The RETS require that the results from the Annual Radiological Environmental Monitoring Program (REMP) be provided to the Nuclear Regulatory Commission.

This report describes the REMP program and its implementation as required by Technical Specifications. It also contains the analytical results, data evaluation, dose assessment, and data trends for each environmental sample media. Also included are results of the land use census, historical data and the Environmental Laboratory's performance in the Quality Assurance Intercomparison Program required by Technical Specifications.

The REMP is implemented to measure radioactivity in the aquatic and the terrestrial pathways. The aquatic pathways include Lake Ontario fish, surface water, and lakeshore sediment. Measurement results of the samples representing these pathways contained naturally occurring background radionuclides and in some sample media, very small concentrations of Cs-137, which are the result of past atmospheric nuclear testing. The 1999 results were consistent with the previous five year historical data.

Terrestrial pathways are monitored and included airborne particulate and radioiodine, milk, food products and direct radiation. Analysis of all terrestrial radiation pathways demonstrated that there has been no detectable increased radiation levels as a result of plant operation. Again, the 1999 results are consistent with the previous five year historical results and exhibit no adverse trends.

In summary, the analytical results from the 1999 Environmental Monitoring Program demonstrate that the routine operation of the James A. FitzPatrick Nuclear Power Plant had no significant or measurable radiological impact on the environment. No elevated radiation levels were detected in the off-site environment as a result of the hydrogen injection rates implemented at the plant during 1999 or from the processing and storage of radioactive waste at the site. The measured concentrations of radionuclides in the off-site environment surrounding the JAFNPP are not increasing as a result of plant operation. The 1999 report continues to document a downward trend or stabilization in the concentration of radionuclides in the environment created from past weapons testing. The results of the program continue to demonstrate that the operation of the plant did not result in a measurable dose of any significance to the general population, above natural background levels or adversely impact the environment as a result of radiological effluents.

2.0 INTRODUCTION

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

2.1 PROGRAM HISTORY

Environmental monitoring of the Nine Mile Point site by various state and private utilities has been on-going since 1964, five years prior to any reactor operations. In 1968, the Niagara Mohawk Power Company began the required preoperational environmental site testing program. This pre-operational data serves as a reference point to compare later data obtained during reactor operation. In 1969, the Nine Mile Point Unit 1 reactor, a 620 Megawatt Boiling Water Reactor (BWR) began full power operation. In 1975, the James A. FitzPatrick Nuclear Power Plant, owned and operated by the New York Power Authority, began full power operation. This 870 Megawatt (Rated) BWR occupies the east sector of the Nine Mile Point site, approximately 1/2 mile from Nine Mile Point Unit 1. In 1985, the individual station Effluent Technical Specifications were standardized to the current Radiological Effluent Technical Specifications, much of which is common to both plants. Data generated by the Radiological Environmental Program is shared, but each utility reviews and publishes their own annual report. In 1988, The Nine Mile Point Unit 2 reactor, also owned and operated by Niagara Mohawk, began full power operation. This 1100 Megawatt BWR is located between Unit 1 and FitzPatrick.

In summary, three Boiling Water Reactors, which generate 2530 Megawatts, have operated collectively at the Nine Mile site since 1988. A large data base of environmental results from the exposure pathways have been collected and analyzed to determine the effect from reactor operations.

2.2 SITE DESCRIPTION

The Nine Mile Point site is located on the southeastern shore of Lake Ontario approximately seven miles east of the Oswego River and the City of Oswego. Syracuse, the nearest metropolitan area, is located 36 miles to the south. The reactors and support buildings occupy a small shoreline portion of the 700 acre site, which is partially wooded. The land, soil of glacial deposits, rises gently from the lake in all directions. Oswego County is a rural environment, with about 34% of the land devoted to agriculture.

2.3 PROGRAM OBJECTIVES

The objectives of the Radiological Environmental Monitoring Program are to:

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

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

3. Demonstrate compliance with the various environmental conditions and requirements of applicable state and federal regulatory agencies including Technical Specifications and 40 CFR Part 190.

4. Provide information by which the general public can evaluate the environmental aspects of nuclear power using unbiased data.

5. Satisfy the community interest regarding the impact of the power plants on the environment.

3.0 PROGRAM DESCRIPTION

To achieve the objectives listed in Section 2.3, an extensive sampling and analysis program is conducted every year. The JAFNPP Radiological Environmental Monitoring Program (REMP) consists of sampling and analysis of various media that include:

- Shoreline Sediment
- Fish
- Surface Waters
- Air
- Milk
- Food Products

In addition, direct radiation measurements are performed using thermoluminescent dosimeters (TLDs). These sampling programs are outlined in Table 3.0-1. The JAFNPP REMP sampling locations are selected and verified by an annual land use census. The accuracy and precision of the program is assured by participation in an Interlaboratory Comparison Quality Assurance Program (ICP). In addition to the participation in the ICP Program, quarterly sample splits are provided to the New York State Department of Health for cross checking purposes.

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 Stations. The site staff is assisted by a contracted environmental engineering company, EA Engineering, Science and Technology, Inc. (EA).

TABLE 3.0-1

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS

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 I-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 3.0-1 (Continued)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS

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 milk 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 milk 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 milk 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 milk animals are on pasture (April through December); monthly (January through March), if required[c].

TABLE 3.0-1 (Continued)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

REQUIRED SAMPLE COLLECTION AND ANALYSIS

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 commerically 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 cenus 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 3.0-1

(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 thorium 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.

NOTES FOR TABLE 3.0-1 (Continued)

(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 at 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 reasonably and reliably be obtained based on communications with the farmer.

3.1 SAMPLE COLLECTION METHODOLOGY

3.1.1 SURFACE WATER

Surface water samples are taken from the respective inlet canals of the JAFNPP and the Niagara Mohawk Oswego Steam Station (OSS) located in the City of Oswego. The FitzPatrick Facility draws water from Lake Ontario on a continuous basis. This is used for the "down-current" or indicator 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 its location relative to prevailing lake current directions and flow pattern of the nearby Oswego River.

Samples from the JAFNPP are composited using automatic sampling equipment which discharges into a compositing tank or bottles. Samples are collected monthly from the compositor and analyzed for gamma emitting radionuclides. Samples from the OSS are also obtained using automatic sampling equipment and collected in a holding tank. Representative samples from this location are obtained weekly and are composited to form a monthly composite sample. The monthly samples are analyzed for gamma emitting radionuclides.

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

In addition to the sample results for the JAFNPP and Oswego Steam Station collection sites, data is presented for the Nine Mile Point Unit 1 and Unit 2 facility inlet canal samples and for samples from the City of Oswego drinking water supply. The latter three locations are not required by the Technical Specifications. These locations are optional sample points which are collected and analyzed to enhance the surface water sampling program. 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 3.3 on Figure 3.3-4.

3.1.2 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. The sampling stations are sited within a distance of 0.2 miles of the site boundary in sectors with the highest calculated meteorological deposition factors (D/Q) based on historical meteorological 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 NMPNS 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) based on historical meteorological data. This station is located in the southeast sector at a distance of 1.8 miles and is designated as location R-4. A fifth station required by the RETS is a control location, designated as station R-5. Station R-5 is located 16.4 miles from the site in the east northeast meteorological sector.

In addition to the RETS required locations, there are ten additional sampling stations. Six of these sampling stations are located within the site boundary and are designated as on-site stations D1, G, H, I, J, and K. These locations are within the site boundary of the JAFNPP and NMPNS. One air sampling station is located off-site in the southwest sector in the vicinity of the City of Oswego and is designated as station G off-site. Three remaining air sampling stations are located in the ESE, SSE, and S sectors and range in distance from 7.2 to 9.0 miles. These are designated as off-site stations D2, E and F respectively.

Each station collects airborne particulates using glass fiber filters (47 millimeter diameter) and radioiodine using 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 on each particulate filter. Charcoal cartridges are analyzed for radioiodine using gamma spectral analysis.

The particulate filters are composited monthly by location and analyzed for gamma emitting radionuclides.

Air sampling stations are shown in Section 3.3, Figures 3.3-2 and 3.3-3.

3.1.3 MILK

Milk samples are routinely collected from six farms during the year. These farms included five indicator locations and one control location. Samples are collected twice per month, April through December and each sample is analyzed for gamma emitting radionuclides and I-131. Samples are collected in January, February and March in the event that I-131 is detected in November and December of the preceding year.

The selection of milk sample locations is based on maximum deposition calculations (D/Q). Deposition values are generated using average historical meteorological data for the site. The Technical Specifications require three sample locations within 5.0 miles of the site with the highest calculated deposition value. During 1999 there were no milk sample locations within 5.0 miles that were suitable for sampling based on production capabilities. There were however, five optional locations beyond five miles that were sampled as indicator location for the routine milk sampling program.

The Technical Specifications also require that a sample be collected from a location greater than ten miles from the site and in a less prevalent wind direction. This location is in the southwest sector and serves as the control location.

Milk samples are collected in polyethylene bottles from a bulk storage tank at each sampled farm. Before the sample is drawn, the tank contents are agitated to assure a homogenous mixture of milk and butterfat. Two gallons are collected from each indicator and control location during the first half and second half of each month. The samples are chilled, preserved and shipped fresh to the analytical laboratory within thirty-six hours of collection in insulated shipping containers.

The milk sample locations are found in Section 3.3 in Figure 3.3-4. (Refer to Table 3.3-1, Section 3.3 for location designations and descriptions).

3.1.4 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 in the annual census that have the highest estimated deposition values (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 less 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 3.3 on Figure 3.3-5.

3.1.5 FISH SAMPLES

Samples of available fish species are selected from the Nine Mile Point Aquatic Ecology Study which monitors lake fish populations. Fish samples are collected twice per year, once in the spring and again in the fall. Indicator samples are collected from a combination of the four on-site sample transects located off shore from the site. One set of control samples are at an off-site sample transect located off shore 8 - 10 miles west of the site. Available species are selected using the following guidelines:

a) Samples are composed of 0.5 to 1 kilogram of the edible portion only. Maximum of three species per location are used.

b) Samples composed of more than 1 kilogram of a 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. Sample weights include only the edible portions.

c) Samples are limited to edible and or sport species when available.

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 3.3 on Figure 3.3 -5.

3.1.6 SHORELINE SEDIMENTS

One kilogram of shoreline sediment is collected at one area of existing or potential recreational value. One sample is also collected from a location 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 to the lab for analysis. Sediment samples are analyzed for gamma emitting radionuclides.

Shoreline sediment locations are shown in Section 3.3 on Figure 3.3-5.

3.1.7 TLD (DIRECT RADIATION)

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. TLDs are supplied and processed quarterly by the J.A. FitzPatrick N.P.P. Environmental Laboratory. The laboratory utilizes a Panasonic based system using UD-814 dosimeters. Each dosimeter contains three calcium sulfate elements and one lithium borate element. Two dosimeters are placed at each monitoring location.

Five different regions around the site are evaluated using environmental TLDs.

- 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 the eight land based meteorological sectors)
- o Special interest TLDs (located at sites of high population density and use)

- 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 nearby 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 for the program are constructed of rectangular teflon wafers impregnated with 25 percent $CaSO_4$:Dy phosphor. Badges are sealed in polyethylene packages to ensure dosimeter integrity. TLD packages are placed in open webbed plastic holders and attached to supporting structures, such as utility poles.

Environmental TLD locations are shown in Section 3.3 on Figures 3.3-2 and 3.3-3.

3.2 ANALYSES PERFORMED

The majority of environmental sample analyses are performed by the James A. FitzPatrick Environmental Laboratory (JAFEL). Tritium and surface water I-131 analysis were performed by Teledyne Brown Engineering Environmental Services. The following samples are analyzed at the JAFEL:

- Air Particulate Filter - gross beta
- Air Particulate Filter Composites - gamma spectral analysis
- Airborne Radioiodine - gamma spectral analysis
- Surface Water Monthly Composites - gamma spectral analysis
- Fish - gamma spectral analysis
- Shoreline Sediment - gamma spectral analysis
- Milk - gamma spectral analysis and I-131
- Direct Radiation - Thermoluminescent Dosimeters (TLDs)
- Special Samples (soil, food products, bottom sediment, etc.) - gamma spectral analysis

Quality assurance samples are analyzed in-house and by Teledyne Brown Engineering N.J. and Teledyne Brown Engineering Midwest.

3.3 SAMPLE LOCATION MAPS

Section 3.3 includes maps illustrating sample locations. Sample locations referenced as letters and numbers on the report period data tables are consistent with designations plotted on the maps.

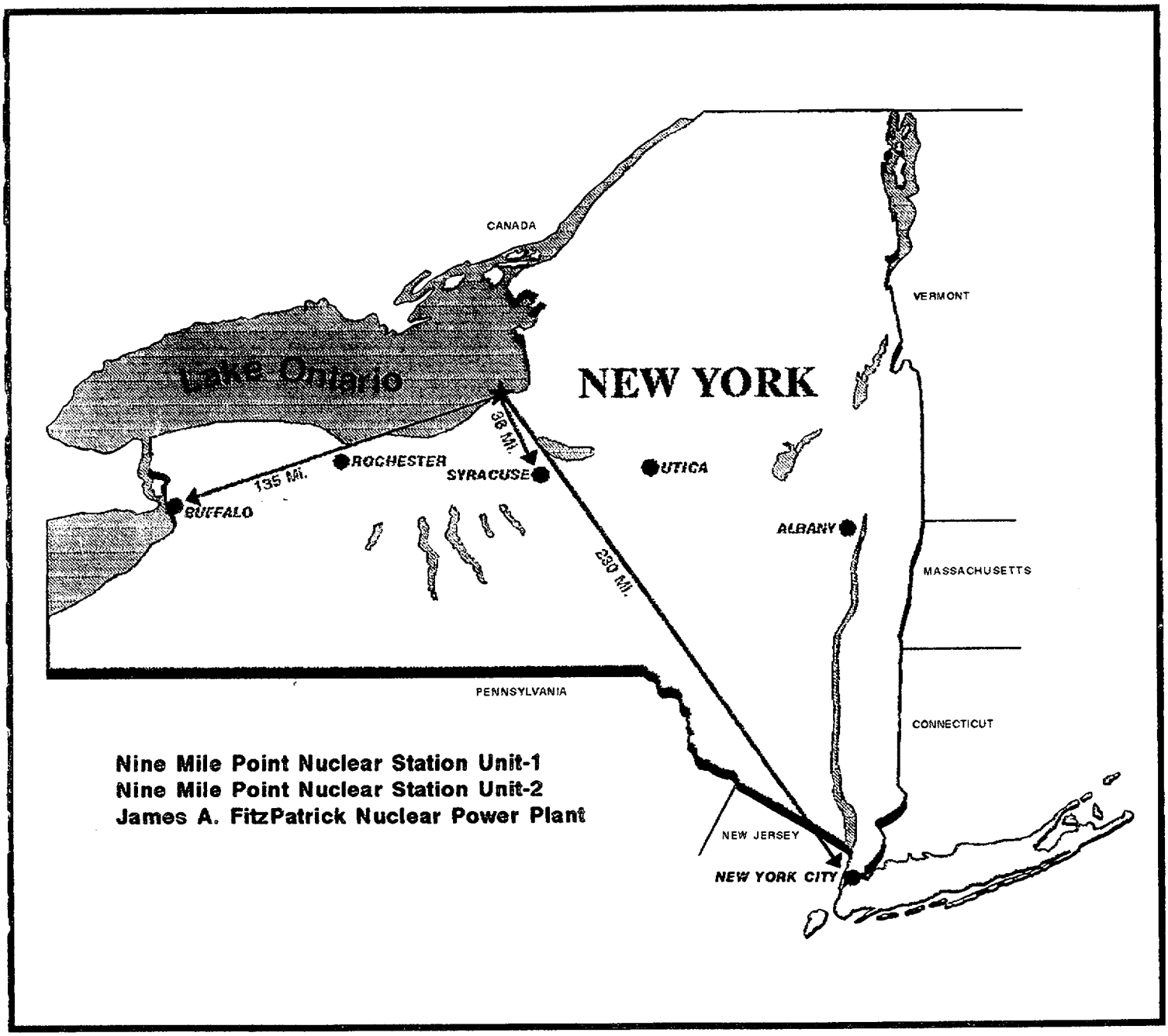
This section also contains an environmental sample location reference table (Table 3.3-1). This table contains the following information:

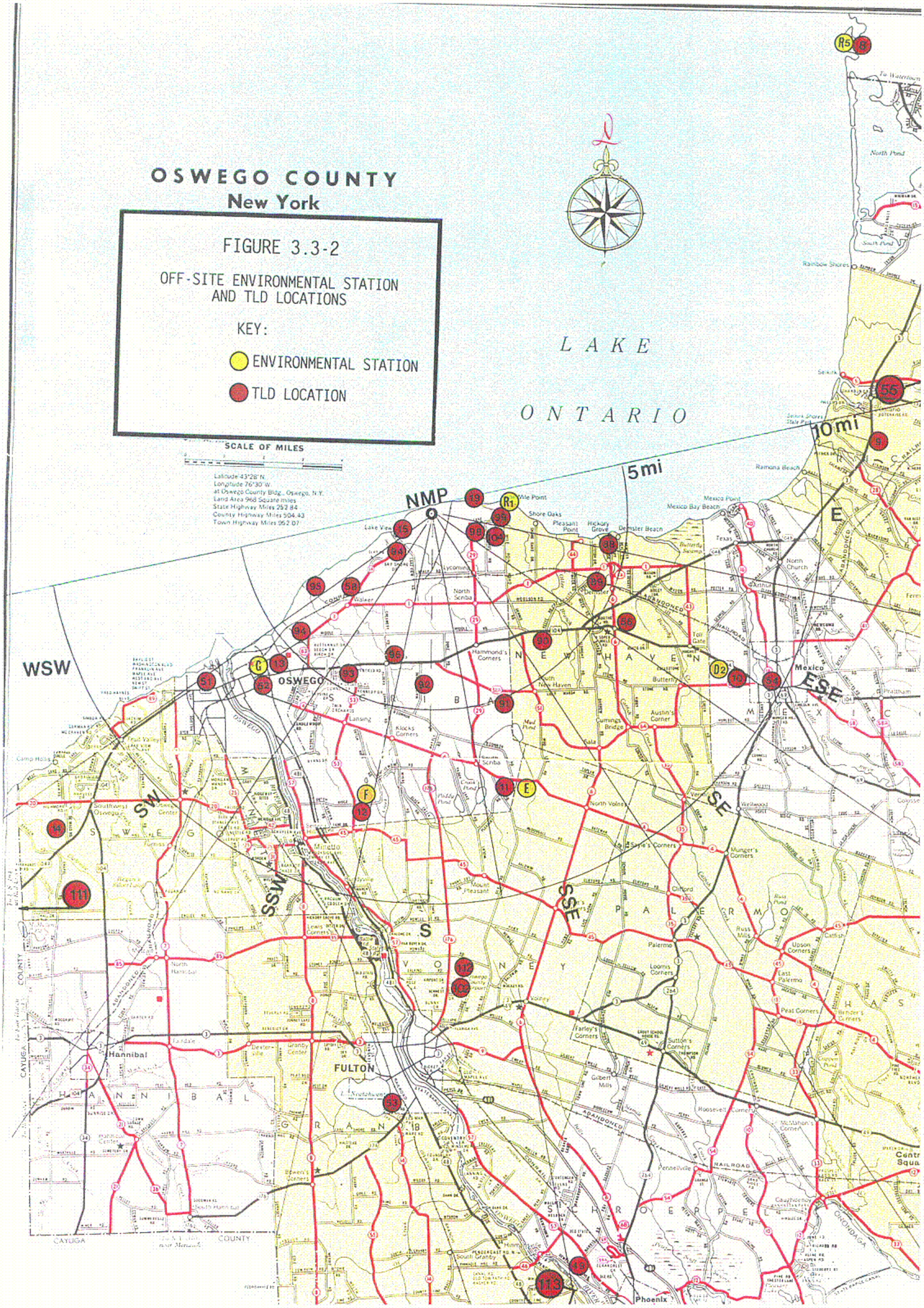
- Sample Medium
- Location designation, (this column contains the key for the sample location and is consistent with the designation on the sample location maps and on the sample results data tables).
- Location description
- Degrees and distance of the sample location from the site.

3.3.1 LIST OF FIGURES

- Figure 3.3-1 - New York State Map
- Figure 3.3-2 - Off-site Environmental Station and TLD Location Map
- Figure 3.3-3 - On-site Environmental Station and TLD Location Map
- Figure 3.3-4 - Milk Animal Census, Milk Sample Location and Surface Water Sample Location Map
- Figure 3.3-5 - Nearest Resident, Food Product, Shoreline Sediment, Fish Sample Location Map

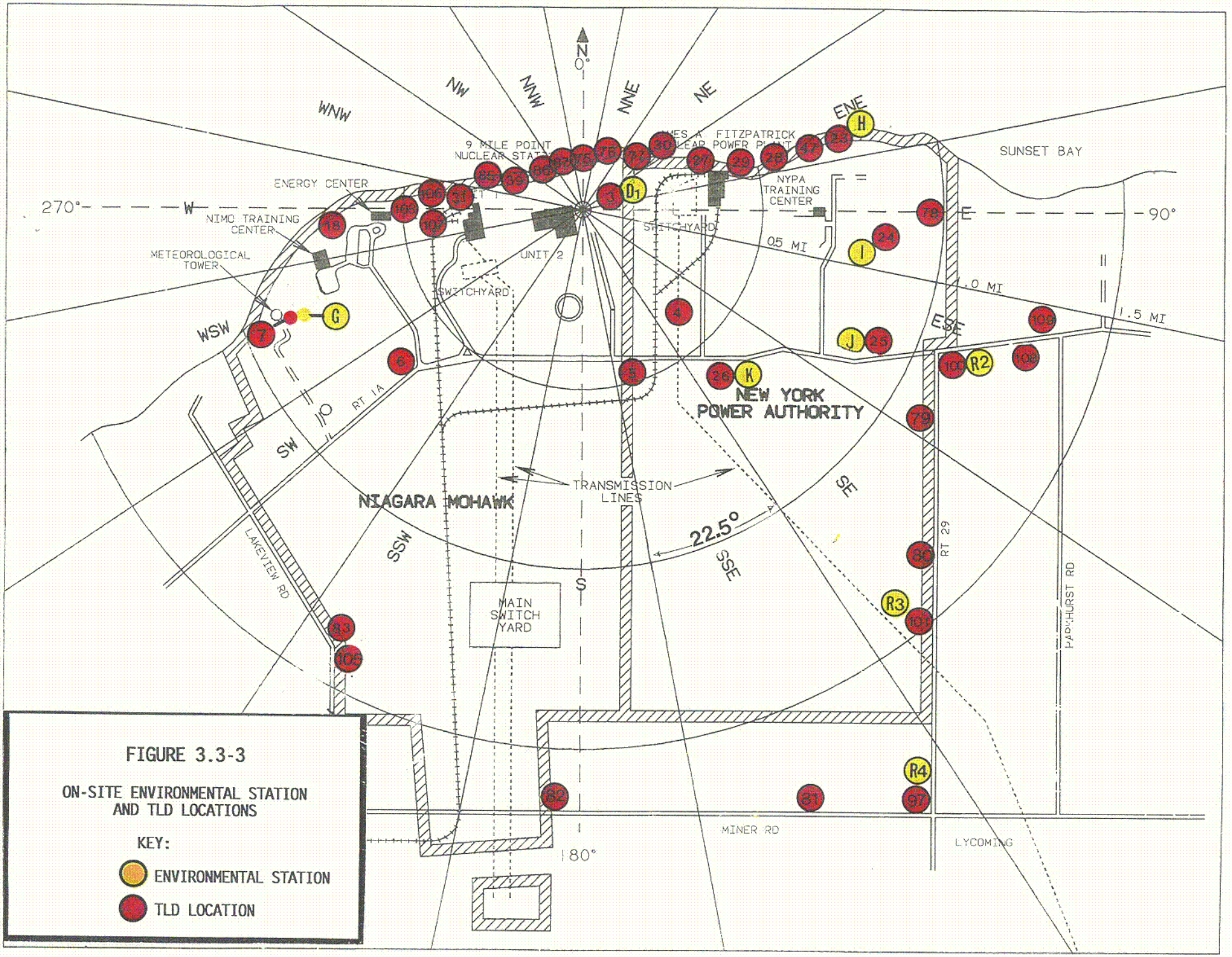
FIGURE 3.3-1
NEW YORK STATE MAP





OSWEGO COUNTY
New York
FIGURE 3.3-2
OFF-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS
KEY:
ENVIRONMENTAL STATION
TLD LOCATION
SCALE OF MILES
LAKE ONTARIO
NMP
5mi
10mi
WSW
SW
SSW
S
SSE
SE
ESE
E
OSWEGO
FULTON
Mexico
Hannibal
Phoenix

C-1


N
0°
NW
NNW
NNE
NE
ENE
WNW
W
270°
E
90°
WSW
SW
SSW
S
SSE
SE
22.5°
9 MILE POINT NUCLEAR STATION
JAMES A FITZPATRICK NUCLEAR POWER PLANT
SUNSET BAY
ENERGY CENTER
NIMO TRAINING CENTER
METEOROLOGICAL TOWER
NYPA TRAINING CENTER
SWITCHYARD
UNIT 2
.05 MI
1.0 MI
1.5 MI
RT 1A
NEW YORK POWER AUTHORITY
NIAGARA MOHAWK
TRANSMISSION LINES
LAKEVIEW RD
MAIN SWITCH YARD
RT 29
PADDOCK RD
MINER RD
LYCOMING
180°
FIGURE 3.3-3
ON-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS
KEY:
ENVIRONMENTAL STATION
TLD LOCATION

C-2

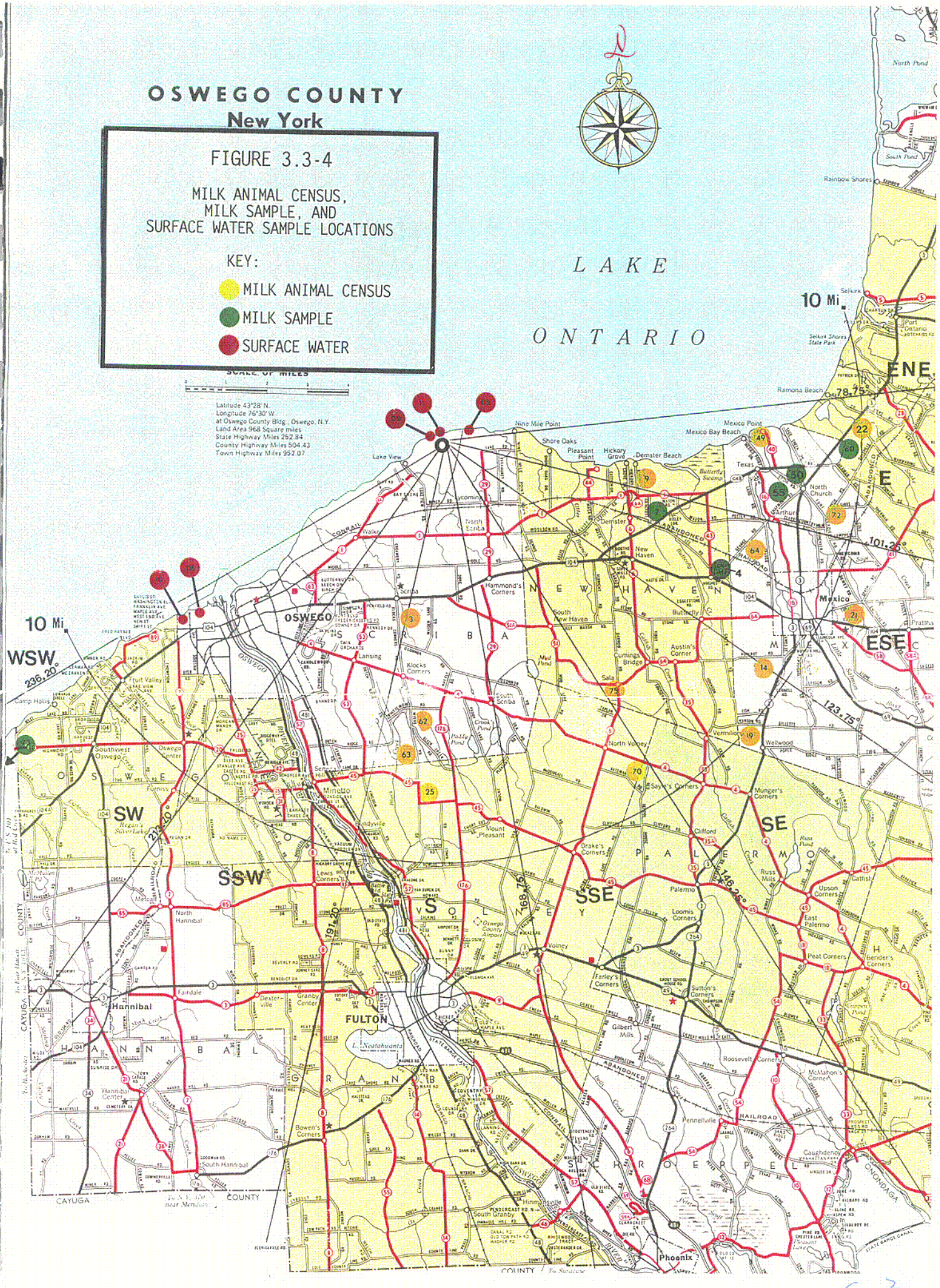
OSWEGO COUNTY
New York

FIGURE 3.3-4

MILK ANIMAL CENSUS,
MILK SAMPLE, AND
SURFACE WATER SAMPLE LOCATIONS

KEY:

- MILK ANIMAL CENSUS
- MILK SAMPLE
- SURFACE WATER



C-3

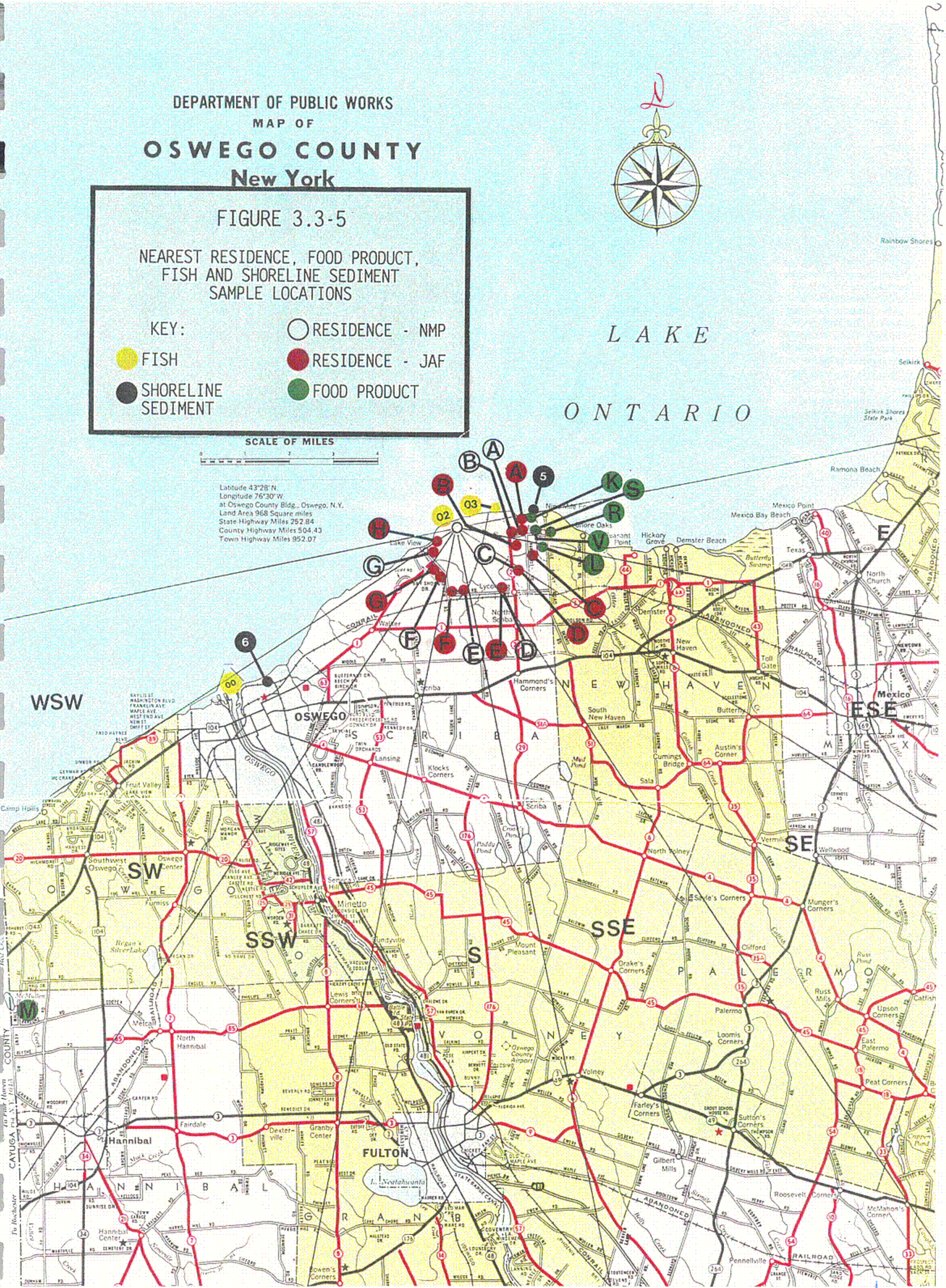

DEPARTMENT OF PUBLIC WORKS
MAP OF
OSWEGO COUNTY
New York
FIGURE 3.3-5
NEAREST RESIDENCE, FOOD PRODUCT, FISH AND SHORELINE SEDIMENT SAMPLE LOCATIONS
KEY:
FISH
SHORELINE SEDIMENT
RESIDENCE - NMP
RESIDENCE - JAF
FOOD PRODUCT
SCALE OF MILES
LAKE
ONTARIO
WSW
SW
SSW
S
SSE
SE
ESE
E
OSWEGO
FULTON
L-4

TABLE 3.3-1

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE (1)
Shoreline 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	302° at 0.3 miles
	10	Oswego City Water	235° at 7.8 miles
	11	Nine Mile Point Unit 2 Inlet	341° 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 On-site Station, On-site	69° at 1.5 miles
	D2	D2 Off-site Station, Co. Rt. 64	117° at 9.0 miles
	E	E Off-site Station, Co. Rt. 4	160° at 7.2 miles
	F	F Off-site Station, Dutch Ridge Rd.	190° at 7.7 miles
	G	G On-site Station, On-site	250° at 0.7 miles
	H	H On-site Station, On-site	70° at 0.8 miles
	I	I On-site Station, On-site	98° at 0.8 miles
	J	J On-site Station, On-site	110° at 0.9 miles
	K	K On-site Station, On-site	132° at 0.5 miles
	G	G Off-site Station, St. Paul St.	225° at 5.3 miles

* Technical Specification location

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

TABLE 3.3-1 (Continued)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE (1)
Thermo-Luminescent Dosimeters (TLDs)	3	D1 On-site Station	69° at 0.2 miles
	4	D2 On-site Station	140° at 0.4 miles
	5	E On-site Station	175° at 0.4 miles
	6	F On-site Station	210° at 0.5 miles
	7*	G On-site Station	250° at 0.7 miles
	8	R-5 Off-site Station	42° at 16.4 miles
	9	D1 Off-site Location	80° at 11.4 miles
	10	D2 Off-site Location	117° at 9.0 miles
	11	E Off-site Location	160° at 7.2 miles
	12	F Off-site Location	190° at 7.7 miles
	13	G Off-site 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 On-site Station, On-site	70° at 0.8 miles
	24	I On-site Station, On-site	98° at 0.8 miles
	25	J On-site Station, On-site	110° at 0.9 miles
	26	K On-site Station, On-site	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

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE 3.3-1 (Continued)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE (1)
Thermo-Luminescent Dosimeters (TLDs)	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
	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*	Co. Rt. 1 & 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

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE 3.3-1 (Continued)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE (1)
Thermo-Luminescent Dosimeters (TLDs)	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
	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
	111	Sterling-Control	214° at 21.8 miles
	112	Emergency Off-site Facility Env. Lab	179° at 11.9 miles
	113	Baldwinsville-Control	170° at 24.7 miles
Cows Milk	7	Indicator Location	107° at 5.5 miles
	50	Indicator Location	93° at 9.1 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
	73*	Control Location	234° at 13.9 miles
Food Products	S	Indicator Location	98° at 1.7 miles
	K*	Indicator Location	90° at 1.7 miles
	L	Indicator Location	112° at 1.9 miles
	R*	Indicator Location	100° at 1.9 miles
	M*	Control Location	225° at 15.6 miles
	V	Indicator Location	98° at 1.8 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

3.4 LAND USE CENSUS

Technical Specifications require that a milch animal census and a residence census be conducted annually.

The milch 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 census is done once per year in the summer. It is conducted by sending questionnaires to previous milch animal owners, and 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 Oswego County Cooperative Extension Service was also contacted to provide any additional information.

The residence census is conducted each year to identify the closest residence in each of the 22.5 degree meteorological sectors out to a distance of five miles. A residence, for the purposes 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. Several of the site meteorological sectors are over Lake Ontario, therefore, there are only eight sectors over land where residences are located within five miles.

In addition to the milch animal and residence census, a garden census is performed. The census is conducted each year to identify the gardens near the site that are to be used for the collection of food product samples. The results of the garden census are not provided in this report. The results are used only to identify appropriate sample locations. The garden census is not required by the Technical Specifications if broadleaf vegetation sampling and analysis is performed.

3.5 CHANGES TO THE REMP PROGRAM

3.5.1 The following changes were implemented during the 1999 sampling program.

A. Food Product/Vegetation

The food product/vegetation sample locations are evaluated each sampling season based on meteorology and product availability. The following sample location changes were implemented in 1999:

- Garden vegetation/food products were collected from location V and S for the 1999 sampling program. These locations were sampled in the past and were utilized in 1999 due to the availability of samples at harvest time and the higher D/Q value relative to the site (ODCM Table H-1 Location No. 15 and 16).

- The sampling program did not utilize food product vegetation location P during 1999. This location was not sampled due to the general unavailability of samples and the higher D/Q values at locations V and S. No corrective actions were implemented, as garden availability is dependent on owner cooperation and seasonal growing conditions.

There were no changes to the program outlined by the plant Technical Specifications.

3.6 DEVIATION AND EXCEPTIONS TO THE PROGRAM

Exceptions to the 1999 sample program concern those samples or monitoring requirements which are required by the Technical Specifications. This section addresses the reporting requirements of Section 6.1.a of the RETS.

The following are deviations from the program specified by the Technical Specifications:

A. The Environmental Air Sampling Pump at Station R-3 was found to be not operating at the end of the one week sampling period. It was determined that the pump was inoperable for the period of 03/16/99 (1000 hrs.) through 03/23/99 (1000 hrs.). The failure was the result of the pump not being returned to service after a flow rate adjustment was made. As a corrective action, the governing Niagara Mohawk Power Corporation Procedure S-ENVSP-4.3 was revised to contain a step to ensure that the air sampling pump was returned to service following maintenance. This event was tracked under Deviation Event Report (DER) No. 99-01645.

No other sample downtime was observed during 1999 for any Technical Specification required air radioiodine and particulate sampling locations. Other occurrences of downtime for optional air sampling stations were documented for 1999. However, these occurrences were minimal and are not presented here as these sampling stations are not required by the Technical Specifications.

B. No other sample deviations were noted for the 1999 program.

3.7 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).

3.7.1 ESTIMATION OF THE MEAN AND STANDARD DEVIATION

The mean, ($\bar{X}$), and standard deviation, (s), were used in the reduction of the data generated by the sampling and analysis of the various media in the JAFNPP Radiological Environmental Monitoring Program (REMP). The following equations were utilized to compute the mean ($\bar{X}$) and the standard deviation (s):

A. Mean

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{N}$$

where,

$\bar{X}$ = estimate of the mean.
i = individual sample, i.
N, 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,

$\bar{X}$ = mean for the values of X

s = standard deviation for the sample population.

3.7.2 ESTIMATION OF THE MEAN AND THE ESTIMATED ERROR FOR THE MEAN

In accordance with program policy, two recounts of samples are performed when the initial count indicates the presence of a plant related radionuclide(s). 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 ($\bar{X}$) and the associated propagated error.

