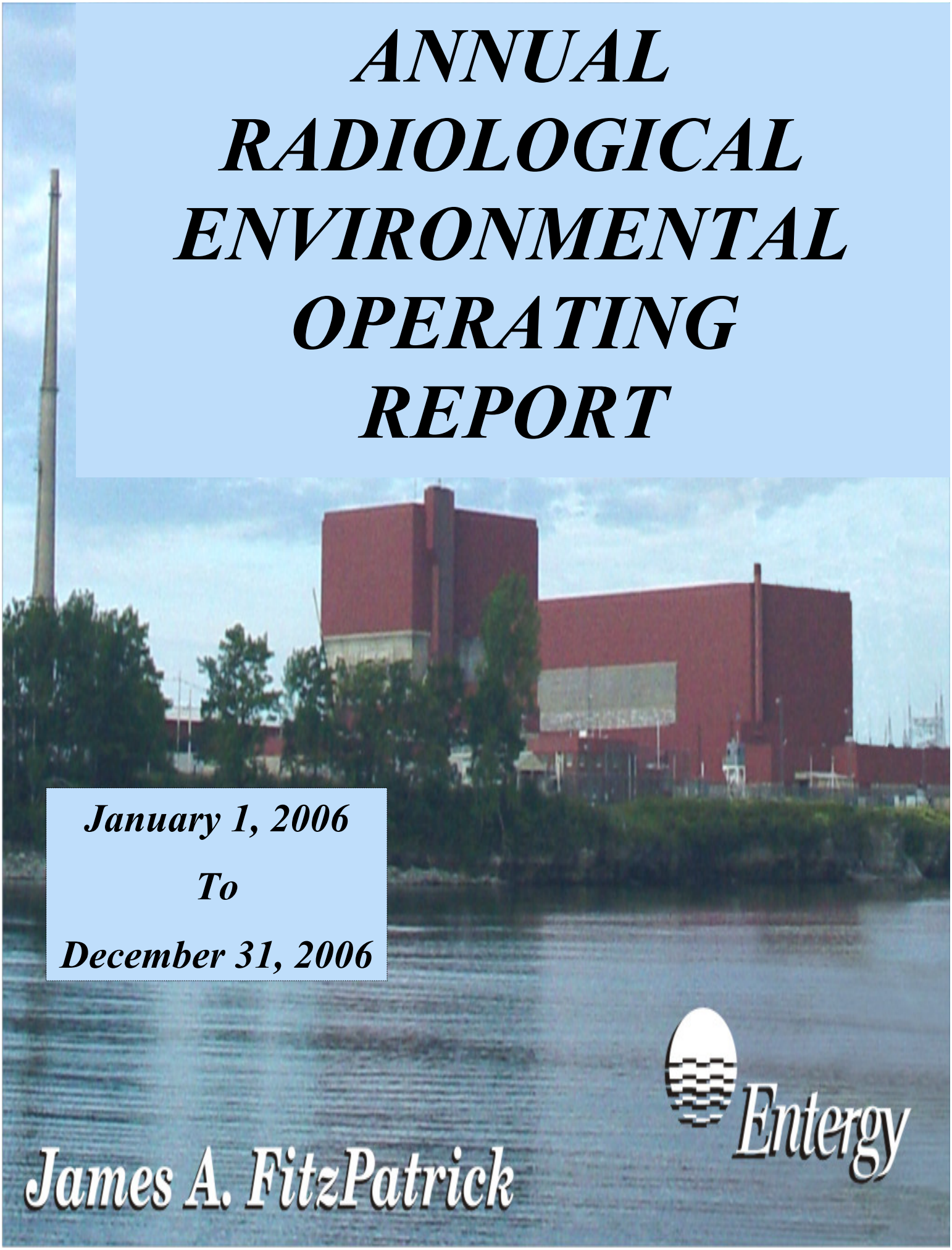
# *ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT*



***January 1, 2006***

***To***

***December 31, 2006***

Entergy

James A. FitzPatrick

# ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

**JANUARY 1, 2006 - DECEMBER 31, 2006**

**FOR**

**JAMES A. FITZPATRICK NUCLEAR POWER PLANT**

**ENTERGY NUCLEAR FITZPATRICK, LLC (ENF)**

**ENTERGY NUCLEAR OPERATIONS, INC (ENO)**

**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 in accordance with the James A. FitzPatrick Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Part I, Section 6.1. The ODCM requires that the results from the annual Radiological Environmental Monitoring Program (REMP) be provided to the Nuclear Regulatory Commission by May 15th of each year.

This report describes the Radiological Environmental Monitoring Program (REMP) program, the implementation of the program, and the results obtained as required by the Offsite Dose Calculation Manual (ODCM). The report also contains the analytical results tables, 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.

The Radiological Environmental Monitoring Program is a comprehensive surveillance program, which is implemented to assess the impact of site operations on the environment and compliance with 10CFR20, 40CFR190 and 10CFR72. Samples are collected from the aquatic and terrestrial pathways applicable to the site. The aquatic pathways include Lake Ontario fish, surface waters and lakeshore sediment. The terrestrial pathways include airborne particulate and radioiodine, milk, food products and direct radiation.

During 2006 there were 2,402 analyses performed on environmental media collected as part of the Radiological Environmental Monitoring Program. These results demonstrated that there is no significant or measurable radiological impact from the operation of the James A. FitzPatrick Nuclear Power Plant. Cesium-137 was detected in one aquatic pathway (shoreline sediment) at very low levels and was attributed to fallout from past weapons testing. The 2006 results for all pathways sampled are consistent with the previous five-year historical results and exhibited no adverse trends.

In summary, the analytical results from the 2006 Radiological Environmental Monitoring Program demonstrate that the routine operation at the James A. FitzPatrick site had no significant or measurable radiological impact on the environment. The program continues to demonstrate that the dose to a member of the public, as a result of the operation of the James A. FitzPatrick Nuclear Power Plant, remains significantly below the federally required dose limits specified in 10CFR20, 40CFR190 and 10CFR72.

## 2.0 INTRODUCTION

The James A. FitzPatrick Nuclear Power Plant is owned and operated by Entergy Nuclear FitzPatrick, LLC (ENF), Entergy Nuclear Operations, Inc. (ENO). This report is submitted in accordance with Offsite Dose Calculation Manual, Part I, Section 6.1. This report covers the calendar year 2006.

## 2.1 PROGRAM HISTORY

Environmental monitoring at the Nine Mile Point site has been ongoing since 1964. The program includes five years of preoperational data, which was conducted 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 615 megawatt Boiling Water Reactor (BWR) began full power operation. In 1975, the James A. FitzPatrick Nuclear Power Plant, owned and operated at that time by the New York Power Authority, began full power operation. The FitzPatrick plant, an 890 megawatt (rated) BWR, occupies the east sector of the Nine Mile Point site, approximately 0.57 miles east of Nine Mile Point Unit 1. In 1988, the Nine Mile Point Unit 2 reactor, also owned and operated by Niagara Mohawk, began full power operation. This 1207 megawatt BWR is located between the Nine Mile Point Unit 1 and FitzPatrick sites.

In 1985, the individual Plant Effluent Technical Specifications were standardized to the generic Radiological Effluent Technical Specifications, much of which was common to the two reactors, and subsequently Nine Mile Point Unit 2. Subsequent Technical Specification amendments relocated the REMP requirements to the ODCM for all three plants. Data generated by the Radiological Environmental Monitoring Program is shared, but each utility reviews and publishes their own annual report. On November 21, 2000 the ownership and operation of the James A. FitzPatrick N.P.P. was transferred from the New York Power Authority to Entergy Nuclear FitzPatrick, LLC and Entergy Nuclear Operations Inc. The facility operating license No. DPR-59 and Docket No. 50-333 remained the same. On November 7, 2001, the ownership of the Nine Mile Point Unit I and II facilities was transferred to Constellation Nuclear. These facilities are operated by Nine Mile Point Nuclear Station, LLC.

In summary, three Boiling Water Reactors, which together generate 2712 megawatts, have operated collectively at the Nine Mile Point site since 1988. A large database of environmental results from the exposure pathways have been collected and analyzed to evaluate the potential impact from reactor operations.

## 2.2 SITE DESCRIPTION

The Nine Mile Point site is located on the southeast shore of Lake Ontario in the town of Scriba, approximately 6.2 miles northeast of the city of Oswego. The nearest metropolitan area is located approximately 36 miles southeast of the site. The James A. FitzPatrick Nuclear Power Plant and support buildings occupy a small shoreline portion of the 702 acre Entergy site, which is partially wooded. The land, soil of glacier deposits, rises gently from the lake in all directions. Oswego County is a rural environment, with about 15% 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 James A. FitzPatrick Nuclear Power Plant site.

3. Demonstrate compliance with the requirements of applicable federal regulatory agencies, including Technical Specifications and the Offsite Dose Calculation Manual.

## 3.0 PROGRAM DESCRIPTION

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

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

In addition, direct radiation measurements are performed using thermoluminescent dosimeters (TLDs). These sampling programs are outlined in Table 3.0-1. The JAF 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 (ICQAP). In addition to participating in the ICQAP Program, 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 Nine Mile Point Nuclear Stations (NMPNS) and James A. FitzPatrick Nuclear Power Plant (JAFNPP). 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:<br>a. 3 Samples from offsite locations in different sectors of the highest calculated site average D/Q (based on all licensed site reactors.).<br>b. 1 sample from the vicinity of a community having the highest calculated site average D/Q (based on all licensed site reactors).<br>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.<br>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:<br>a. An inner ring of stations in the general area of the site boundary.<br>b. An outer ring, in the 4 to 5 mile range from the site, with a station in each of the land based sectors. There are 16 land based sectors in the inner ring, and 8 land based sectors in the outer ring.<br>c. 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.[d]<br>b. 1 sample from the site's most downstream cooling water intake. | Composite sample over a 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].<br>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 milch 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 commercially or recreationally important species in the vicinity of a site discharge point. | Twice per year. | Gamma isotopic[(c)] analysis of edible portions. |
| | b. 1 sample of each of 2 species (same as in a. above or of a species with similar feeding habits) from an area at least 5 miles distant from the site[(d)]. | | |
| FOOD PRODUCTS | a. In lieu of the garden census as specified in Part 1, Section 5.2, samples of at least 3 different kinds of broad leaf vegetation (such as vegetable) grown nearest each of two different offsite 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 thoron daughter decay. If gross beta activity in air is greater than 10 times a historical yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

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

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

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

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

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

(h) A milk sampling location as required in Table 3.0-1 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 SHORELINE SEDIMENTS

One 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 one 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 sample locations are shown in Section 3.3, Figure 3.3-5.

### 3.1.2 FISH

Samples of available fish species that are commercially or recreationally important to Lake Ontario; such as Lake Trout, Salmon, Walleye and Smallmouth Bass, are collected twice per year, once in the spring and again in the fall. Indicator samples are collected from a combination of the two onsite sample transects located offshore from the site. One set of control samples are collected at an offsite sample transect located offshore 8-10 miles west of the site. Available species are selected using the following guidelines:

a. A minimum of two species that are commercially or recreationally important are to be collected from each sample location. Samples selected are limited to edible and/or sport species when available.

b. Samples are composed of the edible portion only.

Selected fish samples are frozen immediately after collection and segregated by species and location. Samples are shipped frozen in insulated containers for analysis. Edible portions of each sample are analyzed for gamma emitting radionuclides.

Fish collection locations are shown in Section 3.3, Figure 3.3-5.

### 3.1.3 SURFACE WATER

Surface water samples are taken from the respective inlet canals of the James A. Fitzpatrick Nuclear Power Plant (JAFNPP) and NRG's Oswego Steam Station. The JAFNPP facility draws water from Lake Ontario on a continuous basis. This is used for the "downstream" or indicator sampling point for the Nine Mile Point site. The Oswego Steam Station inlet canal removes water from Lake Ontario at a point approximately 7.6 miles west of the site. This "upstream" location is considered a control location because of the distance from the site, as well as the result of the lake current patterns and current patterns from the Oswego River located nearby.

Samples from the JAFNPP facility are composited from automatic sampling equipment which discharges into a compositing tank or bottles. Samples are collected monthly from the compositor and analyzed for gamma emitters. Samples from the Oswego Steam Station 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 sample 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 from the City of Oswego drinking water supply. The latter three locations are not required by the ODCM. 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 emitting nuclides, and quarterly composite samples are analyzed for tritium.

Surface water sample locations are shown in Section 3.3 on Figure 3.3-4.

### 3.1.4 AIR PARTICULATE / IODINE

The air sampling stations required by the ODCM 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 deposition factor (D/Q) based on historical meteorological data. These stations (R-1, R-2, and R-3) are located in the E, ESE, and SE sectors as measured from the center of the Nine Mile Point Nuclear Station Unit 2 Reactor Building. The ODCM also require that a fourth air sampling station be located in the vicinity of a year-round community. This station is located in the SE sector at a distance of 1.8 miles and is designated as Station R-4. A fifth station required by the ODCM is a control location designated as Station R-5. Station R-5 is located 16.2 miles from the site in the NE meteorological sector.

In addition to the five ODCM required locations, there are ten additional sampling stations. Six of these sampling stations are located within the site boundary and are designated as Onsite Stations D1, G, H, I, J, and K. These locations are within the site boundary of the NMPNS and JAFNPP. One air sampling station is located offsite in the southwest sector in the vicinity of the City of Oswego and is designated as Station G Offsite. Three remaining air sampling stations are located in the ESE, SSE, and SSW sectors and range in distance from 7.1 to 9.0 miles. These are designated as Offsite Stations D2, E and F respectively.

Each station collects airborne particulates using glass fiber filters (47 millimeter diameter) and radioiodine using charcoal cartridges (2x1 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 station locations are shown in Section 3.3, Figures 3.3-2 and 3.3-3.

### 3.1.5 TLD (DIRECT RADIATION)

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. Environmental TLDs are supplied and processed quarterly by the AREVA NP Environmental Laboratory. The laboratory utilizes a Panasonic based system using UD-814 dosimeters, which are constructed of rectangular teflon wafers impregnated with 25% $CaSO_4$:Dy phosphor. Each dosimeter contains three calcium sulfate elements and one lithium borate element.

#### A. Environmental TLDs

Environmental TLDs are placed in five different geographical regions around site to evaluate effects of direct radiation as a result of plant operations. The following is a description of the five TLD geographical categories used in the NMPNS and JAFNPP Environmental Monitoring Program and the TLDs that make up each region:

| TLD Geographical Category | Description |
|---|---|
| Onsite | TLDs placed at various locations within the site boundary, with three exceptions, are not required by the ODCM. (TLD locations comprising this group are: 3, 4, 5, 6, 7*, 18*, 23*, 24, 25, 26, 27, 28, 29, 30, 31, 39, 47, 103, 106 and 107) |
| Site Boundary | An inner ring of TLDs placed in the general area of the site boundary in each of the sixteen meteorological sectors. This category is required by the ODCM. (TLD locations comprising this group are: 7*, 18*, 23*, 75*, 76*, 77*, 78*, 79*, 80*, 81*, 82*, 83*, 84*, 85*, 86*, and 87*) |

| TLD Geographical Category | Description |
|---|---|
| Offsite | An outer ring of TLDs placed 4 to 5 miles from the site in each of the 8 land based meteorological sectors. This category is required by the ODCM. (TLD locations comprising this group are 88*, 89*, 90*, 91*, 92*, 93*, 94*, and 95*) |
| Special Interest | TLDs placed in special interest areas of high population density and use. These TLDs are located at or near large industrial sites, schools, or nearby towns or communities. This category is required by the ODCM. (TLD locations comprising this group are: 9, 10, 11, 12, 13, 15*, 19, 51, 52, 53, 54, 55, 56*, 58*, 96*, 97*, 98, 99, 100, 101, 102, 108, and 109) |
| Control | TLDs placed in areas beyond significant influence of the site and plant operations. These TLDs are located to the SW, S and NE of the site at distances of 12.6 to 24.7 miles. This category is also required by the ODCM. (TLD locations comprising this group are 8*, 14*, 49*, 111, 113) |

* TLD location required by the ODCM

Although the ODCM requires a total of 32 TLD stations; environmental TLDs are also placed at additional locations not required by the ODCM, within the Onsite, Special Interest and Control TLD categories to supplement the ODCM required Direct Radiation readings.

Two dosimeters are placed at each TLD monitoring location. The TLDs are sealed in polyethylene packages to ensure dosimeter integrity and placed in open webbed plastic holders and attached to supporting structures, such as utility poles.

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

**B. Independent Spent Fuel Storage Installation (ISFSI)**

In order to provide adequate spent fuel storage capacity at the FitzPatrick plant, Entergy constructed an Independent Spent Fuel Storage Installation (ISFSI) onsite. On April 25, 2002, the ISFSI facility was placed in service.

TLDs are used to monitor direct radiation levels in the vicinity of the ISFSI facility. Twelve TLD locations were established around the ISFSI pad on the perimeter fence. Six additional TLD locations are located at varying distances from the pad to determine dose rates at points of interest relative to the storage area and are designated as optional locations. Background data was collected starting in October, 2000 at eight of the TLD locations on the perimeter fence. The remaining locations were established in October 2001.

Two dosimeters are placed at each TLD monitoring location. The TLDs are sealed in polyethylene packages to ensure dosimeter integrity and placed in the field using a supporting structure such as a fence or other immovable object.

ISFSI TLD locations are shown in Section 3.3, Table 3.3.1.

### 3.1.6 MILK

Milk samples are routinely collected from four farms during the sampling year. These farms include three indicator locations and one control location. Samples are normally collected April through December of the sample year. If plant related radionuclides are detected in samples in November and December of the previous year, milk collections are continued into the following year starting in January. If plant related radionuclides are not detected in the November and December samples, then milk collections do not commence until April of the sampling year. Milk samples were not collected in January through March of 2006 as there were no positive detections of plant related radionuclides in samples collected during November and December of 2005.

The ODCM also requires that a sample be collected from a control location nine to twenty miles from the site and in a less prevalent wind direction. This location is in the south sector at a distance of 16 miles 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 butter fat. 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 shown in Section 3.3, Figure 3.3-4. (Refer to Section 3.3, Table 3.3-1 for location designation and descriptions.)

### 3.1.7 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 available 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 distant 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, Figure 3.3-5.

## 3.2 ANALYSES PERFORMED

Environmental sample analyses are performed at the James A. FitzPatrick Nuclear Power Plant (JAFNPP) Environmental Laboratory. The following analyses were performed at the JAFNPP Environmental Lab:

- Air Particulate Filter – Gross Beta
- Air Particulate Filter Composites – Gamma Spectral Analysis
- Airborne Radioiodine – Gamma Spectral Analysis
- Direct Radiation using Thermoluminescent Dosimeters (TLDs) – Analyses performed by a contractor laboratory – AVERA NP Environmental Laboratory.
- Fish – Gamma Spectral Analysis
- Food Products (vegetation) – Gamma Spectral Analysis
- Milk – Gamma Spectral Analysis and I-131
- Shoreline Sediment – Gamma Spectral Analysis
- Special Samples (soil, food, bottom sediment, etc.) – Gamma Spectral Analysis
- Surface Water Monthly Composites – Gamma Spectral Analysis, I-131
- Surface Water Quarterly Composite - Tritium

## 3.3 SAMPLE LOCATIONS

Section 3.3 provides 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

**TABLE 3.3-1**
**2006 ENVIRONMENTAL SAMPLE LOCATIONS**

| SAMPLE MEDIUM | MAP DESIGNATION | FIGURE NUMBER | LOCATION DESCRIPTION | DEGREES & DISTANCE (1) & (2) | | |
|---|---|---|---|---|---|---|
| Shoreline Sediment | 05* | Figure 3.3-5 | Sunset Bay | 82º | at | 1.4 miles |
| | 06 | Figure 3.3-5 | Langs Beach, Control | 232° | at | 4.8 miles |
| Fish | 02* | Figure 3.3-5 | Nine Mile Point Transect | 290° | at | 0.4 miles |
| | 03* | Figure 3.3-5 | FitzPatrick Transect | 62° | at | 0.8 miles |
| | 00* | Figure 3.3-5 | Oswego Transect | 237° | at | 5.9 miles |
| Surface Water | 03* | Figure 3.3-4 | FitzPatrick Inlet | 53° | at | 0.6 miles |
| | 08* | Figure 3.3-4 | Oswego Steam Station Inlet | 237° | at | 7.6 miles |
| | 09 | Figure 3.3-4 | NMP Unit 1 Inlet | 319° | at | 0.3 miles |
| | 10 | Figure 3.3-4 | Oswego City Water | 240° | at | 7.8 miles |
| | 11 | Figure 3.3-4 | NMP Unit 2 Inlet (Split intake with two locations) | 336° | at | 0.3 miles |
| | | | | 353° | at | 0.3 miles |
| Air Radioiodine and Particulates | R-1* | Figure 3.3-2 | R-1 Station, Nine Mile Point Road | 92° | at | 1.8 miles |
| | R-2* | Figure 3.3-3 | R-2 Station, Lake Road | 107° | at | 1.1 miles |
| | R-3* | Figure 3.3-3 | R-3 Station, Co. Rt. 29 | 133° | at | 1.4 miles |
| | R-4* | Figure 3.3-3 | R-4 Station, Co. Rt. 29 | 145° | at | 1.8 miles |
| | R-5* | Figure 3.3-2 | R-5 Station, Montario Point | 42° | at | 16.2 miles |
| | D-1 | Figure 3.3-3 | D1 Onsite Station | 71° | at | 0.3 miles |
| | G | Figure 3.3-3 | G Onsite Station | 245° | at | 0.7 miles |
| | H | Figure 3.3-3 | H Onsite Station | 73° | at | 0.8 miles |
| | I | Figure 3.3-3 | I Onsite Station | 95° | at | 0.8 miles |
| | J | Figure 3.3-3 | J Onsite Station | 109° | at | 0.9 miles |
| | K | Figure 3.3-3 | K Onsite Station | 132° | at | 0.5 miles |
| | G | Figure 3.3-2 | G Offsite Station, Saint Paul Street | 226° | at | 5.4 miles |
| | D-2 | Figure 3.3-2 | D2 Offsite Station, Rt. 64 | 118° | at | 9.0 miles |
| | E | Figure 3.3-2 | E Offsite Station, Rt. 4 | 162° | at | 7.1 miles |
| | F | Figure 3.3-2 | F Offsite Station, Dutch Ridge Road | 192° | at | 7.6 miles |

(1) Degrees and distance based on Nine Mile Point Unit 2 Reactor Centerline rounded to the nearest 1/10 of a mile.
(2) Degrees and Distances updated by Global Positioning System (GPS) in 2006.
* Sample location required by ODCM

**TABLE 3.3-1 (Continued)**
**2006 ENVIRONMENTAL SAMPLE LOCATIONS**

| SAMPLE MEDIUM | MAP DESIGNATION | FIGURE NUMBER | LOCATION DESCRIPTION | DEGREES & DISTANCE (1) & (2) | | |
|---|---|---|---|---|---|---|
| Thermoluminescent Dosimeters (TLD) (Continued) | 3 | Figure 3.3-3 | D1 Onsite | 71° | at | 0.3 miles |
| | 4 | Figure 3.3-3 | D2 Onsite | 143° | at | 0.4 miles |
| | 5 | Figure 3.3-3 | E Onsite | 180° | at | 0.3 miles |
| | 6 | Figure 3.3-3 | F Onsite | 213° | at | 0.5 miles |
| | 7* | Figure 3.3-3 | G Onsite | 245° | at | 0.7 miles |
| | 8* | Figure 3.3-2 | R-5 Offsite Control | 42° | at | 16.2 miles |
| | 9 | Figure 3.3-2 | D1 Offsite | 80° | at | 11.4 miles |
| | 10 | Figure 3.3-2 | D2 Offsite | 118° | at | 9.0 miles |
| | 11 | Figure 3.3-2 | E Offsite | 162° | at | 7.1 miles |
| | 12 | Figure 3.3-2 | F- Offsite | 192° | at | 7.6 miles |
| | 13 | Figure 3.3-2 | G Offsite | 226° | at | 5.4 miles |
| | 14* | Figure 3.3-2 | DeMass Rd., SW Oswego - Control | 227° | at | 12.5 miles |
| | 15* | Figure 3.3-2 | Pole 66, W. Boundary - Bible Camp | 240° | at | 0.9 miles |
| | 18* | Figure 3.3-3 | Energy Info. Center - Lamp Post, SW | 268° | at | 0.4 miles |
| | 19 | Figure 3.3-2 | East Boundary - JAF, Pole 9 | 83° | at | 1.4 miles |
| | 23* | Figure 3.3-3 | H Onsite | 73° | at | 0.8 miles |
| | 24 | Figure 3.3-3 | I Onsite | 95° | at | 0.8 miles |
| | 25 | Figure 3.3-3 | J Onsite | 109° | at | 0.9 miles |
| | 26 | Figure 3.3-3 | K Onsite | 132° | at | 0.5 miles |
| | 27 | Figure 3.3-3 | N. Fence, N. of Switchyard, JAF | 60° | at | 0.4 miles |
| | 28 | Figure 3.3-3 | N. Light Pole,N. of Screenhouse, JAF | 68° | at | 0.5 miles |
| | 29 | Figure 3.3-3 | N. Fence, N. of W. Side | 65° | at | 0.5 miles |
| | 30 | Figure 3.3-3 | N. Fence, (NW) JAF | 57° | at | 0.4 miles |
| | 31 | Figure 3.3-3 | N. Fence, (NW) NMP-1 | 279° | at | 0.2 miles |
| | 39 | Figure 3.3-3 | N. Fence, Rad. Waste-NMP-1 | 298° | at | 0.2 miles |
| | 47 | Figure 3.3-3 | N. Fence, (NE) JAF | 69° | at | 0.6 miles |
| | 49* | Figure 3.3-2 | Phoenix, NY-Control | 168° | at | 19.7 miles |
| | 51 | Figure 3.3-2 | Liberty & Bronson Sts., E of OSS | 234° | at | 7.3 miles |
| | 52 | Figure 3.3-2 | E. 12th & Cayuga Sts., Oswego School | 227° | at | 5.9 miles |
| | 53 | Figure 3.3-2 | Broadwell & Chestnut Sts. Fulton H.S. | 183° | at | 13.7 miles |

(1) Degrees and distance based on Nine Mile Point Unit 2 Reactor Centerline rounded to the nearest 1/10 of a mile.
(2) Degrees and Distances updated by Global Positioning System (GPS) in 2006.
* Sample location required by ODCM

**TABLE 3.3-1 (Continued)**
**2006 ENVIRONMENTAL SAMPLE LOCATIONS**

| SAMPLE MEDIUM | MAP DESIGNATION | FIGURE NUMBER | LOCATION DESCRIPTION | DEGREES & DISTANCE (1) & (2) |
|---|---|---|---|---|
| Thermoluminescent Dosimeters (TLD) (Continued) | 54 | Figure 3.3-2 | Mexico High School | 115° at 9.4 miles |
| | 55 | Figure 3.3-2 | Gas Substation Co. Rt. 5-Pulaski | 75° at 13.0 miles |
| | 56* | Figure 3.3-2 | Rt. 104-New Haven Sch. (SE Corner) | 124° at 5.2 miles |
| | 58* | Figure 3.3-2 | Co Rt. 1A-Alcan (E. of E. Entrance Rd.) | 222° at 3.0 miles |
| | 75* | Figure 3.3-3 | Unit 2, N. Fence, N. of Reactor Bldg. | 354° at 0.1 miles |
| | 76* | Figure 3.3-3 | Unit 2, N. Fence, N. of Change House | 25° at 0.1 miles |
| | 77* | Figure 3.3-3 | Unit 2, N. Fence, N. of Pipe Bldg. | 36° at 0.2 miles |
| | 78* | Figure 3.3-3 | JAF. E. of E. Old Lay Down Area | 85° at 1.0 miles |
| | 79* | Figure 3.3-3 | Co. Rt. 29, Pole #63, 0.2 mi. S. of Lake Rd. | 120° at 1.2 miles |
| | 80* | Figure 3.3-3 | Co. Rt. 29, Pole #54, 0.7 mi. S. of Lake Rd. | 136° at 1.5 miles |
| | 81* | Figure 3.3-3 | Miner Rd., Pole #16, 0.5 mi. W. of Rt. 29 | 159° at 1.6 miles |
| | 82* | Figure 3.3-3 | Miner Rd., Pole # 1-1/2, 1.1 mi. W. of Rt. 29 | 180° at 1.6 miles |
| | 83* | Figure 3.3-3 | Lakeview Rd., Tree 0.45 mi. N. of Miner Rd. | 203° at 1.2 miles |
| | 84* | Figure 3.3-2 | Lakeview Rd., N., Pole #6117, 200ft. N. of Lake Rd. | 226° at 1.1 miles |
| | 85* | Figure 3.3-3 | Unit 1, N. Fence, N. of W. Side of Screen House | 292° at 0.2 miles |
| | 86* | Figure 3.3-3 | Unit 2, N. Fence, N of W. Side of Screen House | 311° at 0.1 miles |
| | 87* | Figure 3.3-3 | Unit 2, N. Fence, N. of E. Side of Screen House | 333° at 0.1 miles |
| | 88* | Figure 3.3-2 | Hickory Grove Rd., Pole #2, 0.6 mi. N. of Rt. 1 | 97° at 4.5 miles |
| | 89* | Figure 3.3-2 | Leavitt Rd., Pole #16, 0.4 mi. S. of Rt.1 | 112° at 4.3 miles |
| | 90* | Figure 3.3-2 | Rt. 104, Pole #300, 150 ft. E. of Keefe Rd. | 135° at 4.2 miles |
| | 91* | Figure 3.3-2 | Rt 51A, Pole #59, 0.8 mi. W. of Rt. 51 | 157° at 4.9 miles |
| | 92* | Figure 3.3-2 | Maiden Lane Rd., Power Pole, 0.6 mi. S. of Rt. 104 | 183° at 4.4 miles |
| | 93* | Figure 3.3-2 | Rt. 53 Pole 1-1, 120 ft. S. of Rt. 104 | 206° at 4.4 miles |
| | 94* | Figure 3.3-2 | Rt. 1, Pole #82, 250 ft. E. of Kocher Rd. (Co. Rt. 63) | 224° at 4.4 miles |
| | 95* | Figure 3.3-2 | Alcan W access Rd., Joe Fultz Blvd, Pole #21 | 239° at 3.7 miles |
| | 96* | Figure 3.3-2 | Creamery Rd., 0.3 mi. S. of Middle Rd., Pole 1-1/2 | 199° at 3.6 miles |
| | 97* | Figure 3.3-3 | Rt. 29, Pole #50, 200ft. N. of Miner Rd. | 145° at 1.8 miles |
| | 98 | Figure 3.3-2 | Lake Rd., Pole #145, 0.15 mi. E. of Rt 29 | 102° at 1.2 miles |

(1) Degrees and distance based on Nine Mile Point Unit 2 Reactor Centerline rounded to the nearest 1/10 of a mile.
(2) Degrees and Distances updated by Global Positioning System (GPS) in 2006.
* Sample location required by ODCM

**TABLE 3.3-1 (Continued)**
**2006 ENVIRONMENTAL SAMPLE LOCATIONS**

| SAMPLE MEDIUM | MAP DESIGNATION | FIGURE NUMBER | LOCATION DESCRIPTION | DEGREES & DISTANCE (1) & (2) | | |
|---|---|---|---|---|---|---|
| Thermoluminescent | 99 | Figure 3.3-2 | NMP Rd., 0.4 mi. N. of Lake Rd., Env. Station R1 | 92° | at | 1.8 miles |
| Dosimeters (TLD) | 100 | Figure 3.3-3 | Rt. 29 & Lake Rd., Env. Station R2 | 106° | at | 1.1 miles |
| (Continued) | 101 | Figure 3.3-3 | Rt. 29, 0.7 mi. S. of Lake Rd., Env. Station R3 | 133° | at | 1.4 miles |
| | 102 | Figure 3.3-2 | EOF/Env. Lab, Rt 176, E. Driveway, Lamp Post | 175° | at | 11.9 miles |
| | 103 | Figure 3.3-3 | EIC, East Garage Rd., Lamp Post | 268° | at | 0.4 miles |
| | 104 | Figure 3.3-2 | Parkhurst Rd., Pole #23, 0.1 mi. S. of Lake rd. | 102° | at | 1.4 miles |
| | 105 | Figure 3.3-3 | Lake view Rd. Pole #36, 0.5 mi. S. of Lake Rd. | 199° | at | 1.4 miles |
| | 106 | Figure 3.3-3 | Shoreline Cove, W. of NMP-1, Tree on W. Edge | 274° | at | 0.3 miles |
| | 107 | Figure 3.3-3 | Shoreline Cove, W. of NMP-1, 30 ft SSW of #106 | 273° | at | 0.3 miles |
| | 108 | Figure 3.3-3 | Lake Rd., Pole #142, 300 ft E. of Rt. 29 S. | 105° | at | 1.1 miles |
| | 109 | Figure 3.3-3 | Tree North of Lake Rd., 300 ft E. of Rt. 29 N | 104° | at | 1.1 miles |
| | 111 | Figure 3.3-2 | Control, State Route 38, Sterling NY | 214° | at | 21.8 miles |
| | 112 | Figure 3.3-2 | EOF/Env. Lab, Oswego County Airport | 175° | at | 11.9 miles |
| | 113 | Figure 3.3-2 | Control, Baldwinsville, NY | 178° | at | 24.7miles |
| Cows Milk | 76 | Figure 3.3-4 | Indicator Location | 120° | at | 6.3 miles |
| | 55 | Figure 3.3-4 | Indicator Location | 97° | at | 8.7 miles |
| | 4 | Figure 3.3-4 | Indicator Location | 115° | at | 7.6 miles |
| | 77* | Figure 3.3-4 | Control Location | 190° | at | 16.0 miles |
| Food Products | 132* | Figure 3.3-5 | Indicator Location | 110° | at | 2.0 miles |
| | 133* | Figure 3.3-5 | Indicator Location | 83° | at | 1.6 miles |
| | 134* | Figure 3.3-5 | Indicator Location | 83° | at | 1.5 miles |
| | 142** | Figure 3.3-5 | Indicator Location | 143° | at | 1.7 miles |
| | 144** | Figure 3.3-5 | Indicator Location | 139° | at | 1.6 miles |
| | 145* | Figure 3.3-5 | Control Location | 222° | at | 15.4 miles |
| | 422** | Figure 3.3-5 | Indicator Location | 112° | at | 2.0 miles |
| Nearest Residence (NMP) | Based on NMP Unit 2 Centerline – Refer to Figure 3.3-5 | | | | | |
| Nearest Residence (JAF) | Based on JAF Centerline – Refer to Figure 3.3-6 | | | | | |

(1) Degrees and distance based on Nine Mile Point Unit 2 Reactor Centerline
(2) Degrees and Distances updated by Global Positioning System (GPS) in 2006.
* Sample location required by ODCM
** Optional sample

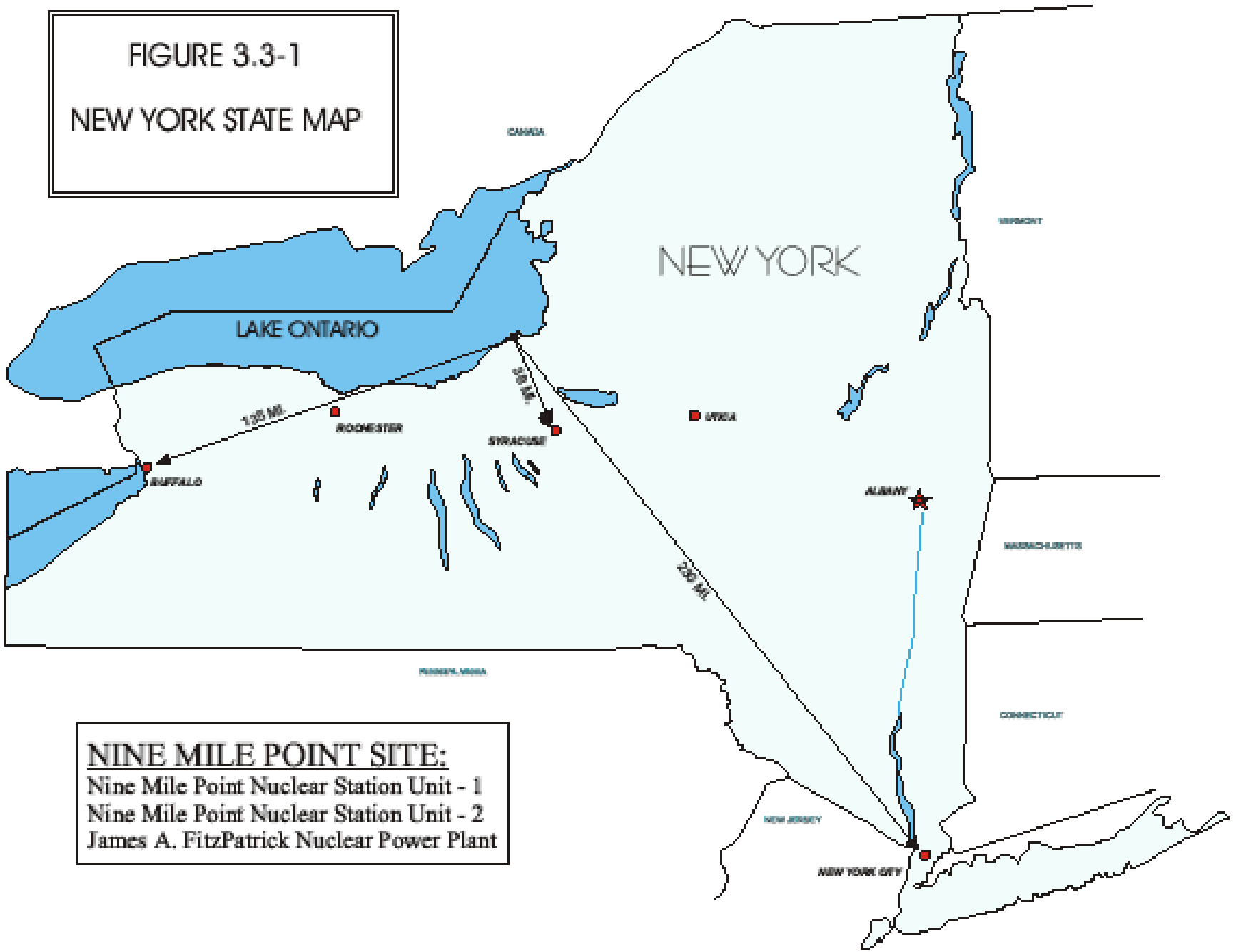
**TABLE 3.3-1 (Continued)**
**2006 ENVIRONMENTAL SAMPLE LOCATIONS**

| SAMPLE MEDIUM | LOCATION DESIGNATION | LOCATION DESCRIPTION |
|---|---|---|
| Thermoluminescent Dosimeters TLD) (Continued) | I-1* | ISFSI West Fence, South End of Storage Pad |
| | I-2* | ISFSI West Fence, Center of Storage Pad |
| | I-3* | ISFSI West Fence, North End of Storage Pad |
| | I-4* | ISFSI North Fence, West End of Storage Pad |
| | I-5* | ISFSI North Fence, Center of Storage Pad |
| | I-6* | ISFSI North Fence, East End of Storage Pad |
| | I-7* | ISFSI East Fence, North End of Storage Pad |
| | I-8* | ISFSI East Fence, Center of Storage Pad |
| | I-9* | ISFSI East Fence, South End of Storage Pad |
| | I-10* | ISFSI South Fence, East End of Storage Pad |
| | I-11* | ISFSI South Fence, Center of Storage Pad |
| | I-12* | ISFSI South Fence, West End of Storage Pad |
| | I-13H | ISFSI Building and Grounds Garage, East of Pad |
| | I-14H | ISFSI Tree ~100 yards South of Pad |
| | I-15H | ISFSI Transmission Line Tower South of Pad at East /West Access Road |
| | I-16H | ISFSI Perimeter Fence ~100 yards West of Pad on Pad Centerline |
| | I-17H | ISFSI North Fence of Main Switch Yard on Pad Centerline |
| | I-18H | ISFSI North Inner Perimeter Fence at Lake Shore on Pad Centerline |

* Sample location required by ODCM
H indicates Optional TLD location

FIGURE 3.3-1

NEW YORK STATE MAP




**NINE MILE POINT SITE:**

Nine Mile Point Nuclear Station Unit - 1
Nine Mile Point Nuclear Station Unit - 2
James A. FitzPatrick Nuclear Power Plant

