ENCLOSURE

NINE MILE POINT NUCLEAR STATION, LLC

2012 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

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NINE MILE POINT NUCLEAR STATION, LLC

2012 ANNUAL

RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

NINE MILE POINT NUCLEAR STATION, LLC

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

January 1, 2012 – December 31, 2012

For

NINE MILE POINT NUCLEAR STATION UNIT 1

Facility Operating License DPR-63

Docket No. 50-220

And

NINE MILE POINT NUCLEAR STATION UNIT 2

Facility Operating License NPF-69

Docket No. 50-410

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1.0 EXECUTIVE SUMMARY

The Annual Radiological Environmental Operating Report is published pursuant to Section 6.6.2 of the Nine Mile Point Unit 1 (NMP1) Technical Specifications and Section 5.6.2 of the Nine Mile Point Unit 2 (NMP2) Technical Specifications.

This report describes the Radiological Environmental Monitoring Program (REMP), the implementation of the program, and the results obtained as required by the Offsite Dose Calculation Manuals (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 Interlaboratory Comparison Quality Assurance Program (ICQAP) required by the NMP1 and NMP2 ODCM.

The REMP is a comprehensive surveillance program, which is implemented to assess the impact of site operations on the environment and compliance with 10 CFR 20 and 40 CFR 190. 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 2012, there were 1887 analyses performed on environmental media collected as part of the REMP. The results demonstrate that there was no significant or measurable radiological impact from the operation of either the NMP1 or NMP2 facilities. The 2012 results for all pathways sampled were consistent with the previous five-year historical results and exhibited no adverse trends.

In summary, the analytical results from the 2012 REMP demonstrate that the routine operation of both facilities at the Nine Mile Point site had no significant or measurable radiological impact on the environment. The results of the REMP continue to demonstrate that the operation of the plants did not result in a significant measurable dose to a member of the general population, or adversely impact the environment as a result of radiological effluents. The program continues to demonstrate that the dose to a member of the public, as a result of the operation of NMP1 and NMP2, remains significantly below the federally required dose limits specified in 10 CFR 20, 10 CFR 72 and 40 CFR 190.

2.0 INTRODUCTION

Nine Mile Point Units 1 and 2 are operated by Nine Mile Point Nuclear Station, LLC. This report is submitted in accordance with Appendix A (Technical Specifications) Section 6.6.2 to License DPR-63, Docket No. 50-220 for Nine Mile Point Nuclear Station, Unit 1, and Appendix A (Technical Specifications) Section 5.6.2 to License NPF-69, Docket No. 50-410 for Nine Mile Point Nuclear Station, Unit 2, for the calendar year 2012.

Nine Mile Point Unit 1 (NMP1) and Nine Mile Point Unit 2 (NMP2) Radiological Environmental Monitoring Program (REMP) requirements reside within the NMP1 Offsite Dose Calculation Manual (ODCM) and NMP2 ODCM, respectively. Throughout this report, references will be made to the ODCM. This refers to both the NMP1 ODCM and the NMP2 ODCM.

2.1 PROGRAM HISTORY

Environmental monitoring of the Nine Mile Point (NMP) site has been on-going since 1964. The program includes five years of pre-operational data which was conducted prior to any reactor operations. In 1968, the Niagara Mohawk Power Company began the required pre-operational environmental site testing program. This pre-operational data serves as a reference point to compare data obtained during reactor operation. In 1969, NMP1, a 1,850 Megawatt-Thermal (MWt) Boiling Water Reactor (BWR) began full power operation. In 1975, the James A. FitzPatrick Nuclear Power Plant (JAFNPP), a 2,536 MWt BWR, currently owned and operated by Entergy, began full power operation. In 1988, NMP2, a 3,323 MWt BWR located between NMP1 and JAFNPP, began full power operation. In 1995, NMP2 was uprated to 3,467 MWt and in 2012, NMP2 was uprated to 3988 MWt.

In 1985, the individual stations' Plant Effluent Technical Specifications were standardized to the generic Radiological Effluent Technical Specifications, much of which is common to both NMP1 and JAFNPP, and subsequently to NMP2. Subsequent Technical Specification amendments relocated the REMP requirements to the ODCM for all three plants. Data generated by the REMP is shared between Nine Mile Point Nuclear Station (NMPNS) and JAFNPP, but each operating company reviews and publishes their own annual report.

In summary, the three BWRs, which together generate approximately 8,374 MWt, have operated collectively since 1988. A large database of environmental results for the exposure pathways has been collected and analyzed to determine the effect from reactor operations.

2.2 SITE DESCRIPTION

The NMP 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 south southeast of the site. The reactors and support buildings occupy a small shoreline portion of the 900-acre site. 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 REMP 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 NMP site.

3. Demonstrate compliance with the requirements of applicable federal regulatory agencies and the Offsite Dose Calculation Manuals.

3.0 PROGRAM DESCRIPTION

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

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

In addition, direct radiation measurements are performed using thermoluminescent dosimeters (TLDs). These sampling programs are outlined in Table 3.0-1 and Table 3.0-2. The NMPNS REMP sampling locations are selected and verified by an annual land use census. The accuracy and precision of the sample analysis program is assured by participation in an Interlaboratory Comparison Quality Assurance Program (ICQAP). In addition to the participation in the ICQAP, 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 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

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 1

Exposure Pathway and/or Sample	Number of Samples [a] and Locations	Sampling and Collection Frequency [a]	Type of Analysis and Frequency
AIRBORNE			
a. Radioiodine and Particulates	Samples from five locations: 1. Three samples from offsite locations in different sectors of the highest calculated site average D/Q (based on all site licensed reactors). 2. One sample from the vicinity of an established year round community having the highest calculated site average D/Q (based on all site licensed reactors). 3. One sample from a control location 10-17 miles distant and in a least prevalent wind direction [d].	Continuous sampler operation with sample collection weekly or as required by dust loading, whichever is more frequent.	Radioiodine Canisters - analyze once per week for I-131. Particulate Samplers - Gross beta radioactivity following filter change [b]. Composite (by location) for gamma isotopic analysis [c] once per 3 months (as a minimum).
b. Direct Radiation [e]	32 stations with two or more dosimeters to be placed as follows: an inner ring of stations in the general area of the site boundary and an outer ring in the 4 to 5 mile range from the site with a station in each land based sector [*]. The balance of the stations should be placed in special interest areas such as population centers, nearby residences, schools and in 2 or 3 areas to serve as control stations.	Once per 3 months.	Gamma dose once per 3 months.

[*] At this distance, 8 wind rose sectors, (W, WNW, NW, NNW, N, NNE, NE, and ENE) are over Lake Ontario.

TABLE 3.0-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 1

Exposure Pathway and/or Sample	Number of Samples [a] and Locations	Sampling and Collection Frequency [a]	Type of Analysis and Frequency
WATERBORNE			
a. Surface [f]	1. One sample upstream. 2. One sample from the site's downstream cooling water intake.	Composite sample over 1 month period [g].	Gamma isotopic analysis [c] once per month. Composite for once per 3 months tritium analysis.
b. Sediment from Shoreline	One sample from a downstream area with existing or potential recreational value.	Twice per year.	Gamma isotopic analysis[c].
INGESTION			
a. Milk	1. Samples from milk sampling locations in three locations within 3.5 miles distance having the highest calculated site average D/Q. If there are none, then one sample from milking animals in each of 3 areas 3.5 – 5.0 miles distant having the highest calculated site average D/Q (based on all site licensed reactors). 2. One sample from a milk sampling location at a control location (9-20 miles distant and in a least prevalent wind direction) [d].	Twice per month, April – December (samples will be collected in January – March if I-131 is detected in November and December of the preceding year).	Gamma isotopic [c] and I-131 analysis twice per month when animals are on pasture (April – December); once per month at other times (January – March) if required.

TABLE 3.0-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 1

Exposure Pathway and/or Sample	Number of Samples [a] and Locations	Sampling and Collection Frequency [a]	Type of Analysis and Frequency
b. Fish	1. One sample each of two commercially or recreationally important species in the vicinity of a plant discharge area [h]. 2. One sample each of the same species from an area at least 5 miles distant from the site [d].	Twice per year.	Gamma isotopic analysis [c] on edible portions twice per year.
c. Food Products	1. Samples of three different kinds of broad leaf vegetation (such as vegetables) grown nearest to each of two different off-site locations of highest calculated site average D/Q (based on all licensed site reactors). 2. One sample of each of the similar broad leaf vegetation grown at least 9.3 – 20 miles distant in a least prevalent wind direction.	Once per year during harvest season.	Gamma isotopic [c] analysis of edible portions (Isotopic to include I-131 or a separate I-131 analysis may be performed) once during the harvest season.