A. Mean

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{N}$$

where,

$\bar{X}$ = estimate of the mean.
i = individual sample, i.
N,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 (Reference 18)

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

where,

ERROR MEAN	= propagated error
i	= individual sample
ERROR	= 1 sigma* error of the individual analysis
N, n	= number of samples with positive indications

* Sigma (σ)

Sigma is the greek letter used to represent the mathematical term Standard Deviation. Standard Deviation is a measure of dispersion from the arithmetic mean of a set of numbers.

3.7.3 LOWER LIMIT OF DETECTION (LLD)

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

The LLDs are specified by the Technical Specifications for radionuclides in specific media and are determined by taking into account the overall measurement methods. The equation used to calculate the LLD is:

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

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 disintegration);

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

2.22 is the number of disintegrations 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.

The RETS LLD formula assumes that:

- The counting times for the sample and background are equal.

- The count rate of the background is approximately equal to the count rate of the sample.

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 3.8-1 lists the RETS program required LLDs for specific media and radionuclides as specified by the NRC. The LLDs actually achieved are routinely much lower than those specified by the RETS.

3.8 COMPLIANCE WITH REQUIRED LOWER LIMITS OF DETECTION (LLD)

Table 6.1-3 of the Radiological Effluent Technical Specification (RETS) specifies the detection capabilities for environmental sample analysis (see Report Table 3.8-1). Section 7.3.d of the RETS requires that a discussion of all analyses for which the required LLDs specified were not routinely achieved be included in the Annual Radiological Environmental Operating Report. Section 3.8 is provided pursuant to this requirement.

3.8.1 All sample analyses performed in 1999, required by the RETS, achieved the Lower Limit of Detection (LLD) specified by RETS Table 6.1-3.

TABLE 3.8-1

REQUIRED DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

LOWER LIMIT OF DETECTION (LLD)

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/l)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
gross beta	4	0.01				
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	15[(a)]	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.

4.0 SAMPLE SUMMARY TABLES IN BRANCH TECHNICAL POSITION FORMAT

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

Column

1 Sample medium.

2 Type and number of analyses performed.

3 Required Lower Limits of Detection (LLD), see Section 3.8, Table 3.8-1. This wording indicates that inclusive data is based on 4.66 s_b (sigma) of background (see Section 3.7).

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 3.3-1 in Section 3.3.

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.

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1999

Medium (Units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Mean (a) Designation Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Surface (Lake) Water (pCi/liter)	H-3 (8):	3000	233 (3/4) 180 - 270	No. 3 233 (3/4) 0.5 @ 70° 180 - 270	324 (2/4) 220 - 510	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 1999

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Mean (a) Designation 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	0.079 (2/2) 0.058 - 0.100	No. 5 0.079 (2/2) 1.5 @ 80° 0.058 - 0.100	<LLD	0
Fish (pCi/g-wet)	GSA (23):					
	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	0.020 (2/15) 0.018 - 0.021	No. 02 0.021 (1/7) 0.3 @ 315° 0.021 - 0.021	<LLD	0
Food Products (pCi/g-wet)	GSA (16):					
	I-131	0.06	<LLD	<LLD	<LLD	0
	Cs-134	0.06	<LLD	<LLD	<LLD	0
	Cs-137	0.08	0.007 (1/12) 0.007 - 0.007	No. L 0.007 (1/4) 1.9 @ 112° 0.007 - 0.007	<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 1999

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Milk (f) (pCi/liter)	GSA (108):						
	Cs-134	15	<LLD		<LLD	<LLD	0
	Cs-137	18	<LLD		<LLD	<LLD	0
	Ba/La-140	15	<LLD		<LLD	<LLD	0
	I-131(108):	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 1999

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Air Particulate and Radioiodine (d) (pCi/m^3)	G.B. (259):	0.01	0.017 (207/207) 0.009 - 0.039	R-2	0.018 (52/52) 1.1 @ 104° 0.011 - 0.039	0.017 (52/52) 0.010 - 0.032	0
	I-131(259):	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 (128):	N/A	5.2 (120/120) (c) 3.3 - 12.3	No. 85 0.2 @ 294°	10.0 (4/4) (e) 8.7 - 12.3	4.4 (8/8) 3.7 - 4.7	0

ANNUAL SUMMARY TABLE NOTES

* = Data for the Annual Summary Tables is based on RETS required samples only.

N/A = Not applicable.

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

(b) = Location is distance in miles, and direction in compass degrees. Location numbers keyed to Table 3.3-1 and results table location designation numbers.

(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, 15, 18, 56, and 58. Control TLDs are all TLDs located beyond the influence of the site (#14, 49).

(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 5.2.4, 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 the location D/Q values.

5.0 DATA EVALUATION AND DISCUSSION

A. Introduction

Each year the results of the Annual Radiological Environmental Monitoring Program are evaluated considering natural processes in the environment and the collection of past environmental radiological data. A number of factors are considered in the course of evaluating and interpreting the Annual Environmental Radiological Data. This interpretation can be made using several methods including trend analysis, population dose estimates, risk estimates to the general population based on significance of environmental concentrations, effectiveness of plant effluent controls and specific research areas. The report not only presents the data collected during the 1999 sample program but also assesses the significance of radionuclides detected in the environment. It is important to note that detection of a radionuclide is not, of itself, an indication of 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 any detection.

B. Units of Measure

Some of the units of measure used in this report are explained below.

Radioactivity is the number of atoms in a material that decay per unit of time. Each time an atom decays, radiation is emitted. The *curie* (Ci) is the unit used to describe the activity of a material and indicates the rate at which the atoms are decaying. One curie of activity indicates the decay of 37 billion atoms per second.

Smaller units of the curie are used in this report. Two common units are the *microcurie* (μCi), one millionth (0.000001) of a curie, and the *picocurie* (pCi), one trillionth (0.000000000001) of a curie. The picocurie is the unit of radiation that is routinely used in this report. The mass, or weight, of radioactive material which would result in one curie of activity depends on the disintegration rate or half life. For example, one gram of radium-226 contains one curie of activity, but it would require about 1.5 million grams of natural uranium to equal one curie. Radium-226 is more radioactive than natural uranium on a weight or mass basis.

C. Dose/Dose to Man

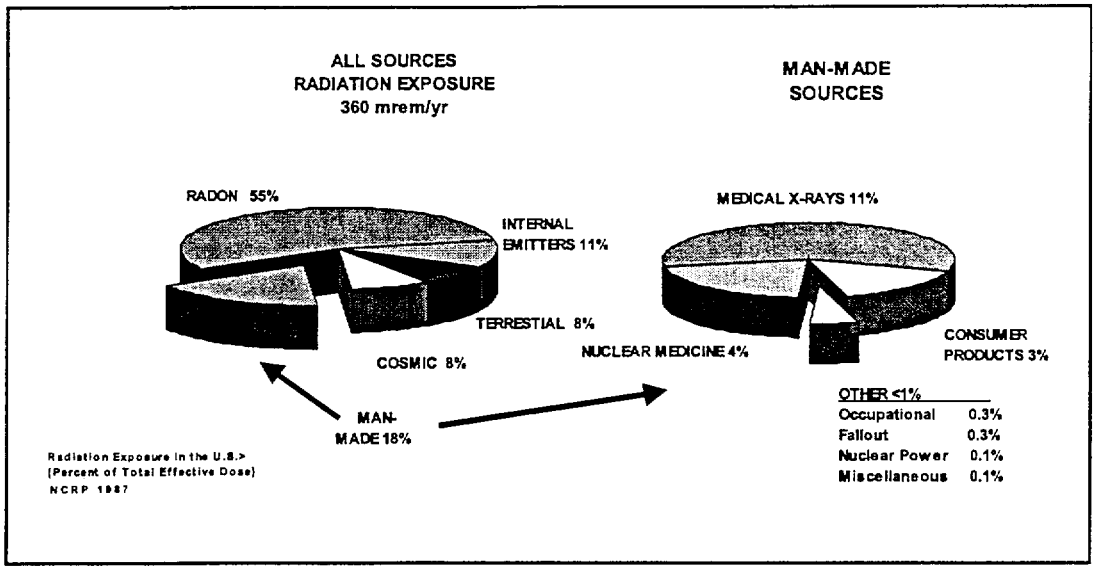
The dose or dose equivalent, simply put, is the amount of ionizing energy deposited or absorbed in living tissue. The amount of energy deposited or ionization caused is dependent on the type of radiation. For example, alpha radiation can cause dense localized ionization that can be up to 20 times the amount of ionization for the same energy imparted as from gamma or x-rays. Therefore, a quality factor must be applied to account for the different ionizing capabilities of various types of radiation. When the quality factor is multiplied by the absorbed dose, the result is the dose equivalent which is an estimate of the possible biological damage resulting from exposure to any type of ionizing radiation. The dose equivalent is measured in rem (roentgen equivalent man). In terms of environmental radiation, the rem is a large unit. Therefore, a smaller unit, the millirem (mrem) is often used. One millirem is equal to 0.001 of a rem.

The term "dose to man" refers to the dose or dose equivalent that is received by members of the general public at or beyond the site boundary. The dose is calculated based on measured concentrations of radioactive material measured in the environment. The primary pathways that contribute to the dose to man are the inhalation pathway, the ingestion pathway and direct radiation.

D. Discussion

There are four separate groups of radionuclides that were measured in the environment in the media analyzed for the 1999 sampling program. The first of these groups consists of those radionuclides that are naturally occurring. The environment contains a significant inventory of naturally occurring radioactive elements. The components of natural or background radiation include the decay of radioactive elements in the earth's crust, a steady stream of high-energy particles from space called cosmic radiation, naturally-occurring radioactive isotopes in the human body like potassium-40, medical procedures, man-made phosphate fertilizers (phosphates and uranium are often found together in nature), and even household items like televisions. In the United States, a person's average annual exposure from background radiation is 360 mrem, as illustrated on the following Background Radiation Chart.

Background Radiation



A number of radionuclides are present in the environment due to sources such as cosmic radiation and fallout from nuclear weapons testing. These radionuclides are expected to be present in many of the environmental samples collected in the vicinity of the Nine Mile Point Site. Some of the radionuclides normally present include:

- *tritium*, present as a result of the interaction of cosmic radiation with the upper atmosphere.
- *beryllium-7*, present as a result of the interaction of cosmic radiation with the upper atmosphere.
- *potassium-40, radium-226*, naturally occurring radionuclide found in the human body and throughout the environment, and
- *fallout radionuclides* from nuclear weapons testing, including cesium-137, strontium-89, and strontium-90.

Beryllium-7 and potassium-40 are especially common in REMP samples. Since they are naturally occurring and are abundant, positive results for these radionuclides are discussed in some cases in Section 5.0 of this report. The data on primary naturally occurring radionuclides are included in Section 6.0, Results Tables. Comparisons of program samples to natural background radiation are made throughout this section to help put program results into perspective and to aid the reader in determining what, if any, significant impact is demonstrated by the Radiological Environmental Monitoring Program (REMP) results.

The second group of radionuclides that were detected are a result of the detonation of thermonuclear devices in the earth's atmosphere. Atmospheric nuclear testing during the early 1950s produced a measurable inventory of radionuclides presently found in the lower atmosphere as well as in ecological systems. In 1963 an Atmospheric Test Ban Treaty was signed. Since the treaty, the global inventory of man made radioactivity in the environment has been greatly reduced through the decay of short lived radionuclides and the removal of radionuclides from the food chain by such natural 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. Although reduced in frequency, atmospheric testing continued into the 1980's. The resulting fallout or deposition from these most recent tests has influenced the background radiation in the vicinity of the site and was evident in many of the sample media analyzed over the years. The highest weapons testing concentrations were noted in samples collected for the 1981 Environmental Surveillance Program. Cs-137 was the major byproduct of this testing and is still detected in a number of environmental media.

A third group of radionuclides were 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 easily detected 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 presence of these radionuclides was a direct result of fallout from the Chernobyl accident.

The fourth group of radionuclides that may be detected in the environment are those that are related to nuclear power technology. These radionuclides are the byproduct of the operation of light water reactors. These byproduct radionuclides are the same as those produced in atmospheric weapons testing and found in the Chernobyl fallout. This commonality makes an evaluation of the source of these radionuclides that may be detected in environmental samples difficult to determine. During 1999, H-3 and Cs-137 were the potentially plant-related radionuclides detected in the RETS samples.

A number of factors must be considered in performing radiological sample data evaluation and interpretation. The evaluation is made at several levels including trend analysis and dose to man. An attempt has been made not only to report the data collected during 1999, but also to assess the significance of the radionuclides detected in the environment as compared to natural and other man-made radiation sources. It is important to note that detected concentrations of radionuclides in the local environment as a result of mans technology are very small and are of no or little significance from an environmental or dose to man perspective.

The 1987 per capita dose was determined to be 360 mrem per year from all sources, as noted in NCRP Report No. 93 (Reference 17). This average dose includes such exposure sources as natural radiation, occupational exposure, weapons testing, consumer products and nuclear medicine. The 1987 per capita dose rate due to natural sources was 295 mrem per year. The per capita radiation dose from nuclear power production nation wide is less than one mrem per year (Reference 10).

The natural background gamma radiation in the environs of the Nine Mile Point Site, resulting from radionuclides in the atmosphere and in 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 60 mrem per year, as a background dose, is significantly greater than any possible doses as a result of routine operations at the site during 1999.

The results for each sample medium are discussed in detail in **Section 5.0**. This includes a summary of the results, the estimated environmental impact, a detailed review of any relevant detections with a dose to man estimate where appropriate, and an analysis of possible long term and short term trends.

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 may include; aquatic vegetation (cladophora), bottom sediment, mollusk, milk (Sr-90), meat, poultry and soil samples. The optional samples that are collected will vary from year to year. In addition to the optional sample media, additional locations are sampled and analyzed for those pathways required by Technical Specifications. These additional sample locations are obtained to ensure that a variety of environmental pathways are monitored in a comprehensive manner. Data from additional sample locations that are associated with the required Technical Specification sample media are included in the data presentation and evaluation. When additional locations are included, the use of this data will be specifically noted in **Section 5.0**.

Section 6.0 contains the analytical results for the sample media addressed in this report. Tables are provided for each required sample medium analyzed during the 1999 program.

Section 7.0, titled HISTORICAL DATA, contains statistics from previous years environmental sampling. The process of determining the impact of plant operation on the environment includes the evaluation of past analytical data, to determine if trends are changing or developing. As state-of-the-art detection capabilities improve, data comparison is difficult in some cases. For example, Lower Limits of Detections (LLDs) have improved significantly since 1969 due to technological advances in laboratory procedures and analytical equipment.

5.1 AQUATIC PROGRAM

The aquatic program consists of samples from three environmental pathways. These pathways are:

- o Shoreline Sediment
- o Fish
- o Surface Waters

Section 6.0, Tables 6.1 through 6.4 represent the analytical results for the aquatic samples collected for the 1999 sampling period.

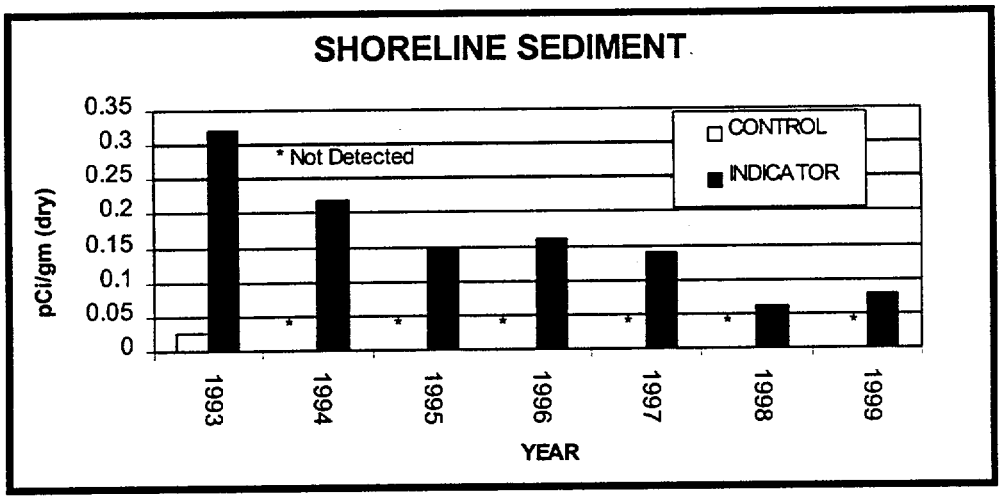
5.1.1 SHORELINE SEDIMENT RESULTS

A. Results Summary

Shoreline sediment samples were obtained in April and October of 1999 at one off-site control location (near Oswego Harbor) and at one indicator location which is an area east of the site considered to have recreational value. A total of four sediment samples were collected for the 1999 sample program, two indicator and two control. Cs-137 was detected in the two samples taken at Sunset Beach which is the indicator location. The Cs-137 concentrations ranged from a minimum of 0.058 pCi/g (dry) to a maximum of 0.100 pCi/g (dry). The mean concentration for the two samples was 0.079 pCi/g (dry). Cs-137 was not detected at the control location during 1999, however, it has been detected intermittently in the past specifically 1979, 1980, 1982 and 1993. Historical Cs-137 concentrations at previous control locations have ranged from 0.027 to 0.22 pCi/g (dry). The source of the Cs-137 detected in the indicator shoreline sediment is considered to be the result of fallout from atmospheric nuclear weapons testing and not from operations at the site. The mean concentration of Cs-137 measured in the 1999 indicator samples is the second lowest measured concentration since sampling began in 1985. Historical mean concentrations measured at the indicator location ranged from a maximum of 0.32 pCi/g in 1993 to a minimum value of 0.06 pCi/g in 1998. The results for the 1999 control location were less than the detection limit. No other plant related radionuclides were detected in the 1999 shoreline sediment samples.

The calculated potential whole body and skin doses which may result from the measured Cs-137 concentrations are extremely small and are insignificant when compared to natural background doses.

Below is a graph of the average Cs-137 concentration in shoreline sediment samples over the previous six years. This graph illustrates a general downward trend in the Cs-137 concentrations since 1993.



B. Data Evaluation and Discussion

Shoreline sediment samples are routinely collected twice per year from the shoreline of Lake Ontario. Samples are collected from one indicator location (Sunset Beach), and one control location (Lang's Beach). The first sample collection was made in April 1999 at both the indicator and control locations. The second shoreline sample collection was made in October 1999, again at both the indicator and the control locations. The results of these sample collections are presented in Section 6.0, Table 1. Cesium-137 (Cs-137) and Potassium-40 (K-40) were the significant radionuclides detected in the sediment samples.

Cs-137 was detected in the April and October indicator samples collected for the 1999 program. The measured concentrations for these samples were 0.058 pCi/g (dry) and 0.100 pCi/g (dry). The presence of Cs-137 in certain environmental sample media such as soil, shoreline sediment and fish is routine. Cs-137 is a fission product that is produced in power reactors and during weapons testing. In addition to the Cs-137 found in the environment as a result of past weapons testing, a significant inventory of Cs-137 was also introduced globally as a result of the Chernobyl accident in 1986. Because Cs-137 is found in environmental samples as a result of weapons testing and Chernobyl, it is difficult to accurately determine the source of Cs-137 measured in the sediment sample. It is highly probable that the

source of the cesium is from sources other than the operation of plants at the Nine Mile Point Site. It is likely that any sediment sample containing Cs-137 concentration which were the result of plant operation would also contain other plant related isotopes such as Co-60 and Cs-134. The absence of corroborating isotopes would indicate that the source of Cs-137 in sediment sample is from the existing background Cs-137 which is attributed to weapons testing. This assessment is further substantiated by the fact that Cs-137 was detected in 1993 sediment control sample. Cs-137 has been measured in the control samples of other environmental media such as fish and soil.

The routine absence of Cs-137 in the control samples is attributed to the differences in the sediment types between the two sample locations. Few shoreline regions west of the site contain fine sediment and/or sand which would be representative of the indicator location. It is difficult to obtain control samples, which are comparable in physical and chemical characteristics to the indicator samples. Other factors, which include changing lake level and shoreline erosion, further complicate attempts at consistency in shoreline sediment sampling. Recent soil samples from locations beyond any expected influence from the site have contained levels of Cs-137 equal to or greater than the concentrations found in 1999 shoreline sediment. The Cs-137 is commonly found in soil samples and is attributed to weapons testing fallout. Shoreline samples containing soil or sediment are likely to contain Cs-137.

C. Dose Evaluation

The radiological impact of 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 provided in Regulatory Guide 1.109, the potential dose to man in mrem per year can be calculated. The following regulatory guide values were 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 0.100 pCi/g (dry) remains constant for the year.

Using these conservative parameters, the potential dose to the maximum exposed individual (teenager) would be 0.00034 mrem/year to the whole body and 0.00039 mrem/year to the skin. This calculated dose is very small and is insignificant when compared to the natural background annual exposure of approximately 60 mrem.

D. Data Trends

The mean Cs-137 concentration for the shoreline sediment indicator samples for 1999 was 0.079 pCi/g (dry), which is the second lowest mean concentration measured since sediment sampling was initiated in 1985. Indicator samples collected in 1985 through 1988 contained no measurable concentrations of Cs-137. The mean values for 1989 -1990 were both 0.29 pCi/g. The mean concentrations measured in 1993 and 1994 were 0.32 pCi/g and 0.22 pCi/g respectively. The mean 1995 through 1997 results for Cs-137 ranged from 0.14 to 0.16 pCi/g (dry).

The presence of Cs-137 in the 1993 control sample was the first positive measurement at the control location since sediment sampling was implemented in 1985. Cs-137 was not detected in the control sample in the 1999 samples.

A review of indicator and control sample results for 1985 - 1988 indicate only naturally occurring radionuclides present in shoreline sediment. The period from 1989 - 1999 shows the presence of Cs-137 in the indicator samples. The ten year data base shows an emergence of Cs-137 concentrations in 1989 which continues through 1999. The trend since 1989 shows a reduction in Cs-137 concentrations over the four year period to the concentration of 0.13 pCi/g (dry) measured in 1992. The 1993 sample showed an increase in Cs-137 concentration to 0.32 pCi/g (dry) followed by a reduction in concentration to 0.22 pCi/g (dry) in 1994 and continued general reductions through 1999 to 0.079 pCi/g (dry). The overall five year trend for Cs-137 concentrations in shoreline sediment is a steady reduction in concentrations from year to year to a low concentration of 0.064 pCi/g (dry) in 1998 and remaining low in 1999.

Shoreline sediment sampling commenced in 1985. Prior to 1985, no data were available for long term trend analysis.

Tables 1 and 2 in Section 7.0 illustrate historical environmental data for shoreline sediment samples.

5.1.2 FISH SAMPLE RESULTS

A. Results Summary

A total of 23 fish samples were collected for the 1999 sample program. Analysis of the 1999 fish samples showed detectable concentrations of Cs-137, a radionuclide related to past weapons testing. Cs-137 was detected in two fish samples collected at the indicator location. Cs-137 was not detected in the fish samples collected from the control location. The 1999 mean results for the indicator sample was 0.020 pCi/g (wet) which is consistent with the previous five year sample mean for both the indicator and control locations. Small concentrations of Cs-137 detected in two fish samples represents approximately 9% of the total fish samples collected from both the on-site and off-site locations. This percentage is lower than the previous year which had positive detections in 11% of the sample collected and down significantly from 1994 when 37% of the samples showed Cs-137 concentrations. No other radionuclides were detected in the 1999 fish samples.

The detectable levels of Cs-137 in the indicator fish samples are small with a range of 0.018 pCi/g (wet) to 0.021 pCi/g (wet). Both of the positive detections were found in the walleye species of fish. Cs-137 is routinely detected in a small percentage of the fish samples collected each year. Cs-137 has been measured in fish samples at both the indicator and control locations consistently over the last 19 years. Cesium-137 was also measured in samples collected in 1974, and earlier, which was preoperational for the FitzPatrick Plant. These low levels of Cs-137 represent no significant dose to man or impact on the environment. As noted above, the measured concentrations of Cs-137 in the fish samples are the result of fallout from past weapons testing. Comparable concentrations of Cs-137 are routinely found in samples of other aquatic media such as shoreline sediment, bottom sediment and aquatic vegetation. The potential whole body and critical organ doses calculated as a result of fish consumption by humans are extremely small. The dose that could result from the Cs-137 in fish can be considered background exposure because of the sources of the Cs-137.

The fish sample results demonstrate that plant operations at the Nine Mile Point Site have no measurable radiological environmental impact on the upper levels of the Lake Ontario food chain. The 1999 results are consistent with the previous year's results and continue to support the general long term downward trend in fish Cs-137 concentrations over the last 22 years. The Cs-137 mean indicator concentration for 1994 through 1999, as a group, are the lowest measured concentrations since the beginning of the FitzPatrick Environmental Monitoring Program 24 years ago (1974).

B. Data Evaluation and Discussion

Fish collections were made utilizing gill nets at one location greater than five miles from the site (Oswego Harbor area), and at two locations in the vicinity of the lake discharges for 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. All samples were analyzed for gamma emitters. Table 6-2 shows individual results for all the samples in units of pCi/g (wet).

The spring fish collection was made up of eleven individual samples representing four separate species. Brown trout, smallmouth bass, lake trout and walleye were collected from all three sample locations.

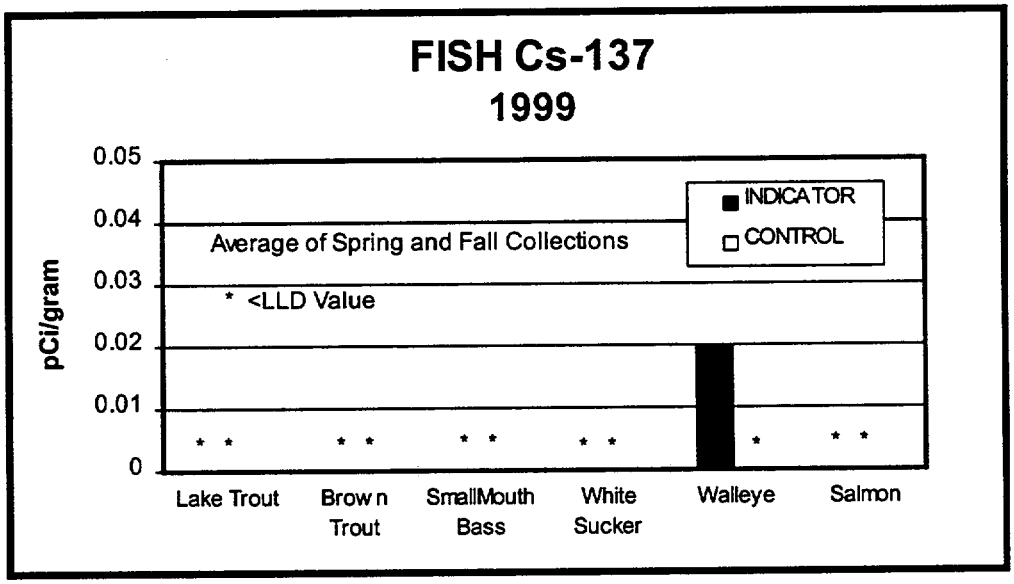
The total fall fish collection was comprised of twelve individual samples representing four individual species. Brown trout, walleye, smallmouth bass and chinook salmon samples were collected at the indicator sampling locations (NMP and JAF) and the control location (Oswego Harbor).

Cs-137 was detected in two of the six indicator samples collected during the spring at a concentration of 0.021 pCi/g (wet) and 0.018 pCi/g (wet). Cs-137 was not detected in the fish species collected at the control location for the same sample period.

In the fall sample collection, Cs-137 was not detected in any of the twelve samples collected from the control or indicator locations.

The indicator 1999 sample mean result was slightly lower than the 1997 mean concentration. The 1999 results are consistent with the pervious five years in terms of mean concentration. The source of the Cs-137 in fish samples is considered to be the existing Cs-137 background concentration in the environment from weapons testing and Chernobyl.

The following graph presents the measured Cs-137 concentrations for the fish species analyzed for 1999. Walleye samples yielded the only measurable Cs-137 concentration for the 1999 samples and were both at the indicator location. Walleye samples from the control location showed no detectable Cs-137.



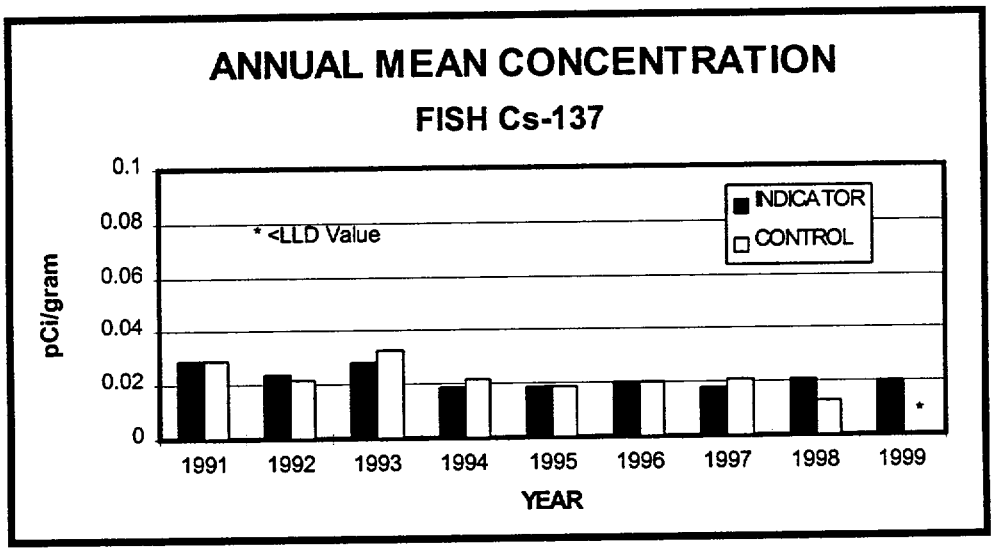
C. Dose Evaluation

Some Lake Ontario fish species may be considered an important food source due to the local sport fishing industry. Therefore, these fish are an integral part of the human food chain. Based on the use of fish in the local diet, a conservative estimate of potential dose to man can be calculated. Assuming that an adult consumes 21.0 kg of fish per year and a teen consumes 16 kg of fish per year (Regulatory Guide 1.109 maximum exposed age group) and the fish consumed contains a Cs-137 concentration of 0.021 pCi/g (wet) (maximum result for the indicator samples for 1999), the adult whole body dose received would be 0.032 mrem per year. The organ of interest for Cs-137 is the teen liver which would receive a calculated dose of 0.05 mrem per year. The Cs-137 whole body and organ doses are conservatively estimated doses based on the consumption of fish species from the Nine Mile Point area. Due to the long half life of Cs-137, no radiological decay is assumed for the calculation of doses.

In summary, the potential whole body and organ doses received as a result of fish consumption are very small. The dose to man that could be received from the indicator sample group is considered to be background exposures. The dose to man from operation of the plants at Nine Mile Point via the fish pathway is of no significance.

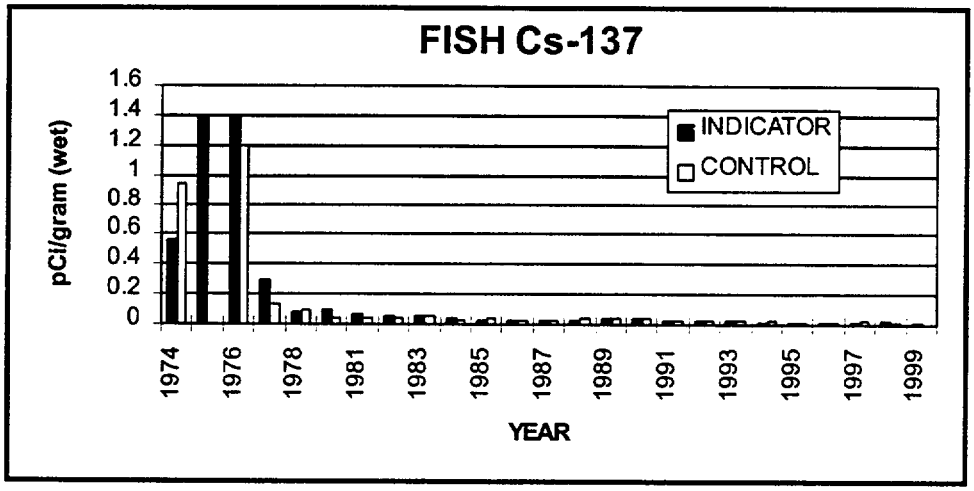
D. Data Trends

Results for the previous five years (1994 through 1998) have shown a generally steady trend for Cs-137 levels in the control and indicator samples. During the period of 1990 through 1994, control and indicator mean results were on a small downward trend with a small rise in 1993. The 1994 through 1999 results as a group are the lowest Cs-137 concentrations measured over the 20 year existence of the sampling program. The graph below illustrates the mean Cs-137 concentrations for 1999 and the previous eight years.



The long term trend shows that mean concentrations of Cs-137 for indicator samples has decreased from a maximum concentration of 1.4 pCi/g (wet) in 1976 to a minimum level of 0.018 pCi/g (wet) measured in 1997. Control sample Cs-137 results have also decreased from a maximum level of 1.2 pCi/g (wet) in 1976 to less than detectable levels in 1999. The 1999 indicator concentration showed a very small decrease of 0.001 pCi/g (wet) over the 1998 results.

The general long term decreasing trend for Cs-137, illustrated in the graph below, is most probably a result of the cesium becoming unavailable to the ecosystem due to ion exchange with soils and sediments and radiological decay. The concentrations of Cs-137 detected in fish since 1976 are a result of weapons testing fallout. The general downward trend in concentrations will continue as a function of additional ecological cycling and nuclear decay. There was no apparent effect from the 1986 Chernobyl Nuclear Plant accident during 1986 relative to Cs-137 concentrations in fish samples although an effect may have been detected during the period of 1987 through 1990 when both indicator and control location mean results increased slightly.



The 1999 Cs-137 indicator concentration of 0.020 pCi/g (wet) shows a decrease in concentration from 1976 by a factor of 70. Control sample results have decreased from a maximum level of 1.2 pCi/g (wet) in 1976 to levels that were not detectable in 1999. Fish results for the 1998 control samples show a decrease in concentration by a factor of approximately 72 when compared to preoperational data (1974) and by a factor of about 92 compared to 1976.

Tables 7-3 and 7-4 in Section 7.0 show historical environmental sample data for fish. Full size reproductions of the fish result graphs are found in Section 8.0.

5.1.3 SURFACE WATER (LAKE)

A. Results Summary

The Radiological Effluent Technical Specifications (RETS) require that monthly surface water samples be taken from the respective inlet water supply of the James A. FitzPatrick N.P.P. and Niagara Mohawk's Oswego Steam Station. In conjunction with the RETS samples, three additional Lake Ontario surface water locations are sampled and analyzed. These additional locations are the Oswego City Water Intake, the NMP Unit #1 Intake and the NMP Unit #2, Intake. Gamma spectral analysis was performed on 24 monthly composite samples from the RETS locations and on 36 monthly composite samples from the additional sample locations. The results of the gamma spectral analysis show that only two naturally occurring radionuclides were detected in the 60 samples from the five locations collected for the 1999 Sampling Program. The two naturally occurring radionuclides are K-40 and Ra-226 and are not related to operations of the plant. Monthly composite samples show no presence or buildup of plant related gamma emitting isotopes in the waters of Lake Ontario as a result of the operation of the plant.

Quarterly composite samples collected from the same locations are analyzed for tritium. Twenty tritium samples were collected and analyzed in 1999, twelve samples showed a positive tritium concentration. The 1999 mean tritium concentration for the Oswego Steam Station inlet (control location) was 365 pCi/l based on positive tritium results in two of the four samples. The mean concentration for the JAF inlet, which serves as the indicator location, was 233 pCi/l based on three positive detection of tritium at this sample location in 1999. Tritium results for 1999 also showed positive detections of tritium at the Nine Mile Point (Unit 1) inlet sample locations with a sample mean of 273 pCi/l based again on three positive measurements for the year. The evaluation of surface water sample results demonstrates that there is no measurable radiological impact on the surface waters of Lake Ontario from tritium concentrations based on the concentrations measured. Individual sample results from the control station were similar or higher than those measured at the indicator location(s). The measured concentrations for all the indicator and control samples were within the normal historical variations for naturally occurring tritium in surface water.

B. Data Evaluation and Discussion

Gamma spectral analysis was performed on monthly composite samples from five Lake Ontario sampling locations. Only K-40 and Ra-226 were detected in samples from the five locations over the course of the 1999 sampling program. Both of these radionuclides are naturally occurring and are not plant related.

K-40 was detected consistently in both of the Technical Specification required intake canals. The James A. FitzPatrick inlet canal samples and Oswego Steam Station samples showed K-40 was detected in all twelve monthly samples. Ra-226 was also detected intermittently in samples from both locations required by Technical Specifications. K-40 was also detected at the other optional sample locations.

Tritium samples are quarterly samples that are a composite of the appropriate monthly samples. Tritium concentration for The James A. FitzPatrick inlet canal samples had a mean of 233 pCi/l for three positive detections and ranged from 180 pCi/l to 270 pCi/l. The Technical Specification control location (Oswego Steam Station inlet canal) results had a mean concentration of 365 pCi/l with a range of 220 pCi/l to 510 pCi/l.

Tritium was detected in seven of the twelve optional lake samples taken. The calculated mean concentrations for all three locations was 266 pCi/l and ranged from 170 pCi/l to 380 pCi/l.

Samples collected from the Oswego City water supply showed detectable tritium concentrations in the range of 220 pCi/l to 270 pCi/l with a mean concentration of 245 pCi/l.

A summary of tritium results for the 1999 sample program is listed below:

Sample Location	Tritium Concentration pCi/liter Minimum	Maximum	Mean (Annual)
JAF Inlet	<170	270±170	233
Oswego Steam Inlet	<170	510±160	365
NMP #1 Inlet	<170	350±160	273
NMP #2 Inlet	<170	380±180	275
City Water Intake	<170	270±170	245

C. Dose Evaluation

The Oswego Steam Station is considered a control location because of its distance from the site and the influence of lake current patterns and current patterns from the Oswego River located nearby. The current patterns distinguish the Oswego Steam Station intake and the near by Oswego City water intake as an "up-current" sampling point and the JAFNPP inlet canal as a "down-current" sampling point. The Nine Mile Point Site is located such that it would not have a radiological impact on Oswego drinking water supply. The Oswego City water intake is located west of the Oswego Steam Station inlet placing it upstream from the Nine Mile Point Site. The tritium concentrations measured in these upstream or control locations are representative of natural background levels present in Lake Ontario.

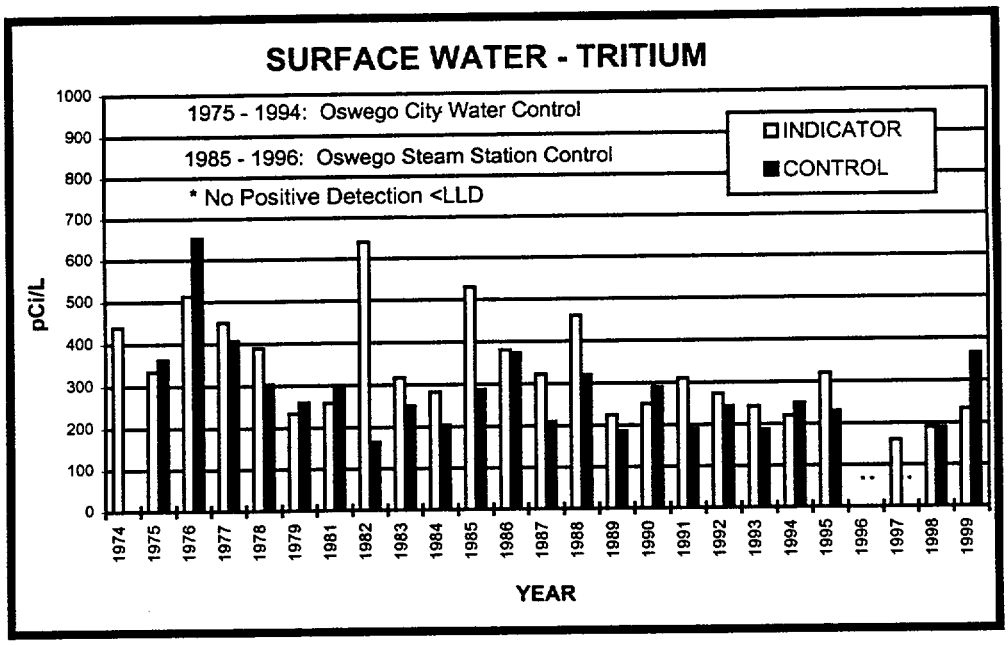
The radiological impact to members of the public from natural background levels of tritium in water is insignificant. This can be illustrated by calculating a dose to the whole body and maximum organ using Regulatory Guide 1.109 methodology. Based on a water ingestion rate of 510 l/yr and a measure concentration of 510 pCi/l the calculated dose would be 0.053 mrem to the child whole body and 0.053 mrem to the child liver (critical age group/organ). The drinking water sample is from the Oswego City intake which is drawn from Lake Ontario at a location more distant than the control location. The calculated dose from tritium at this location would be 0.028 mrem to the child whole body and 0.028 mrem to the child liver based on a concentration of 270 pCi/l. Doses received as a result of water ingestion are approximately the same regardless of the location. Doses from all water sampled are considered background doses and are negligible compared to the 300 mrem annual dose considered to the overall background annual dose.