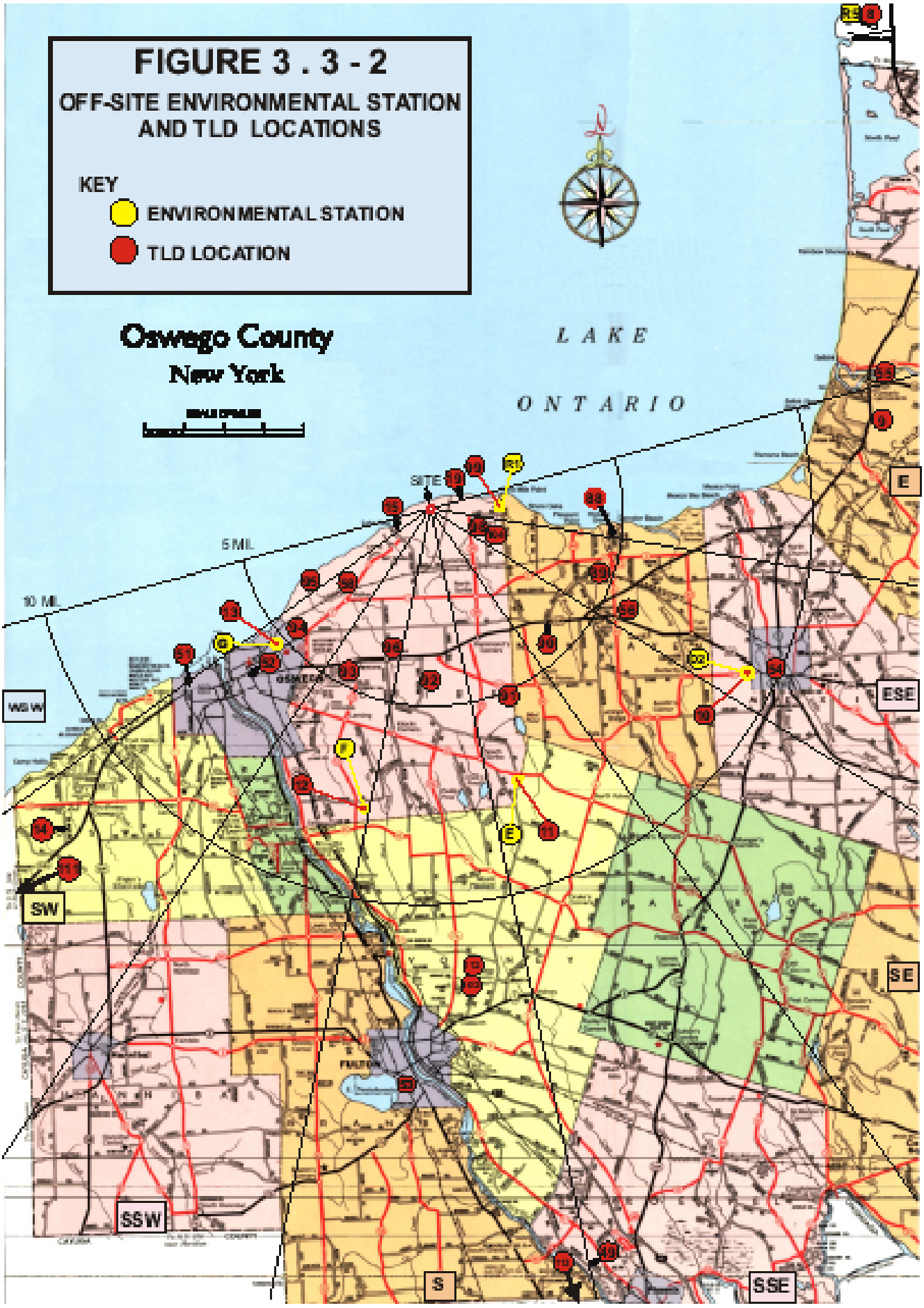
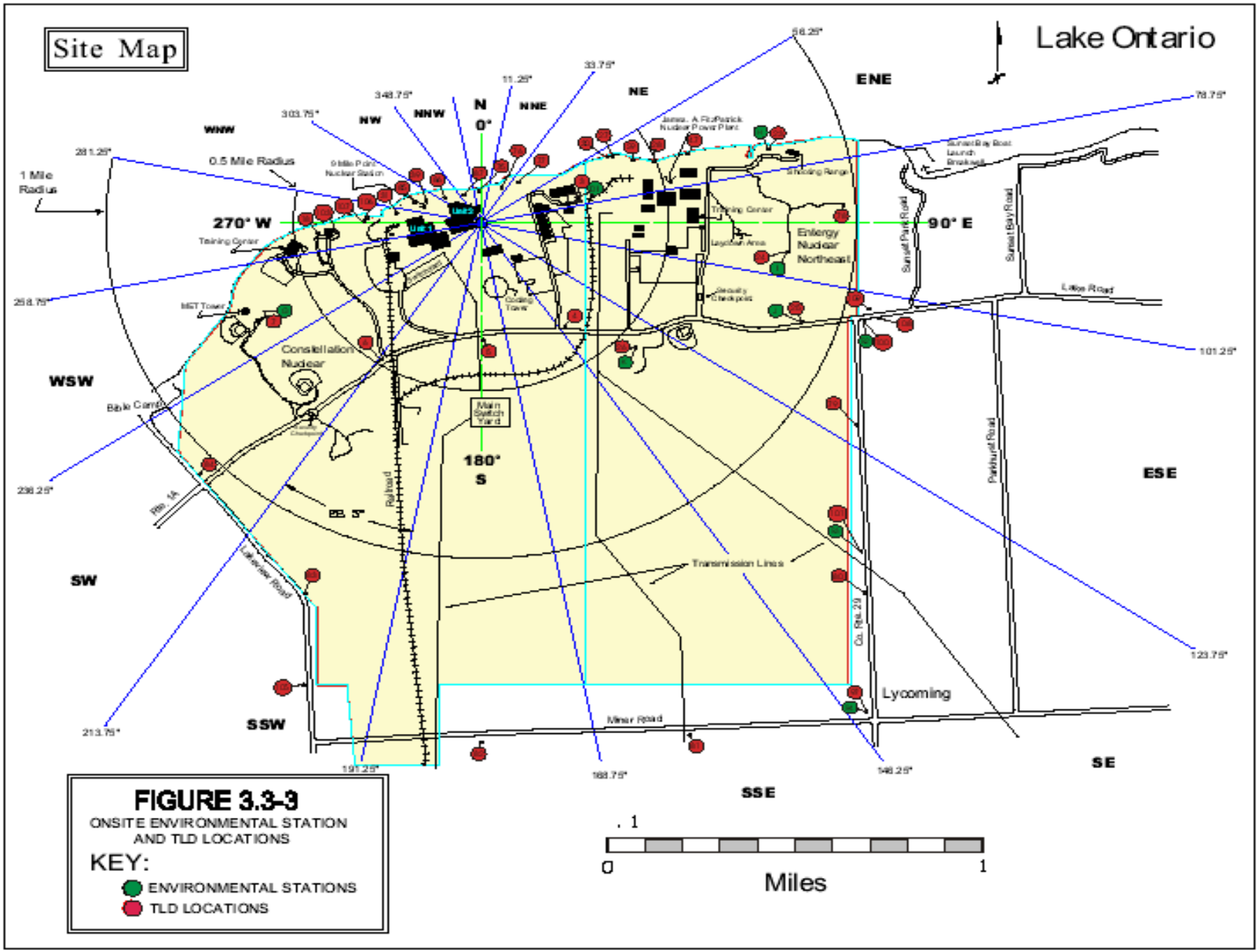
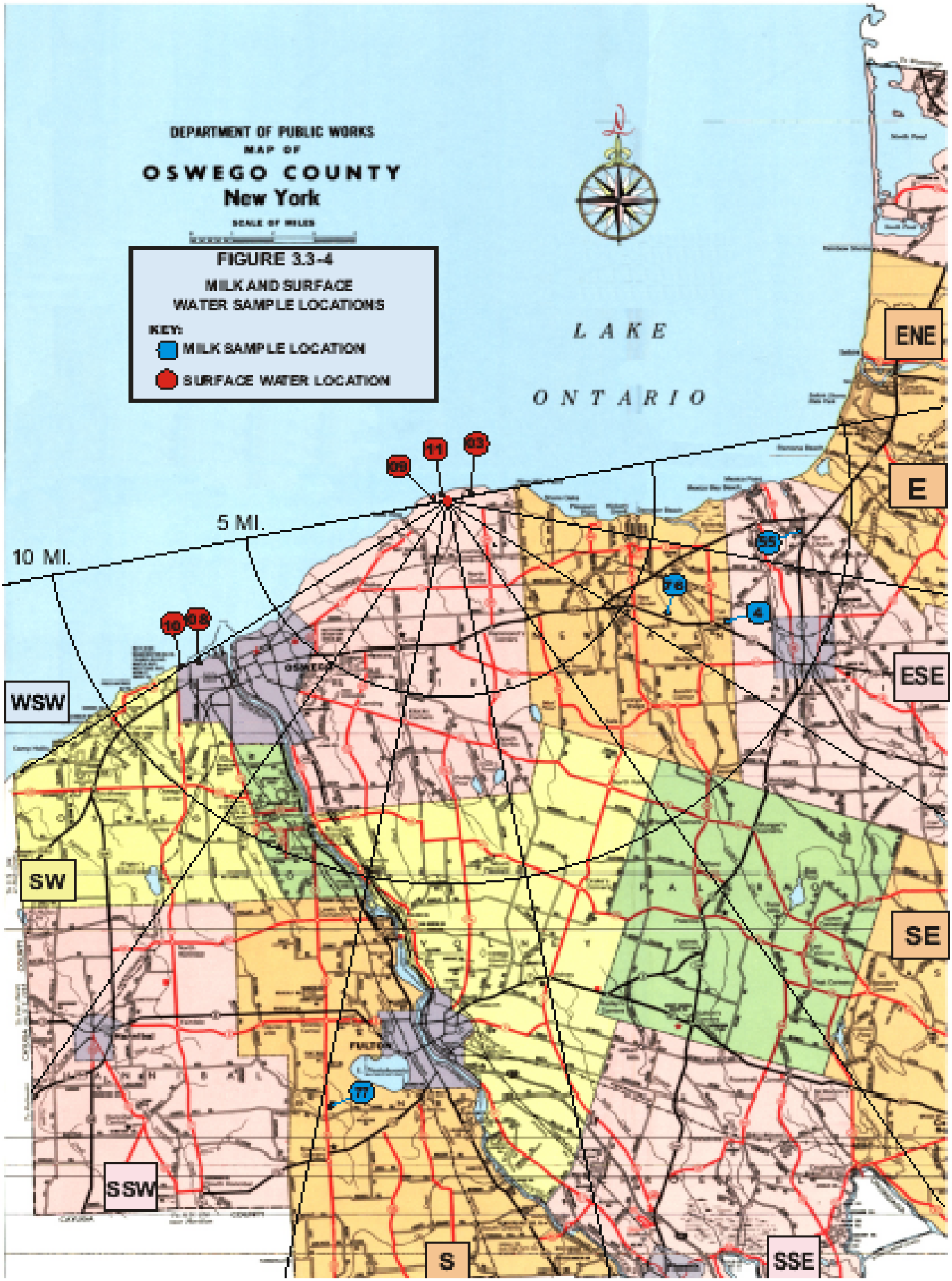
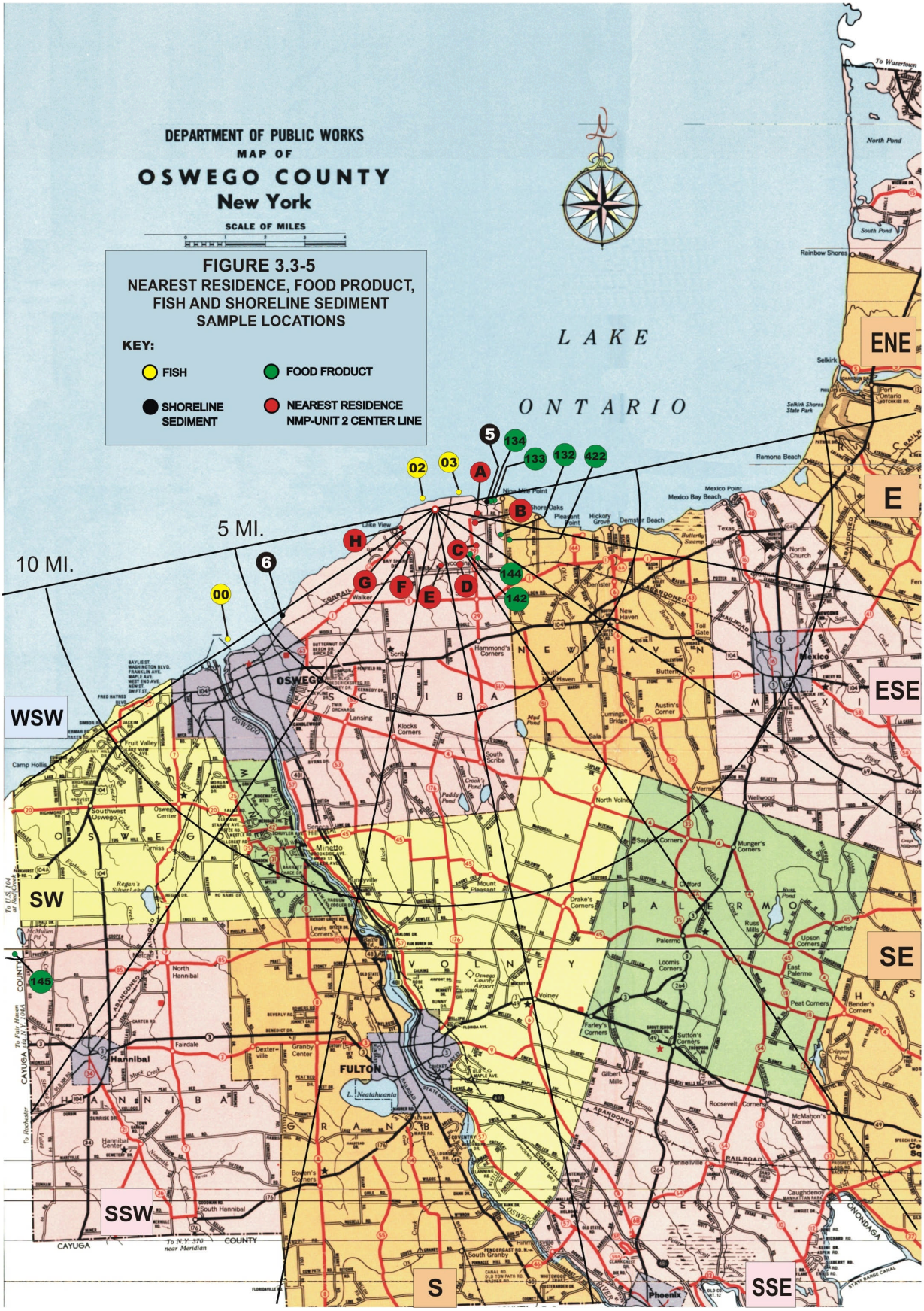
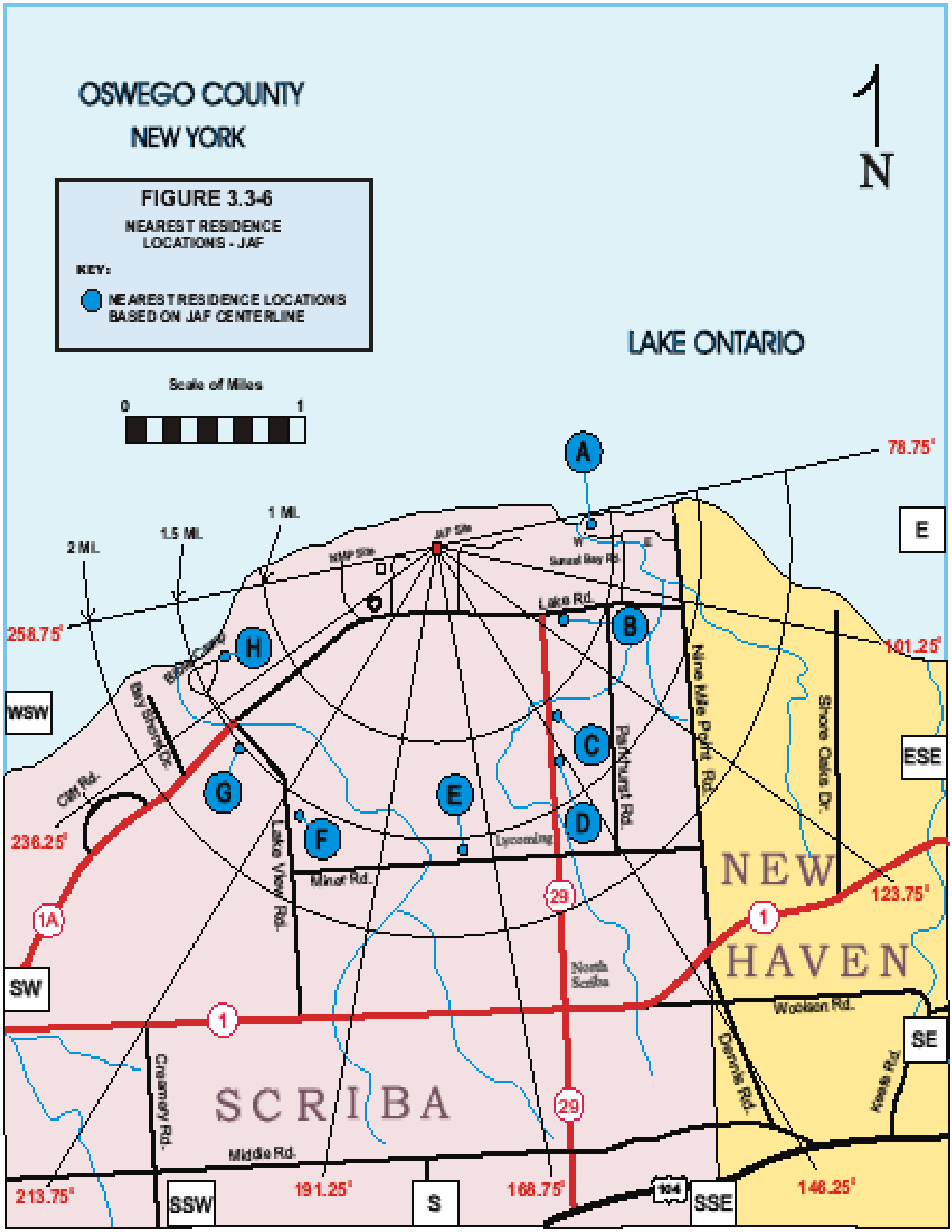


FIGURE 3 . 3 - 2
OFF-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS
KEY
ENVIRONMENTAL STATION
TLD LOCATION
Oswego County
New York
LAKE
ONTARIO
SITE
5 MI.
10 MI.
E
ESE
SE
SSE
S
SSW
SW
WSW


Site Map
Lake Ontario
N
0°
NNE
NE
ENE
NNW
NW
WNW
WSW
SW
SSW
SSE
SE
ESE
90° E
180° S
270° W
1 Mile Radius
0.5 Mile Radius
Unit 3
Unit 1
Training Center
Laydown Area
Shooting Range
Entergy Nuclear Northeast
Constellation Nuclear
Main Switch Yard
Transmission Lines
Lyoming
Miner Road
Lakeview Road
Parkhurst Road
Sunset Park Road
Sunset Bay Road
Lake Road
Railroad
MET Tower
Cooling Tower
Security Checkpoint
Bay Camp
Rte. 14
Co. Rte. 29
33.75°
11.25°
348.75°
303.75°
281.25°
258.75°
236.25°
213.75°
191.25°
168.75°
146.25°
123.75°
101.25°
78.75°
56.25°
. 1
0
1
Miles
FIGURE 3.3-3
ONSITE ENVIRONMENTAL STATION AND TLD LOCATIONS
KEY:
ENVIRONMENTAL STATIONS
TLD LOCATIONS


DEPARTMENT OF PUBLIC WORKS
MAP OF
OSWEGO COUNTY
New York
SCALE OF MILES
FIGURE 3.3-4
MILK AND SURFACE
WATER SAMPLE LOCATIONS
KEY:
MILK SAMPLE LOCATION
SURFACE WATER LOCATION
LAKE
ONTARIO
5 MI.
10 MI.
ENE
E
ESE
SE
S
SSE
SSW
SW
WSW


DEPARTMENT OF PUBLIC WORKS
MAP OF
OSWEGO COUNTY
New York
SCALE OF MILES
FIGURE 3.3-5
NEAREST RESIDENCE, FOOD PRODUCT, FISH AND SHORELINE SEDIMENT SAMPLE LOCATIONS
KEY:
FISH
FOOD FRODUCT
SHORELINE SEDIMENT
NEAREST RESIDENCE NMP-UNIT 2 CENTER LINE
LAKE ONTARIO
5 MI.
10 MI.
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
OSWEGO
FULTON
Hannibal
Phoenix
CAYUGA
ONONDAGA
00
02
03
A
B
C
D
E
F
G
H
5
6
133
134
132
422
144
142
145


OSWEGO COUNTY
NEW YORK
FIGURE 3.3-6
NEAREST RESIDENCE LOCATIONS - JAF
KEY:
NEAREST RESIDENCE LOCATIONS BASED ON JAF CENTERLINE
N
LAKE ONTARIO
Scale of Miles
0
1
A
B
C
D
E
F
G
H
78.75'
101.25'
123.75'
146.25'
168.75'
191.25'
213.75'
236.25'
258.75'
1 ML
1.5 ML
2 ML
E
ESE
SE
SSE
S
SSW
SW
WSW
JAF Site
NMP Site
Sunset Bay Rd.
Lake Rd.
Nine Mile Point Rd.
Shore Circle Dr.
Parkhurst Rd.
Upcoming
Minor Rd.
Lake View Rd.
Bay Shore Dr.
Ridge Crest
City Rd.
North Scriba
Wadsen Rd.
Creamery Rd.
Middle Rd.
Kasia Rd.
NEW HAVEN
SCRIBA
1A
1
29
104

## 3.4 LAND USE CENSUS

The ODCM requires that a milch animal census and a residence census be conducted annually out to a distance of five miles. Milch animals are defined as any animal that is routinely used to provide milk for human consumption.

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 ODCM if broadleaf vegetation sampling and analysis are performed.

## 3.5 CHANGES TO THE REMP PROGRAM

The following changes were implemented during the 2006 sampling program:

### A. Food Product Sampling Program

During the reporting period, two new food product locations were added to the Environmental Monitoring locations to implement the requirements of ODCM, Part 1, Table 5.1-1. Sample locations selected were based on the 2006 annual land use census and were utilized to implement the 2006 food product requirements.

## 3.6 DEVIATION AND EXCEPTIONS TO THE PROGRAM

The noted exceptions to the 2006 sample program address only those samples or monitoring requirements which are required by the ODCM, Part I, Table 5.1-1. This section satisfies the reporting requirements of ODCM, Part I, Section 5.1.1.c.1.

### A. ODCM Program Deviations

The following are deviations from the program specified by the ODCM:

1. The air sampling pump at the R5 Environmental Sampling Station was inoperable for approximately 3 hours during the sample period of 1/17/06 through 1/24/06. The air sample pump was running at the time of sample collection. The sample pump out of service time was determined based on the sample pump run time integrator. The inoperability of the pump was due to a loss of power to the sampler. No corrective actions were required to restore the unit to service.

2. The air sampling pump at the R3 and R4 Environmental Sampling Stations were inoperable for approximately 1 hour on 2/22/06 due to high winds that caused a power outage. The sample pump out of service times were determined based on the sample pump run time integrator. No corrective actions were implemented.

3. The air sampling pump at the R5 Environmental Sampling Station was inoperable for approximately 2.6 hours on 2/22/06 due to high winds that caused a power outage. The sample pump out of service time was determined

based on the sample pump run time integrator. No corrective action was implemented.

4. The air sampling pump at the R1 and R2 Environmental Sampling Stations were inoperable for approximately 0.8 hours during the sample period of 3/28/06 through 4/4/06. The air sample pumps were running at the time of sample collection. The sample pump out of service times were determined based on the sample pump run time integrators. The inoperability of the pumps was due to a loss of power to the samplers. No corrective actions were required to restore these units to service.

5. The air sampling pump at the R5 Environmental Sampling Station was inoperable for approximately 2.4 hours on 6/6/06. The sample pump out of service time was determined based on the sample pump run time integrator. The inoperability of the pump was due to a loss of power to the sampler. No corrective actions were required to restore the unit to service.

6. The air sampling pump at the R1 and R2 Environmental Sampling Stations were inoperable for approximately 0.7 hours on 8/1/06. The sample pump out of service times were determined based on the sample pump run time integrators. The inoperability of the pumps was due to a loss of power to the samplers. No corrective actions were required to restore the unit to service.

7. The air sampling pump at the R5 Environmental Sampling Station was inoperable for approximately 2.5 hours during the sample period of 9/12/06 through 9/19/06. The air sample pump was running at the time of sample collection. The sample pump out of service time was determined based on the sample pump run time integrator. The inoperability of the pump was due to loss of power to the sampler. No corrective actions were required to restore unit to service.

8. The air sampling pump at the R5 Environmental Sampling Station was inoperable for approximately 2.5 hours during the sample period of 9/26/06 through 10/3/06. The air sample pump was running at the time of sample collection. The sample pump out of service time was determined based on the sample pump run time integrator. The inoperability of the pump was due to a loss of power to the sampler. No corrective actions were required to restore these units to service.

9. The air sampling pump at R1 and R2 Environmental Sampling Stations were inoperable for approximately 9.7 hours for the sample period 10/23/06 through 10/31/06. The sample pump out of service times were determined based on the sample pump run time integrators. The sample pumps were found running. The inoperability of the pumps was due to a loss of power caused by strong winds. No corrective actions were required to restore the unit to service.

10. The air sampling pump at the R5 Environmental Sampling Station was inoperable for approximately 2.0 hours during the sample period of 12/05/06 through 12/12/06. The air sample pump was running at the time of sample collection. The sample pump out of service time was determined based on the sample pump run time integrator. The inoperability of the pump was due to a loss of power to the sampler. No corrective actions were required to restore these units to service.

## B. Air Sampling Station Operability Assessment

The ODCM required air sampling program consists of 5 individual sampling locations. The collective operable time period for the air monitoring stations was 43,760 hours out of a possible 43,800 hours. The air sampling availability factor for the report period was 99.91%.

## 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 ($\overline{X}$) 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 ($\overline{X}$) and the standard deviation (s):

A. Mean

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

Where,

$\overline{X}$ = estimate of the mean

i = individual sample

N, n = total number of samples with positive indications

$X_i$ = value for sample i above the lower limit of detection.

B. Standard Deviation

$$\mathbf{s} = \left[ \frac{\sum_{\mathbf{i=1}}^{\mathbf{n}} (\mathbf{X_i} - \overline{\mathbf{X}})^2}{(\mathbf{N} - 1)} \right]^{1/2}$$

Where,

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

s = standard deviation for the sample population

### 3.7.2 ESTIMATION OF THE MEAN & 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 ($\overline{X}$) and the associated propagated error.

A. Mean

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

Where,

| | | |
|---|---|---|
| $\overline{X}$ | = | estimate of the mean |
| i | = | individual sample |
| 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)

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

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 ($\sigma$)

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 ODCM 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 = the a priori lower limit of detection, as defined above (in picocuries per unit mass or volume)

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

E = the counting efficiency (in counts per disintegration)

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

2.22 = the number of disintegrations per minute per picocurie

Y = the fractional radiochemical yield (when applicable)

$\lambda$ = the radioactive decay constant for the particular radionuclide

$\Delta t$ = the elapsed time between sample collection (or end of the sample collection period) and time of counting

The ODCM 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 ODCM 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 ODCM program required LLDs for specific media and radionuclides as specified by the NRC. The LLDs actually achieved are routinely lower than those specified by the ODCM.

## 3.8 COMPLIANCE WITH REQUIRED LOWER LIMITS OF DETECTION (LLD)

ODCM, Part 1, Table 5.1-3 specifies the detection capabilities for environmental sample analysis (see report Table 3.8-1). ODCM, Part 1, Section 6.1 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 2006 as required by the ODCM, achieved the Lower Limit of Detection (LLD) as specified by ODCM, Part 1, Table 5.1-3. See report Table 3.8-1 for required LLD values.

**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 | 3000 (a) | | | | | |
| Mn-54 | 15 | | 130 | | | |
| Fe-59 | 30 | | 260 | | | |
| Co-58, Co-60 | 15 | | 130 | | | |
| Zn-65 | 30 | | 260 | | | |
| Zr-95, 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 3000 pCi/liter is used for H-3 and an LLD value of 15 pCi/liter is used for I-131.

## 3.9 REGULATORY LIMITS

Two federal agencies, the Nuclear Regulatory Commission and Environmental Protection Agency, have responsibility for regulations promulgated for protecting the public from radiation and radioactivity beyond the site boundary.

### 3.9.1 The Nuclear Regulatory Commission (NRC):

The NRC, in 10 CFR 20.1301, limits the levels of radiation in unrestricted areas resulting from the possession or use of radioactive materials such that they limit any individual to a dose of:

- less than or equal to 100 mrem per year to the total body

In addition to this dose limit, the NRC has established design objectives for nuclear plant licensees. Conformance to these guidelines ensures that nuclear power reactor effluents are maintained as far below the legal limits as is reasonably achievable.

The NRC; in 10CFR 50, Appendix I, establishes design objectives for the dose to a member of the general public from radioactive material in liquid effluents released to unrestricted areas to be limited to:

- less than or equal to 3 mrem per year to the total body
  or
- less than or equal to 10 mrem per year to any organ

The air dose due to release of Noble gases in gaseous effluents is restricted to:

- less than or equal to 10 mrad per year for gamma radiation or
- less than or equal to 20 mrad per year for beta radiation

The dose to a member of the general public from iodine-131, tritium, and all particulate radionuclides with half-lives greater than 8 days in gaseous effluents is limited to:

- less than or equal to 15 mrem per year to any organ

The NRC, in 10CFR72.104(a), establishes criteria for radioactive materials in effluents and direct radiation from an Independent Spent Fuel Storage Installation (ISFSI).

During normal operations and anticipated occurrences, the annual dose equivalent to any real individual who is located beyond the controlled area must not exceed:

- 25 mrem per year to the total body
- 75 mrem per year to the thyroid
  and
- 25 mrem per year to any other organ as a result of :
  1. Planned discharges of radioactive material, radon and its decay products excepted, to the environment
  2. Direct radiation from ISFSI
  3. Any other radiation from fuel cycle operation in the region

### 3.9.2 Environmental Protection Agency (EPA)

The EPA, in 40CFR190.10, Subpart B, sets forth the environmental standards for the uranium fuel cycle. During normal operation, the annual dose to any member of the public from the entire uranium fuel cycle shall be limited to:

- less than or equal to 25 mrem per year to the total body
- less than or equal to 75 mrem per year to the thyroid
  and
- less than or equal to 25 mrem per year to any other organ

## 4.0 SAMPLE SUMMARY TABLES IN BRANCH TECHNICAL POSITION FORMAT

All sample data is summarized in table form. The tables are titled "Radiological Environmental 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 non-routine reports sent to the Nuclear Regulatory Commission.

NOTE: Only positive measured values are used in statistical calculations.

## TABLE 4.0-1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
## JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
## OSWEGO COUNTY, STATE OF NEW YORK, JANUARY – DECEMBER 2006*

| MEDIUM (UNITS) | TYPE AND NUMBER OF ANALYSES* | LLD(a) | INDICATOR LOCATIONS: MEAN (f) / RANGE | LOCATION (b) OF HIGHEST ANNUAL MEAN: LOCATION & MEAN (f) / RANGE | CONTROL LOCATION: MEAN (f) / RANGE | NUMBER OF NONROUTINE REPORTS |
|---|---|---|---|---|---|---|
| Shoreline Sediment (pCi/kg-dry) | GSA (4): Cs-134 | 150 | <LLD | <LLD | <LLD | 0 |
| | Cs-137 | 180 | 56 (1/2) / 56 | No. 5: 1.5 miles at 80° 56 (1/2) / 56 | <LLD | 0 |
| Fish (pCi/kg-wet) | GSA (22): (h) Mn-54 | 130 | <LLD | <LLD | <LLD | 0 |
| | Fe-59 | 260 | <LLD | <LLD | <LLD | 0 |
| | Co-58 | 130 | <LLD | <LLD | <LLD | 0 |
| | Co-60 | 130 | <LLD | <LLD | <LLD | 0 |
| | Zn-65 | 260 | <LLD | <LLD | <LLD | 0 |
| | Cs-134 | 130 | <LLD | <LLD | <LLD | 0 |
| | Cs-137 | 150 | <LLD | <LLD | <LLD | 0 |

## TABLE 4.0-1 (continued)

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
## JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
## OSWEGO COUNTY, STATE OF NEW YORK, JANUARY – DECEMBER 2006*

| MEDIUM (UNITS) | TYPE AND NUMBER OF ANALYSES* | LLD(a) | INDICATOR LOCATIONS: MEAN (f) / RANGE | LOCATION (b) OF HIGHEST ANNUAL MEAN: LOCATION & MEAN (f) / RANGE | CONTROL LOCATION: MEAN (f) / RANGE | NUMBER OF NONROUTINE REPORTS |
|---|---|---|---|---|---|---|
| Surface Water (pCi/liter) | H-3 (8): | | | | | |
| | H-3 | 3000(c) | <LLD | <LLD | <LLD | 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(c) | <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 |

## TABLE 4.0-1 (continued)

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
## JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
## OSWEGO COUNTY, STATE OF NEW YORK, JANUARY – DECEMBER 2006*

| MEDIUM (UNITS) | TYPE AND NUMBER OF ANALYSES* | LLD(a) | INDICATOR LOCATIONS: MEAN (f) / RANGE | LOCATION (b) OF HIGHEST ANNUAL MEAN: LOCATION & MEAN (f) / RANGE | CONTROL LOCATION: MEAN (f) / RANGE | NUMBER OF NONROUTINE REPORTS |
|---|---|---|---|---|---|---|
| TLD (mrem per standard month) | Gamma Dose (140) | (d) | 4.7 (120/120) (i)<br>3.3 – 9.2 | TLD #85 (g): 8.4 (4/4)<br>0.2 miles at 292° 7.9 – 9.2 | 4.1 (20/20) (i)<br>3.3 – 5.3 | 0 |
| Air Particulates ($pCi/m^3$) | Gross Beta (260): | 0.01 | 0.015 (208/208)<br>0.005 – 0.035 | R-2 0.016 (52/52)<br>1.1 miles at 107° 0.007 – 0.035 | 0.016 (52/52)<br>0.007 – 0.033 | 0 |
| | I-131 (260): | 0.07 | <LLD | <LLD | <LLD | 0 |
| | GSA (60):<br>Cs-134 | 0.05 | <LLD | <LLD | <LLD | 0 |
| | Cs-137 | 0.06 | <LLD | <LLD | <LLD | 0 |
| Milk (pCi/liter) | GSA (68): (e) (h)<br>Cs-134 | 15 | <LLD | <LLD | <LLD | 0 |
| | Cs-137 | 18 | <LLD | <LLD | <LLD | 0 |
| | Ba/La-140 | 15 | <LLD | <LLD | <LLD | 0 |
| | I-131 (68):<br>I-131 | 1 | <LLD | <LLD | <LLD | 0 |

## TABLE 4.0-1 (continued)

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
## JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
## OSWEGO COUNTY, STATE OF NEW YORK, JANUARY – DECEMBER 2006*

| MEDIUM (UNITS) | TYPE AND NUMBER OF ANALYSES* | LLD(a) | INDICATOR LOCATIONS: MEAN (f) / RANGE | LOCATION (b) OF HIGHEST ANNUAL MEAN: LOCATION & MEAN (f) / RANGE | CONTROL LOCATION: MEAN (f) / RANGE | NUMBER OF NONROUTINE REPORTS |
|---|---|---|---|---|---|---|
| Food Products (pCi/kg-wet) | GSA (28): (h) | | | | | |
| | I-131 | 60 | <LLD | <LLD | <LLD | 0 |
| | Cs-134 | 60 | <LLD | <LLD | <LLD | 0 |
| | Cs-137 | 80 | <LLD | <LLD | <LLD | 0 |

**TABLE NOTES:**

* = Data for Table 4.0-1 is based on ODCM required samples only.

(a) = LLD values as required by the ODCM. LLD units are specified in the medium column.

(b) = Location is distance in miles and direction in compass degrees based on NMP-2 reactor center-line rounded to the nearest 1/10 mile. Units in this column are specified in medium column.

(c) = The ODCM specify an I-131 and tritium LLD value for surface water analysis (non-drinking water) of 15 pCi/liter and 3000 pCi/liter respectively.

(d) = The ODCM do not specify a particular LLD value to environmental TLDs.

(e) = The ODCM criteria for indicator milk sample locations include locations within 5.0 miles of the site. There are no milk sample locations within 5.0 miles of the site. Therefore, the only sample location required by the ODCM is the control location. There were three optional locations during 2006.

(f) = Fraction of number of detectable measurements to total number of measurements. Mean and range results are based on detectable measurements only.

(g) = 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).

(h) = Data includes results from optional samples in addition to samples required by the ODCM.

(i) = Indicator TLD locations are: #7, 15, 18, 23, 56, 58, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, and 97. Control TLDs are all TLDs located beyond the influence of the site (TLD #: 8, 14, 49, 111, 113).

# 5.0 DATA EVALUATION AND DISCUSSION

## A. Introduction

Each year the results of the annual Radiological Environmental Monitoring Program (REMP) are evaluated considering plant operations at the site, the natural processes in the environment, and the archive of historical 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 2006 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* (uCi), which is one millionth (0.000001) of a curie, and the *picocurie* (pCi), which is one trillionth (0.000000000001) of a curie. The picocurie (pCi) is the unit of radiation that is routinely used in this report. The mass, or weight, of radioactive material that 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

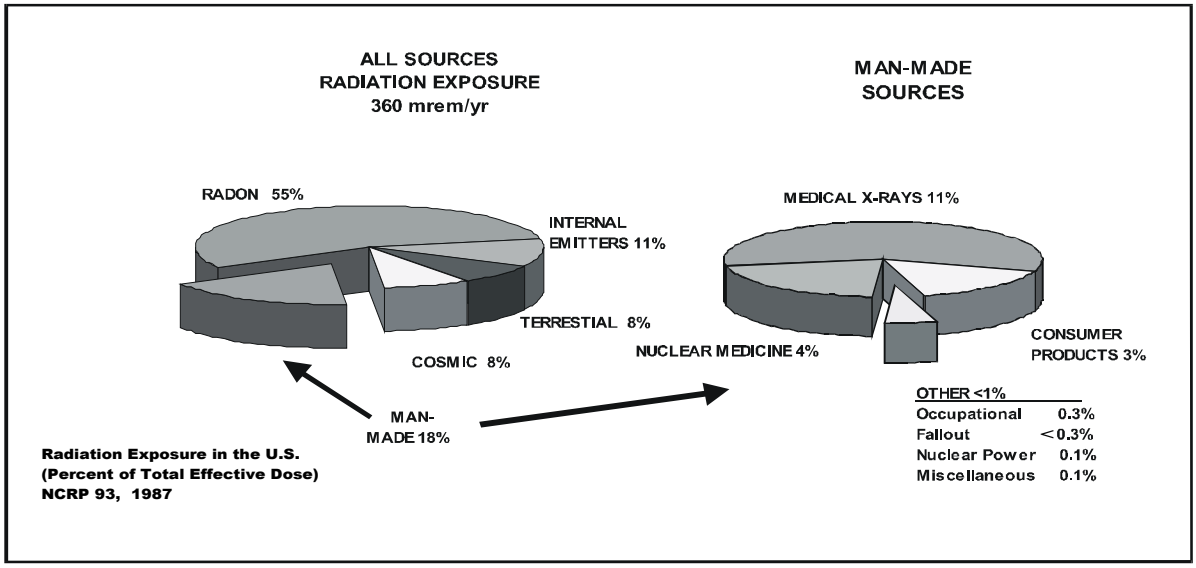
The dose or dose equivalent, simply put, is the amount of ionizing energy deposited or absorbed in living tissue. The amount of energy deposited or ionization caused is dependent on the type of radiation. For example, alpha radiation can cause dense localized ionization that can be up to 20 times the 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 (mrem) 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 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 three separate groups of radionuclide that were measured in the environment in the media analyzed for the 2006 sampling program. The first of these groups consists of the 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 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 and radium-226*, naturally occurring radionuclides found in the human body and throughout the environment

- *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 reported in some cases in Section 6.0 of this report. 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 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 1950's 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 and underground weapons testing by India, Pakistan & North Korea. 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 REMP. Cs-137 was the major byproduct of this testing and is still occasionally detected in a few select number of environmental media.

The third 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 a determination of the source of these radionuclides that may be detected in environmental samples difficult to determine. During 2006, Cs-137 was the only potential plant-related radionuclide detected in the REMP samples.

A number of factors must be considered in performing radiological sample data evaluation and interpretation. The evaluation is made using several approaches including trend analysis and dose to man. An attempt has been made not only to report the data collected during 2006, 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 man's technology are very small and are of no or little significance from an environmental or dose to man perspective.

The 1987 per capita average dose was determined to be 360 mrem per year from all sources, as noted in NCRP Report No. 93 (Reference 14). 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 nationwide is less than one mrem per year.

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) and of primordial origin (Ra-226, K-40, and Th-232). 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 2006.

The results of each sample medium are discussed in detail in Sections 5.1 and 5.2. 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.

During routine implementation of the REMP, additional or optional environmental pathway media are sampled and analyzed. These samples are obtained to:

- Expand the area covered by the program beyond that required by the ODCM
- Provide more comprehensive monitoring than is currently required
- Monitor the secondary dose to main pathways
- Maintain the analytical data base established when the plants began commercial operation

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 the ODCM. 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 ODCM sample media are included in the data presentation and evaluation. When additional locations are included, the use of this data is specifically noted in Sections 5.1 and 5.2.

Section 6.0 contains the analytical results for the sample media addressed in the report. Tables are provided for each required sample medium analyzed during the 2006 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 collected from three environmental pathways. These pathways are:

- Shoreline Sediment
- Fish
- Surface Waters

Section 6.0, Tables 6-1 through 6-4 present the analytical results for the aquatic samples collected for the 2006 sampling period.

### 5.1.1 SHORELINE SEDIMENT RESULTS

#### A. Results Summary

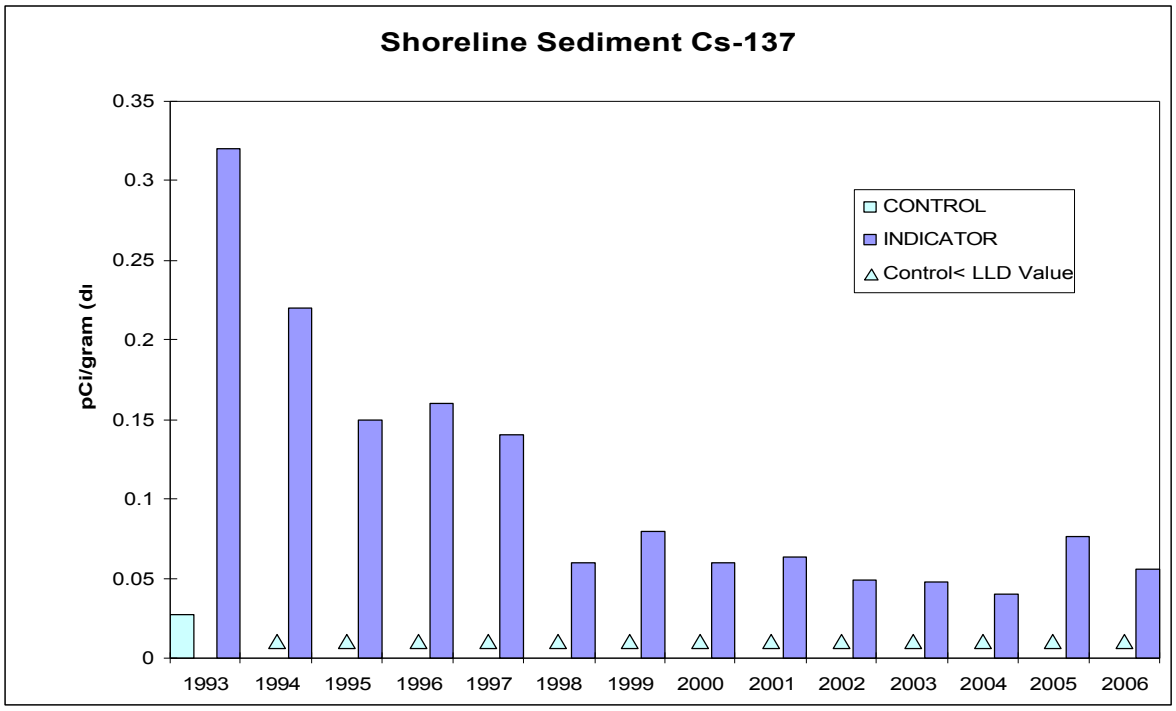
Shoreline sediment samples were obtained in April and October of 2006 at one offsite control location (Lang's Beach located near Oswego Harbor) and at one indicator location (Sunset Bay) which is an area east of the site considered to have recreational value.

A total of four sediment samples were collected for the 2006 sample program, two indicator and two control. Cs-137 was detected in one of the samples collected from the Sunset Bay indicator location in 2006, measuring 0.056 pCi/g (dry). These results continue to show a downward trend over the last 10 years. Cs-137 was not detected in samples collected from the Lang's Beach control location during 2006; however, Cs-137 was detected in the control samples in 1993 at an average concentration of 0.03 pCi/g.

The general lack of Cs-137 at the control location is attributed to the differences in the sediment types between the two sample locations (See Data Evaluation and Discussion). 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 2006 indicator sample is consistent with measured concentrations since shoreline sediment sampling began in 1985. Historical mean concentrations measured at the Sunset Bay indicator location ranged from a maximum of 0.33 pCi/g in 1993 to a minimum of 0.04 pCi/g (dry) in 2004. The results for the 2006 control location were less than the detection limit. The one naturally-occurring radionuclide detected was K-40 and was not related to plant operations. No other plant-related radionuclides were detected in the 2006 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.

The following is a graph of the average Cs-137 concentration in shoreline sediment samples over the previous 13 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 Bay), and one control location (Lang's Beach). Samples were collected from both the indicator and control locations in April and October 2006. The results of these sample collections are presented in Section 6.0, Table 6-1, "Concentrations of Gamma Emitters in Shoreline Sediment Samples – 2006". Cesium–137 (Cs-137) and Potassium–40 (K-40) were the significant radionuclides detected in the sediment samples.

Cs-137 was detected in the indicator sample collected in October for the 2006 program. The measured concentration for this sample was 0.056 pCi/g (dry). The presence of Cs-137 in certain environmental sample media such as soil, shoreline sediment and fish is historically common. Cs-137 is a fission product that is produced in nuclear power reactors and during atmospheric 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 which was the result of plant operation would also contain other plant related isotopes such as Co-60 and Cs-134. The absence of corroborating radionuclides would indicate that the source of Cs-137 in sediment samples is from the existing background Cs-137 which is attributed to weapons testing and the Chernobyl accident. This assessment is further substantiated by the fact that Cs-137 was detected in the 1993 sediment control sample. Historically, Cs-137 has been routinely measured in the control samples of other environmental media such as fish and soil.