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 and may be substituted. Actual locations (distance and directions) from the site shall be provided in the Annual Radiological Environmental Operating Report. Highest D/Q locations are based on historical meteorological data for all site licensed 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 the 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 facility.

(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, such as historical control locations 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 by considered to be one phosphor, and two or more phosphors in a packet may be considered as two or more dosimeters. Film badges shall not be used for measuring direct radiation.

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

(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 obtaining a representative sample.

(h) In the event commercial or recreational important species are not available as a result of three attempts, then other species may be utilized as available.

TABLE 3.0-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 2

Exposure Pathway and/or Sample	Number of Samples and Sample Locations [a]	Sampling and Collection Frequency	Type of Analysis and Frequency
AIRBORNE			
a. Direct Radiation	32 routine monitoring stations [b] either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows: 1. An inner ring of stations, one in each meteorological sector in the general area of the Site Boundary. 2. An outer ring of stations, one in each land base meteorological sector in the 4 to 5 mile [c] range from the site. 3. The balance of the stations should be placed in special interest areas such as population centers, nearby residences, schools, and in one of two areas to serve as control stations [d].	Once per 3 months.	Gamma dose once per 3 months.

TABLE 3.0-2 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 2

Exposure Pathway and/or Sample	Number of Samples and Sample Locations [a]	Sampling and Collection Frequency	Type of Analysis and Frequency
b. Airborne Radioiodine and Particulates	Samples from five locations: 1. Three samples from off-site locations close to the site boundary (within one mile) in different sectors of the highest calculated annual site average ground-level D/Q (based on all site licensed reactors)[e]. 2. One sample from the vicinity of an established year-round community having the highest calculated annual site average ground-level D/Q (based on all site licensed reactors)[e]. 3. One sample from a control location at least 10 miles distant and in a least prevalent wind direction [d].	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Canister: I-131 analysis weekly. Particulate Sampler: 1. Gross beta radioactivity analysis ≥ 24 hours following filter change[f], 2. Gamma isotopic analysis on each sample where gross beta activity is >10 times the previous yearly mean of control samples, and 3. Gamma isotopic analysis [g] of composite sample (by location) once per 3 months.
WATERBORNE			
a. Surface	1. One sample upstream [d] [h]. 2. One sample from the site's downstream cooling water intake [h].	Composite sample over 1-month period [i].	Gamma isotopic analysis [g] once per month and tritium analysis once per 3 months.

TABLE 3.0-2 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 2

Exposure Pathway and/or Sample	Number of Samples and Sample Locations [a]	Sampling and Collection Frequency	Type of Analysis and Frequency
b. Ground	Samples from one or two sources if likely to be affected [j].	Grab sample once per 3 months.	Gamma isotopic [g] and tritium analysis once per 3 months.
c. Drinking	One sample each of one to three of the nearest water supplies that could be affected by its discharge [k].	When I-131 analysis is performed, a composite sample over a 2-week period[i]; otherwise, a composite sample monthly.	1. I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year[l]. 2. Composite for gross beta and gamma isotopic analyses [g] monthly. 3. Composite for tritium analysis once per 3 months.
d. Sediment from Shoreline	One sample from a downstream area with existing or potential recreational value.	Twice per year.	Gamma isotopic analysis[g].

TABLE 3.0-2 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 2

Exposure Pathway and/or Sample	Number of Samples and Sample Locations [a]	Sampling and Collection Frequency	Type of Analysis and Frequency
INGESTION			
a. Milk	1. Samples from Milk Sampling Locations in three locations within 3.5 miles[e] distance having the highest calculated annual site average D/Q (based on all licensed site reactors). 2. If there are none, then 1 sample from Milk Sampling Locations in each of three areas 3.5 – 5.0 miles[e] distant having the highest calculated annual site average D/Q (based on all licensed site reactors). 3. One sample from a Milk Sample Location at a control location 9 - 20 miles distant and in a least prevalent wind direction [d].	Twice per month, April – December (samples will be collected January – March if I-131 is detected in November and December of the preceding year)[m].	1. Gamma isotopic [g] and I-131 analysis twice per month when animals are on pasture (April – December); 2. Gamma isotopic [g] and I-131 analysis once per month at other times (January – March, if required).
b. Fish	1. One sample each of two commercially or recreationally important species in the vicinity of a plant discharge area [n]. 2. One sample of the same species in areas not influenced by station discharge [d].	Twice per year.	Gamma isotopic analysis [g] on edible portions twice per year.

TABLE 3.0-2 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
REQUIRED SAMPLE COLLECTION AND ANALYSIS
Nine Mile Point Unit 2

Exposure Pathway and/or Sample	Number of Samples and Sample Locations [a]	Sampling and Collection Frequency	Type of Analysis and Frequency
c. Food Products	1. One sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have been discharged [o].	At time of harvest [p].	Gamma isotopic [g] and I-131 analysis of each sample of edible portions.
	2. Samples of three different kinds of broad leaf vegetation (such as vegetables) grown nearest to each of two different off-site locations of highest calculated annual site average D/Q (based on all licensed site reactors)[e].	Once per year during the harvest season.	
	3. One sample of each of the similar broad leaf vegetation grown at least 9.3 miles distant in a least prevalent wind direction.	Once per year during the harvest season.	

NOTES FOR TABLE 3.0-2

(a) Specific parameters of distance and direction sector from the centerline of one reactor, and additional descriptions where pertinent, shall be provided for each and every sample location in Table 3.0-2. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position on Environmental Monitoring, Revision 1, November 1979. Deviations are permitted from the required sampling schedule if specimens are unobtainable because of such circumstances as hazardous conditions, seasonal unavailability (which includes theft and uncooperative residents), or malfunction of automatic sampling equipment.

(b) 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. Each of the 32 routine monitoring stations shall be equipped with 2 or more dosimeters or with 1 instrument for measuring and recording dose rate continuously. For the purpose of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor, two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation.

(c) At this distance, 8 wind rose sectors, (W, WNW, NW, NNW, N, NNE, NE, and ENE) are over Lake Ontario.

(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) Having the highest calculated annual site average ground-level D/Q based on all site licensed reactors.

(f) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay.

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

(h) 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.

(i) In this program, representative composite sample aliquots shall be collected at time intervals that are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure obtaining a representative sample.

(j) Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

(k) Drinking water samples shall be taken only when drinking water is a dose pathway.

(l) Analysis for I-131 may be accomplished by Ge-Li analysis, provided that the lower limit of detection (LLD) for I-131 in water samples found on Table 3.7-1 can be met. Doses shall be calculated for the maximum organ and age group.

(m) Samples will be collected January through March if I-131 is detected in November and December of the proceeding year.

NOTES FOR TABLE 3.0-2 (continued)

(n) In the event two commercially or recreationally important species are not available after three attempts of collection, then two samples of one species or other species not necessarily commercially or recreationally important may be utilized.

(o) Applicable only to major irrigation projects within 9 miles of the site in the general down current direction.

(p) If harvest occurs more than once/year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be taken monthly. Attention shall be paid to including samples of tuberous and root food products.

3.1 SAMPLE COLLECTION METHODOLOGY

3.1.1 SHORELINE SEDIMENTS

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 on-site sample transects located offshore from the site. One set of control samples are collected at an off-site 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 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 gamm-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 JAFNPP and the NRG Oswego Generating 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 Generating 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 Generating 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, that are analyzed for tritium.

In addition to the sample results for the JAFNPP and Oswego Generating Station collection sites, data is presented for the Nine Mile Point Unit 1 (NMP1) and Nine Mile Point Unit 2 (NMP2) facility inlet canal samples and from the City of Oswego drinking water supply. These 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.

Sampling for groundwater and drinking water, as found in Section D 3.5.1 of the NMP2 ODCM, was not required during 2012. There was no groundwater source in 2012 that was tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties support contamination migration; therefore, drinking water was not a dose pathway during 2012.

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

3.1.4 GROUNDWATER MONITORING PROGRAM

The Nuclear Energy Institute (NEI) Groundwater Protection Initiative was established to determine the potential impact nuclear power plants may have on the surrounding environment due to unplanned releases of radioactive liquids. Under the NEI 07-07 Groundwater Protection Initiative (GPI) – Final Guidance Document, August 2007, groundwater monitoring is accomplished through sampling of the water table around the plant and analyzing for tritium. In addition to the groundwater monitoring requirements specified in the NMP2 ODCM, NMPNS started monitoring groundwater wells in October 2005 and has been monitoring the plant dewatering systems as part of the response to Generic Letter 80-10 for several years. During 2012, eight (8) new wells were installed. Samples collected from these locations are analyzed for tritium, gamma emitters, and strontium.