D. Data Trends

There are no data trends for gamma emitters such as Cs-137 and Co-60 as historically these radionuclides have not been detected in lake water samples.

Tritium results for the 1999 lake water samples were consistent with results from the previous five years for both the indicator and control locations. During the previous five year period the maximum indicator and control concentrations were measured in 1995 and 1999 respectively. The mean positive tritium concentrations for the period of 1994 - 1998 range from 190 pCi/l to 250 pCi/l for the control and 160 pCi/l to 320 pCi/l for the indicator locations. By comparison, the mean 1999 tritium concentrations for the control was 365 pCi/l and 233 pCi/l for the indicator. The previous five year data indicates significant trends in either the indicator or the control mean concentrations. This previous five year data set is consistent with long term tritium results measured at the site. The data from 1989 through 1999 is representative of natural variations in environmental tritium concentrations. The mean control value of 365 is the highest measured since 1986 but is within the variability of results measured over the program life. The ten year historical results are consistent with normal background concentrations which will vary from year to year.

The following graph illustrates the concentrations of tritium measured in Lake Ontario over the past 25 years at both an indicator and control location. Prior to 1985, the Oswego, City Water Supply results are used as control location data as this location closely approximates the Oswego Steam Station, the current control location.



The highest concentrations for the indicator location were detected in the period between 1982 and 1988. The maximum annual mean concentration was measured in 1982 (641 pCi/liter) and the minimum in 1997 (160 pCi/liter). Results for the period of 1982 through 1989 shows that the indicator samples were higher than the control samples. This trend reversed itself in 1990 and returned in 1991 through 1993 and again in 1995. In 1999, the control location was higher than the indicator location.

Annual mean tritium results from previous city water samples from 1980 to 1999 show that the tritium concentrations have fluctuated over the years with no specific trend(s).

5.2 TERRESTRIAL PROGRAM

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

- o Airborne particulate and radioiodine
- o Direct radiation
- o Milk
- o Food Products

Tables 6-5 through 6-14 represent the analytical results for the terrestrial samples collected for the 1999 reporting period.

5.2.1 AIR PARTICULATE GROSS BETA

A. Results Summary

Weekly, air samples were collected and analyzed for particulate gross beta particulate activity. For the 1999 program, a total of 53 samples were collected from the control location R-5 and 208 samples were collected from the indicator locations R-1, R-2, R-3 and R-4. These five locations are required by the Technical Specifications. Additional air sampling locations are maintained and discussed under Section 5.2.1.B below. The mean concentration of the control location, R-5, was 0.017 pCi/m^3 for 1999. The mean concentration for the indicator locations was 0.017 pCi/m^3 for 1999. The mean results for the indicator and the control stations were equal for 1999. The consistency of the two mean results demonstrates that there are no increased airborne radioactivity levels in the general vicinity of the site. The indicator results are constant with concentrations measured over the last eleven years. The consistency of these low concentrations over the past eleven years may indicate that the natural baseline gross beta activity has been reached. It is possible that the manmade radionuclide contribution to the natural background from atmospheric weapons testing and Chernobyl can no longer be detected above the background concentrations of naturally occurring beta emitting radionuclides.

B. Data Evaluation and Discussion

A total of fifteen air sampling locations are maintained, including the five required by the Technical Specifications. The air monitoring system consists of six on-site and nine off-site locations which are sampled weekly for gross beta particulate activity. A total of 778 samples were collected and analyzed as part of the 1999 program. Five of the nine off-site locations are required by Technical Specifications. These locations are designated as R-1, R-2, R-3, R-4 and R-5. R-5 is a control location required by the Technical Specifications and is located beyond any local influence from the site. In addition, optional off-site and on-site air sample locations are maintained from which weekly samples are collected. The optional off-site locations are designated as D-2, E, F, and G. The optional on-site locations are designated as D-1, G, H, I, J and K.

Gross beta analysis requires that the samples be counted no sooner than 24 hours after collection. This allows for the decay of short half-life naturally occurring radionuclides, thereby increasing the sensitivity of the analysis for plant related radionuclides.

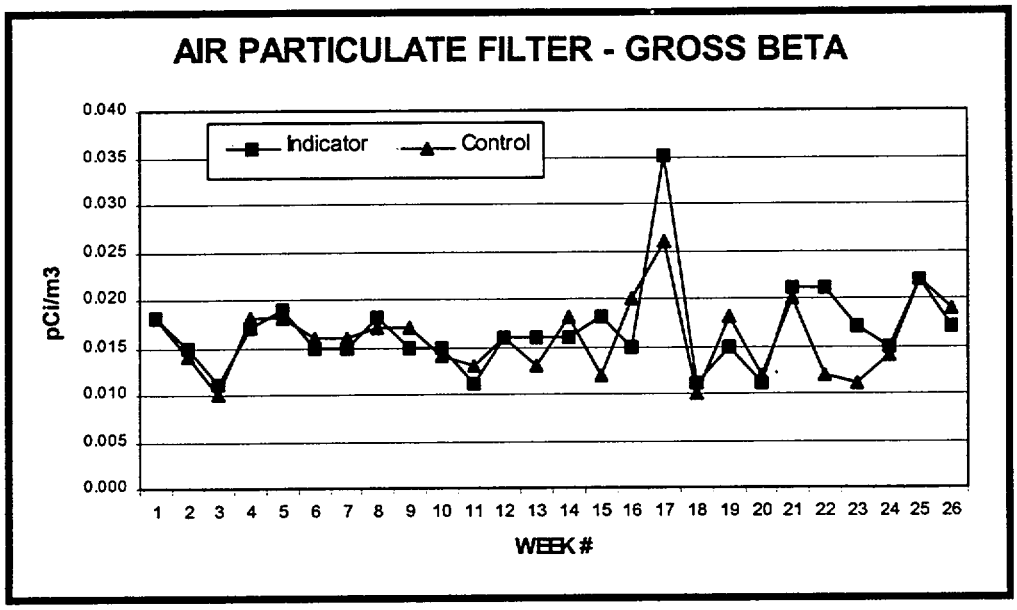
Tables 6-5 and 6-6 in Section 6.0 present the weekly gross beta activity results for the off-site and on-site stations.

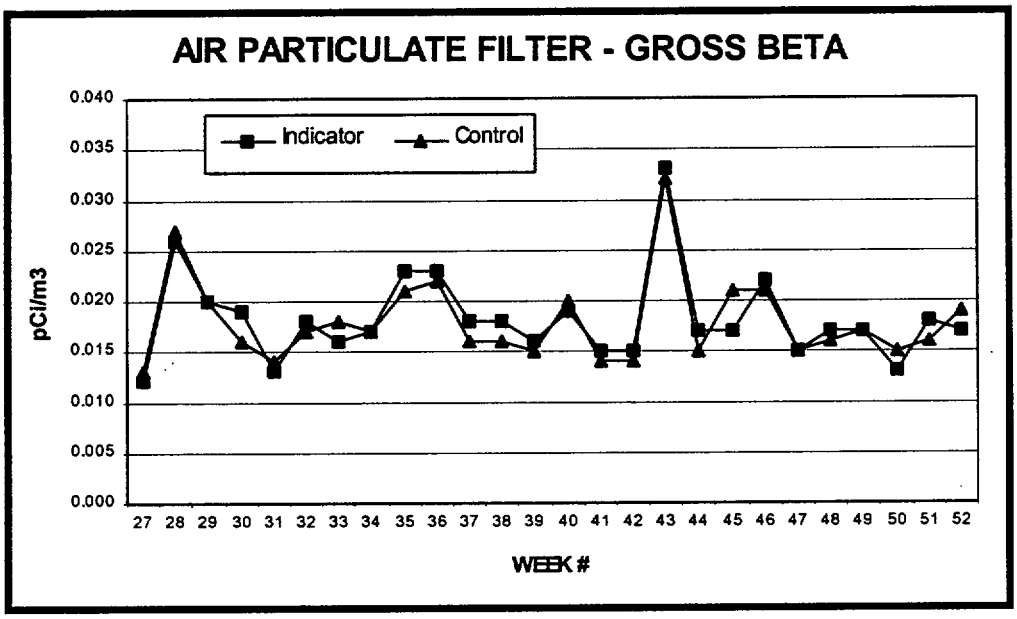
The average annual gross beta indicator concentrations for the indicator stations (R-1, R-2, R-3 and R-4) was 0.017 pCi/m^3. The off-site station (R-5) annual mean concentration was 0.017 pCi/m^3. The minimum, maximum and average gross beta results for sample locations required by Technical Specifications were:

	Concentration pCi/m^3		
Location*	Minimum	Maximum	Average
R-1	0.011	0.036	0.017
R-2	0.011	0.039	0.018
R-3	0.010	0.034	0.017
R-4	0.009	0.034	0.017
R-5 (control)	0.010	0.032	0.017

* Locations required by Technical Specifications

The mean weekly gross beta concentrations measured in 1999 are illustrated in the graphs below.





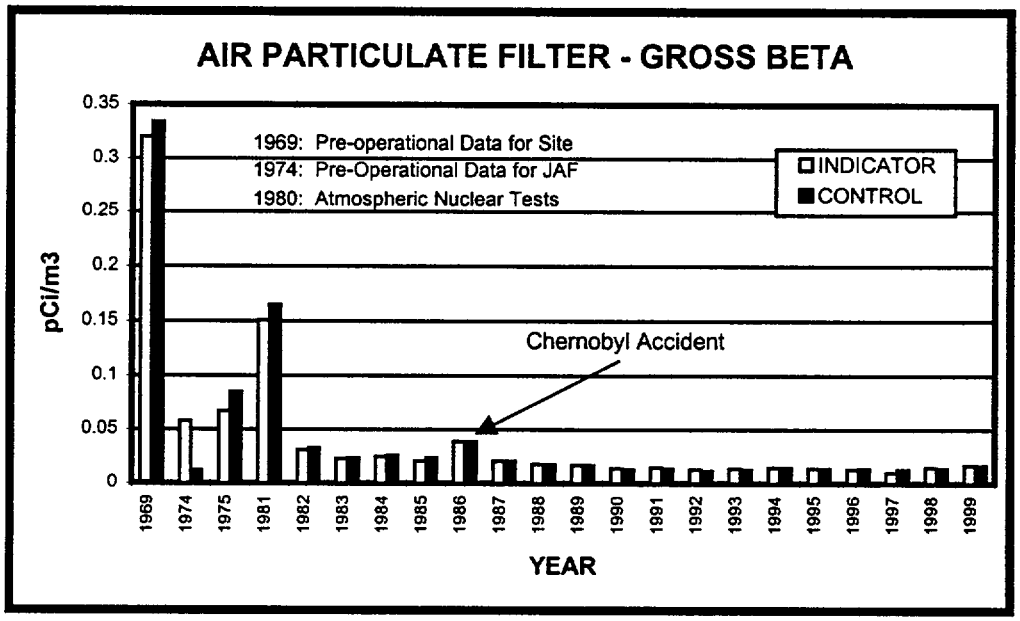
The small fluctuations observed in the gross beta activity over the year can be attributed to changes in the environment, especially seasonal changes. The concentrations of naturally occurring radionuclides in the lower levels of the atmosphere directly above land are affected by time related processes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

C. Dose Evaluation

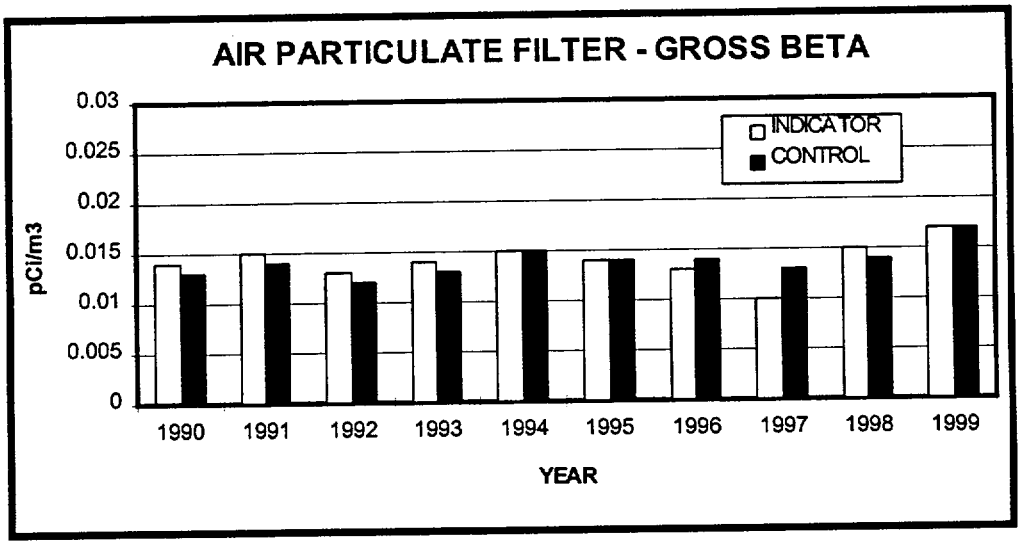
Dose calculations are not performed based on gross beta concentrations. Dose to man as a result of radioactivity in air is calculated using the specific radionuclide and the associated dose factor. See Section 5.2.2.C for dose calculations from air concentrations. The dose received by man from air gross beta concentration is a component of the natural background.

D. Data Trends

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 1981. The 1981 samples were affected by fallout from a Chinese atmospheric nuclear test which was detonated in 1980.



The trend for the previous five years represents a base line concentration or natural background level for gross beta concentrations. This trend is stable with minor fluctuations due to natural variations. The change in concentrations over the period of 1990 through 1999 is very small. This is illustrated by the following graph.



The air particulate gross beta indicator mean result for 1999 is a factor of 19 less than the concentrations measured in 1969. 1969 concentrations are considered to be preoperational results for the site. For the operational period of 1975 - 1999, the mean annual gross beta concentration at the control station (R-5) has decreased from a maximum concentration of 0.165 pCi/m^3 in 1981 (due to weapons testing) to a minimum of 0.013 pCi/m^3 in 1997. The mean annual concentrations for the indicator stations for this same time period ranged from a maximum of 0.151 pCi/m^3 (due to weapons testing) in 1981 to a minimum of 0.010 pCi/m^3 in 1997. 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 in the atmosphere. 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 0.018 to 0.026 pCi/m^3. This level of activity appears to be near baseline range for naturally occurring gross beta levels. The 1986 annual mean result was 0.039 pCi/m^3 for both the indicator and control stations. This concentration is almost two times higher than 1983-1985 and 1987-1992 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 7.0 and 8.0, respectively.

5.2.2 MONTHLY PARTICULATE COMPOSITES (GAMMA EMITTERS)

A. Results Summary

No plant related gamma emitting radionuclides were detected in any of the air particulate filter samples collected from the five required Technical Specifications sampling locations. These stations are located near the site boundary and off-site. No plant related radionuclides were detected in the ten additional air sampling stations maintained as part of the sampling program. Together, these fifteen continuous air sampling stations make up a comprehensive environmental monitoring network for measuring radioactive air particulate concentrations in the environs of the site. Annually the air monitoring station provides approximately 780 individual air particulate samples and 180 particulate filter composites.

The gamma analysis results for the monthly composite samples routinely showed positive detections of Be-7, K-40, Ra-226, and AcTh-228. Each of these radionuclides is naturally occurring.

Be-7 was detected in all the monthly composite samples for the indicator and control locations. K-40, Ru-226 and AcTh-228 were found intermittently in the monthly composite samples from all locations.

B. Data Evaluation Discussion

A total of fifteen continuous air sampling locations are maintained on and around the Nine Mile Point Site. Five sample locations are required by Technical Specifications and ten optional stations are in operation to establish a comprehensive monitoring network. Composite air filter samples are assembled for each of the fifteen sampling locations. Each of the four weekly air particulate samples for the month are assembled by location to form monthly composite samples. The monthly composite samples required by Technical Specifications are R-1, R-2, R-3, R-4, and R-5. Other sample locations not required by the Technical Specifications for which analytical results have been provided include six on-site locations and four off-site locations. The analytical results for all air particulate filter composites in 1999 showed no detected levels of plant related radionuclides for the inhalation pathway. The results of all monthly composite samples are presented in Section 6.0, Table 6-9.

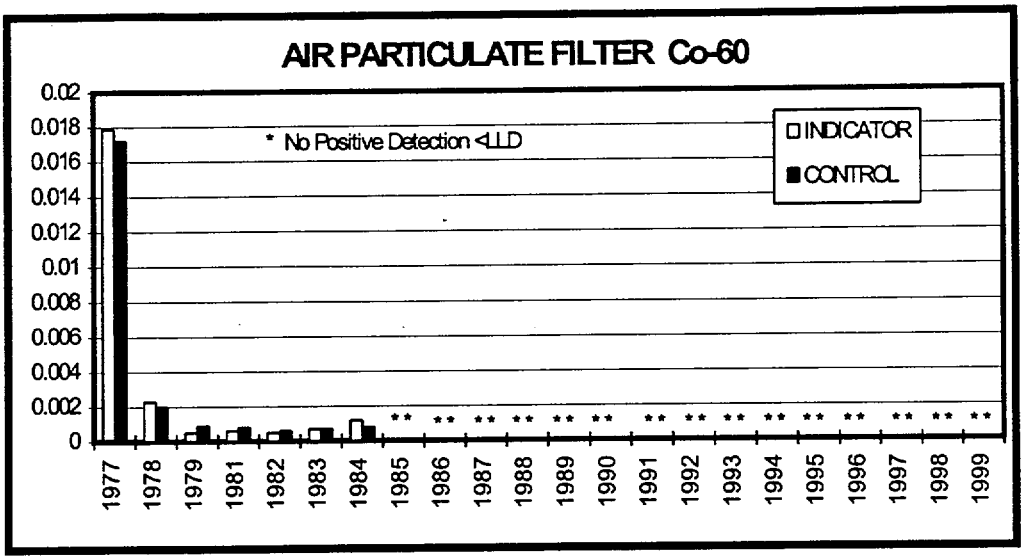
C. Dose Evaluation

The air particulate sampling program demonstrated no off-site dose to man from this pathway as a result of operations of the plant. No plant related radionuclides were detected at any of the sampling locations located at or beyond the site boundary.

D. Data Trends

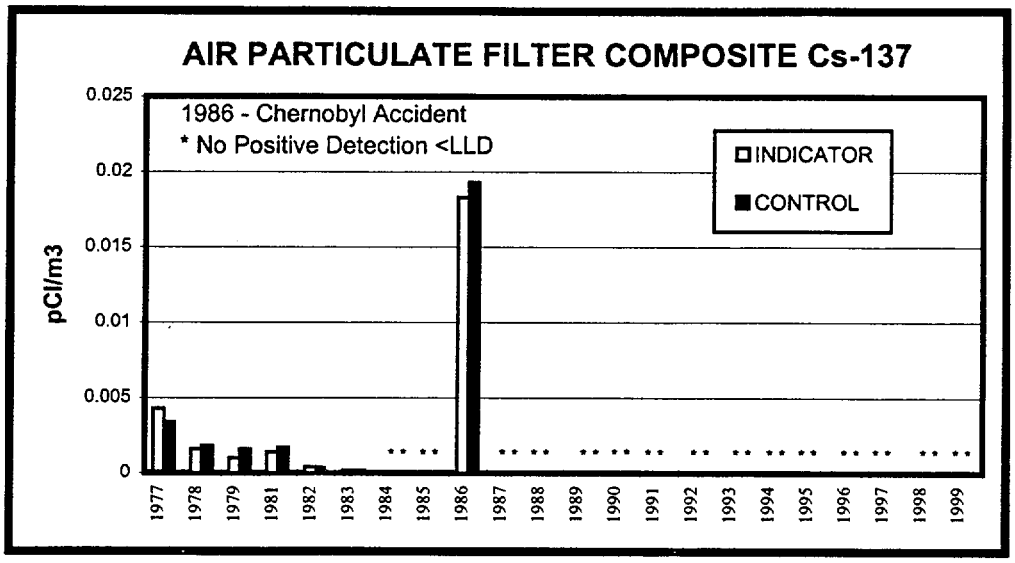
No plant related radionuclides were detected during 1999 at the off-site air monitoring locations.

The five year data base of air particulate composite analysis shows that there is no buildup or routine presence of plant related radionuclides in particulate form in the atmosphere around the site. Historically 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 presence of Co-60 in the air samples collected during these years was the result of atmospheric weapons testing. The maximum yearly mean concentration detected during this period was in 1977 when the mean for the indicator results was 0.0179 pCi/m^3. The mean control value for this same year was 0.0172 pCi/m^3. The Co-60 in the air particulate samples trended downward during the 1977 through 1984 period to a low mean concentration of 0.0008 pCi/m^3 at the control location. Co-60 has not been detected in any of the required air particulate samples since 1985. This general downward trend and eventual elimination of Co-60 in the air samples is illustrated in the following graph.



Historical data show that Cs-137 is the fission product radionuclide most frequently detected in the air particulate filter composites. Cs-137 was detected in each of the years from 1977 through 1983 at both the control and indicator sampling locations. The maximum concentrations for this period were measured in 1977 with a mean indicator concentration of 0.0043 pCi/m^3 and the corresponding control concentration of 0.0034 pCi/m^3. After 1977, the Cs-137 concentration showed a reduction by a factor of approximately two and remained constant through 1981. In 1982, a second reduction in Cs-137 concentration was measured followed by a further reduction in concentration in 1983. Cs-137 was not detected during 1984 and 1985 in any of the indicator or control air particulate composite samples.

For the period, 1986 to 1991, Cs-137 was detected only in 1986 due to the fallout from the Chernobyl accident. The 1986 mean concentration of Cs-137 for the control location was 0.0193 pCi/m^3. The mean concentration of Cs-137 for the indicator location was 0.0183 pCi/m^3 for the sample period. This overall reduction in Cs-137 results since 1977 is attributed to nuclear decay and ecological cycling of Cs-137 initially produced as a result of weapons testing. The decrease in air particulate Cs-137 concentrations since 1977 is clearly illustrated on the following graph of historical data.



In the 1986 samples, a number of other radionuclides were detected in addition to Cs-137. The isotopes, Zr-95, Ce-141, Nb-95, I-131, Ce-144, Mn-54, Ru-103, Ru-106, Ba-140 were all detected. These isotopes were measured in air particulate composite samples as a result of the fallout from the Chernobyl accident. After 1986, no plant related or fallout radionuclides were detected in any of the off-site air particulate composite samples. A review of the past five year's data for air particulate filter composites indicates no plant related radiological impact on the environment. All the historical positive detections of fission product radionuclides were associated with atmospheric weapons testing or the Chernobyl accident.

Current air particulate filter composite results cannot be compared to preoperational data as none exists prior to 1977.

Historical data for air particulate results are presented in Section 7.0, Tables 7-11 and 7-12. Full page graphic presentation of air particulate composite Co-60 and Cs-137 concentrations are presented in Section 8.0.

5.2.3 AIRBORNE RADIOIODINE (I-131)

A. Results Summary

Iodine 131 was not detected in any of the 778 samples analyzed for the 1999 program. No radioiodine has been measured off-site at the constant air monitoring stations since 1986 when measurable levels of I-131 were found as a result of fallout from the Chernobyl accident.

B. Data Evaluation and Discussion

Airborne radioiodine is monitored at the fifteen air sampling stations also used to collect air particulate samples. There are nine off-site locations, five of which are required by Technical Specifications. The off-site locations required by Technical Specifications are designated as R-1, R-2, R-3, R-4 and R-5. R-5 is a control station located beyond any local influence from the plant. Ten air sampling locations are maintained in addition to those required by Technical Specifications. Six of these stations, D-1, G, H, I, J and K, are located on-site. D-2, E, F and G are the optional stations located off-site.

Samples are collected using activated charcoal cartridges. They are analyzed weekly for I-131. The analytical data for radioiodine are presented in Section 6.0, Table 6-7 and 6-8.

C. Dose Evaluation

The I-131 airborne sampling program demonstrated no dose to man due to the operation of the plant. No radioiodine was detected in any sampling location.

D. Data Trends

No radioiodine has been detected at air sampling locations required by Technical Specifications since 1987.

The prior five years of data show no positive detection of I-131. This demonstrates that there is no measurable environmental impact or positive trend for iodine buildup due to plant operations during the period from 1990 through 1994. I-131 was detected twice over the last ten year period, in 1986 and 1987. The 1986 detection was the result of the Chernobyl accident and the 1987 detection was the result of plant operations.

Iodine - 131 (I-131) has been detected in the past at control locations. During 1976, the mean measured off-site I-131 concentration was 0.604 pCi/m^3. The 1977 mean I-131 concentration decreased to 0.323 pCi/m^3 and for 1978 the mean measured concentration decreased by a factor of ten to 0.032 pCi/m^3. During 1979 - 1981 and 1983 - 1985, I-131 was not detected at the control locations. I-131 was detected once at the control location during 1982 at a concentration of 0.039 pCi/m^3. I-131 was detected at the on-site locations in 1980 through 1983, 1986 and 1987. The mean concentrations ranged from 0.013 pCi/m^3 in 1980 to a maximum of 0.119 pCi/m^3 in 1986. The maximum I-131 concentration of 0.119 pCi/m^3 was the result of the Chernobyl accident. I-131 was detected in a total of 75 weekly samples collected during the 1986 sample program. The 1986 measured concentrations ranged from a minimum of 0.023 pCi/m^3 to a maximum of 0.36 pCi/m^3. Each of the positive detection of I-131 in 1986 was the direct result of the Chernobyl Nuclear accident.

Preoperational data for I-131 in air is limited. Results from 1974 showed no positive measurement of I-131. Current data, which showed no measured concentrations of I-131 are consistent with the 1969 and 1974 preoperational data.

A graphic presentation of airborne radioiodine is presented in Section 8.0.

5.2.4 DIRECT RADIATION
THERMOLUMINESCENT DOSIMETERS (TLD)

A. Results Summary

A total of 72 Environmental TLD locations are used to measure direct radiation levels in the environment. The dosimeters are collected and read each quarter.

The 1999 results are consistent with those observed in 1998 and previous years. The results of the TLD program document and confirm that there are no increased levels of direct radiation at or beyond the site boundry. TLD results are evaluated by organizing the locations into five special groups by geographic location relative to the site. The five groups are on-site, site boundary, off-site, special interest and controls. A summary of the measured exposure in each group is as follows:

	Dose in mrem per standard month		
Location Groups	Minimum	Maximum	Mean
On-site indicators	3.3	28.4	6.6
Site boundary*†	3.3	7.5	4.7
Off-site indicators*	3.8	7.1	4.6
Site interest*	3.7	7.1	4.6
Controls*	3.7	4.7	4.4

* Location required by Technical Specifications

† Only includes results not affected by radwaste direct shine

The highest dose rate measured at a location required by Technical Specification was 12.3 mrem per standard month. This TLD, (No. 85) represents the site boundary maximum dose. Location No. 85 is in the WNW sector along the lake shore and is in close proximity to the NMP Unit #1 plant. The TLD locations along the lakeshore close to the plants are influenced by the radwaste building and radwaste shipping activities. These environmental dose rates are not representative of dose rates measured at the remaining site boundary locations. The remaining TLD locations which are located away from the plant are comparable to levels measured at the control or background locations.

Overall, the environmental direct radiation measurement results for 1999 showed no indication of increased direct radiation above background at or beyond the site boundary. This is demonstrated by the net site boundary dose rate. The TLD results show that the 1999 injection rate utilized for hydrogen water chemistry did not significantly increase the dose rate at the site boundary or the general off-site dose rate to the general public.

Quarter	Site Boundary*	Control*	Net Site Boundary Dose Rate*
1	4.2	4.3	- 0.1
2	5.6	5.3	+ 0.3
3	4.5	4.4	+ 0.1
4	4.5	4.4	+ 0.1

* Dose rate in mrem per standard month

The net site boundary dose was calculated from applicable site boundary 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, 111 and 113.

B. Data Evaluation and Discussion

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. The TLDs used during 1999 were Panasonic UD-814 dosimeters.

TLDs from 72 environmental locations were collected and read on a quarterly basis during the sample year. The location results are an average of six independent readings per quarter at each location and are reported in mrem per standard month (See Section 6.0, Table 6-10). Of the 72 TLD locations, 33 are required by Technical Specifications.

The majority of the locations required by the Technical Specifications were

initiated in 1985 as a result of the issuance of new Technical Specifications by the NRC. Therefore, the majority of 1999 results can only be compared to 1985 - 1997 results. Some locations, including a number required by the Technical Specifications (i.e., numbers 7, 14, 15, 18, 23, 49, 56, and 58), can be compared to earlier results as these TLDs were established prior to 1985.

On-site TLDs are located at special interest areas within the site boundary. With the exception of location numbers 7 and 23, these locations are not required by the Technical Specifications. Locations 7 and 23 are located near the generating facilities at previous or existing on-site air sampling stations and are used to evaluate meteorological sectors that do not extend beyond the site boundary. TLDs located at the on-site environmental monitoring stations include numbers 3, 4, 5, 6, 7, 23, 24, 25 and 26. The results for these locations are consistent with the previous year results. The 1999 results for the on-site group ranged from 3.6 to 28.8 mrem per standard month. Other on-site special interest TLDs are located near the north shoreline of the Nine Mile Point Unit 1, Unit 2 and JAF facilities. They are in close proximity to radwaste facilities and the Unit 1 reactor building. These locations include numbers 27, 28, 29, 30, 31, 39 and 47. Results for these TLDs during 1999 were widely variable and ranged from 6.0 to 59.3 mrem per standard month. These dose rates vary as a result of activities at the radwaste facilities and the operating modes of the generating plants. The results for 1999 are consistent with the ranges of variability noted in previous years for measurement at or near these locations.

Additional on-site TLD locations are located near the on-site Energy Center and the associated northeast shoreline. These locations include numbers 18, 103, 106 and 107. TLDs 103, 106, and 107 are located east of the Energy Center and west of the Unit 1 facility. TLD number 18 is located on the west side of the Energy Center. Results for this group ranged from 4.2 to 6.1 mrem per standard month for 1999 and were consistent with the 1998 results.

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 22.5 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 3.3 to 7.5 mrem per standard month.

Site boundary TLD results for 1999 were consistent with 1985 - 1998 results. TLD numbers 23, 75, 76, 77, 85, 86, and 87 showed results that ranged up to two times the results of the control TLDs. These results ranged from 4.6 to 12.3 mrem per standard month. TLDs in this latter group are located near the lake shoreline (approximately 100 feet from the shoreline), but are also located in close proximity to the reactor building and radwaste facilities of NMP Unit #1 and NMP Unit #2 and the radwaste facilities of the FitzPatrick plant.

A net site boundary dose can be estimated using site boundary TLD results and control TLD results. Results from TLDs located at the site boundary in land based sectors (excluding TLDs near the generating facilities and along the Lake Ontario shoreline) 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, 111 and 113. Net site boundary doses for each quarter in mrem per standard month are as follows:

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

*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 is located four to five miles from the site in each of the eight land based 22.5 degree meteorological sectors. These locations are required by the Technical Specifications and are referred to an off-site sector TLDs. At this distance, badges are not present in eight of the sixteen meteorological sectors which are located over Lake Ontario.

Results for this group of TLDs during 1999 showed a range of 3.6 to 5.6 mrem per standard month. The range of results is caused by differences in the natural physical conditions of each site and the varying concentrations of naturally occurring radionuclides in the ground at each of the locations. These results are consistent with control TLD results during 1999 and with the 1986 - 1996 results. These TLDs were established in 1985 and include numbers 88, 89, 90, 91, 92, 93, 94 and 95.

The fourth group of environmental TLDs is located near the site boundary and at special interest areas. Included in this group are monitoring locations at industrial sites, schools, nearby communities, 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. The remaining locations for this group are optional. This group of locations 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 locations that were established during 1988 and were added to assist in the evaluation of the nearest residence. In 1999, results ranged from 3.6 to 6.0 mrem per standard month for locations 108 and 109 with an annual mean of 4.6 mrem per standard month. All of the TLD results from this group were within the general variation of the control TLDs. Results during 1999 were consistent with the results for previous years.

The fifth category of TLDs is used to measure the dose rate at the control locations. These TLDs are required by the Technical Specifications and include numbers 14 and 49. Optional control locations are numbers 8, 111 and 113. Location number 111 was added to the program during 1988 to expand the data base for control measurements. Results for all control locations from 1999 ranged from 3.9 to 7.1 mrem per standard month. Results from 1999 were consistent with previous years results.

C. Dose Evaluation

TLDs located at the site boundary averaged 4.7 mrem per standard month (No. 7, 18, 78, 79, 80, 81, 82 83, 84).

TLDs placed at the special interest locations averaged 4.6 mrem per standard month. (No. 8, 15, 56, 58, 96, 97, 98).

The control TLD results averaged 4.6 mrem per standard month in 1999 (No. 8, 14, 49, 111, 113).

The measured mean dose rate in the proximity of the closest resident was 4.6 mrem per standard month (No. 108 and 109), which is consistent with the control measurements which was 4.6 mrem per standard month.

The mean annual dose for each of the geographic location categories demonstrates that there is no statistical difference in the annual dose as a function of distance from the site. The TLD program verifies that operations at the site do not measurably contribute to the levels of direct radiation present in the off-site environment.

D. Data Trends

A comparison of historical TLD results can be made using the different categories of measurement locations. These include site boundary TLDs in each meteorological sector (16 locations), TLDs located off-site in each land based sector at a distance of four to five miles (8 locations), badges located at special interest areas (6 locations) and TLDs located at control locations (5 locations). As noted previously, many of the present TLD locations became effective in 1985 and these results can only be evaluated for 1985 - 1997.

TLDs located at the site boundary averaged 6.1 mrem per standard month during 1987. During 1992, 1993, 1994, 1995, and 1996 site boundary dose rates averaged 5.1, 5.4, 5.2, 5.4, and 5.2 mrem per standard month, respectively. As noted previously, this group of TLDs exhibits fluctuating results because several of these TLDs are located in close proximity to the generating facilities and are influenced by operational modes. During 1999,

site boundary measurements averaged 4.7 mrem per standard month which is consistent with the previous five years.

TLDs located off-site at a distance of four to five miles from the site in each of the land based meteorological sectors (off-site sectors) averaged 5.2 mrem per standard month during 1987. During the previous five years, 1994 through 1998, the annual off-site sector dose rates averaged 4.0, 4.3, 4.2, 4.4 and 4.2 mrem per standard month, respectively. Results for the group averaged 4.2 mrem standard month over the five year period. The 1999 mean dose of 4.4 mrem per standard month is consistent with the previous five year mean and each individual yearly mean.

Special interest locations averaged 4.3 mrem per standard month over the previous five years. The 1999 results for these locations averaged 4.6 mrem per standard month. This is consistent with the previous five year average of 4.3 mrem per standard month.

The last group of TLD locations required by the Technical Specifications is the control group. This group (No. 8, 14, 49, 111 and 113) utilizes locations positioned well beyond the site. Results from 1986 for the control group averaged 6.3 mrem per standard month. During 1987, this same group of TLDs averaged 5.4 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 1994, 1995, 1996, 1997 and 1998 averaged 4.1, 4.4, 4.3, 4.7 and 4.4 mrem per standard month, respectively with a five year mean of 4.4 mrem per standard month. Control results for 1999 averaged 4.6 mrem per standard month, which is consistent with the previous five year mean of 4.4 mrem per standard month. These results indicates that the 1999 data is representative of the natural background dose rate.

The 1999 TLD program results, when compared to the previous five years and pre-operational data, show no significant trends relative to increased dose rates in the environment.

Tables 7-15 and 7-16 show the historical environmental sample data for environmental TLDs. A graph of historical TLD data is presented in Section 8.0.

5.2.5 MILK

A. Results Summary

A total of 216 analyses were performed on the 108 milk samples collected and analyzed for the 1999 program. Each sample was analyzed for gamma emitting radionuclides using gamma spectroscopy. In addition, each sample undergoes an iodine extraction procedure to determine the presence of Iodine-131 (I-131).

Iodine-131, a possible plant related radionuclide, is measured to evaluate the land deposition, grass, cow, dose pathway to man. In 1999, I-131 was not detected in any of the 108 samples collected from the six milk sampling locations.

Gamma spectral analyses of the bimonthly samples showed only naturally occurring radionuclides such as K-40 and Ra-226 were detected in milk samples during 1999. K-40 was detected in all indicator and control samples. Ra-226 was detected intermittently in milk samples. K-40 and Ra-226 are naturally occurring radionuclides and are found in many environmental sample media.

The 1999 results demonstrate that routine operation of the FitzPatrick Plant results in no contribution to the "dose to the public" from the cow/milk pathway.

B. Sampling Overview

Milk samples were collected from five indicator locations and one control location. Technical Specifications require that three sample locations be within five miles of the site. Based on the milk animal census, there were no adequate milk sample locations within five miles of the site in 1999. Samples were collected from five farms located beyond the five mile requirement to ensure the continued monitoring of this important pathway. The five indicator locations ranged from 5.5 to 9.5 miles from the site. The control samples were collected from a farm 13.2 miles from the site and in a low frequency wind sector (upwind). With the exception of indicator location No. 7 and the control

location, each of the reported locations has been sampled since 1989. The geographical location of each location is listed below:

Location No.	Direction From Site	Direction (Miles)
50	E	9.1
55	E	9.0
60	E	9.5
4	ESE	7.8
7	ESE	5.5
73 Control	SW	13.2

Samples were collected at locations from April through December, during the first and second half of each month. Because I-131 was not detected in samples collected during November and December of 1998 additional samples were not required for January through March of 1999 as stipulated in the Technical Specifications.

C. Data Evaluation and Discussion

Each sample is analyzed for gamma emitters using gamma spectral analysis. The I-131 analysis is performed using resin extraction followed by spectral analysis for each sample. I-131 analytical results and sample analysis results for gamma emitters are provided in Section 6.0, Table 6-11.

Iodine-131 was not detected in any indicator or control samples analyzed during 1999. All I-131 milk results were reported as lower limits of detection (LLD). The LLD results for all samples ranged from <0.30 to <1.00 pCi/liter. No plant related radionuclides were detected in the 1999 samples. K-40 was the most abundant radionuclide detected in milk samples collected. K-40 is a naturally occurring radionuclide and is found in many of the environmental media samples. K-40 was detected in every indicator and control sample. K-40 concentration for all samples ranged from 1210 to 1820 pCi/liter. Ra-226 was detected intermittently in the milk samples and is a naturally occurring radionuclide. During 1999, Cs-137 was not detected in any indicator or control milk samples.

D. Dose Evaluation

The calculated dose as a result of plant effluents is not evaluated due to the fact that no plant related radionuclides were detected.

The dose to man from naturally occurring concentrations of K-40 in milk and other environmental media can be calculated. This calculation illustrates that the dose received due to exposure from plant effluents is negligible as compared to the dose received from naturally occurring radionuclides. Significant levels of K-40 have been measured in environmental samples. 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 bone tissue is about 20 mrem per year (Eisenbud) as a result of internally deposited naturally occurring K-40.

E. Data Trends

Man made radionuclides are not routinely detected in milk samples. In the past ten years, Cs-137 was detected in 1986 and 1987. The mean Cs-137 indicator activities for those years were 8.6 and 7.4 pCi/liter, respectively. I-131 was measured in two milk samples in 1997 from a single sample location at a mean concentration of 0.35 pCi/liter and was of undetermined origin. The previous detection was in 1986 with a mean concentration of 13.6 pCi/liter. The 1986 activity was a result of the Chernobyl accident.