The general 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 that 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 the 2006 shoreline sediment samples. 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 and the maximum 2006 shoreline sediment indicator Cs-137 concentration 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, and
- The maximum measured Cs-137 concentration of 0.056 pCi/g (dry).

Using these conservative parameters, the potential dose to the maximum exposed individual (teenager) would be 0.00019 mrem/year to the whole body and 0.00022 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 as measured by control TLDs in the vicinity of the site.

## D. Data Trends

The mean Cs-137 concentration for the shoreline sediment indicator sample for 2006 was 0.056 pCi/g (dry). This is consistent with mean concentrations measured at the indicator location over the past ten years.

The previous five years of data show a stable mean concentration values measured at the indicator locations. Over the five year period, mean concentrations ranged from a high of 0.08 pCi/g (dry) in 2005 to a low value of 0.04 pCi/g (dry) measured in 2004. Cesium-137 was not detected in the control location samples over this same five year period.

The previous ten year data trend for indicator shoreline samples showed a overall downward trend in concentration measured at the indicator sample locations. Over the previous ten year period of 1996 through 2006, mean concentrations at the indicator location ranged from a maximum of 0.16 pCi/g (dry) in 1996 to a minimum of 0.04 pCi/g (dry) measured in 2004. The mean indicator concentration measured in 2006 of 0.056 pCi/g (dry) continues to support the long term decreasing trend in Cs-137 concentration in shoreline sediment samples. Cesium-137 was not detected in the control samples collected over the previous ten years.

Shoreline sediment sampling at the indicator location commenced in 1985. Prior to 1985, no data was available for long term trend analysis.

Section 7.0, Tables 7-1 and 7-2 illustrate historical environmental data for shoreline sediment samples.

### 5.1.2 FISH SAMPLE RESULTS

#### A. Results Summary

A total of 22 fish samples were collected for the 2006 sample program. Species collected were: smallmouth bass, brown trout, rainbow trout, lake trout, and walleye. The analytical results for the 2006 fish samples showed no detectable concentration of radionuclide that would be attributable to plant operations at the site or past atmospheric weapons testing. The absence of Cs-137 in the 2006 fish samples is significant in the fact that it continues to validate the absence of Cs-137 in fish samples observed. With the exception of 2001, 2003, 2004, 2005 and 2006, positive concentrations of Cs-137 have been measured in fish samples collected in the previous 20 years at a combination of both the indicator and/or control locations. (Refer to Tables 7-3 and 7-4). These low levels of Cs-137 represented no significant dose to man or impact on the environment.

The 2006 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 2006 results are consistent with previous year's results in that they continue to support the general long-term downward trend in fish Cs-137 concentrations over the last 24 years. Cs-137 was not detected in fish samples collected in 2000, 2001, 2003, 2004, 2005 and 2006 from indicator locations. The period of 2000 through 2006 as a group are the lowest results measured since the beginning of the Site Environmental Monitoring Program in 1969.

#### 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 NMPNS and the JAFNPP facilities. The Oswego Harbor samples served as control samples while the NMPNS and JAFNPP samples served as indicator samples. All samples were analyzed for gamma emitters. Section 6.0, Table 6-2 shows individual results for all the samples collected in 2006 in units of pCi/g (wet).

The spring fish collection was made up of 9 individual samples representing three separate species. Walleye, smallmouth bass and brown trout were collected from all three locations.

The total fall fish collection was comprised of 13 individual samples representing five individual species. Brown trout, lake trout, rainbow trout, smallmouth bass and walleye were collected.

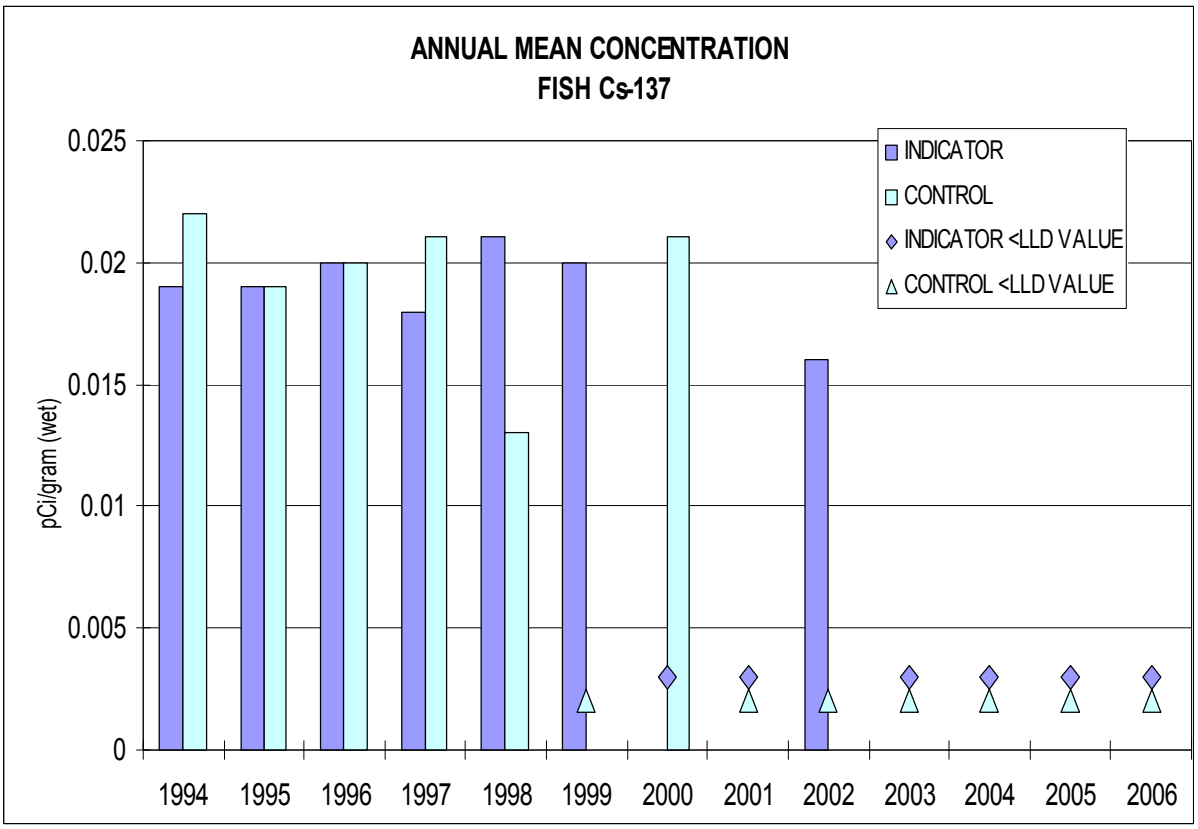
Cs-137 was not detected in any of the fish species collected for the 2006 sample program.

## C. Dose Evaluation

Fish represent the highest level in the aquatic food chain and have the potential to be a contributor to the dose to man from the operations at the site. The lack of detectable concentrations of plant-related radionuclides in the 2006 fish samples demonstrates that there is no attributable dose to man from operations at the site through the aquatic pathway. 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.

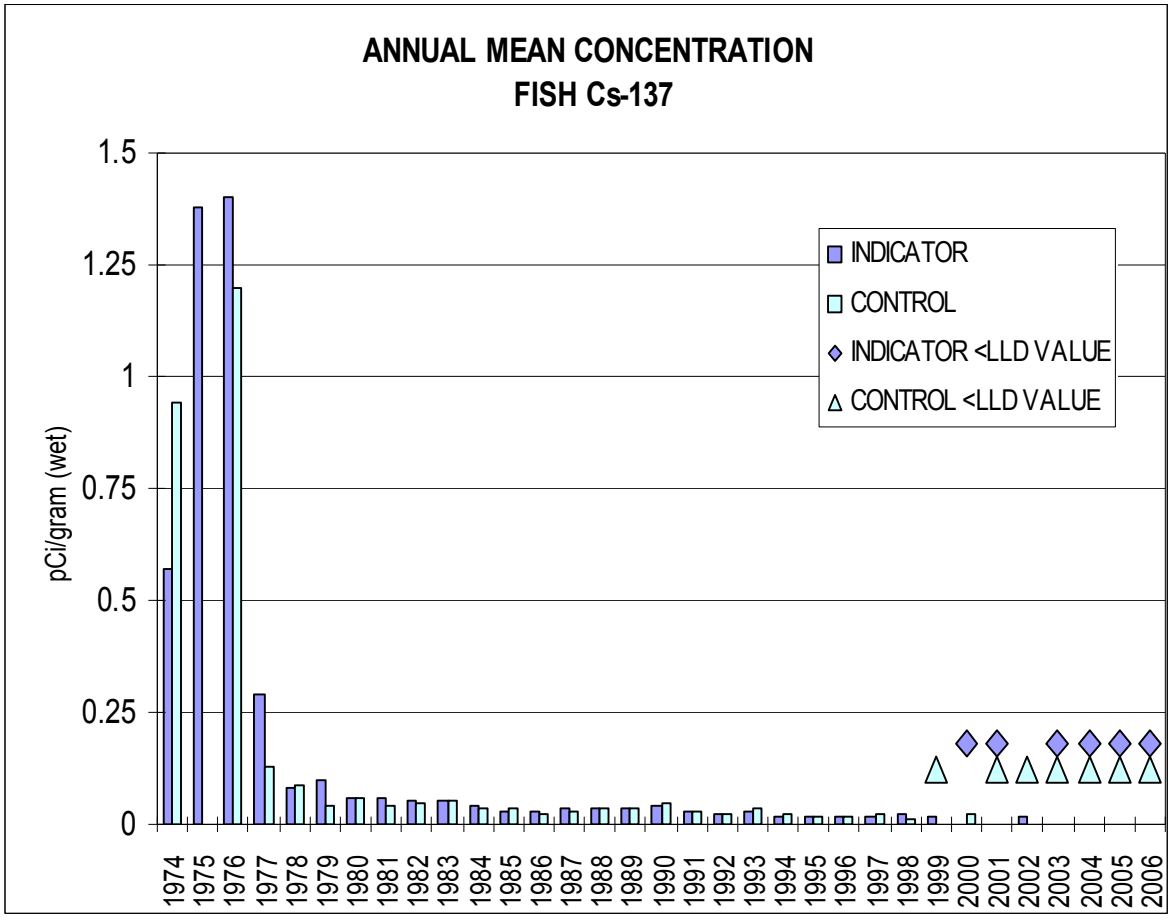
## D. Data Trends

The Cs-137 data for fish samples over the previous five years (2002 through 2006) show that the number of positive detections has decreased over this period relative to historical data. With the exception of 2002, there was no positive detection of Cs-137 over the previous five year period at the indicator locations. The lack of positive detections was continued in the 2006 sample year. The graph below illustrates the mean control and indicator Cs-137 concentrations for 2006 and the previous twelve years.



The twelve year data trend shows a consistent level of Cs-137 measured in fish between 1994 and 1998. After 1998, the number of positive detections drops off as noted in the five year trend. The 1994 through 2006 results, as a group, are the lowest Cs-137 concentrations measured over the existence of the sample program.

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 considered to be the result of weapons testing fallout. The general downward trend in concentrations will continue as a function of additional ecological cycling and radiological decay.




Section 7.0, Tables 7-3 and 7-4 show historical environmental sample data for fish.

### 5.1.3 SURFACE WATER (LAKE)

#### A. Results Summary

The ODCM requires that monthly surface water samples be taken from the respective inlet water supplies of the JAFNPP and NRG Energy's Oswego Steam Station. In conjunction with the required samples, three additional Lake Ontario surface water locations are sampled and analyzed. These additional locations are the Oswego City Water Intake, the NMP1 Intake and the NMP2 Intake. Gamma spectral analysis was performed on 24 monthly composite samples from the ODCM locations and on 36 monthly composite samples collected from the additional sample locations. The results of the gamma spectral analyses showed that only naturally-occurring radionuclides were detected in the 60 samples from the five locations collected for the 2006 Sampling Program. The two naturally-occurring radionuclide detected were K-40 and Ra-226 and were not related to plant operations. Monthly composite samples showed no presence of plant-related gamma emitting isotopes in the waters of Lake Ontario as a result of plant operations.

The monthly surface water samples are composited on a quarterly basis and are analyzed for tritium. A total of 20 samples were analyzed for tritium as part of the 2006 REMP program. The results for the 2006 samples showed no positive detections of tritium. All results for 2006 were below the established measurement sensitivity and are reported as less than the lower limit of detection (<LLD). There is no indication of a long-term buildup of tritium concentrations in the surface waters adjacent to the site.

#### B. Data Evaluation and Discussion

Gamma spectral analysis was performed on monthly composite samples from five Lake Ontario sampling locations. No plant-related radionuclide were detected in 2006 samples. This is consistent with historical data, which has not shown the presence of plant-related radionuclides in surface water samples.

Tritium samples are quarterly samples that are a composite of the applicable monthly samples for a given location. Tritium samples analyzed for the 2006 sample program were analyzed to an instrument detection level of 500 pCi/l.

The tritium results for the JAFNPP inlet canal samples contained no positive detections. The 2006 results had LLD values that ranged from <442 pCi/l to <498 pCi/l. The ODCM Control location (Oswego Steam Station inlet canal) results showed no positive detections and the sample results had LLD values in the range of <442 pCi/l to <461 pCi/l.

Tritium was not detected in any of the twelve optional Lake Ontario samples collected in 2006. The Oswego City Water inlet is sampled to monitor drinking water quality and is representative of a control location due to its distance from the site. The city water inlet is located 7.8 miles west of the site in an "upstream" direction based on the current patterns in the lake.

No positive detections of tritium were identified in 2006. The following is a summary of LLD results for the 2006 sample program:

| Sample Location | Tritium Concentration pCi/liter | | |
|---|---|---|---|
| | Minimum | Maximum | Mean (Annual) |
| JAF Inlet (Indicator)* | <442 | <498 | <466 |
| Oswego Steam Inlet (Control)* | <442 | <461 | <455 |
| NMP #1 Inlet | <442 | <461 | <455 |
| NMP #2 Inlet | <442 | <461 | <455 |
| Oswego City Water Supply | <442 | <461 | <455 |

* Sample location required by ODCM

The above LLD values are below the ODCM required LLD value of 3000 pCi/l.

Analytical results for surface water samples are found in Section 6.0, Tables 6-3 through 6-4.

## C. Dose Evaluation

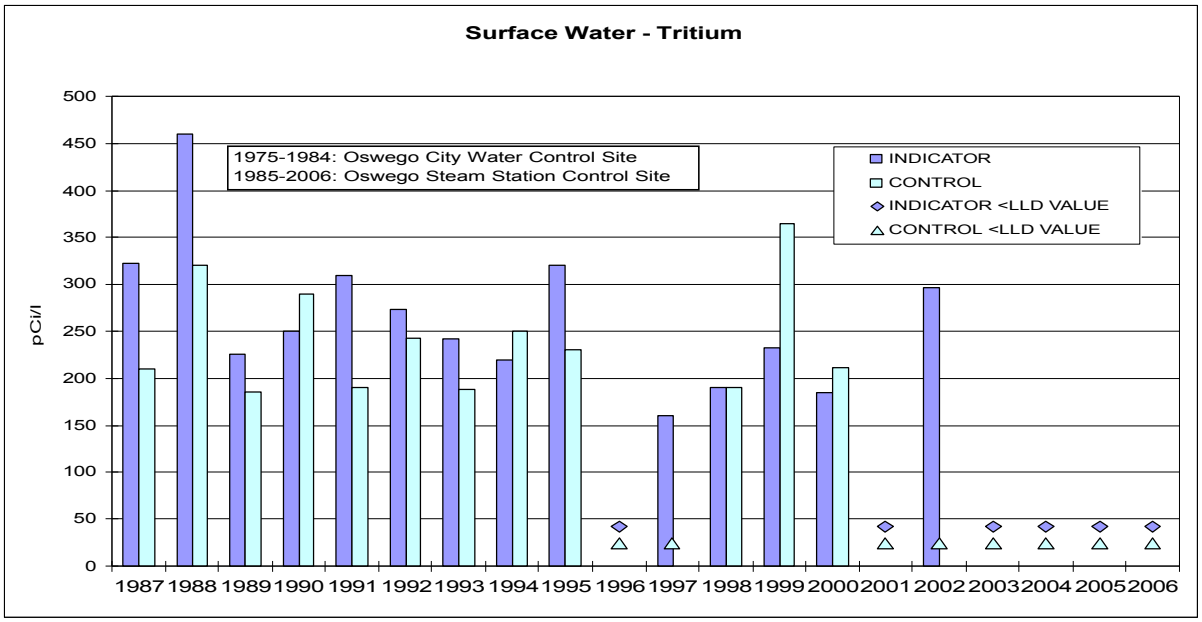
The radiological impact to members of the public from low levels of tritium in water is insignificant. This can be illustrated by calculating a dose to the whole body and maximum organ using the maximum LLD value and Regulatory Guide 1.109 methodology. Based on a water ingestion rate of 510 liters/yr and the maximum 2006 LLD concentration of <498 pCi/l, the calculated dose would be less than 0.052 mrem to the child whole body and less than 0.052 mrem to the child liver (critical age group/organ).

## 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 2006 lake water samples were consistent with results from the previous five years for both the indicator and control locations. The mean measured tritium concentrations for the previous five year period of 2001 – 2005 ranged from <LLD pCi/l to 297 pCi/l for the indicator and <LLD pCi/l for the control location. By comparison, the mean 2006 tritium concentrations were <455 pCi/l and <466 pCi/l for the control and indicator locations respectively. The previous five year data indicates no 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 indicator data from the previous ten year period, 1996 through 2005, is representative of natural variations in environmental tritium concentrations with no significant levels of tritium measured. The 1999 mean control value of 365 pCi/l is the highest concentration measured since 1987 and is within the variability of results measured over the life of the program. The ten year historical results are consistent between the control and indicator locations with no large variation in the measured results.

The following graph illustrates the concentrations of tritium measured in Lake Ontario over the past 20 years at both an indicator and control location. Prior to 1985, the Oswego City Water Supply results were used as control location data as this location closely approximates the Oswego Steam Station, the current control location. There is no existing preoperational data for comparison to recent data.




Historical data for Surface Water Tritium is presented in Section 7.0, Tables 7-7 and 7-8.

## 5.2 TERRESTRIAL PROGRAM

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

- Airborne particulate and radioiodine,
- Direct Radiation,
- Milk, and
- Food Products

Section 6.0, Tables 6-5 through 6-12 present the analytical results for the terrestrial samples collected for the 2006 reporting period.

### 5.2.1 AIR PARTICULATE GROSS BETA

#### A. Results Summary

Weekly air samples were collected and analyzed for particulate gross beta activity. For the 2006 program, a total of 52 samples were collected from control location R-5 and 208 samples were collected from indicator locations R-1, R-2, R-3, and R-4. These five locations are required by the ODCM. Additional air sampling locations are maintained and are discussed in Section 5.2.1.B below. The mean gross beta concentration for samples collected from the control location (R-5) in 2006 was 0.016 $pCi/m^3$. The mean gross beta concentration for the samples collected from the indicator locations (R-1, R-2, R-3, and R-4) in 2006 was 0.015 $pCi/m^3$. The mean gross beta results for the indicator and the control stations were equivalent in 2006. The consistency between the indicator and control mean values, demonstrates that there are no increased airborne radioactivity levels in the general vicinity of the site. The indicator results are consistent with concentrations measured over the last fifteen years. This consistency demonstrates that the natural baseline gross beta activity has been reached. The man-made 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

The air monitoring system consists of fifteen sample locations, six onsite and nine offsite. Each location is sampled weekly for particulate gross beta activity. A total of 780 samples were collected and analyzed as part of the 2006 program. Five of the nine offsite locations are required by the ODCM. 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 ODCM and is located beyond any local influence from the site. In addition, optional offsite and onsite air sample locations are maintained from which weekly samples are collected. The optional offsite locations are designated as D-2, E, F and G. The optional onsite 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.

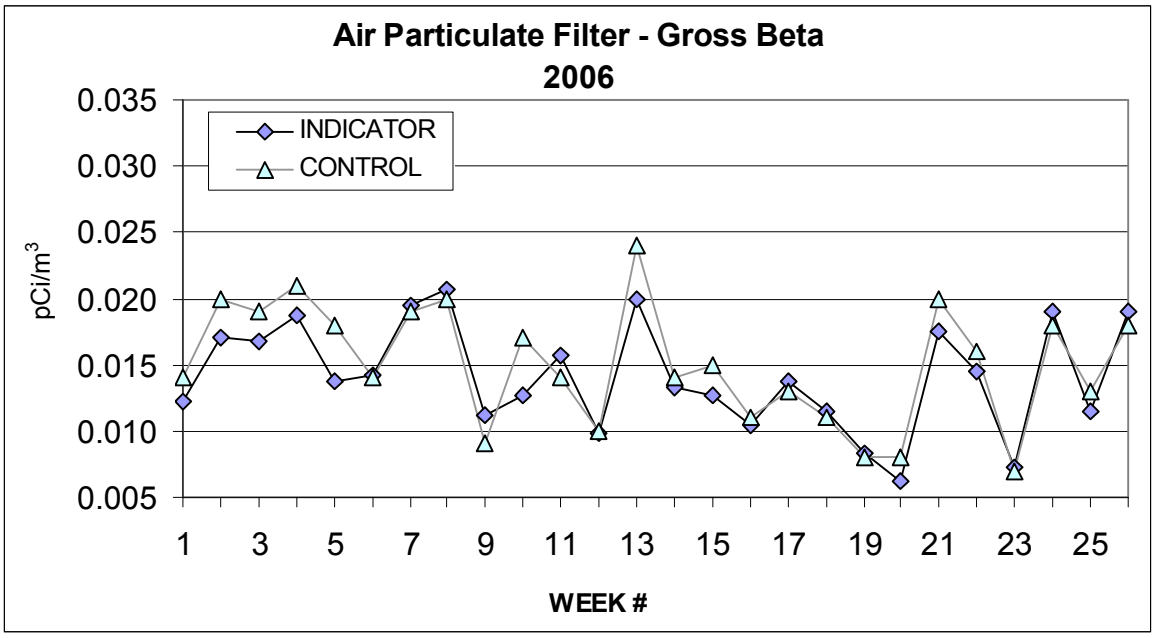
Section 6.0, Tables 6-5 and 6-6 present the weekly gross beta activity results for samples collected from the offsite and onsite locations.

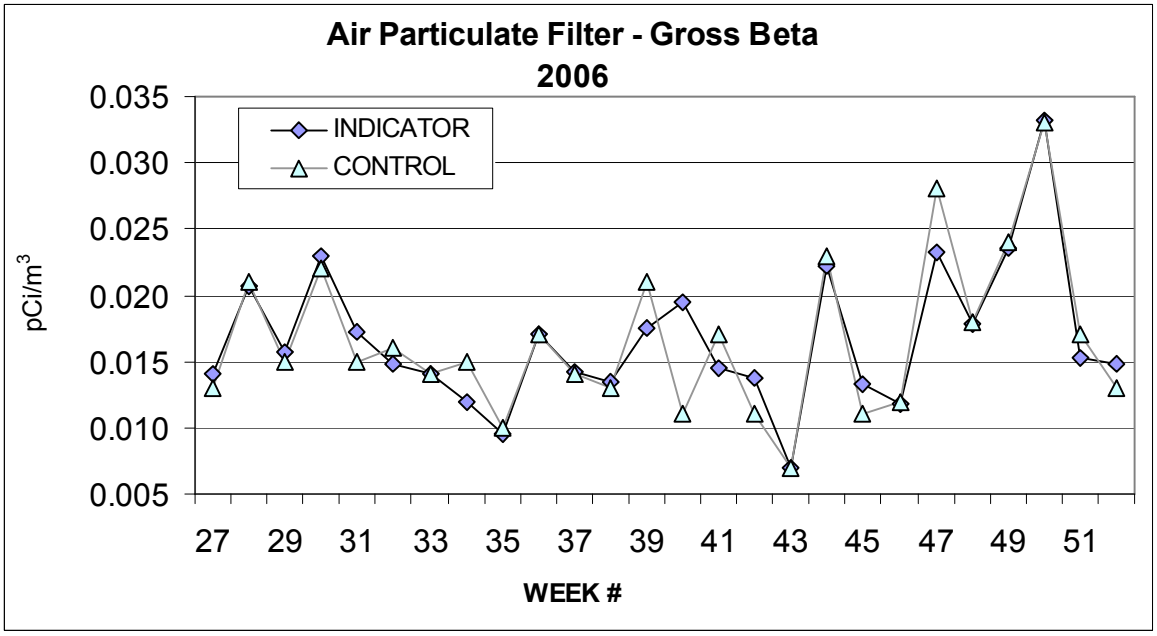
The mean annual gross beta indicator concentrations for the ODCM indicator stations (R-1, R-2, R-3 and R-4) was 0.016 pCi/$m^3$. The offsite ODCM control station (R-5) annual mean gross beta concentration was 0.016 pCi/$m^3$. The minimum, maximum and average gross beta results for sample locations required by the ODCM were as follows:

| | | Concentration pCi/$m^3$ | |
|---|---|---|---|
| Location | Minimum | Maximum | Mean |
| R-1 | 0.007 | 0.032 | 0.016 |
| R-2 | 0.007 | 0.035 | 0.016 |
| R-3 | 0.005 | 0.035 | 0.015 |
| R-4 | 0.005 | 0.031 | 0.015 |
| R-5 (control) | 0.007 | 0.033 | 0.016 |
| R1 – R4 Indicator Stations | Min 0.005 | | |
| | Max 0.035 | | |
| | Mean 0.016 | | |

The mean weekly gross beta concentrations measured in 2006 are illustrated in the following graphs:

The 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 the land are affected by time-related processes such as wind direction, precipitation, snow cover, soil temperature and soil moisture content.



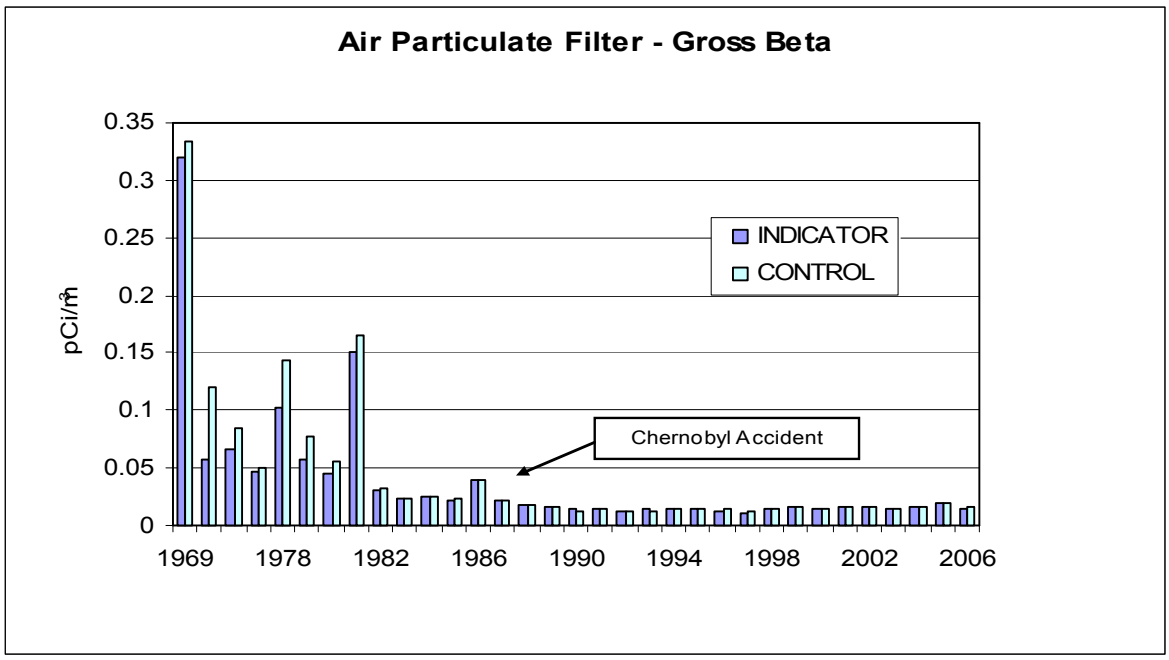
## C. Dose Evaluation

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.

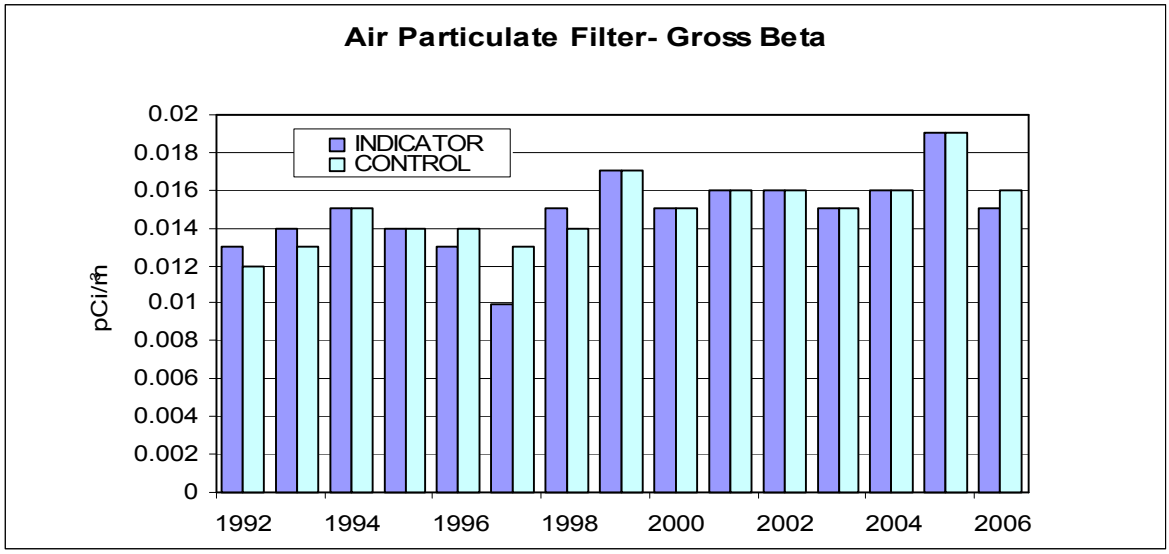
## D. Data Trends

With the exception of the 1986 sample data, which was affected by the Chernobyl accident, the general trend in air particulate gross beta activity has been one of decreasing activity since 1981, when the mean control value was 0.165 pCi/$m^3$. The 1981 samples were affected by fallout from a Chinese atmospheric nuclear test which was carried out in 1980.

The mean gross beta concentration measured in 1978 to 2006 are illustrated in the following graph:




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 1996 through 2006 is very small. This is illustrated by the following graph.




For the operational period of 1996 to 2006, the mean annual gross beta concentration at the control station (R-5) has remained steady with a narrow range of 0.013 pCi/$m^3$ to 0.019 pCi/$m^3$. The mean annual concentrations for the indicator stations for this same time period were similar to the control and ranged from a minimum of 0.010 pCi/$m^3$ in 1997 to a maximum mean of 0.019 pCi/$m^3$ in 2005.

Historical data of air particulate gross beta activity are presented in Section 7.0, Tables 7-9 and 7-10.

### 5.2.2 MONTHLY PARTICULATE COMPOSITES (GAMMA EMITTERS)

#### A. Results Summary

Fifteen air monitoring stations are maintained around the Nine Mile Point Site. Five of the 15 air monitoring stations are required by the ODCM and are located offsite near the site boundary and offsite as a control location. Ten additional air sampling stations are also 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 stations provide 780 individual air particulate samples which are assembled by location into 180 monthly composite samples. The monthly composites are analyzed using gamma spectroscopy.

No plant-related gamma emitting radionuclides were detected in any of the air particulate filter samples collected during 2006.

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

## B. Data Evaluation Discussion

A total of fifteen air sampling stations are in continuous operation and located both onsite and in the offsite sectors surrounding the Nine Mile Point Site. Five of the fifteen monitoring stations are required by the ODCM and the remaining ten are optional to provide an effective monitoring network. Composite air filter samples are assembled for each of the fifteen sampling locations. Each of the weekly air particulate filters collected for the month is assembled by location to form monthly composite samples. The monthly composite samples required by the ODCM are composite samples assembled for R-1, R-2, R-3, R-4 and R-5. Other sample locations not required by the ODCM, for which analytical results have been provided, include six onsite locations and four offsite locations. The analytical results for the 180 air particulate filter composites in 2006 showed no detectable activity of plant related radionuclides.

The results of the monthly composite samples are presented in Section 6.0, Table 6-7.

## C. 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 in 2006. The monthly air particulate sampling program demonstrated no offsite dose to man from this pathway as a result of operations of the plants located at the Nine Mile Point Site(NMP).

## D. Data Trends

No plant related radionuclides were detected during 2006 at the offsite air monitoring locations.

The ten year database 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. Co-60 was again detected in an offsite 2000 indicator sample and was the only positive detection of Co-60 since 1984. The detection of Co-60 in the one 2000 sample was an isolated event associated with effluents from the NMP1 facility. There have been no subsequent measurable concentrations of Co-60 in the environment surrounding the NMP site.

Historical data shows 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 presence of Cs-137 in the air samples collected during these years was the result of atmospheric weapons testing. Cs-137 was again detected in 1986 as a result of the Chernobyl accident. Since 1986 there have been no detections of Cs-137 in the environment surrounding the NMP site.

After 1986, no plant related or fallout radionuclides were detected in any of the offsite air particulate composite samples with the exception of the isolated detection of Co-60 in 2000 in a single sample. A review of the past five year's data for air particulate filter composites indicates no plant related radiological impact on the environment. All previous historical positive detections of fission product radionuclides were associated with atmospheric weapons testing or the Chernobyl accident, with the exception of the 2000 detection noted above.

Historical data for air particulate results are presented in Section 7.0, Tables 7-11 and 7-12.

### 5.2.3 AIRBORNE RADIOIODINE (I-131)

#### A. Results Summary

Iodine-131 (I-131) was not detected in any of the 780 samples analyzed for the 2006 program. No radioiodine (I-131) has been measured offsite at the constant air monitoring stations since 1987.

#### B. Data Evaluation and Discussion

Airborne radioiodine (I-131) is monitored at the fifteen air sampling stations also used to collect air particulate samples. There are nine offsite locations, five of which are required by the ODCM. The offsite locations required by the ODCM 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 also maintained in addition to those required by the ODCM. Six of these stations D-1, G, H, I, J and K are located onsite. D-2, E, F and G are the optional stations located offsite. 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, Tables 6-8 and 6-9.

## C. Dose Evaluation

The calculated dose as a result of I-131 was not evaluated due to the fact I-131 was not detected during 2006. The I-131 sampling program demonstrated no offsite dose to man from this pathway as a result of operation of the plants located at Nine Mile Point.

## D. Data Trends

No radioiodine has been detected in samples collected from the air sampling locations required by the ODCM since 1987.

There has been no positive detection of I-131 in air samples collected over the last ten years. This demonstrates that there is no measurable environmental impact or positive trend for iodine buildup due to plant operations during the period from 1996 through 2006. I-131 has previously been detected in samples collected in 1986 and 1987. The 1986 detection of I-131 was the result of the Chernobyl accident and the 1987 detection was the result of plant operations.

I-131 has been detected in the past at control locations. Control samples collected during 1976 had a mean I-131 concentration of 0.60 $pCi/m^3$. During 1977 this mean decreased to 0.32 $pCi/m^3$, and further decreased by a factor of ten to 0.03 $pCi/m^3$ in 1978. I-131 was not detected in samples collected from the control location during 1979 – 1981 and 1983 to 1985. I-131 was detected once at the control location during 1982 at a concentration of 0.039 $pCi/m^3$.

Iodine-131 has been detected in samples collected from the onsite indicator locations during 1980 to 1983 and 1986 to 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 mean indicator 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 positive detection of I-131 in samples collected in 1986 was the direct result of the Chernobyl Nuclear accident.

Historical data for I-131 are presented in Section 7.0, Tables 7-13 and 7-14.

## 5.2.4 DIRECT RADIATION THERMOLUMINESCENT DOSIMETERS (TLD)

### A. Results Summary

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. As part of the 2006 environmental monitoring program, TLDs were placed at a total of 72 different environmental TLD locations (32 required by the ODCM and 40 optional locations). These TLDs were placed, collected and read each quarter of 2006. As a result of placing two TLDs at each location, the results presented in this report are the average of two TLD readings obtained for a given location.

The TLDs were placed in the following five geographical locations around the site boundary:

- Onsite (areas within the site boundary includes TLD #s 3, 4, 5, 6, 7, 23, 24, 25, 26, TLD #s 18, 27, 28, 29, 30, 31, 39, 47, 103, 106, 107 are excluded)
- Site Boundary (area of the site boundary in each of the 16 meteorological sectors: Only includes TLD results that are not affected by radwaste direct shine are TLD #s 7, 18, 78, 79, 80, 81, 82, 83, 84, excluded TLD #s: 23, 75, 76, 77, 85, 86, 87)
- Offsite Sector (area four to five miles from the site in each of the eight land based meteorological sectors, includes TLD #s: 88, 89, 90, 91, 92, 93, 94, 95)
- Special Interest (areas of high population density, includes TLD #s 15, 56, 58, 96, 97, 98)
- Control (areas beyond significant influence of the site includes TLD #s 8, 14, 49)

All geographical locations are required by the ODCM with the exception of the Onsite area which was optional. Description of the five geograpical categories and the designation of specific TLD locations that make up each category is presented in Section 3.1.5, TLD (Direct Radiation) of this report.

A summary of the 2006 dose rates for each of the five geographical locations is as follows:

| Geographic Category | Dose in mrem per standard month | | |
|---|---|---|---|
| | Min | Max | Mean |
| Onsite (Optional) | 3.5 | 14.4 | 5.3 |
| Site Boundary (Inner Ring) * | 3.5 | 4.7 | 4.1 |
| Offsite Sectors (Outer Ring) * | 3.3 | 4.4 | 4.0 |
| Special Interest * | 3.5 | 4.6 | 4.0 |
| Control * | 3.3 | 5.3 | 4.3 |

* Geographical locations required by the ODCM

Comparison of annual mean dose rates associated with each geographical location indicate that there is no statistical difference in annual dose as a function of distance from the site boundary. The measured annual dose rate at the nearest resident to the site was consistent with the dose rates measured at the site boundary and control locations. The results for the Site Boundary, Offsite Sectors and Special Interest (Offsite) were well within expected normal variation when compared to the Control TLD results.

The results for the 2006 environmental TLD monitoring program indicate that there was no significant increase in dose rates as a result of operations at the site. The Hydrogen Water Chemistry system and the Independent Spent Fuel Storage Installation (ISFSI) in use at the Fitzpatrick plant did not measurably increase the ambient radiation exposure rate beyond the site boundary.

## B. Data Evaluation and Discussion

Direct Radiation (Gamma Dose) measurements were taken at 72 different environmental locations during 2006, 32 of which are required by the ODCM. These locations are grouped into five geographical location categories for evaluation of results. The five categories include: Onsite, Site Boundary, Offsite Sector, Special Interest and Control locations. All categories are required by the ODCM with the exception of the Onsite TLDs. Onsite TLDs are placed at various locations within the site boundary to provide additional information on direct radiation levels at and around the NMP1, NMP2 and JAFNPP facilities.

Onsite TLD results ranged from 3.5 to 14.4 mrem per standard month in 2006. This range includes TLDs that are located near NMP1, NMP2 and JAFNPP generating facilities including those in close proximity to the Radwaste buildings of NMP1, NMP2 and JAFNPP.

Site Boundary TLD results ranged from 3.5 to 9.2 mrem per standard month in 2006. This range included all TLDs placed in each of the 16 meteorological sectors in the general area of the site boundary. The highest dose rate measured at a location required by the ODCM was 9.2 mrem per standard month. This TLD, (TLD 85) represents the site boundary maximum dose and is located in the WNW sector along the lake shore in close proximity to the NMP1 plant. The TLD locations along the lakeshore close to the plants (TLD #s 75, 76, 77, 85, 86 and 87) are influenced by radwaste buildings and radwaste shipping activities. These locations and are not accessible to members of the public and the TLD results for these areas are not representative of dose rates measured at the remaining site boundary locations. The remaining Site Boundary TLD locations, which are located away

from the plant ranged from 3.5 to 4.7 mrem per standard month resulting in an average dose rate of 4.1 mrem per standard month.

Offsite Sector TLDs, required by the ODCM, located 4 to 5 miles from the site in each of the 8 land based meteorological sectors ranged from 3.3 to 4.4 mrem per standard month with an average dose rate of 4.0 mrem per standard month.

Special Interest TLDs from all locations ranged from 3.5 to 4.6 mrem per standard month with a 2006 annual average dose rate of 4.0 mrem per standard month.

The Control TLD group required by the ODCM utilizes locations positioned well beyond the site. 2006 Control TLD results ranged from 3.3 to 5.3 mrem per standard month with an annual average dose rate of 4.3 mrem per standard month. These results include both the ODCM required control TLDs and the additional control TLDs.

TLD analysis results are presented in Section 6.0, Table 6-10.

**C. Dose evaluation**

2006 annual mean dose rates for each geographic location required by the ODCM (excluding TLD #s 75, 76, 77, 85,86,87) are as follows:

Site Boundary: 4.1 mrem per standard month (TLD #s: 7,18, 78, 79, 80, 81, 82, 83, 84)

Offsite Sectors: 4.0 mrem per standard month (TLD #s: 88, 89, 90, 91, 92, 93, 94, 95)

Special Interest: 4.0 mrem per standard month (TLD #s: 15, 56, 58, 96, 97)

Control: 4.3 mrem per standard month (TLD #s 8, 14, 49)

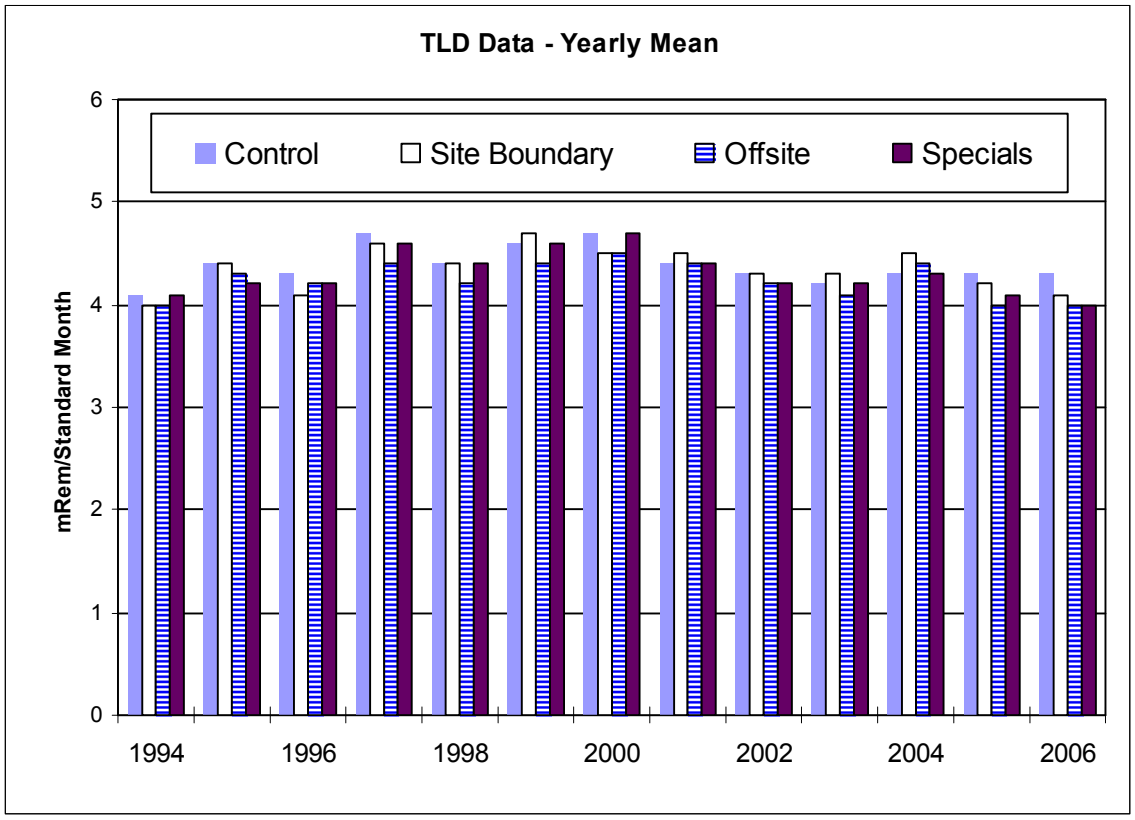
The measured mean dose rate in the proximity of the closest resident was 4.2 mrem per standard month (TLD #s: 108, 109) which is consistent with the control measurements of 4.1 mrem per standard month.