During the operating year 2012, there were no unplanned releases or spills of radioactive liquids on the NMPNS site.

Groundwater samples are analyzed using liquid scintillation detection and gamma isotopic analysis.

Groundwater tritium results are documented in the 2012 Annual Radiological Effluent Release Report. Historical groundwater data is presented in Section 7, Historical Data Tables.

Groundwater sample locations are shown in Section 3.3, Figure 3.3-6.

3.1.5 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 annual site average ground-level 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 NMP2 Reactor Building. The ODCM also requires 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 16.4 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 SW sector in the vicinity of the City of Oswego and is designated as Offsite Station G. Three remaining air sampling stations are located in the ESE, SSE, and SSW sectors and range in distance from 7.2 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 sample cartridges (2 x 1 inches). 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 quarterly by location and analyzed for gamma-emitting radionuclides.

Air sampling station locations (Environmental Stations) are shown in Section 3.3, Figures 3.3-2 and 3.3-3.

3.1.6 THERMOLUMMINESCENT DOSIMETERS (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 Environmental Dosimetry Company. The laboratory utilizes a Panasonic based system using UD-814 dosimeters that 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.

1. Environmental TLDs

Environmental TLDs are placed in five different geographical regions around the 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 are not required by the ODCM, with the exception of TLD # 7, 18 and 23. (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*)
Offsite	An outer ring of TLDs placed 4 to 5 miles from the site in each of the eight 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 ODCM

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 data.

Two dosimeters are placed at each TLD monitoring location. The TLDs are sealed in polyethylene packages to ensure dosimeter integrity, 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.

2. Independent Spent Fuel Storage Installation (ISFSI)

In order to provide adequate spent fuel storage capacity at NMP1 and NMP2, NMPNS constructed an ISFSI onsite west of NMP1. During 2012 the NMPNS ISFSI facility was placed into service.

TLDs are used to monitor direct radiation levels in the vicinity of the ISFSI facility. Sixteen (16) TLD locations were established around the site boundary. Background data has been collected from the initiation of the NMPNS REMP TLD program in 1985.

In addition, fourteen (14) Optically Stimulated Luminescence Dosimeters (OSDLs) are located around the ISFSI and in areas where personnel are assigned routine work activities. These locations are designated as optional locations. Background data was collected starting in June, 2011.

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

3.1.7 MILK

Milk samples are routinely collected from farms during the sampling year. These farms include one indicator location and one control location. Samples are normally collected April through December of the sample year. If plant-related radionuclides are detected during 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 next sampling year. Milk samples were not collected in January through March of 2012, as there were no positive detections of plant related radionuclides in samples collected during November and December 2010.

The ODCM also requires that a sample be collected from a control location nine to twenty miles from the site and in a least prevalent wind direction. This location, No. 77, 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 butterfat. Two gallons are collected from each indicator and control location during the first half and second half of each month. The samples are chilled, preserved and shipped fresh to the analytical laboratory within thirty-six hours of collection, in insulated shipping containers.

The milk sample locations are shown in Section 3.3, Figure 3.3-4.

3.1.8 FOOD PRODUCTS (VEGETATION)

Food products are collected once per year during the late summer harvest season. A minimum of three different kinds of broadleaf vegetation, edible or inedible, is collected from two different indicator garden locations. Sample locations are selected from gardens identified in the annual census that have the highest calculated annual site average D/Q values 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 least prevalent wind direction. Control samples are of the same or similar type of vegetation when available.

Food product samples are analyzed for gamma emitters using gamma isotopic analysis and for carbon-14 (C-14) using liquid scintillation detection.

Food product locations are shown in Section 3.3, Figure 3.3-5.

3.2 ANALYSES PERFORMED

The following environmental sample analyses are performed by the JAFNPP Environmental Laboratory:

- Air Particulate Filter – Gross Beta
- Air Particulate Filter Composites – Gamma Spectral Analysis
- Airborne Radioiodine – Gamma Spectral Analysis
- Fish – Gamma Spectral Analysis
- Food Products (Vegetation) – Gamma Spectral Analysis, and I-131
- Milk – Gamma Spectral Analysis and I-131
- Shoreline Sediment – Gamma Spectral Analysis
- Special Samples (soil, food products, bottom sediment, etc.) – Gamma Spectral Analysis
- Surface Water Monthly Composites – Gamma Spectral Analysis and I-131
- Surface Water Quarterly Composites – Tritium
- Groundwater Quarterly Samples – Gamma Spectral Analysis, Strontium and Tritium

The analyses of Direct Radiation using Thermoluminescent (TLDs) are performed by a contractor laboratory – Environmental Dosimetry Company.

The strontium and C-14 analyses are performed by a contractor laboratory – GEL Laboratories, LLC.

3.3 SAMPLE LOCATIONS

Figures 3.3-1 through 3.3-6 provide 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
- Map 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)
- Figure number
- Location description
- Degrees and distance of the sample location from the site

TABLE 3.3-1

2012 ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION (a & b)	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES & DISTANCE (c & d)
Shoreline Sediment	5*	Figure 3.3-5	Sunset Bay	84° at 1.2 miles
	6	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 - Control	237° at 5.9 miles
Surface Water	03*	Figure 3.3-4	FitzPatrick Inlet	71° at 0.5 miles
	08*	Figure 3.3-4	Oswego Generating Station Inlet - Control	236° at 7.6 miles
	09	Figure 3.3-4	NMP1 Inlet	319° at 0.3 miles
	10	Figure 3.3-4	Oswego City Water	240° at 7.8 miles
	11	Figure 3.3-4	NMP2 Inlet	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	106° at 1.1 miles
	R-3*	Figure 3.3-3	R-3 Station, Co. Rt. 29	134° 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 - Control	42° at 16.2 miles
	D1	Figure 3.3-3	D1 On-Site Station	73° at 0.3 miles
	G	Figure 3.3-3	G On-Site Station	244° at 0.7 miles
	H	Figure 3.3-3	H On-Site Station	74° at 0.8 miles
	I	Figure 3.3-3	I On-Site Station	96° at 0.8 miles
	J	Figure 3.3-3	J On-Site Station	110° at 0.9 miles
	K	Figure 3.3-3	K On-Site Station	133° at 0.5 miles
	G	Figure 3.3-2	G Off-Site Station, Saint Paul Street	226° at 5.4 miles
	D2	Figure 3.3-2	D2 Off-Site Station, Rt. 64	118° at 9.0 miles
	E	Figure 3.3-2	E Off-Site Station, Rt. 4	162° at 7.1 miles
	F	Figure 3.3-2	F Off-site Station, Dutch Ridge Road	192° at 7.6 miles

TABLE 3.3-1 (continued)

2012 ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION (a & b)	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES & DISTANCE (c & d)
Thermoluminescent Dosimeters (TLD)	3	Figure 3.3-3	D1 On-Site Station	73° at 0.3 miles
	4	Figure 3.3-3	D2 On-Site Station	143° at 0.4 miles
	5	Figure 3.3-3	E On-Site Station	150° at 0.4 miles
	6	Figure 3.3-3	F On-Site Station	213° at 0.5 miles
	7*	Figure 3.3-3	G On-Site Station	244° at 0.7 miles
	8	Figure 3.3-2	R-5 Off-Site Station - Control	42° at 16.2 miles
	9	Figure 3.3-2	State Route 3	80° at 11.4 miles
	10	Figure 3.3-2	D2 Off-Site Station	118° at 9.0 miles
	11	Figure 3.3-2	E Off-Site Station	162° at 7.1 miles
	12	Figure 3.3-2	F Off-Site Station	192° at 7.7 miles
	13	Figure 3.3-2	G Off-Site Station	226° at 5.4 miles
	14*	Figure 3.3-2	Southwest Oswego – Control	227° at 12.5 miles
	15*	Figure 3.3-2	West Site Boundary	239° at 0.9 miles
	18*	Figure 3.3-3	Energy Information Center	266° at 0.5 miles
	19	Figure 3.3-2	East Site Boundary	83° at 1.4 miles
	23*	Figure 3.3-3	H On-Site Station	74° at 0.8 miles
	24	Figure 3.3-3	I On-Site Station	96° at 0.8 miles
	25	Figure 3.3-3	J On-Site Station	110° at 0.9 miles
	26	Figure 3.3-3	K On-Site Station	133° at 0.5 miles
	27	Figure 3.3-3	North Fence, JAFNPP	60° at 0.4 miles
	28	Figure 3.3-3	North Fence, JAFNPP	68° at 0.5 miles
	29	Figure 3.3-3	North Fence JAFNPP	65° at 0.5 miles
	30	Figure 3.3-3	North Fence JAFNPP	57° at 0.4 miles
	31	Figure 3.3-3	North Fence NMP1	278° at 0.2 miles
	39	Figure 3.3-3	North Fence NMP1	296° at 0.2 miles
	47	Figure 3.3-3	North Fence JAFNPP	69° at 0.6 miles
	49*	Figure 3.3-2	Phoenix, NY – Control	168° at 19.7 miles
	51	Figure 3.3-2	Oswego Generating Station, East	234° at 7.3 miles
	52	Figure 3.3-2	Fitzhugh Park Elementary School, East	227° at 5.9 miles
	53	Figure 3.3-2	Fulton High School	183° at 13.7 miles
	54	Figure 3.3-2	Mexico High School	115° at 9.4 miles
	55	Figure 3.3-2	Pulaski Gas Substation, Rt. 5	75° at 13.0 miles