From 1976 to 1985, Cs-137 and I-131 were intermittently detected. Cs-137 was detected in a 1983 milk sample with a concentration of 5.1 pCi/liter. In 1980, I-131 was detected at the indicator and control locations with mean concentrations of 4.9 and 1.4 pCi/liter, respectively. The Cs-137 and I-131 activity during this period is attributed to Chinese atmospheric thermonuclear weapons testing. The comparison of 1999 data to historical results over the operating life of the plant and preoperational data (1974) show that Cs-137 and I-131 levels have decreased significantly since 1974. The levels of Cs-137 and I-131 detected prior to the plant going into commercial operation were the result of activities not related to power production at the site.

Historical data and a graphic presentation of milk sample results for Cs-137 and I-131 are presented in Section 7.0, Tables 7-17 and 7-18 and in Section 8.0, respectively.

5.2.6 FOOD PRODUCTS (VEGETATION)

A. Results Summary

There were no plant related radionuclides detected in the 17 food product samples collected and analyzed for the 1999 program. Cs-137, a ubiquitous environmental radionuclide, was detected in one indicator location sample at a concentration of 0.007±0.001 pCi/g (wet) in squash leaves. A review of historical environmental data shows that Cs-137 has been detected in five of the previous ten year sampling programs. Cesium was not detected in the 1999 control location sample. The presence of Cs-137 in this sample is attributed to Cs-137 found in soil from past weapons testing and not considered to be site related.

Detectable levels of naturally occurring K-40 were measured in all control and indicator samples collected for the 1999 program. Be-7, a second naturally occurring radionuclide, was also detected in all of the samples collected in 1999. These results are consistent with the levels measured in 1998 and previous years.

The results of the 1999 sampling program demonstrate that the dose to man from the garden pathway is insignificant and the contribution from the operation of the FitzPatrick plant, if any, is below the limits of detection.

B. Data Analysis and Discussion

Food product samples were collected from five indicator locations and one control location. The collection of annual food product samples became a requirement as a result of Technical Specification Amendment 127 in 1985. The indicator locations are represented by nearby gardens in areas of highest D/Q (deposition factor) values based on historical meteorology and an annual garden census. The control location was a garden 15 miles away in a predominately upwind direction.

Food product samples collected during 1999 did not include varieties that are considered edible broadleaf vegetables. The lack of edible broadleaf vegetation samples was the result of a hot dry summer and such varieties were not available in local gardens. Where broadleaf vegetables were not available,

non-edible broadleaf vegetation was collected. Non-edible vegetation consisting of squash leaves, bean leaves, pepper leaves and cucumber leaves were collected for the 1999 program. The leaves of these plants were sampled as representative of broadleaf vegetation which is a measurement of radionuclide deposition. Samples were collected during the late-summer/fall harvest season. Each sample was analyzed for gamma emitters using gamma spectroscopy.

The results of the 1999 program contained a positive detection of Cs-137 in one sample of non-edible squash leaves at location "L". The measured concentration of the Cs-137 was 0.007 pCi/g (wet). Cs-137 has been intermittently detected in previous years at both indicator and control locations. The source of the measured Cs-137 is considered to be past nuclear weapons testing. Although Cs-137 was not detected in the control samples during 1999 there has been a number of positive detections for Cs-137 in the historical sample collections at other sample media control locations (see Section 7.0). Cs-137 is found in a number of other environmental sample media including vegetation, fish, soil and lakeshore sediment. The presence of Cs-137 in the control and indicator locations of other sample media supports the conclusion that the source of the Cs-137 as past weapons testing fallout and not plant operations. Food product results for the past five years demonstrate that there is no build-up of plant related radionuclides in the garden food products grown in areas close to the site.

Naturally occurring Be-7, K-40, Ra-226 and AcTh-228 were detected in food product samples. The concentration of Be-7 in vegetation samples ranged from 0.59 to 2.68 pCi/g (wet). The concentration of K-40 in indicator and control samples ranged from 1.93 pCi/g (wet) to 5.94 pCi/g (wet). Ra-226 and AcTh-228 were detected intermittently in the samples. The results for naturally occurring radionuclides are consistent with those of prior years. Analytical results for food products are found in Section 6.0, Table 6-13.

C. Dose Evaluation

The measured concentration of Cs-137 in the vegetation is very small. This can be illustrated by calculating the hypothetical dose to an individual who may consume vegetation from the sample locations. The dose to man is calculated utilizing the methodology from Regulatory Guide 1.109 and the

conservative assumption that a person was to consume vegetation from the sample garden and the non-edible vegetation was representative of the edible leafy vegetation. The calculated dose to the maximum exposed individual would be 0.060 mrem to the child liver (critical organ) and 0.032 mrem to the adult whole body. This increase in the annual dose is extremely small when compared to the annual terrestrial background dose rate of 60 mrem/year in the general area of the site.

D. Data Trends

Food product/vegetation sample results for the last five years demonstrate that there is no chronic deposition or build-up of plant related radionuclides in the garden food products in the environs near the site.

In the previous five year period, Cs-137 was detected in three of those years at the indicator location. Since operation began at the FitzPatrick Power Plant, Cs-137 has been detected in eight separate years, including 1999. These historical Cs-137 concentrations for samples collected during J.A. FitzPatrick N.P.P. operational years ranged from a maximum level of 0.047 pCi/g (wet) in 1985 to a minimum level of 0.007 pCi/g (wet) in 1999. The maximum Cs-137 concentration was detected in 1974 at a concentration of 0.142 pCi/g (wet) which was pre-operational for JAF. The trend for Cs-137 is a general reduction in concentration to a baseline concentration in the range of 0.010 to 0.013 pCi/g.

There is no measurable trend for Zn-65 in vegetation samples. Zn-65 was detected one time in 1997 in food products sampled as part of the Environmental Radiological Surveillance Program. Zn-65 was not detected in the 1999 samples.

Historical data and graphic presentations of food product results are presented in Section 7.0, Tables 7-19 and 7-20, and in Section 8.0.

5.2.7 LAND USE CENSUS RESULTS

A. Results Summary

Technical Specifications require that an annual land use census be performed to identify potential new locations for milk sampling and for calculating the dose to man from plant effluents. In 1999 a milk animal census, a nearest resident census and a garden survey were performed.

No changes were required to milk sampling indicator or control locations in 1999 based on the 1999 milk animal census.

The results of the closest residence census conducted in 1999 required no change to the Off-site Dose Calculation Manual (ODCM) closest resident location.

A garden census, not required by Technical Specifications, is performed to identify appropriate garden sampling locations and dose calculation receptors. Garden samples were collected from those locations listed in Table H-1 of the ODCM and identified in the census as active for 1999. See Table 3.3-1 for 1999 sampling locations.

B. Data Evaluation and Discussion

A land use census is conducted each year to determine the utilization of land in the vicinity of the site. The land use census consists of two types of surveys. A milk animal census is conducted to identify all milk animals within a distance of 10 miles from the site. The census, covering areas out to a distance of 10 miles, exceeds the 5 mile distance required by the Technical Specifications. A resident census is conducted and is designed to identify the nearest resident in each meteorological sector out to a distance of five miles.

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 during the first half of the grazing season by sending questionnaires to previous milk animal owners and also by road surveys to locate any possible new locations. In the event the questionnaires are not

answered, the owners are contacted by telephone or in person. The local county agricultural agency is also contacted as a further source of information concerning new milk animal locations in the vicinity of the site.

The number of milk animals located within an approximate ten mile radius of the site was estimated to be 696 cows and 6 goats based on the 1999 land use census. The number of cows increased by 54 and the number of goats increased by one with respect to the 1998 census. The goats identified during the census were not milking goats.

The locations identified as a result of the milk animal census are illustrated on a map in Section 3.3, Figure 3.3-4.

The results of the milk animal census are found in Section 6.0, Table 6-12.

The second type of census is a residence census. The census is conducted in order to identify the closest residence within 5 miles in each of the 22.5 degree land based meteorological sectors. There are only eight sectors over land where residences are located within 5 miles. The water sectors include: N, NNE, NE, ENE, W, WNW, NW and NNW. The results of the residence census, showing the applicable sectors and degrees and distance of each of the nearest residence, are found in Section 6.0, Table 6-14. No changes were noted in the 1999 census for the closest resident in the land based meteorological sectors.

The nearest resident locations are illustrated on a map in Section 3.3, Figure 3.3-5.

5.3 CONCLUSION

The REMP is an on going program implemented to measure and document the radiological impact of JAFNPP operations on the local environment. The program is designed to detect and evaluate small changes in the radiological environment surrounding the site. Environmental media representing food sources consumed at the higher levels of the food chain, such as fish, food products and milk, are part of a comprehensive sampling program. Results of all samples are reviewed closely to determine any possible impact to the environment or to man. In addition, program results are evaluated for possible short and long term historical trends.

The results of the 1999 Radiological Environmental Surveillance Program continues to clearly demonstrate that there is no significant short term or chronic long term radiological impact on the environment in the vicinity of the Nine Mile Point site. No unusual radiological characteristics were measured or observed in the local environment. The Environmental Monitoring Program continues to demonstrate that the effluents from the site to the environment contribute no significant measurable radiation exposures to the general public as confirmed by the sampling and analysis of environmental media from recognized environmental pathways. No increase in radiation levels in the environment beyond the site boundary were measured as a result of the hydrogen water chemistry program based on TLD results. Environmental radiation levels measured at the nearest resident are at the background level. The only measurable radiological impact on the environment continues to be the result of atmospheric weapons testing conducted in the early 1980s and the 1986 accident at the Chernobyl Nuclear Power Plant. Both of these source terms have contributed to a ubiquitous inventory of Cs-137 in the environment. The results for the 1999 sample program demonstrate that the concentrations of manmade radionuclides continue to decline. This reduction in environmental background concentrations will allow for the site environmental program to become more sensitive to the measurable impact of plant operations on the environment as time goes on.

The environmental monitoring program detected one fission product radionuclide in the sample media collected during 1999. Cs-137 was detected in shoreline sediment samples, fish and vegetation samples. The source of the Cs-137 measured in these samples is considered to be fallout from past atmospheric nuclear weapons testing. The measured concentrations of Cs-137 in each of the samples was small and consistent with historical values. The impact of these Cs-137 concentrations are minimal in terms of dose to man. Dose from man made sources in the environment are very small when compared to doses from naturally occurring sources of radioactivity.

Radiation from naturally occurring radionuclides such as K-40 and Ra-226 contributed the vast majority of the total annual dose to members of the general public. The contribution to the off-site whole body dose as a result of plant operations is extremely small in comparison to the dose contribution from natural background levels and sources other than the plant. Whole body dose in Oswego County due to all natural sources is approximately 50-60 mrem per individual per year as demonstrated by control environmental TLDs. The fraction of the annual dose to man attributable to site operation remains insignificant.

From the collective results of the 1999 Radiological Environmental Surveillance Program, it can be concluded that the levels and variation of radioactivity in the environmental samples were consistent with background levels that would be expected for the lakeshore environment of the site.

5.4 REFERENCES

1. Radiological Effluent Technical Specifications, Appendix B to Facility Operating License No. DPR-59 For James A. FitzPatrick Nuclear Power Plant, New York Power Authority, Docket No. 50-333, Amendment 127.

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.

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

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

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10. Eisenbud, Merril, Environmental Radioactivity, Third Edition, Academic Press, New York, New York, 1987.

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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. Knoll, G., Radiation Detection and Measurement, Second Edition, John Wiley & Sons, New York, New York, 1989.

6.0 REPORT PERIOD ANALYTICAL RESULTS TABLES

6.1 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.

6.2 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 3.7.3 for detailed explanation).

6.3 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 3.7.2 for methodology).

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

TABLE 6-1

CONCENTRATIONS OF GAMMA EMITTERS IN SHORELINE SEDIMENT SAMPLES - 1999

Results in Units of pCi/g (dry) ± 1 Sigma

STATION CODE*	COLLECTION DATE	GAMMA EMITTERS					
		K-40	Co-60	Cs-134	Cs-137	Zn-65	OTHERS**
Sunset Beach (05)	04/99	20.9±0.41	<0.050	<0.049	0.058±0.010	<0.104	<LLD
	10/99	20.4±0.70	<0.121	<0.085	0.100±0.018	<0.277	<LLD
Lang's Beach (06, Control)	04/99	14.0±0.55	<0.051	<0.043	<0.035	<0.069	<LLD
	10/99	14.1±0.66	<0.055	<0.060	<0.059	<0.085	<LLD

* Corresponds to sample locations noted on the maps in Section 3.3.

** Plant Related Isotopes

TABLE 6-2

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES - 1999

Results in Units of pCi/g (wet) ± 1 Sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					FITZPATRICK					
05/18/99	Lake Trout	3.97±0.24	<0.026	<0.032	<0.106	<0.032	<0.070	<0.024	<0.025	<LLD
06/02/99	Brown Trout	5.39±0.19	<0.025	<0.026	<0.060	<0.024	<0.059	<0.023	<0.021	<LLD
06/09/99	Walleye	3.60±0.21	<0.024	<0.033	<0.108	<0.025	<0.063	<0.024	0.018±0.004	<LLD
06/17/99	Smallmouth Bass	4.21±0.20	<0.021	<0.026	<0.083	<0.022	<0.057	<0.020	<0.019	<LLD
09/28/99	Chinook	6.43±0.54	<0.076	<0.077	<0.142	<0.068	<0.019	<0.070	<0.064	<LLD
09/29/99	Brown Trout	5.87±0.27	<0.052	<0.051	<0.015	<0.059	<0.132	<0.059	<0.052	<LLD
09/29/99	Smallmouth Bass	6.08±0.51	<0.057	<0.046	<0.160	<0.061	<0.171	<0.044	<0.070	<LLD
09/29/99	Walleye	5.01±0.31	<0.059	<0.064	<0.147	<0.088	<0.013	<0.060	<0.060	<LLD

* Plant Related Radionuclides

TABLE 6-2 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES - 1999

Results in Units of pCi/g (wet) ± 1 Sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					NINE MILE POINT					
05/21/99	Smallmouth Bass	3.72±0.21	<0.023	<0.027	<0.092	<0.021	<0.066	<0.022	<0.019	<LLD
05/21/99	Walleye	4.12±0.13	<0.027	<0.032	<0.076	<0.024	<0.053	<0.019	0.021±0.004	<LLD
06/09/99	Brown Trout	4.11±0.24	<0.026	<0.033	<0.065	<0.029	<0.062	<0.023	<0.025	<LLD
09/16/99	Smallmouth Bass	6.23±0.64	<0.080	<0.082	<0.242	<0.074	<0.156	<0.065	<0.075	<LLD
09/28/99	Brown Trout	5.50±0.45	<0.063	<0.062	<0.149	<0.058	<0.161	<0.054	<0.048	<LLD
09/28/99	Walleye	5.93±0.58	<0.052	<0.082	<0.168	<0.098	<0.152	<0.058	<0.048	<LLD
09/29/99	Chinook	5.52±0.47	<0.053	<0.066	<0.018	<0.059	<0.144	<0.072	<0.064	<LLD

* Plant Related Radionuclides

TABLE 6-2 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES - 1999

Results in Units of pCi/g (wet) ± 1 Sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					OSWEGO HARBOR (Control)					
05/19/99	Lake Trout	3.98±0.23	<0.028	<0.045	<0.140	<0.037	<0.074	<0.026	<0.023	<LLD
05/28/99	Brown Trout	3.12±0.19	<0.020	<0.026	<0.067	<0.018	<0.059	<0.024	<0.023	<LLD
05/28/99	Walleye	5.56±0.19	<0.023	<0.029	<0.058	<0.019	<0.029	<0.021	<0.022	<LLD
06/08/99	Smallmouth Bass	5.86±0.19	<0.022	<0.031	<0.070	<0.020	<0.058	<0.023	<0.020	<LLD
09/16/99	Brown Trout	5.42±0.56	<0.060	<0.062	<0.223	<0.063	<0.131	<0.066	<0.058	<LLD
09/16/99	Walleye	4.50±0.54	<0.076	<0.075	<0.198	<0.086	<0.014	<0.062	<0.056	<LLD
09/16/99	Salmon	5.27±0.33	<0.043	<0.064	<0.116	<0.034	<0.117	<0.043	<0.044	<LLD
09/28/99	Smallmouth Bass	6.30±0.51	<0.063	<0.073	<0.120	<0.068	<0.128	<0.074	<0.060	<LLD

* Plant Related Radionuclides

TABLE 6-3

CONCENTRATIONS OF TRITIUM IN SURFACE WATER
(QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/liter ± 1 Sigma

STATION CODE	PERIOD	DATE	TRITIUM
FITZPATRICK* (03, INLET)	First Quarter	01/04/99 - 03/31/99	<170
	Second Quarter	03/31/99 - 06/30/99	250±100
	Third Quarter	06/30/99 - 09/30/99	270±170
	Fourth Quarter	09/30/99 - 12/30/99	180±110
OSWEGO STEAM* STATION (08, CONTROL)	First Quarter	01/04/99 - 03/31/99	<170
	Second Quarter	03/31/99 - 06/30/99	220±100
	Third Quarter	06/30/99 - 09/30/99	510±160
	Fourth Quarter	09/30/99 - 12/30/99	<170
NINE MILE POINT UNIT 1** (09, INLET)	First Quarter	01/04/99 - 03/31/99	280±110
	Second Quarter	03/31/99 - 06/30/99	190±100
	Third Quarter	06/30/99 - 09/30/99	350±160
	Fourth Quarter	09/30/99 - 12/30/99	<170
NINE MILE POINT UNIT 2** (11, INLET)	First Quarter	01/04/99 - 03/31/99	<170
	Second Quarter	03/31/99 - 06/30/99	170±100
	Third Quarter	06/30/99 - 09/30/99	380±180
	Fourth Quarter	09/30/99 - 12/30/99	<170
OSWEGO CITY** WATER (10)	First Quarter	01/04/99 - 03/31/99	<170
	Second Quarter	03/31/99 - 06/30/99	220±100
	Third Quarter	06/30/99 - 09/30/99	270±170
	Fourth Quarter	09/30/99 - 12/30/99	<170

* Samples required by Technical Specifications

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

TABLE 6-4

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1999
Results in Units of pCi/liter ± 1 Sigma

OSWEGO STEAM STATION* (08, CONTROL)**

NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
I-131	<0.77	<0.82	<0.52	<0.59	<0.47	<0.73
Cs-134	<3.31	<3.01	<3.46	<1.73	<3.52	<2.97
Cs-137	<3.54	<2.86	<3.68	<2.56	<3.56	<2.75
Zr-95	<7.62	<5.78	<7.73	<4.91	<7.53	<5.19
Nb-95	<4.69	<3.59	<5.04	<4.05	<5.32	<3.72
Co-58	<4.43	<2.87	<4.80	<3.13	<4.83	<3.65
Mn-54	<3.42	<2.95	<3.96	<3.10	<4.19	<3.09
Fe-59	<9.93	<9.52	<8.06	<8.52	<8.14	<8.20
Zn-65	<8.64	<7.45	<9.68	<6.53	<8.78	<6.71
Co-60	<4.67	<7.24	<4.80	<2.41	<4.65	<3.38
K-40	230±22.4	<37.0	254±22.9	42.1±12.4	171±20.0	<37.0
Ba/La-140	<9.82	<7.12	<9.90	<9.42	<10.0	<10.8

NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
I-131	<0.54	<0.32	<0.42	<0.43	<0.60	<0.83
Cs-134	<2.19	<3.80	<2.76	<4.05	<3.01	<3.28
Cs-137	<2.67	<3.25	<3.18	<4.13	<2.97	<3.79
Zr-95	<3.95	<7.28	<5.83	<8.54	<5.90	<6.62
Nb-95	<3.39	<5.11	<4.32	<5.71	<3.72	<4.91
Co-58	<3.02	<4.64	<3.24	<5.25	<3.72	<3.83
Mn-54	<2.89	<3.95	<3.47	<3.91	<2.93	<4.01
Fe-59	<6.02	<9.82	<9.20	<10.9	<6.17	<9.79
Zn-65	<6.01	<8.66	<7.55	<8.57	<7.07	<8.53
Co-60	<2.53	<5.23	<3.54	<5.06	<3.05	<3.17
K-40	162±14.0	195±19.7	224±19.0	202±25.6	160±15.5	231±20.3
Ba/La-140	<8.03	<11.2	<10.7	<14.1	<6.49	<12.0

* Samples required by Technical Specifications.
** Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1999
Results in Units of pCi/liter ± 1 Sigma

FITZPATRICK* (03, INLET)**

NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
I-131	<0.89	<0.87	<0.43	<0.55	<0.43	<0.74
Cs-134	<2.08	<2.03	<2.06	<4.03	<3.47	<1.48
Cs-137	<1.93	<2.00	<2.00	<4.19	<3.56	<2.29
Zr-95	<3.72	<3.47	<3.80	<7.74	<6.18	<4.56
Nb-95	<2.63	<2.32	<2.43	<5.64	<4.89	<3.53
Co-58	<2.28	<2.21	<2.71	<5.61	<4.51	<2.59
Mn-54	<2.03	<2.24	<2.42	<4.49	<3.44	<2.33
Fe-59	<5.70	<5.66	<5.48	<10.8	<10.0	<7.24
Zn-65	<5.04	<4.53	<5.04	<10.3	<8.45	<5.22
Co-60	<2.41	<2.71	<2.81	<4.87	<4.34	<2.38
K-40	69.7±10.1	42.1±8.71	41.2±9.03	170±21.0	199±20.3	<25.0
Ba/La-140	<5.45	<6.98	<7.17	<14.1	<11.3	<9.27

NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
I-131	<0.39	<0.35	<0.54	<1.00	<0.34	<0.44
Cs-134	<2.19	<2.27	<2.37	<2.75	<1.85	<1.82
Cs-137	<2.13	<2.00	<2.34	<2.88	<2.87	<1.89
Zr-95	<4.38	<4.22	<5.30	<5.45	<6.03	<3.57
Nb-95	<2.62	<2.56	<3.47	<4.19	<3.73	<2.16
Co-58	<2.43	<2.63	<2.68	<3.69	<3.19	<2.04
Mn-54	<2.37	<2.30	<2.71	<3.05	<3.20	<1.91
Fe-59	<5.33	<6.25	<5.96	<7.70	<7.35	<5.07
Zn-65	<5.39	<4.53	<5.46	<7.60	<7.42	<4.25
Co-60	<2.30	<2.33	<3.07	<3.52	<2.81	<2.39
K-40	58.3±9.12	77.4±10.6	184±14.9	178±15.7	167±15.5	143±11.2
Ba/La-140	<5.28	<6.17	<6.79	<7.28	<8.10	<4.93

* Samples required by Technical Specifications.
** Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1999
Results in Units of pCi/liter ± 1 Sigma

NINE MILE POINT UNIT 1* (09, INLET)**

NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
I-131	<5.46	<5.84	<5.69	<7.58	<14.1	<13.5
Cs-134	<2.10	<2.32	<2.23	<2.19	<4.98	<1.57
Cs-137	<1.72	<2.23	<2.06	<2.27	<4.61	<1.73
Zr-95	<3.76	<4.34	<3.84	<4.28	<11.1	<3.55
Nb-95	<2.19	<2.86	<2.66	<3.14	<7.28	<2.71
Co-58	<2.21	<2.62	<2.16	<2.56	<5.32	<2.12
Mn-54	<1.94	<2.20	<2.28	<2.47	<4.28	<1.74
Fe-59	<5.01	<4.79	<5.34	<5.17	<11.7	<4.84
Zn-65	<4.37	<2.99	<4.99	<3.08	<11.2	<4.08
Co-60	<2.78	<2.31	<2.68	<2.18	<5.34	<1.73
K-40	25.2±9.24	219±12	30.1±7.74	213±12.5	205±24.6	39.2±6.51
Ba/La-140	<5.25	<4.84	<7.37	<5.67	<10.0	<9.72

NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
I-131	<14.8	<5.62	<14.7	<13.9	<9.24	<9.79
Cs-134	<1.35	<2.08	<2.67	<4.33	<3.08	<2.51
Cs-137	<2.47	<1.87	<2.69	<4.81	<2.99	<2.83
Zr-95	<5.62	<4.66	<6.93	<9.33	<5.80	<5.54
Nb-95	<3.92	<2.66	<5.06	<5.64	<3.93	<3.26
Co-58	<3.24	<2.33	<4.08	<4.93	<3.52	<3.06
Mn-54	<2.75	<2.22	<2.92	<5.24	<3.26	<2.64
Fe-59	<7.96	<5.66	<9.94	<12.8	<7.34	<7.02
Zn-65	<5.21	<5.29	<7.92	<11.0	<3.92	<5.40
Co-60	<2.44	<2.30	<3.80	<4.86	<2.62	<2.89
K-40	203±15.0	76.8±10.1	214±19.5	132±21.4	237±17.2	21.0±15.8
Ba/La-140	<11.6	<5.92	<12.6	<11.0	<7.79	<9.95

* Optional sample location. Samples not required by Technical Specifications.
** Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1999
Results in Units of pCi/liter ± 1 Sigma

NINE MILE POINT UNIT 2* (11, INLET)**

NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
I-131	<7.47	<8.94	<15.0	<6.61	<8.09	<11.1
Cs-134	<2.30	<2.94	<4.34	<2.00	<1.43	<7.57
Cs-137	<2.75	<4.24	<5.26	<1.85	<2.45	<1.21
Zr-95	<5.17	<8.36	<11.0	<4.30	<4.36	<2.71
Nb-95	<3.78	<4.88	<6.09	<2.54	<1.94	<1.95
Co-58	<3.28	<4.93	<5.80	<2.58	<2.85	<1.62
Mn-54	<2.96	<4.08	<4.79	<2.07	<2.39	<1.31
Fe-59	<8.05	<9.43	<11.4	<6.07	<5.46	<3.58
Zn-65	<8.72	<8.93	<13.5	<5.02	<3.13	<1.70
Co-60	<2.90	<4.57	<6.29	<2.43	<2.11	<1.33
K-40	30.6±10.2	247±22	209±26.2	51.9±8.41	25.6±13.2	30.9±8.35
Ba/La-140	<8.20	<9.60	<14.90	<7.23	<5.86	<6.03

NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
I-131	<14.2	<7.43	<13.7	<11.8	<6.82	<12.1
Cs-134	<3.96	<2.22	<2.58	<3.05	<2.37	<2.66
Cs-137	<4.19	<2.53	<2.59	<3.66	<2.53	<2.81
Zr-95	<8.42	<4.69	<5.22	<6.54	<5.00	<5.81
Nb-95	<5.39	<3.12	<3.59	<4.64	<3.90	<4.10
Co-58	<4.54	<2.60	<3.08	<4.48	<2.88	<3.32
Mn-54	<4.21	<2.45	<2.46	<3.95	<2.99	<2.91
Fe-59	<9.99	<5.85	<6.38	<8.77	<6.71	<6.90
Zn-65	<10.20	<5.58	<6.45	<8.67	<6.65	<6.57
Co-60	<4.05	<2.95	<2.77	<3.59	<3.11	<3.16
K-40	26.9±22.7	174±14.9	219±14.1	279±22.2	221±16.1	207±16.6
Ba/La-140	<12.5	<7.32	<9.23	<8.09	<6.68	<9.25

* Optional sample location. Samples not required by Technical Specifications.
** Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-4 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1999
Results in Units of pCi/liter ± 1 Sigma

OSWEGO CITY WATER* (10)**

NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
I-131	<13.6	<6.00	<10.4	<13.8	<14.5	<12.2
Cs-134	<3.02	<2.09	<1.36	<3.45	<4.43	<0.78
Cs-137	<4.79	<2.12	<2.21	<4.01	<4.96	<12.2
Zr-95	<10.6	<4.14	<4.73	<7.98	<9.34	<2.75
Nb-95	<6.50	<2.73	<3.33	<5.18	<6.57	<2.04
Co-58	<5.77	<2.77	<2.77	<4.51	<5.18	<1.59
Mn-54	<4.57	<2.20	<2.32	<3.66	<5.39	<1.19
Fe-59	<12.3	<5.35	<5.66	<10.4	<11.4	<3.82
Zn-65	<12.4	<2.29	<2.93	<8.15	<11.9	<1.66
Co-60	<5.09	<2.14	<2.22	<4.09	<5.35	<1.23
K-40	159±24.5	242±13	245±12.8	194±20.8	181±23.8	238±7.27
Ba/La-140	<12.0	<5.45	<7.42	<10.9	<15.0	<6.63

NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
I-131	<7.46	<6.38	<14.8	<14.0	<10.3	<10.7
Cs-134	<2.29	<2.08	<2.88	<4.84	<2.79	<1.59
Cs-137	<2.12	<2.08	<2.83	<4.54	<2.97	<2.48
Zr-95	<4.48	<3.75	<6.56	<9.64	<5.16	<4.75
Nb-95	<2.84	<2.68	<4.94	<6.40	<3.91	<3.11
Co-58	<2.58	<2.44	<4.05	<5.75	<3.60	<2.96
Mn-54	<2.24	<2.20	<3.47	<4.04	<3.12	<2.62
Fe-59	<5.51	<5.03	<8.87	<10.9	<7.42	<5.50
Zn-65	<5.32	<5.47	<7.30	<14.0	<3.92	<2.99
Co-60	<2.45	<2.16	<4.26	<5.59	<2.97	<2.68
K-40	61.1±9.54	267±13.0	204±20.0	190±26.8	244±16.9	288±13.9
Ba/La-140	<6.47	<5.11	<13.1	<14.2	<7.47	<6.42

* Optional sample location. Samples not required by Technical Specifications.
** Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-5

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF-SITE STATIONS
GROSS BETA ACTIVITY $pCi/m^3 \pm 1$ SIGMA
LOCATION

WEEK START DATE	R-1 OFF*	R-2 OFF*	R-3 OFF*	R-4 OFF*	R-5 OFF*	D-2 OFF	E-OFF	F-OFF	G-OFF
01/05/99	0.017±0.001	0.021±0.001	0.015±0.001	0.019±0.001	0.018±0.001	0.018±0.001	0.020±0.001	0.018±0.001	0.017±0.001
01/12/99	0.013±0.001	0.016±0.001	0.015±0.001	0.016±0.001	0.014±0.001	0.012±0.001	0.015±0.001	0.014±0.001	0.015±0.001
01/19/99	0.011±0.001	0.011±0.001	0.010±0.001	0.011±0.001	0.010±0.001	0.008±0.001	0.010±0.001	0.011±0.001	0.012±0.001
01/26/99	0.017±0.001	0.019±0.001	0.017±0.001	0.016±0.001	0.018±0.001	0.018±0.001	0.016±0.001	0.017±0.001	0.016±0.001
02/02/99	0.019±0.001	0.018±0.001	0.021±0.001	0.016±0.001	0.018±0.001	0.016±0.001	0.016±0.001	0.017±0.001	0.018±0.001
02/09/99	0.015±0.001	0.015±0.001	0.015±0.001	0.014±0.001	0.016±0.001	0.015±0.001	0.015±0.001	0.016±0.001	0.015±0.001
02/16/99	0.016±0.001	0.019±0.001	0.018±0.001	0.018±0.001	0.017±0.001	0.017±0.001	0.018±0.001	0.018±0.001	0.019±0.001
02/23/99	0.016±0.001	0.014±0.001	0.016±0.001	0.014±0.001	0.017±0.001	0.015±0.001	0.016±0.001	0.015±0.001	0.014±0.001
03/02/99	0.016±0.001	0.014±0.001	0.015±0.001	0.015±0.001	0.014±0.001	0.013±0.001	0.017±0.001	0.015±0.001	0.018±0.001
03/09/99	0.013±0.001	0.013±0.001	0.014±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001
03/16/99	0.011±0.001	0.011±0.001	**	0.010±0.001	0.013±0.001	0.013±0.001	0.012±0.001	0.012±0.001	0.011±0.001
03/23/99	0.015±0.001	0.017±0.001	0.016±0.001	0.014±0.001	0.016±0.001	0.014±0.001	0.015±0.001	0.012±0.001	0.014±0.001
03/30/99	0.015±0.001	0.017±0.001	0.015±0.001	0.018±0.001	0.012±0.001	0.017±0.001	0.018±0.001	0.017±0.001	0.015±0.001
04/06/99	0.017±0.001	0.015±0.001	0.017±0.001	0.015±0.001	0.018±0.001	0.016±0.001	0.017±0.001	0.017±0.001	0.015±0.001
04/13/99	0.020±0.001	0.018±0.001	0.020±0.001	0.015±0.001	0.012±0.001	0.019±0.001	0.014±0.001	0.015±0.001	0.017±0.001
04/20/99	0.016±0.001	0.015±0.001	0.016±0.001	0.013±0.001	0.020±0.001	0.016±0.001	0.013±0.001	0.015±0.001	0.011±0.001
04/28/99	0.036±0.001	0.039±0.001	0.034±0.001	0.029±0.001	0.026±0.001	0.030±0.001	0.030±0.001	0.028±0.001	0.024±0.001
05/04/99	0.010±0.001	0.011±0.001	0.010±0.001	0.009±0.001	0.010±0.001	0.007±0.001	0.012±0.001	0.010±0.001	0.009±0.001
05/11/99	0.016±0.001	0.015±0.001	0.016±0.001	0.013±0.001	0.018±0.001	0.015±0.001	0.014±0.001	0.014±0.001	0.014±0.001
05/18/99	0.012±0.001	0.011±0.001	0.010±0.001	0.009±0.001	0.012±0.001	0.013±0.001	0.012±0.001	0.009±0.001	0.012±0.001
05/25/99	0.021±0.001	0.020±0.001	0.022±0.001	0.020±0.001	0.020±0.001	0.020±0.001	0.020±0.001	0.023±0.001	0.022±0.001
06/01/99	0.022±0.001	0.020±0.001	0.020±0.001	0.020±0.001	0.021±0.001	0.020±0.001	0.021±0.001	0.017±0.001	0.023±0.001
06/08/99	0.013±0.001	0.028±0.001	0.013±0.001	0.012±0.001	0.011±0.001	0.013±0.001	0.014±0.001	0.014±0.001	0.012±0.001
06/15/99	0.015±0.001	0.016±0.001	0.012±0.001	0.014±0.001	0.014±0.001	0.014±0.001	0.013±0.001	0.014±0.001	0.013±0.001
06/22/99	0.023±0.001	0.024±0.001	0.021±0.001	0.021±0.001	0.022±0.001	0.024±0.001	0.019±0.001	0.021±0.001	0.014±0.001
06/29/99	0.019±0.001	0.016±0.001	0.017±0.001	0.016±0.001	0.019±0.001	0.015±0.001	0.018±0.001	0.016±0.001	0.019±0.001

* Sample locations required by Technical Specifications

** No sample results due to pump failure

TABLE 6-5 (Continued)

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF-SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK START DATE	R-1 OFF*	R-2 OFF*	R-3 OFF*	R-4 OFF*	R-5 OFF*	D-2 OFF	E-OFF	F-OFF	G-OFF
07/06/99	0.012±0.001	0.013±0.001	0.012±0.001	0.010±0.001	0.013±0.001	0.012±0.001	0.010±0.001	0.015±0.001	0.011±0.001
07/13/99	0.030±0.001	0.025±0.001	0.025±0.001	0.023±0.001	0.027±0.001	0.029±0.001	0.031±0.001	0.024±0.001	0.024±0.001
07/20/99	0.020±0.001	0.021±0.001	0.020±0.001	0.017±0.001	0.020±0.001	0.020±0.001	0.017±0.001	0.017±0.001	0.018±0.001
07/27/99	0.018±0.001	0.021±0.001	0.017±0.001	0.018±0.001	0.016±0.001	0.019±0.001	0.020±0.001	0.017±0.001	†0.023±0.001
08/03/99	0.012±0.001	0.015±0.001	0.012±0.001	0.012±0.001	0.014±0.001	0.012±0.001	0.013±0.001	0.013±0.001	†0.015±0.001
08/10/99	0.022±0.001	0.020±0.001	0.021±0.001	0.020±0.001	0.017±0.001	0.021±0.001	0.021±0.001	0.021±0.001	0.017±0.001
08/17/99	0.020±0.001	0.021±0.001	0.016±0.001	0.014±0.001	0.018±0.001	0.019±0.001	0.017±0.001	0.015±0.001	0.015±0.001
08/24/99	0.018±0.001	0.016±0.001	0.016±0.001	0.016±0.001	0.017±0.001	0.017±0.001	0.019±0.001	0.016±0.001	0.015±0.001
08/31/99	0.024±0.001	0.025±0.001	0.023±0.001	0.020±0.001	0.021±0.001	0.022±0.001	0.020±0.001	0.021±0.001	0.020±0.001
09/07/99	0.021±0.001	0.022±0.001	0.024±0.001	0.024±0.001	0.022±0.001	0.020±0.001	0.022±0.001	0.026±0.001	0.023±0.001
09/14/99	0.018±0.001	0.018±0.001	0.017±0.001	0.017±0.001	0.016±0.001	0.019±0.001	†0.016±0.001	0.018±0.001	0.020±0.001
09/21/99	0.017±0.001	0.018±0.001	0.019±0.001	0.019±0.001	0.016±0.001	0.016±0.001	0.014±0.001	0.016±0.001	0.017±0.001
09/28/99	0.018±0.001	0.016±0.001	0.015±0.001	0.016±0.001	0.015±0.001	0.018±0.001	0.012±0.001	0.017±0.001	0.017±0.001
10/05/99	0.022±0.001	0.020±0.001	0.018±0.001	0.017±0.001	0.020±0.001	0.019±0.001	0.018±0.001	0.018±0.001	0.020±0.001
10/12/99	0.016±0.001	0.015±0.001	0.012±0.001	0.015±0.001	0.014±0.001	0.014±0.001	0.015±0.001	0.017±0.001	0.011±0.001
10/19/99	0.015±0.001	0.015±0.001	0.015±0.001	0.013±0.001	0.014±0.001	0.017±0.001	0.015±0.001	0.016±0.001	0.017±0.001
10/26/99	0.032±0.001	0.032±0.001	0.034±0.001	0.034±0.001	0.032±0.001	0.034±0.001	0.034±0.001	0.030±0.001	0.030±0.001
11/02/99	0.019±0.001	0.015±0.001	0.016±0.001	0.017±0.001	0.015±0.001	0.017±0.001	0.017±0.001	0.017±0.001	0.020±0.001
11/09/99	0.016±0.001	0.018±0.001	0.018±0.001	0.017±0.001	0.021±0.001	0.016±0.001	0.018±0.001	0.017±0.001	0.015±0.001
11/16/99	0.020±0.001	0.023±0.001	0.020±0.001	0.023±0.001	0.021±0.001	0.021±0.001	0.021±0.001	0.024±0.001	0.022±0.001
11/23/99	0.013±0.001	0.013±0.001	0.017±0.001	0.015±0.001	0.015±0.001	0.013±0.001	0.012±0.001	0.011±0.001	0.012±0.001
11/30/99	0.017±0.001	0.016±0.001	0.017±0.001	0.018±0.001	0.016±0.001	0.013±0.001	0.017±0.001	0.014±0.001	0.015±0.001
12/07/99	0.016±0.001	0.018±0.001	0.016±0.001	0.018±0.001	0.017±0.001	0.017±0.001	0.018±0.001	0.016±0.001	0.017±0.001
12/14/99	0.014±0.001	0.013±0.001	0.010±0.001	0.013±0.001	0.015±0.001	0.017±0.001	0.013±0.001	0.012±0.001	0.012±0.001
12/21/99	0.017±0.001	0.016±0.001	0.018±0.001	0.020±0.001	0.016±0.001	0.020±0.001	0.018±0.001	0.018±0.001	0.018±0.001
12/28/99	0.018±0.001	0.016±0.001	0.016±0.001	0.018±0.001	0.019±0.001	0.018±0.001	0.018±0.001	0.018±0.001	0.016±0.001

*** Sample locations required by Technical Specifications**

† Sample pump trip – Occurrence Report 2-99, 4-99, 5-99 and 7-99

TABLE 6-6

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ON-SITE STATIONS
GROSS BETA ACTIVITY $pCi/m^3 \pm 1$ SIGMA
LOCATION