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 offsite environment.

## D. Data Trends

A comparison of historical TLD results can be made using the different geographical categories of measurement locations. These include Site Boundary TLDs located in each of the 16 meteorological sectors, TLDs located offsite in each land based sector at a distance of 4 to 5 miles from the site, TLDs located at special interest areas and TLDs located at control locations. Site Boundary, Offsite Sector and Special Interest TLD locations became effective in 1985; therefore, trends for these results can only be evaluated from 1985 to the present.

The following graph illustrates TLD results for the Control, Site Boundary, Offsite Sectors and Special Interest groups from 1992 through 2006:



TLDs located at the site boundary averaged 4.1 mrem per standard month during 2006 (Site Boundary average results do not include TLDs influenced by radwaste buildings and radwaste shipping activities: TLDs 75, 76, 77, 85, 86, 87). This result is consistent with the previous five year average of 4.3 mrem per standard month.

Offsite Sector TLDs averaged 4.0 mrem per standard month during 2006. This result is also consistent with the previous five year average of 4.2 mrem per standard month for offsite sectors.

Special Interest TLD locations averaged 4.0 mrem per standard month during 2006 which is consistent with the previous five year average of 4.1 mrem per standard month.

The last group of TLD locations required by the ODCM is the Control Group. This group utilized TLD locations positioned well beyond the site. 2006 control results from all Control TLDs averaged 4.1 mrem per standard month, consistent with the previous five year average of 4.3 mrem per standard month. The 2006 TLD program results, when compared to the previous seventeen years, showed no significant trends relative to increased dose rates in the environment.

Section 7.0, Tables 7-15 through 7-20 show the historical environmental sample data for environmental TLDs.

### 5.2.5 MILK

#### A. Results Summary

A total of 72 milk samples were collected during the 2006 program and 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).

I–131, a possible plant related radionuclide, is measured to evaluate the cow/milk dose pathway to man. I-131 was not detected in any of the 72 milk samples collected in 2006 from the four milk sample locations.

Gamma spectral analyses of the milk samples showed only naturally occurring radionuclides, such as K-40, were detected in milk samples collected during 2006. K-40 was detected in all indicator and control samples. K-40 is a naturally occurring radionuclide and is found in many environmental sample media.

The 2006 results demonstrate that routine operations of the Nine Mile Point Site resulted in no measurable contribution to the “dose to the public” from the cow/milk pathway.

## B. Sampling Overview

Milk samples were collected from three indicator locations and one control location. The ODCM requires 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 2006. Samples were collected from four farms located beyond the five-mile requirement to ensure the continued monitoring of this important pathway. The three indicator locations ranged from 6.3 to 9.0 miles from the site. The control samples were collected from a farm located 16.0 miles from the site and in a low frequency wind sector (upwind). The geographic location of each sample location is listed below:

| Location No. | Direction From Site | Distance (Miles) |
|---|---|---|
| 76 | SE | 6.3 |
| 55 | E | 8.7 |
| 4 | ESE | 7.6 |
| 77 (Control) | SSW | 16.0 |

Samples were collected from Indicator locations #4, #55, # 76 and Control location #77 from April through December, during the first and second half of each month. Samples were not required to be collected during January through March of 2006 as a result of I-131 not having been detected in samples collected during November and December of 2006, as stipulated in the ODCM.

## C. Data Evaluation and Discussion

Each milk 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 and gamma analysis results for milk samples collected during 2006 are provided in Section 6.0, Table 6-11.

Iodine–131 was not detected in any indicator or control milk samples analyzed during 2006. All I-131 milk results were reported as Lower Limits of Detection (LLD). The LLD results for all samples ranged from <0.50 to <0.85 pCi/l. No plant-related radionuclides were detected in any milk sample collected in 2006. K-40 was the most abundant radionuclide detected, and found in every indicator and control sample collected. K-40 is a naturally-occurring radionuclide and is found in many of the environmental media samples. The K-40 concentration for all milk samples analyzed ranged from 1360 to 1790 pCi/l. Cs-137 was not detected in any indicator or control milk sample collected in 2006.

### 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 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 as a result of internal deposition of naturally-occurring K-40.

### E. Data Trends

Manmade radionuclides are not routinely detected in milk samples. In the past twenty years, Cs-137 was only detected in 1986, 1987, and 1988. The mean Cs-137 indicator activities for those years were 8.6, 6.8 and 10.0 pCi/liter, respectively. I-131 was measured in two milk samples collected in 1997 from a single sample location, having a mean concentration of 0.50 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.

The comparison of 2006 data to historical results over the operating life of the plants shows that Cs-137 and I-131 levels have decreased significantly since 1988.

Historical data of milk sample results for Cs-137 and I-131 are presented in Section 7.0, Tables 7-21 and 7-22.

## 5.2.6 FOOD PRODUCTS (VEGETATION)

### A. Results Summary

There were no plant-related radionuclides detected in the 28 food product samples collected and analyzed for the 2006 program.

Detectable levels of naturally occurring K–40 were measured in all control and indicator samples collected for the 2006 program. Be-7 a naturally-occurring radionuclide, was also detected intermittently in samples collected in 2006. These results are consistent with the levels measured in 2005 and previous years.

The results of the 2006 sampling program demonstrate that there is no measurable impact on the dose to the public from the garden pathway as a result of plant operations.

## B. Data Analysis and Discussion

Food product samples were collected from four indicator locations and one control location. 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 2006 included one variety considered to be an edible broadleaf vegetable. Collards, an edible broadleaf vegetable, was collected from one indicator location. Collards was not available from the control location. The general lack of edible broadleaf vegetation samples was the result of grower preference 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, zuccini leaves, rhubarb, grape leaves, pumpkin leaves, corn leaves, horseradish leaves and pepper leaves were collected for the 2006 program. The leaves of these plants were sampled as representative of broadleaf vegetation which is a measurement of radionuclide deposition. In addition to the broadleaf vegetation, tomato samples were collected from all locations. Samples were collected during the late summer/fall harvest season. Each sample was analyzed for gamma emitters using gamma spectroscopy.

The analysis of food product samples collected during 2006 did not detect any plant-related radionuclides. Results for the past five years also demonstrate that there is no buildup 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 0.28 to 5.05 pCi/g (wet). The concentration of K-40 in indicator and control samples ranged from 2.31 to 6.32 pCi/g (wet). The results for naturally-occurring radionuclides are consistent with the data of prior years.

Analytical results for food products are found in Section 6.0, Table 6-12.

### C. 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 food product sampling program demonstrated no measurable offsite dose to man from this pathway as a result of operations of the plants located at Nine Mile Point.

### D. Data Trends

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

The last positive indication was for Cs-137 which was detected at one indicator location in 1999 with a concentration of 0.007 pCi/g (wet).

Historically, Cs-137 had been detected in ten separate years since 1976 ranging from a maximum mean concentration of 0.047 pCi/g (wet) in 1985 to a minimum of 0.006 pCi/g (wet) in 1994. The trend for Cs-137 is a general reduction in concentration to non detectable levels in samples collected during the 2000 through 2006 sample programs.

Historical data of food product results are presented in Section 7.0, Tables 7-23 and 7-24.

## 5.2.7 LAND USE CENSUS RESULTS

### A. Results Summary

The ODCM requires 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 2006, a milk animal census, a nearest resident census and a garden survey were performed. The results of the closest residence census conducted in 2006 required no change to Fitzpatrick ODCMs' closest resident location.

A garden census, not required by the ODCM, is performed to identify appropriate garden sampling locations and dose calculation receptors. Garden samples were collected from a number of locations identified in the census as active for 2006. See Table 3.3-1 for 2006 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 Nine Mile Point 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 ODCM. A resident census is conducted and is designed to identify the nearest resident in each meteorological sector out to a distance of 5 miles.
The milk animal census is an estimation of the number of cows and goats within an approximate 10 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 extension service is also contacted as an additional source of information concerning new milk animal locations in the vicinity of the site.

The number of milk animals located within an approximate 10 mile radius of the site was estimated to be 533 cows and 6 goats based on the 2006 land use census. The number of cows has increased by 26 and the number of goats has decreased by 1 when compared to the 2005 census. The census determined that the milk from the goats identified is was not shipped in 2006 . The results of the milk animal census are found in Section 6.0, Table 6-13.

The second type of census conducted 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. There were two changes identified in the 2006 census for the closest resident in the land based meteorological sectors. The nearest resident locations are illustrated in Section 3.3, Figure 3.3-5. Both changes were in the same general area and had similar D/Q for their respective meteological sectors.

## 5.2.8 DIRECT RADIATION, THERMOLUMINESCENT DOSIMETERS (TLD)

### Independent Spent Fuel Storage Installation (ISFSI)

### A. Results Summary

Thermoluminescent Dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the localized environment of the ISFSI pad. Eighteen TLD locations are in place around the perimeter of the ISFSI pad. TLDs were placed at these locations prior to loading the first storage casks for baseline dose rate determination in the general area of the pad.

On April 25, 2002, the ISFSI facility was placed in service with the installation of the first storage cask on the pad. Two subsequent storage casks were moved to the storage facility on May 8, 2002 and May 21, 2002. A second series of six storage casks were added to the storage facility starting on September 6, 2005. The sixth and last cask in this series was placed in the storage facility on November 12, 2005 bringing the total number of casks in storage to nine. The nine casks are located on the northern end of the pad are in close proximity to the north ISFSI perimeter fence. In addition, the radiation exposure from hydrogen water chemistry also contribute to the higher dose rates measured at the north fenceline of the ISFSI storage facility.

The increase in dose rate is limited to the general area of the storage facility. The implementation and loading of the ISFSI project has resulted in no increase in dose at the site boundary or to the public. The analysis of offsite doses from direct radiation measurements, presented in Section 5.2.4 of this report, concludes that there is no significant difference in annual dose to the public at or beyond the site boundary. The measured annual dose rate at the nearest residence to the site was consistent with the dose rates measured at the site boundary and the offsite control locations. The results for the Site Boundary, Offsite Sectors, and Special Interest (offsite) were well within expected normal variation when compared to the Control TLD results. The results for the 2006 environmental TLD monitoring program indicate that there is no significant increase in dose rates as a result of operations at the site. The use of hydrogen injection and the implementation of the Independent Spent Fuel Storate Installation (ISFSI) at the FitzPatrick plant did not measurably increase the ambient radiation exposure rate at or beyond the site boundary. The lack of a dose rate increase at or beyond the site boundary is consistent with design calculations performed to evaluate compliance with 10 CFR72.104(a).

The measured results of the 2006 TLD monitoring program demonstrate compliance with the offsite dose limits to members of the public specified in 40CFR190 and 10CFR72.104(a).

## B. Program Design

An array of eight TLD locations was established around the perimeter of the ISFSI pad 18 months prior to facility usage. Six months prior to the facility becoming operational, an additional 10 TLD locations were established at areas of interest on the facility perimeter. These preoperational TLDs were used for baseline dose rate determination. The TLDs are placed, collected and read each quarter. Two dosimeters are placed at each location and the average of the two dosimeters is reported. The quarterly results are compared to baseline data to assess the contribution to ambient dose rates in the vicinity of the storage facility from casks as they are placed on the storage pad.

## C. Dose Evaluation

A maximum dose rate of 17.1 mrem per standard month above the baseline dose rate was measured at the north perimeter fence. The lowest measured dose rate of 2006 was 3.9 mrem per standard month above the baseline dose rate and was measured at the southern perimeter fence.

An evaluation of Site Boundary TLDs and Control TLDs results for 2006 shows that there is no increase in dose rate at or beyond the site boundary. A detailed discussion of this evaluation is found in Section 5.2.4. The Environmental TLD results for this period show no significant difference in control and site boundary dose rates for 2006.

2006 DOSE IN MREM PER STANDARD MONTH

| | Minimum | Maximum | Mean |
|---|---|---|---|
| Site Boundary | 3.5 | 4.7 | 4.1 |
| Control | 3.3 | 5.3 | 4.3 |

## 5.3 CONCLUSION

The Radiological Environmental Monitoring Program (REMP) is an ongoing 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 federal government has established dose limits to protect the public from radiation and radioactivity. The Nuclear Regulatory Commission (NRC) specifies a whole body dose limit of 100 mrem/yr to be received by the maximum exposed member of the general public. This limit is set forth in Section 1301, Part 20, Title 10 of the U.S. Code of Federal Regulations (10CFR20). The Environmental Protection Agency (EPA) limits the annual whole body dose to 25 mrem/yr, which is specified in Section 10, Part 190, Title 40, of the Code of Federal Regulations (40CFR190). Radiation exposure to members of the public, calculated based on the results of the REMP, is extremely small. The dose to members of the public from operations at the Nine Mile Point site, based on environmental measurement and calculations made from effluent releases, is determined to be a fraction of limits set forth by the NRC and EPA.

The results of the 2006 Radiological Environmental Surveillance Program continue 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 or even measurable radiation exposures to the general public as confirmed by the sampling and analysis of environmental media from recognized environmental pathways. Based on TLD results there was no measurable increase in radiation levels beyond the site boundary as a result of the hydrogen water chemistry programs. Environmental radiation levels measured at the nearest residence are at the background level based on control station TLD results. 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 measurable inventory of Cs-137 in the environment. The results for the 2006 sample program demonstrate that the concentrations of man-made 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 potential plant-related radionuclide in the sample media collected during 2006. Cs-137 was detected in one shoreline sediment sample. The source of the Cs-137 measured in this sample is considered to be fallout from past atmospheric nuclear weapons testing. The measured concentration of Cs-137 in the sample was small and consistent with historical results for shoreline sediment. The impact of these Cs-137 concentrations are minimal in terms of dose to man. Dose from man-made sources in the environment is very small when compared to the dose originating 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 dose to members of the public, resulting from plant operations, is extremely small in comparison to the dose contribution from natural background levels and sources other than the plants. The whole body dose in Oswego County due to 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.

Based upon the overall results of the 2006 Radiological Environmental Monitoring Program, it can be concluded that the levels and variation of radioactivity in the environment samples were consistent with background levels that would be expected for the lakeshore environment of the site.

## 5.4 REFERENCES


1. U.S. Nuclear Regulatory Commission Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", March 1976.

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5. National Council on Radiation Protection and Measurements (NCRP), Environmental Radiation Measurements, NCRP Report No. 50, 1975.

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9. International Commission on Radiological Protection (ICRP), Radionuclide Release into the Environment: Assessment of Doses to Man, ICRP Publication 29, 1979.

10. Glasstone, Samuel and Jordan, Walter H., Nuclear Power and Its Environmental Effects, First Edition, American Nuclear Society, La Grange Park, Ill., 1980.

11. Schleien, Bernard. The Health Physics and Radiological Health Handbook. Scinta, Inc., Silver Spring, Maryland, 1992.

12. U.S. Department of Health and Human Services. Preparedness and Response in Radiation Accidents, National Center for Devices and Radiological Health, Rackville, Maryland 20857, August 1983.

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

14. National Council on Radiation Protection and Measurements (NCRP), Exposure of the Population in the United States and Canada from National Background Radiation, NCRP Report No. 94, 1987.

## 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 Related 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 – 2006**
**Results in Units of pCi/g (dry) ± 1 Sigma**

| Sample Location | Collection Date | GAMMA EMITTERS | | | | | |
|---|---|---|---|---|---|---|---|
| | | K-40 | Co-60 | Cs-134 | Cs-137 | Zn-65 | Others † |
| Sunset Bay (05)*** | 04/19/06 | 18.6 ± 1.33 | <0.104 | <0.131 | <0.108 | <0.296 | <LLD |
| | 10/19/06 | 17.9 ± 0.57 | <0.052 | <0.044 | 0.056 ± 0.02 | <0.064 | <LLD |
| Lang's Beach (06, Control) *** | 04/19/06 | 14.5 ±0.55 | <0.047 | <0.052 | <0.046 | <0.063 | <LLD |
| | 10/19/06 | 11.5 ± 0.59 | <0.053 | <0.048 | <0.038 | <0.070 | <LLD |

*** Corresponds to sample location noted on Figure 3.3-5

† Plant related radionuclides

**TABLE 6-2**

**CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES – 2006**
**Results in Units of pCi/g (wet) ± 1 Sigma**

## FITZPATRICK (03)***

| Date | Type | K-40 | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Cs-134 | Cs-137 | Others † |
|---|---|---|---|---|---|---|---|---|---|---|
| 05/31/06 | Brown Trout | 4.63 ± 0.45 | <0.051 | <0.052 | <0.122 | <0.058 | <0.137 | <0.041 | <0.049 | <LLD |
| 05/31/06 | Smallmouth Bass | 5.15 ±0.54 | <0.070 | <0.049 | <0.251 | <0.065 | <0.158 | <0.058 | <0.062 | <LLD |
| 05/31/06 | Walleye | 5.14 ± 0.49 | <0.041 | <0.042 | <0.212 | <0.040 | <0.137 | <0.063 | <0.052 | <LLD |
| 09/07/06 | Brown Trout | 5.18 ± 0.47 | <0.042 | <0.048 | <0.152 | <0.064 | <0.150 | <0.045 | <0.053 | <LLD |
| 09/07/06 | Lake Trout | 5.28 ± 0.49 | <0.052 | <0.051 | <0.125 | <0.054 | <0.114 | <0.053 | <0.060 | <LLD |
| 09/07/06 | Smallmouth Bass | 5.67 ± 0.61 | <0.065 | <0.052 | <0.163 | <0.065 | <0.179 | <0.064 | <0.059 | <LLD |
| 09/07/06 | Walleye | 5.07 ± 0.52 | <0.043 | <0.062 | <0.190 | <0.054 | <0.162 | <0.048 | <0.058 | <LLD |

*** Corresponds to sample location noted on Figure 3.3-5

† Plant related radionuclides

**TABLE 6-2 (continued)**

**CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES – 2006**
**Results in Units of pCi/g (wet) ± 1 Sigma**

## NINE MILE POINT (02)***

| Date | Type | K-40 | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Cs-134 | Cs-137 | Others † |
|---|---|---|---|---|---|---|---|---|---|---|
| 05/31/06 | Brown Trout | 4.17 ± 0.44 | <0.049 | <0.049 | <0.135 | <0.049 | <0.132 | <0.049 | <0.049 | <LLD |
| 06/06/06 | Smallmouth Bass | 5.82 ± 0.45 | <0.046 | <0.050 | <0.128 | <0.057 | <0.107 | <0.048 | <0.046 | <LLD |
| 06/06/06 | Walleye | 5.45 ± 0.51 | <0.053 | <0.059 | <0.204 | <0.055 | <0.125 | <0.060 | <0.046 | <LLD |
| 08/31/06 | Brown Trout | 5.49 ± 0.62 | <0.067 | <0.105 | <0.216 | <0.082 | <0.136 | <0.059 | <0.055 | <LLD |
| 08/31/06 | Rainbow Trout | 3.60 ± 0.38 | <0.062 | <0.056 | <0.195 | <0.062 | <0.168 | <0.036 | <0.056 | <LLD |
| 09/06/06 | Smallmouth Bass | 4.46 ± 0.53 | <0.056 | <0.047 | <0.123 | <0.079 | <0.161 | <0.065 | <0.071 | <LLD |
| 09/06/06 | Walleye | 4.71 ± 0.54 | <0.072 | <0.056 | <0.189 | <0.073 | <0.143 | <0.071 | <0.056 | <LLD |

*** Corresponds to sample location noted on Figure 3.3-5

† Plant related radionuclides

**TABLE 6-2 (continued)**

**CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES – 2006**
**Results in Units of pCi/g (wet) ± 1 Sigma**

## OSWEGO HARBOR (CONTROL) (00)***

| Date | Type | K-40 | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Cs-134 | Cs-137 | Others † |
|---|---|---|---|---|---|---|---|---|---|---|
| 05/31/06 | Smallmouth Bass | 6.14 ± 0.45 | <0.039 | <0.051 | <0.130 | <0.060 | <0.130 | <0.042 | <0.051 | <LLD |
| 06/01/06 | Brown Trout | 4.55 ± 0.53 | <0.056 | <0.072 | <0.196 | <0.069 | <0.172 | <0.053 | <0.064 | <LLD |
| 06/01/06 | Walleye | 4.76 ± 0.46 | <0.046 | <0.054 | <0.188 | <0.072 | <0.094 | <0.054 | <0.050 | <LLD |
| 09/07/06 | Brown Trout | 5.86 ± 0.48 | <0.068 | <0.057 | <0.170 | <0.046 | <0.158 | <0.069 | <0.060 | <LLD |
| 09/07/06 | Lake Trout | 4.85 ± 0.48 | <0.057 | <0.055 | <0.126 | <0.050 | <0.156 | <0.051 | <0.047 | <LLD |
| 09/07/06 | Rainbow Trout | 6.07 ± 0.57 | <0.075 | <0.062 | <0.217 | <0.098 | <0.166 | <0.050 | <0.056 | <LLD |
| 09/07/06 | Walleye | 5.54 ± 0.56 | <0.048 | <0.075 | <0.148 | <0.074 | <0.175 | <0.057 | <0.071 | <LLD |
| 09/08/06 | Smallmouth Bass | 4.79 ± 0.52 | <0.055 | <0.054 | <0.214 | <0.056 | <0.134 | <0.069 | <0.058 | <LLD |

*** Corresponds to sample location noted on Figure 3.3-5

† Plant related radionuclides

**TABLE 6-3**

**CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES – 2006**
**(QUARTERLY COMPOSITE SAMPLES)**

**Results in Units of pCi/l ± 1 Sigma**

| Station Code | Period | Date | Tritium |
|---|---|---|---|
| FitzPatrick* (03, Inlet)*** | First Quarter | 12/30/2005 – 03/31/2006 | <467 |
| | Second Quarter | 03/31/2006 – 06/29/2006 | <498 |
| | Third Quarter | 06/29/2006 – 09/29/2006 | <442 |
| | Fourth Quarter | 09/29/2006 – 12/29/2006 | <457 |
| Oswego Steam Station* (08, Control)*** | First Quarter | 12/30/2005 – 03/31/2006 | <461 |
| | Second Quarter | 03/31/2006 – 06/29/2006 | <459 |
| | Third Quarter | 06/29/2006 – 09/29/2006 | <442 |
| | Fourth Quarter | 09/29/2006 – 12/29/2006 | <457 |
| Nine Mile Point Unit 1** (09, Inlet)*** | First Quarter | 12/30/2005 – 03/31/2006 | <461 |
| | Second Quarter | 03/31/2006 – 06/29/2006 | <459 |
| | Third Quarter | 06/29/2006 – 09/29/2006 | <442 |
| | Fourth Quarter | 09/29/2006 – 12/29/2006 | <457 |
| Nine Mile Point Unit 2** (11, Inlet)*** | First Quarter | 12/30/2005 – 03/31/2006 | <461 |
| | Second Quarter | 03/31/2006 – 06/29/2006 | <459 |
| | Third Quarter | 06/29/2006 – 09/29/2006 | <442 |
| | Fourth Quarter | 09/29/2006 – 12/29/2006 | <457 |
| Oswego City Water** (10)*** | First Quarter | 12/30/2005 – 03/31/2006 | <461 |
| | Second Quarter | 03/31/2006 – 06/29/2006 | <459 |
| | Third Quarter | 06/29/2006 – 09/29/2006 | <442 |
| | Fourth Quarter | 09/29/2006 – 12/29/2006 | <457 |

* Sample location required by ODCM
** Optional Sample location
*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-4**

**CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

**OSWEGO STEAM STATION * (08, CONTROL)*****

| Nuclide | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| I-131 | <0.81 | <0.78 | <0.82 | <0.80 | <0.85 | <0.70 |
| Cs-134 | <2.86 | <4.01 | <3.16 | <2.74 | <3.85 | <3.97 |
| Cs-137 | <2.61 | <3.48 | <3.02 | <2.03 | <3.52 | <4.03 |
| Zr-95 | <5.37 | <6.70 | <5.74 | <4.86 | <7.29 | <8.24 |
| Nb-95 | <3.90 | <4.75 | <3.71 | <3.52 | <5.16 | <5.10 |
| Co-58 | <3.29 | <4.36 | <2.81 | <2.71 | <4.51 | <3.98 |
| Mn-54 | <2.65 | <3.52 | <2.55 | <2.85 | <3.65 | <3.02 |
| Fe-59 | <9.16 | <12.10 | <10.30 | <7.82 | <13.20 | <12.60 |
| Zn-65 | <6.53 | <7.68 | <6.65 | <5.51 | <7.76 | <5.00 |
| Co-60 | <2.73 | <3.85 | <2.48 | <2.68 | <4.54 | <4.56 |
| K-40 | 174 ± 16 | 198 ± 23 | 162 ± 15 | 106 ± 13 | 165 ± 21 | 340 ± 26 |
| Ba/La-140 | <8.47 | <10.20 | <7.92 | <6.50 | <11.90 | <9.72 |
| **Nuclide** | **July** | **August** | **September** | **October** | **November** | **December** |
| I-131 | <0.75 | <0.79 | <0.79 | <0.83 | <0.66 | <0.75 |
| Cs-134 | <3.85 | <3.99 | <2.27 | <3.47 | <3.56 | <4.85 |
| Cs-137 | <3.63 | <3.35 | <2.37 | <4.19 | <4.16 | <4.82 |
| Zr-95 | <7.34 | <7.94 | <5.89 | <8.88 | <8.69 | <8.42 |
| Nb-95 | <5.47 | <5.32 | <3.73 | <6.13 | <6.36 | <6.43 |
| Co-58 | <4.19 | <4.56 | <3.18 | <5.12 | <5.32 | <5.08 |
| Mn-54 | <3.66 | <3.34 | <2.72 | <4.72 | <4.66 | <4.65 |
| Fe-59 | <11.80 | <13.80 | <8.71 | <13.50 | <13.50 | <18.9 |
| Zn-65 | <7.50 | <10.40 | <7.10 | <12.20 | <11.70 | <13.7 |
| Co-60 | <3.56 | <4.24 | <3.31 | <5.07 | <5.24 | <6.31 |
| K-40 | 236 ± 23 | 108 ± 18 | 119 ± 14 | 202 ± 27 | 106 ± 19 | 148 ± 26 |
| Ba/La-140 | <11.20 | <12.90 | <7.60 | <10.00 | <13.30 | <14.5 |

* Sample location required by ODCM

*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-4 (continued)**

**CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

**FITZPATRICK* (03, INLET)*****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| I-131 | <0.66 | <0.59 | <0.57 | <0.71 | <0.66 | <0.55 |
| Cs-134 | <1.76 | <1.59 | <3.41 | <4.80 | <3.19 | <2.51 |
| Cs-137 | <2.72 | <2.54 | <2.87 | <3.96 | <3.28 | <3.06 |
| Zr-95 | <5.34 | <4.28 | <5.16 | <7.02 | <6.85 | <6.32 |
| Nb-95 | <3.22 | <3.16 | <3.96 | <4.81 | <5.51 | <3.99 |
| Co-58 | <2.65 | <2.65 | <3.30 | <3.99 | <3.86 | <3.63 |
| Mn-54 | <2.70 | <2.63 | <2.90 | <3.52 | <3.34 | <3.33 |
| Fe-59 | <8.33 | <8.12 | <8.44 | <13.20 | <14.80 | <10.00 |
| Zn-65 | <6.59 | <6.77 | <3.20 | <9.51 | <7.50 | <7.86 |
| Co-60 | <2.76 | <2.68 | <3.43 | <3.58 | <3.55 | <3.75 |
| K-40 | 120 ± 14 | 121 ± 15 | 145 ± 16 | 116 ± 20 | 169 ± 18 | 100 ± 16 |
| Ba/La-140 | <5.12 | <5.26 | <6.45 | <9.39 | <14.40 | <7.08 |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| I-131 | <0.55 | <0.46 | <0.74 | <0.76 | <0.55 | <0.48 |
| Cs-134 | <4.11 | <3.58 | <4.50 | <4.16 | <4.27 | <4.51 |
| Cs-137 | <3.50 | <4.94 | <4.14 | <3.88 | <4.79 | <3.95 |
| Zr-95 | <8.22 | <7.69 | <8.20 | <7.48 | <8.71 | <9.08 |
| Nb-95 | <4.84 | <4.64 | <5.53 | <4.73 | <7.13 | <5.47 |
| Co-58 | <4.42 | <5.44 | <5.23 | <3.85 | <5.14 | <4.47 |
| Mn-54 | <3.60 | <4.24 | <3.63 | <3.43 | <4.86 | <4.21 |
| Fe-59 | <12.70 | <15.90 | <14.9 | <11.90 | <13.90 | <12.1 |
| Zn-65 | <9.74 | <10.80 | <9.36 | <8.16 | <11.50 | <11.2 |
| Co-60 | <3.67 | <5.57 | <4.69 | <3.76 | <5.89 | <4.12 |
| K-40 | 130 ± 20 | 157 ± 24 | 270 ± 26 | 159 ± 20 | 148 ± 24 | 238 ± 25 |
| Ba/La-140 | <10.50 | <14.20 | <8.55 | <8.17 | <11.60 | <11.3 |

* Sample location required by ODCM
*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-4 (continued)**

**CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

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

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| I-131 | <14.20 | <8.58 | <10.70 | <13.10 | <14.40 | <9.50 |
| Cs-134 | <2.47 | <2.79 | <3.33 | <4.10 | <3.53 | <2.30 |
| Cs-137 | <3.45 | <2.92 | <3.03 | <3.48 | <2.72 | <3.03 |
| Zr-95 | <7.41 | <5.73 | <6.70 | <6.78 | <6.34 | <6.24 |
| Nb-95 | <5.06 | <3.42 | <4.35 | <4.65 | <4.27 | <3.78 |
| Co-58 | <3.98 | <2.94 | <3.67 | <3.93 | <3.87 | <3.84 |
| Mn-54 | <4.03 | <2.63 | <3.31 | <3.96 | <3.50 | <3.19 |
| Fe-59 | <13.00 | <9.23 | <12.10 | <11.90 | <9.73 | <9.08 |
| Zn-65 | <8.36 | <6.47 | <7.93 | <9.70 | <6.94 | <4.49 |
| Co-60 | <4.03 | <2.65 | <3.78 | <4.03 | <4.00 | <3.44 |
| K-40 | 396 ± 25 | 146 ± 15 | 330 ± 22 | 146 ± 22 | 178 ± 18 | 108 ± 16 |
| Ba/La-140 | <5.78 | <6.74 | <10.20 | <8.73 | <11.50 | <7.65 |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| I-131 | <14.90 | <14.40 | <11.90 | <12.80 | <14.80 | <14.5 |
| Cs-134 | <4.72 | <2.13 | <3.60 | <4.93 | <2.41 | <4.19 |
| Cs-137 | <4.40 | <2.90 | <3.83 | <3.96 | <3.26 | <4.13 |
| Zr-95 | <9.50 | <6.31 | <6.63 | <7.51 | <6.93 | <8.39 |
| Nb-95 | <5.75 | <4.48 | <5.26 | <5.92 | <4.85 | <5.30 |
| Co-58 | <4.92 | <3.81 | <4.05 | <4.82 | <3.98 | <4.64 |
| Mn-54 | <5.03 | <3.30 | <3.34 | <3.73 | <3.07 | <4.34 |
| Fe-59 | <13.90 | <11.00 | <10.4 | <12.40 | <12.50 | <14.8 |
| Zn-65 | <10.60 | <7.98 | <4.13 | <9.52 | <7.80 | <9.44 |
| Co-60 | <4.61 | <2.45 | <3.62 | <4.45 | <3.83 | <4.22 |
| K-40 | 245 ± 27 | 202 ± 20 | 296 ± 22 | 155 ± 23 | 151 ± 17 | 248 ± 24.4 |
| Ba/La-140 | <13.20 | <11.80 | <8.57 | <13.60 | <10.60 | <12.6 |

** Optional Sample location
*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-4 (continued)**

**CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

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

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| I-131 | <9.90 | <9.70 | <9.81 | <12.70 | <11.10 | <11.70 |
| Cs-134 | <2.77 | <2.06 | <2.96 | <4.81 | <2.23 | <5.16 |
| Cs-137 | <2.73 | <2.92 | <2.51 | <4.20 | <2.73 | <4.41 |
| Zr-95 | <4.87 | <5.53 | <5.31 | <7.05 | <5.30 | <8.65 |
| Nb-95 | <3.46 | <3.89 | <3.43 | <4.66 | <4.08 | <5.74 |
| Co-58 | <2.96 | <2.88 | <2.67 | <4.16 | <3.11 | <5.07 |
| Mn-54 | <2.67 | <3.20 | <2.53 | <3.66 | <2.81 | <4.63 |
| Fe-59 | <7.40 | <7.83 | <9.39 | <14.40 | <9.31 | <18.40 |
| Zn-65 | <6.95 | <4.09 | <6.60 | <9.07 | <6.87 | <11.20 |
| Co-60 | <2.60 | <2.89 | <2.96 | <3.74 | <3.09 | <5.61 |
| K-40 | 120 ± 15 | 139 ± 15 | 104 ± 14 | 135 ± 19 | 140 ± 15 | 324 ± 30 |
| Ba/La-140 | <8.86 | <7.39 | <9.25 | <10.80 | <8.48 | <12.20 |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| I-131 | <14.70 | <14.10 | <13.5 | <12.20 | <14.60 | <14.90 |
| Cs-134 | <2.98 | <3.45 | <3.02 | <4.77 | <3.53 | <3.80 |
| Cs-137 | <4.08 | <3.12 | <3.61 | <3.88 | <3.36 | <3.41 |
| Zr-95 | <9.83 | <5.93 | <7.60 | <7.66 | <5.95 | <6.59 |
| Nb-95 | <5.57 | <3.87 | <5.62 | <5.70 | <4.56 | <4.92 |
| Co-58 | <3.68 | <3.37 | <4.44 | <4.30 | <3.90 | <3.45 |
| Mn-54 | <4.12 | <2.95 | <3.92 | <3.81 | <3.57 | <3.61 |
| Fe-59 | <13.80 | <9.59 | <13.4 | <10.90 | <10.90 | <10.5 |
| Zn-65 | <9.76 | <7.26 | <11.0 | <6.71 | <8.06 | <8.59 |
| Co-60 | <3.58 | <3.15 | <4.85 | <4.74 | <3.50 | <3.76 |
| K-40 | 132 ± 21 | 141 ± 16 | 227 ± 23 | 309 ± 27 | 187 ± 19 | 232 ± 22 |
| Ba/La-140 | <11.40 | <10.80 | <10.0 | <10.90 | <10.90 | <9.46 |

** Optional Sample location
*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-4 (continued)**

**CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

**OSWEGO CITY WATER** (10)*****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| I-131 | <14.90 | <7.70 | <10.20 | <10.10 | <10.30 | <11.50 |
| Cs-134 | <3.91 | <2.85 | <2.19 | <2.35 | <2.99 | <3.01 |
| Cs-137 | <3.75 | <2.69 | <3.11 | <3.02 | <2.61 | <4.58 |
| Zr-95 | <7.69 | <5.35 | <5.60 | <6.10 | <6.13 | <7.76 |
| Nb-95 | <4.89 | <3.44 | <3.97 | <4.29 | <3.49 | <5.40 |
| Co-58 | <4.61 | <2.84 | <3.06 | <3.49 | <2.87 | <4.87 |
| Mn-54 | <3.89 | <2.86 | <2.60 | <3.06 | <2.35 | <4.04 |
| Fe-59 | <12.10 | <8.73 | <8.99 | <10.10 | <9.70 | <11.30 |
| Zn-65 | <8.73 | <3.81 | <5.50 | <4.83 | <6.41 | <9.00 |
| Co-60 | <4.46 | <2.88 | <3.43 | <3.25 | <2.88 | <4.32 |
| K-40 | 179 ± 22 | 85 ± 13 | 148 ± 15 | 275 ± 20 | 166 ± 15 | 162 ± 22 |
| Ba/La-140 | <11.20 | <7.22 | <7.22 | <7.72 | <8.36 | <11.20 |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| I-131 | <11.70 | <13.50 | <13.9 | <14.80 | <14.80 | <14.9 |
| Cs-134 | <3.68 | <2.31 | <4.19 | <4.93 | <3.83 | <3.83 |
| Cs-137 | <3.51 | <2.77 | <3.75 | <4.51 | <3.82 | <3.42 |
| Zr-95 | <8.40 | <5.74 | <6.86 | <8.57 | <6.99 | <7.99 |
| Nb-95 | <5.03 | <3.96 | <5.28 | <5.78 | <3.59 | <5.66 |
| Co-58 | <4.67 | <3.21 | <4.43 | <4.44 | <4.30 | <4.28 |
| Mn-54 | <3.60 | <2.75 | <4.69 | <4.81 | <3.79 | <4.14 |
| Fe-59 | <15.70 | <9.59 | <13.7 | <17.90 | <11.80 | <12.9 |
| Zn-65 | <9.94 | <7.25 | <5.90 | <12.80 | <5.22 | <9.88 |
| Co-60 | <3.64 | <2.94 | <4.48 | <6.09 | <3.70 | <4.28 |
| K-40 | 97 ± 16 | 124 ± 13 | 165 ± 22 | 192 ± 27.1 | 286 ± 21 | 207 ± 23 |
| Ba/La-140 | <12.30 | <8.41 | <13.7 | <14.00 | <12.30 | <12.1 |

** Optional Sample location
*** Corresponds to sample location noted on Figure 3.3-4

## TABLE 6-5

## ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFFSITE STATIONS – 2006

### GROSS BETA ACTIVITY pCi/ $m^3$ ± 1 Sigma

| Week End Date | R-1 * | R-2 * | R-3 * | R-4 * | R-5 * | D-2 ** | E ** | F ** | G ** |
|---|---|---|---|---|---|---|---|---|---|
| 01/10/06 | 0.012 ± 0.001 | 0.015 ± 0.001 | 0.009 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.010 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 |
| 01/17/06 | 0.018 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.020 ± 0.002 | 0.015 ± 0.001 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.019 ± 0.001 |
| 01/24/06 | 0.015 ± 0.001 | 0.021 ± 0.002 | 0.016 ± 0.001 | 0.015 ± 0.001 | 0.019 ± 0.002 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.018 ± 0.001 |
| 01/31/06 | 0.022 ± 0.002 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.021 ± 0.002 | 0.017 ± 0.001 | 0.020 ± 0.001 | 0.020 ± 0.001 | 0.019 ± 0.001 |
| 02/07/06 | 0.014 ± 0.001 | 0.011 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.018 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 |
| 02/14/06 | 0.016 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 | 0.019 ± 0.001 | 0.016 ± 0.001 |
| 02/22/06 | 0.018 ± 0.001 | 0.021 ± 0.001 | 0.019 ± 0.001 | 0.020 ± 0.001 | 0.019 ± 0.001 | 0.018 ± 0.001 | 0.022 ± 0.001 | 0.022 ± 0.001 | 0.020 ± 0.001 |
| 02/28/06 | 0.021 ± 0.002 | 0.020 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.002 | 0.020 ± 0.002 | 0.017 ± 0.002 | 0.020 ± 0.002 | 0.019 ± 0.002 | 0.020 ± 0.002 |
| 03/07/06 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.010 ± 0.001 | 0.010 ± 0.001 | 0.012 ± 0.001 | 0.010 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 |
| 03/14/06 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.011 ± 0.001 | 0.015 ± 0.001 |
| 03/21/06 | 0.015 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.021 ± 0.001 | 0.014 ± 0.001 |
| 03/28/06 | 0.010 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.011 ± 0.001 | 0.010 ± 0.001 | 0.010 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.009 ± 0.001 |
| 04/04/06 | 0.020 ± 0.001 | 0.017 ± 0.001 | 0.022 ± 0.002 | 0.021 ± 0.002 | 0.024 ± 0.002 | 0.020 ± 0.002 | 0.018 ± 0.001 | 0.019 ± 0.001 | 0.022 ± 0.002 |
| 04/11/06 | 0.011 ± 0.001 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 |
| 04/18/06 | 0.011 ± 0.001 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 |
| 04/25/06 | 0.012 ± 0.001 | 0.009 ± 0.001 | 0.010 ± 0.001 | 0.010 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.010 ± 0.001 | 0.007 ± 0.001 |
| 05/02/06 | 0.013 ± 0.001 | 0.016 ± 0.001 | 0.011 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.011 ± 0.001 |
| 05/09/06 | 0.012 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.010 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 |
| 05/16/06 | 0.008 ± 0.001 | 0.010 ± 0.001 | 0.007 ± 0.001 | 0.008 ± 0.001 | 0.008 ± 0.001 | 0.004 ± 0.001 | 0.007 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 |
| 05/23/06 | 0.007 ± 0.001 | 0.008 ± 0.001 | 0.005 ± 0.001 | 0.005 ± 0.001 | 0.008 ± 0.001 | 0.006 ± 0.001 | 0.006 ± 0.001 | 0.005 ± 0.001 | 0.007 ± 0.001 |
| 05/31/06 | 0.020 ± 0.001 | 0.021 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.020 ± 0.001 | 0.021 ± 0.001 | 0.018 ± 0.001 | 0.020 ± 0.001 | 0.017 ± 0.001 |
| 06/06/06 | 0.015 ± 0.001 | 0.017 ± 0.002 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.016 ± 0.002 | 0.018 ± 0.002 | 0.019 ± 0.002 | 0.017 ± 0.002 | 0.019 ± 0.002 |
| 06/13/06 | 0.008 ± 0.001 | 0.007 ± 0.001 | 0.006 ± 0.001 | 0.008 ± 0.001 | 0.007 ± 0.001 | 0.007 ± 0.001 | 0.007 ± 0.001 | 0.005 ± 0.001 | 0.010 ± 0.001 |
| 06/20/06 | 0.018 ± 0.001 | 0.021 ± 0.002 | 0.018 ± 0.001 | 0.019 ± 0.001 | 0.018 ± 0.001 | 0.018 ± 0.001 | 0.019 ± 0.001 | 0.019 ± 0.001 | 0.017 ± 0.001 |
| 06/27/06 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.010 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 |
| 07/05/06 | 0.018 ± 0.001 | 0.018 ± 0.001 | 0.020 ± 0.001 | 0.020 ± 0.001 | 0.018 ± 0.001 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.014 ± 0.001 | 0.022 ± 0.001 |