TABLE 3.3-1 (continued)

2012 ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	MAP DESIGNATION (a & b)	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES & DISTANCE (c & d)
Thermoluminescent	56*	Figure 3.3-2	New Haven Elementary School	124° at 5.2 miles
Dosimeters (TLD)	58*	Figure 3.3-2	County Route 1A and Alcan	222° at 3.0 miles
(Continued)	75*	Figure 3.3-3	North Fence, NMP2	354° at 0.1 miles
	76*	Figure 3.3-3	North Fence, NMP2	27° at 0.1 miles
	77*	Figure 3.3-3	North Fence, NMP2	37° at 0.2 miles
	78*	Figure 3.3-3	East Boundary, JAFNPP	86° at 1.0 miles
	79*	Figure 3.3-3	County Route 29	121° at 1.2 miles
	80*	Figure 3.3-3	County Route 29	136° at 1.5 miles
	81*	Figure 3.3-3	Miner Road	160° at 1.7 miles
	82*	Figure 3.3-3	Miner Road	180° at 1.6 miles
	83*	Figure 3.3-3	Lakeview Road	203° at 1.2 miles
	84*	Figure 3.3-3	Lakeview Road	225° at 1.1 miles
	85*	Figure 3.3-3	North Fence, NMP1	290° at 0.2 miles
	86*	Figure 3.3-3	North Fence, NMP1	310° at 0.1 miles
	87*	Figure 3.3-3	North Fence, NMP2	332° at 0.1 miles
	88*	Figure 3.3-2	Hickory Grove Road	97° at 4.5 miles
	89*	Figure 3.3-2	Leavitt Road	112° at 4.3 miles
	90*	Figure 3.3-2	Route 104 and Keefe Road	135° at 4.2 miles
	91*	Figure 3.3-2	County Route 51A	157° at 4.9 miles
	92*	Figure 3.3-2	Maiden Lane Road	183° at 4.5 miles
	93*	Figure 3.3-2	County Route 53	206° at 4.4 miles
	94*	Figure 3.3-2	County Route 1 and Kocher Road	224° at 4.4 miles
	95*	Figure 3.3-2	Lakeshore Camp Site	239° at 3.7 miles
	96*	Figure 3.3-2	Creamery Road	199° at 3.7 miles
	97*	Figure 3.3-3	County Route 29	145° at 1.8 miles
	98*	Figure 3.3-2	Lake Road	103° at 1.2 miles
	99	Figure 3.3-2	Nine Mile Point Road	92° at 1.8 miles
	100	Figure 3.3-3	County Route 29 and Lake Road	106° at 1.1 miles
	101	Figure 3.3-3	County Route 29	134° at 1.4 miles
	102	Figure 3.3-2	Oswego County Airport	175° at 11.9 miles
	103	Figure 3.3-3	Energy Center, East	268° at 0.4 miles
	104	Figure 3.3-2	Parkhurst Road	102° at 1.4 miles

TABLE 3.3-1 (continued)

2012 ENVIRONMENTAL SAMPLE LOCATIONS

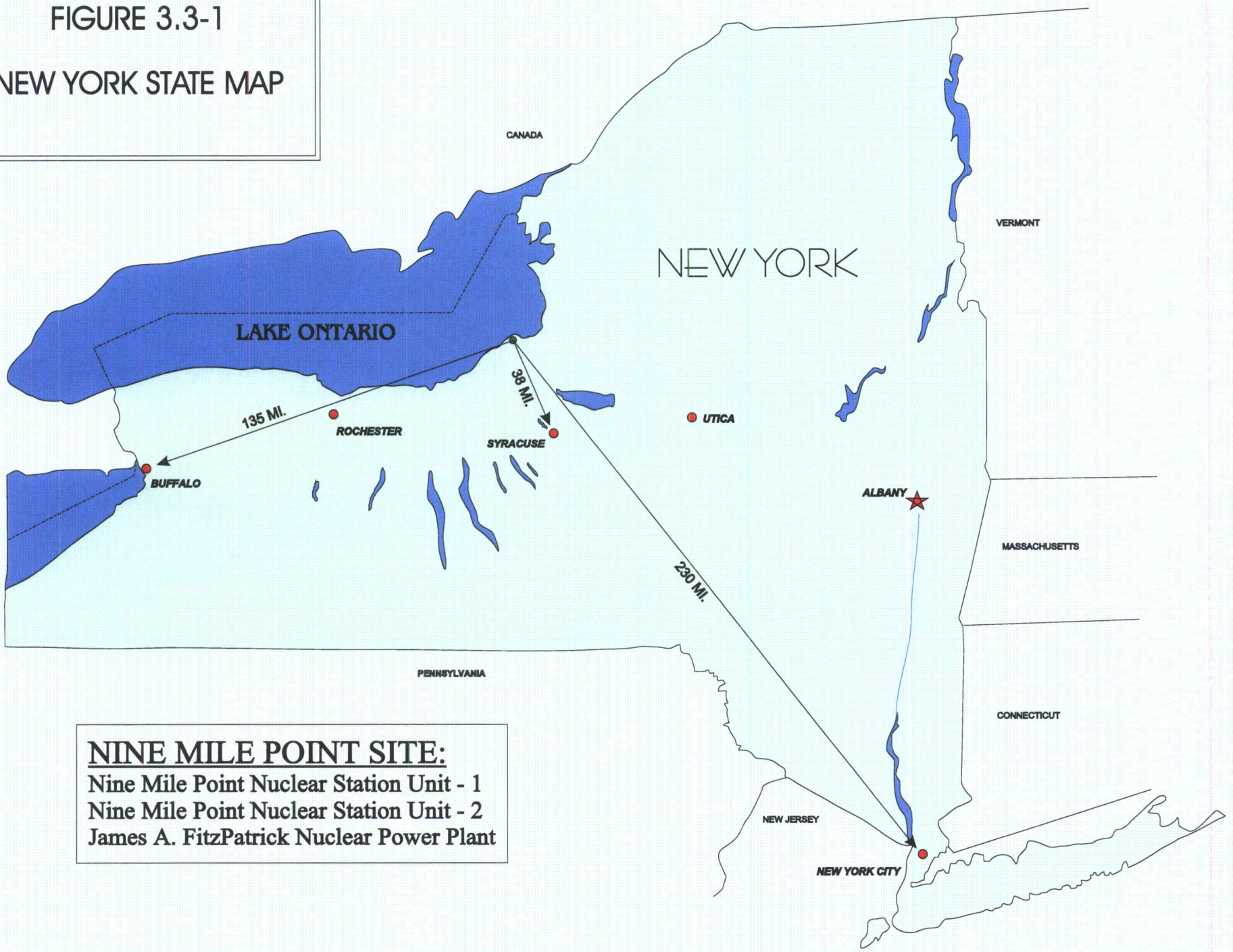
SAMPLE MEDIUM	MAP DESIGNATION (a & b)	FIGURE NUMBER	LOCATION DESCRIPTION	DEGREES & DISTANCE (c & d)
Thermoluminescent	105	Figure 3.3-3	Lakeview Road	199° at 1.4 miles
Dosimeters (TLD)	106	Figure 3.3-3	Shoreline Cove, West of NMP1	272° at 0.3 miles
(Continued)	107	Figure 3.3-3	Shoreline Cove, West of NMP1	271° at 0.3 miles
	108	Figure 3.3-3	Lake Road	105° at 1.1 miles
	109	Figure 3.3-3	Lake Road	104° at 1.1 miles
	111	Figure 3.3-2	Sterling, NY – Control	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	Baldwinsville, NY – Control	178° at 24.7 miles
Cow Milk	55	Figure 3.3-4	Indicator Location	97° at 8.8 miles
	77*	Figure 3.3-4	Control Location	190° at 16.0 miles
Food Products	133**	Figure 3.3-5	Indicator Location	84° at 1.6 miles
	134**	Figure 3.3-5	Indicator Location	84° at 1.5 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
	484*	Figure 3.3-5	Indicator Location	132° at 1.4 miles
Groundwater**	MW 1,2, 4-13, 15-21	Figure 3.3-6	Down Gradient Wells - Indicator	258° to 78° at <0.3 miles
	GMX-MW-1	Figure 3.3-6	Upland Well - Control	160° at 0.3 miles
	GMX-MW-2	Figure 3.3-6	Upland Well - Control	198° at 0.3 miles
	MW-B119	Figure 3.3-6	Upland Well – Control	195° at 0.8 miles
	MW-14	Figure 3.3-6	Control	187° at 0.2 miles
	Storm Drain	Figure 3.3-6	NMP2 Dewatering System - Indicator	32° at <0.1 miles