WEEK START DATE	D1 ON-SITE	G ON-SITE	H ON-SITE	I ON-SITE	J ON-SITE	K ON-SITE
01/04/99	0.016±0.001	0.018±0.001	0.017±0.001	0.014±0.001	0.019±0.001	0.017±0.001
01/11/99	0.017±0.001	0.017±0.001	0.016±0.001	0.017±0.001	0.016±0.001	0.018±0.001
01/18/99	0.011±0.001	0.011±0.001	0.010±0.001	0.012±0.001	0.009±0.001	0.013±0.001
01/25/99	0.017±0.001	0.019±0.001	0.018±0.001	0.017±0.001	0.017±0.001	0.017±0.001
02/01/99	0.019±0.001	0.019±0.001	0.017±0.001	0.019±0.001	0.017±0.001	0.016±0.001
02/08/99	0.016±0.001	0.015±0.001	0.015±0.001	0.015±0.001	0.016±0.001	0.016±0.001
02/16/99	0.018±0.001	0.016±0.001	0.018±0.001	0.019±0.001	0.015±0.001	0.016±0.001
02/22/99	0.015±0.001	0.016±0.001	0.017±0.001	0.015±0.001	0.016±0.001	0.018±0.001
03/01/99	0.014±0.001	0.013±0.001	0.013±0.001	0.014±0.001	0.014±0.001	0.014±0.001
03/08/99	0.013±0.001	0.011±0.001	0.013±0.001	0.013±0.001	0.014±0.001	0.014±0.001
03/15/99	0.012±0.001	0.014±0.001	0.013±0.001	0.014±0.001	0.014±0.001	0.014±0.001
03/22/99	0.011±0.001	0.013±0.001	0.014±0.001	0.012±0.001	0.012±0.001	0.015±0.001
03/29/99	0.017±0.001	0.016±0.001	0.016±0.001	0.019±0.001	0.016±0.001	0.014±0.001
04/05/99	0.014±0.001	0.015±0.001	0.012±0.001	0.014±0.001	0.012±0.001	0.012±0.001
04/12/99	0.010±0.001	0.007±0.001	0.010±0.001	0.009±0.001	0.010±0.001	0.010±0.001
04/19/99	0.013±0.001	0.011±0.001	0.012±0.001	0.014±0.001	0.012±0.001	0.012±0.001
04/27/99	0.026±0.001	0.028±0.001	0.022±0.001	0.026±0.001	0.024±0.001	0.022±0.001
05/03/99	0.010±0.001	0.010±0.001	0.010±0.001	0.013±0.001	0.010±0.001	0.009±0.001
05/10/99	0.016±0.001	0.012±0.001	0.014±0.001	0.020±0.001	0.015±0.001	0.013±0.001
05/17/99	0.014±0.001	0.013±0.001	0.013±0.001	0.008±0.001	0.014±0.001	0.012±0.001
05/24/99	0.017±0.001	0.019±0.001	0.021±0.001	0.022±0.002	0.021±0.001	0.017±0.001
06/01/99	0.021±0.001	0.021±0.001	0.018±0.001	0.020±0.001	0.021±0.001	0.018±0.001
06/07/99	0.013±0.001	0.014±0.001	0.014±0.001	0.015±0.001	0.015±0.001	0.014±0.001
06/14/99	0.010±0.001	0.008±0.001	0.010±0.001	0.010±0.001	0.011±0.001	0.011±0.001
06/21/99	0.020±0.001	0.017±0.001	0.021±0.001	0.022±0.001	0.022±0.001	0.017±0.001
06/28/99	0.018±0.001	0.018±0.001	0.018±0.001	0.018±0.001	0.016±0.001	0.018±0.001

*** No sample results due to lost filter or pump failure**

TABLE 6-6 (Continued)

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ON-SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK START DATE	D1 ON-SITE	G ON-SITE	H ON-SITE	I ON-SITE	J ON-SITE	K ON-SITE
07/06/99	0.010±0.001	0.010±0.001	0.010±0.001	0.010±0.001	0.009±0.001	0.013±0.001
07/12/99	0.024±0.001	0.025±0.001	0.025±0.001	0.025±0.001	0.026±0.001	0.024±0.001
07/19/99	0.017±0.001	0.018±0.001	0.018±0.001	0.016±0.001	0.019±0.001	0.015±0.001
07/26/99	0.022±0.001	0.018±0.001	0.017±0.001	0.017±0.001	0.017±0.001	0.017±0.001
08/03/99	0.008±0.001	0.010±0.001	0.010±0.001	0.009±0.001	0.011±0.001	0.009±0.001
08/09/99	0.012±0.001	0.016±0.001	0.016±0.001	0.014±0.001	0.015±0.001	0.014±0.001
08/16/99	0.016±0.001	0.014±0.001	0.016±0.001	0.017±0.001	0.016±0.001	0.014±0.001
08/23/99	0.019±0.001	0.018±0.001	0.020±0.001	0.019±0.001	0.017±0.001	0.018±0.001
08/30/99	0.018±0.001	0.018±0.001	0.020±0.001	0.023±0.001	0.020±0.001	0.021±0.001
09/07/99	0.020±0.001	0.018±0.001	0.022±0.001	0.021±0.001	0.022±0.001	0.018±0.001
09/13/99	0.024±0.001	0.020±0.001	0.018±0.001	0.019±0.001	0.017±0.001	0.018±0.001
09/20/99	0.017±0.001	0.014±0.001	0.017±0.001	0.016±0.001	0.014±0.001	0.014±0.001
09/27/99	0.018±0.001	0.019±0.001	0.020±0.001	0.017±0.001	0.018±0.001	0.016±0.001
10/04/99	0.018±0.001	†0.013±0.001	0.016±0.001	0.017±0.001	0.018±0.001	0.018±0.001
10/11/99	0.013±0.001	*	0.014±0.001	0.015±0.001	0.016±0.001	0.015±0.001
10/18/99	0.015±0.001	0.014±0.001	0.014±0.001	0.015±0.001	0.015±0.001	0.015±0.001
10/25/99	0.029±0.001	0.026±0.001	0.027±0.001	0.025±0.001	0.027±0.001	0.030±0.001
11/01/99	0.019±0.001	0.021±0.001	0.020±0.001	0.021±0.001	0.019±0.001	0.020±0.001
11/08/99	0.019±0.001	0.020±0.001	0.018±0.001	0.021±0.001	0.020±0.001	0.022±0.001
11/15/99	0.019±0.001	0.020±0.001	0.022±0.001	0.019±0.001	0.024±0.001	0.019±0.001
11/22/99	0.011±0.001	0.012±0.001	0.015±0.001	0.012±0.001	0.013±0.001	0.012±0.001
11/29/99	0.015±0.001	0.016±0.001	0.016±0.001	0.016±0.001	0.016±0.001	0.015±0.001
12/06/99	0.016±0.001	0.018±0.001	0.014±0.001	0.017±0.001	0.018±0.001	0.015±0.001
12/13/99	0.014±0.001	0.016±0.001	0.014±0.001	0.014±0.001	0.016±0.001	0.014±0.001
12/20/99	0.015±0.001	0.019±0.001	0.019±0.001	0.017±0.001	0.017±0.001	0.019±0.001
12/27/99	0.019±0.001	0.021±0.001	0.022±0.001	0.023±0.001	0.020±0.001	0.020±0.001

*** No sample results due to lost filter or pump failure**
† Occurrence Report 99-07, DER written

TABLE 6-7

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF-SITE STATIONS
I-131 ACTIVITY $pCi/m^3 \pm 1$ SIGMA
LOCATION

WEEK START DATE	R-1* OFF-SITE	R-2* OFF-SITE	R-3* OFF-SITE	R-4* OFF-SITE	R-5* OFF-SITE	D-2 OFF-SITE	E OFF-SITE	F OFF-SITE	G OFF-SITE
01/05/99	<0.010	<0.014	<0.011	<0.014	<0.012	<0.011	<0.012	<0.011	<0.014
01/12/99	<0.008	<0.016	<0.012	<0.012	<0.010	<0.010	<0.017	<0.008	<0.012
01/19/99	<0.009	<0.011	<0.012	<0.015	<0.013	<0.011	<0.009	<0.010	<0.014
01/26/99	<0.010	<0.008	<0.015	<0.007	<0.010	<0.011	<0.012	<0.013	<0.010
02/02/99	<0.011	<0.011	<0.014	<0.014	<0.016	<0.011	<0.010	<0.011	<0.017
02/09/99	<0.015	<0.013	<0.012	<0.014	<0.019	<0.012	<0.014	<0.014	<0.013
02/16/99	<0.011	<0.010	<0.015	<0.011	<0.014	<0.010	<0.015	<0.011	<0.014
02/23/99	<0.009	<0.016	<0.014	<0.012	<0.011	<0.010	<0.012	<0.014	<0.012
03/02/99	<0.008	<0.013	<0.012	<0.011	<0.012	<0.010	<0.011	<0.012	<0.010
03/09/99	<0.012	<0.013	<0.013	<0.012	<0.006	<0.013	<0.014	<0.011	<0.012
03/16/99	<0.020	<0.016	**	<0.014	<0.017	<0.011	<0.014	<0.015	<0.020
03/23/99	<0.016	<0.016	<0.025	<0.013	<0.015	<0.009	<0.014	<0.014	<0.014
03/30/99	<0.012	<0.017	<0.028	<0.015	<0.013	<0.013	<0.016	<0.019	<0.013
04/06/99	<0.013	<0.015	<0.026	<0.016	<0.015	<0.018	<0.024	<0.014	<0.014
04/13/99	<0.012	<0.016	<0.027	<0.015	<0.016	<0.012	<0.018	<0.009	<0.014
04/20/99	<0.016	<0.013	<0.026	<0.012	<0.015	<0.014	<0.024	<0.016	<0.012
04/28/99	<0.023	<0.015	<0.020	<0.014	<0.016	<0.013	<0.018	<0.023	<0.014
05/04/99	<0.009	<0.018	<0.022	<0.018	<0.016	<0.014	<0.019	<0.027	<0.018
05/11/99	<0.012	<0.010	<0.014	<0.017	<0.016	<0.014	<0.016	<0.014	<0.020
05/18/99	<0.014	<0.020	<0.022	<0.014	<0.017	<0.013	<0.017	<0.024	<0.016
05/25/99	<0.014	<0.020	<0.026	<0.016	<0.020	<0.017	<0.015	<0.018	<0.023
06/01/99	<0.017	<0.017	<0.013	<0.016	<0.019	<0.012	<0.021	<0.015	<0.017
06/08/99	<0.013	<0.015	<0.019	<0.013	<0.020	<0.019	<0.018	<0.012	<0.018
06/15/99	<0.014	<0.018	<0.018	<0.014	<0.016	<0.018	<0.015	<0.003	<0.016
06/22/99	<0.014	<0.016	<0.022	<0.015	<0.021	<0.016	<0.018	<0.022	<0.020
06/29/99	<0.019	<0.019	<0.023	<0.019	<0.015	<0.022	<0.016	<0.022	<0.019

* Sample locations required by Technical Specifications

** Sample volume insufficient

TABLE 6-7 (Continued)

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF-SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK START DATE	R-1* OFF-SITE	R-2* OFF-SITE	R-3* OFF-SITE	R-4* OFF-SITE	R-5* OFF-SITE	D-2 OFF-SITE	E OFF-SITE	F OFF-SITE	G OFF-SITE
07/06/99	<0.014	<0.022	<0.019	<0.012	<0.015	<0.017	<0.014	<0.018	<0.020
07/13/99	<0.016	<0.019	<0.016	<0.013	<0.022	<0.013	<0.017	<0.015	<0.016
07/20/99	<0.020	<0.015	<0.016	<0.015	<0.019	<0.014	<0.017	<0.018	<0.016
07/27/99	<0.017	<0.015	<0.017	<0.016	<0.010	<0.014	<0.016	<0.014	†<0.042
08/03/99	<0.014	<0.012	<0.012	<0.014	<0.019	<0.024	<0.011	<0.016	†<0.056
08/10/99	<0.017	<0.018	<0.014	<0.015	<0.015	<0.016	<0.021	<0.013	<0.014
08/17/99	<0.020	<0.018	<0.024	<0.019	<0.024	<0.011	<0.020	<0.018	<0.012
08/24/99	<0.013	<0.015	<0.012	<0.019	<0.015	<0.016	<0.019	<0.016	<0.018
08/31/99	<0.016	<0.016	<0.018	<0.012	<0.011	<0.023	<0.017	<0.015	<0.021
09/07/99	<0.016	<0.013	<0.013	<0.020	<0.012	<0.013	<0.012	<0.018	<0.014
09/14/99	<0.014	<0.009	<0.012	<0.018	<0.017	<0.012	<0.010	<0.014	<0.015
09/21/99	<0.014	<0.014	<0.012	<0.013	<0.014	<0.016	†<0.046	<0.015	<0.013
09/28/99	<0.021	<0.014	<0.021	<0.021	<0.017	<0.017	<0.019	<0.016	<0.019
10/05/99	<0.021	<0.027	<0.022	<0.022	<0.028	<0.020	<0.023	<0.025	<0.022
10/12/99	<0.008	<0.025	<0.017	<0.018	<0.022	<0.022	<0.013	<0.015	<0.021
10/19/99	<0.015	<0.020	<0.017	<0.018	<0.021	<0.018	<0.013	<0.016	<0.010
10/26/99	<0.014	<0.017	<0.014	<0.011	<0.014	<0.022	<0.016	<0.039	<0.020
11/02/99	<0.011	<0.014	<0.015	<0.020	<0.017	<0.018	<0.019	<0.019	<0.015
11/09/99	<0.015	<0.021	<0.023	<0.013	<0.011	<0.019	<0.019	<0.014	<0.013
11/16/99	<0.014	<0.016	<0.011	<0.014	<0.017	<0.022	<0.013	<0.013	<0.014
11/23/99	<0.011	<0.013	<0.019	<0.018	<0.011	<0.013	<0.021	<0.018	<0.014
11/30/99	<0.018	<0.021	<0.018	<0.017	<0.016	<0.019	<0.022	<0.018	<0.012
12/07/99	<0.014	<0.021	<0.012	<0.019	<0.014	<0.018	<0.015	<0.019	<0.016
12/14/99	<0.024	<0.018	<0.015	<0.021	<0.019	<0.018	<0.012	<0.015	<0.015
12/21/99	<0.022	<0.016	<0.014	<0.016	<0.015	<0.019	<0.014	<0.014	<0.017
12/28/99	<0.017	<0.022	<0.013	<0.011	<0.020	<0.015	<0.017	<0.017	<0.014

* Sample locations required by Technical Specifications
† No sample results due to pump failure (Occurrence Report 3-99, 4-99, 5-99 & 7-99)

TABLE 6-8

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ON-SITE STATIONS
I-131 ACTIVITY $pCi/m^3 \pm 1$ SIGMA
LOCATION

WEEK START DATE	D1 ON-SITE	G ON-SITE	H ON-SITE	I ON-SITE	J ON-SITE	K ON-SITE
01/04/99	<0.011	<0.010	<0.008	<0.009	<0.014	<0.012
01/11/99	<0.007	<0.011	<0.009	<0.007	<0.010	<0.012
01/18/99	<0.009	<0.011	<0.013	<0.015	<0.013	<0.011
01/25/99	<0.010	<0.011	<0.011	<0.011	<0.012	<0.014
02/01/99	<0.013	<0.008	<0.012	<0.013	<0.011	<0.013
02/08/99	<0.009	<0.013	<0.010	<0.009	<0.011	<0.011
02/16/99	<0.014	<0.016	<0.012	<0.002	<0.012	<0.014
02/22/99	<0.010	<0.011	<0.007	<0.011	<0.010	<0.011
03/01/99	<0.014	<0.008	<0.010	<0.006	<0.011	<0.009
03/08/99	<0.010	<0.009	<0.011	<0.012	<0.010	<0.015
03/15/99	<0.009	<0.011	<0.012	<0.015	<0.013	<0.019
03/22/99	<0.015	<0.016	<0.012	<0.015	<0.014	<0.016
03/29/99	<0.020	<0.016	<0.023	<0.016	<0.025	<0.017
04/05/99	<0.014	<0.017	<0.020	<0.017	<0.015	<0.017
04/12/99	<0.020	<0.016	<0.021	<0.018	<0.017	<0.027
04/19/99	<0.012	<0.020	<0.021	<0.021	<0.016	<0.015
04/27/99	<0.014	<0.016	<0.015	<0.027	<0.016	<0.014
05/03/99	<0.026	<0.018	<0.013	<0.018	<0.018	<0.014
05/10/99	<0.017	<0.018	<0.014	<0.018	<0.013	<0.026
05/17/99	<0.020	<0.017	<0.024	<0.034	<0.030	<0.015
05/24/99	<0.022	<0.013	<0.016	<0.019	<0.016	<0.015
06/01/99	<0.015	<0.018	<0.018	<0.020	<0.009	<0.014
06/07/99	<0.003	<0.030	<0.014	<0.018	<0.016	<0.020
06/14/99	<0.014	<0.012	<0.011	<0.016	<0.017	<0.019
06/21/99	<0.021	<0.016	<0.016	<0.017	<0.019	<0.017
06/28/99	<0.022	<0.017	<0.014	<0.021	<0.017	<0.017

TABLE 6-8 (Continued)

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ON-SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK START DATE	D1 ON-SITE	G ON-SITE	H ON-SITE	I ON-SITE	J ON-SITE	K ON-SITE
07/06/99	<0.015	<0.016	<0.017	<0.026	<0.018	<0.016
07/12/99	<0.015	<0.020	<0.015	<0.014	<0.014	<0.015
07/19/99	<0.019	<0.009	<0.017	<0.023	<0.024	<0.014
07/26/99	<0.020	<0.017	<0.018	<0.014	<0.020	<0.022
08/03/99	<0.014	<0.018	<0.012	<0.025	<0.018	<0.011
08/09/99	<0.012	<0.014	<0.024	<0.015	<0.011	<0.020
08/16/99	<0.014	<0.016	<0.020	<0.013	<0.017	<0.020
08/23/99	<0.013	<0.013	<0.015	<0.026	<0.016	<0.015
08/30/99	<0.012	<0.016	<0.012	<0.016	<0.012	<0.018
09/07/99	<0.022	<0.012	<0.015	<0.021	<0.016	<0.019
09/13/99	<0.020	<0.012	<0.014	<0.013	<0.012	<0.014
09/20/99	<0.014	<0.013	<0.013	<0.012	<0.014	<0.011
09/27/99	<0.014	<0.017	<0.018	<0.031	<0.021	<0.012
10/04/99	<0.020	†<0.058	<0.038	<0.019	<0.024	<0.027
10/11/99	<0.020	*	<0.017	<0.022	<0.020	<0.021
10/18/99	<0.015	<0.024	<0.025	<0.017	<0.016	<0.025
10/25/99	<0.015	<0.014	<0.020	<0.022	<0.012	<0.017
11/01/99	<0.026	<0.022	<0.020	<0.020	<0.030	<0.019
11/08/99	<0.018	<0.016	<0.013	<0.019	<0.015	<0.021
11/15/99	<0.018	<0.011	<0.020	<0.019	<0.017	<0.016
11/22/99	<0.020	<0.013	<0.015	<0.018	<0.018	<0.011
11/29/99	<0.023	<0.020	<0.018	<0.021	<0.023	<0.021
12/06/99	<0.017	<0.017	<0.016	<0.018	<0.020	<0.015
12/13/99	<0.015	<0.017	<0.018	<0.013	<0.020	<0.017
12/20/99	<0.020	<0.012	<0.028	<0.017	<0.019	<0.014
12/27/99	<0.019	<0.011	<0.019	<0.011	<0.015	<0.013

* No sample results due to pump failure
† Occurrence Report 99-07 (DER written)

TABLE 6-9

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

R1 OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	82.9±8.80	87.0±7.38	77.5±10.1	108±11.0	128±15.1	112±13.6
Zn-65	<4.19	<3.44	<3.10	<2.96	<5.88	<8.98
Cs-134	<1.63	<1.49	<1.61	<1.82	<2.99	<2.73
Cs-137	<1.63	<1.09	<1.87	<1.79	<2.82	<2.50
Zr-95	<3.56	<2.27	<4.35	<4.13	<5.58	<6.77
Nb-95	<2.48	<1.47	<2.23	<2.55	<4.09	<4.62
Co-58	<2.37	<1.42	<2.69	<1.95	<3.08	<3.11
Mn-54	<1.81	<1.61	<2.01	<2.40	<1.83	<2.27
Co-60	<2.43	<0.96	<3.06	<2.62	<3.54	<2.38
K-40	49.5±9.6	<10.2	<27.9	<22.9	<10.1	140±18.6
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	99.6±16.3	142±16.2	98.7±19.1	70.9±13.8	60.5±13.3	65.0±13.5
Zn-65	<9.33	<6.04	<13.4	<2.91	<7.53	<8.04
Cs-134	<5.46	<2.66	<4.81	<2.28	<3.42	<3.29
Cs-137	<2.98	<2.22	<1.19	<2.14	<2.46	<3.22
Zr-95	<8.37	<7.31	<10.5	<5.83	<4.11	<7.30
Nb-95	<6.14	<3.98	<6.08	<6.11	<3.50	<1.37
Co-58	<5.15	<2.18	<6.83	<3.45	<2.41	<4.33
Mn-54	<4.95	<3.40	<5.70	<1.01	<2.78	<1.03
Co-60	<5.56	<1.01	<6.48	<4.93	<1.27	<5.05
K-40	105±22.2	29.1±11.1	<63.4	<18.0	<35.4	<18.5
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Location Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

R2 OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	82.0±10.9	70.3±5.96	94.3±12.8	94.5±12.1	134±18.5	118±14.0
Zn-65	<5.82	<3.57	<4.42	<7.19	<9.91	<7.51
Cs-134	<1.51	<1.56	<2.97	<2.56	<2.65	<1.74
Cs-137	<1.76	<1.12	<1.76	<2.66	<4.08	<3.21
Zr-95	<4.36	<2.96	<5.84	<4.12	<5.53	<7.26
Nb-95	<2.47	<1.78	<2.99	<3.23	<4.55	<4.29
Co-58	<2.65	<1.70	<3.18	<3.57	<3.42	<4.06
Mn-54	<1.89	<1.53	<2.56	<2.75	<3.00	<4.17
Co-60	<3.27	<1.34	<2.96	<2.92	<1.37	<2.47
K-40	35.0±9.3	65.1±8.20	<40.9	<31.2	<14.0	104±17.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	127±23.4	98.7±13.8	67.6±14.1	88.8±14.2	74.4±10.4	67.6±10.7
Zn-65	<4.15	<6.21	<13.1	<7.77	<7.33	<7.10
Cs-134	<4.25	<2.49	<2.93	<3.15	<2.50	<2.03
Cs-137	<4.29	<3.60	<4.21	<2.65	<2.98	<2.29
Zr-95	<10.4	<6.93	<7.32	<7.28	<5.31	<5.27
Nb-95	<2.10	<3.61	<5.28	<4.06	<3.40	<3.38
Co-58	<8.35	<4.83	<6.51	<3.38	<3.59	<2.68
Mn-54	<5.50	<2.82	<3.61	<3.21	<2.98	<2.31
Co-60	<8.61	<4.16	<4.63	<1.70	<3.52	<3.59
K-40	<69.4	68.8±17.1	82.6±19.9	<70.2	87.2±16.8	<20.5
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Location Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

R3 OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	75.0±10.1	75.2±5.91	64.4±14.4	123±16.7	188±27.6	110±16.9
Zn-65	<4.62	<2.98	<8.86	<11.8	<3.94	<8.70
Cs-134	<1.95	<1.02	<2.63	<3.39	<3.51	<3.23
Cs-137	<1.54	<0.95	<4.54	<3.53	<12.0	<3.28
Zr-95	<4.58	<1.83	<9.96	<8.64	<8.10	<6.53
Nb-95	<3.27	<1.18	<5.68	<4.36	<8.04	<3.78
Co-58	<2.49	<0.99	<4.95	<4.69	<1.65	<4.40
Mn-54	<1.77	<1.38	<3.90	<3.71	<6.89	<2.62
Co-60	<1.52	<1.57	<5.97	<3.54	<2.30	<11.9
K-40	<17.4	<17.8	62.2±21.2	47.1±15.7	73.9±27.5	<12.1
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	106±17.2	112±17.7	136±22.3	61.4±6.23	66.4±12.0	72.0±9.69
Zn-65	<11.5	<10.4	<3.75	<6.69	<8.19	<3.60
Cs-134	<4.51	<3.22	<5.05	<2.57	<3.63	<2.08
Cs-137	<3.40	<2.90	<5.93	<2.39	<2.54	<1.69
Zr-95	<11.3	<7.12	<8.69	<4.73	<4.58	<3.31
Nb-95	<7.46	<4.86	<5.84	<3.73	<2.68	<2.76
Co-58	<4.58	<4.64	<5.10	<3.35	<3.96	<2.36
Mn-54	<5.18	<3.30	<4.72	<2.45	<3.82	<2.25
Co-60	<5.21	<15.2	<2.19	<2.75	<4.23	<1.72
K-40	74.6±21.1	<53.4	<22.4	49.8±9.95	<27.10	<20.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Location Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

R4 OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	57.1±11.1	71.3±6.47	97.1±12.4	98.7±13.2	133±16.9	91.1±12.2
Zn-65	<5.12	<2.68	<5.32	<4.23	<6.54	<7.00
Cs-134	<2.45	<1.14	<1.95	<2.71	<3.32	<3.25
Cs-137	<2.38	<0.76	<2.01	<2.47	<1.63	<2.02
Zr-95	<5.85	<1.82	<3.19	<6.18	<3.80	<5.21
Nb-95	<4.38	<1.35	<3.16	<3.49	<4.54	<4.29
Co-58	<3.04	<1.30	<2.38	<2.76	<2.32	<2.70
Mn-54	<2.83	<1.36	<2.09	<2.98	<2.58	<2.56
Co-60	<2.29	<1.10	<3.81	<2.59	<3.11	<1.74
K-40	35.7±13.0	<16.6	27.0±10.2	34.1±10.3	<31.5	128±18.7
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	108±16.9	95.3±14.1	87.5±15.2	79.5±15.0	67.7±12.7	73.7±10.0
Zn-65	<9.21	<6.30	<13.0	<10.9	<8.15	<6.19
Cs-134	<2.54	<3.32	<3.61	<1.70	<1.54	<2.95
Cs-137	<3.02	<2.57	<3.67	<2.55	<2.29	<2.09
Zr-95	<7.69	<6.83	<8.02	<10.7	<7.26	<4.16
Nb-95	<5.30	<3.48	<7.21	<3.90	<4.92	<3.70
Co-58	<1.12	<3.55	<3.53	<1.13	<2.82	<2.27
Mn-54	<2.61	<3.89	<4.81	<3.09	<2.59	<2.61
Co-60	<3.95	<3.29	<4.43	<6.85	<4.30	<2.08
K-40	<40.1	64.8±14.9	80.1±18.2	<16.9	<33.10	67.9±12.3
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Location Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

R5 OFF-SITE COMPOSITE (CONTROL)*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	90.9±11.2	75.2±5.65	73.1±8.97	102±10.5	124±19.5	114±14.9
Zn-65	<4.01	<3.83	<6.02	<5.89	<14.1	<5.45
Cs-134	<2.32	<6.96	<1.94	<2.30	<4.22	<2.38
Cs-137	<1.58	<1.15	<1.80	<1.90	<1.04	<1.68
Zr-95	<2.80	<2.95	<4.77	<4.98	<9.10	<1.44
Nb-95	<3.90	<1.65	<2.96	<2.39	<7.88	<4.04
Co-58	<1.07	<1.52	<2.46	<2.70	<4.87	<4.07
Mn-54	<2.09	<1.16	<2.34	<2.38	<4.94	<2.42
Co-60	<2.28	<1.33	<2.41	<2.57	<5.09	<2.86
K-40	<24.7	65.3±8.15	90.7±13.7	86.1±13.5	<68.3	<38.3
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	190±27.0	127±19.7	126±22.6	76.2±9.8	62.0±10.5	45.0±10.5
Zn-65	<9.90	<11.4	<15.3	<11.5	<7.40	<2.87
Cs-134	<2.62	<4.81	<2.87	<2.61	<2.95	<2.26
Cs-137	<3.99	<3.71	<4.27	<0.78	<3.10	<2.14
Zr-95	<8.84	<7.00	<8.91	<9.54	<5.63	<1.94
Nb-95	<6.10	<5.32	<4.77	<4.09	<3.98	<3.82
Co-58	<5.16	<5.35	<5.22	<5.04	<3.63	<3.31
Mn-54	<4.41	<2.57	<5.61	<3.24	<3.52	<1.00
Co-60	<5.45	<4.26	<2.24	<4.87	<2.34	<7.23
K-40	<81.2	<60.8	<91.3	31.9±15.0	163±21.4	<46.8
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Location Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

D2 OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	71.3±8.2	83.9±6.05	70.0±9.46	103±10.9	147±25.2	106±12.9
Zn-65	<4.41	<2.35	<4.40	<4.42	<3.70	<5.54
Cs-134	<1.49	<0.93	<1.56	<1.57	<5.00	<2.90
Cs-137	<1.52	<0.75	<1.38	<2.26	<4.12	<2.78
Zr-95	<3.47	<2.17	<3.63	<5.21	<9.66	<5.96
Nb-95	<2.27	<1.25	<2.68	<2.38	<5.11	<4.35
Co-58	<2.07	<1.10	<2.24	<2.42	<4.46	<2.84
Mn-54	<1.83	<1.09	<2.58	<2.72	<3.91	<3.08
Co-60	<1.94	<1.35	<2.96	<2.67	<6.15	<3.54
K-40	58.2±9.0	11.4±4.17	<23.2	<23.4	<80.0	111±17.8
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	98.2±17.0	98.0±13.2	95.0±19.0	92.7±12.2	69.0±10.5	79.8±11.3
Zn-65	<9.11	<9.02	<16.7	<6.99	<6.78	<6.43
Cs-134	<2.63	<3.44	<5.06	<2.17	<2.05	<2.31
Cs-137	<2.25	<2.78	<3.29	<2.29	<2.97	<2.13
Zr-95	<6.96	<7.07	<8.79	<3.86	<5.62	<3.68
Nb-95	<6.65	<4.06	<1.83	<2.73	<3.84	<3.29
Co-58	<4.27	<3.68	<9.14	<3.11	<2.50	<2.40
Mn-54	<3.98	<3.48	<4.74	<1.34	<2.05	<2.43
Co-60	<4.86	<4.26	<2.19	<3.63	<3.81	<2.87
K-40	69.1±17.8	96.1±18.9	72.4±23.5	38.1±11.5	77.7±17.2	<25.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

E OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	96.0±10.2	89.1±7.43	59.8±10.7	116±13.6	96.2±16.8	117±15.8
Zn-65	<4.52	<2.65	<7.87	<5.49	<9.10	<7.06
Cs-134	<1.69	<1.00	<2.10	<2.25	<3.74	<3.22
Cs-137	<1.79	<0.94	<1.73	<2.00	<2.87	<2.53
Zr-95	<2.77	<2.16	<4.70	<4.55	<6.67	<6.16
Nb-95	<2.12	<1.27	<2.63	<1.97	<5.19	<4.14
Co-58	<1.61	<1.35	<2.91	<3.32	<6.27	<5.03
Mn-54	<1.48	<1.22	<2.26	<2.73	<5.10	<1.96
Co-60	<2.22	<1.21	<2.32	<3.73	<5.48	<3.67
K-40	<15.0	13.8±5.17	<9.05	<9.03	<64.8	<39.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	127±23.1	80.5±15.2	63.3±16.2	102±12.7	48.0±10.3	74.4±9.15
Zn-65	<13.7	<9.14	<14.3	<7.90	<9.20	<5.27
Cs-134	<4.57	<2.93	<2.70	<2.21	<3.68	<1.40
Cs-137	<4.14	<4.52	<4.01	<2.08	<2.04	<1.61
Zr-95	<11.7	<8.79	<11.3	<4.79	<5.11	<4.81
Nb-95	<6.94	<6.45	<5.80	<3.39	<4.81	<3.08
Co-58	<8.05	<3.67	<6.21	<3.17	<4.35	<1.72
Mn-54	<5.30	<3.89	<6.95	<2.25	<3.52	<1.52
Co-60	<6.55	<4.41	<4.01	<2.61	<3.99	<2.63
K-40	65.6±26.1	<54.3	106±26.5	34.9±9.96	119±18.2	<24.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

F OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	72.1±9.9	77.6±5.63	83.5±10.1	109±14.5	138±21.6	114±14.8
Zn-65	<3.62	<2.63	<4.66	<5.20	<9.26	<9.30
Cs-134	<1.41	<1.40	<2.35	<2.57	<0.86	<2.25
Cs-137	<1.61	<1.16	<1.87	<2.29	<2.89	<2.87
Zr-95	<3.47	<2.44	<4.38	<4.81	<10.7	<5.13
Nb-95	<1.51	<1.43	<4.00	<3.19	<5.41	<4.28
Co-58	<2.42	<1.33	<3.02	<2.22	<3.74	<3.53
Mn-54	<1.60	<1.26	<2.04	<2.90	<1.20	<2.66
Co-60	<2.73	<1.30	<2.06	<1.07	<1.89	<3.94
K-40	36.2±10.6	75.5±8.37	47.4±10.9	<53.0	<66.2	<36.3
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	59.4±20.1	116±13.6	51.0±12.3	79.1±10.1	61.4±10.7	77.0±10.3
Zn-65	<9.75	<5.33	<10.4	<5.75	<4.51	<7.54
Cs-134	<2.58	<2.67	<4.82	<2.63	<2.43	<2.93
Cs-137	<3.01	<3.47	<4.31	<1.66	<2.51	<1.78
Zr-95	<8.30	<6.52	<8.81	<5.03	<5.80	<4.61
Nb-95	<4.84	<3.60	<4.51	<3.04	<3.45	<3.27
Co-58	<6.61	<4.19	<3.67	<2.88	<2.07	<2.84
Mn-54	<3.44	<3.47	<4.46	<1.86	<2.33	<2.33
Co-60	<1.97	<2.62	<4.55	<2.44	<2.16	<2.56
K-40	<20.0	99.6±17.6	91.6±21.8	48.6±10.6	<25.30	66.8±12.8
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

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

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

G OFF-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	63.9±9.9	64.4±5.60	71.9±11.5	94.7±12.9	96.8±18.4	76.9±13.0
Zn-65	<6.71	<1.83	<5.48	<4.31	<12.6	<7.33
Cs-134	<1.80	<1.28	<1.12	<2.53	<3.27	<3.37
Cs-137	<1.64	<1.05	<2.52	<2.89	<3.23	<3.34
Zr-95	<3.88	<2.48	<4.20	<5.84	<7.57	<4.33
Nb-95	<3.60	<1.37	<4.36	<3.18	<8.40	<4.99
Co-58	<2.24	<1.44	<2.46	<3.14	<4.44	<4.36
Mn-54	<2.12	<1.01	<2.15	<2.48	<5.75	<3.28
Co-60	<2.81	<1.45	<3.36	<3.35	<2.15	<5.12
K-40	<19.2	<17.5	41.7±12.7	33.2±10.5	<22.0	86.7±20.4
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	156±25.4	90.2±17.5	97.8±19.1	80.4±7.16	68.1±10.2	73.5±12.4
Zn-65	<11.2	<13.5	<3.55	<7.49	<6.71	<6.63
Cs-134	<5.68	<3.73	<3.91	<1.88	<2.77	<1.53
Cs-137	<3.50	<6.10	<6.04	<2.76	<2.68	<3.24
Zr-95	<12.5	<8.25	<8.30	<5.68	<5.55	<4.75
Nb-95	<9.55	<4.88	<5.62	<3.09	<4.41	<4.13
Co-58	<7.16	<3.33	<6.82	<2.20	<3.66	<0.98
Mn-54	<5.84	<3.82	<4.47	<3.64	<2.84	<0.85
Co-60	<5.63	<5.02	<2.07	<2.53	<2.35	<1.46
K-40	160±33.4	72.8±25.1	<21.2	33.9±6.30	76.0±15.6	<39.8
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

D1 ON-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	100±14	86.7±6.45	91.6±12.2	106±10.8	135±14.4	120±13.9
Zn-65	<6.59	<2.66	<6.35	<6.73	<6.29	<7.83
Cs-134	<2.68	<1.16	<1.46	<2.32	<2.75	<3.21
Cs-137	<2.39	<1.06	<0.47	<2.29	<2.15	<3.21
Zr-95	<6.32	<2.77	<4.63	<4.69	<5.14	<5.78
Nb-95	<3.21	<1.76	<2.60	<3.46	<2.90	<4.21
Co-58	<3.05	<1.43	<2.58	<2.17	<2.90	<4.02
Mn-54	<2.75	<1.33	<1.92	<2.44	<2.93	<3.15
Co-60	<2.51	<1.16	<2.28	<1.86	<3.38	<3.78
K-40	<30.2	16.4±4.33	<24.3	34.0±9.49	<23.3	83.9±18.3
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	126±20.1	147±17.2	79.4±16.1	94.4±13.1	94.5±19.5	<21.60
Zn-65	<10.8	<8.68	<11.5	<6.89	<9.88	<2.96
Cs-134	<3.94	<1.94	<4.14	<2.32	<0.84	<3.01
Cs-137	<3.43	<2.96	<1.46	<2.22	<1.00	<0.81
Zr-95	<8.94	<5.35	<7.55	<4.76	<10.4	<5.80
Nb-95	<6.22	<4.78	<3.62	<2.26	<4.83	<1.39
Co-58	<6.51	<3.67	<5.01	<2.78	<4.18	<3.43
Mn-54	<5.51	<3.46	<3.69	<1.73	<5.27	<1.03
Co-60	<5.26	<3.67	<3.23	<1.00	<6.21	<5.04
K-40	108±25.0	<29.5	98.7±21.1	<10.30	<22.7	<69.9
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

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

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

G ON-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	79.7±11.7	77.6±5.70	77.1±11.9	109±11.5	123±12.9	169±18.8
Zn-65	<5.16	<2.73	<6.36	<4.48	<7.15	<10.1
Cs-134	<1.63	<1.12	<2.54	<2.19	<2.67	<3.07
Cs-137	<1.92	<1.06	<2.51	<0.97	<2.00	<2.19
Zr-95	<4.54	<2.57	<6.55	<4.01	<5.63	<6.13
Nb-95	<3.07	<1.93	<4.52	<1.90	<4.13	<2.79
Co-58	<2.24	<1.20	<0.68	<2.67	<3.60	<3.32
Mn-54	<2.12	<1.13	<2.79	<2.89	<2.88	<1.97
Co-60	<2.37	<0.97	<2.64	<2.33	<3.33	<2.94
K-40	45.7±11.4	52.3±6.49	16.6±8.02	<33.6	122±17.8	<3.94
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	17.9±24.1	104±14.3	97.2±20.0	80.6±12.4	62.6±12.6	91.1±12.1
Zn-65	<10.0	<7.99	<16.8	<10.6	<8.16	<4.35
Cs-134	<2.16	<3.75	<5.50	<2.86	<3.55	<2.31
Cs-137	<3.63	<2.47	<1.15	<3.32	<2.66	<1.69
Zr-95	<9.47	<3.60	<8.86	<5.31	<4.86	<5.51
Nb-95	<5.95	<3.11	<6.93	<4.42	<4.27	<2.98
Co-58	<5.49	<5.06	<5.19	<4.11	<3.65	<2.32
Mn-54	<4.14	<3.93	<3.78	<3.38	<3.35	<1.78
Co-60	<6.25	<2.83	<2.21	<1.94	<4.29	<2.75
K-40	<43.3	<44.2	<22.6	99.5±19.3	<33.0	<24.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