* Sample location required by ODCM

** Optional sample location

**TABLE 6-5 (continued)**

**ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFFSITE STATIONS – 2006**

**GROSS BETA ACTIVITY pCi/ $m^3$ ± 1 Sigma**

| Week End Date | R-1 * | R-2 * | R-3 * | R-4 * | R-5 * | D-2 ** | E ** | F ** | G ** |
|---|---|---|---|---|---|---|---|---|---|
| 07/11/06 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.014 ± 0.001 |
| 07/18/06 | 0.022 ± 0.002 | 0.021 ± 0.002 | 0.019 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.002 | 0.017 ± 0.001 | 0.020 ± 0.001 | 0.021 ± 0.001 | 0.020 ± 0.002 |
| 07/25/06 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.020 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 |
| 08/01/06 | 0.023 ± 0.002 | 0.022 ± 0.002 | 0.024 ± 0.002 | 0.023 ± 0.002 | 0.022 ± 0.002 | 0.020 ± 0.001 | 0.022 ± 0.002 | 0.024 ± 0.002 | 0.022 ± 0.002 |
| 08/08/06 | 0.018 ± 0.001 | 0.018 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.015 ± 0.001 | 0.018 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 |
| 08/15/06 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 | 0.012 ± 0.001 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 |
| 08/22/06 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 |
| 08/29/06 | 0.011 ± 0.001 | 0.010 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 |
| 09/06/06 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.011 ± 0.001 | 0.009 ± 0.001 | 0.010 ± 0.001 | 0.008 ± 0.001 | 0.010 ± 0.001 | 0.010 ± 0.001 | 0.008 ± 0.001 |
| 09/12/06 | 0.018 ± 0.002 | 0.015 ± 0.001 | 0.018 ± 0.002 | 0.017 ± 0.002 | 0.017 ± 0.001 | 0.014 ± 0.001 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.018 ± 0.002 |
| 09/19/06 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.018 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 |
| 09/26/06 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.010 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 |
| 10/03/06 | 0.020 ± 0.002 | 0.018 ± 0.002 | 0.015 ± 0.002 | 0.017 ± 0.002 | 0.021 ± 0.002 | 0.017 ± 0.002 | 0.017 ± 0.002 | 0.018 ± 0.002 | 0.019 ± 0.002 |
| 10/10/06 | 0.022 ± 0.002 | 0.019 ± 0.002 | 0.017 ± 0.002 | 0.020 ± 0.002 | 0.011 ± 0.001 | 0.019 ± 0.002 | 0.019 ± 0.002 | 0.015 ± 0.002 | 0.018 ± 0.002 |
| 10/17/06 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.017 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 |
| 10/24/06 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.011 ± 0.001 | 0.010 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 |
| 10/31/06 | 0.007 ± 0.001 | 0.009 ± 0.001 | 0.007 ± 0.001 | 0.005 ± 0.001 | 0.007 ± 0.001 | 0.006 ± 0.001 | 0.008 ± 0.001 | 0.008 ± 0.001 | 0.008 ± 0.001 |
| 11/07/06 | 0.022 ± 0.002 | 0.024 ± 0.002 | 0.022 ± 0.002 | 0.021 ± 0.001 | 0.023 ± 0.002 | 0.019 ± 0.001 | 0.022 ± 0.001 | 0.022 ± 0.002 | 0.021 ± 0.002 |
| 11/14/06 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.011 ± 0.001 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 |
| 11/21/06 | 0.012 ± 0.001 | 0.013 ± 0.002 | 0.013 ± 0.002 | 0.009 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.002 | 0.014 ± 0.002 | 0.012 ± 0.001 | 0.014 ± 0.002 |
| 11/28/06 | 0.025 ± 0.002 | 0.022 ± 0.002 | 0.022 ± 0.002 | 0.024 ± 0.002 | 0.028 ± 0.002 | 0.024 ± 0.002 | 0.024 ± 0.002 | 0.022 ± 0.001 | 0.022 ± 0.002 |
| 12/05/06 | 0.016 ± 0.001 | 0.019 ± 0.001 | 0.018 ± 0.001 | 0.018 ± 0.002 | 0.018 ± 0.001 | 0.016 ± 0.001 | 0.022 ± 0.002 | 0.019 ± 0.001 | 0.017 ± 0.001 |
| 12/12/06 | 0.026 ± 0.002 | 0.024 ± 0.002 | 0.020 ± 0.001 | 0.024 ± 0.002 | 0.024 ± 0.002 | 0.022 ± 0.001 | 0.023 ± 0.002 | 0.020 ± 0.001 | 0.023 ± 0.002 |
| 12/19/06 | 0.032 ± 0.002 | 0.035 ± 0.002 | 0.035 ± 0.002 | 0.031 ± 0.002 | 0.033 ± 0.002 | 0.030 ± 0.002 | 0.032 ± 0.002 | 0.028 ± 0.002 | 0.035 ± 0.002 |
| 12/26/06 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 |
| 01/02/07 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 |

* Sample location required by ODCM

** Optional sample location

**TABLE 6-6**
**ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ONSITE STATIONS – 2006**

**GROSS BETA ACTIVITY pCi/ $m^3$ ± 1 Sigma**

| Week End Date | D-1 ** | G ** | H ** | I ** | J ** | K ** |
|---|---|---|---|---|---|---|
| 01/09/06 | 0.010 ± 0.001 | 0.012 ± 0.001 | 0.017 ± 0.002 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 |
| 01/16/06 | 0.014 ± 0.001 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 |
| 01/23/06 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.018 ± 0.001 |
| 01/31/06 | 0.020 ± 0.001 | 0.016 ± 0.001 | 0.022 ± 0.001 | 0.021 ± 0.001 | 0.018 ± 0.001 | 0.019 ± 0.001 |
| 02/06/06 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.002 | 0.017 ± 0.002 | 0.019 ± 0.002 | 0.019 ± 0.001 |
| 02/13/06 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 |
| 02/21/06 | 0.019 ± 0.001 | 0.020 ± 0.001 | 0.021 ± 0.001 | 0.021 ± 0.001 | 0.019 ± 0.001 | 0.022 ± 0.001 |
| 02/27/06 | 0.025 ± 0.002 | 0.020 ± 0.002 | 0.025 ± 0.002 | 0.029 ± 0.002 | 0.024 ± 0.002 | 0.025 ± 0.002 |
| 03/06/06 | 0.011 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.011 ± 0.001 |
| 03/13/06 | 0.012 ± 0.001 | 0.010 ± 0.001 | 0.011 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.016 ± 0.001 |
| 03/20/06 | 0.013 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.017 ± 0.001 | 0.014 ± 0.001 |
| 03/27/06 | 0.008 ± 0.001 | 0.008 ± 0.001 | 0.008 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.007 ± 0.001 |
| 04/03/06 | 0.021 ± 0.002 | 0.022 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.001 | 0.020 ± 0.001 | 0.022 ± 0.002 |
| 04/10/06 | 0.012 ± 0.001 | 0.010 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 |
| 04/17/06 | 0.013 ± 0.001 | 0.016 ± 0.002 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.002 |
| 04/24/06 | 0.011 ± 0.001 | 0.008 ± 0.001 | 0.010 ± 0.001 | 0.010 ± 0.001 | 0.011 ± 0.001 | 0.009 ± 0.001 |
| 05/01/06 | 0.011 ± 0.001 | 0.010 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.010 ± 0.001 |
| 05/08/06 | 0.015 ± 0.001 | 0.009 ± 0.001 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 |
| 05/15/06 | 0.010 ± 0.001 | 0.011 ± 0.001 | 0.009 ± 0.001 | 0.010 ± 0.001 | 0.009 ± 0.001 | 0.012 ± 0.001 |
| 05/22/06 | 0.008 ± 0.001 | 0.009 ± 0.001 | 0.005 ± 0.001 | 0.006 ± 0.001 | 0.005 ± 0.001 | 0.006 ± 0.001 |
| 05/30/06 | 0.019 ± 0.001 | 0.019 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.016 ± 0.001 | 0.019 ± 0.001 |
| 06/05/06 | 0.021 ± 0.002 | 0.018 ± 0.002 | 0.021 ± 0.002 | 0.019 ± 0.002 | 0.019 ± 0.002 | 0.019 ± 0.002 |
| 06/12/06 | 0.007 ± 0.001 | 0.011 ± 0.001 | 0.009 ± 0.001 | 0.008 ± 0.001 | 0.009 ± 0.001 | 0.011 ± 0.001 |
| 06/19/06 | 0.018 ± 0.001 | 0.018 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 |
| 06/26/06 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 |

** Optional sample location

**TABLE 6-6 (continued)**
**ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ONSITE STATIONS – 2006**

**GROSS BETA ACTIVITY pCi/ $m^3$ ± 1 Sigma**

| Week End Date | D-1 ** | G ** | H ** | I ** | J ** | K ** |
|---|---|---|---|---|---|---|
| 07/05/06 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.018 ± 0.001 | 0.015 ± 0.001 |
| 07/10/06 | 0.015 ± 0.002 | 0.015 ± 0.002 | 0.014 ± 0.002 | 0.016 ± 0.002 | 0.014 ± 0.002 | 0.013 ± 0.001 |
| 07/17/06 | 0.021 ± 0.002 | 0.017 ± 0.001 | 0.021 ± 0.002 | 0.019 ± 0.001 | 0.021 ± 0.001 | 0.021 ± 0.002 |
| 07/24/06 | 0.016 ± 0.001 | 0.021 ± 0.002 | 0.021 ± 0.002 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.015 ± 0.001 |
| 07/31/06 | 0.022 ± 0.002 | 0.023 ± 0.002 | 0.021 ± 0.002 | 0.020 ± 0.001 | 0.019 ± 0.001 | 0.020 ± 0.001 |
| 08/07/06 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.015 ± 0.001 | 0.018 ± 0.001 | 0.019 ± 0.001 |
| 08/14/06 | 0.019 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.016 ± 0.001 |
| 08/21/06 | 0.016 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 |
| 08/28/06 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 |
| 09/05/06 | 0.010 ± 0.001 | 0.008 ± 0.001 | 0.009 ± 0.001 | 0.008 ± 0.001 | 0.008 ± 0.001 | 0.010 ± 0.001 |
| 09/11/06 | 0.017 ± 0.001 | 0.018 ± 0.002 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.016 ± 0.001 | 0.017 ± 0.002 |
| 09/18/06 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.011 ± 0.001 |
| 09/25/06 | 0.017 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | No Sample Available |
| 10/02/06 | 0.017 ± 0.002 | 0.019 ± 0.002 | 0.019 ± 0.002 | 0.019 ± 0.002 | 0.015 ± 0.002 | 0.019 ± 0.002 |
| 10/09/06 | 0.017 ± 0.002 | 0.022 ± 0.002 | 0.018 ± 0.002 | 0.020 ± 0.002 | 0.017 ± 0.002 | 0.016 ± 0.002 |
| 10/16/06 | 0.018 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.001 |
| 10/23/06 | 0.017 ± 0.001 | 0.018 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.015 ± 0.001 |
| 10/30/06 | 0.009 ± 0.001 | 0.007 ± 0.001 | 0.007 ± 0.001 | 0.008 ± 0.001 | 0.006 ± 0.001 | 0.007 ± 0.001 |
| 11/06/06 | 0.017 ± 0.001 | 0.020 ± 0.001 | 0.021 ± 0.001 | 0.018 ± 0.001 | 0.019 ± 0.001 | 0.021 ± 0.002 |
| 11/13/06 | 0.019 ± 0.001 | 0.016 ± 0.001 | 0.019 ± 0.001 | 0.019 ± 0.001 | 0.018 ± 0.001 | 0.010 ± 0.001 |
| 11/20/06 | 0.011 ± 0.002 | 0.012 ± 0.002 | 0.012 ± 0.001 | 0.014 ± 0.002 | 0.010 ± 0.001 | 0.011 ± 0.001 |
| 11/27/06 | 0.022 ± 0.001 | 0.027 ± 0.002 | 0.020 ± 0.001 | 0.022 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.001 |
| 12/04/06 | 0.023 ± 0.002 | 0.021 ± 0.002 | 0.023 ± 0.002 | 0.018 ± 0.001 | 0.022 ± 0.002 | 0.022 ± 0.002 |
| 12/11/06 | 0.024 ± 0.002 | 0.023 ± 0.002 | 0.024 ± 0.002 | 0.022 ± 0.002 | 0.020 ± 0.001 | 0.023 ± 0.002 |
| 12/18/06 | 0.035 ± 0.002 | 0.035 ± 0.002 | 0.034 ± 0.002 | 0.031 ± 0.002 | 0.033 ± 0.002 | 0.029 ± 0.002 |
| 12/26/06 | 0.014 ± 0.001 | 0.016 ± 0.002 | 0.014 ± 0.001 | 0.018 ± 0.001 | 0.014 ± 0.001 | 0.018 ± 0.001 |
| 01/02/07 | 0.017 ± 0.001 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 | 0.014 ± 0.001 | 0.018 ± 0.001 |

** Optional sample location

**TABLE 6-7**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**R1 OFFSITE COMPOSITE***

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | <25.60 | 77.6 ± 18.7 | 45.0 ± 14.6 | 109 ± 20.4 | 109 ± 23.3 | 115 ±17.9 |
| Zn-65 | <4.00 | <3.93 | <6.40 | <8.85 | <11.80 | <12.20 |
| Cs-134 | <5.97 | <3.59 | <5.05 | <5.00 | <6.64 | <5.38 |
| Cs-137 | <5.12 | <3.40 | <2.74 | <2.72 | <4.56 | <1.81 |
| Zr-95 | <12.00 | <7.99 | <6.36 | <10.70 | <11.00 | <8.23 |
| Nb-95 | <4.87 | <4.82 | <4.96 | <4.52 | <2.21 | <4.67 |
| Co-58 | <4.28 | <4.22 | <2.62 | <4.05 | <6.85 | <5.65 |
| Mn-54 | <6.48 | <5.70 | <0.89 | <4.41 | <6.82 | <3.90 |
| Co-60 | <8.08 | <7.92 | <1.35 | <5.34 | <2.49 | <4.28 |
| K-40 | <10.10 | <23.70 | 53.8 ± 19.0 | <19.20 | <92.10 | <50.10 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 126 ± 21.8 | 110 ± 19.2 | 121 ± 25.4 | 62.4 ± 15.3 | 78.4 ± 16.0 | 105 ± 18.1 |
| Zn-65 | <11.10 | <11.40 | <14.3 | <5.91 | <10.9 | <10.9 |
| Cs-134 | <6.81 | <4.40 | <1.83 | <3.30 | <4.85 | <3.65 |
| Cs-137 | <4.89 | <2.39 | <4.43 | <2.51 | <2.67 | <3.46 |
| Zr-95 | <8.76 | <5.75 | <13.1 | <1.64 | <6.16 | <4.79 |
| Nb-95 | <4.65 | <5.76 | <10.2 | <1.13 | <4.81 | <5.77 |
| Co-58 | <4.54 | <1.23 | <2.23 | <2.48 | <5.50 | <2.79 |
| Mn-54 | <3.96 | <3.06 | <5.62 | <3.07 | <2.22 | <4.17 |
| Co-60 | <7.06 | <4.71 | <3.05 | <4.48 | <6.06 | <1.29 |
| K-40 | <18.90 | <16.80 | <88.40 | <12.60 | 133 ± 27.8 | 66.4 ± 21.9 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

* Sample location required by ODCM
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**R2 OFFSITE COMPOSITE***

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 78.8 ±15.6 | 78.6 ±17.7 | 86.5 ± 17.5 | 69.3 ± 15.3 | 133 ± 22.9 | 120 ±22.0 |
| Zn-65 | <6.77 | <14.30 | <8.60 | <6.46 | <3.49 | <14.10 |
| Cs-134 | <4.82 | <3.87 | <4.52 | <3.76 | <4.27 | <6.36 |
| Cs-137 | <3.27 | <3.97 | <2.63 | <2.74 | <4.02 | <4.38 |
| Zr-95 | <8.02 | <5.17 | <7.55 | <6.56 | <9.64 | <2.96 |
| Nb-95 | <3.04 | <3.46 | <5.06 | <1.23 | <5.22 | <7.86 |
| Co-58 | <4.29 | <4.41 | <3.87 | <3.92 | <1.53 | <5.00 |
| Mn-54 | <3.59 | <4.08 | <3.77 | <3.35 | <4.26 | <6.50 |
| Co-60 | <4.68 | <5.32 | <3.71 | <3.54 | <1.99 | <6.82 |
| K-40 | <64.30 | <15.10 | <37.60 | <13.80 | <20.20 | <24.50 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 134 ± 21.9 | 93.3 ± 14.8 | 55.7 ± 13.8 | 73.0 ± 13.7 | 72.2 ± 16.3 | 43.6 ± 14.1 |
| Zn-65 | <3.21 | <1.98 | <8.38 | <7.69 | <11.1 | <8.65 |
| Cs-134 | <7.28 | <3.13 | <4.39 | <3.41 | <5.36 | <4.31 |
| Cs-137 | <4.34 | <2.97 | <3.58 | <2.27 | <3.32 | <3.65 |
| Zr-95 | <10.10 | <4.29 | <9.70 | <5.42 | <8.02 | <7.35 |
| Nb-95 | <4.61 | <4.85 | <4.42 | <3.72 | <1.11 | <4.22 |
| Co-58 | <5.20 | <3.25 | <4.32 | <3.22 | <4.66 | <4.79 |
| Mn-54 | <1.21 | <2.79 | <4.35 | <3.06 | <4.66 | <3.26 |
| Co-60 | <1.84 | <1.13 | <1.77 | <1.10 | <6.33 | <6.05 |
| K-40 | <50.90 | <31.20 | <17.90 | 76.1 ± 20.2 | <12.5 | <14.8 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

* Sample location required by ODCM

† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**R3 OFFSITE COMPOSITE***

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 64.1 ± 13.9 | 115 ± 21.8 | 51.9 ± 16.4 | 86.3 ± 16.2 | 114 ± 20.1 | 69.7 ± 16.5 |
| Zn-65 | <11.00 | <3.68 | <9.77 | <6.11 | <3.30 | <7.50 |
| Cs-134 | <5.16 | <5.69 | <5.57 | <3.81 | <5.01 | <4.39 |
| Cs-137 | <4.13 | <5.53 | <2.53 | <2.30 | <4.95 | <3.21 |
| Zr-95 | <8.10 | <11.80 | <8.77 | <7.54 | <10.60 | <9.62 |
| Nb-95 | <5.90 | <6.12 | <4.83 | <4.65 | <4.94 | <6.42 |
| Co-58 | <2.90 | <5.70 | <4.69 | <0.99 | <6.06 | <5.02 |
| Mn-54 | <3.94 | <6.50 | <4.48 | <3.36 | <4.65 | <2.69 |
| Co-60 | <6.68 | <2.14 | <5.06 | <4.60 | <5.36 | <4.15 |
| K-40 | 135 ± 26.9 | <21.80 | <40.60 | 113 ± 25.2 | <19.10 | <16.20 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 107 ± 19.5 | 89.4 ± 13.2 | 81.1 ± 14.9 | 45.9 ± 13.2 | <37.0 | 85.2 ± 19.2 |
| Zn-65 | <12.60 | <1.86 | <8.83 | <7.40 | <13.8 | <9.09 |
| Cs-134 | <4.63 | <3.45 | <6.13 | <4.00 | <5.57 | <6.86 |
| Cs-137 | <0.92 | <2.50 | <0.82 | <2.20 | <4.28 | <3.56 |
| Zr-95 | <10.20 | <5.95 | <6.96 | <5.59 | <2.91 | <6.53 |
| Nb-95 | <4.14 | <3.50 | <5.45 | <5.43 | <9.45 | <4.85 |
| Co-58 | <1.24 | <3.71 | <2.87 | <3.77 | <4.90 | <4.97 |
| Mn-54 | <3.51 | <2.27 | <2.51 | <3.59 | <4.30 | <3.72 |
| Co-60 | <6.83 | <3.83 | <1.48 | <1.23 | <6.65 | <6.32 |
| K-40 | <16.50 | <36.90 | <40.90 | <44.90 | <23.9 | <52.4 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

* Sample location required by ODCM

† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**R4 OFFSITE COMPOSITE***

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 57.1 ± 13.4 | 98.5 ± 16.1 | <9.62 | 81.6 ± 18.2 | 76.5 ± 20.1 | 111 ± 18.6 |
| Zn-65 | <10.80 | <10.60 | <3.72 | <6.53 | <8.32 | <6.96 |
| Cs-134 | <4.11 | <3.61 | <1.97 | <4.56 | <3.03 | <4.65 |
| Cs-137 | <3.49 | <3.42 | <0.83 | <2.76 | <3.59 | <3.14 |
| Zr-95 | <6.91 | <6.82 | <1.65 | <7.16 | <6.74 | <5.21 |
| Nb-95 | <6.56 | <1.25 | <1.56 | <2.76 | <6.85 | <4.41 |
| Co-58 | <4.61 | <2.82 | <1.43 | <4.72 | <5.68 | <1.05 |
| Mn-54 | <2.51 | <4.66 | <1.67 | <2.08 | <4.35 | <3.01 |
| Co-60 | <4.87 | <4.77 | <1.24 | <4.77 | <4.95 | <3.81 |
| K-40 | <73.10 | <50.80 | <16.90 | <30.70 | <17.6 | <14.20 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 146 ± 23.2 | 93.1 ± 15.3 | 83.9 ± 17.1 | 62.6 ± 16.0 | 22.7 ± 15.7 | 93.0 ± 20.8 |
| Zn-65 | <10.90 | <6.52 | <8.67 | <7.87 | <2.96 | <16.00 |
| Cs-134 | <6.07 | <3.17 | <3.88 | <5.56 | <3.64 | <1.40 |
| Cs-137 | <3.85 | <2.79 | <3.43 | <3.25 | <3.44 | <3.40 |
| Zr-95 | <9.56 | <7.13 | <8.53 | <8.60 | <7.98 | <7.89 |
| Nb-95 | <1.51 | <2.70 | <5.14 | <4.01 | <7.60 | <1.93 |
| Co-58 | <4.90 | <0.80 | <3.39 | <5.23 | <4.13 | <7.23 |
| Mn-54 | <4.28 | <2.22 | <2.95 | <3.77 | <4.65 | <4.31 |
| Co-60 | <4.67 | <1.03 | <3.73 | <4.44 | <1.70 | <2.34 |
| K-40 | <17.40 | <10.40 | <37.80 | <44.90 | <17.4 | <68.4 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

* Sample location required by ODCM

† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**R5 OFFSITE COMPOSITE***

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 53.0 ± 21.1 | 115 ± 20.3 | 67.0 ± 18.7 | 83.4 ± 19.1 | 109 ± 19.2 | 120 ± 18.5 |
| Zn-65 | <13.70 | <11.70 | <9.71 | <8.85 | <8.82 | <12.90 |
| Cs-134 | <4.78 | <4.73 | <6.90 | <5.86 | <4.98 | <4.54 |
| Cs-137 | <5.51 | <3.55 | <3.79 | <3.97 | <3.39 | <4.14 |
| Zr-95 | <11.40 | <8.35 | <10.30 | <6.56 | <6.80 | <9.44 |
| Nb-95 | <5.22 | <5.04 | <4.71 | <5.70 | <4.68 | <5.77 |
| Co-58 | <6.16 | <4.41 | <6.43 | <4.05 | <4.46 | <4.53 |
| Mn-54 | <1.48 | <1.50 | <3.81 | <4.41 | <6.10 | <2.72 |
| Co-60 | <2.33 | <6.56 | <7.49 | <1.87 | <19.40 | <4.33 |
| K-40 | <67.60 | <69.90 | <60.20 | <54.60 | <61.10 | 80.4 ± 27.7 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 133 ± 26.3 | 112 ± 15.8 | 70.4 ± 16.8 | 58.1 ± 13.0 | 68.2 ± 16.1 | 106 ± 17.0 |
| Zn-65 | <18.80 | <7.32 | <9.37 | <8.89 | <8.93 | <10.6 |
| Cs-134 | <5.64 | <2.40 | <4.16 | <3.54 | <0.94 | <5.31 |
| Cs-137 | <7.09 | <2.42 | <4.24 | <2.99 | <0.83 | <3.10 |
| Zr-95 | <3.43 | <4.75 | <6.93 | <8.79 | <5.53 | <5.63 |
| Nb-95 | <7.93 | <4.59 | <3.70 | <5.53 | <7.21 | <4.76 |
| Co-58 | <9.55 | <2.76 | <3.20 | <3.19 | <4.68 | <4.77 |
| Mn-54 | <6.41 | <3.07 | <2.79 | <4.11 | <3.18 | <3.26 |
| Co-60 | <2.74 | <2.97 | <5.62 | <4.18 | <1.50 | <4.01 |
| K-40 | <79.70 | <10.70 | <16.00 | <44.60 | <52.4 | <42.6 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

* Sample location required by ODCM
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**D2 OFFSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 58.9 ± 15.0 | 108 ± 17.7 | 61.0 ± 14.0 | 101 ± 17.0 | 101 ± 19.3 | 112 ± 19.1 |
| Zn-65 | <6.88 | <10.80 | <11.20 | <8.84 | <7.95 | <9.87 |
| Cs-134 | <3.18 | <4.78 | <5.81 | <3.85 | <5.43 | <6.09 |
| Cs-137 | <3.66 | <4.02 | <3.81 | <2.98 | <2.38 | <3.46 |
| Zr-95 | <6.66 | <9.31 | <1.86 | <1.68 | <6.01 | <8.32 |
| Nb-95 | <6.17 | <3.26 | <4.55 | <3.32 | <5.21 | <5.55 |
| Co-58 | <3.55 | <4.63 | <4.06 | <4.08 | <3.49 | <4.49 |
| Mn-54 | <3.12 | <4.29 | <3.56 | <2.16 | <4.87 | <2.21 |
| Co-60 | <4.78 | <5.00 | <5.49 | <3.31 | <1.67 | <3.41 |
| K-40 | <14.10 | <41.60 | <40.00 | <35.10 | <16.90 | <50.70 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 111 ± 21.6 | 103 ± 15.1 | 53.4 ± 13.9 | 73.1 ± 14.3 | 67.8 ± 15.6 | 80.2 ± 14.1 |
| Zn-65 | <13.00 | <6.41 | <11.3 | <5.64 | <7.72 | <2.41 |
| Cs-134 | <4.64 | <5.19 | <4.91 | <4.15 | <4.29 | <4.13 |
| Cs-137 | <3.78 | <2.49 | <3.10 | <3.40 | <3.10 | <2.22 |
| Zr-95 | <6.93 | <5.76 | <9.93 | <6.67 | <7.15 | <7.54 |
| Nb-95 | <4.67 | <3.61 | <5.06 | <4.59 | <6.31 | <3.40 |
| Co-58 | <6.40 | <4.04 | <4.36 | <2.96 | <4.65 | <4.71 |
| Mn-54 | <3.98 | <3.46 | <4.15 | <3.81 | <3.89 | <2.36 |
| Co-60 | <4.89 | <4.04 | <6.44 | <3.37 | <1.29 | <1.39 |
| K-40 | <19.00 | <24.80 | <36.30 | <32.70 | 125 ± 24.5 | <38.6 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**E OFFSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | <40.40 | 105 ± 17.6 | 74.9 ± 15.7 | 91.6 ± 17.1 | 118 ± 21.2 | 98.0 ± 18.1 |
| Zn-65 | <4.33 | <2.50 | <6.82 | <10.20 | <7.79 | <6.74 |
| Cs-134 | <4.98 | <3.82 | <5.05 | <3.50 | <6.24 | <5.21 |
| Cs-137 | <5.53 | <4.14 | <4.47 | <2.72 | <3.21 | <2.88 |
| Zr-95 | <11.10 | <4.77 | <7.88 | <7.73 | <8.84 | <6.65 |
| Nb-95 | <5.26 | <5.48 | <5.91 | <7.02 | <6.78 | <4.43 |
| Co-58 | <6.71 | <5.20 | <5.62 | <5.28 | <1.29 | <4.51 |
| Mn-54 | <4.29 | <3.23 | <3.95 | <2.35 | <5.15 | <3.03 |
| Co-60 | <2.54 | <1.44 | <5.21 | <3.72 | <4.39 | <3.73 |
| K-40 | <73.7 | <14.6 | <39.85 | <37.90 | <46.00 | <14.60 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 123 ± 20.9 | 82.0 ± 17.8 | 67.2 ± 21.4 | 52.3 ± 12.7 | 63.1 ± 15.8 | 90.3 ± 17.5 |
| Zn-65 | <10.20 | <7.38 | <14.10 | <6.48 | <6.27 | <10.70 |
| Cs-134 | <4.54 | <3.74 | <5.67 | <4.03 | <6.36 | <4.61 |
| Cs-137 | <4.92 | <4.34 | <4.35 | <2.57 | <0.73 | <4.67 |
| Zr-95 | <9.37 | <5.45 | <2.97 | <6.88 | <7.45 | <5.16 |
| Nb-95 | <6.31 | <5.45 | <5.45 | <2.86 | <5.86 | <5.68 |
| Co-58 | <3.32 | <3.37 | <5.01 | <3.82 | <5.41 | <4.96 |
| Mn-54 | <4.68 | <1.00 | <4.37 | <1.85 | <3.39 | <2.98 |
| Co-60 | <6.17 | <6.57 | <2.38 | <1.07 | <3.56 | <7.09 |
| K-40 | <47.20 | <45.40 | <24.30 | <28.40 | <45.5 | 130 ± 26.0 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**F OFFSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 67.4 ± 13.3 | 72.0 ± 14.5 | 50.1 ± 13.7 | 93.6 ± 15.4 | 101 ± 23.7 | 107 ± 17.1 |
| Zn-65 | <10.40 | <8.87 | <8.84 | <11.30 | <4.72 | <8.31 |
| Cs-134 | <3.91 | <2.09 | <3.41 | <4.39 | <7.24 | <3.71 |
| Cs-137 | <0.71 | <1.96 | <2.70 | <2.55 | <1.45 | <2.22 |
| Zr-95 | <6.15 | <7.16 | <4.52 | <5.43 | <13.90 | <8.47 |
| Nb-95 | <4.10 | <4.40 | <5.89 | <4.55 | <2.41 | <3.42 |
| Co-58 | <3.10 | <2.37 | <0.91 | <4.37 | <5.88 | <1.04 |
| Mn-54 | <3.72 | <3.56 | <2.59 | <2.43 | <5.03 | <3.43 |
| Co-60 | <3.45 | <4.81 | <4.14 | <3.40 | <7.74 | <3.97 |
| K-40 | <36.30 | <12.30 | <41.90 | 68.0 ± 18.4 | <27.70 | <38.70 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 86.6 ± 16.8 | 80.8 ± 13.7 | 76.4 ± 15.4 | 49.0 ± 13.5 | 75.0 ± 18.6 | 70.4 ± 14.4 |
| Zn-65 | <11.60 | <5.03 | <13.40 | <9.33 | <15.26 | <11.21 |
| Cs-134 | <5.62 | <3.19 | <4.39 | <2.74 | <3.63 | <4.72 |
| Cs-137 | <4.75 | <0.58 | <3.20 | <1.71 | <1.19 | <2.61 |
| Zr-95 | <8.36 | <4.00 | <2.04 | <6.32 | <9.51 | <7.36 |
| Nb-95 | <3.81 | <4.05 | <3.95 | <4.35 | <7.40 | <6.43 |
| Co-58 | <4.77 | <3.38 | <4.97 | <2.51 | <6.91 | <3.71 |
| Mn-54 | <3.23 | <0.69 | <4.72 | <3.50 | <4.10 | <4.22 |
| Co-60 | <6.29 | <2.76 | <4.14 | <3.39 | <6.34 | <1.46 |
| K-40 | 99.0 ± 26.7 | <29.10 | <55.40 | <43.80 | <82.4 | <14.84 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**G OFFSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 51.1 ± 15.4 | 120 ± 21.2 | 71.3 ± 14.3 | 128 ± 21.6 | 137 ± 23.7 | 126 ± 20.4 |
| Zn-65 | <11.20 | <3.60 | <14.40 | <14.20 | <13.60 | <7.10 |
| Cs-134 | <3.78 | <3.41 | <4.19 | <4.91 | <3.32 | <3.43 |
| Cs-137 | <4.18 | <3.83 | <3.26 | <3.37 | <4.59 | <2.15 |
| Zr-95 | <7.35 | <7.08 | <10.60 | <10.50 | <9.48 | <6.57 |
| Nb-95 | <6.42 | <1.75 | <5.88 | <6.49 | <7.58 | <6.66 |
| Co-58 | <3.70 | <4.39 | <2.87 | <5.06 | <4.89 | <3.84 |
| Mn-54 | <5.58 | <4.89 | <4.81 | <3.41 | <1.29 | <2.67 |
| Co-60 | <6.05 | <2.09 | <5.06 | <1.84 | <1.96 | <5.39 |
| K-40 | 136 ± 27.3 | <21.40 | <40.60 | <68.00 | <19.90 | <15.26 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 125 ± 20.8 | 68.8 ± 12.5 | 59.3 ± 18.0 | 56.3 ± 14.4 | <38.0 | <38.4 |
| Zn-65 | <8.36 | <6.42 | <12.40 | <6.80 | <7.63 | <9.96 |
| Cs-134 | <3.67 | <1.92 | <6.32 | <6.39 | <5.25 | <6.35 |
| Cs-137 | <3.76 | <3.07 | <3.77 | <3.61 | <2.57 | <4.12 |
| Zr-95 | <2.19 | <5.15 | <7.55 | <5.86 | <5.96 | <8.40 |
| Nb-95 | <6.29 | <2.77 | <4.00 | <4.50 | <3.99 | <6.29 |
| Co-58 | <5.34 | <2.12 | <4.52 | <4.13 | <6.28 | <4.16 |
| Mn-54 | <3.62 | <2.64 | <4.39 | <4.26 | <3.96 | <3.27 |
| Co-60 | <4.57 | <1.07 | <4.56 | <3.02 | <5.30 | <1.22 |
| K-40 | <46.30 | <10.80 | <44.40 | <38.80 | <44.78 | <51.44 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**D1 ONSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 89.7 ± 15.0 | 55.0 ± 14.5 | 65.2 ± 16.3 | 72.4 ± 13.7 | 92.0 ± 18.9 | 129 ± 24.3 |
| Zn-65 | <6.90 | <10.40 | <12.20 | <6.06 | <12.60 | <10.70 |
| Cs-134 | <5.16 | <4.64 | <4.91 | <2.15 | <4.36 | <1.36 |
| Cs-137 | <3.64 | <4.14 | <4.87 | <2.01 | <4.31 | <4.17 |
| Zr-95 | <4.61 | <9.10 | <2.59 | <4.88 | <6.45 | <9.71 |
| Nb-95 | <5.80 | <5.24 | <6.02 | <3.39 | <4.48 | <7.54 |
| Co-58 | <5.03 | <5.97 | <4.36 | <4.12 | <1.38 | <1.66 |
| Mn-54 | <2.46 | <4.54 | <3.79 | <2.16 | <5.00 | <4.19 |
| Co-60 | <1.38 | <4.84 | <5.86 | <3.31 | <1.82 | <2.28 |
| K-40 | <14.00 | 105 ± 24.8 | <21.00 | <35.00 | <67.40 | <97.90 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 155 ± 25.8 | 113 ± 18.5 | 82.2 ± 19.8 | 74.1 ± 14.2 | 91.1 ± 17.1 | 81.1 ± 17.2 |
| Zn-65 | <14.80 | <7.29 | <9.59 | <13.80 | <7.23 | <9.98 |
| Cs-134 | <5.14 | <2.52 | <3.33 | <2.41 | <4.06 | <5.05 |
| Cs-137 | <4.57 | <2.82 | <5.67 | <4.07 | <3.09 | <3.80 |
| Zr-95 | <8.54 | <7.93 | <10.26 | <6.94 | <5.69 | <5.34 |
| Nb-95 | <2.13 | <5.47 | <6.01 | <5.60 | <4.89 | <6.49 |
| Co-58 | <6.71 | <4.25 | <7.84 | <3.58 | <3.74 | <1.08 |
| Mn-54 | <4.60 | <2.86 | <4.78 | <2.42 | <3.76 | <3.95 |
| Co-60 | <9.02 | <4.39 | <8.57 | <5.38 | <1.53 | <4.11 |
| K-40 | <72.80 | <15.70 | <20.80 | <14.40 | <61.85 | <50.43 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**G ONSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 62.2 ± 19.0 | 75.0 ± 23.3 | 67.2 ± 17.5 | 75.2 ± 14.1 | 94.4 ± 17.1 | 99.7 ± 18.7 |
| Zn-65 | <4.20 | <14.30 | <11.40 | <8.09 | <2.29 | <7.06 |
| Cs-134 | <3.83 | <4.97 | <2.50 | <4.32 | <4.24 | <5.46 |
| Cs-137 | <6.00 | <6.51 | <2.34 | <2.07 | <2.63 | <3.02 |
| Zr-95 | <12.70 | <10.40 | <1.91 | <7.50 | <7.42 | <6.99 |
| Nb-95 | <2.00 | <1.77 | <1.29 | <3.68 | <4.42 | <3.68 |
| Co-58 | <4.53 | <6.51 | <5.07 | <3.58 | <2.62 | <3.21 |
| Mn-54 | <1.53 | <4.88 | <3.63 | <2.07 | <3.59 | <0.98 |
| Co-60 | <6.70 | <2.08 | <3.85 | <3.27 | <4.28 | <1.49 |
| K-40 | <25.30 | <89.10 | <15.00 | <33.10 | <36.10 | <15.20 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 126 ± 22.1 | 72.7 ± 15.2 | 36.6 ± 14.3 | 51.2 ± 15.7 | 84.7 ± 16.2 | 66.7 ± 16.2 |
| Zn-65 | <8.17 | <1.98 | <10.60 | <2.17 | <10.80 | <10.50 |
| Cs-134 | <5.97 | <3.12 | <3.27 | <3.68 | <3.54 | <2.73 |
| Cs-137 | <3.48 | <1.79 | <3.59 | <2.91 | <4.08 | <2.72 |
| Zr-95 | <9.49 | <6.38 | <5.72 | <6.05 | <5.27 | <8.65 |
| Nb-95 | <4.35 | <4.40 | <4.94 | <1.15 | <1.24 | <3.56 |
| Co-58 | <3.37 | <2.83 | <3.76 | <0.96 | <4.53 | <4.52 |
| Mn-54 | <2.92 | <3.38 | <3.25 | <0.82 | <3.00 | <3.95 |
| Co-60 | <5.65 | <3.69 | <6.46 | <3.52 | <5.02 | <1.52 |
| K-40 | <17.60 | <31.10 | <53.20 | <34.20 | <45.98 | <55.38 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**H ONSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 50.5 ± 15.6 | 111 ± 19.9 | 69.5 ± 14.6 | 67.8 ± 17.4 | 130 ± 15.9 | 80.3 ± 17.8 |
| Zn-65 | <6.48 | <7.56 | <2.45 | <9.05 | <8.71 | <9.93 |
| Cs-134 | <4.02 | <4.22 | <5.54 | <4.57 | <5.18 | <5.69 |
| Cs-137 | <3.49 | <4.01 | <2.84 | <4.05 | <3.58 | <3.70 |
| Zr-95 | <7.71 | <8.35 | <8.66 | <6.76 | <4.80 | <9.46 |
| Nb-95 | <3.68 | <5.62 | <3.54 | <5.93 | <4.92 | <5.62 |
| Co-58 | <3.70 | <2.96 | <4.43 | <1.45 | <3.15 | <5.20 |
| Mn-54 | <3.43 | <2.59 | <2.99 | <5.86 | <2.67 | <4.27 |
| Co-60 | <1.30 | <1.53 | <1.40 | <1.91 | <4.50 | <5.05 |
| K-40 | <37.40 | <42.20 | <14.30 | <55.70 | <43.50 | <62.20 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 111 ± 20.8 | 67.4 ± 12.8 | 68.8 ± 15.7 | 69.1 ± 13.0 | 69.4 ± 18.0 | 79.0 ± 15.8 |
| Zn-65 | <2.95 | <1.88 | <6.67 | <7.57 | <12.80 | <8.65 |
| Cs-134 | <5.51 | <4.23 | <5.25 | <3.60 | <7.44 | <5.95 |
| Cs-137 | <3.98 | <1.70 | <3.31 | <2.59 | <4.02 | <4.50 |
| Zr-95 | <2.19 | <4.10 | <10.90 | <4.23 | <9.83 | <6.27 |
| Nb-95 | <7.07 | <2.83 | <6.46 | <4.85 | <6.64 | <4.21 |
| Co-58 | <3.31 | <3.46 | <4.85 | <3.56 | <5.39 | <4.77 |
| Mn-54 | <3.61 | <2.65 | <3.86 | <4.16 | <3.35 | <2.17 |
| Co-60 | <1.69 | <3.86 | <5.90 | <1.08 | <4.47 | <4.23 |
| K-40 | <17.20 | <37.20 | <14.30 | <10.90 | <58.40 | <60.72 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**I ONSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 45.7 ± 14.9 | 75.9 ± 18.7 | 74.7 ± 17.2 | 118 ± 17.5 | 102 ± 15.9 | 93.7 ± 18.5 |
| Zn-65 | <10.60 | <11.00 | <11.70 | <7.64 | <8.36 | <9.70 |
| Cs-134 | <5.95 | <5.15 | <6.24 | <2.72 | <1.96 | <6.01 |
| Cs-137 | <3.02 | <2.71 | <3.74 | <2.97 | <2.17 | <3.00 |
| Zr-95 | <8.51 | <8.91 | <8.67 | <10.70 | <7.29 | <7.00 |
| Nb-95 | <4.03 | <5.50 | <5.37 | <4.30 | <4.52 | <1.72 |
| Co-58 | <4.96 | <3.68 | <5.05 | <3.69 | <4.04 | <4.34 |
| Mn-54 | <4.61 | <3.38 | <4.02 | <2.71 | <1.95 | <4.84 |
| Co-60 | <4.92 | <5.13 | <5.76 | <3.31 | <3.07 | <7.48 |
| K-40 | 124 ± 29.8 | <42.60 | 135 ± 26.5 | <35.10 | <31.00 | <21.20 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 139 ± 20.8 | 69.4 ± 12.4 | 74.6 ± 14.5 | 61.9 ± 14.7 | <52.0 | 54.9 ± 16.8 |
| Zn-65 | <8.55 | <6.16 | <10.60 | <7.54 | <13.86 | <10.6 |
| Cs-134 | <3.62 | <3.22 | <3.26 | <4.07 | <3.81 | <4.66 |
| Cs-137 | <4.50 | <1.48 | <3.21 | <1.79 | <4.28 | <4.14 |
| Zr-95 | <1.87 | <3.76 | <7.22 | <8.11 | <10.09 | <9.70 |
| Nb-95 | <7.57 | <4.69 | <5.99 | <5.15 | <6.83 | <6.53 |
| Co-58 | <4.09 | <2.85 | <2.55 | <5.70 | <1.72 | <4.76 |
| Mn-54 | <5.20 | <1.67 | <2.77 | <3.28 | <5.47 | <6.89 |
| Co-60 | <4.05 | <3.32 | <5.11 | <3.54 | <8.45 | <2.26 |
| K-40 | <14.30 | <26.70 | <13.00 | <36.00 | <23.94 | <83.73 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**J ONSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | <26.90 | <44.20 | 44.5 ± 18.2 | 104 ± 17.6 | 81.1 ± 15.2 | 95.7 ± 17.9 |
| Zn-65 | <12.60 | <3.62 | <12.20 | <7.81 | <7.90 | <2.47 |
| Cs-134 | <5.66 | <4.31 | <4.90 | <2.96 | <3.48 | <4.29 |
| Cs-137 | <4.51 | <3.04 | <3.76 | <4.12 | <3.29 | <2.26 |
| Zr-95 | <10.60 | <9.03 | <8.87 | <8.40 | <8.49 | <5.23 |
| Nb-95 | <6.14 | <4.84 | <6.96 | <4.78 | <4.84 | <3.50 |
| Co-58 | <5.69 | <4.43 | <5.53 | <3.45 | <4.05 | <1.06 |
| Mn-54 | <5.79 | <1.34 | <3.79 | <3.40 | <2.96 | <3.88 |
| Co-60 | <6.06 | <2.09 | <5.85 | <1.30 | <5.46 | <1.42 |
| K-40 | <21.70 | <60.90 | <59.70 | <13.20 | <37.50 | <64.30 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 116 ± 19.9 | 87.0 ± 13.5 | 79.9 ± 20.4 | 60.0 ± 15.4 | 46.6 ± 15.7 | 83.7 ± 16.6 |
| Zn-65 | <9.46 | <5.04 | <14.70 | <7.47 | <9.65 | <9.26 |
| Cs-134 | <3.27 | <2.41 | <6.72 | <5.27 | <4.00 | <4.69 |
| Cs-137 | <3.35 | <2.43 | <4.08 | <3.07 | <3.26 | <2.47 |
| Zr-95 | <7.18 | <6.80 | <5.73 | <8.23 | <7.64 | <7.29 |
| Nb-95 | <4.86 | <3.32 | <1.43 | <3.87 | <7.91 | <6.38 |
| Co-58 | <3.71 | <3.25 | <4.21 | <4.99 | <3.15 | <3.78 |
| Mn-54 | <4.14 | <0.70 | <4.22 | <3.58 | <3.43 | <3.81 |
| Co-60 | <5.95 | <1.06 | <5.79 | <4.20 | <5.29 | <5.88 |
| K-40 | <15.10 | <10.70 | <46.30 | <42.50 | <65.42 | <15.82 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