Table Notes:

(a) Sample Locations marked by an asterisk (*) are locations required by ODCM
(b) Sample Locations marked by an double asterisk (**) are optional locations
(c) Degrees and Distance based on Nine Mile Point Unit 2 Reactor Centerline
(d) Degrees and Distances updated by Global Positioning System (GPS)

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

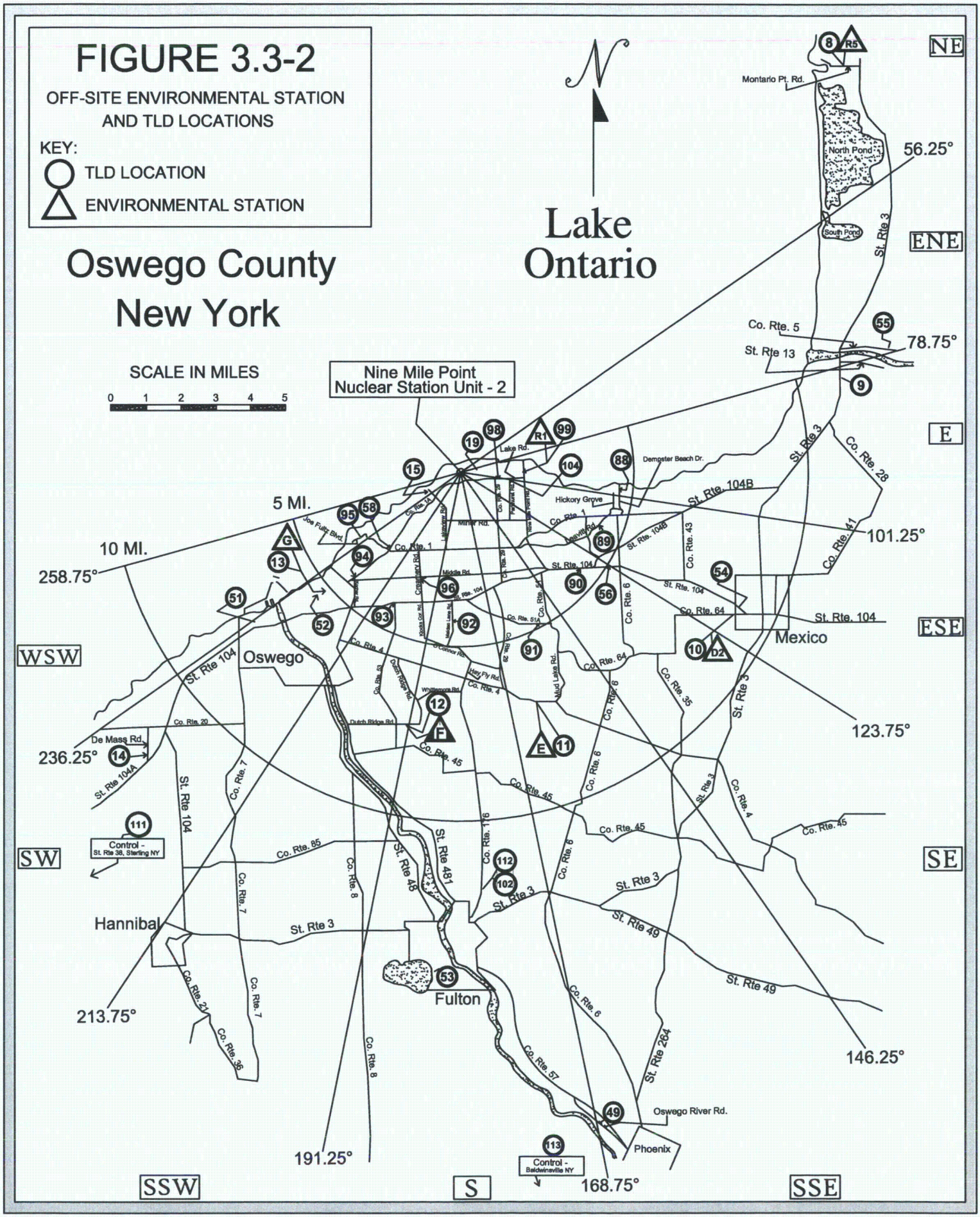


FIGURE 3.3-2
OFF-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS
KEY:
TLD LOCATION
ENVIRONMENTAL STATION
Oswego County New York
Lake Ontario
SCALE IN MILES
0 1 2 3 4 5
Nine Mile Point Nuclear Station Unit - 2
5 MI.
10 MI.
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
56.25°
78.75°
101.25°
123.75°
146.25°
168.75°
191.25°
213.75°
236.25°
258.75°
Montario Pt. Rd.
North Pond
South Pond
St. Rte 3
Co. Rte. 5
St. Rte 13
Co. Rte. 28
St. Rte. 104B
Hickory Grove
Dempster Beach Dr.
Lake Rd.
Miller Rd.
Joe Fultz Blvd.
Co. Rte. 1
Co. Rte. 1A
Co. Rte. 43
Co. Rte. 41
St. Rte. 104
Middle Rd.
Co. Rte. 6
Co. Rte. 64
Mexico
Oswego
St. Rte 104
Co. Rte. 4
Dutch Ridge Rd.
Co. Rte. 45
Co. Rte. 35
De Mass Rd.
Co. Rte. 20
St. Rte 104A
Co. Rte. 7
Co. Rte. 85
Control - St. Rte 38, Sterling NY
Hannibal
St. Rte 3
St. Rte 48
St. Rte 481
Co. Rte. 176
Co. Rte. 8
St. Rte 49
Co. Rte. 22
Co. Rte. 36
Fulton
Co. Rte. 57
St. Rte 264
Oswego River Rd.
Phoenix
Control - Baldwinsville NY