H ON-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	73.9±8.70	76.1±6.77	82.2±12.2	92.5±11.9	105±12.2	155±19.0
Zn-65	<6.05	<3.26	<4.36	<5.30	<8.44	<7.50
Cs-134	<1.27	<1.09	<2.43	<1.65	<2.94	<3.46
Cs-137	<1.48	<0.88	<2.07	<2.54	<2.77	<1.79
Zr-95	<2.66	<2.03	<5.54	<3.44	<6.05	<6.43
Nb-95	<2.58	<1.50	<4.14	<3.15	<3.09	<5.89
Co-58	<2.29	<1.08	<2.90	<1.69	<3.37	<3.96
Mn-54	<1.50	<1.22	<2.15	<2.41	<2.52	<4.11
Co-60	<1.42	<1.71	<3.37	<2.79	<2.84	<5.87
K-40	<20.0	8.85±3.92	39.5±12.8	<29.8	82.0±15.5	47.1±14.3
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	220±28.5	131±18.9	94.4±16.5	82.0±10.7	71.5±11.6	76.9±9.77
Zn-65	<13.1	<6.99	<12.2	<6.86	<4.90	<5.00
Cs-134	<2.73	<4.41	<4.64	<2.11	<3.38	<1.84
Cs-137	<4.04	<4.36	<4.47	<1.97	<2.46	<1.81
Zr-95	<2.73	<6.06	<6.91	<4.13	<7.20	<2.42
Nb-95	<1.92	<4.78	<6.17	<3.82	<3.95	<3.84
Co-58	<4.32	<4.10	<4.64	<3.24	<3.73	<1.41
Mn-54	<5.94	<3.75	<3.30	<2.28	<4.15	<1.75
Co-60	<6.81	<14.9	<3.23	<2.54	<2.77	<2.34
K-40	<57.6	<52.3	99.2±25.2	107±15.3	115±18.7	<21.6
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

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

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

I ON-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	76.6±9.4	87.4±6.25	78.4±10.9	117±17.2	145±18.8	127±15.1
Zn-65	<4.71	<1.75	<4.13	<9.87	<2.25	<8.92
Cs-134	<1.17	<0.86	<2.65	<3.32	<2.17	<3.50
Cs-137	<1.37	<0.98	<2.12	<3.21	<3.29	<2.43
Zr-95	<3.18	<1.94	<4.45	<6.50	<8.12	<7.32
Nb-95	<1.84	<1.21	<2.89	<4.35	<7.33	<3.70
Co-58	<1.77	<0.95	<2.47	<3.27	<2.64	<3.95
Mn-54	<2.17	<1.08	<2.38	<3.00	<4.04	<2.76
Co-60	<1.43	<1.40	<2.19	<5.11	<1.30	<4.10
K-40	33.8±9.9	<10.9	20.5±8.56	72.3±19.0	<52.8	114±19.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	98.0±22.8	96.8±138	71.7±19.1	90.0±12.9	53.4±11.5	71.7±10.9
Zn-65	<16.3	<8.02	<10.9	<9.71	<5.85	<6.14
Cs-134	<5.09	<2.57	<4.41	<2.28	<3.03	<3.25
Cs-137	<5.45	<2.77	<3.50	<3.15	<2.56	<2.19
Zr-95	<10.5	<5.39	<12.0	<6.22	<7.74	<5.83
Nb-95	<7.35	<5.43	<6.34	<3.53	<5.28	<3.09
Co-58	<8.36	<4.65	<4.37	<3.64	<3.76	<2.59
Mn-54	<6.30	<2.86	<1.47	<3.31	<2.97	<3.36
Co-60	<2.36	<4.81	<6.64	<5.07	<5.00	<2.86
K-40	52.6±22.5	<37.7	<64.8	<30.0	<43.6	84.5±15.6
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

J ON-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	80.5±10.5	104±8.04	70.0±13.3	117±13.8	129±13.7	120±13.9
Zn-65	<7.08	<3.91	<5.46	<6.41	<6.08	<7.23
Cs-134	<2.81	<1.25	<3.01	<1.14	<2.57	<2.92
Cs-137	<1.86	<1.10	<3.33	<2.09	<2.24	<2.68
Zr-95	<3.81	<2.43	<7.33	<6.46	<2.79	<7.81
Nb-95	<2.74	<1.15	<4.59	<4.33	<4.33	<5.41
Co-58	<1.77	<1.35	<3.50	<3.79	<2.16	<3.64
Mn-54	<1.82	<1.50	<2.36	<2.82	<2.83	<2.90
Co-60	<2.08	<1.20	<1.11	<0.94	<2.22	<3.08
K-40	<21.7	<14.9	<42.2	69.0±18.6	<7.98	66.9±13.4
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	113±19.5	81.8±13.1	95.6±16.8	74.4±8.95	58.8±13.9	85.4±14.7
Zn-65	<11.6	<8.07	<13.3	<5.11	<14.6	<8.08
Cs-134	<3.89	<2.67	<3.83	<2.35	<2.30	<0.68
Cs-137	<3.62	<2.72	<3.89	<1.89	<3.47	<2.79
Zr-95	<7.30	<8.61	<7.50	<5.07	<7.15	<5.82
Nb-95	<7.77	<5.07	<5.08	<4.12	<4.90	<4.02
Co-58	<4.90	<2.82	<5.30	<2.54	<7.66	<5.70
Mn-54	<3.55	<3.46	<5.11	<2.48	<4.80	<1.03
Co-60	<4.26	<4.66	<4.69	<2.32	<2.21	<5.06
K-40	<43.1	58.0±15.8	103±24.2	60.7±11.3	<62.5	<18.5
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-9 (Continued)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1999

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

K ON-SITE COMPOSITE*

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Be-7	82.3±13.7	83.1±6.28	63.7±9.53	110±10.7	149±17.5	88.1±12.6
Zn-65	<8.91	<3.07	<5.97	<6.13	<8.50	<7.95
Cs-134	<2.09	<1.22	<2.23	<2.47	<2.66	<1.81
Cs-137	<2.24	<0.97	<1.67	<2.23	<2.89	<3.04
Zr-95	<6.92	<2.12	<4.81	<4.73	<5.00	<7.88
Nb-95	<2.85	<1.89	<3.28	<3.17	<3.14	<5.85
Co-58	<3.31	<1.48	<2.01	<2.62	<2.12	<3.67
Mn-54	<2.13	<1.36	<2.31	<2.18	<2.97	<3.19
Co-60	<2.78	<1.19	<2.65	<3.27	<2.73	<2.79
K-40	<25.9	68.7±8.47	93.6±13.9	91.1±13.7	<42.4	10.5±17.6
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
NUCLIDES	**JULY**	**AUGUST**	**SEPTEMBER**	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Be-7	165±20.8	100±16.8	114±20.1	61.6±5.82	69.7±12.5	85.3±11.7
Zn-65	<12.7	<10.2	<13.2	<7.00	<9.41	<7.18
Cs-134	<4.94	<3.71	<2.86	<1.72	<3.26	<2.68
Cs-137	<4.79	<3.30	<3.35	<1.90	<2.59	<1.51
Zr-95	<5.79	<9.09	<2.76	<4.75	<5.26	<5.37
Nb-95	<1.18	<5.31	<4.85	<2.98	<3.22	<4.29
Co-58	<0.98	<5.32	<5.26	<1.70	<3.55	<2.73
Mn-54	<5.10	<4.90	<7.34	<2.38	<3.29	<1.92
Co-60	<6.24	<5.38	<9.39	<2.45	<4.31	<3.62
K-40	75.2±18.6	44.9±25.2	76.0±23.9	<30.7	<41.0	<20.7
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Optional Sample Location. Not Required by Technical Specifications.

† Plant Related Radionuclides.

TABLE 6-10

DIRECT RADIATION MEASUREMENT RESULTS (1999)
Results in Units of mrem/std. Month ± 1 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
3	D1 On-site	13.0±1.2	28.4±3.8	25.1±2.5	14.1±0.8	0.2 miles @ 69
4	D2 On-site	4.2±0.5	5.0±0.4	5.1±0.6	4.7±0.1	0.4 miles @ 140
5	E On-site	4.2±0.6	4.7±0.4	missing	4.9±0.3	0.4 miles @ 175
6	F On-site	4.0±0.1	4.4±0.2	4.4±0.2	4.5±0.3	0.5 miles @ 210
7*	G On-site	3.3±0.2	5.0±1.4	4.2±0.3	3.9±0.3	0.7 miles @ 250
8	R-5 Off-site Control	4.8±0.3	7.1±1.5	5.3±0.4	5.2±0.3	16.4 miles @ 42
9	D1 Off-site	4.1±0.2	4.4±0.3	4.1±0.3	4.6±0.3	11.4 miles @ 80
10	D2 Off-site	4.5±0.2	4.6±0.6	4.9±0.4	5.0±0.2	9.0 miles @ 117
11	E Off-site	4.3±0.4	4.6±0.4	4.3±0.2	4.4±0.3	7.2 miles @ 160
12	F Off-site	3.8±0.3	4.8±0.9	4.1±0.1	4.5±0.1	7.7 miles @ 190
13	G Off-site	4.3±0.3	4.5±0.5	4.4±0.3	4.7±0.5	5.3 miles @ 225
14*	DeMass Rd., SW Oswego-Control	4.5±0.5	4.7±0.6	4.4±0.3	4.6±0.2	12.6 miles @ 226
15*	Pole 66, W. Boundary-Bible Camp	3.8±0.6	4.5±0.6	4.0±0.4	4.2±0.2	0.9 miles @ 237
18*	Energy Info. Center-Lamp Post, SW	4.4±0.5	5.6±0.7	4.6±0.5	5.0±0.4	0.4 miles @ 265
19	East Boundary-JAF, Pole 9	4.8±0.5	5.3±0.6	4.6±0.3	4.7±0.1	1.3 miles @ 81
23*	H On-site	5.7±0.6	7.7±1.4	6.5±0.4	5.6±0.3	0.8 miles @ 70
24	I On-site	4.2±0.3	5.6±0.8	5.1±0.1	5.2±0.3	0.8 miles @ 98
25	J On-site	4.1±0.2	4.6±0.3	4.8±0.6	4.4±0.3	0.9 miles @ 110
26	K On-site	4.4±0.4	5.4±0.4	4.9±0.4	4.5±0.3	0.5 miles @ 132
27	N. Fence, N. of Switchyard, JAF	19.6±0.7	53.3±8.1	46.6±3.9	27.1±1.6	0.4 miles @ 60
28	N. Light Pole, N. of Screenhouse, JAF	30.8±3.8	59.3±5.7	49.5±3.0	35.8±4.2	0.5 miles @ 68
29	N. Fence, N. of W. Side	24.7+4.3	57.7±10.0	49.2±2.5	Missing	0.5 miles @ 65
30	N. Fence,(NW) JAF	17.1±1.0	34.2±3.2	26.9±1.4	17.5±1.2	0.4 miles @ 57
31	N. Fence,(NW) NMP-1	6.0±0.2	6.8±0.5	6.8±0.7	7.5±0.5	0.2 miles @ 276
39	N. Fence, Rad. Waste-NMP-1	8.7±0.5	9.4±1.4	8.5±0.8	9.4±0.5	0.2 miles @ 292
47	N. Fence,(NE) JAF	7.2±0.3	12.2±1.2	11.2±0.6	7.9±0.7	0.6 miles @ 69
49*	Phoenix, NY-Control	4.0±0.2	4.4±0.8	3.7±0.3	4.6±0.2	19.8 miles @ 170
51	Liberty & Bronson Sts., E of OSS	4.3±0.5	5.4±1.0	4.3±0.1	4.8±0.3	7.4 miles @ 233
52	East 12th & Cayuga Sts., Oswego School	4.2±0.6	5.5±1.3	4.1±0.1	4.4±0.1	5.8 miles @ 227

TABLE 6-10 (Continued)

DIRECT RADIATION MEASUREMENT RESULTS (1999)
Results in Units of mrem/std. Month ± 1 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
53	Broadwell & Chestnut Sts. - Fulton H.S.	4.5±0.1	5.2±0.5	4.5±0.3	Missing	13.7 miles @ 183
54	Liberty St. & Co. Rt. 16 - Mexico H.S.	4.3±0.3	4.9±0.5	4.2±0.3	4.1±0.3	9.3 miles @ 115
55	Gas Substation Co. Rt. 5-Pulaski	4.1±0.3	5.5±1.1	4.6±0.2	4.4±0.3	13.0 miles @ 75
56*	Rt. 104-New Haven SCH.(SE Corner)	4.3±0.4	4.8±0.2	4.6±0.2	4.9±0.4	5.3 miles @ 123
58*	Co.Rt. 1A-Alcan (E.of E. Entrance Rd.)	4.5±0.4	5.5±0.8	4.0±0.2	4.5±0.1	3.1 miles @ 220
75*	Unit 2, N. Fence, N. of Reactor Bldg.	7.2±0.7	5.7±1.0	7.2±0.7	7.0±0.6	0.1 miles @ 5
76*	Unit 2, N. Fence, N. of Change House	5.2±0.5	9.3±1.4	6.3±0.2	5.9±0.4	0.1 miles @ 25
77*	Unit 2, N. Fence, N. of Pipe Bldg.	4.6±0.4	9.9±1.7	7.1±0.5	8.0±0.8	0.2 miles @ 45
78*	JAF, E. of E. Old Lay Down Area	5.1±0.4	6.6±1.2	5.2±0.3	5.2±0.3	1.0 miles @ 90
79*	Co.Rt. 29, Pole #63, 0.2 mi. S. of Lake Rd.	3.8±0.4	4.6±0.1	4.5±0.3	4.4±0.2	1.1 miles @ 115
80*	Co.Rt. 29, Pole #54, 0.7 mi. S. of Lake Rd.	4.0±0.5	5.0±0.6	4.5±0.2	4.7±0.4	1.4 miles @ 133
81*	Miner Rd., Pole #16, 0.5 mi. W. of Rt. 29	4.4±0.3	7.5±1.2	4.0±0.2	4.5±0.2	1.6 miles @ 159
82*	Miner Rd., Pole #1 1/2, 1.1 mi. W. of Rt. 29	4.3±0.3	5.8±1.1	4.1±0.4	4.3±0.2	1.6 miles @ 181
83*	Lakeview Rd., Tree 0.45 mi. N. of Miner Rd.	4.0±0.3	4.6±0.4	4.8±0.3	4.4±0.3	1.2 miles @ 200
84*	Lakeview Rd., N., Pole #6117, 200 ft. N. of Lake Rd.	4.4±0.3	6.1±1.7	4.2±0.5	4.5±0.2	1.1 miles @ 225
85*	Unit 1, N. Fence, N. of W. Side of Screen House	8.9±0.6	12.3±0.9	8.7±0.8	10.2±0.9	0.2 miles @ 294
86*	Unit 2, N. Fence, N. of W. Side of Screen House	7.2±0.7	8.2±1.7	6.3±0.5	7.9±0.4	0.1 miles @ 315

TABLE 6-10 (Continued)

DIRECT RADIATION MEASUREMENT RESULTS (1999)
Results in Units of mrem/std. Month ± 1 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	6.7±0.6	6.6±1.1	5.7±0.7	6.7±0.6	0.1 miles @ 341
88*	Hickory Grove Rd., Pole #2. 0.6 mi. N. of Rt. 1	4.2±0.4	5.1±0.6	4.3±0.5	4.8±0.5	4.8 miles @ 97
89*	Leavitt Rd., Pole #16, 0.4 mi. S. of Rt. 1	4.8±0.4	5.2±0.6	5.2±0.4	4.8±0.4	4.1 miles @ 111
90*	Rt. 104, Pole #300, 150 Ft. E. of Keefe Rd.	3.6±0.4	4.5±0.2	4.4±0.3	4.5±0.6	4.2 miles @ 135
91*	Rt. 51A, Pole #59, 0.8 mi. W. of Rt. 51	3.9±0.6	4.9±0.7	4.1±0.1	4.5±0.3	4.8 miles @ 156
92*	Maiden Lane Rd., Power Pole, 0.6 mi. S. of Rt. 104	4.1±0.4	5.6±0.9	4.4±0.3	5.0±0.2	4.4 miles @ 183
93*	Rt. 53, Pole 1-1, 120 ft. S. of Rt. 104	4.1±0.3	4.8±0.5	3.9±0.2	4.7±0.5	4.4 miles @ 205
94*	Rt. 1, Pole #82, 250 ft. E. of Kocher Rd. (Co. Rt. #63)	3.7±0.4	4.9±0.5	3.7±0.5	4.0±0.2	4.7 miles @ 223
95*	Lakeshore Camp Site, from Alcan W. access Rd., Pole #21, 1.2 mi. N. of Rt. 1	3.8±0.2	4.1±0.6	3.7±0.3	3.9±0.2	4.1 miles @ 237
96*	Creamery Rd., 0.3 mi. S. of Middle Rd., Pole 1 ½	3.6±0.1	4.4±0.4	4.2±0.2	4.0±0.3	3.6 miles @ 199
97*	Rt. 29, Pole #50, 200 ft. N. of Miner Rd.	3.9±0.4	5.1±0.5	4.2±0.4	4.3±0.3	1.8 miles @ 143
98*	Lake Rd., Pole #145, 0.15 mi. E. of Rt. 29	3.8±0.3	5.0±0.5	4.9±0.4	4.9±0.5	1.2 miles @ 101
99	NMP Rd., 0.4 mi. N. of Lake Rd., Env. Station R1 Off-site	4.3±0.4	5.1±0.5	4.2±0.1	4.9±0.3	1.8 miles @ 88
100	Rt. 29 and Lake Rd., Env. Station R2 Off-site	5.2±0.2	6.0±0.9	4.6±0.2	4.7±0.3	1.1 miles @ 104
101	Rt. 29, 0.7 mi. S. of Lake Rd., Env. Station R3 Off-site	3.9±0.3	4.6±0.2	4.4±0.3	4.4±0.3	1.5 miles @ 132

TABLE 6-10 (Continued)

DIRECT RADIATION MEASUREMENT RESULTS (1999)
Results in Units of mrem/std. Month ± 1 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) E. Driveway, Lamp Post	3.9±0.4	5.1±0.7	4.9±0.3	4.4±0.4	11.9 miles @ 175
103	EIC, East Garage Rd., Lamp Post R3 Off-site	5.0±0.4	5.0±0.5	4.2±0.3	4.6±0.4	0.4 miles @ 267
104	Parkhurst Road, Pole #148 1/2-A, 0.1 miles South of Lake Rd.	5.1±0.4	5.4±0.9	4.9±0.1	4.1±0.3	1.4 miles @ 102
105	Lakeview Rd., Pole #6125, 0.6 mi. South of Lake Road	4.1±0.4	5.6±0.7	4.7±0.2	4.3±0.3	1.4 miles @ 198
106	Shoreline Cove, West of NMP-1, Tree on West Edge	5.9±0.4	6.1±0.6	5.5±0.4	4.9±0.3	0.3 miles @ 274
107	Shoreline Cove, West of NMP-1	5.0±0.3	6.0±0.6	5.6±0.4	5.1±0.6	0.3 miles @ 272
108	Lake Road, Pole #142, 300 ft. East of Rt. 29 S.	4.2±0.2	5.8±1.0	4.8±0.2	4.1±0.3	1.1 miles @ 104
109	Tree North of Lake Road, 300 ft. East of Route 29 N.	4.3±0.4	5.1±1.2	3.6±0.4	4.5±0.5	1.1 miles @ 103
111	Sterling, NY	4.2±0.4	5.0±0.8	4.2±0.3	3.6±0.2	26.4 miles @ 166
112	EOF/Env. Lab, Oswego Co. Airport	4.1±0.4	5.8±0.9	4.1±0.6	4.0±0.2	11.9 miles @ 175
113	Control, Baldwinsville, NY	3.8±0.5	5.1±0.8	4.2±0.2	3.9±0.3	21.8 miles @ 214

* Technical Specification Location

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

*** TLD lost in field

TABLE 6-11

CONCENTRATIONS OF IODINE-131 AND GAMMA EMITTERS IN MILK

Results in Units of pCi/liter ± 1 Sigma

SAMPLE LOCATION NO. 4						
COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba/La-40	OTHERS*
04/05/99	<0.59	1580±61	<4.09	<3.86	<4.80	LLD
04/19/99	<0.42	1470±59	<4.18	<3.76	<6.14	LLD
05/03/99	<0.68	1460±92	<3.32	<5.22	<6.94	LLD
05/17/99	<0.57	1500±97	<8.17	<8.93	<12.3	LLD
06/07/99	<0.43	1420±71	<5.19	<5.88	<5.88	LLD
06/21/99	<0.40	1710±87	<5.36	<6.14	<6.22	LLD
07/06/99	<0.68	1810±52	<2.35	<3.94	<4.71	LLD
07/19/99	<0.44	1820±52	<4.04	<3.94	<3.69	LLD
08/02/99	<0.36	1650±85	<6.90	<7.16	<9.01	LLD
08/23/99	<0.34	1620±85	<7.57	<7.62	<7.47	LLD
09/07/99	<0.40	1890±73	<5.79	<5.19	<6.92	LLD
09/20/99	<0.40	1660±87	<7.57	<8.01	<8.68	LLD
10/04/99	<0.47	1680±86	<5.93	<7.07	<8.23	LLD
10/18/99	<0.62	1610±81	<5.19	<5.30	<8.80	LLD
11/01/99	<0.46	1660±61	<3.44	<5.61	<5.56	LLD
11/22/99	<0.43	1680±50	<3.67	<3.99	<4.95	LLD
12/06/99	<0.34	1580±66	<4.21	<4.27	<6.59	LLD
12/20/99	<0.53	1590±82	<6.22	<5.88	<9.18	LLD

SAMPLE LOCATION NO. 50						
COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba/La-40	OTHERS*
04/05/99	<0.38	1480±73	<5.19	<4.73	<7.28	LLD
04/19/99	<0.36	1320±69	<5.27	<5.34	<7.57	LLD
05/03/99	<0.36	1410±90	<8.28	<9.47	<11.0	LLD
05/17/99	<0.35	1600±96	<9.20	<9.34	<12.2	LLD
06/07/99	<0.47	1630±85	<6.23	<7.35	<5.96	LLD
06/21/99	<0.47	1610±83	<6.33	<6.93	<7.00	LLD
07/06/99	<1.00	1520±83	<8.27	<7.73	<7.95	LLD
07/19/99	<0.38	1570±65	<4.51	<4.59	<9.11	LLD
08/02/99	<0.39	1720±51	<3.47	<3.96	<4.67	LLD
08/23/99	<0.29	1680±68	<3.91	<4.26	<6.23	LLD
09/07/99	<0.32	1610±68	<5.60	<5.99	<6.97	LLD
09/20/99	<0.33	1730±51	<2.57	<4.17	<3.70	LLD
10/04/99	<0.33	1670±67	<4.16	<4.52	<6.70	LLD
10/18/99	<0.48	1560±102	<10.4	<8.95	<10.2	LLD
11/01/99	<0.37	1570±103	<7.43	<8.95	<7.23	LLD
11/22/99	<0.36	1640±67	<4.53	<3.77	<6.28	LLD
12/06/99	<0.50	1660±67	<4.39	<4.52	<6.49	LLD
12/20/99	<0.45	1590±81	<6.23	<5.77	<6.65	LLD

TABLE 6-11 (Continued)

CONCENTRATIONS OF IODINE-131 AND GAMMA EMITTERS IN MILK

Results in Units of pCi/liter ± 1 Sigma

SAMPLE LOCATION NO. 55						
COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba/La-40	OTHERS*
04/05/99	<0.35	1430±92	<8.90	<9.47	<12.9	LLD
04/19/99	<0.61	1520±82	<6.03	<7.89	<6.47	LLD
05/03/99	<0.45	1550±95	<9.39	<9.34	<8.27	LLD
05/17/99	<0.40	1530±60	<4.19	<3.56	<6.85	LLD
06/07/99	<0.43	1410±92	<9.10	<8.20	<13.4	LLD
06/21/99	<0.48	1440±72	<2.94	<5.98	<5.24	LLD
07/06/99	<1.00	1650±86	<7.84	<7.93	<10.8	LLD
07/19/99	<0.37	1540±39	<4.53	<4.58	<6.58	LLD
08/02/99	<0.53	1420±57	<4.10	<3.82	<5.98	LLD
08/23/99	<0.34	1310±69	<3.20	<5.34	<6.60	LLD
09/07/99	<0.37	1610±85	<6.65	<6.78	<7.14	LLD
09/20/99	<0.44	1640±85	<5.93	<5.97	<6.80	LLD
10/04/99	<0.37	1620±50	<3.90	<4.27	<3.89	LLD
10/18/99	<0.55	1440±80	<6.71	<6.79	<8.65	LLD
11/01/99	<0.52	1580±80	<5.45	<6.40	<8.48	LLD
11/22/99	<0.46	1210±131	<12.0	<10.9	<14.8	LLD
12/06/99	<0.80	1660±86	<7.11	<7.25	<10.2	LLD
12/20/99	<0.41	1560±82	<7.48	<6.12	<7.25	LLD

SAMPLE LOCATION NO. 60						
COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba/La-40	OTHERS*
04/04/99	<0.35	1600±98	<8.63	<8.54	<10.4	LLD
04/18/99	<0.33	1440±90	<7.76	<9.35	<10.7	LLD
05/02/99	<0.40	1350±90	<8.61	<8.79	<10.4	LLD
05/16/99	<0.38	1270±68	<3.26	<5.34	<7.16	LLD
06/06/99	<0.57	1660±50	<4.15	<3.74	<3.90	LLD
06/20/99	<0.55	1750±51	<2.44	<3.69	<4.80	LLD
07/05/99	<0.53	1670±50	<4.05	<4.17	<5.22	LLD
07/18/99	<0.24	1630±86	<7.42	<7.51	<10.9	LLD
08/01/99	<0.31	1640±85	<7.58	<7.84	<9.92	LLD
08/22/99	<0.38	1560±59	<3.78	<4.41	<4.26	LLD
09/06/99	<0.51	1680±68	<4.31	<4.88	<5.84	LLD
09/19/99	<0.35	1470±66	<5.40	<5.73	<6.05	LLD
10/03/99	<0.57	1720±68	<2.47	<5.62	<7.26	LLD
10/17/99	<0.74	1600±60	<2.89	<4.88	<6.88	LLD
11/01/99	<0.57	1610±60	<3.14	<4.73	<5.39	LLD
11/21/99	<0.44	1580±69	<4.78	<5.20	<5.86	LLD
12/05/99	<0.45	1590±68	<5.76	<5.27	<6.37	LLD
12/20/99	<0.51	1410±77	<6.10	<7.06	<9.54	LLD

TABLE 6-11 (Continued)

CONCENTRATIONS OF IODINE-131 AND GAMMA EMITTERS IN MILK

Results in Units of pCi/liter ± 1 Sigma

SAMPLE LOCATION NO. 73						
COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba/La-40	OTHERS*
04/05/99	<0.45	1520±59	<2.27	<4.05	<5.56	LLD
04/19/99	<0.38	1320±68	<5.74	<5.98	<5.44	LLD
05/03/99	<0.76	1500±73	<5.27	<4.98	<7.59	LLD
05/17/99	<0.33	1500±59	<3.48	<3.66	<3.97	LLD
06/07/99	<0.40	1490±59	<3.95	<4.01	<5.34	LLD
06/21/99	<0.44	1570±48	<2.49	<3.91	<4.17	LLD
07/06/99	<0.47	1520±82	<7.42	<6.79	<9.58	LLD
07/19/99	<0.49	1690±50	<3.96	<3.91	<4.34	LLD
08/02/99	<0.34	1690±50	<2.23	<4.04	<4.34	LLD
08/23/99	<0.50	1540±66	<5.70	<5.05	<4.59	LLD
09/07/99	<0.30	1670±67	<4.70	<4.40	<6.29	LLD
09/20/99	<0.35	1570±65	<4.01	<4.13	<6.87	LLD
10/04/99	<0.40	1690±50	<2.45	<3.63	<3.70	LLD
10/18/99	<0.33	1430±67	<4.83	<5.25	<5.64	LLD
11/01/99	<0.45	1540±79	<5.70	<6.97	<8.06	LLD
11/22/99	<0.48	1660±87	<7.52	<6.81	<10.5	LLD
12/06/99	<0.45	1640±50	<2.37	<3.60	<4.79	LLD
12/20/99	<0.36	1460±98	<7.25	<10.0	<10.8	LLD

SAMPLE LOCATION NO. 7						
COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba/La-40	OTHERS*
04/05/99	<0.44	1550±84	<6.52	<7.89	<8.21	LLD
04/19/99	<0.38	1580±61	<4.18	<4.19	<5.57	LLD
05/03/99	<0.43	1500±73	<5.27	<4.98	<7.59	LLD
05/17/99	<0.43	1470±72	<5.27	<5.56	<5.45	LLD
06/07/99	<0.37	1560±50	<3.46	<3.72	<5.47	LLD
06/21/99	<0.56	1390±70	<4.36	<5.56	<7.89	LLD
07/06/99	<0.55	1640±50	<3.58	<4.15	<4.39	LLD
07/19/99	<0.34	1320±68	<5.27	<5.67	<6.15	LLD
08/02/99	<0.35	1420±71	<6.04	<5.56	<6.93	LLD
08/23/99	<0.50	1550±48	<2.51	<3.99	<4.47	LLD
09/07/99	<0.36	1300±54	<4.46	<4.27	<5.77	LLD
09/20/99	<0.30	1590±49	<4.01	<4.44	<4.64	LLD
10/04/99	<0.45	1540±82	<6.06	<8.01	<7.69	LLD
10/18/99	<0.40	1530±89	<5.24	<4.67	<5.41	LLD
11/01/99	<0.65	1690±11	<8.51	<9.21	<9.40	LLD
11/22/99	<0.42	1510±66	<5.13	<5.60	<6.38	LLD
12/06/99	<0.38	1620±68	<5.94	<4.99	<6.10	LLD
12/20/99	<0.51	1510±58	<4.92	<4.78	<5.84	LLD

TABLE 6-12

MILK ANIMAL CENSUS 1999

TOWN OR AREA(a)	NUMBER ON CENSUS MAP(1)	DEGREES(2)	DISTANCE(2)	NUMBER OF MILK ANIMALS
Scriba	3 62 63	190° 183° 185°	4.5 miles 6.7 8.0	NONE 5G 40C
New Haven	9 4* 7* 64 75	95° 113° 107° 107° 146°	5.2 7.8 5.5 7.9 7.5	42C 100C 65C 51C 1G
Mexico	72 14 19 60* 50* 55* 21 49	98° 120° 132° 90° 93° 95° 112° 88°	9.9 9.8 10.5 9.5 9.1 9.0 10.5 7.9	36C 56C 40C 40C 90C 56C 75C NONE
Richland	22	85°	10.2	NONE
Sterling	73**	234°	13.9	52C
Volney	70 25	147° 182°	9.4 9.5	5C NONE

TABLE 6-12 (Continued)

MILK ANIMAL CENSUS 1999

MILKING ANIMAL TOTALS (including control locations)	MILKING ANIMAL TOTALS (excluding control locations)
748 Cows 6 Goats	696 Cows 6 Goats

C = Cows
G = Goats
* = Milk sample location
** = Milk sample control location
(1) = References Section 3.3
(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 and/or goats.
(a) = Census performed out to a distance of approximately ten miles.

TABLE 6-13

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS

Results in Units of pCi/g (wet) ± 1 Sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	Zn-65
R	09/99	BEAN LEAVES	1.59±0.06	2.52±0.12	<0.014	<0.013	<0.012	<0.032
		SQUASH LEAVES	1.86±0.04	3.21±0.07	<0.008	<0.006	<0.006	<0.014
K*	09/99	SWEET PEPPERS	0.71±0.03	5.72±0.10	<0.010	<0.006	<0.006	<0.018
		BEAN LEAVES	1.73±0.04	2.12±0.07	<0.013	<0.005	<0.006	<0.014
		SQUASH LEAVES	2.01±0.05	2.49±0.09	<0.009	<0.007	<0.007	<0.021
L	09/99	BEAN LEAVES	2.35±0.04	1.93±0.06	<0.006	<0.005	<0.005	<0.013
		PEPPER LEAVES	1.09±0.03	5.70±0.09	<0.038	<0.006	<0.006	<0.016
		CUCUMBER LEAVES	2.68±0.04	2.36±0.05	<0.007	<0.003	<0.005	<0.007
		SQUASH LEAVES	2.14±0.03	3.80±0.06	<0.015	<0.007	0.007±0.001	<0.017
V	09/99	SQUASH LEAVES	2.63±0.53	2.44±0.08	<0.008	<0.005	<0.008	<0.021
		HOT PEPPERS	0.84±0.30	5.94±0.11	<0.008	<0.006	<0.006	<0.019
M* (CONTROL)	09/99	SQUASH LEAVES	2.36±0.05	3.08±0.08	<0.010	<0.005	<0.006	<0.015
		CUCUMBER LEAVES	2.59±0.05	2.59±0.08	<0.008	<0.006	<0.007	<0.017
		BEAN LEAVES	0.68±0.03	2.64±0.07	<0.007	<0.006	<0.006	<0.016
		SWEET PEPPERS	0.59±0.03	7.39±0.11	<0.006	<0.006	<0.006	<0.020
S	09/99	SWEET PEPPERS	1.06±0.06	3.93±0.17	<0.035	<0.016	<0.016	<0.041

NOTE: Other Plant Related Radionuclides <LLD

* Samples required by Technical Specifications

TABLE 6-14

1999 RESIDENCE CENSUS

LOCATION	MAP DESIGNATION[b]	METEROLOGICAL 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 the maps in Section 3.3.

7.0 HISTORICAL DATA TABLES

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 and 1978 through 1997 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 7-1

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†	**	**	**	**	**	**	**	**	**
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	0.027	0.027	0.027	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<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.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-2

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†	**	**	**	**	**	**	**	**	**
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	0.29	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	0.28	0.30	0.29	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	0.12	0.14	0.13	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	0.12	0.14	0.13	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	0.18	0.46	0.32	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	0.06	0.37	0.22	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	0.14	0.15	0.15	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	0.15	0.17	0.16	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	0.11	0.17	0.14	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	0.06	0.06	0.06	<LLD	<LLD	<LLD
1999	<LLD	<LLD	<LLD	0.06	0.10	0.08	<LLD	<LLD	<LLD

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

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

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-3

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†	0.94	0.94	0.94
1975†	<MDL	<MDL	<MDL
1976	1.2	1.2	1.2
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
1990	0.033	0.079	0.045
1991	0.021	0.034	0.029
1992	0.019	0.026	0.022
1993	0.030	0.036	0.033
1994	0.014	0.031	0.022
1995	0.017	0.023	0.019
1996	0.018	0.022	0.020
1997	0.012	0.030	0.021
1998	0.013	0.013	0.013
1999	<LLD	<LLD	<LLD

* 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 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-4

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
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
1990	0.027	0.093	0.040
1991	0.018	0.045	0.029
1992	0.014	0.030	0.024
1993	0.018	0.035	0.028
1994	0.015	0.023	0.019
1995	0.016	0.022	0.019
1996	0.016	0.025	0.020
1997	0.014	0.023	0.018
1998	0.021	0.021	0.021
1999	0.018	0.021	0.020

* 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 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-5

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††	*	*	*	*	*	*
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No gamma analysis performed (not required).

† Location was the City of Oswego Water Supply for 1969 - 1984 and the Oswego Steam Station inlet canal for 1985 - 1999.

†† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-6

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††	*	*	*	*	*	*
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No gamma analysis performed (not required).

† Indicator location was the NMP 1 Inlet Canal for the period 1969 - 1973, and the JAF Inlet Canal for 1974 - 1999.

†† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-7

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
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
1990	260	320	290
1991	180	200	190
1992	190	310	243
1993	160	230	188
1994	250	250	250
1995	230	230	230
1996	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD
1998	190	190	190
1999	220	510	365

* Control location is the City of Oswego, drinking water for 1969 - 1984 and the Oswego Steam Station inlet canal for 1985 - 1999.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-8

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
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
1990	220	290	250
1991	250	390	310
1992	240	300	273
1993	200	280	242
1994	180	260	220
1995	320	320	320
1996	<LLD	<LLD	<LLD
1997	160	160	160
1998	190	190	190
1999	180	270	233

* Indicator location was the NMP-1 Inlet Canal during the period 1969-1973, and the JAF Inlet Canal for 1974-1999.

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

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-9

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
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
1990	0.003	0.027	0.013
1991	0.007	0.028	0.014
1992	0.006	0.020	0.012
1993	0.007	0.022	0.013
1994	0.008	0.025	0.015
1995	0.006	0.023	0.014
1996	0.008	0.023	0.014
1997	0.006	0.025	0.013
1998	0.004	0.034	0.014
1999	0.010	0.032	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 1985-1999 (formerly C off-site location).

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-10

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
1981	0.004	0.528	0.151
1982	0.001	0.113	0.031
1983	0.003	0.062	0.023
1984	0.001	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
1990	0.006	0.023	0.014
1991	0.006	0.033	0.015
1992	0.005	0.024	0.013
1993	0.005	0.023	0.014
1994	0.006	0.024	0.015
1995	0.004	0.031	0.014
1996	0.006	0.025	0.013
1997	0.001	0.018	0.010
1998	0.002	0.040	0.015
1999	0.009	0.039	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 - 1999 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 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-11

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†	*	*	*	*	*	*
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<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 - 1999.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-12

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†	*	*	*	*	*	*
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<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. Sample locations included R-1 through R-4 air monitoring locations for 1985 - 1999.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-13

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
1981	<LLD	0.039	0.039
1982	0.039	<LLD	<LLD
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	<LLD	0.332	0.151
1986	0.041	<LLD	<LLD
1987	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD
1999	<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 - 1999.

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

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-14

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
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
1990	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD
1999	<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 - 1999 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 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-15A

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem/standard month

LOCATION: CONTROL **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	2.7	8.9	5.6
1975†	4.8	6.0	5.5
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
1990	3.7	6.0	4.7
1991	3.8	5.8	4.7
1992	2.6	5.1	4.1
1993	3.4	5.7	4.4
1994	3.1	5.0	4.1
1995	3.4	5.7	4.4
1996	3.4	5.6	4.3
1997	3.7	6.2	4.7
1998	3.7	5.6	4.4
1999	3.6	7.1	4.6

* Data not available.

** TLD #8 and 14 established 1974, TLD #49 established 1980, TLD #111 established 1988, TLD #113 established 1991.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-15B

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: RETS CONTROL **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	2.7	8.9	5.6
1975†	4.8	6.0	5.5
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
1990	3.7	6.0	4.8
1991	3.8	5.3	4.6
1992	2.6	4.7	3.9
1993	3.4	5.3	4.4
1994	3.1	4.6	3.9
1995	3.4	4.9	4.2
1996	3.4	5.6	4.2
1997	3.9	5.2	4.6
1998	3.7	4.8	4.2
1999	3.7	4.7	4.4

* Data not available.

** TLD #14 established 1974, TLD #49 established 1980.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16A

HISTORICAL ENVIRONMENTAL SAMPLE DATA
ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: SITE BOUNDARY **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	*	*	*
1975†	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	4.9(4.1)	5.9(12.6)	5.3(6.2)
1986	5.4(4.4)	6.8(18.7)	5.9(7.0)
1987	4.7(4.4)	5.9(14.3)	5.3(6.1)
1988	5.0(3.4)	6.1(17.9)	5.4(6.4)
1989	4.5(2.8)	5.2(15.4)	4.8(5.9)
1990	4.5(3.6)	5.4(14.9)	4.8(6.4)
1991	4.3(3.2)	5.5(16.7)	4.8(6.0)
1992	3.7(3.2)	4.6(10.4)	4.2(5.1)
1993	3.8(3.3)	4.8(11.7)	4.3(5.4)
1994	2.8(2.8)	4.9(12.4)	4.0(5.2)
1995	3.5(3.5)	5.1(9.6)	4.4(5.4)
1996	3.2(3.2)	5.3(9.1)	4.1(5.2)
1997	3.5(3.5)	5.9(10.2)	4.6(5.9)
1998	3.7(3.7)	5.1(9.4)	4.4(5.4)
1999	3.3(3.3)	7.5(12.3)	4.7(5.8)

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

** TLD #7, 18 and 23 established 1972 - 1974.
TLD # 75-87 established 1985.
TLD #23, 75, 76, 77, 85, 86 and 87 are in close proximity to operational buildings along the north boundary. This boundary is the lakeshore and is considered to be generally not accessible to the public. The doses from these locations are not included in the historical data statistics, but are shown in the summary table as ( ) data.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16B

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: OFF-SITE SECTORS **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	*	*	*
1975†	*	*	*
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
1990	3.6	6.3	4.7
1991	3.6	5.8	4.7
1992	2.9	5.0	4.1
1993	3.4	6.3	4.5
1994	3.0	5.1	4.0
1995	3.2	5.2	4.3
1996	3.2	5.3	4.2
1997	3.5	5.8	4.4
1998	3.5	5.0	4.2
1999	3.6	5.6	4.4

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

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

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16C

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: SITE INTEREST **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	*	*	*
1975†	*	*	*
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
1990	3.2	6.3	4.8
1991	2.9	5.6	4.4
1992	3.0	4.8	4.1
1993	3.2	5.8	4.5
1994	2.9	4.8	4.1
1995	3.6	4.8	4.2
1996	3.2	5.1	4.2
1997	3.5	6.2	4.6
1998	3.7	5.6	4.4
1999	3.6	7.1	4.6

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

** TLD locations initiated in 1985 as required by the New Technical Specifications. Includes TLD numbers 8, 15, 56, 58, 96, 97 and 98, which are located near critical residences and populated areas near the site.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16D

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: ON-SITE INDICATOR **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	3.1	10.6	5.7
1975†	4.6	16.0	7.3
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
1990	3.6	12.9	5.5
1991	3.2	11.6	5.4
1992	3.2	5.6	4.3
1993	3.1	13.6	5.2
1994	2.8	14.3	5.1
1995	3.5	28.6	6.2
1996	3.1	32.6	6.4
1997	3.5	28.8	8.1
1998	3.6	28.8	6.2
1999	3.3	28.4	6.6

* 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 - 1999). Locations are existing or previous on-site environmental air monitoring locations.