**TABLE 6-7 (continued)**
**CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES**
**OF JAF/NMPNS SITE AIR PARTICULATE SAMPLES - 2006**
**Results in Units of 10E-3 pCi/ $m^3$ ± 1 Sigma**

**K ONSITE COMPOSITE****

| Nuclides | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7 | 57.1 ± 14.0 | 78.1 ± 15.4 | 65.1 ± 15.7 | 73.2 ± 16.6 | 83.1 ± 14.9 | 83.7 ± 15.9 |
| Zn-65 | <10.60 | <9.33 | <10.50 | <10.40 | <7.28 | <8.75 |
| Cs-134 | <3.30 | <5.13 | <5.25 | <4.69 | <4.37 | <5.13 |
| Cs-137 | <0.80 | <2.99 | <4.70 | <2.97 | <2.89 | <3.97 |
| Zr-95 | <9.11 | <9.97 | <8.36 | <5.86 | <4.91 | <7.46 |
| Nb-95 | <3.41 | <4.74 | <4.87 | <2.78 | <4.40 | <6.54 |
| Co-58 | <4.81 | <4.19 | <3.72 | <3.58 | <3.47 | <5.30 |
| Mn-54 | <3.25 | <0.97 | <3.73 | <3.70 | <2.94 | <2.61 |
| Co-60 | <4.96 | <3.87 | <1.52 | <4.21 | <4.10 | <4.15 |
| K-40 | <50.20 | <72.90 | <61.30 | <30.30 | <29.30 | <42.10 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| **Nuclides** | **July** | **August** | **September** | **October** | **November** | **December** |
| Be-7 | 99.5 ± 23.4 | 63.9 ± 12.6 | <52.5 | 61.5 ± 15.5 | 34.4 ± 14.9 | 73.6 ± 15.4 |
| Zn-65 | <16.30 | <8.41 | <13.30 | <7.81 | <10.64 | <8.94 |
| Cs-134 | <7.34 | <5.52 | <8.20 | <4.49 | <5.73 | <3.98 |
| Cs-137 | <8.16 | <3.05 | <4.33 | <3.40 | <3.11 | <4.64 |
| Zr-95 | <9.43 | <4.76 | <9.74 | <6.35 | <5.73 | <8.20 |
| Nb-95 | <6.39 | <4.30 | <7.21 | <5.12 | <5.72 | <4.74 |
| Co-58 | <7.42 | <2.75 | <6.16 | <2.61 | <3.00 | <4.70 |
| Mn-54 | <7.51 | <3.45 | <6.44 | <2.77 | <3.27 | <3.68 |
| Co-60 | <2.76 | <4.03 | <4.59 | <4.91 | <1.54 | <1.50 |
| K-40 | <28.10 | <24.70 | <46.20 | <13.20 | <53.66 | <52.38 |
| Others † | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

** Optional sample location
† Plant related radionuclides

## TABLE 6-8

## ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFFSITE STATIONS – 2006

### I-131 ACTIVITY pCi/ $m^3$ ± 1 Sigma

| Week End Date | R-1 * | R-2 * | R-3 * | R-4 * | R-5 * | D-2 ** | E ** | F ** | G ** |
|---|---|---|---|---|---|---|---|---|---|
| 01/10/06 | <0.026 | <0.023 | <0.042 | <0.029 | <0.028 | <0.008 | <0.021 | <0.024 | <0.041 |
| 01/17/06 | <0.022 | <0.016 | <0.025 | <0.042 | <0.023 | <0.028 | <0.042 | <0.024 | <0.014 |
| 01/24/06 | <0.028 | <0.028 | <0.006 | <0.008 | <0.034 | <0.024 | <0.031 | <0.026 | <0.018 |
| 01/31/06 | <0.020 | <0.026 | <0.023 | <0.039 | <0.025 | <0.025 | <0.024 | <0.008 | <0.027 |
| 02/07/06 | <0.029 | <0.022 | <0.035 | <0.025 | <0.023 | <0.022 | <0.008 | <0.022 | <0.024 |
| 02/14/06 | <0.025 | <0.015 | <0.016 | <0.013 | <0.021 | <0.023 | <0.016 | <0.023 | <0.019 |
| 02/22/06 | <0.007 | <0.018 | <0.019 | <0.008 | <0.015 | <0.017 | <0.032 | <0.024 | <0.031 |
| 02/28/06 | <0.032 | <0.022 | <0.031 | <0.035 | <0.026 | <0.032 | <0.049 | <0.024 | <0.006 |
| 03/07/06 | <0.025 | <0.020 | <0.019 | <0.025 | <0.011 | <0.019 | <0.024 | <0.020 | <0.018 |
| 03/14/06 | <0.042 | <0.025 | <0.021 | <0.042 | <0.019 | <0.022 | <0.031 | <0.020 | <0.024 |
| 03/21/06 | <0.029 | <0.015 | <0.028 | <0.025 | <0.028 | <0.018 | <0.036 | <0.020 | <0.024 |
| 03/28/06 | <0.018 | <0.027 | <0.020 | <0.023 | <0.028 | <0.022 | <0.026 | <0.021 | <0.036 |
| 04/04/06 | <0.020 | <0.027 | <0.016 | <0.032 | <0.028 | <0.024 | <0.025 | <0.026 | <0.025 |
| 04/11/06 | <0.045 | <0.032 | <0.020 | <0.017 | <0.030 | <0.032 | <0.032 | <0.029 | <0.015 |
| 04/18/06 | <0.030 | <0.026 | <0.015 | <0.030 | <0.015 | <0.037 | <0.025 | <0.021 | <0.022 |
| 04/25/06 | <0.005 | <0.031 | <0.029 | <0.024 | <0.024 | <0.029 | <0.027 | <0.022 | <0.030 |
| 05/02/06 | <0.029 | <0.020 | <0.019 | <0.024 | <0.030 | <0.028 | <0.021 | <0.020 | <0.023 |
| 05/09/06 | <0.023 | <0.021 | <0.022 | <0.024 | <0.029 | <0.025 | <0.036 | <0.021 | <0.021 |
| 05/16/06 | <0.008 | <0.019 | <0.024 | <0.027 | <0.027 | <0.026 | <0.008 | <0.027 | <0.026 |
| 05/23/06 | <0.032 | <0.025 | <0.027 | <0.024 | <0.019 | <0.033 | <0.027 | <0.018 | <0.027 |
| 05/31/06 | <0.021 | <0.024 | <0.020 | <0.038 | <0.028 | <0.025 | <0.022 | <0.023 | <0.018 |
| 06/06/06 | <0.026 | <0.035 | <0.029 | <0.018 | <0.037 | <0.027 | <0.019 | <0.020 | <0.033 |
| 06/13/06 | <0.033 | <0.016 | <0.019 | <0.023 | <0.023 | <0.008 | <0.018 | <0.020 | <0.033 |
| 06/20/06 | <0.027 | <0.017 | <0.021 | <0.017 | <0.016 | <0.020 | <0.016 | <0.026 | <0.016 |
| 06/27/06 | <0.037 | <0.025 | <0.024 | <0.018 | <0.023 | <0.026 | <0.027 | <0.014 | <0.018 |

* Sample location required by ODCM

** Optional sample location

**TABLE 6-8 (continued)**

**ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFFSITE STATIONS – 2006**

**I-131 ACTIVITY pCi/ $m^3$ ± 1 Sigma**

| Week End Date | R-1 * | R-2 * | R-3 * | R-4 * | R-5 * | D-2 ** | E ** | F ** | G ** |
|---|---|---|---|---|---|---|---|---|---|
| 07/04/06 | <0.026 | <0.018 | <0.013 | <0.020 | <0.017 | <0.013 | <0.023 | <0.023 | <0.018 |
| 07/11/06 | <0.037 | <0.026 | <0.028 | <0.026 | <0.038 | <0.041 | <0.049 | <0.027 | <0.029 |
| 07/18/06 | <0.038 | <0.020 | <0.020 | <0.026 | <0.029 | <0.026 | <0.039 | <0.027 | <0.024 |
| 07/25/06 | <0.022 | <0.021 | <0.027 | <0.042 | <0.024 | <0.022 | <0.027 | <0.033 | <0.028 |
| 08/01/06 | <0.023 | <0.028 | <0.033 | <0.023 | <0.019 | <0.037 | <0.022 | <0.022 | <0.027 |
| 08/08/06 | <0.032 | <0.017 | <0.014 | <0.019 | <0.022 | <0.020 | <0.009 | <0.011 | <0.011 |
| 08/15/06 | <0.008 | <0.018 | <0.021 | <0.026 | <0.005 | <0.021 | <0.024 | <0.027 | <0.026 |
| 08/22/06 | <0.031 | <0.024 | <0.021 | <0.028 | <0.024 | <0.033 | <0.019 | <0.013 | <0.025 |
| 08/29/06 | <0.025 | <0.029 | <0.025 | <0.019 | <0.017 | <0.028 | <0.026 | <0.020 | <0.021 |
| 09/06/06 | <0.023 | <0.018 | <0.023 | <0.035 | <0.024 | <0.026 | <0.026 | <0.038 | <0.025 |
| 09/12/06 | <0.018 | <0.022 | <0.015 | <0.025 | <0.024 | <0.022 | <0.016 | <0.020 | <0.021 |
| 09/19/06 | <0.028 | <0.007 | <0.018 | <0.016 | <0.024 | <0.049 | <0.008 | <0.029 | <0.037 |
| 09/26/06 | <0.021 | <0.012 | <0.020 | <0.016 | <0.015 | <0.024 | <0.025 | <0.022 | <0.024 |
| 10/03/06 | <0.025 | <0.031 | <0.019 | <0.024 | <0.034 | <0.030 | <0.015 | <0.027 | <0.027 |
| 10/10/06 | <0.040 | <0.023 | <0.023 | <0.040 | <0.024 | <0.026 | <0.008 | <0.030 | <0.038 |
| 10/17/06 | <0.032 | <0.024 | <0.018 | <0.017 | <0.022 | <0.031 | <0.034 | <0.014 | <0.022 |
| 10/24/06 | <0.037 | <0.021 | <0.018 | <0.024 | <0.024 | <0.027 | <0.034 | <0.018 | <0.022 |
| 10/31/06 | <0.030 | <0.025 | <0.021 | <0.020 | <0.028 | <0.027 | <0.039 | <0.023 | <0.031 |
| 11/07/06 | <0.028 | <0.014 | <0.029 | <0.022 | <0.021 | <0.026 | <0.031 | <0.020 | <0.026 |
| 11/14/06 | <0.026 | <0.024 | <0.021 | <0.032 | <0.028 | <0.020 | <0.023 | <0.022 | <0.025 |
| 11/21/06 | <0.013 | <0.023 | <0.028 | <0.035 | <0.025 | <0.020 | <0.023 | <0.033 | <0.019 |
| 11/28/06 | <0.026 | <0.021 | <0.028 | <0.031 | <0.025 | <0.026 | <0.017 | <0.023 | <0.008 |
| 12/05/06 | <0.026 | <0.025 | <0.026 | <0.034 | <0.029 | <0.025 | <0.029 | <0.035 | <0.023 |
| 12/12/06 | <0.023 | <0.023 | <0.038 | <0.022 | <0.014 | <0.023 | <0.028 | <0.023 | <0.026 |
| 12/19/06 | <0.025 | <0.022 | <0.022 | <0.028 | <0.029 | <0.020 | <0.024 | <0.024 | <0.022 |
| 12/26/06 | <0.023 | <0.024 | <0.020 | <0.034 | <0.026 | <0.016 | <0.025 | <0.018 | <0.026 |
| 01/02/07 | <0.022 | <0.028 | <0.024 | <0.026 | <0.033 | <0.027 | <0.028 | <0.023 | <0.029 |

* Sample location required by ODCM

** Optional sample location

**TABLE 6-9**

**ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ONSITE STATIONS – 2006**

**I-131 ACTIVITY pCi/m3 ± 1 Sigma**

| Week End Date | D1 ** | G ** | H ** | I ** | J ** | K ** |
|---|---|---|---|---|---|---|
| 01/09/06 | <0.041 | <0.031 | <0.009 | <0.021 | <0.038 | <0.026 |
| 01/16/06 | <0.027 | <0.021 | <0.026 | <0.008 | <0.022 | <0.029 |
| 01/23/06 | <0.021 | <0.018 | <0.008 | <0.013 | <0.024 | <0.034 |
| 01/31/06 | <0.021 | <0.024 | <0.027 | <0.026 | <0.022 | <0.025 |
| 02/06/06 | <0.032 | <0.023 | <0.027 | <0.024 | <0.025 | <0.037 |
| 02/13/06 | <0.027 | <0.006 | <0.024 | <0.024 | <0.022 | <0.025 |
| 02/21/06 | <0.024 | <0.023 | <0.034 | <0.012 | <0.028 | <0.008 |
| 02/27/06 | <0.043 | <0.025 | <0.024 | <0.018 | <0.019 | <0.024 |
| 03/06/06 | <0.032 | <0.026 | <0.022 | <0.031 | <0.016 | <0.030 |
| 03/13/06 | <0.032 | <0.026 | <0.030 | <0.024 | <0.025 | <0.034 |
| 03/20/06 | <0.041 | <0.032 | <0.019 | <0.031 | <0.028 | <0.030 |
| 03/27/06 | <0.023 | <0.024 | <0.015 | <0.040 | <0.019 | <0.030 |
| 04/03/06 | <0.030 | <0.026 | <0.019 | <0.022 | <0.027 | <0.034 |
| 04/10/06 | <0.040 | <0.022 | <0.029 | <0.030 | <0.032 | <0.021 |
| 04/17/06 | <0.028 | <0.020 | <0.031 | <0.024 | <0.025 | <0.046 |
| 04/24/06 | <0.022 | <0.012 | <0.015 | <0.022 | <0.029 | <0.029 |
| 05/01/06 | <0.041 | <0.026 | <0.019 | <0.025 | <0.019 | <0.026 |
| 05/08/06 | <0.022 | <0.023 | <0.022 | <0.005 | <0.020 | <0.033 |
| 05/15/06 | <0.029 | <0.024 | <0.028 | <0.028 | <0.032 | <0.015 |
| 05/22/06 | <0.025 | <0.029 | <0.027 | <0.020 | <0.027 | <0.022 |
| 05/30/06 | <0.033 | <0.019 | <0.027 | <0.014 | <0.015 | <0.024 |
| 06/05/06 | <0.026 | <0.028 | <0.018 | <0.020 | <0.027 | <0.027 |
| 06/12/06 | <0.037 | <0.028 | <0.026 | <0.021 | <0.031 | <0.036 |
| 06/19/06 | <0.051 | <0.021 | <0.026 | <0.022 | <0.015 | <0.027 |
| 06/26/06 | <0.040 | <0.024 | <0.028 | <0.021 | <0.018 | <0.019 |

** Optional sample location

**TABLE 6-9 (continued)**

**ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ONSITE STATIONS – 2006**

**I-131 ACTIVITY pCi/ $m^3$ ± 1 Sigma**

| Week End Date | D1 ** | G ** | H ** | I ** | J ** | K ** |
|---|---|---|---|---|---|---|
| 07/05/06 | <0.030 | <0.015 | <0.022 | <0.016 | <0.018 | <0.024 |
| 07/10/06 | <0.031 | <0.026 | <0.041 | <0.031 | <0.045 | <0.026 |
| 07/17/06 | <0.031 | <0.030 | <0.025 | <0.020 | <0.014 | <0.022 |
| 07/24/06 | <0.021 | <0.021 | <0.019 | <0.025 | <0.024 | <0.023 |
| 07/31/06 | <0.034 | <0.019 | <0.025 | <0.020 | <0.005 | <0.026 |
| 08/07/06 | <0.022 | <0.023 | <0.025 | <0.020 | <0.005 | <0.021 |
| 08/14/06 | <0.037 | <0.026 | <0.027 | <0.024 | <0.027 | <0.029 |
| 08/21/06 | <0.033 | <0.021 | <0.025 | <0.019 | <0.029 | <0.019 |
| 08/28/06 | <0.022 | <0.026 | <0.025 | <0.023 | <0.022 | <0.023 |
| 09/05/06 | <0.026 | <0.017 | <0.005 | <0.018 | <0.025 | <0.020 |
| 09/11/06 | <0.041 | <0.031 | <0.023 | <0.024 | <0.016 | <0.030 |
| 09/18/06 | <0.025 | <0.023 | <0.029 | <0.025 | <0.031 | <0.027 |
| 09/25/06 | <0.029 | <0.029 | <0.027 | <0.032 | <0.037 | No Sample |
| 10/02/06 | <0.028 | <0.014 | <0.016 | <0.016 | <0.009 | <0.023 |
| 10/09/06 | <0.031 | <0.029 | <0.021 | <0.029 | <0.016 | <0.024 |
| 10/16/06 | <0.064 | <0.014 | <0.020 | <0.015 | <0.016 | <0.023 |
| 10/23/06 | <0.021 | <0.017 | <0.016 | <0.016 | <0.019 | <0.025 |
| 10/30/06 | <0.028 | <0.026 | <0.023 | <0.016 | <0.024 | <0.015 |
| 11/06/06 | <0.025 | <0.020 | <0.019 | <0.030 | <0.027 | <0.021 |
| 11/13/06 | <0.022 | <0.015 | <0.018 | <0.027 | <0.021 | <0.018 |
| 11/20/06 | <0.031 | <0.022 | <0.014 | <0.023 | <0.022 | <0.033 |
| 11/27/06 | <0.022 | <0.016 | <0.030 | <0.028 | <0.030 | <0.022 |
| 12/04/06 | <0.027 | <0.023 | <0.024 | <0.023 | <0.015 | <0.030 |
| 12/11/06 | <0.020 | <0.027 | <0.025 | <0.042 | <0.024 | <0.022 |
| 12/18/06 | <0.029 | <0.021 | <0.021 | <0.023 | <0.037 | <0.025 |
| 12/26/06 | <0.013 | <0.019 | <0.027 | <0.031 | <0.027 | <0.025 |
| 01/02/07 | <0.017 | <0.012 | <0.016 | <0.021 | <0.022 | <0.015 |

** Optional sample location

# TABLE 6-10

## DIRECT RADIATION MEASUREMENT RESULTS – 2006
## Results in Units of mrem/std. Month ± 1 Sigma

| Location Number | Location | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Degrees & Distance (1) |
|---|---|---|---|---|---|---|
| 3 | D1 Onsite | 12.52 ± 0.71 | 14.38 ± 0.58 | 14.37 ± 0.67 | 11.10 ± 0.57 | 69° at 0.2 miles |
| 4 | D2 Onsite | 4.78 ± 0.26 | 4.88 ± 0.26 | 4.25 ± 0.20 | 4.50 ± 0.22 | 140° at 0.4 miles |
| 5 | E Onsite | 4.60 ± 0.29 | 4.71 ± 0.26 | 4.41 ± 0.26 | 4.68 ± 0.26 | 175° at 0.4 miles |
| 6 | F Onsite | 3.96 ± 0.22 | 3.91 ± 0.17 | 3.99 ± 0.31 | 4.00 ± 0.20 | 210° at 0.5 miles |
| 7* | G Onsite | 3.60 ± 0.19 | 3.73 ± 0.28 | 3.57 ± 0.16 | 3.49 ± 0.16 | 250° at 0.7 miles |
| 8* | R-5 Offsite Control | 5.25 ± 0.33 | 4.80 ± 0.20 | 4.72 ± 0.20 | 4.92 ± 0.25 | 42° at 16.4 miles |
| 9 | D1 Offsite | 4.38 ± 0.24 | 4.24 ± 0.25 | 3.99 ± 0.25 | 4.12 ± 0.22 | 80° at 11.4 miles |
| 10 | D2 Offsite | 4.33 ± 0.29 | 3.95 ± 0.17 | 3.85 ± 0.20 | 4.13 ± 0.18 | 117° at 9.0 miles |
| 11 | E Offsite | 4.10 ± 0.23 | 4.11 ± 0.19 | 3.88 ± 0.22 | 4.09 ± 0.21 | 160° at 7.2 miles |
| 12 | F- Offsite | 4.15 ± 0.18 | 4.16 ± 0.22 | 3.93 ± 0.25 | 4.20 ± 0.21 | 190° at 7.7 miles |
| 13 | G Offsite | 4.21 ± 0.31 | 4.11 ± 0.22 | 4.03 ± 0.27 | 4.13 ± 0.20 | 225° at 5.3 miles |
| 14* | DeMass Rd., SW Oswego - Control | 4.41 ± 0.18 | 4.39 ± 0.20 | 4.28 ± 0.17 | 4.39 ± 0.24 | 226° at 12.6 miles |
| 15* | Pole 66, W. Boundary - Bible Camp | 3.82 ± 0.18 | 3.67 ± 0.19 | 3.57 ± 0.31 | 3.85 ± 0.22 | 237° at 0.9 miles |
| 18* | Energy Info. Center - Lamp Post, SW | 4.61 ± 0.24 | 4.28 ± 0.27 | 4.37 ± 0.19 | 4.64 ± 0.25 | 265° at 0.4 miles |
| 19 | East Boundary - JAF, Pole 9 | 4.82 ± 0.27 | 4.43 ± 0.20 | 4.34 ± 0.24 | 4.52 ± 0.28 | 81° at 1.3 miles |
| 23* | H Onsite | 5.28 ± 0.24 | 5.37 ± 0.20 | 4.98 ± 0.25 | 5.45 ± 0.43 | 70° at 0.8 miles |
| 24 | I Onsite | 4.54 ± 0.22 | 4.50 ± 0.19 | 4.30 ± 0.19 | 4.42 ± 0.26 | 98° at 0.8 miles |
| 25 | J Onsite | 4.14 ± 0.24 | 4.23 ± 0.18 | 4.05 ± 0.19 | 4.36 ± 0.22 | 110° at 0.9 miles |
| 26 | K Onsite | 4.48 ± 0.18 | 4.30 ± 0.21 | 4.09 ± 0.21 | 4.45 ± 0.23 | 132° at 0.5 miles |
| 27 | N. Fence, N. of Switchyard, JAF | 23.83 ± 1.23 | 20.70 ± 1.25 | 21.69 ± 1.03 | 16.13 ± 0.98 | 60° at 0.4 miles |
| 28 | N. Light Pole, N. of Screenhouse, JAF | 31.78 ± 1.61 | 26.74 ± 1.10 | 28.38 ± 1.66 | 27.96 ± 1.41 | 68° at 0.5 miles |
| 29 | N. Fence, N. of W. Side | 28.68 ± 2.09 | 24.77 ± 1.52 | 26.62 ± 1.47 | 19.16 ± 1.38 | 65° at 0.5 miles |
| 30 | N. Fence, (NW) JAF | 13.32 ± 1.04 | 12.57 ± 0.96 | 13.04 ± 1.34 | 9.94 ± 0.58 | 57° at 0.4 miles |
| 31 | N. Fence, (NW) NMP-1 | 7.60 ± 0.38 | 7.15 ± 0.36 | 6.90 ± 0.29 | 7.37 ± 0.36 | 276° at 0.2 miles |

## TABLE 6-10 (continued)

## DIRECT RADIATION MEASUREMENT RESULTS – 2006
## Results in Units of mrem/std. Month ± 1 Sigma

| Location Number | Location | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Degrees & Distance (1) |
|---|---|---|---|---|---|---|
| 39 | N. Fence, Rad. Waste-NMP-1 | 10.91 ± 0.52 | 9.24 ± 0.89 | 9.54 ± 0.38 | 9.99 ± 0.62 | 292° at 0.2 miles |
| 47 | N. Fence, (NE) JAF | 8.01 ± 0.32 | 7.06 ± 0.31 | 6.67 ± 0.25 | 6.28 ± 0.26 | 69° at 0.6 miles |
| 49* | Phoenix, NY-Control | 3.81 ± 0.20 | 3.50 ± 0.15 | 3.33 ± 0.22 | 3.84 ± 0.30 | 163° at 19.8 miles |
| 51 | Liberty & Bronson Sts., E of Oswego Steam Station | 4.38 ± 0.24 | 4.07 ± 0.22 | 3.88 ± 0.18 | 4.18 ± 0.19 | 233° at 7.4 miles |
| 52 | E. 12th & Cayuga Sts., Oswego School | 4.30 ± 0.22 | 3.84 ± 0.15 | 3.73 ± 0.21 | 3.84 ± 0.17 | 227° at 5.8 miles |
| 53 | Broadwell & Chestnut Sts. Fulton H.S. | 4.73 ± 0.23 | 4.45 ± 0.22 | 4.15 ± 0.21 | 4.38 ± 0.28 | 183° at 13.7 miles |
| 54 | Liberty St. & Co. Rt. 16 Mexico H.S. | 4.27 ± 0.24 | 3.92 ± 0.24 | 3.53 ± 0.23 | 3.93 ± 0.25 | 115° at 9.3 miles |
| 55 | Gas Substation Co. Rt. 5-Pulaski | 4.34 ± 0.20 | 4.05 ± 0.16 | 3.57 ± 0.19 | 4.02 ± 0.21 | 75° at 13.0 miles |
| 56* | Rt. 104-New Haven Sch. (SE Corner) | 3.85 ± 0.17 | 3.69 ± 0.22 | 3.51 ± 0.17 | 3.84 ± 0.24 | 123° at 5.3 miles |
| 58* | Co Rt. 1A-Alcan (E. of E. Entrance Rd.) | 4.58 ± 0.20 | 4.39 ± 0.29 | 4.20 ± 0.22 | 4.53 ± 0.30 | 220° at 3.1 miles |
| 75* | Unit 2, N. Fence, N. of Reactor Bldg. | 7.94 ± 0.54 | 7.21 ± 0.30 | 7.48 ± 0.30 | 7.81 ± 0.44 | 5° at 0.1 miles |
| 76* | Unit 2, N. Fence, N. of Change House | 5.99 ± 0.28 | 5.35 ± 0.29 | 5.48 ± 0.24 | 5.68 ± 0.29 | 25° at 0.1 miles |
| 77* | Unit 2, N. Fence, N. of Pipe Bldg. | 6.77 ± 0.35 | 6.29 ± 0.31 | 6.35 ± 0.48 | 6.52 ± 0.31 | 45° at 0.2 miles |
| 78* | JAF. E. of E. Old Lay Down Area | 4.72 ± 0.28 | 4.15 ± 0.21 | 4.25 ± 0.32 | 4.57 ± 0.26 | 90° at 1.0 miles |
| 79* | Co. Rt. 29, Pole #63, 0.2 mi. S. of Lake Rd. | 4.10 ± 0.18 | 3.82 ± 0.15 | 3.75 ± 0.21 | 3.96 ± 0.20 | 115° at 1.1 miles |
| 80* | Co. Rt. 29, Pole #54, 0.7 mi. S. of Lake Rd. | 4.30 ± 0.18 | 4.25 ± 0.25 | 3.83 ± 0.18 | 4.13 ± 0.27 | 133° at 1.4 miles |
| 81* | Miner Rd., Pole #16, 0.5 mi. W. of Rt. 29 | 4.30 ± 0.32 | 3.83 ± 0.28 | 3.89 ± 0.22 | 4.25 ± 0.48 | 159° at 1.6 miles |
| 82* | Miner Rd., Pole # 1-1/2, 1.1 mi. W. of Rt. 29 | 4.14 ± 0.21 | 4.15 ± 0.27 | 3.75 ± 0.23 | 4.02 ± 0.29 | 181° at 1.6 miles |
| 83* | Lakeview Rd., Tree 0.45 mi. N. of Miner Rd. | 4.14 ± 0.32 | 4.04 ± 0.17 | 4.09 ± 0.20 | 3.81 ± 0.23 | 200° at 1.2 miles |
| 84* | Lakeview Rd., N, Pole #6117, 200ft. N. of Lake Rd. | 4.06 ± 0.19 | 4.08 ± 0.18 | 3.78 ± 0.24 | 4.16 ± 0.20 | 225° at 1.1 miles |
| 85* | Unit 1, N. Fence, N. of W. Side of Screen House | 9.16 ± 0.38 | 7.96 ± 0.40 | 7.88 ± 0.31 | 8.49 ± 0.56 | 294° at 0.2 miles |
| 86* | Unit 2, N. Fence, N of W. Side of Screen House | 8.37 ± 0.35 | 7.45 ± 0.46 | 7.67 ± 0.50 | 7.80 ± 0.51 | 315° at 0.1 miles |
| 87* | Unit 2, N. Fence, N. of E. Side of Screen House | 8.10 ± 0.52 | 7.82 ± 0.35 | 7.89 ± 0.38 | 7.95 ± 0.56 | 341° at 0.1 miles |
| 88* | Hickory Grove Rd., Pole #2, 0.6 mi. N. of Rt. 1 | 4.28 ± 0.35 | 3.93 ± 0.19 | 3.82 ± 0.22 | 4.07 ± 0.23 | 97° at 4.5 miles |

## TABLE 6-10

## DIRECT RADIATION MEASUREMENT RESULTS – 2006
### Results in Units of mrem/std. Month ± 1 Sigma

| Location Number | Location | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Degrees & Distance (1) |
|---|---|---|---|---|---|---|
| 89* | Leavitt Rd., Pole #16, 0.4 mi. S. of Rt.1 | 4.42 ± 0.21 | 4.31 ± 0.21 | 3.98 ± 0.22 | 4.34 ± 0.22 | 111° at 4.1 miles |
| 90* | Rt. 104, Pole #300, 150 ft. E. of Keefe Rd. | 3.94 ± 0.19 | 4.00 ± 0.16 | 3.60 ± 0.24 | 4.10 ± 0.20 | 135° at 4.2 miles |
| 91* | Rt 51A, Pole #59, 0.8 mi. W. of Rt. 51 | 4.17 ± 0.38 | 3.74 ± 0.26 | 3.53 ± 0.20 | 3.96 ± 0.29 | 156° at 4.8 miles |
| 92* | Maiden Lane Rd., Power Pole, 0.6 mi. S. of Rt. 104 | 4.30 ± 0.21 | 4.41 ± 0.20 | 4.18 ± 0.19 | 4.42 ± 0.23 | 183° at 4.4 miles |
| 93* | Rt. 53 Pole 1-1, 120 ft. S. of Rt. 104 | 4.11 ± 0.17 | 4.10 ± 0.27 | 3.69 ± 0.23 | 4.13 ± 0.17 | 205° at 4.4 miles |
| 94* | Rt. 1, Pole #82, 250 ft. E. of Kocher Rd. (Co. Rt. 63) | 3.95 ± 0.20 | 3.80 ± 0.24 | 3.53 ± 0.16 | 3.84 ± 0.22 | 223° at 4.7 miles |
| 95* | Alcan W access Rd., Joe Fultz Blvd, Pole #21 | 3.85 ± 0.24 | 3.54 ± 0.24 | 3.29 ± 0.21 | 3.60 ± 0.19 | 237° at 4.1 miles |
| 96* | Creamery Rd., 0.3 mi. S. of Middle Rd., Pole 1-1/2 | 4.17 ± 0.26 | 3.98 ± 0.16 | 3.71 ± 0.25 | 3.96 ± 0.26 | 199° at 3.6 miles |
| 97* | Rt. 29, Pole #50, 200ft. N. of Miner Rd. | 4.21 ± 0.21 | 4.09 ± 0.24 | 3.72 ± 0.22 | 4.09 ± 0.21 | 143° at 1.8 miles |
| 98 | Lake Rd., Pole #145, 0.15 mi. E. of Rt 29 | 4.36 ± 0.31 | 4.23 ± 0.17 | 3.87 ± 0.17 | 4.23 ± 0.18 | 101° at 1.2 miles |
| 99 | NMP Rd., 0.4 mi. N. of Lake Rd., Env. Station R1 | 4.60 ± 0.18 | 4.16 ± 0.21 | 4.08 ± 0.22 | 4.25 ± 0.22 | 88° at 1.8 miles |
| 100 | Rt. 29 & Lake Rd., Env. Station R2 | 4.34 ± 0.21 | 4.19 ± 0.19 | 3.96 ± 0.17 | 4.18 ± 0.28 | 104° at 1.1 miles |
| 101 | Rt. 29, 0.7 mi. S. of Lake Rd., Env. Station R3 | 3.86 ± 0.24 | 3.75 ± 0.20 | 3.53 ± 0.17 | 3.85 ± 0.23 | 132° at 1.5 miles |
| 102 | EOF/Env. Lab, Rt 176, E. Driveway, Lamp Post | 4.23 ± 0.22 | 3.94 ± 0.19 | 3.81 ± 0.21 | 4.15 ± 0.28 | 175° at 11.9 miles |
| 103 | EIC, East Garage Rd., Lamp Post | 4.81 ± 0.21 | 4.26 ± 0.26 | 4.33 ± 0.23 | 4.56 ± 0.23 | 267° at 0.4 miles |
| 104 | Parkhurst Rd., Pole #23, 0.1 mi. S. of Lake rd. | 4.22 ± 0.21 | 4.11 ± 0.19 | 3.96 ± 0.20 | 4.06 ± 0.25 | 102° at 1.4 miles |
| 105 | Lake view Rd. Pole #36, 0.5 mi. S. of Lake Rd. | 4.36 ± 0.22 | 4.28 ± 0.31 | 3.94 ± 0.16 | 4.21 ± 0.23 | 198° at 1.4 miles |
| 106 | Shoreline Cove, W. of NMP-1, Tree on W. Edge | 5.94 ± 0.36 | 5.31 ± 0.47 | 5.25 ± 0.22 | 5.12 ± 0.24 | 274° at 0.3 miles |
| 107 | Shoreline Cove, W. of NMP-1, 30 ft SSW of #106 | 5.42 ± 0.57 | 4.80 ± 0.31 | 5.20 ± 0.35 | 5.12 ± 0.24 | 272° at 0.3 miles |
| 108 | Lake Rd., Pole #142, 300 ft E. of Rt. 29 S. | 4.45 ± 0.18 | 4.13 ± 0.18 | 4.09 ± 0.17 | 4.22 ± 0.28 | 104° at 1.1 miles |
| 109 | Tree North of Lake Rd., 300 ft E. of Rt. 29 N | 4.44 ± 0.24 | 4.00 ± 0.23 | 4.15 ± 0.17 | 4.21 ± 0.20 | 103° at 1.1 miles |
| 111 | State Route 38, Sterling NY - Control | 4.15 ± 0.20 | 3.75 ± 0.24 | 3.72 ± 0.25 | 3.89 ± 0.26 | 166° at 26.4 miles |
| 112 | EOF/Env. Lab, Oswego County Airport | 4.39 ± 0.35 | 3.76 ± 0.19 | 3.84 ± 0.21 | 3.73 ± 0.17 | 175° at 11.9 miles |
| 113 | Baldwinsville, NY - Control | 3.85 ± 0.16 | 3.45 ± 0.23 | 3.47 ± 0.24 | 3.76 ± 0.20 | 214° at 21.8 miles |

(1) Direction and distance based on NMP-2 reactor centerline and sixteen 22.5$^{o}$ sector grid

* TLD required by ODCM

**TABLE 6-11**
**CONCENTRATIONS OF IODINE-131 AND GAMMA EMITTERS IN MILK – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

| Sample Location*** No. 55** | | | | | | |
|---|---|---|---|---|---|---|
| **Collection Date** | **I-131** | **K-40** | **Cs-134** | **Cs-137** | **Ba/La** | **Others †** |
| 04/03/06 | <0.782 | 1410 ± 87 | <7.90 | <7.36 | <10.10 | < LLD |
| 04/16/06 | <0.740 | 1670 ± 94 | <7.87 | <7.99 | <13.48 | < LLD |
| 05/08/06 | <0.717 | 1480 ± 90 | <8.24 | <6.04 | <7.31 | < LLD |
| 05/22/06 | <0.831 | 1660 ± 112 | <9.92 | <9.62 | <2.27 | < LLD |
| 06/05/06 | <0.789 | 1630 ± 104 | <6.87 | <8.72 | <11.60 | < LLD |
| 06/19/06 | <0.688 | 1680 ± 103 | <10.20 | <8.72 | <9.20 | < LLD |
| 07/10/06 | <0.706 | 1600 ± 97 | <9.19 | <9.29 | <11.20 | < LLD |
| 07/24/06 | <0.736 | 1510 ± 93 | <9.35 | <8.25 | <4.89 | < LLD |
| 08/07/06 | <0.529 | 1500 ± 95 | <9.83 | <9.12 | <7.18 | < LLD |
| 08/21/06 | <0.773 | 1460 ± 91 | <8.80 | <6.93 | <9.18 | < LLD |
| 09/11/06 | <0.546 | 1610 ± 101 | <7.58 | <10.40 | <10.30 | < LLD |
| 09/25/06 | <0.798 | 1790 ± 122 | <9.80 | <12.40 | <8.65 | < LLD |
| 10/10/06 | <0.818 | 1460 ± 93 | <8.51 | <9.12 | <9.39 | < LLD |
| 10/23/06 | <0.751 | 1420 ± 94 | <9.19 | <7.68 | <10.10 | < LLD |
| 11/06/06 | <0.800 | 1610 ± 80 | <5.70 | <7.47 | <9.12 | < LLD |
| 11/20/06 | <0.849 | 1460 ± 119 | <9.45 | <9.49 | <12.30 | < LLD |
| 12/04/06 | <0.842 | 1640 ± 96 | <8.54 | <7.38 | <5.79 | < LLD |
| 12/18/06 | <0.759 | 1580 ± 106 | <9.16 | <8.19 | <9.07 | < LLD |

| Sample Location*** No. 4** | | | | | | |
|---|---|---|---|---|---|---|
| **Collection Date** | **I-131** | **K-40** | **Cs-134** | **Cs-137** | **Ba/La** | **Others †** |
| 04/03/06 | <0.806 | 1500 ± 88 | <6.40 | <7.32 | <8.66 | < LLD |
| 04/16/06 | <0.690 | 1370 ± 98 | <8.99 | <9.98 | <14.70 | < LLD |
| 05/08/06 | <0.646 | 1730 ± 103 | <5.61 | <8.93 | <11.60 | < LLD |
| 05/22/06 | <0.832 | 1440 ± 98 | <7.73 | <7.24 | <7.54 | < LLD |
| 06/05/06 | <0.623 | 1530± 93 | <7.49 | <7.17 | <10.80 | < LLD |
| 06/19/06 | <0.785 | 1520 ± 95 | <7.68 | <7.58 | <11.40 | < LLD |
| 07/10/06 | <0.748 | 1660 ± 101 | <9.40 | <8.01 | <10.90 | < LLD |
| 07/24/06 | <0.756 | 1550 ± 95 | <6.78 | <7.41 | <8.12 | < LLD |
| 08/07/06 | <0.496 | 1430 ± 93 | <8.98 | <9.29 | <8.88 | < LLD |
| 08/21/06 | <0.757 | 1470 ± 95 | <6.22 | <8.15 | <9.82 | < LLD |
| 09/11/06 | <0.567 | 1440 ± 100 | <10.30 | <8.63 | <9.96 | < LLD |
| 09/25/06 | <0.812 | 1480 ± 130 | <14.80 | <11.80 | <3.40 | <LLD |
| 10/10/06 | <0.831 | 1580 ± 97 | <8.09 | <8.41 | <10.2 | < LLD |
| 10/23/06 | <0.819 | 1680 ± 87 | <4.83 | <6.54 | <6.25 | < LLD |
| 11/06/06 | <0.794 | 1500 ± 107 | <13.40 | <10.40 | <10.30 | < LLD |
| 11/20/06 | <0.793 | 1670 ± 107 | <8.46 | <8.55 | <9.33 | < LLD |
| 12/04/06 | <0.769 | 1450 ± 77 | <4.96 | <6.37 | <4.41 | < LLD |
| 12/18/06 | <0.796 | 1430 ± 120 | <10.30 | <13.40 | <11.90 | < LLD |

† Plant related radionuclides
** Optional sample location
*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-11**
**CONCENTRATIONS OF IODINE-131 AND GAMMA EMITTERS IN MILK – 2006**
**Results in Units of pCi/liter ± 1 Sigma**

| Sample Location*** No. 76** | | | | | | |
|---|---|---|---|---|---|---|
| **Collection Date** | **I-131** | **K-40** | **Cs-134** | **Cs-137** | **Ba/La** | **Others †** |
| 04/03/06 | <0.719 | 1550 ± 94 | <9.20 | <7.54 | <8.31 | < LLD |
| 04/16/06 | <0.769 | 1520 ± 129 | <11.50 | <11.20 | <14.50 | < LLD |
| 05/08/06 | <0.843 | 1420 ± 67 | <4.40 | <5.82 | <6.39 | < LLD |
| 05/22/06 | <0.806 | 1400 ± 102 | <10.50 | <9.52 | <11.40 | < LLD |
| 06/05/06 | <.0.656 | 1640 ± 86 | <7.40 | <8.79 | <6.82 | < LLD |
| 06/19/06 | <0.843 | 1590 ± 96 | <9.79 | <9.70 | <11.80 | < LLD |
| 07/10/06 | <0.826 | 1540 ± 71 | <4.85 | <6.30 | <4.80 | < LLD |
| 07/24/06 | <0.845 | 1650 ± 87 | <8.40 | <8.35 | <5.59 | < LLD |
| 08/07/06 | <0.488 | 1710 ± 88 | <6.35 | <7.91 | <6.83 | < LLD |
| 08/21/06 | <0.802 | 1650 ± 125 | <11.00 | <11.50 | <8.25 | < LLD |
| 09/11/06 | <0.571 | 1460 ± 103 | <8.65 | <7.95 | <12.50 | < LLD |
| 09/25/06 | <0.783 | 1630 ± 118 | <12.00 | <10.30 | <12.30 | < LLD |
| 10/10/06 | <0.809 | 1760 ± 89 | <6.82 | <7.76 | <6.25 | < LLD |
| 10/23/06 | <0.836 | 1650 ± 73 | <4.62 | <5.99 | <7.31 | < LLD |
| 11/06/06 | <0.797 | 1630 ± 116 | <12.70 | <9.06 | <13.60 | < LLD |
| 11/20/06 | <0.808 | 1450 ± 115 | <12.80 | <8.84 | <9.41 | < LLD |
| 12/04/06 | <0.772 | 1500 ± 121 | <10.40 | <11.90 | <11.70 | < LLD |
| 12/18/06 | <0.776 | 1410 ± 106 | <9.75 | <8.10 | <13.60 | < LLD |
| **Sample Location No. 77*** (Control)** | | | | | | |
| **Collection Date** | **I-131** | **K-40** | **Cs-134** | **Cs-137** | **Ba/La** | **Others †** |
| 04/03/06 | <0.807 | 1700 ± 95 | <6.60 | <7.01 | <7.23 | < LLD |
| 04/16/06 | <0.793 | 1750 ± 120 | <9.26 | <11.90 | <12.90 | < LLD |
| 05/08/06 | <0.733 | 1570 ± 97 | <8.64 | <8.48 | <8.44 | < LLD |
| 05/22/06 | <0.760 | 1590 ± 79 | <8.64 | <7.41 | <6.49 | < LLD |
| 06/05/06 | <0.818 | 1700 ± 74 | <4.05 | <6.35 | <6.07 | < LLD |
| 06/19/06 | <0.756 | 1680 ± 72 | <4.15 | <6.60 | <6.70 | < LLD |
| 07/10/06 | <0.700 | 1480 ± 94 | <7.95 | <7.01 | <7.19 | < LLD |
| 07/24/06 | <0.679 | 1360 ± 105 | <9.49 | <7.76 | <13.60 | < LLD |
| 08/07/06 | <0.633 | 1620 ± 124 | <12.00 | <9.31 | <11.80 | < LLD |
| 08/21/06 | <0.813 | 1610 ± 62 | <5.41 | <5.81 | <4.68 | < LLD |
| 09/11/06 | <0.725 | 1480 ± 105 | <10.52 | <5.59 | <13.60 | < LLD |
| 09/25/06 | <0.782 | 1430 ± 112 | <13.20 | <8.95 | <12.80 | < LLD |
| 10/10/06 | <0.837 | 1620 ± 122 | <12.30 | <9.73 | <10.10 | < LLD |
| 10/23/06 | <0.706 | 1520 ± 95 | <7.95 | <7.54 | <8.75 | < LLD |
| 11/06/06 | <0.845 | 1700 ± 99 | <8.70 | <8.17 | <7.01 | < LLD |
| 11/20/06 | <0.815 | 1620 ± 89 | <5.77 | <7.07 | <9.54 | < LLD |
| 12/04/06 | <0.830 | 1610 ± 108 | <8.81 | <9.52 | <7.54 | < LLD |
| 12/18/06 | <0.836 | 1670 ± 113 | <10.60 | <8.30 | <9.32 | < LLD |