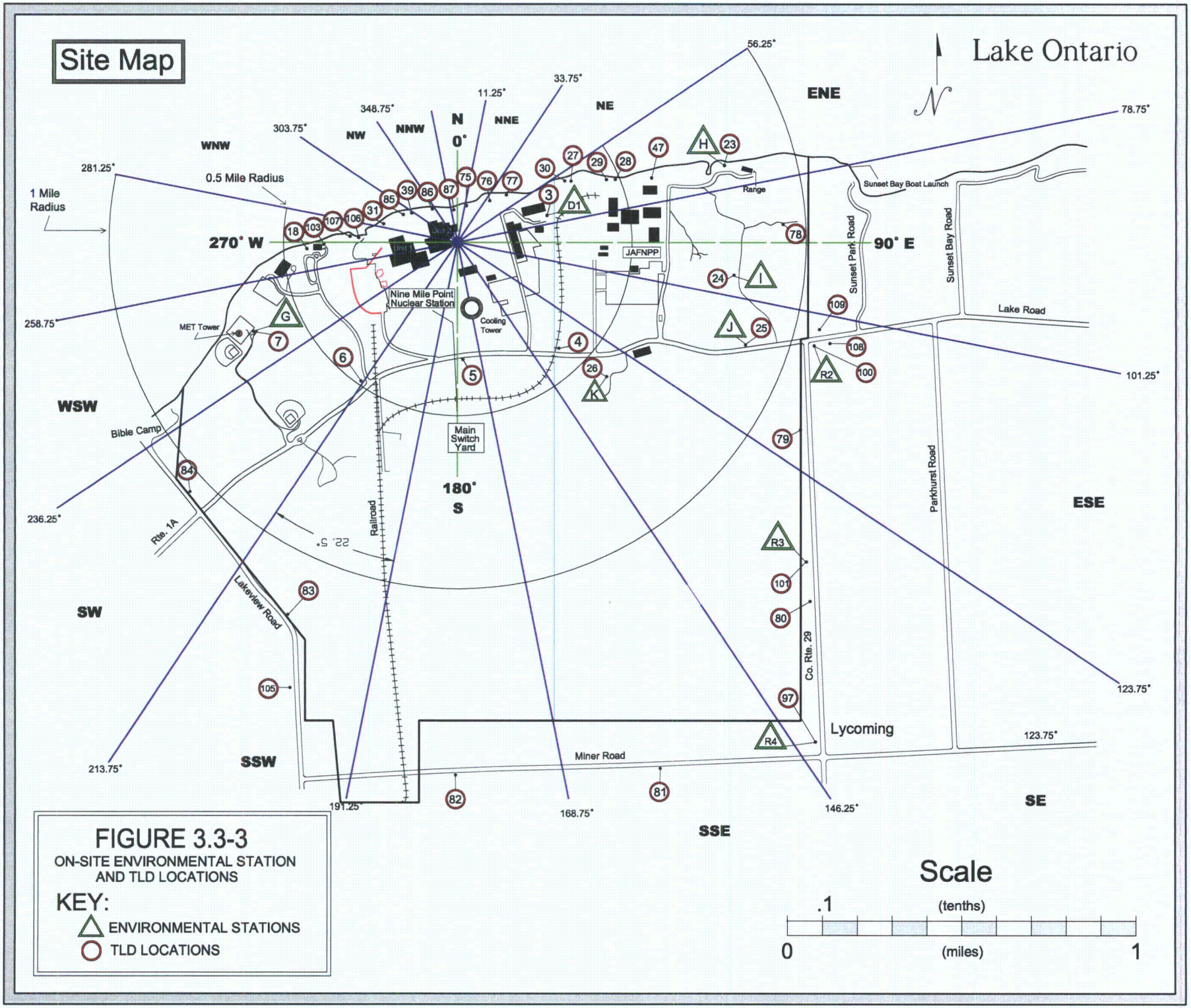


FIGURE 3.3-3
ON-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS

KEY:
△ ENVIRONMENTAL STATIONS
○ TLD LOCATIONS

Scale
.1 (tenths)
0 (miles) 1

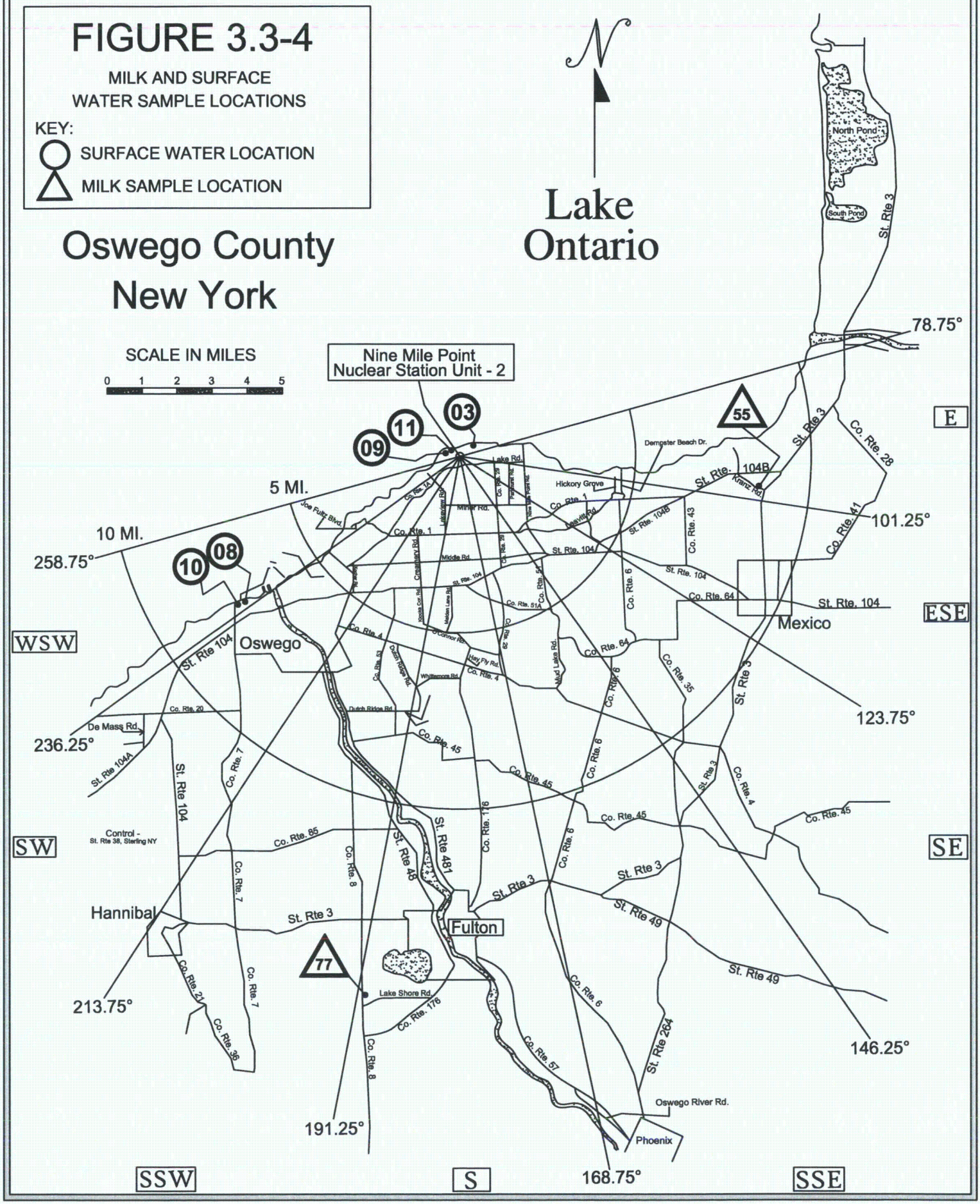
FIGURE 3.3-4

MILK AND SURFACE
WATER SAMPLE LOCATIONS

KEY:

SURFACE WATER LOCATION

MILK SAMPLE LOCATION



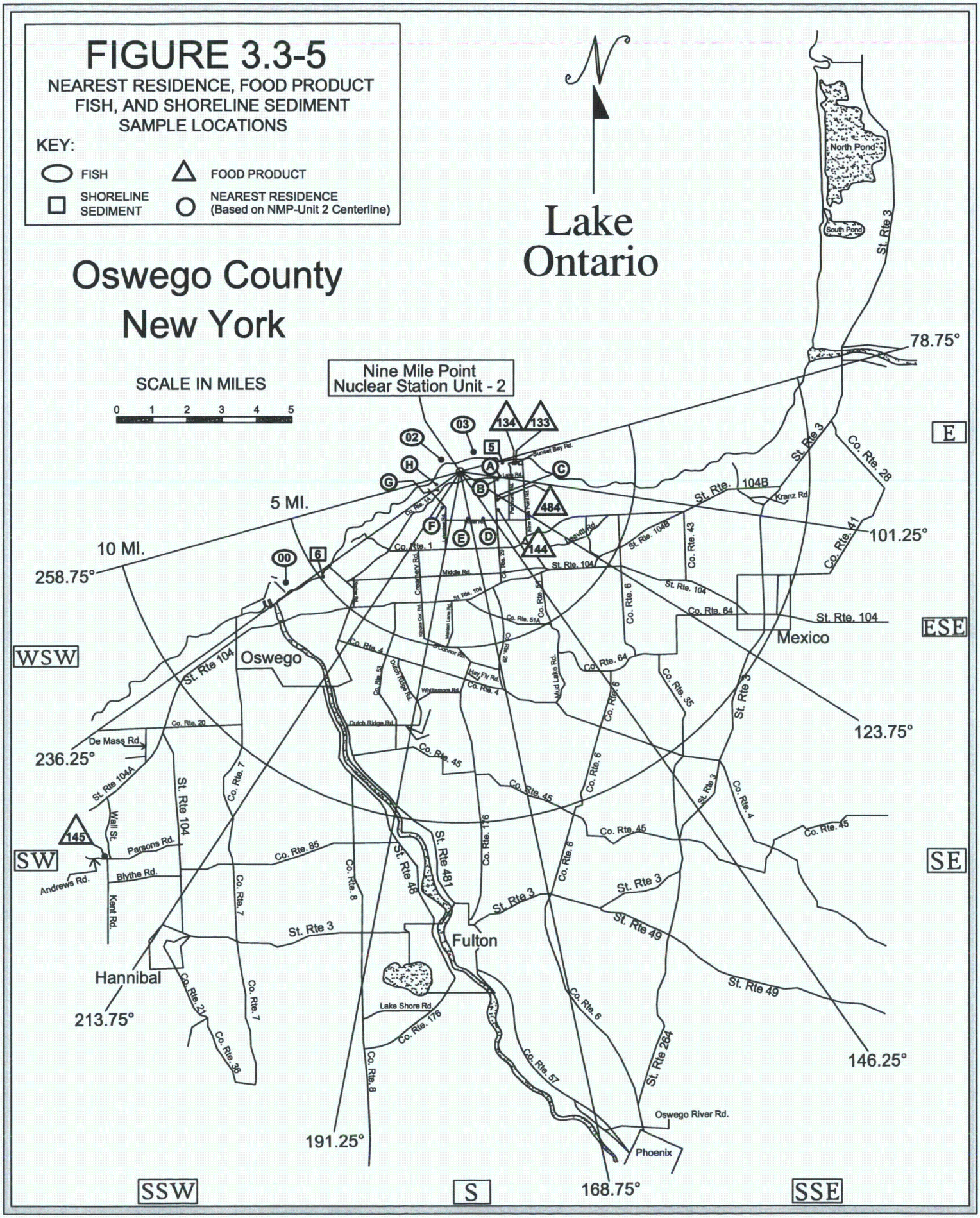


FIGURE 3.3-5
NEAREST RESIDENCE, FOOD PRODUCT
FISH, AND SHORELINE SEDIMENT
SAMPLE LOCATIONS
KEY:
FISH
FOOD PRODUCT
SHORELINE SEDIMENT
NEAREST RESIDENCE (Based on NMP-Unit 2 Centerline)
Lake Ontario
Oswego County
New York
SCALE IN MILES
0 1 2 3 4 5
Nine Mile Point Nuclear Station Unit - 2
5 MI.
10 MI.
258.75°
78.75°
101.25°
123.75°
146.25°
168.75°
191.25°
213.75°
236.25°
E
ESE
SE
SSE
S
SSW
SW
WSW
Oswego
Mexico
Fulton
Hannibal
Phoenix
North Pond
South Pond
St. Rte 3
St. Rte 104
St. Rte 481
St. Rte 49
St. Rte 264
Co. Rte. 28
Co. Rte. 41
Co. Rte. 64
Co. Rte. 35
Co. Rte. 45
Co. Rte. 85
Co. Rte. 176
Co. Rte. 57
Co. Rte. 1
Co. Rte. 4
Co. Rte. 6
Co. Rte. 7
Co. Rte. 8
Co. Rte. 20
Co. Rte. 21
Co. Rte. 39
Co. Rte. 43
Co. Rte. 51
Co. Rte. 51A
Co. Rte. 54
Co. Rte. 104B
Sunset Bay Rd.
Lake Rd.
Kranz Rd.
Middle Rd.
Coleman Rd.
Whitaker Rd.
Dutch Ridge Rd.
Whittemore Rd.
Mud Lake Rd.
Key Fly Rd.
De Mass Rd.
Parsons Rd.
Blythe Rd.
Andrews Rd.
Kent Rd.
Wall St.
St. Rte 104A
Lake Shore Rd.
Oswego River Rd.
00
02
03
133
134
144
145
484
A
B
C
D
E
F
G
H
5
6

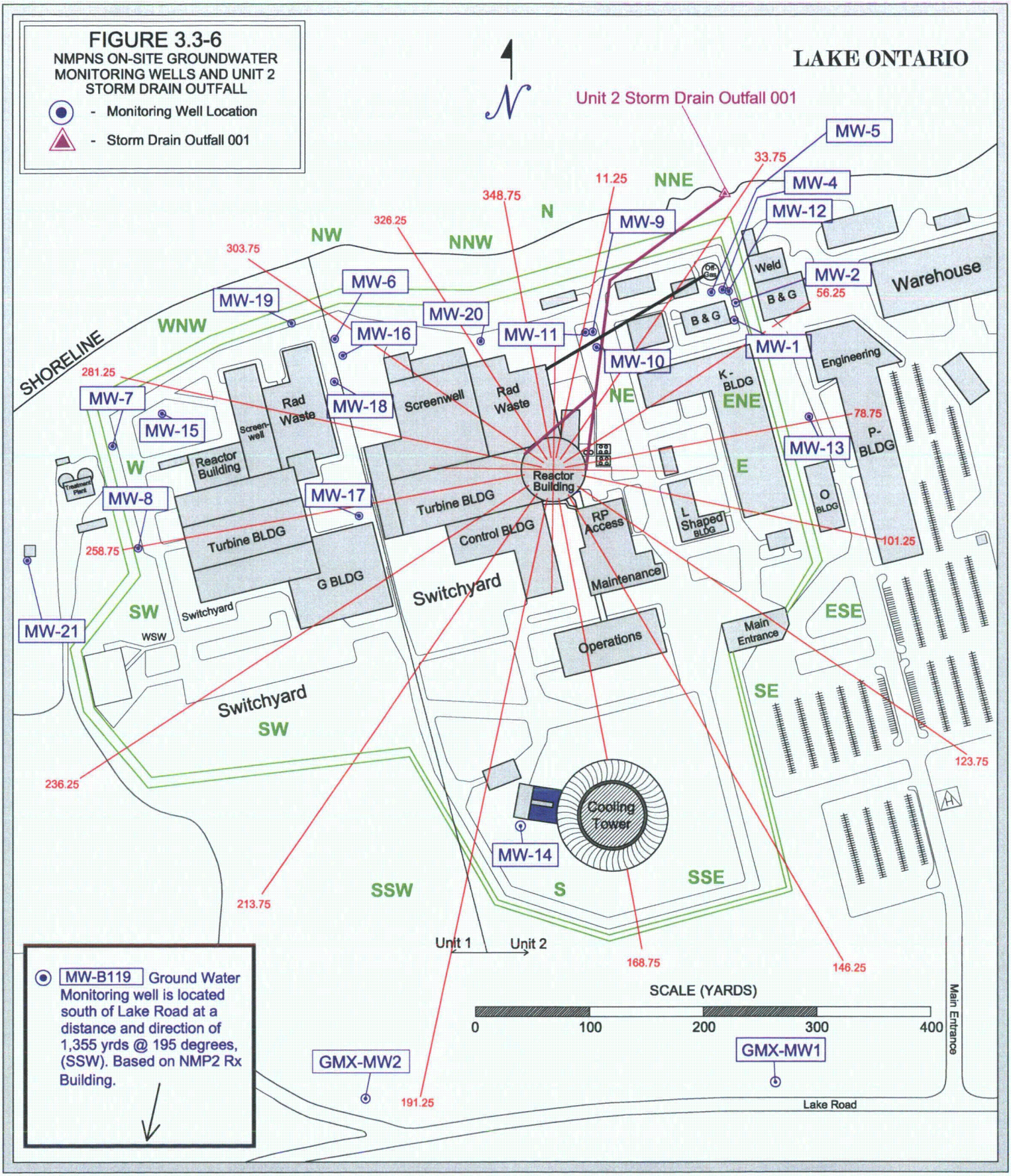


FIGURE 3.3-6
NMPNS ON-SITE GROUNDWATER MONITORING WELLS AND UNIT 2 STORM DRAIN OUTFALL
- Monitoring Well Location
- Storm Drain Outfall 001
LAKE ONTARIO
Unit 2 Storm Drain Outfall 001
MW-5
MW-4
MW-12
MW-9
MW-2
MW-1
MW-10
MW-11
MW-20
MW-6
MW-19
MW-16
MW-18
MW-7
MW-15
MW-8
MW-17
MW-13
MW-14
MW-21
GMX-MW2
GMX-MW1
MW-B119 Ground Water Monitoring well is located south of Lake Road at a distance and direction of 1,355 yrds @ 195 degrees, (SSW). Based on NMP2 Rx Building.
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
33.75
11.25
348.75
326.25
303.75
281.25
78.75
56.25
101.25
123.75
146.25
168.75
213.75
236.25
258.75
191.25
SHORELINE
Warehouse
Weld
B & G
Off Gas
Engineering
K - BLDG
P- BLDG
O BLDG
L Shaped BLDG
Reactor Building
Turbine BLDG
Control BLDG
RP Access
Maintenance
Operations
Main Entrance
Screen-well
Rad Waste
Screenwell
Treatment Plant
G BLDG
Switchyard
Cooling Tower
Unit 1
Unit 2
SCALE (YARDS)
0
100
200
300
400
Lake Road

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. This census is performed once per year in the summer 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 located 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 ODCMs if broadleaf vegetation sampling and analysis is performed.

3.5 CHANGES TO THE REMP PROGRAM

There were no changes to the 2012 REMP sampling program.