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16E

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: OFF-SITE INDICATOR **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1974†	2.4	8.9	5.3
1975†	4.5	7.1	5.5
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
1990	3.8	6.1	4.8
1991	3.4	5.8	4.5
1992	3.1	5.2	4.1
1993	3.2	5.7	5.0
1994	3.0	5.1	4.1
1995	3.9	5.7	4.4
1996	3.3	5.5	4.1
1997	3.7	6.2	4.7
1998	3.9	5.6	4.5
1999	3.8	7.1	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 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-17

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†	*	*	*	*	*	*
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<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 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-18

HISTORICAL ENVIRONMENTAL SAMPLE

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
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
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1994	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD	0.25	0.44	0.35
1998	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1999	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

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

** No data available (samples not required).

† 1969 data is considered to be pre-operational for the site. 1974 and 1975 data is considered to be pre-operational for the JAFNPP.

TABLE 7-19

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

LOCATION: CONTROL *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975†	**	**	**
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
1990	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD
1993	0.008	0.008	0.008
1994	<LLD	<LLD	<LLD
1995	<LLD	<LLD	<LLD
1996	<LLD	<LLD	<LLD
1997	<LLD	<LLD	<LLD
1998	<LLD	<LLD	<LLD
1999	<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 and 1975 data is considered to be pre-operational for the JAFNPP.

†† Data comprised of broadleaf and non-broadleaf vegetation (1980-1984). Data comprised of broadleaf vegetation only (1985-1999).

TABLE 7-20

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
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
1990	<LLD	<LLD	<LLD
1991	0.039	0.039	0.039
1992	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD
1994	0.006	0.012	0.010
1995	0.011	0.012	0.012
1996	<LLD	<LLD	<LLD
1997	0.013	0.013	0.013
1998	<LLD	<LLD	<LLD
1999	0.007	0.007	0.007

* 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 and 1975 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 (1985-1999).

8.0 GRAPHICAL PRESENTATIONS

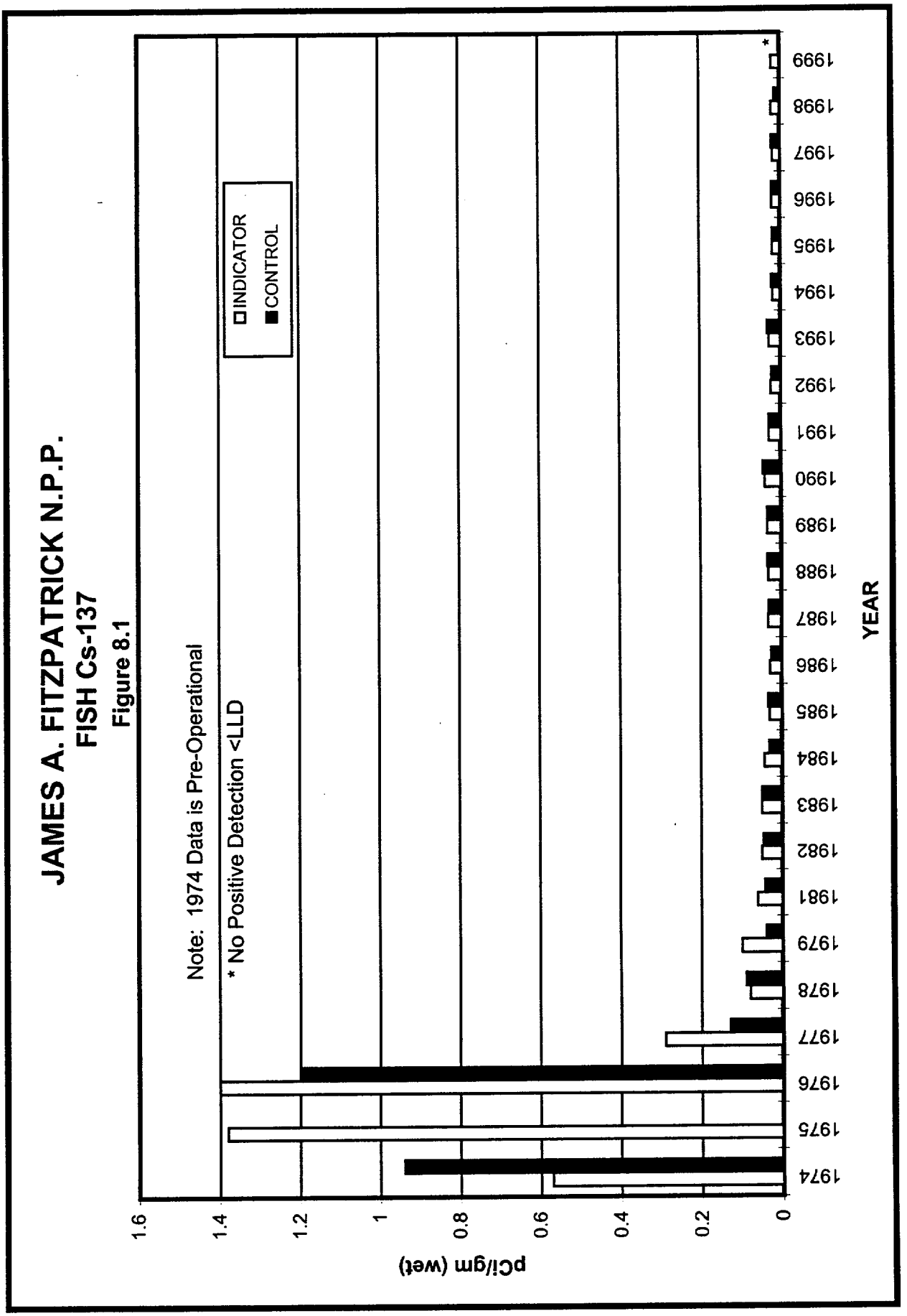
1. DATA GRAPHS

This section includes graphic representation of selected sample results.

For graphic representation, results reported as MDL or LLD were considered to be at the "zero" level of activity. MDL and LLD results were indicated where possible.

2. SAMPLE LOCATIONS

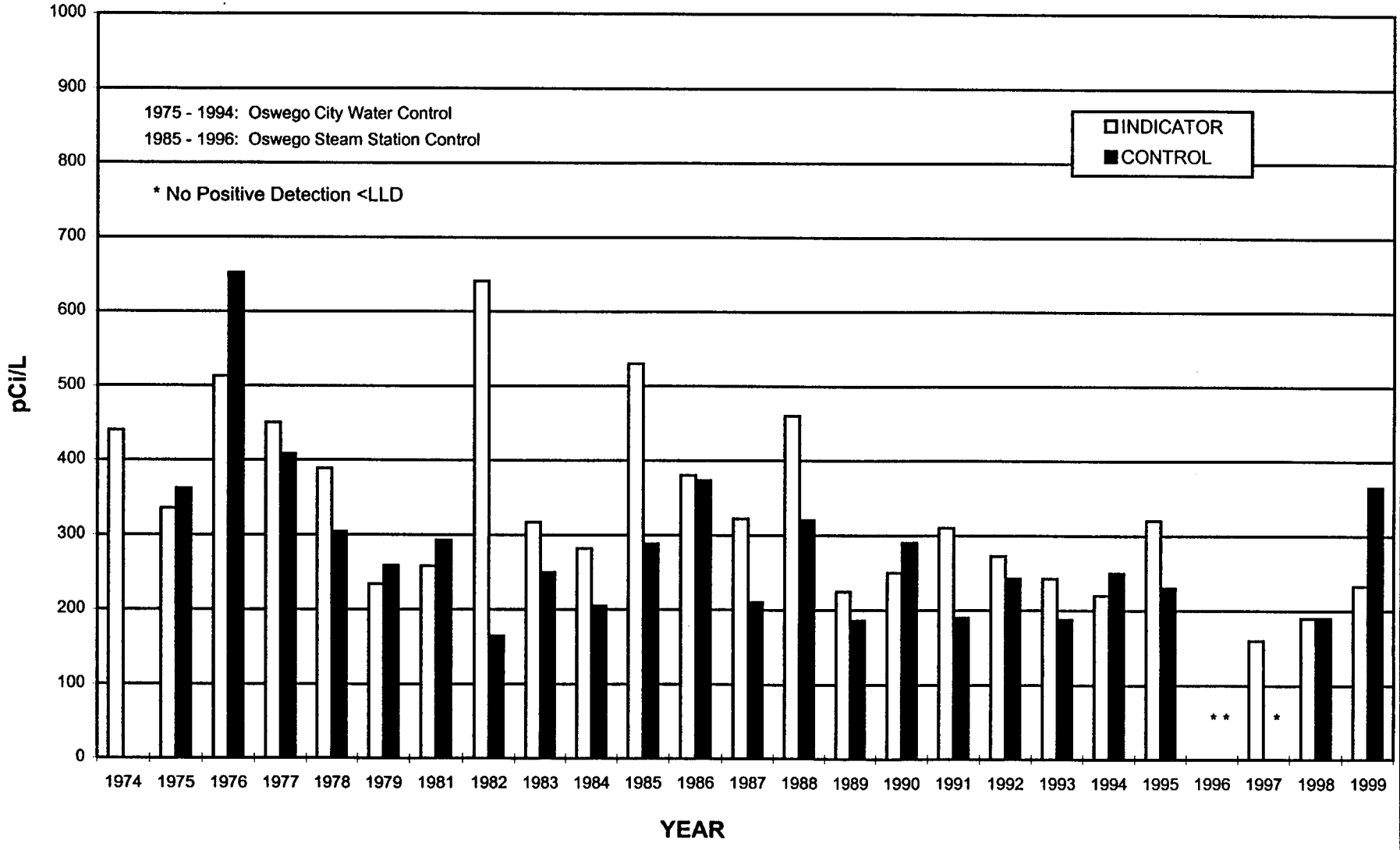
Sample location results specified as "indicator" and "control" on the graphs can be referenced back to Section 3.3 for specific locations.

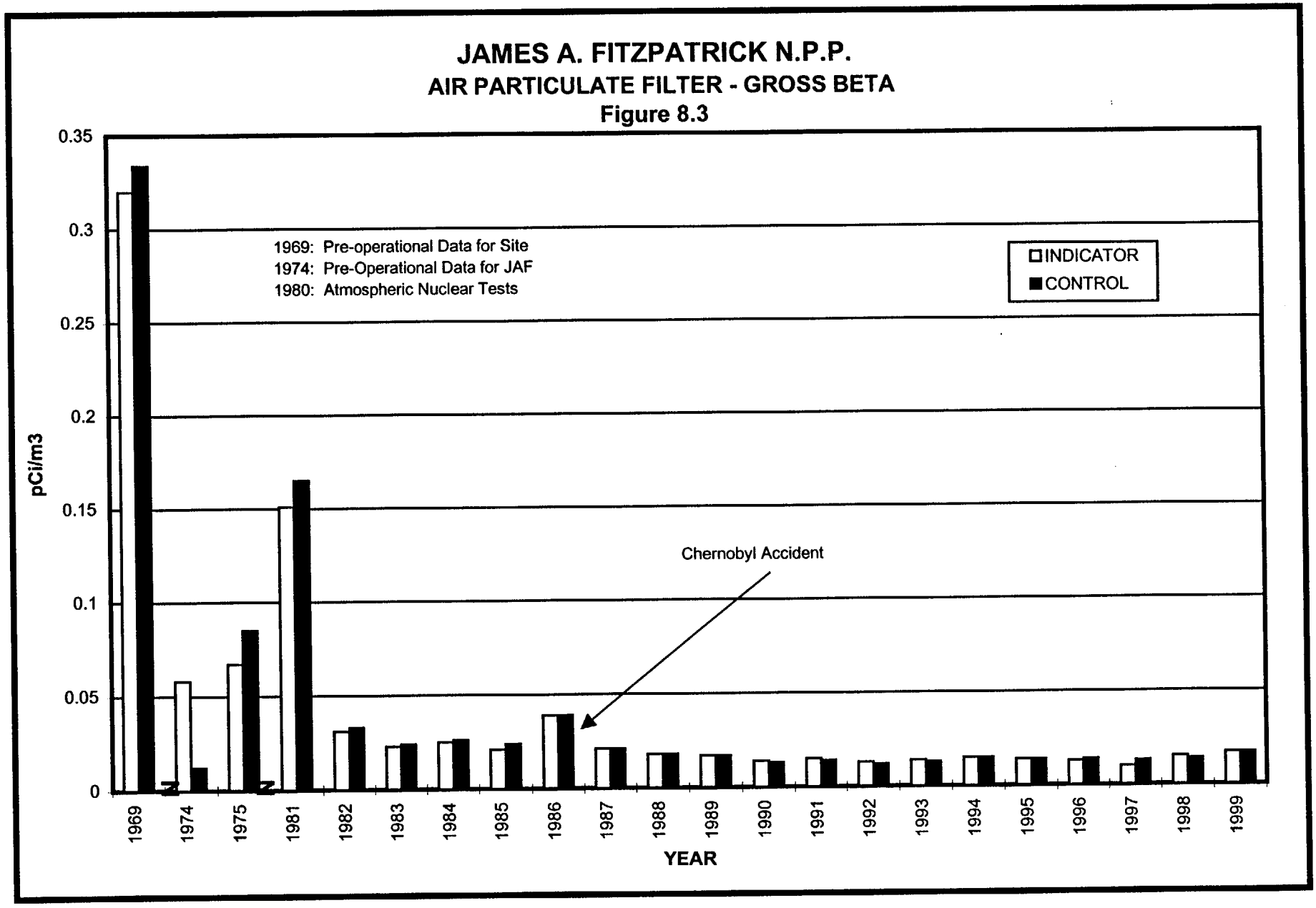

JAMES A. FITZPATRICK N.P.P.
FISH Cs-137
Figure 8.1
Note: 1974 Data is Pre-Operational
* No Positive Detection <LLD
INDICATOR
CONTROL
pCi/gm (wet)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1974
1975
1976
1977
1978
1979
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
YEAR

JAMES A. FITZPATRICK N.P.P.

SURFACE WATER - TRITIUM

Figure 8.2

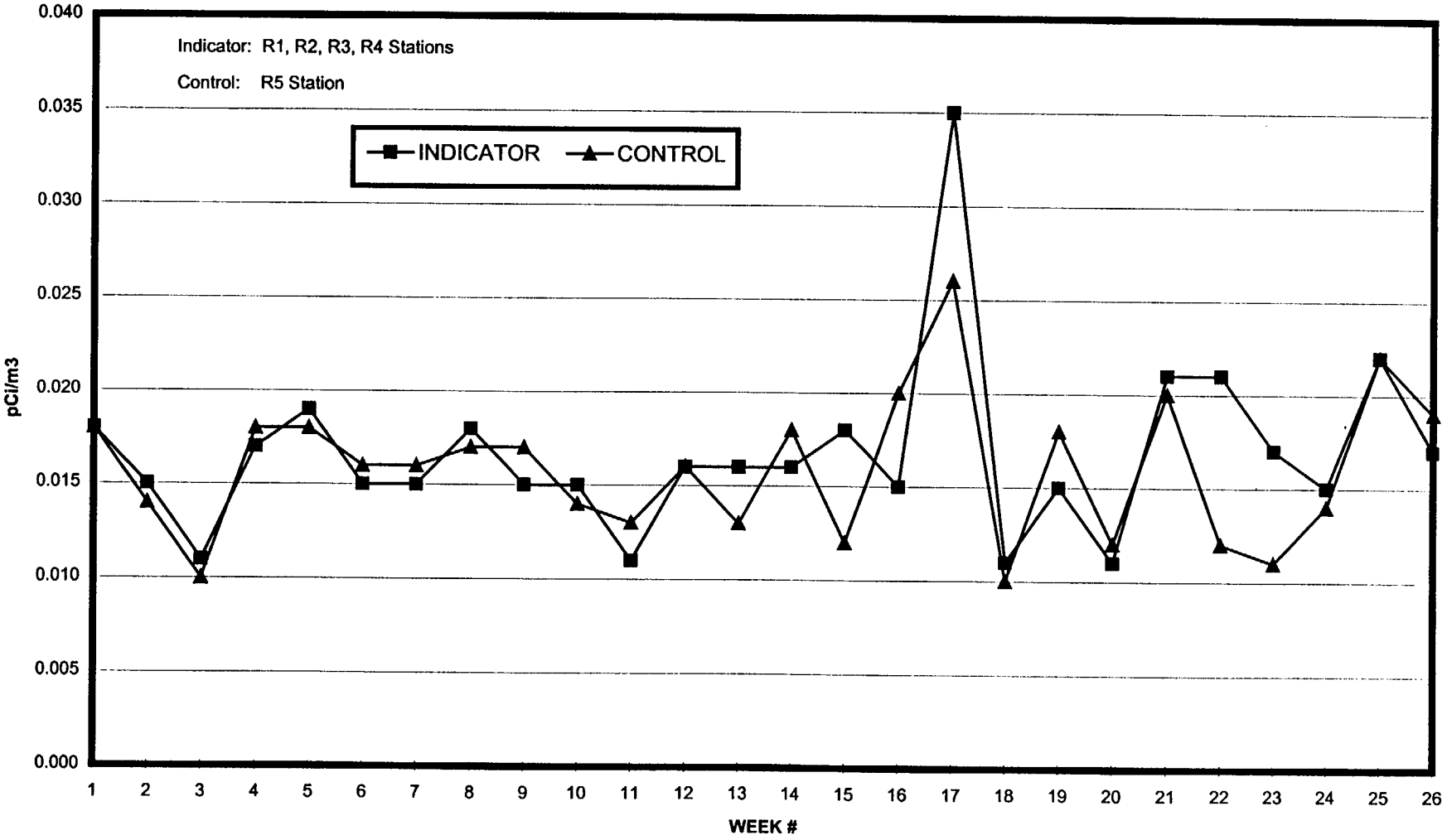



JAMES A. FITZPATRICK N.P.P.
AIR PARTICULATE FILTER - GROSS BETA
Figure 8.3
1969: Pre-operational Data for Site
1974: Pre-Operational Data for JAF
1980: Atmospheric Nuclear Tests
INDICATOR
CONTROL
Chernobyl Accident
pCi/m3
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1969
1974
1975
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
YEAR

JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER - GROSS BETA

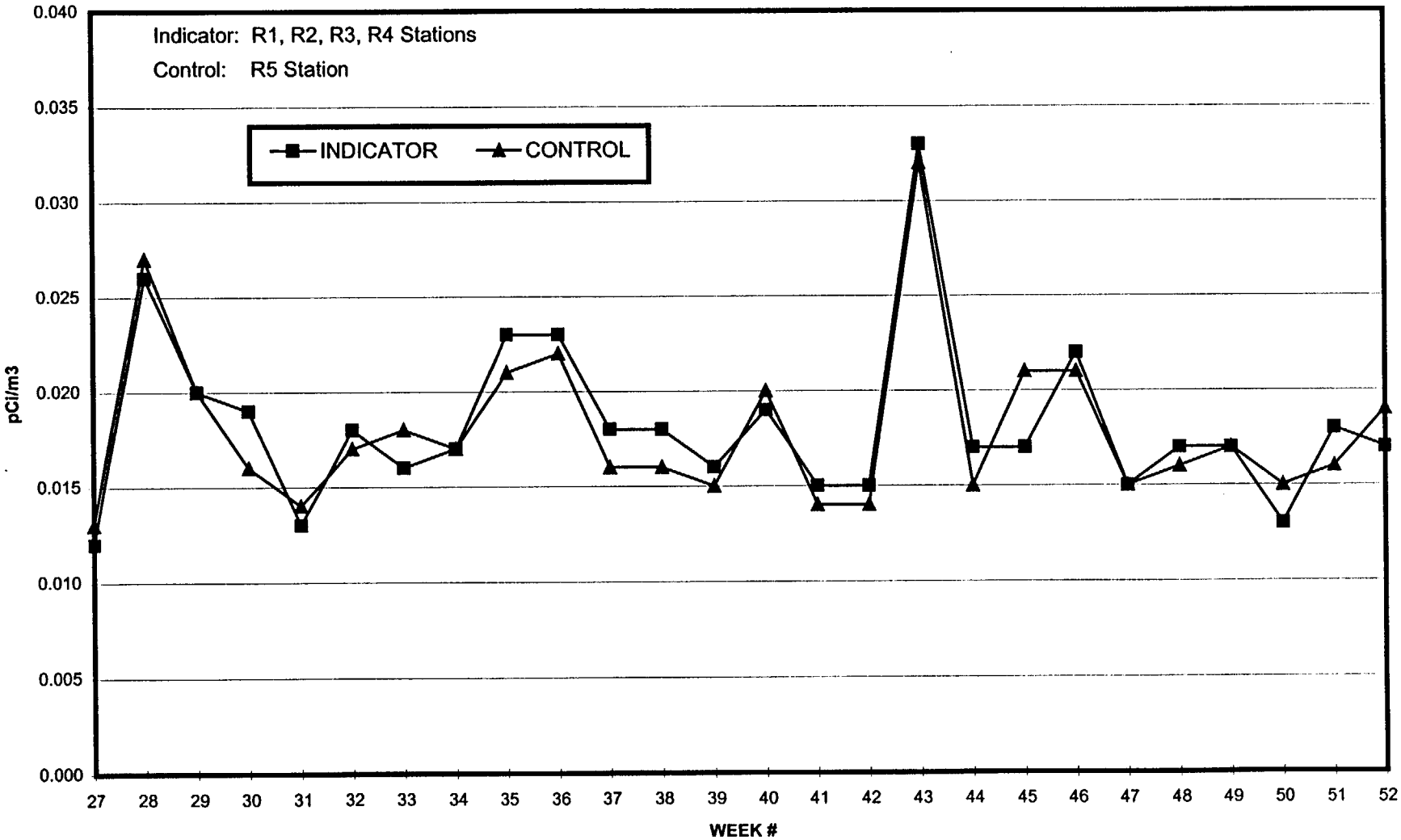
Figure 8.4



JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER - GROSS BETA

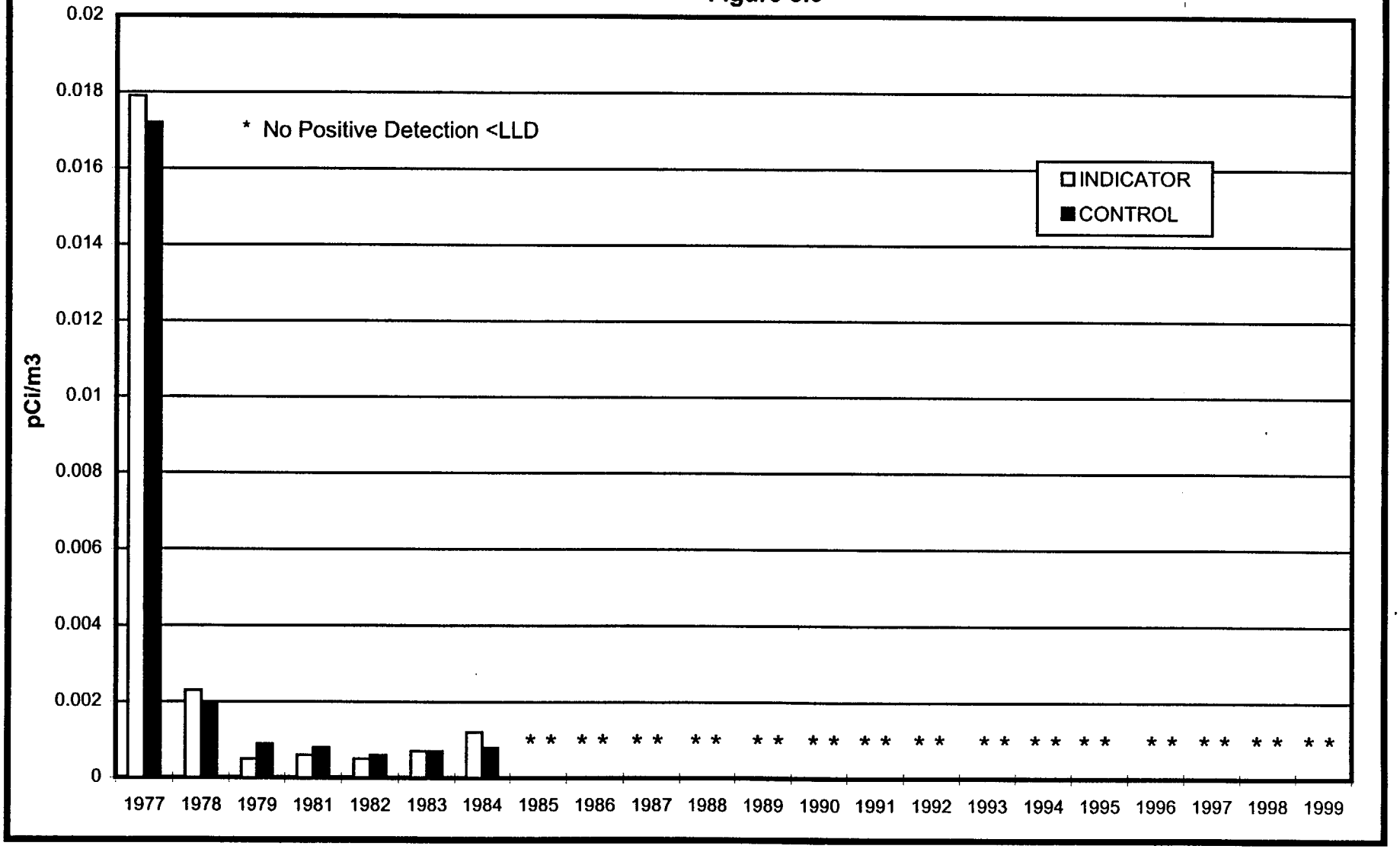
Figure 8.5



JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER COMPOSITE Co-60

Figure 8.6



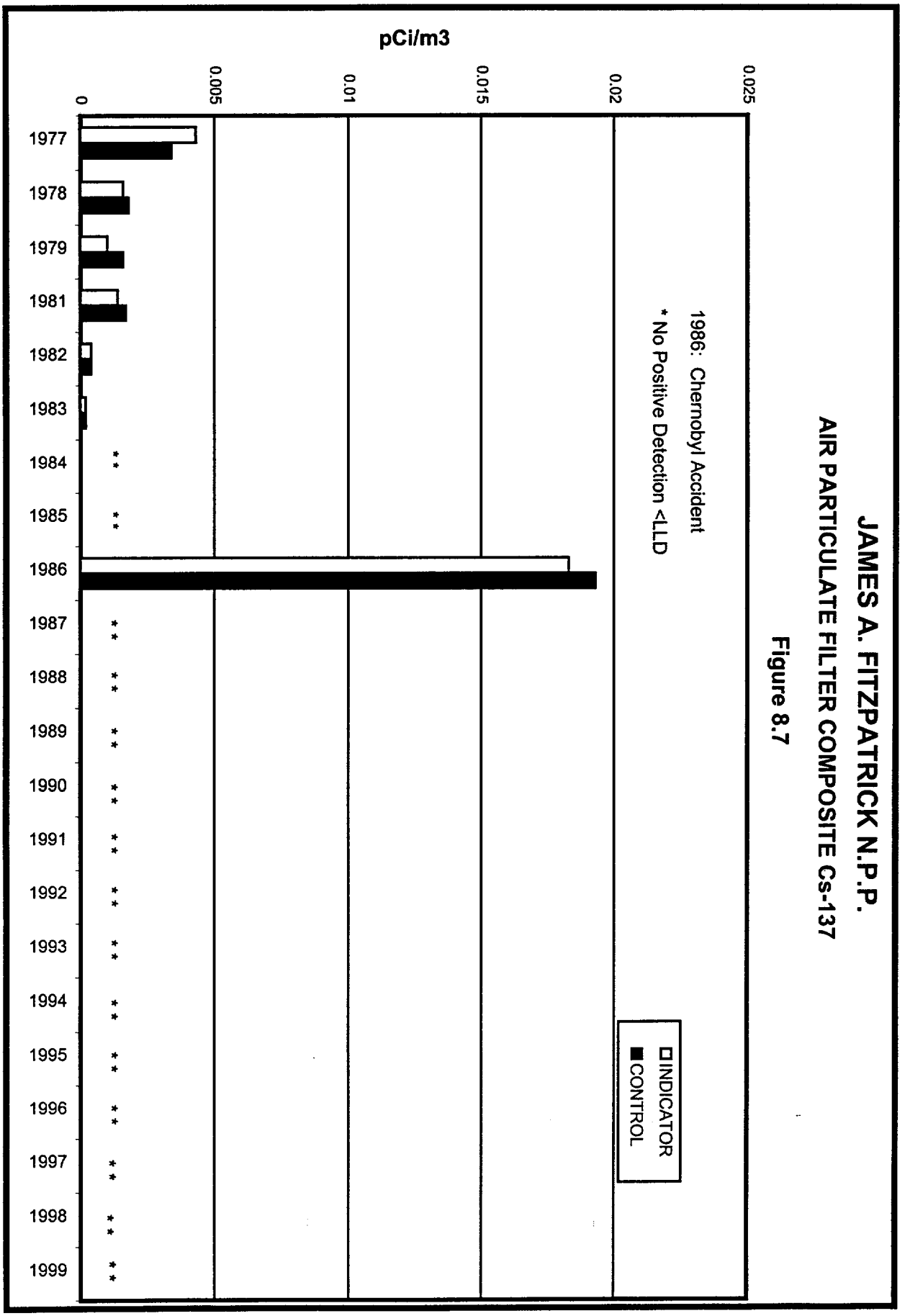
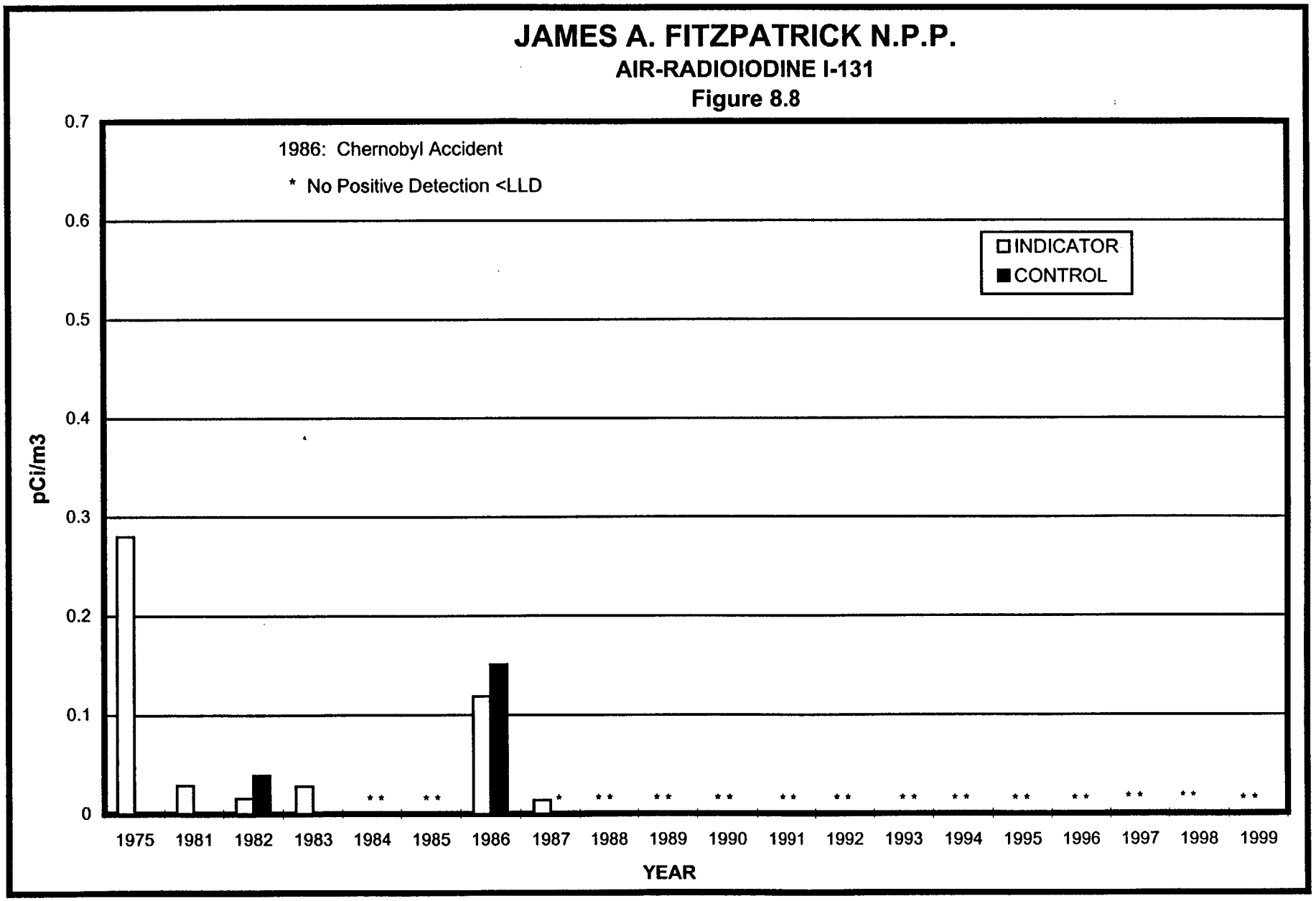

JAMES A. FITZPATRICK N.P.P.
AIR PARTICULATE FILTER COMPOSITE Cs-137
pCi/m3
0
0.005
0.01
0.015
0.02
0.025
1977
1978
1979
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
INDICATOR
CONTROL
1986: Chernobyl Accident
* No Positive Detection <LLD

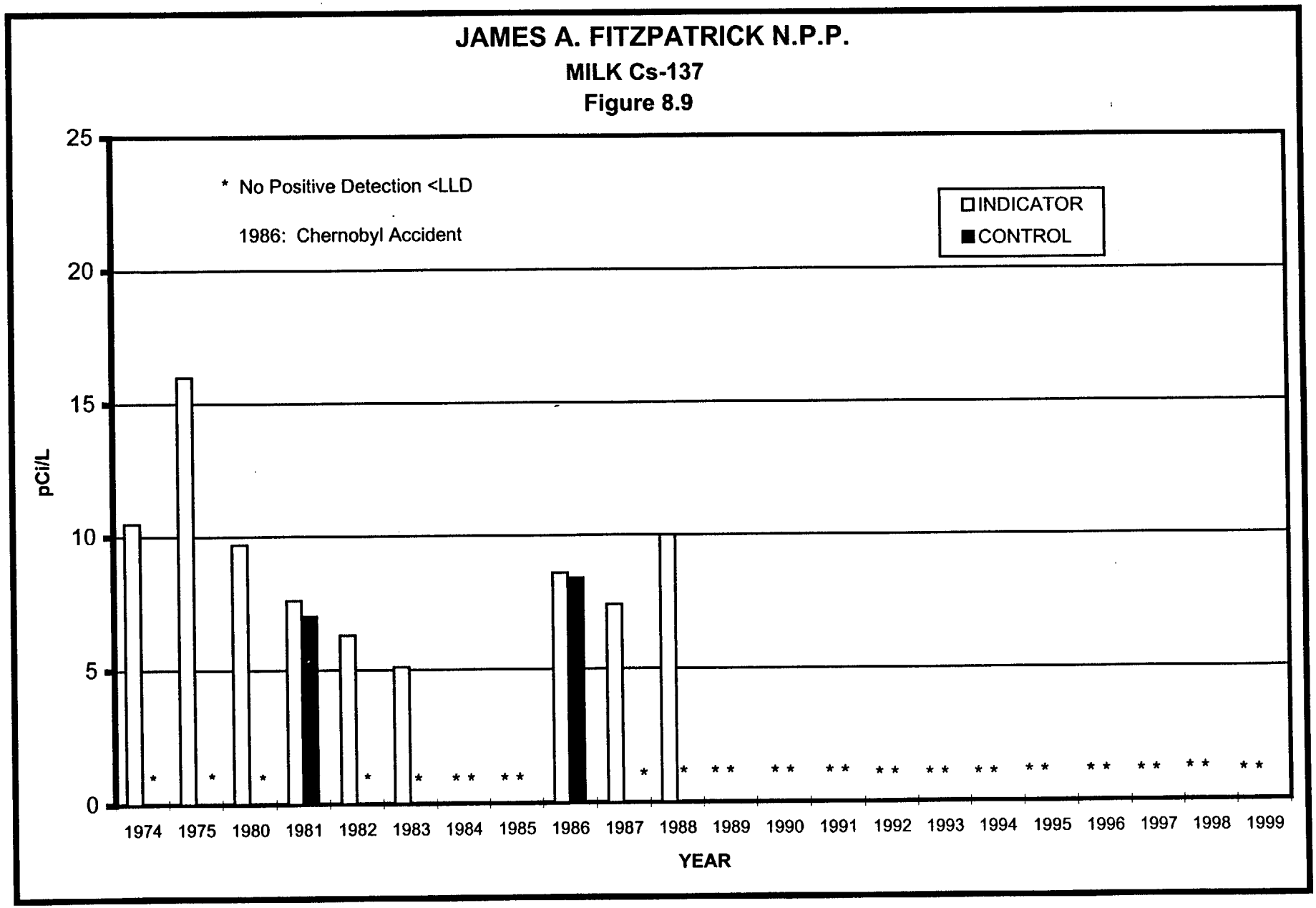
Figure 8.7

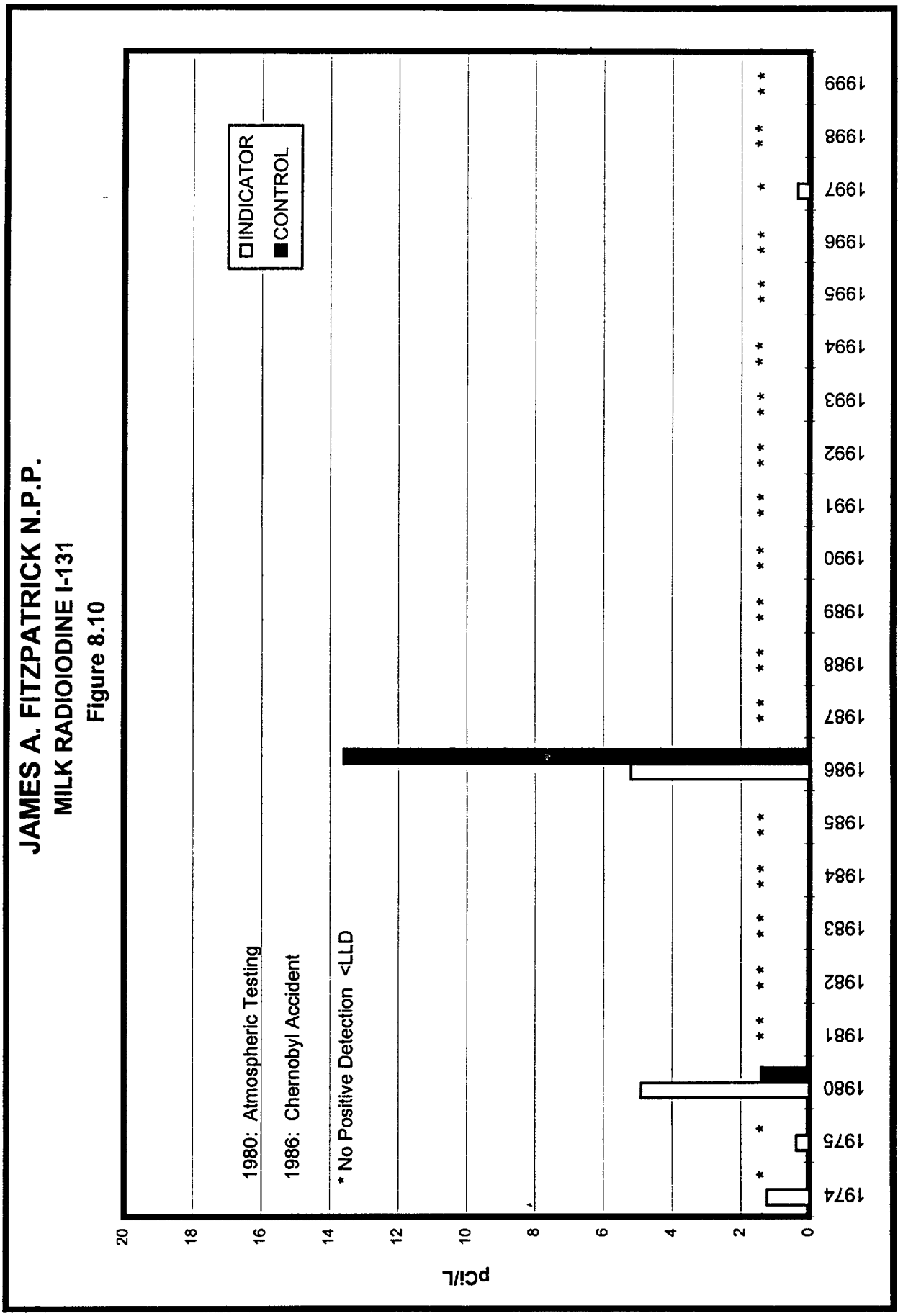
JAMES A. FITZPATRICK N.P.P.