† Plant related radionuclides
** Optional sample location
*** Corresponds to sample location noted on Figure 3.3-4

**TABLE 6-12**

**CONCENTRATION OF GAMMA EMITTERS IN FOOD PRODUCTS**

**Results in pCi/g (wet) ± 1 sigma**

| Site | Sample Date | Description | Be-7 | K-40 | I-131 | Cs-134 | Cs-137 | Zn-65 |
|---|---|---|---|---|---|---|---|---|
| 132* | 09/12/06 | Tomatoes | <0.08 | 2.53 ± 0.12 | <0.01 | <0.01 | <0.01 | <0.02 |
| | | Pepper Leaves | 0.761 ± 0.15 | 4.82 ± 0.49 | <0.05 | <0.05 | <0.05 | <0.13 |
| | | Zucchini Leaves | 1.70 ± 0.17 | 3.57 ± 0.32 | <0.04 | <0.04 | <0.03 | <0.08 |
| 133* | 09/12/06 | Tomatoes | <0.07 | 2.70 ± 0.11 | <0.01 | <0.01 | <0.01 | <0.02 |
| | | Pepper Leaves | 0.565 ± 0.11 | 6.32 ± 0.41 | <0.05 | <0.04 | <0.03 | <0.08 |
| | | Squash Leaves | 2.20 ± 0.16 | 3.20 ± 0.25 | <0.04 | <0.03 | <0.03 | <0.06 |
| | | Rhubarb Leaves | <0.29 | 2.95 ± 0.35 | <0.05 | <0.03 | <0.03 | <0.06 |
| | | Collard Greens | 0.278 ± 0.10 | 4.15 ± 0.36 | <0.03 | <0.03 | <0.03 | <0.06 |
| | | Zucchini Leaves | 1.51 ± 0.15 | 3.06 ± 0.29 | <0.04 | <0.04 | <0.02 | <0.08 |
| 134* | 09/12/06 | Grape Leaves | 1.73 ± 0.16 | 3.29 ± 0.32 | <0.05 | <0.03 | <0.03 | <0.09 |
| 142** | 09/12/06 | Corn Leaves | 3.30 ± 0.21 | 3.58 ± 0.30 | <0.05 | <0.03 | <0.03 | <0.10 |
| | | Tomatoes | <0.19 | 3.37 ± 0.26 | <0.03 | <0.03 | <0.03 | <0.06 |
| | | Grape Leaves | 3.48 ± 0.25 | 3.44 ± 0.36 | <0.06 | <0.04 | <0.03 | <0.12 |

* Sample location required by ODCM

** Optional sample location

Note: Other plant related nuclides <LLD

**TABLE 6-12 (Continued)**

**CONCENTRATION OF GAMMA EMITTERS IN FOOD PRODUCTS**

**Results in pCi/g (wet) ± 1 sigma**

| Site | Sample Date | Description | Be-7 | K-40 | I-131 | Cs-134 | Cs-137 | Zn-65 |
|---|---|---|---|---|---|---|---|---|
| 144** | 09/12/06 | Horseradish Leaves | 0.611 ± 0.13 | 5.57 ± 0.34 | <0.05 | <0.03 | <0.03 | <0.11 |
| | | Tomatoes | <0.08 | 2.41 ± 0.15 | <0.01 | <0.02 | <0.01 | <0.04 |
| | | Squash Leaves | 3.31 ± 0.23 | 2.44 ± 0.31 | <0.06 | <0.04 | <0.03 | <0.09 |
| | | Corn Leaves | 2.22 ± 0.22 | 3.44 ± 0.36 | <0.06 | <0.05 | <0.05 | <0.09 |
| | | Pumpkin Leaves | 5.05 ± 0.24 | 3.46 ± 0.30 | <0.06 | <0.03 | <0.02 | <0.03 |
| 422** | 09/12/06 | Tomatoes | <0.06 | 2.31 ± 0.12 | <0.01 | <0.01 | <0.01 | <0.03 |
| | | Pepper Leaves | 0.695 ± 0.09 | 5.74 ± 0.32 | <0.03 | <0.03 | <0.02 | <0.06 |
| | | Zucchini Leaves | 1.62 ± 0.11 | 3.29 ± 0.21 | <0.03 | <0.02 | <0.02 | <0.06 |
| 145* (Control) | 09/11/06 | Rhubarb Leaves | 0.293 ± 0.07 | 4.98 ± 0.29 | <0.03 | <0.03 | <0.02 | <0.07 |
| | | Pumpkin Leaves | 2.29 ± 0.13 | 4.67 ± 0.25 | <0.03 | <0.02 | <0.02 | <0.05 |
| | | Horseradish Leaves | 0.259 ± 0.09 | 4.02 ± 0.29 | <0.05 | <0.02 | <0.02 | <0.09 |
| | | Corn Leaves | 1.52 ± 0.16 | 5.28 ± 0.33 | <0.05 | <0.03 | <0.03 | <0.09 |
| | | Tomatoes | <0.08 | 2.80 ± 0.13 | <0.01 | <0.01 | <0.01 | <0.03 |
| | | Squash Leaves | 1.28 ± 0.09 | 3.15 ± 0.19 | <0.03 | <0.02 | <0.02 | <0.06 |
| | | Zucchini Leaves | 0.617 ± 0.14 | 3.04 ± 0.36 | <0.06 | <0.03 | <0.03 | <0.08 |

* Sample location required by ODCM

** Optional sample location

Note: Other plant related nuclides <LLD

**TABLE 6-13**

**MILK ANIMAL CENSUS 2006**

| Town or Area[a] | Location Designation[1] | Degrees[2] | Distance[2] (Miles) | Number of Milk Animals |
|---|---|---|---|---|
| Scriba | 62 | 184° | 6.6 | 4G |
| New Haven | 75 | 145° | 7.6 | 2G |
| | 9 | 97° | 4.8 | 40C |
| | 4* | 113° | 7.8 | 80C |
| | 64 | 107° | 7.9 | 38C |
| | 78 | 128° | 8.0 | 2C |
| Mexico | 14 | 123° | 9.4 | 56C |
| | 60 | 91° | 9.5 | 25C |
| | 76* | 120° | 6.3 | 30C |
| | 55* | 95° | 9.0 | 50C |
| | 21 | 112° | 10.3 | 70C |
| | 72 | 100° | 9.6 | 38C |
| Sterling | 73 | 234° | 13.1 | 4C |
| Richland | 22 | 90° | 9.7 | 6C |
| Volney | 66 | 156° | 7.8 | 34C |
| Granby (Control) | 77** | 191° | 13.9 | 60C |

MILKING ANIMAL TOTALS: 533 Cows
(including control locations) 6 Goats

MILKING ANIMAL TOTALS: 473 Cows
(excluding control locations) 6 Goats

NOTES:

C Cows
G Goats
* Milk sample location
** Milk sample control location
(1) Reference Figure 3.3-4
(2) Degrees and distance are based on NMP-2 Reactor Building centerline
(a) Census performed out to a distance of approximately 10 miles

**TABLE 6-14**

**2006 RESIDENCE CENSUS**

| Meteorological Sector | Location | Map Location[(1)] | Degrees[(2)] | Distance[(2)] |
|---|---|---|---|---|
| N | * | - | - | - |
| NNE | * | - | - | - |
| NE | * | - | - | - |
| ENE | * | - | - | - |
| E | West Sunset Bay Road | A | 100° | 1.3 miles |
| ESE | Lake Road | B | 104° | 1.1 miles |
| SE | County Route 29 | C | 125° | 1.4 miles |
| SSE | County Route 29 | D | 158° | 1.7 miles |
| S | Miner Road | E | 171° | 1.6 miles |
| SSW | Lakeview Road | F | 208° | 1.2 miles |
| SW | Lakeview Road | G | 215° | 1.1 miles |
| WSW | Bible Camp Retreat | H | 239° | 0.9 miles |
| W | * | - | - | - |
| WNW | * | - | - | - |
| NW | * | - | - | - |
| NNW | * | - | - | - |

NOTES:

* This meteorological sector is over Lake Ontario. There is no residence within five miles
(1) Corresponds to Figure 3.3-5
(2) Degrees and distance are based on NMP-2 Reactor Building centerline

## 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 results listed as 1974 and 1975 were taken from the respective Annual Radiological Environmental Operating Reports for Nine Mile Point Unit 1 Nuclear Station. Sample results listed as 1985 through the current year were taken from the respective James A. FitzPatrick Nuclear Power Plant Annual Radiological Environmental Operating Reports.

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† | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| 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 |
| 2000 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <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† | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| 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 |
| 2000 | <LLD | <LLD | <LLD | 0.06 | 0.07 | 0.06 | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | 0.06 | 0.07 | 0.07 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | 0.05 | 0.05 | 0.05 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | 0.04 | 0.05 | 0.05 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | 0.04 | 0.04 | 0.04 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | 0.06 | 0.09 | 0.08 | <LLD | <LLD | <LLD |
| 2006 | <LLD | <LLD | <LLD | 0.06 | 0.06 | 0.06 | <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 |
| 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 |
| 2000 | 0.021 | 0.021 | 0.021 |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <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 |
| 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 |
| 2000 | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | 0.016 | 0.016 | 0.016 |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <LLD | <LLD | <LLD |

* 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†† | * | * | * | * | * | * |
| 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 |
| 2000 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <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 - Present.

†† 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†† | * | * | * | * | * | * |
| 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 |
| 2000 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <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 - Present.

†† 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 |
| 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** |
| 2000 | 196 | 237 | 212 |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <LLD | <LLD | <LLD |

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

† 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 |
| 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 |
| 2000 | 161 | 198 | 185 |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | 297 | 297 | 297 |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <LLD | <LLD | <LLD |

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

** 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 |
| 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 |
| 2000 | 0.006 | 0.027 | 0.015 |
| 2001 | 0.006 | 0.034 | 0.016 |
| 2002 | 0.008 | 0.027 | 0.016 |
| 2003 | 0.004 | 0.032 | 0.015 |
| 2004 | 0.008 | 0.032 | 0.016 |
| 2005 | 0.008 | 0.034 | 0.019 |
| 2006 | 0.007 | 0.033 | 0.016 |

* 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-Present (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 |
| 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 |
| 2000 | 0.005 | 0.033 | 0.015 |
| 2001 | 0.004 | 0.037 | 0.016 |
| 2002 | 0.006 | 0.026 | 0.016 |
| 2003 | 0.005 | 0.035 | 0.015 |
| 2004 | 0.003 | 0.036 | 0.016 |
| 2005 | 0.007 | 0.041 | 0.019 |
| 2006 | 0.005 | 0.035 | 0.015 |

* 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 – Present: 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† | * | * | * | * | * | * |
| 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 |
| 2000 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <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 - Present.

† 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† | * | * | * | * | * | * |
| 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 |
| 2000 | <LLD | <LLD | <LLD | 0.0048 | 0.0048 | 0.0048 |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <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 - Present.

† 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 |
| 1985 | <LLD | <LLD | <LLD |
| 1986 | 0.041 | 0.332 | 0.151 |
| 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 |
| 2000 | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <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 – Present.

** 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 |
| 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 |
| 2000 | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <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 – Present, 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 7-15**

**HISTORICAL ENVIRONMENTAL SAMPLE DATA**

**ENVIRONMENTAL TLD**

**Results in mrem/standard month**

| LOCATION: CONTROL ** | | | |
|---|---|---|---|
| **Year** | **Min.** | **Max.** | **Mean** |
| Preop† | **(1)** | **(1)** | **(1)** |
| 1974† | 2.7 | 8.9 | 5.6 |
| 1975† | 4.8 | 6.0 | 5.5 |
| 1976 | 3.2 | 7.2 | 5.4 |
| 1977 | 4.0 | 8.0 | 5.3 |
| 1978 | 3.3 | 4.7 | 4.3 |
| 1979 | 3.3 | 5.7 | 4.7 |
| 1980 | 3.8 | 5.8 | 4.9 |
| 1981 | 3.5 | 5.9 | 4.8 |
| 1982 | 3.8 | 6.1 | 5.1 |
| 1983 | 4.9 | 7.2 | 5.8 |
| 1984 | 4.7 | 8.2 | 6.2 |
| 1985 | 4.5 (4.4)* | 7.6 (6.8)* | 5.6 (5.4)* |
| 1986 | 5.3 (5.5)* | 7.5 (7.2)* | 6.3 (6.3)* |
| 1987 | 4.6 (4.6)* | 6.6 (5.8)* | 5.4 (5.2)* |
| 1988 | 4.4 (4.8)* | 6.8 (6.8)* | 5.6 (5.4)* |
| 1989 | 2.9 (2.9)* | 6.4 (5.6)* | 4.7 (4.6)* |
| 1990 | 3.7 (3.7)* | 6.0 (5.9)* | 4.8 (4.6)* |
| 1991 | 3.8 (3.8)* | 5.4 (5.3)* | 4.5 (4.3)* |
| 1992 | 2.6 (2.6)* | 5.0 (4.7)* | 4.1 (3.9)* |
| 1993 | 3.4 (3.4)* | 5.6 (5.2)* | 4.4 (4.3)* |
| 1994 | 3.1 (3.1)* | 5.0 (4.6)* | 4.1 (3.9)* |
| 1995 | 3.4 (3.4)* | 5.7 (4.9)* | 4.4 (4.2)* |
| 1996 | 3.4 (3.4)* | 5.6 (5.6)* | 4.3 (4.2)* |
| 1997 | 3.7 (3.9)* | 6.2 (5.2)* | 4.7 (4.6)* |
| 1998 | 3.7 (3.7)* | 5.6 (4.8)* | 4.4 (4.2)* |
| 1999 | 3.6 (3.7)* | 7.1 (4.7)* | 4.6 (4.4)* |
| 2000 | 3.7 (3.7)* | 7.3 (5.5)* | 4.7 (4.3)* |
| 2001 | 3.6 (3.9)* | 5.4 (5.0)* | 4.4 (4.4)* |
| 2002 | 3.4 (3.4)* | 5.5 (5.2)* | 4.3 (4.1)* |
| 2003 | 3.4 (3.4)* | 5.5 (4.8)* | 4.2 (4.2)* |
| 2004 | 3.3 (3.3)* | 5.9 (5.9)* | 4.3 (4.5)* |
| 2005 | 3.3 (3.4)* | 5.1 (4.5)* | 4.1 (4.0)* |
| 2006 | 3.3 (3.3)* | 5.3 (5.3)* | 4.1 (4.3)* |

* Data in parentheses is RETS control data and is determined using TLDs #8, 14 and 49.

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

(1) Data not available.

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

**TABLE 7-16**
**HISTORICAL ENVIRONMENTAL SAMPLE DATA**
**ENVIRONMENTAL TLD**
**Results in mrem per standard month**

| LOCATION: SITE BOUNDARY ** | | | |
|---|---|---|---|
| **Year** | **Min.** | **Max.** | **Mean** |
| Preop† | * | * | * |
| 1974† | * | * | * |
| 1975† | * | * | * |
| 1985 | 4.9 | 5.9 | 5.3 |
| 1986 | 5.4 | 6.8 | 5.9 |
| 1987 | 4.7 | 5.9 | 5.3 |
| 1988 | 5.0 | 6.1 | 5.4 |
| 1989 | 4.5 | 5.2 | 4.8 |
| 1990 | 4.5 | 5.4 | 4.8 |
| 1991 | 4.3 | 5.5 | 4.8 |
| 1992 | 3.7 | 4.6 | 4.2 |
| 1993 | 3.8 | 4.8 | 4.3 |
| 1994 | 2.8 | 4.9 | 4.0 |
| 1995 | 3.5 | 5.1 | 4.4 |
| 1996 | 3.2 | 5.3 | 4.1 |
| 1997 | 3.5 | 5.9 | 4.6 |
| 1998 | 3.7 | 5.1 | 4.4 |
| 1999 | 3.3 | 7.5 | 4.7 |
| 2000 | 3.6 | 6.8 | 4.5 |
| 2001 | 3.6 | 5.3 | 4.5 |
| 2002 | 3.5 | 5.1 | 4.3 |
| 2003 | 3.2 | 4.9 | 4.3 |
| 2004 | 3.3 | 6.4 | 4.4 |
| 2005 | 3.4 | 4.8 | 4.2 |
| 2006 | 3.5 | 4.7 | 4.1 |

* Data not available (not required prior to 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. These locations are not used in the site boundary dose determination.

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

** TLD's used for statistics: 7, 18, 78, 79, 80, 81, 82, 83 & 84.

**TABLE 7-17**
**HISTORICAL ENVIRONMENTAL SAMPLE DATA**
**ENVIRONMENTAL TLD**
**Results in mrem per standard month**

| LOCATION: OFF-SITE SECTORS ** | | | |
|---|---|---|---|
| **Year** | **Min.** | **Max.** | **Mean** |
| Preop† | * | * | * |
| 1974† | * | * | * |
| 1975† | * | * | * |
| 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 |
| 2000 | 3.4 | 6.6 | 4.5 |
| 2001 | 3.6 | 5.4 | 4.4 |
| 2002 | 3.1 | 5.3 | 4.2 |
| 2003 | 3.4 | 4.8 | 4.1 |
| 2004 | 3.2 | 6.7 | 4.4 |
| 2005 | 3.2 | 4.7 | 4.0 |
| 2006 | 3.3 | 4.4 | 4.0 |

* 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 7-18**
**HISTORICAL ENVIRONMENTAL SAMPLE DATA**
**ENVIRONMENTAL TLD**
**Results in mrem per standard month**

| LOCATION: SPECIAL INTEREST ** | | | |
|---|---|---|---|
| **Year** | **Min.** | **Max.** | **Mean** |
| Preop† | * | * | * |
| 1974† | * | * | * |
| 1975† | * | * | * |
| 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 |
| 2000 | 3.6 | 7.3 | 4.7 |
| 2001 | 3.8 | 5.4 | 4.4 |
| 2002 | 3.5 | 5.5 | 4.2 |
| 2003 | 3.4 | 5.5 | 4.3 |
| 2004 | 3.0 | 5.9 | 4.2 |
| 2005 | 3.4 | 5.1 | 4.1 |
| 2006 | 3.5 | 5.3 | 4.1 |

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

** TLD locations initiated in 1985 include 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 7-19**
**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 |
| 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 |
| 2000 | 3.7 | 16.5 | 5.6 |
| 2001 | 3.8 | 14.5 | 5.6 |
| 2002 | 3.5 | 13.6 | 5.3 |
| 2003 | 3.2 | 12.9 | 5.3 |
| 2004 | 3.3 | 13.2 | 5.4 |
| 2005 | 3.4 | 14.1 | 5.4 |
| 2006 | 3.5 | 14.4 | 5.3 |

* 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 – Present). 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 7-20**
**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 |
| 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 |
| 2000 | 3.8 | 7.3 | 4.6 |
| 2001 | 3.7 | 5.9 | 4.6 |
| 2002 | 3.6 | 5.5 | 4.4 |
| 2003 | 3.1 | 5.5 | 4.4 |
| 2004 | 3.2 | 6.5 | 4.5 |
| 2005 | 3.6 | 5.1 | 4.2 |
| 2006 | 3.9 | 5.3 | 4.2 |

* No data available.

** Includes TLD numbers 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 7-21**
**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† | * | * | * | * | * | * |
| 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 |
| 2000 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <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 7-22**

**HISTORICAL ENVIRONMENTAL SAMPLE DATA**

**MILK**

**Results in pCi/liter**

| LOCATION: INDICATOR | | | | | | |
|---|---|---|---|---|---|---|
| **Isotope** | **Cs-137** | | | **I-131** | | |
| **Year** | **Min.** | **Max.** | **Mean** | **Min.** | **Max.** | **Mean** |
| 1969† | * | * | * | * | * | * |
| 1974† | 1.6 | 39 | 10.5 | 0.70 | 2.00 | 1.23 |
| 1975† | 6.0 | 22 | 16 | 0.01 | 2.99 | 0.37 |
| 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 | .044 | 0.35 |
| 1998 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 1999 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2000 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |
| 2006 | <LLD | <LLD | <LLD | <LLD | <LLD | <LLD |

* No data available (sample 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 7-23**

**HISTORICAL ENVIRONMENTAL SAMPLE DATA**

**FOOD PRODUCTS**

**Results in pCi/g (wet)**

| LOCATION: CONTROL * | | | |
|---|---|---|---|
| **Isotope** | **Cs-137** | | |
| **Year** | **Min.** | **Max.** | **Mean** |
| 1969† | ** | ** | ** |
| 1974† | ** | ** | ** |
| 1975† | ** | ** | ** |
| 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 |
| 2000 | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <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-Present).

**TABLE 7-24**
**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 |
| 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 |
| 2000 | <LLD | <LLD | <LLD |
| 2001 | <LLD | <LLD | <LLD |
| 2002 | <LLD | <LLD | <LLD |
| 2003 | <LLD | <LLD | <LLD |
| 2004 | <LLD | <LLD | <LLD |
| 2005 | <LLD | <LLD | <LLD |
| 2006 | <LLD | <LLD | <LLD |

* 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 (1984). Data comprised of broadleaf vegetation only (1985-Present).

# 8.0 QA/QC PROGRAM

## 8.1 PROGRAM DESCRIPTION

The Offsite Dose Calculation Manual (ODCM), Part 1, Section 5.3 requires that the licensee participate in an Interlaboratory Comparison Program. The Interlaboratory Comparison Program shall include sample media for which samples are routinely collected and for which comparison 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 requirement for an Interlaboratory Comparison Program, the JAF Environmental Laboratory has engaged the services of two independent laboratories to provide quality assurance comparison samples. The two laboratories are Analytics, Incorporated in Atlanta, Georgia and the U.S. Department of Commerce's National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland.

Analytics supplies sample media as blind sample spikes, which contain certified levels of radioactivity unknown to the analysis laboratory. 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 Analytic's sample results.

In addition to the Analytics Program, the JAF Environmental Laboratory participates in the NEI/NIST Measurement Assurance Program. In 1987, the nuclear industry established a Measurement Assurance Program at the National Bureau of Standards (now the National Institute of Standards and Technology) to provide sponsoring nuclear utilities an independent verification, traceable to NIST, of their capability to make accurate measurements of radioactivity, as described in NRC Regulatory Guide 4.15. The program includes distribution to sponsoring utilities, approximately six times a year. The samples are prepared by NIST to present specific challenges to participating laboratories. NIST supplies sample media as blind sample spikes. These samples are prepared and analyzed by the JAF Environmental Laboratory and the results are submitted to the Entergy Nuclear Northeast representative, who uses predetermined acceptance criteria methodology for evaluating the laboratory's performance. The performance results along with the NIST Report of Test (Certifies what activities are present in the sample) are forwarded to the laboratory.

## 8.2 PROGRAM SCHEDULE

| SAMPLE MEDIA | LABORATORY ANALYSIS | SAMPLE PROVIDER ANALYTICS |
|---|---|---|
| Water | Gross Beta | 1 |
| Water | Tritium | 4 |
| Water | I-131 | 2 |
| Water | Mixed Gamma | 2 |
| Air | Gross Beta | 2 |
| Air | I-131 | 2 |
| Air | Mixed Gamma | 3 |
| Milk | I-131 | 2 |
| Milk | Mixed Gamma | 2 |
| Soil | Mixed Gamma | 1 |
| Vegetation | Mixed Gamma | 1 |
| **TOTAL SAMPLE INVENTORY** | | **22** |

## 8.3 ACCEPTANCE CRITERIA

Each sample result is evaluated to determine the accuracy and precision of the laboratory's analysis result. The sample evaluation method is discussed below.

### 8.3.1 SAMPLE RESULTS EVALUATION

Samples provided by Analytics and NIST 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.

$$\text{The error resolution} = \frac{\text{Reference Result}}{\text{Reference Results Error (1 sigma)}}$$

Using the appropriate row under the Error Resolution column in Table 8.3.1 below, a corresponding Ratio of Agreement interval is given.

The value for the ratio is then calculated.

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

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

**TABLE 8.3.1**

| ERROR RESOLUTION | RATIO OF AGREEMENT |
|---|---|
| < 4 | No Comparison |
| 4 to 7 | 0.5-2.0 |
| 8 to 15 | 0.6-1.66 |
| 16 to 50 | 0.75-1.33 |
| 51 to 200 | 0.8-1.25 |
| >200 | 0.85-1.18 |

This acceptance test is generally referred to as the "NRC" method. The acceptance criteria is contained in Procedure EN-CY-102. The NRC method generally results in an acceptance range of approximately ± 25% of the Known value when applied to sample results from the Analytics and NIST Interlaboratory Comparison Program. This method is used as the procedurally required assessment method and requires the generation of a deviation from QA/QC program report when results are unacceptable.

## 8.4 PROGRAM RESULTS SUMMARY

The Interlaboratory Comparison Program numerical results are provided on Table 8-1.

### 8.4.1 ANALYTICS QA SAMPLES RESULTS

Twenty QA blind spike samples were analyzed as part of Analytics 2006 Interlaboratory Comparison Program. The following sample media were evaluated as part of the comparison program.

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

The JAF Environmental Laboratory performed 84 individual analyses on the 20 QA samples. Of the 84 analyses performed, 82 were in agreement using the NRC acceptance criteria for a 97.6% agreement ratio.

There were two non-conformities in the 2006 program.

#### 8.4.1.1 ANALYTICS SAMPLE NONCONFORMITIES

**Analytics Sample E4882-05, Ce-141 in Water**
**Nonconformity No. 2006-01**

A spiked mixed gamma in water sample supplied by Analytics, Inc., was analyzed in accordance with standard laboratory procedures. The sample contained a total of ten radionuclides for analysis. Ten of the ten radionuclides present were quantified. Nine of the ten radionuclides were quantified within the acceptable range. The mean result for Ce-141 was determined to be outside the QA Acceptance Criteria resulting in a sample nonconformity. The water sample was analyzed three times using three different detectors. An average Ce-141 value of 64.8 pCi/L was reported. The known result for the sample was 86.8 pCi/L as determined by the supplier. One of the three reported results was 72 pCi/L and resulted in an agreement when compared to the known of 86.8 pCi/L with a ratio of 0.83. The remaining 2 individual results were outside the acceptance criteria and had ratios to the known that ranged from 0.67 and 0.74. All of the analysis had relatively low count rate, which ranged from 3.9 counts per minute to 4.9 counts per minute.

An evaluation of the Ce-141 result was performed. The detector calibrations were reviewed to determine if the efficiency determination in the lower end (<500 KeV) of the calibration curve exhibited any anomalies. The efficiency curve evaluation showed that shape of the curve and the corresponding efficiency coefficients were within the normal range and compared favorably with the previous calibration. The

spectrum and peak search results were examined with no abnormalities identified. Ce-141 decays by beta minus with a 32.5 day half-life and a gamma ray energy of 145 KeV with a yield of 48%. No significant secondary gamma energies are produced in the Ce-141 decay scheme.

The combination of low sample activity and low net counts most likely resulted in an inaccurate sample result. The nonconforming analytical results for this sample media and radionuclide are not routine and does not indicate a programmatic deficiency in the analysis of Ce-141 in water samples or other environmental media. Confidence in the accurate analysis of Ce-141 can be demonstrated by other Ce-141 analytical results. The Ce-141 results for the other Quality Assurance samples analyzed as part of the 2006 Interlaboratory Comparison Program were all acceptable and are summarized below. These results demonstrate that at the time of sample analysis the gamma spectral analysis system was performing properly and was in control.

**2006 Ce-141 Results**

| Sample ID | Medium | JAF | Reference | Ratio |
|---|---|---|---|---|
| E4883-05 | Filter pCi/filter | 58.6 ± 1.6 | 61.4 ± 1 | 0.95 |
| E5002-05 | Milk pCi/liter | 185.7 ± 4.0 | 184 ± 3.1 | 1.01 |
| E5003-05 | Soil pCi/g | 0.241 ± 0.008 | 0.214 ± 0.004 | 1.13 |
| E5005-05 | Vegetation pCi/g | 0.209 ± 0.007 | 0.223 ± 0.004 | 0.94 |
| E5076-05 | Water pCi/liter | 94.2 ± 2.61 | 88.0 ± 1.47 | 1.07 |
| E5077-05 | Filter pCi/filter | 80.3 ± 1.41 | 78.6 ± 1.13 | 1.02 |
| E5078-05 | Milk pCi/liter | 86.7 ± 2.76 | 86.0 ± 1.44 | 1.01 |
| E4963-09 * | Milk pCi/liter | 98.4 ± 3.95 | 104 ± 1.5 | 0.94 |
| E4997-09 * | Water pCi/liter | 160 ± 19 | 149 ± 2.5 | 1.07 |
| E5073-09 * | Vegetation pCi/g | 0.162 ± 0.003 | 0.153 ± 0.002 | 1.06 |
| E5170-09 * | Water pCi/liter | 284.3 ± 5.6 | 286 ± 5.0 | 0.99 |
| | | | Mean Ratio = | 1.02 |

* Provided by laboratory client, NOT reported in Annual Report

These results demonstrate that at the time of sample analysis the gamma spectral analysis system was performing properly and was in control. Historical results from the 2005 Interlaboratory Comparison program demonstrated the laboratory's ability to analyze Ce-141 accurate in low level environmental sample media. These results are summarized below:

**2005 Ce-141 Results**

| Sample ID | Medium | JAF | Reference | Ratio |
|---|---|---|---|---|
| E-4488-05 | Water pCi/liter | 235±6 | 221±4 | 1.06 |
| E-4713-05 | Water pCi/liter | 291±4 | 282±5 | 1.03 |
| E-4489-05 | Filter pCi/filter | 157±3 | 155±3 | 1.01 |
| E-4714-05 | Filter pCi/filter | 176±3 | 165±3 | 1.07 |
| E-4585 | Soil pCi/kg | 173±2 | 182±3 | 0.95 |
| E-4584-05 | Milk pCi/liter | 101±5 | 92±2 | 1.09 |
| E-4715-05 | Milk pCi/liter | 237±4 | 233±4 | 1.02 |
| E-4587 | Vegetation pCi/kg | 178±9 | 174±3 | 1.02 |
| NIST 1801-20 | Filter pCi/filter | 1.89E5±475 | 1.96E5±2176 | 0.96 |
| NIST-1800-10 | Water pCi/G | 1.47E5±441 | 1.48E5±1125 | 0.99 |
| | | | Mean Ratio = | 1.02 |

The mean ratio for these samples relative to the known (reference) value was 1.02. The 2006 nonconformity is considered to be an isolated instance. The Ce-141 results for 2005 and 2006 program demonstrate that there is no systematic error or persistent low bias present in the analysis of samples for Ce-141 in water or other environmental sample media. No corrective actions were implemented as a result of this nonconformity.

**Analytics Sample E5221-05, Gross Beta in Water**
**Nonconformity No. 2006-02**

A water sample, spiked with Cs-137, supplied by Analytics was analyzed for gross beta activity in accordance with standard laboratory procedures. Half of the 1 liter sample provided was evaporated such that any remaining residue would remain in a 2 inch stainless steel planchet. The planchet was then counted 3 times on a low background counter (LBC). An average Gross Beta value of 173 pCi/L was determined and reported for the sample. The known value for the sample was 249 pCi/L as determined by Analytics. The acceptable ratio of agreement for this sample was determined to be 0.8 to 1.25. The calculated ratio of sample results divided by the known value was 0.69, which fell outside the QA Acceptance Criteria. An investigation into the QA nonconformity was initiated.

A thorough review of all raw data and calculations used to determine the reported gross beta value was conducted with no errors noted. The original stainless steel planchet was then reanalyzed on a different LBC with no appreciable difference in the resulting gross beta value.

The remaining 500ml of E5221-05 was then analyzed by gamma spectroscopy, which confirmed Analytics known Cs-137 activity. Following the confirmation of the samples Cs-137 concentration, a duplicate gross beta analysis was performed on the remaining sample in accordance with standard laboratory procedures. A value of 245 pCi/L was obtained on the backup gross beta analysis, equivalent to 98% recovery of the known value.

Based on the difference between the initial and backup results, it is believed that some of the sample residue was removed from the original stainless steel planchet prior to counting. The missing material equates to 26cpm or 68dpm. All equipment used to process the original sample was checked for loose radioactive material, none was detected. The following procedure revision has been submitted to address this nonconformity: Add "Use caution when evaporating samples. Boiling or spattering may cause substantial sample losses and cross-contamination."

**Historical Water Gross Beta Results**

| Sample ID | Medium | JAF | Reference | Ratio |
|---|---|---|---|---|
| QAP-58 (2003) | Water Bq/liter | 588±7 | 627±10 | 0.937 |
| QAP-59 (2003) | Water Bq/liter | 1796±17 | 1948±195 | 0.922 |
| QAP-0403 (2004) | Water Bq/liter | 1105±17 | 1170±117 | 0.944 |
| A19773-05 (2005) | Water pCi/ml | 1802±2 | 1830±46 | 0.985 |
| E4458-80 (2005) | Water pCi/L | 260±1.4 | 268±8.9 | 0.970 |
| | | | Mean Ratio = | 0.95 |

The mean ratio for these samples relative to the known (reference) value was 0.95. The 2006 nonconformity is considered to be an isolated instance. The results for 2003 through 2005 demonstrate that there is no systematic error present in the analysis of samples for gross beta in water.

### 8.4.2 NIST QA SAMPLES RESULTS

In 2006, JAF Environmental Laboratory participated in the NEI/NIST Measurement Assurance Program. Two QA blind spike samples were analyzed. The following sample media were evaluated as part of the comparison program.

- Air Particulate Filter: Mixed Gamma Emitters
- Water: I-131, Tritium

The JAF Environmental Laboratory performed 7 individual analyses on the two QA samples. Of the 7 analyses performed, 7 were in agreement using the NRC acceptance criteria for a 100% agreement ratio.

There were no non-conformities in the 2006 program.

## 8.4.3 NUMERICAL RESULTS TABLES

TABLE 8-1
INTERLABORATORY INTERCOMPARISON PROGRAM
Gross Beta Analysis of Air Particulate Filter

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/filter ±1 sigma | REFERENCE LAB* pCi/filter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 6/8/2006 | E5001-05 | Filter | Gross Beta | 64.8 ± 1.20 | 60.0 ± 2.00 | 1.08 | Acceptable |
| 12/7/2006 | E5171-05 | Filter | Gross Beta | 99.5 ± 1.45 | 86.0 ± 2.87 | 1.16 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

Tritium Analysis of Water

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/liter ±1 sigma | REFERENCE LAB* pCi/liter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 3/23/2006 | E4881-05 | Water | H-3 | 4530 ± 107 | 4210 ± 140 | 1.08 | Acceptable |
| 7/14/2006 | E5059-05 | Water | H-3 | 933 ± 84 | 750 ± 25 | 1.24 | Acceptable |
| 9/14/2006 | E5080-05 | Water | H-3 | 832 ± 82 | 903 ± 30 | 0.92 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

Gross Beta Analysis of Water

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/liter ±1 sigma | REFERENCE LAB* pCi/liter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 12/7/2006 | E5221-05 | Water | Gross Beta | 173.0 ± 2.18 | 249 ± 8.29 | 0.69 | Not Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

I-131 Gamma Analysis of Air Charcoal

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi ±1 sigma | REFERENCE LAB* pCi ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 6/8/2006 | E5004-05 | Air | I-131 | 63.3 ± 2.42 | 66.0 ± 2.20 | 0.96 | Acceptable |
| 9/14/2006 | E5079-05 | Air | I-131 | 97.2 ± 2.5 | 91.9 ± 3.06 | 1.06 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

TABLE 8-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Water

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/liter ±1 sigma | REFERENCE LAB* pCi/liter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 3/23/2006 | E4882-05 | Water | Ce-141 | 64.8 ± 3.7 | 86.8 ± 2.9 | 0.75 | Not Acceptable |
| | | | Cr-51 | 263.0 ± 17.8 | 234.0 ± 7.8 | 1.12 | Acceptable |
| | | | Cs-134 | 107.0 ± 3.4 | 101.0 ± 3.4 | 1.06 | Acceptable |
| | | | Cs-137 | 71.8 ± 2.9 | 74.3 ± 2.5 | 0.97 | Acceptable |
| | | | Co-58 | 79.0 ± 3.1 | 87.5 ± 2.9 | 0.90 | Acceptable |
| | | | Mn-54 | 85.1 ± 3.1 | 78.1 ± 2.6 | 1.09 | Acceptable |
| | | | Fe-59 | 79.5 ± 3.6 | 72.4 ± 2.4 | 1.10 | Acceptable |
| | | | Zn-65 | 156.0 ± 6.3 | 148.0 ± 4.9 | 1.05 | Acceptable |
| | | | Co-60 | 104.0 ± 2.5 | 107.0 ± 3.6 | 0.97 | Acceptable |
| | | | I-131** | 71.9 ± 0.9 | 67.4 ± 2.3 | 1.07 | Acceptable |
| 9/14/2006 | E5076-05 | Water | Ce-141 | 94.2 ± 2.6 | 88.0 ± 2.9 | 1.07 | Acceptable |
| | | | Cr-51 | 288.7 ± 13.1 | 288.0 ± 9.6 | 1.00 | Acceptable |
| | | | Cs-134 | 94.1 ± 1.9 | 87.0 ± 2.9 | 1.08 | Acceptable |
| | | | Cs-137 | 173.0 ± 2.4 | 179.0 ± 6.0 | 0.97 | Acceptable |
| | | | Co-58 | 115.0 ± 2.1 | 112.0 ± 3.7 | 1.03 | Acceptable |
| | | | Mn-54 | 124.3 ± 2.1 | 115.0 ± 3.8 | 1.08 | Acceptable |
| | | | Fe-59 | 47.9 ± 1.9 | 44.7 ± 1.5 | 1.07 | Acceptable |
| | | | Zn-65 | 148.0 ± 3.9 | 148.0 ± 4.9 | 1.00 | Acceptable |
| | | | Co-60 | 139.0 ± 1.7 | 137.0 ± 4.6 | 1.01 | Acceptable |
| | | | I-131** | 86.1 ± 1.2 | 79.9 ± 2.66 | 1.08 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.
** Result determined by Resin Extraction/Gamma Spectral Analysis.

TABLE 8-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis Milk

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/liter ±1 sigma | REFERENCE LAB* pCi/liter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 6/8/2006 | E5002-05 | Milk | Ce-141 | 185.7 ± 4.0 | 184.0 ± 6.1 | 1.01 | Acceptable |
| | | | Cr-51 | 257.7 ± 16.9 | 259.0 ± 8.6 | 0.99 | Acceptable |
| | | | Cs-134 | 128.0 ± 3.0 | 127.0 ± 4.2 | 1.01 | Acceptable |
| | | | Cs-137 | 112.7 ± 2.8 | 117.0 ± 3.9 | 0.96 | Acceptable |
| | | | Co-58 | 98.8 ± 2.6 | 100.0 ± 3.3 | 0.99 | Acceptable |
| | | | Mn-54 | 153.3 ± 3.2 | 146.0 ± 4.9 | 1.05 | Acceptable |
| | | | Fe-59 | 94.8 ± 3.4 | 93.6 ± 3.1 | 1.01 | Acceptable |
| | | | Zn-65 | 191.0 ± 6.0 | 185.0 ± 6.2 | 1.03 | Acceptable |
| | | | Co-60 | 127.3 ± 2.3 | 129.0 ± 4.3 | 0.99 | Acceptable |
| | | | I-131** | 61.9 ± 0.9 | 63.2 ± 2.1 | 0.98 | Acceptable |
| 9/14/2006 | E5078-05 | Milk | Ce-141 | 86.7 ± 2.8 | 86.0 ± 2.9 | 1.01 | Acceptable |
| | | | Cr-51 | 285.3 ± 14.2 | 282.0 ± 9.4 | 1.01 | Acceptable |
| | | | Cs-134 | 89.5 ± 2.2 | 85.0 ± 2.8 | 1.05 | Acceptable |
| | | | Cs-137 | 170.0 ± 2.4 | 175.0 ± 5.8 | 0.97 | Acceptable |
| | | | Co-58 | 105.0 ± 2.3 | 109.0 ± 3.7 | 0.96 | Acceptable |
| | | | Mn-54 | 117.7 ± 2.2 | 113.0 ± 3.8 | 1.04 | Acceptable |
| | | | Fe-59 | 47.5 ± 2.4 | 43.7 ± 1.5 | 1.09 | Acceptable |
| | | | Zn-65 | 147.7 ± 4.2 | 145.0 ± 4.8 | 1.02 | Acceptable |
| | | | Co-60 | 129.3 ± 1.8 | 134.0 ± 4.5 | 0.97 | Acceptable |
| | | | I-131** | 72.7 ± 1.3 | 73.8 ± 2.46 | 0.99 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.
** Result determined by Resin Extraction/Gamma Spectral Analysis.