3.6 DEVIATIONS AND EXCEPTIONS TO THE PROGRAM

The noted exceptions to the 2012 sample program address only those samples or monitoring requirements which are required by the ODCM. This section satisfies the reporting requirements of Section D 6.9.1.d of the NMP1 ODCM and Section D 4.1.2 of the NMP2 ODCM.

A. ODCM PROGRAM DEVIATIONS

The following are the deviations from the program specified by the NMP1 and NMP2 ODCM:

1. The air station sample pumps at R1 and R2 off-site environmental sampling stations were inoperable for approximately 1.5 hours each during the sampling period of March 27, 2012 to April 3, 2012. The sample pump out–of-service time was determined based on the sample pump run time integrator. The inoperability of the pumps were due to loss of power to the air station. No corrective actions were required to restore power to the air stations.

2. The air station sample pump at R5 off-site environmental sampling station was inoperable for approximately 2.5 hours during the sampling period of July 3, 2012 to July 10, 2012. 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 air station. No corrective actions were required to restore power to the air station.

3. The air station sample pump at R5 off-site environmental sampling station was inoperable for approximately 5.8 hours during the sampling period of July 31, 2012 to August 7, 2012. 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 air station. No corrective actions were required to restore power to the air station.

4. The air station sample pump at R5 off-site environmental sampling station was inoperable for approximately 2.4 hours during the sampling period of August 14, 2012 to August 21, 2012. 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 air station. No corrective actions were required to restore power to the air station.

5. The air station sample pumps at R1, R2, R3 and R4 off-site environmental sampling stations were inoperable for approximately 30.4 hours each during the sampling period of October 23, 2012 to October 30, 2012. The sample pump out–of-service time was determined based on the sample pump run time integrator. The inoperability of the pumps was due to loss of power to the air stations. No corrective actions were required to restore owner to the air stations.

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 43,876 hours out of a possible 43,920 hours. The air sampling availability factor for the reporting period was 99.9%.

3.7 STATISTICAL METHODOLOGY

There is 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 NMPNS 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, i
N, n = total number of samples with positive indications
X_i = value for sample i above the lower limit of detection

B. Standard Deviation

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

Where,

$\overline{X}$ = mean for the values of X
s = standard deviation for the sample population

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

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

The following equations were utilized to estimate the mean ($\overline{X}$) 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, i

N, n = total number of samples with positive indications

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

B. Error of the Mean

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

Where,

ERROR MEAN = propagated error

i = individual sample

ERROR = 1 sigma* error of the individual analysis

N, n = number of samples with positive indications

* Sigma (σ)

Sigma is the greek letter used to represent the mathematical term Standard Deviation.

Standard Deviation is a measure of dispersion from the arithmetic mean of a set of numbers.

3.7.3 LOWER LIMIT OF DETECTION (LLD)

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

The LLDs are specified by the 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)

λ = the radioactive decay constant for the particular radionuclide

Δt = 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 3.7-1 lists the ODCM program required LLDs for specific media and radionuclides. The LLDs actually achieved are routinely lower than those specified by the ODCM.

TABLE 3.7-1

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.

3.8 COMPLIANCE WITH REQUIRED LOWER LIMITS OF DETECTION (LLD)

Tables D 4.6.20-1 and D 3.5.1-3 of the NMP1 ODCM and NMP2 ODCM, respectively, specify the detection capabilities for environmental sample analysis (See Table 3.7-1). The reporting requirements of NMP1 ODCM, Section D 6.9.1.d and NMP2 ODCM, Section D 4.1.2 require that a discussion of all analyses for which the LLDs required by Tables D 4.6.20-1 and D 3.5.1-3 were not achieved be included in the Annual Radiological Environmental Operating Report. This Section is provided pursuant to this requirement.

All sample analyses performed in 2012, as required by the ODCM, achieved the LLD specified by ODCM Tables D 4.6.20-1 and D 3.5.1-3.

3.9 REGULATORY DOSE LIMITS

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

3.9.1 The Nuclear Regulatory Commission

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 10 CFR 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 eight days in gaseous effluents is limited to:

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

The NRC, in 10 CFR 72.104(a), established criteria for radioactive materials in effluents and direct radiation from an ISFSI. During normal operations and anticipated occurrences, the annual dose equivalent to any real individual who is located beyond the owner controlled area must not exceed:

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

3.9.2 Environmental Protection Agency

The EPA, in 40 CFR 190.10 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 whole 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. Table 4.0-1 is titled "Radiological Environmental Monitoring Program Annual Summary" and follows the specification outlined in the NRC Radiological Assessment Branch Technical Position (Rev. 1, November 1979), which is summarized below.

Column

1. Sample medium.

2. Type and number of analyses performed.

3. Required Lower Limits of Detection (LLD), see Section 3.7.3, Table 3.7-1. 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
JANUARY – DECEMBER 2012*

MEDIUM (UNITS)	TYPE AND NUMBER OF ANALYSES*	LLD[a]	INDICATOR LOCATIONS: MEAN [b] / RANGE	LOCATION [c] OF HIGHEST ANNUAL MEAN: LOCATION & MEAN [b] / RANGE	CONTROL LOCATION: MEAN [b] / RANGE	NUMBER OF NONROUTINE REPORTS
Shoreline Sediment (pCi/kg-dry)	Gamma-Spectrum Analysis (GSA) (4):					
	Cs-134	150	<LLD	<LLD	<LLD	0
	Cs-137	180	<LLD	<LLD	<LLD	0
Fish (pCi/kg-wet)	GSA (18) [d]:					
	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
JANUARY – DECEMBER 2012*

MEDIUM (UNITS)	TYPE AND NUMBER OF ANALYSES*	LLD[a]	INDICATOR LOCATIONS: MEAN [b] / RANGE	LOCATION [c] OF HIGHEST ANNUAL MEAN: LOCATION & MEAN [b] / RANGE	CONTROL LOCATION: MEAN [b] / RANGE	NUMBER OF NONROUTINE REPORTS
Surface Water (pCi/liter)	H-3 (8):					
	H-3	3000[e]	<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[e]	<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
JANUARY – DECEMBER 2012*

MEDIUM (UNITS)	TYPE AND NUMBER OF ANALYSES*	LLD[a]	INDICATOR LOCATIONS: MEAN [b] / RANGE	LOCATION [c] OF HIGHEST ANNUAL MEAN: LOCATION & MEAN [b] / RANGE	CONTROL LOCATION: MEAN [b] / RANGE	NUMBER OF NONROUTINE REPORTS
TLD (mrem per standard month)	Gamma Dose (140)	[f]	4.8 (120/120) [g] 3.4 – 10.6	TLD #85 [h]: 10.2 (4/4) 0.2 miles at 290° 9.8 – 10.6	4.0 (20/20) 3.6 – 5.0	0
Air Particulates (pCi/m^3)	Gross Beta (260):	0.01	0.016 (208/208) 0.004 – 0.031	R-3 0.016 (52/52) 1.4 miles at133° 0.004 – 0.029	0.016 (52/52) 0.005 – 0.025	0
	I-131 (260):	0.07	<LLD	<LLD	<LLD	0
	GSA (20):		<LLD	<LLD	<LLD	
	Cs-134	0.05				0
	Cs-137	0.06	<LLD	<LLD	<LLD	0
Milk (pCi/liter)	GSA (36): [d] [i]					
	Cs-134	15	<LLD	<LLD	<LLD	0
	Cs-137	18	<LLD	<LLD	<LLD	0
	Ba/La-140	15	<LLD	<LLD	<LLD	0
	I-131 (36):					
	I-131	1	<LLD	<LLD	<LLD	0

TABLE 4.0-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
JANUARY – DECEMBER 2012*

MEDIUM (UNITS)	TYPE AND NUMBER OF ANALYSES*	LLD[a]	INDICATOR LOCATIONS: MEAN [b] / RANGE	LOCATION [c] OF HIGHEST ANNUAL MEAN: LOCATION & MEAN [b] / RANGE	CONTROL LOCATION: MEAN [b] / RANGE	NUMBER OF NONROUTINE REPORTS
Food Products (pCi/kg-wet)	GSA (16): [d]					
	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 NMP1 and NMP2 ODCM required samples unless otherwise indicated.

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

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

(c) Location is distance in miles and direction in compass degrees based on NMP2 reactor center-line. Units in this column are specified in medium column.

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

(e) 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.

(f) The ODCM do not specify a particular LLD value for environmental TLDs. The NMP1 and NMP2 ODCM contain specifications for environmental TLD sensitivities.

(g) 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, 97, and 98. Control TLDs are all TLDs located beyond the influence of the site (TLD #8, 14, 49, 111, and 113).

(h) 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).

(i) 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 was one optional location during 2012.