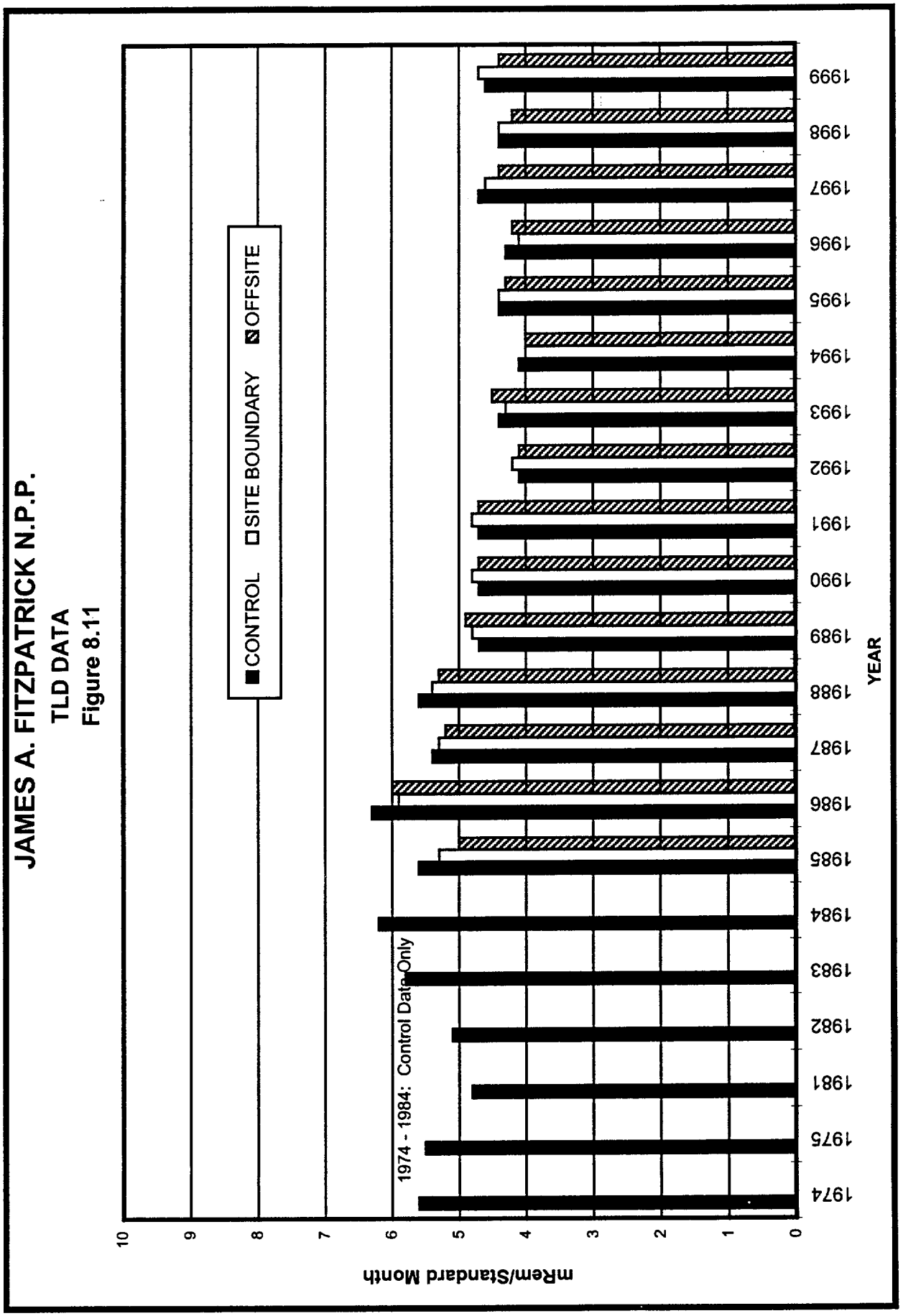
AIR-RADIOIODINE I-131

Figure 8.8




JAMES A. FITZPATRICK N.P.P.
MILK Cs-137
Figure 8.9
* No Positive Detection <LLD
1986: Chernobyl Accident
INDICATOR
CONTROL
pCi/L
25
20
15
10
5
0
1974 1975 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999
YEAR


JAMES A. FITZPATRICK N.P.P.
MILK RADIOIODINE I-131
Figure 8.10
INDICATOR
CONTROL
1980: Atmospheric Testing
1986: Chernobyl Accident
* No Positive Detection <LLD
pCi/L
0
2
4
6
8
10
12
14
16
18
20
1974
1975
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999


JAMES A. FITZPATRICK N.P.P.
TLD DATA
Figure 8.11
CONTROL
SITE BOUNDARY
OFFSITE
1974 - 1984: Control Data Only
mRem/Standard Month
YEAR
0
1
2
3
4
5
6
7
8
9
10
1974
1975
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999

9.0 QA/QC PROGRAM

9.1 PROGRAM DESCRIPTION

Section 6.3 of the Radiological Effluent Technical Specification (RETS) requires that each licensee participate in an Interlaboratory Comparison Program. The Interlaboratory Comparison Program shall include sample media for which samples are routinely collected and for which cross-check samples are commercially available. Participation in an Interlaboratory Comparison Program ensures that independent checks on the precision and accuracy of the measurement of radioactive material in the environmental samples are performed as part of the Quality Assurance Program for environmental monitoring. To fulfill the Technical Specification requirement for an Interlaboratory Comparison Program, the JAF Environmental Laboratory has engaged the services of two independent laboratories to provide quality assurance cross-check samples. The two laboratories are Analytics, Incorporated in Atlanta, Georgia and the U.S. Department of Energy's Environmental Measurement Laboratory (EML) in New York City.

Analytics supplies requested sample media as blind sample spikes, which contain known levels of radioactivity. These samples are prepared and analyzed using standard laboratory procedures. The results are submitted to Analytics which issues a statistical summary report. The JAFNPP Environmental Laboratory uses predetermined acceptance criteria methodology for evaluating the laboratory's performance for Analytics' sample results.

In addition to the Analytics Program, the JAF Environmental Laboratory participated in the Environmental Measurements Laboratory (EML) Quality Assessment Program (QAP). EML supplies sample media as blind sample spikes to approximately 127 laboratories worldwide. These samples containing known amounts of low level activity are analyzed using standard laboratory procedures. The results are submitted to the Environmental Measurements Laboratory for statistical evaluation. Reports are provided to each participating laboratory, which provide an evaluation of the laboratory's performance.

Teledyne Brown Engineering Laboratory performs the routine tritium analysis for the JAF Environmental Laboratory. To provide a quality assurance check on the Teledyne Lab, tritium samples from Analytics and EML are provided by the JAF laboratory to Teledyne for analysis.

9.2 PROGRAM SCHEDULE

SAMPLE MEDIA	LABORATORY ANALYSIS	SAMPLE PROVIDER ANALYTICS	EML	YEARLY TOTAL
Water	Gross Beta	0	2	2
Water	Tritium	1	2	3
Water	I-131	2	0	2
Water	Mixed Gamma	2	2	4
Air	Gross Beta	2	2	4
Air	I-131	2	0	2
Air	Mixed Gamma	2	2	4
Milk	I-131	2	0	2
Milk	Mixed Gamma	2	0	2
Soil	Mixed Gamma	1	0	1
Vegetation	Mixed Gamma	1	0	1
TOTAL SAMPLE INVENTORY		17	10	27

9.3 ACCEPTANCE CRITERIA

Each sample result is evaluated to determine the accuracy and precision of the laboratory's analysis result. The evaluation method for the QA sample results is dependent on the supplier of the cross-check sample. The sample evaluation methods are discussed below.

9.3.1 ANALYTICS SAMPLE RESULTS

Samples provided by Analytics are evaluated using what is specified as the NRC method. This method is based on the calculation of the ratio of results reported by the participating laboratory (QC result) to the Vendor Laboratory Known Value (reference result).

An Environmental Laboratory analytical result is evaluated using the following calculation:

The value for the error resolution is calculated.

$$\text{The error resolution} = \frac{\text{Reference Result}}{\text{Reference Error}}$$

Using the appropriate row under the Error Resolution column in Table 9.3.1 below, a corresponding Ratio of Agreement interval is given.

The value for the ratio is then calculated.

$$\text{Ratio} = \frac{\text{QC Result}}{\text{Reference Result}}$$

If the value falls within the agreement interval, the result is acceptable.

TABLE 9.3.1

ERROR RESOLUTION	RATIO OF AGREEMENT
<3	0.4-2.5
3.1 to 7.5	0.5-2.0
7.6 to 15.5	0.6-1.66
15.6 to 50.5	0.75-1.33
50.6 to 200	0.8-1.25
>200	0.85-1.18

Again, this acceptance test is generally referred to as the "NRC" method. The acceptance criteria is contained in Procedure DVP-04.01 and was taken from the Criteria of Comparing Analytical Results (USNRC) and Bevington, P.R., Data Reduction and Error Analysis for the Physical Sciences, McGraw-Hill, New York, (1969). The NRC method generally results in an acceptance range of approximately ± 25% of the Known Value when applied to sample results from the Analytics Inc. Interlaboratory Comparison Program. This method is used as the procedurally required assessment method and requires the generation of a nonconformity report when results are unacceptable.

9.3.2 ENVIRONMENTAL MEASUREMENTS LABORATORY (QAP)

The laboratory's analytical performance is evaluated by EML based on the historical analytical capabilities for individual analyte/matrix pairs. The statistical criteria for Acceptable Performance, "A", has been chosen by EML to be between the 15th and 85th percentile of the cumulative normalized distribution, which can be viewed as the middle 70% of all historic measurements. The Acceptable With Warning criteria, "W", is between the 5th

and 15th percentile and between the 85th and 95th percentile. In other words, the middle 70% of all reported values are acceptable, while the other 5th-15th (10%) and 85th-95th percentiles (10%) are in the warning area. The Not Acceptable criteria, "N", is established at less than the 5th percentile and greater than the 95th percentile, that is, the outer 10% of the historical data. Using five years worth of historical analytical data, the EML, determined performance results using the percentile criteria summarized below:

Result	Cumulative Normalized Distribution
Acceptable ("A")	15% - 85%
Acceptable with Warning ("W")	5% - 15% or 85% - 95%
Not Acceptable ("N")	<5% or >95%

9.4 PROGRAM RESULTS SUMMARY

The Interlaboratory Cross-Check Program numerical results are provided on Table 9-1.

9.4.1 ANALYTICS QA SAMPLES RESULTS

Seventeen QA blind spike samples were analyzed as part of Analytics' 1999 Interlaboratory Comparison Program. The following sample media were evaluated as part of the Cross-Check Program.

- Air Charcoal Cartridge, I-131
- Air Particulate Filter, Mixed Gamma Emitters/Gross Beta
- Water, I-131/Mixed Gamma Emitters/Tritium
- Soil, Mixed Gamma Emitters
- Milk, I-131 Mixed Gamma Emitters
- Vegetation, Mixed Gamma Emitters

The JAF Environmental Laboratory performed 67 individual analysis on the seventeen QA samples. Of the 67 analysis performed, 64 were in agreement using the NRC acceptance criteria for a 95.5% agreement ratio. These percentage values were calculated using the re-analysis results for Analytics Sample E-1671-05.

Sample non-agreements are discussed in Section 9.4.2 below.

9.4.2 ANALYTICS SAMPLE NONCONFORMITIES

9.4.2.1 Analytics Sample E-1907-05 Nonconformity No. 99-02, Cr-51 in Water

A mixed gamma water sample was received from Analytics and prepared for counting in accordance with laboratory procedures. The sample contained a total of eight radioisotopes for analysis. Eight of the eight isotopes present were quantified with seven of the isotopes quantified with acceptable results. The results for Cr-51 were determined to be outside the acceptable range.

The Lab reported Cr-51 results of 138±22 pCi/l, 144±28 pCi/l and 137±21 pCi/l for a mean of 139.7±13.8 pCi/l. The Analytics or reference value was 184±3 pCi/l. The peak search results were examined with no recurring abnormalities identified. Cr-51 decays by electron capture with 27.7 day half-life and a gamma ray energy and yield of 320 KeV and 9.8% respectively. No other gamma energies are produced. This low gamma yield will result in low net counts for samples containing environmental levels of Cr-51. The average net count rate for the three analyses was approximately 1 count per minute.

The Cr-51 results for other Quality Assurance samples analyzed as part of the 1999 program were all acceptable and are summarized below:

		1999 Cr-51 Results		
Sample ID	Medium	JAF	Reference Lab	Ratio
E-1670-05	WATER	380±13.5	398±6.7	0.95
E-1909-05	MILK	125±17	149±2	0.84
E-1908-05	FILTER	80±10	86±1	0.93
E-1768-05	MILK	216±19	215±4	1.00

A review of historical QA data for 1998 was performed to determine if this is a recurring systematic error or bias. In 1998 six QA samples were analyzed which contained Cr-51. The mean ratio for these samples relative to the Known (reference) Value is 0.955. There was one Cr-51 disagreement in the 1998 Crosscheck Program. The current and historical data demonstrate that there is no systematic error or significant bias for the analysis of Cr-51 in environmental samples.

The 1999 QA sample contained a relatively low concentration of Cr-51 relative to the other QA samples analyzed. The lower concentration and resulting low count rate may have contributed to the inaccuracy in the measured results. This nonconformity does not represent a systematic error or programmatic deficiency in the laboratory analysis program. No corrective actions were implemented as a result of this nonconformity.

9.4.2.2 Analytics Sample E-1671-05
Nonconformity No. 99-01, Air Particulate Filter Gamma Emitters

A QA sample consisting of a single air particulate filter (APF) was received from Analytics, Inc. This sample was part of the scheduled Intercomparison Crosscheck Program. The filter is used to verify the four filters APF geometry, which is routinely used to analyze the monthly air particulate filter composite samples. In preparation for analysis, the filter is placed flat into a petri dish which is the normal air particulate filter counting geometry. Three additional blank filters were added to make a composite sample which is representative of the routine APF composite configuration. The evaluation of the results reported by the laboratory determined that seven of the eight radionuclides included in the sample were not in agreement with the reference value. The ensuing investigation showed that the configuration of the filters had shifted within the petri dish during the counting process. The three blank composite filters were flat on the counting face of the petri dish but the active filter was stuck to the top of the petri dish cover. The location of the filter resulted in the active filter being away from the detector face. The slight change in geometry for the active filter caused the calculated activity to be proportionally low for all the radionuclides in the sample. When samples are counted on the detector end cap, small changes in the sample to detector distance can have measurable impact on the accuracy of the quantitative results.

As an immediate corrective action, the sample was taken apart and the filter composite was reassembled. The active filter was placed in the number two of four position in the composite stack. The composite was recounted in the new configuration. The sample results for the re-analysis were in agreement with the exception of Cr-51 and Fe-59, which had decayed off to a concentration that was below the detection limit. The short term corrective action is complete and was reported on the Interlaboratory Intercomparison Program Results Table under sample ID E-1671-05.

The long term corrective action is to configure future composite filters using sufficient filters to fill the petri dish. This action will ensure that the active filter will not shift within the petri dish and become miss-aligned with the detector face.

The nonconformity resulting from this QA sample does not represent a systematic error or programmatic deficiency in the laboratory analysis program.

9.4.2.3 Analytics Sample E-1908-05
Nonconformity No. 99-03, Air Particulate Filter Gamma Emitters

The QA analysis of sample E-1908, which contained eight radionuclides, resulted in seven agreements and one disagreement. The Fe-59 results had a calculated ratio of 1.32, which places the results outside the acceptable limit. The nonconformity for the Fe-59 was the result of geometry differences between the QA filter and the calibration standard. The sample ratio of 1.32 demonstrates that the Fe-59 sample results are biased high. The Fe-59 was the single outlier of the radionuclide inventory in the sample. The results for the other seven radionuclides in the sample were in agreement with the reference values. An evaluation of collective ratio values for all the radionuclides showed that all the results, with the exception of Cs-134, were on the positive side of the ratio calculation with a mean ratio of 1.15. Cs-134 results have a known negative bias of approximately 8% which would explain why the Cs-134 result did not demonstrate a positive bias shown by the other results. An investigation into the cause for the positive bias revealed that the placement of the active filter in the 16 filter composite stack in the No. 4 of 16 location placed the filter a slight distance closer to the detector than would be representative of a homogeneous 16 filter stack. The placement of the active filter in the No. 4 location introduced a positive bias into the sample results. Counting geometries which are surface loaded and are counted on the detector end cap are very sensitive to slight changes in distance relative to the detector face. The sample was reanalyzed using the four filter stack geometry. This reanalysis resulted in a mean ratio of 1.02, which

is very good accuracy. When the sample was analyzed using the four filter geometry the ratio for Fe-59 was 1.19 which is within the acceptable band.

Both sixteen filter and four filter geometries are used at the lab for routine analysis of air particulate filter composites. Using a single filter QA sample to demonstrate performance of multi-filter geometries produces inherent biases in the process that can not be removed. The out of bounds results for Fe-59 measurement in this sample does not represent a systematic or process bias in the laboratory procedure. Routine sample analysis is performed using calibration standards that are constructed such that they duplicate the sample configuration exactly. The laboratory maintains specific calibration standards for the single filter, four filter and the sixteen filter composite geometry (configuration). The bias experienced in this sample is the result of differences in calibration and the QA sample counting geometries not procedure or program deficiencies. A corrective action in response to this nonconformity will require that future QA air particulate filter samples will be constructed and analyzed in a manner that will minimize the effects of analyzing a single filter to demonstrate the precision and accuracy of multi-filter geometries.

9.4.2.4 Analytics Sample E-1911-05 Nonconformity No. 99-04, Vegetation Gamma Emitters

The Analytics vegetation QA sample E-1911-05 contained six gamma emitting radionuclides. The analytical results for the sample produced measurements that were in agreement with the reference value for five of the six radionuclides present. The Zn-65 result was low relative to the reference value of 181±3 and had a calculated ratio of 0.73. The resulting ratio value of 0.73 is outside the acceptance band. A review of the data set showed that one of three analysis results was an outlier. The three measured values were in pCi/kg 144±29, 96±29 and 155±31 with a mean of 132±17. The measured value of 96 pCi/kg is considered an outlier for the data set. A review of the spectral data showed that the peak was properly shaped and positioned in the

spectrum and was correctly identified. The analysis of this sample was a two hour count and resulted in a total of 38 net counts or a count rate of 0.3 counts per minute. This low count rate resulted in Zn-65 peak that was close to background. The background count rate in this area of the spectrum was approximately 0.4 counts per minute. The physical properties of the sample also introduced a small negative bias into the sample results. The bias was the result of the relative differences in density between the sample and the calibration standard of 4.3 to 1.0. The higher density of the sample biased the sample results low. When the outlier value in the Zn-65 sample result set is removed (96±29 pCi/kg) the calculated mean for the remaining two results are 149.5 which calculates a ratio of 0.82, within the acceptable range.

In summary, the reason for the Zn-65 nonconformity was low concentration of Zn-65 in the sample resulting in a low count rate relative to the background. The computer analysis of the peak shape resulted in a conservative estimate of the total number of counts in the Zn-65 photo peak. The differences in densities between sample and calibration standard also added a small negative bias to the calculated sample result.

To determine if this nonconformity represents an inherent or systematic error in the routine analysis process, a review was made of other spiked samples analyzed as part of the 1999 Interlaboratory Intercomparison Program. In addition to the vegetation sample, Zn-65 was present in seven other spiked sample analyzed in 1999 representing four different sample media. Each of these seven samples were in agreement with the reference sample and as a group had an agreement ratio of 1.00 for Zn-65. The ratio of 1.00 is an excellent indicator that the routine measurement of Zn-65 in environmental media is accurate and produces collective results around unity. These collective results demonstrate that there is no systematic error for analysis of Zn-65. A corrective action in response to this nonconformity will result in a vegetation sample matrix which has a density which is more representative of the calibration standard that is used for vegetation analysis.

9.4.3 ENVIRONMENTAL MEASUREMENTS LABORATORY (EML)

In 1999, the JAF Environmental Laboratory participated in both the EML Quality Assessment Programs, QAP-50 and QAP-51. Sample sets consisted of the following sample media:

- Water - Gross Beta/Mixed Gamma Emitters
- Water - Tritium
- Air Particulate Filter - Mixed Gamma Emitters/Gross Beta

A total of 19 radionuclides were evaluated for the ten samples included in QAP-50 and QAP-51. Using the EML acceptance criteria, 18 of 19 radionuclide analyses (94.7%) were evaluated to be acceptable or acceptable with warning. One of 19 sample result was not acceptable (5.3%).

A summary of the JAF Environmental Laboratory results is as follows:

Matrix	Total Analyses	Acceptable*	Not Acceptable
Air	11	11	0
Water	8	7	1
Total Evaluation	19	18	1
Percentage		94.7%	5.3%

* Acceptable and Acceptable with Warning

9.4.3.1 EML Nonconformities

There were no JAFEL nonconformities in the 1999 program. All sample results were in agreement. One nonconformity for tritium in water was the result of a contractor analysis. See Section 9.4.4.

9.4.4 TELEDYNE BROWN ENGINEERING QA SAMPLES

Teledyne Brown Engineering Northeast (TBE) performs the analysis of tritium in water samples for the JAFEL. During 1999, TBE participated in an interlaboratory cross-check program with EML and Analytics, Inc. The JAFEL provides QA samples directly to TBE as a part of the interlaboratory cross-check program. These samples are obtained as part of the Analytics/JAFEL Program and the EML/JAFEL Program. Three tritium samples were provided to TBE for the 1999 program and the results are listed on Table 9-1. The sample ID's are; E-1669-05, QAP-50 Water/Tritium, and QAP-51 Water/Tritium. One tritium analysis performed by Teledyne resulted in a nonconformity.

9.4.4.1 Teledyne Nonconformity

Nonconformity No. 99-05, Tritium in Water

The QAP-51, Tritium result provided by TBE was evaluated as not acceptable. The sample ratio was 1.93 which is an indication of a sample preparation or counting instrument problem. Teledyne reported that acceptable results were obtained for their internal EML/QAP-51 Tritium sample analysis. Teledyne also obtained acceptable results for their internal analysis of the QAP-50 tritium blind spike which was performed in June of 1998. Calibration checks for the fourth quarter 1999 were reviewed by Teledyne and found to be acceptable. A review of the in-house spike results for the fourth quarter 1999 showed that all sample results were in the acceptable range. An investigation by TBE concluded that the tritium analysis process was in control during this period. The unacceptable results for JAFEL sample was determined to have been caused by the use of a small sample volume of 1.0 ml and a relatively short sample count time of 100 minutes. The sample was subsequently recounted using a sample volume of 100 ml and a count time of 200 minutes. The recount result was 78 Bq/l which is within the acceptable range with a calculated ratio of 0.98. In the case of the initial sample analysis, Teledyne did not follow the standard laboratory procedure steps for tritium analysis.

The failure to distill samples prior to tritium analysis was sited by Teledyne as the reason for missing a JAFEL tritium sample in 1998 as part of the QAP-49 sample set. This current sample nonconformity implies that Teledyne has not effectively implemented corrective actions promulgated in 1998 in response to the nonconformity. The JAFEL is currently evaluating alternate laboratories and processes for future tritium analysis.

9.5 REFERENCES

9.5.1 Semi-Annual Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program, EML 604, June 1999.

9.5.2 Semi-Annual Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program, EML 605, December 1999.

TABLE 9-1

INTERLABORATORY INTERCOMPARISON PROGRAM

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

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
06/24/99	E-1767-05	AIR	Gross Beta	41.7±1.6 42.7±1.6 45.1±1.6 Mean = 43.2±0.9	50±1	0.88, A
12/09/99	E-2012-05	AIR	Gross Beta	66.0±2.0 66.1±2.0 63.8±1.9 Mean = 65.3±1.1	69±1	0.94, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Samples provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Tritium Analysis of Water (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/18/99	E-1669-05	WATER	H-3	2500±200	2698±45	0.93, A

(1) Results reported as activity ± 1 sigma. Sample Analyzed by Teledyne Brown Eng.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Samples provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Iodine Analysis of Water, Air and Milk

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/18/99	E-1670-05	WATER pCi/liter	I-131**	89.3±2.0 101.0±6.0 78.7±2.2 Mean = 89.7±2.2	91.0±1.7	0.99, A
06/24/99	E-1770-05	AIR pCi/cc	I-131	81.4±17.6 55.2±15.3 58.5±15.7 Mean = 65.0±9.4	77±1.3	0.84, A
06/24/99	E-1768-05	MILK pCi/liter	I-131**	74.9±3.0 62.3±3.3 51.5±5.6 Mean = 62.9±2.4	72±1.3	0.88, A
09/23/99	E-1909-05	MILK pCi/liter	I-131**	84.1±7.6 71.4±10.8 70.5±10.9 Mean = 75.3±5.7	91±1.7	0.82, A
09/23/99	E-1910-05	AIR pCi/cc	I-131	73.4±7.7 71.5±7.4 60.4±7.7 Mean = 68.4±4.4	62±1	1.10, A
09/23/99	E-1907-05	WATER pCi/liter	I-131**	64.8±6.7 60.4±6.4 72.3±7.0 Mean = 65.8±3.9	77±1.2	0.86, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Samples provided by Analytics, Inc.

(**) Result determined by Resin Extraction/Gamma Spectral Analysis.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis Water (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/18/99	E-1670-05	WATER	Ce-141	167±5 178±5 173±5 Mean = 173±2.9	177±3	0.98, A
			Cr-51	405±26 369±21 366±23 Mean = 380±13.5	398±6.7	0.95, A
			Cs-134	107±4 103±2 102±2 Mean = 104±1.3	114±2	0.91, A
			Cs-137	221±5 229±5 220±4 Mean = 223±2.7	240±4	0.93, A
			Mn-54	159±5 153±4 150±4 Mean = 154±2.5	152±2.7	1.01, A
			Fe-59	71.5±6.3 82.6±5.8 79.3±6.2 Mean = 77.8±3.5	79±1.3	0.99, A
			Zn-65	175±8 205±8 190±7 Mean = 190±4.4	195±3.3	0.97, A
			Co-60	186±4 179±3 174±3 Mean = 180±1.9	181±3	0.99, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Sample provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis Water (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
09/23/99	E-1907-05	WATER	Ce-141	229±8 233±8 238±7 Mean = 233±4.4	244±4	0.95, A
			Cr-51	138±22 144±28 137±21 Mean=139.7±13.8	184±3	0.76 , D
			Cs-134	102±3 96.7±3.3 99.5±2.7 Mean = 99.4±1.7	119±2	0.83, A
			Cs-137	238±7 248±7 265±5.4 Mean = 250±3.8	268±4.3	0.93, A
			Mn-54	208±7 217±7 228±5 Mean = 217.7±3.7	210±3.7	1.04, A
			Fe-59	97.4±8.6 105±8 95.3±6.3 Mean = 99.2±5.1	94±1.7	1.05, A
			Zn-65	214±11 202±11 205±8 Mean = 207±5.8	202±3.3	1.02, A
			Co-60	159±5 155±5 160±4 Mean = 158±2.7	159±2.7	0.99, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Sample provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

(D) Evaluation Results, Disagreement.

TABLE 9-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filters (pCi/filter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/18/99	E-1671-05	FILTER	Ce-141	78.5±5.6 78.7±7.1 85.8±4.7 Mean = 81.0±3.4 Mean = 102±30.1 †	108±1.7	0.75, D 0.94, A †
			Cs-134	46.1±3.5 46.6±4.8 37.9±3.5 Mean = 43.5±2.3 Mean = 62.2±3.4 †	69±1	0.64, D 0.90, A †
			Cs-137	110±7 82.3±7.9 109±5.4 Mean = 100±4 Mean = 155±6.4 †	146±2.3	0.68, D 1.06, A †
			Mn-54	76.1±6.2 70.8±8.0 75.0±5.0 Mean = 74.0±3.8 Mean = 94.0±6.5 †	93±1.7	0.80, D 1.01, A †
			Fe-59	28.5±8.0 37.5±11.6 29.5±8.0 Mean = 31.8±5.4 Mean = <171 †	48±0.7	0.67, D N/A †
			Zn-65	96.7±12.3 94.7±15.2 98.3±9.7 Mean = 96.6±7.3 Mean = 123±12.7 †	119±2	0.82, A 1.03, A †
			Co-60	72.9±5.1 83.3±7.0 81.8±4.4 Mean = 79.3±3.2 Mean = 115±5.3 †	110±2	0.72, D 1.05, A †
			Cr-51	96.0±26.8 151±40.2 183±25 Mean = 143.3±18.1 Mean = <1430 †	242±4	0.59, D N/A †

(1) Results reported as activity ± 1 sigma.
(2) Ratio = Reported/Analytics (See Section 9.3).
(*) Sample provided by Analytics, Inc.
(D) Evaluation Results, Disagreement.
(A) Evaluation Results, Acceptable.
(†) Recount Analysis, See Section 9.4.2.2.

TABLE 9-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filters (pCi/filter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
09/23/99	E-1908-05	FILTER	Ce-141	126±5 129±5 128±5 Mean = 127.7±2.9 Mean = 116±3 †	114±2	1.12, A 1.02, A †
			Cr-51	105±21 79.2±19.3 92.9±19 Mean = 92.4±11.4 Mean = 80.1±9.9 †	86±1.3	1.07, A 0.93, A †
			Cs-134	48.3±2.6 45.7±2.6 48.8±3.4 Mean = 47.6±1.7 Mean = 41.6±1.5 †	56±1	0.86, A 0.74, D †
			Cs-137	149±6 146±5 150±6 Mean = 148.3±3.3 Mean = 131±3 †	125±2	1.18, A 1.05, A †
			Mn-54	116±5 129±6 117±5 Mean = 120.7±3.1 Mean = 108±3 †	98±1.7	1.23, A 1.10, A †
			Fe-59	57.4±7.4 62.9±7.3 54.6±7.3 Mean = 58.3±4.2 Mean = 52.5±3.8 †	44±0.7	1.32, D 1.19, A †
			Zn-65	111±9 109±9 129±9 Mean = 116.3±5.2 Mean = 105±5 †	94±1.7	1.23, A 1.12, A †
			Co-60	77.7±3.6 81.4±3.6 78.9±3.6 Mean = 79.3±2.1 Mean = 71.9±2.0 †	74±1.3	1.07, A 0.97, A †

(1) Results reported as activity ± 1 sigma.
(2) Ratio = Reported/Analytics (See Section 9.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.
(D) Evaluation Results, Disagreement.
(†) Recount Analysis, See Section 9.4.2.3.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis of Milk (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
06/24/99	E-1768-05	MILK	Ce-141	158±7 158±8 178±7 Mean = 165±4	168±2.7	0.98, A
			Cr-51	200±27 228±37 219±35 Mean = 216±19	215±3.7	1.00, A
			Cs-134	105±4 97.9±5.9 96.9±5.0 Mean = 99.9±2.9	115±2.0	0.87, A
			Cs-137	178±7 178±8 170±7 Mean = 175±4	188±3.0	0.93, A
			Mn-54	86.6±5.4 71±6 86.3±5.4 Mean = 81.3±3.2	85±1.3	0.96, A
			Fe-59	40±9 49.3±9.5 50.2±9.7 Mean = 46.5±5.4	48±0.7	0.97, A
			Zn-65	119±11 103±11 110±12 Mean = 111±7	122±2.0	0.91, A
			Co-60	212±6 228±7 217±6 Mean = 219±4	214±3.7	1.02, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Sample provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis of Milk (pCi/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
09/23/99	E-1909-05	MILK	Ce-141	189±6 185±8 198±8 Mean = 190.7±4.3	197±3.3	0.97, A
			Cr-51	144±25 118±31 112±30 Mean = 124.7±16.6	149±2.3	0.84, A
			Cs-134	81.9±2.5 83.2±4.0 78.8±3.0 Mean = 81.3±1.9	96±1.7	0.84, A
			Cs-137	202±5 190±6 201±6 Mean = 197.7±3.3	217±3.7	0.91, A
			Mn-54	171±6.1 158±6 172±6 Mean = 167±3.3	170±3	0.98, A
			Fe-59	77.4±6.1 76.0±8.7 63.1±8 Mean = 72.2±4.4	76±1.3	0.95, A
			Zn-65	168±8 154±10 150±10 Mean = 157.3±5.4	164±2.7	0.96, A
			Co-60	131±3 129±4 131±4 Mean = 130.3±2.1	129±2	1.01, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Sample provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis of Soil (pCi/g)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
06/24/99	E-1769-05	SOIL	Ce-141	0.291±0.056 0.215±0.042 0.272±0.044 Mean=0.259±0.028	0.269±0.004	0.96, A
			Cs-134	0.155±0.015 0.150±0.011 0.158±0.014 Mean=0.154±0.008	0.184±0.003	0.84, A
			Cs-137	0.379±0.027 0.368±0.020 0.409±0.027 Mean=0.385±0.014	0.429±0.007	0.90, A
			Mn-54	0.134±0.019 0.133±0.015 0.154±0.020 Mean=0.140±0.010	0.136±0.002	1.03, A
			Co-60	0.354±0.022 0.361±0.016 0.352±0.021 Mean = 0.356±0.11	0.343±0.006	1.04, A
			Zn-65	0.183±0.045 0.246±0.031 0.177±0.038 Mean=0.202±0.022	0.196±0.003	1.03, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Sample provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis of Vegetation

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
09/23/99	E-1911-05	VEGETATION	Ce-141	200±15 185±16 196±16 Mean = 193.7±9.0	219±3.7	0.89, A
			Cs-134	89.5±8.1 96.5±8.7 83.1±8.0 Mean = 89.7±4.8	107±1.7	0.84, A
			Cs-137	232±16 265±16 229±16 Mean = 242±9.2	241±4	1.00, A
			Mn-54	198±16 187±16 162±15 Mean = 182.3±9.0	188±3	0.97, A
			Zn-65	144±29 95.5±28.8 155±31.4 Mean = 131.5±17.2	181±3	0.73, D
			Co-60	127±12 143±12 136±12.1 Mean = 135.3±6.9	143±2.3	0.94, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/Analytics (See Section 9.3).

(*) Sample provided by Analytics, Inc.

(A) Evaluation Results, Acceptable.

(D) Evaluation Results, Disagreement.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis of Water

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/01/99	QAP-50	WATER Bq/liter	Cs-137	38.1±1.8 36.5±1.2 35.9±1.7 Mean = 36.8±0.9	39.4±2.4	0.93, A
			Co-60	53.7±1.8 52.2±1.2 51.8±1.8 Mean = 52.6±0.9	51.1±3.0	1.03, A
09/01/99	QAP-51	WATER Bq/liter	Cs-137	77.3±1.7 75.0±1.8 79.6±1.7 † Mean = 77.3±1.0	76.0±3.4	1.02, A
			Co-60	55.5±1.2 54.7±1.3 55.5±1.2 † Mean = 55.2±0.4	52.4±2.2	1.05, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/EML.

(*) Sample provided by Environmental Measurements Lab, Dept. of Energy.

(A) Evaluation Results, Acceptable.

(†) Revised from initially reported and published values. Initial sample results reported with incorrect volumes for 2 of 3 analysis. Sample volumes were corrected and ratio values recalculated.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gamma Analysis Air Particulate Filters (Bq/filter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/01/99	QAP-50	FILTER	Co-57	2.88±0.08 3.08±0.11 2.96±0.09 Mean = 2.97±0.05	3.01±0.14	0.99, A
			Co-60	5.00±0.16 5.07±0.23 4.77±0.15 Mean = 4.95±0.11	4.96±0.28	1.00, A
			Sb-125	3.02±0.23 4.37±0.38 3.34±0.24 Mean = 3.58±0.17	3.59±0.31	1.00, A
			Cs-137	5.70±0.19 6.11±0.28 6.07±0.15 Mean = 5.96±0.12	6.05±0.3	0.99, A
09/01/99	QAP-51	FILTER	Mn-54	9.18±0.28 8.81±0.28 8.92±0.28 Mean = 8.97±0.13	7.91±0.45	1.13, A
			Co-60	6.96±0.21 6.62±0.20 6.66±0.20 Mean = 6.75±0.12	6.35±0.41	1.06, A
			Co-57	8.36±0.14 8.07±0.14 8.07±0.14 Mean = 8.17±0.08	7.73±0.033	1.06, A
			Cs-137	6.92±0.23 6.51±0.22 6.73±0.23 Mean = 6.72±0.13	6.43±0.42	1.05, A
			Ru-106	4.96±1.04 6.81±1.04 6.18±1.05 Mean = 5.98±0.60	5.5±1.76	1.09, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/EML.

(*) Sample provided by Environmental Measurements Lab, Dept. of Energy.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gross Beta Analysis of Water (Bq/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/01/99	QAP-50	WATER	GROSS BETA	1143.7±24.1 1080±24 1175.1±25.5 Mean=1132.9±14.2	1100±40	1.03, A
09/01/99	QAP-51	WATER	GROSS BETA	851.7±21.1 850.3±21.1 840.6±20.7 Mean=847.5±12.1	740.0±40.0	1.15, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/EML.

(*) Sample provided by Environmental Measurements Lab, Dept. of Energy.

(A) Evaluation Results, Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Tritium Analysis of Water (Bq/liter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS†	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/01/99	QAP-50	WATER	H-3	140.6±29.6	121.1±6.8	1.16, A
09/01/99	QAP-51	WATER	H-3	155.4±40.7	80.7±3.7	1.93, N

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/EML.

(*) Sample provided by Environmental Measurements Lab, Dept. of Energy.

(†) Analysis performed by Teledyne Brown Engineering

(A) Evaluation Results, Acceptable.

(N) Evaluation Results, Not Acceptable.

TABLE 9-1 (Continued)

INTERLABORATORY INTERCOMPARISON PROGRAM

Gross Beta Analysis of Air (Bq/filter)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	REFERENCE LABORATORY* (1)	RATIO (2)
03/01/99	QAP-50	AIR	GROSS BETA	1.49±0.06 1.42±0.06 1.58±0.06 Mean = 1.50±0.03	1.56±0.16	0.96, A
09/01/99	QAP-51	AIR	GROSS BETA	2.75±0.08 2.92±0.08 2.78±0.08 Mean = 2.82±0.05	2.66±0.26	1.06, A

(1) Results reported as activity ± 1 sigma.

(2) Ratio = Reported/EML.

(*) Sample provided by Environmental Measurements Lab, Dept. of Energy.

(A) Evaluation Results, Acceptable.