TABLE 8-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Air Particulate Filters

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/filter ±1 sigma | REFERENCE LAB* pCi/filter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 3/23/2006 | E4883-05 | Filter | Ce-141 | 58.6 ± 1.60 | 61.4 ± 2.05 | 0.95 | Acceptable |
| | | | Cr-51 | 169.0 ± 10.3 | 166.0 ± 5.52 | 1.02 | Acceptable |
| | | | Cs-134 | 74.0 ± 3.90 | 71.5 ± 2.38 | 1.03 | Acceptable |
| | | | Cs-137 | 51.8 ± 2.10 | 52.5 ± 1.75 | 0.99 | Acceptable |
| | | | Co-58 | 60.5 ± 2.40 | 61.9 ± 2.06 | 0.98 | Acceptable |
| | | | Mn-54 | 61.5 ± 2.40 | 55.3 ± 1.84 | 1.11 | Acceptable |
| | | | Fe-59 | 55.6 ± 2.90 | 51.3 ± 1.71 | 1.08 | Acceptable |
| | | | Zn-65 | 115.0 ± 5.50 | 104.0 ± 3.48 | 1.11 | Acceptable |
| | | | Co-60 | 72.5 ± 2.10 | 75.6 ± 2.52 | 0.96 | Acceptable |
| 9/14/2006 | E5077-05 | Filter | Ce-141 | 80.3 ± 1.41 | 78.6 ± 2.62 | 1.02 | Acceptable |
| | | | Cr-51 | 266.3 ± 9.88 | 257.0 ± 8.57 | 1.04 | Acceptable |
| | | | Cs-134 | 84.1 ± 2.03 | 77.7 ± 2.59 | 1.08 | Acceptable |
| | | | Cs-137 | 159.7 ± 2.24 | 160.0 ± 5.33 | 1.00 | Acceptable |
| | | | Co-58 | 101.3 ± 2.03 | 99.8 ± 3.33 | 1.01 | Acceptable |
| | | | Mn-54 | 112.0 ± 2.01 | 103.0 ± 3.42 | 1.09 | Acceptable |
| | | | Fe-59 | 46.1 ± 1.98 | 39.9 ± 1.33 | 1.15 | Acceptable |
| | | | Zn-65 | 147.7 ± 4.09 | 132.0 ± 4.41 | 1.12 | Acceptable |
| | | | Co-60 | 119.7 ± 1.71 | 122.0 ± 4.07 | 0.98 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

Gamma Analysis of Soil

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/gram ±1 sigma | REFERENCE LAB* pCi/gram ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 6/8/2006 | E5003-05 | Soil | Ce-141 | 0.241 ± 0.008 | 0.214 ± 0.007 | 1.13 | Acceptable |
| | | | Cr-51 | 0.349 ± 0.036 | 0.302 ± 0.010 | 1.16 | Acceptable |
| | | | Cs-134 | 0.162 ± 0.006 | 0.147 ± 0.005 | 1.10 | Acceptable |
| | | | Cs-137 | 0.249 ± 0.007 | 0.237 ± 0.008 | 1.05 | Acceptable |
| | | | Co-58 | 0.114 ± 0.004 | 0.117 ± 0.004 | 0.97 | Acceptable |
| | | | Mn-54 | 0.185 ± 0.006 | 0.170 ± 0.006 | 1.09 | Acceptable |
| | | | Fe-59 | 0.120 ± 0.007 | 0.109 ± 0.004 | 1.10 | Acceptable |
| | | | Zn-65 | 0.236 ± 0.010 | 0.216 ± 0.007 | 1.09 | Acceptable |
| | | | Co-60 | 0.155 ± 0.004 | 0.150 ± 0.005 | 1.04 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

TABLE 8-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Gamma Analysis of Vegetation

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/gram ±1 sigma | REFERENCE LAB* pCi/gram ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 6/8/2006 | E5005-05 | Vegetation | Ce-141 | 0.209 ± 0.007 | 0.223 ± 0.007 | 0.94 | Acceptable |
| | | | Cr-51 | 0.293 ± 0.034 | 0.315 ± 0.011 | 0.93 | Acceptable |
| | | | Cs-134 | 0.159 ± 0.007 | 0.154 ± 0.005 | 1.03 | Acceptable |
| | | | Cs-137 | 0.127 ± 0.006 | 0.143 ± 0.005 | 0.89 | Acceptable |
| | | | Co-58 | 0.109 ± 0.006 | 0.122 ± 0.004 | 0.90 | Acceptable |
| | | | Mn-54 | 0.160 ± 0.006 | 0.178 ± 0.006 | 0.90 | Acceptable |
| | | | Fe-59 | 0.105 ± 0.008 | 0.114 ± 0.004 | 0.92 | Acceptable |
| | | | Zn-65 | 0.207 ± 0.013 | 0.225 ± 0.008 | 0.92 | Acceptable |
| | | | Co-60 | 0.140 ± 0.005 | 0.156 ± 0.005 | 0.90 | Acceptable |

(1) Ratio = Reported/Analytics (See Section 8.3).
* Sample provided by Analytics, Inc.

TABLE 8-1 (Continued)
INTERLABORATORY INTERCOMPARISON PROGRAM
Analysis of water

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/gram ±1 sigma | REFERENCE LAB* pCi/gram ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 2/15/2006 | 1831-3 | Water | I-131 | 2.06E+06 ± 2.77E+04 | 2.09E+06 ± 1.47E+04 | 0.99 | Acceptable |
| | | | H-3 | 1.12E+06 ± 3.11E+03 | 1.11E+06 ± 8.86E+03 | 1.01 | Acceptable |

(1) Ratio = Reported/NIST (See Section 8.3).
* Sample provided by NIST

Gamma Analysis of Filter

| DATE | SAMPLE ID NO. | MEDIUM | ANALYSIS | JAF LAB pCi/filter ±1 sigma | REFERENCE LAB* pCi/filter ±2 sigma | RATIO (1) | EVALUATION |
|---|---|---|---|---|---|---|---|
| 6/8/2006 | 1851-16 | Filter | Mn-54 | 3.08E+04 ± 158 | 2.80E+04 ± 280 | 1.10 | Acceptable |
| | | | Co-57 | 3.74E+04 ± 94 | 3.36E+04 ± 336 | 1.11 | Acceptable |
| | | | Fe-59 | 1.01E+05 ± 1418 | 8.91E+04 ± 891 | 1.13 | Acceptable |
| | | | Se-75 | 5.24E+04 ± 508 | 5.61E+04 ± 561 | 0.93 | Acceptable |
| | | | Cs-134 | 3.00E+04 ± 143 | 2.76E+04 ± 276 | 1.09 | Acceptable |

(1) Ratio = Reported/NIST (See Section 8.3).
* Sample provided by NIST

## 8.5 REFERENCES

8.5.1 Radioactivity and Radiochemistry, The Counting Room: Special Edition, 1994 Caretaker Publications, Atlanta, Georgia.

8.5.2 Data Reduction and Error Analysis for the Physical Sciences, Bevington P.R., McGraw Hill, New York (1969).

## 9.0 GRAPHICAL PRESENTATIONS

### 1. DATA GRAPHS

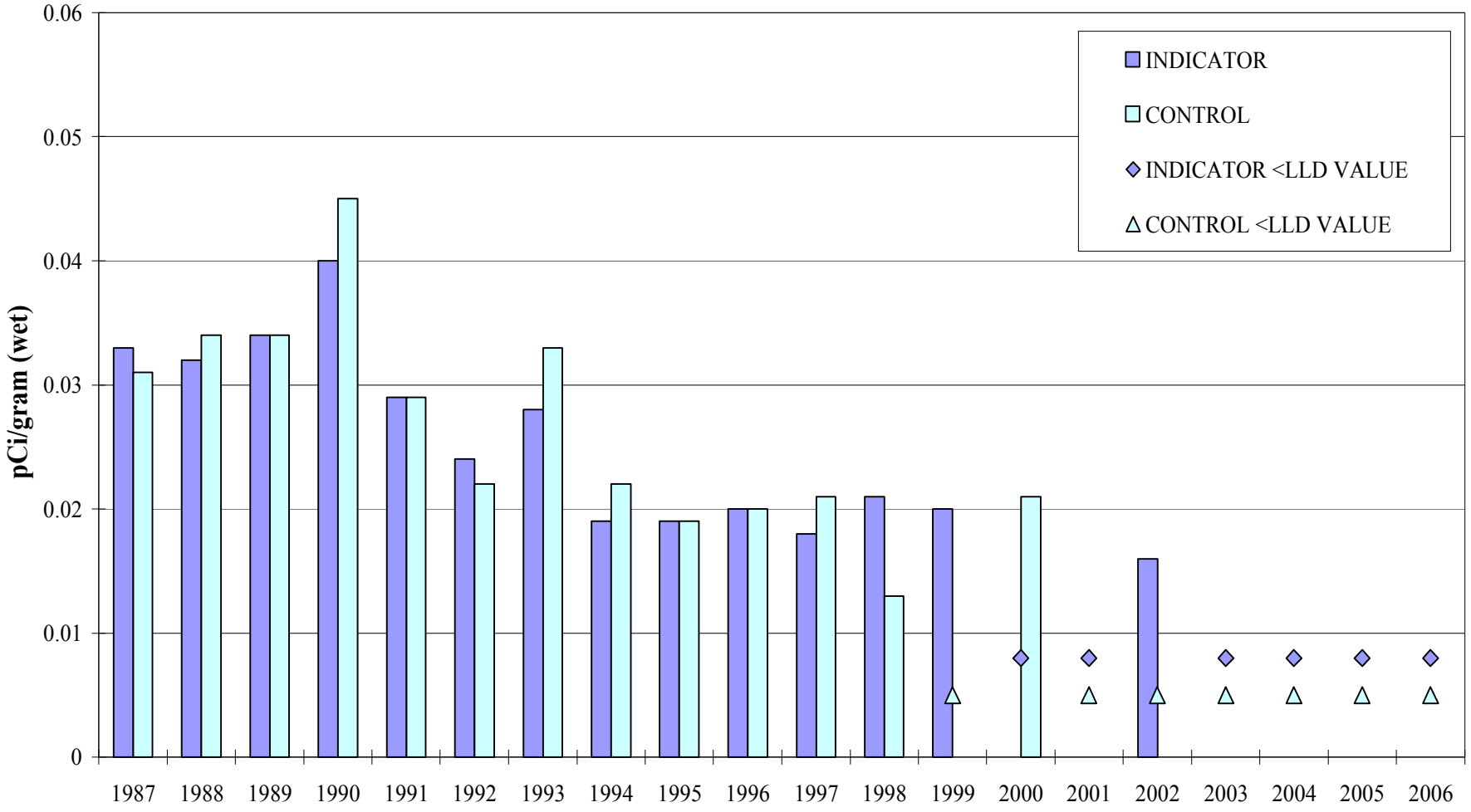
This section includes graphic representation of selected sample results.

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.

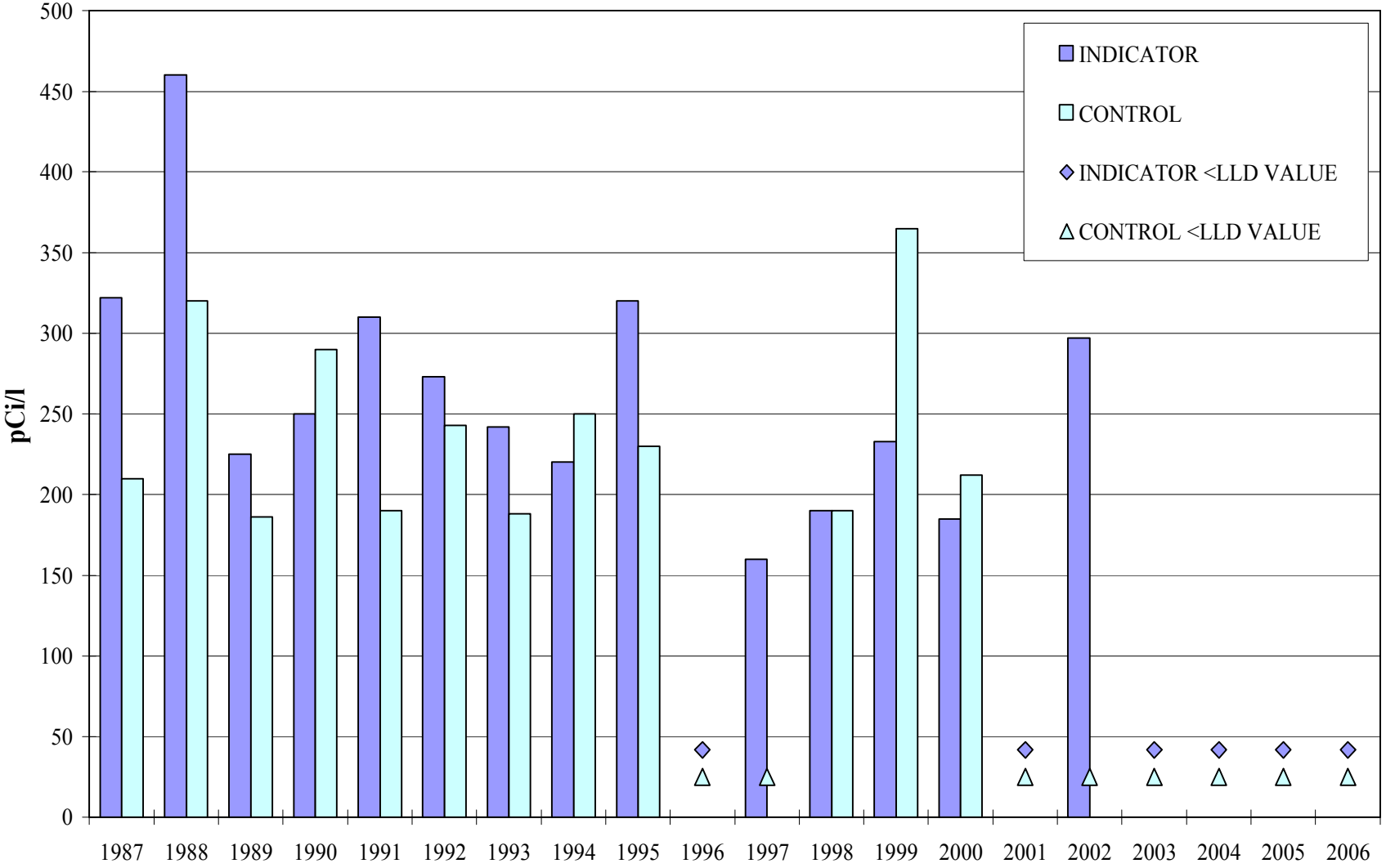
### 2. SAMPLE LOCATIONS

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

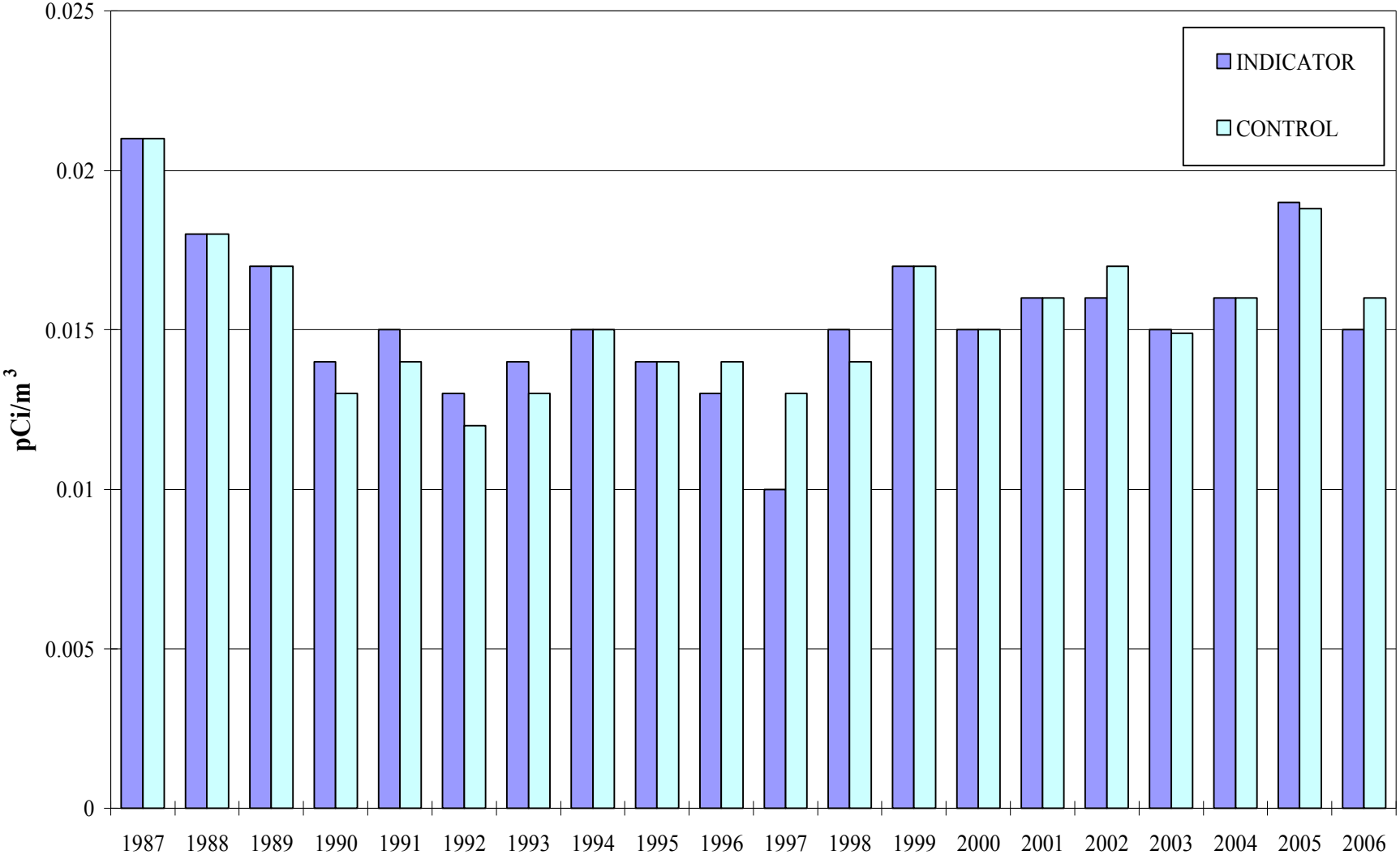
**James A. FitzPatrick N.P.P.**
**Fish Cs-137**
**Figure 9.1**



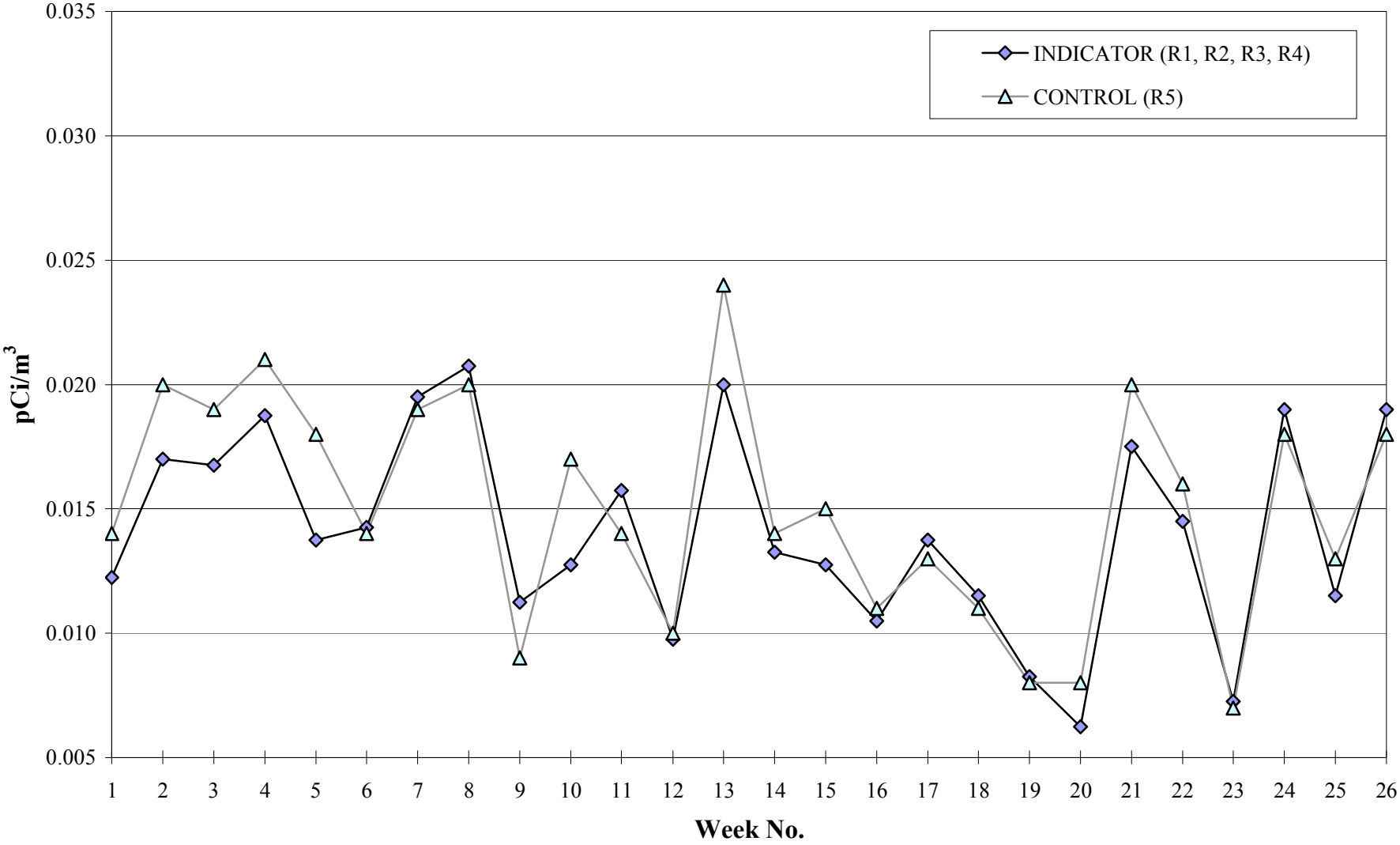
**James A. FitzPatrick N.P.P.**
**Surface Water - Tritium**
**Figure 9.2**



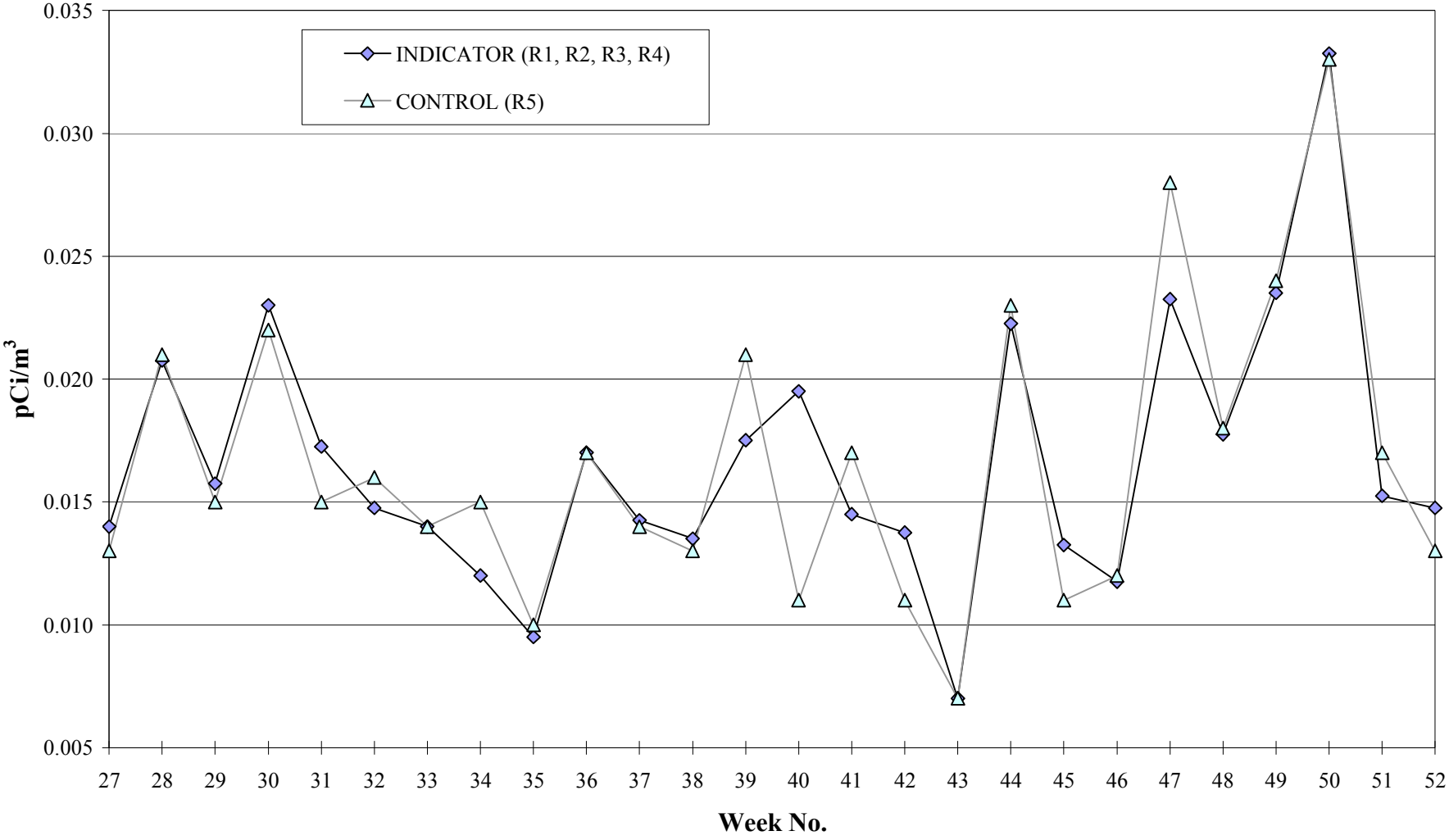
**James A. FitzPatrick N.P.P.**
**Air Particulate Filter - Gross Beta**
**Figure 9.3**



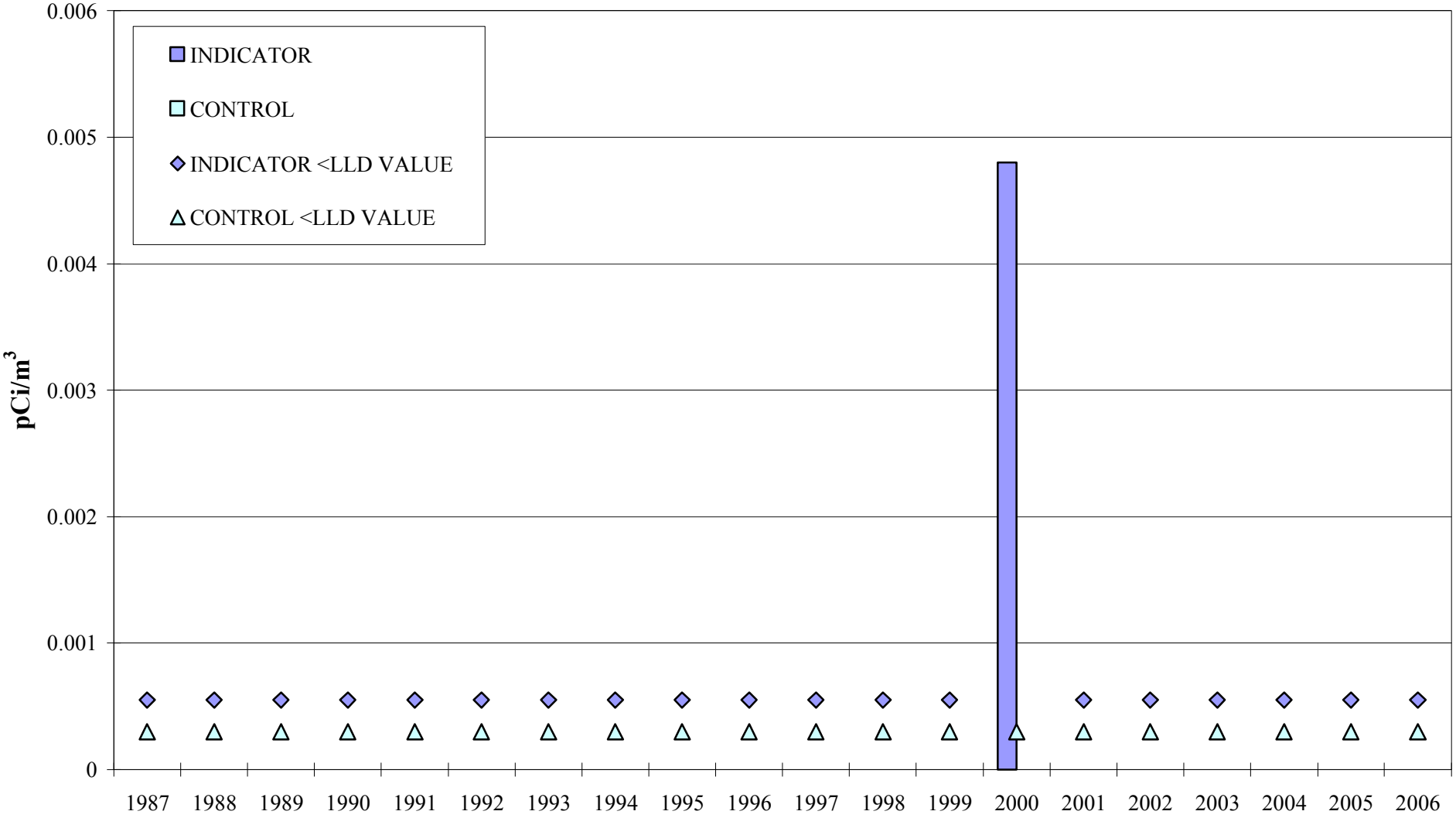
**James A. FitzPatrick N.P.P.**
**Air Particulate Filter - Gross Beta**
**Figure 9.4**



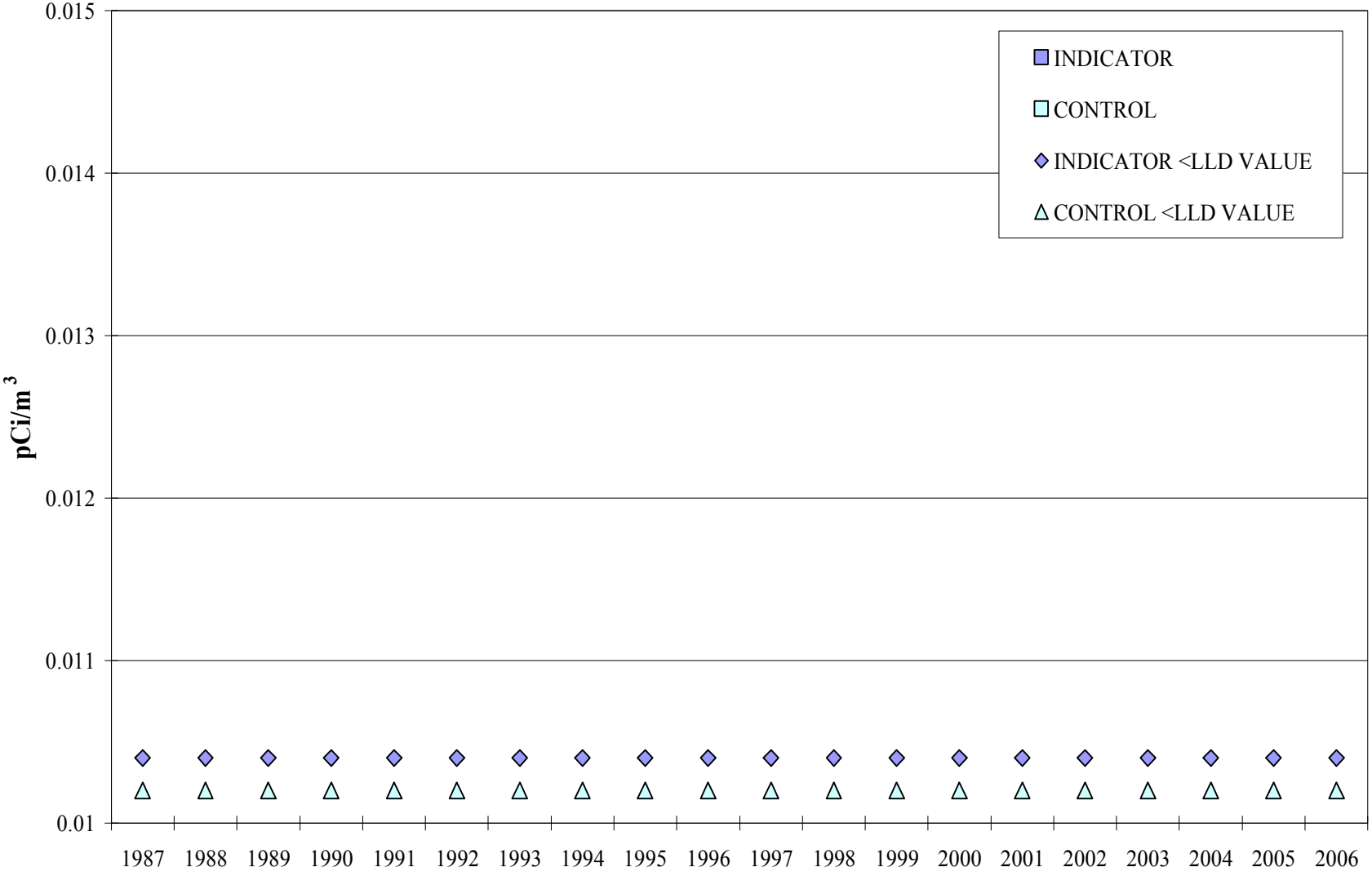
**James A. FitzPatrick N.P.P.**
**Air Particulate Filter - Gross Beta**
**Figure 9.5**



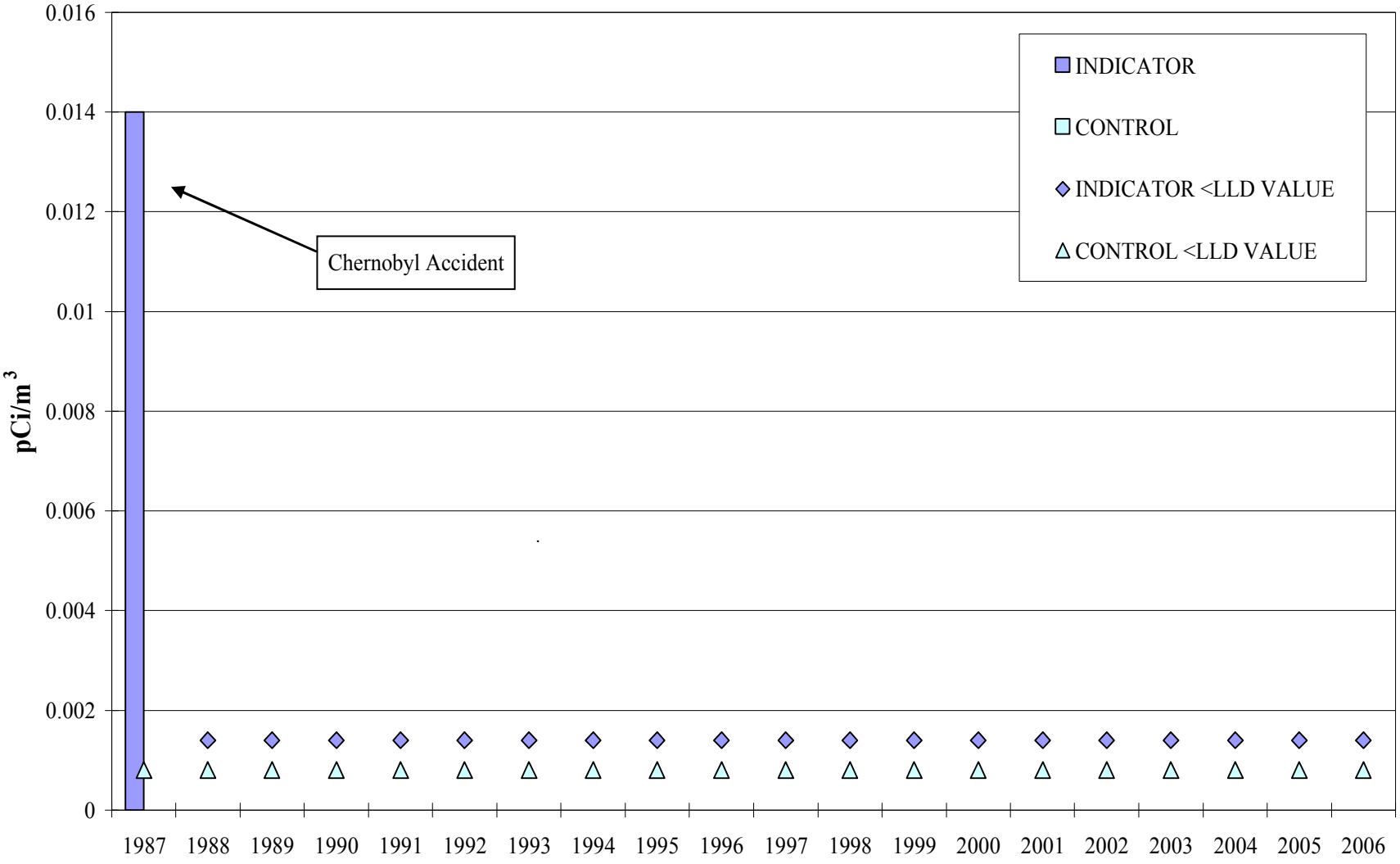
**James A. FitzPatrick N.P.P.**
**Air Particulate Filter Composite Co-60**
**Figure 9.6**



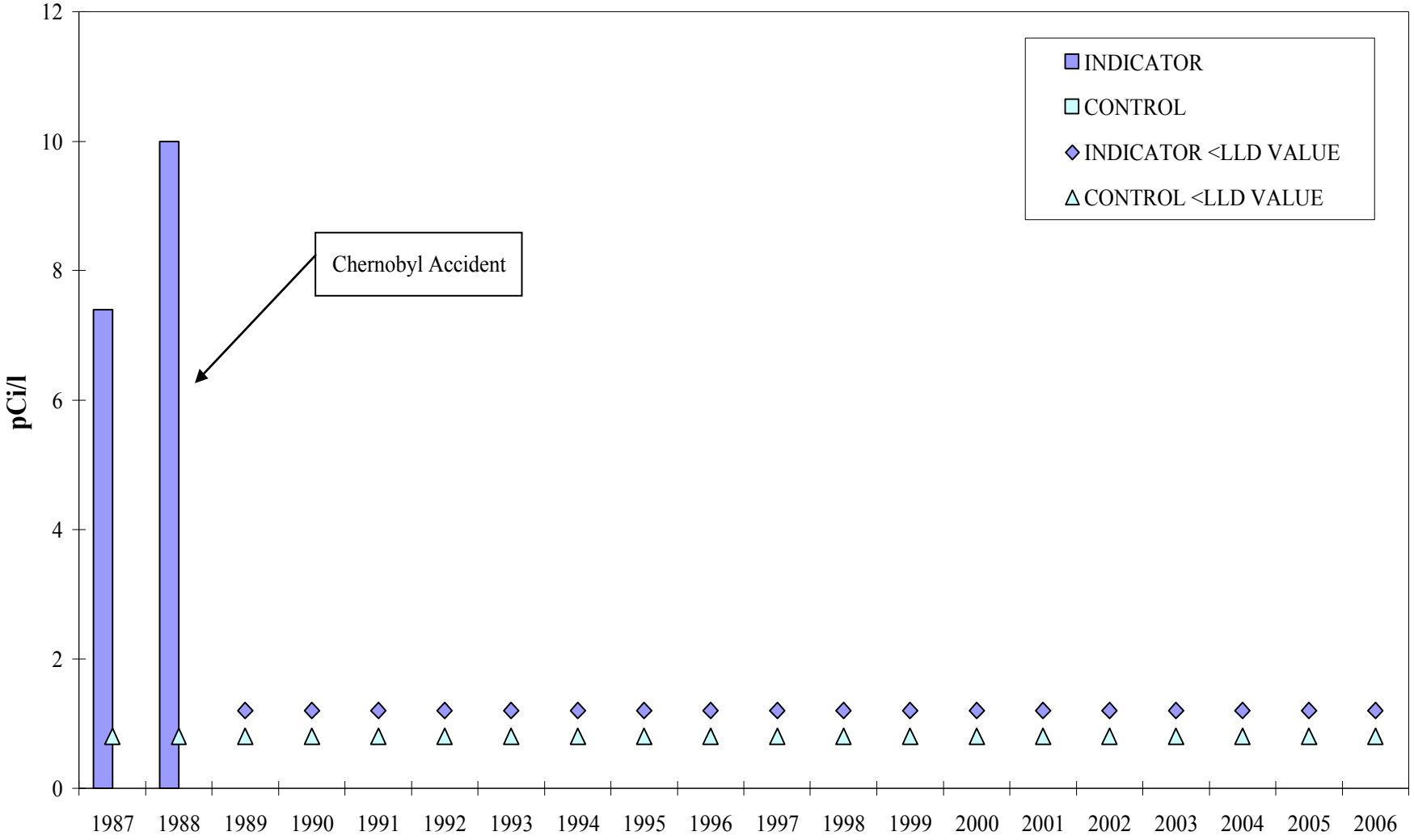
**James A. FitzPatrick N.P.P.**
**Air Particulate Filter Composite Cs-137**
**Figure 9.7**



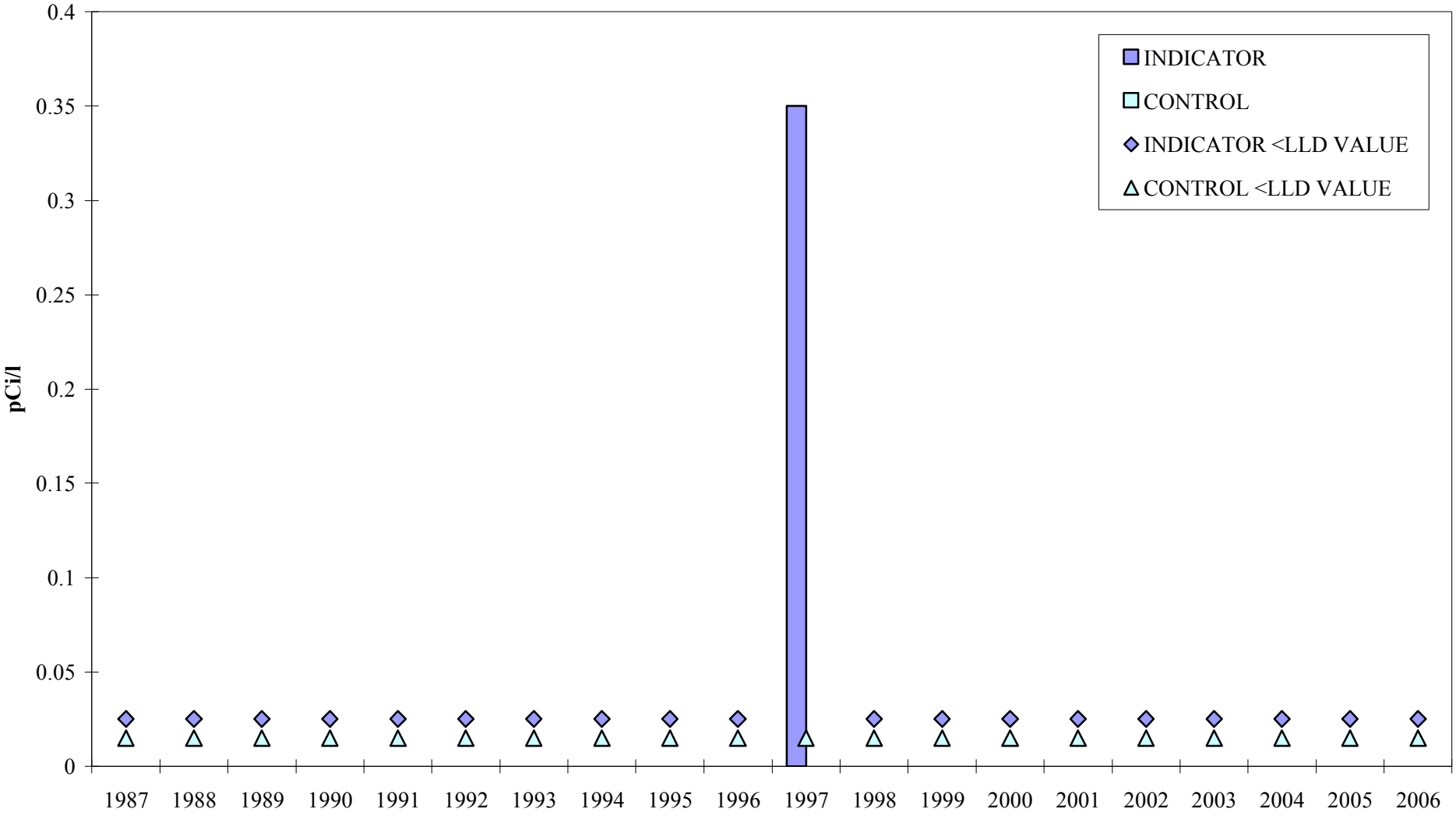
**James A. FitzPatrick N.P.P.**
**Air Charcoal I-131**
**Figure 9.8**



**James A. FitzPatrick N.P.P.**
**Milk Cs-137**
**Figure 9.9**



**James A. FitzPatrick N.P.P.**
**Milk I-131**
**Figure 9.10**



**James A. FitzPatrick N.P.P.**
**TLD Data**
**Figure 9.11**