SALEM AND HOPE CREEK

GENERATING STATIONS

OFFSITE DOSE CALCULATION MANUAL (ODCM)

FOR THE COMMON

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

(PSEG NUCLEAR, LLC)

Revision 01

Prepared by: **Rick Heathwaite** See SAP 80130868 0400 — 08/14/2025
REMP/REC Program Manager — Date

Accepted by: **Coley Chappell** See SAP 80130868 0410 — 08/11/2025
FRC Chairman — Date

Meeting #: **F2025-14 on August 11, 2025**

Approved by: **Rick DeSanctis** See SAP 80130868 0420 — 08/26/2025
Salem Plant Manager — Date

Approved by: **Robbi McLaughlin** See SAP 80130868 0430 — 08/26/2025
Hope Creek Plant Manager — Date

Effective Date 08/26/2025

This revision is effective on the Effective Date after review and acceptance by FRC and the final approval of the Salem and Hope Creek Plant Managers.

Item No.	Rev. 0 page No.	Rev. 1 page No.	Description of Change(s)	Type of Change
1.		Numerous throughout	Revised to include Improved Technical Specification (ITS) references, using dual- annotations {CTS: ….} and {ITS: ….} to indicate the differences throughout the document.	Editorial-ITS
2.	4	4	Added the following 5th bullet to Section A "Because Salem Units 1 and 2 were built and operated prior to the Hope Creek Unit 1 construction and operations, the REMP locations, distances, and sectors are oriented to the midpoint of Salem's two units." Reason: Clarifies that the common REMP is oriented to Salem Units 1 and 2.	Editorial
3.		8	Added new definition for FUNCTIONAL/FUNTIONALITY Justification: This is part of the Improved Technical Specification (ITS)	Editorial-ITS
4.	9	9	Revised definition of Member(s) of the Public to match the definition in 10 CFR 20: "Member of the public means any individual except when that individual is receiving an occupational dose." Reason: This definition is in alignment with the definitions used for the tech specs in support of the Wind Port Project.	Editorial
5.	11	10	Expanded on the Definition of REMP Justification: This is part of the Improved Technical Specification (ITS)	Editorial-ITS
6.	12	11	Revised definition of Site Boundary to match the definition in 10 CFR 20: "Site boundary means that line beyond which the land or property is not owned, leased, or otherwise controlled by the licensee. (10 CFR 20) (See Figure 1.1-1) Reason: This definition is in alignment with the definitions used for the tech specs in support of the Wind Port Project.	Editorial
7.	12	11	Revised definition of Unrestricted Area to match the definition in 10 CFR 20: "Unrestricted area means an area, access to which is neither limited nor controlled by the licensee." (10 CFR 20) (See Figure 1.1-1) Reason: This definition is in alignment with the definitions used for the tech specs in support of the Wind Port Project.	Editorial

Item No.	Rev. 0 page No.	Rev. 1 page No.	Description of Change(s)	Type of Change
8.	12	12	Revised Table 1.1 Surveillance Frequency Notation to remove the following notations: S At least once per 12 hours D At least once per 24 hours R At least once per 18 months (550 days) S/U Prior to each reactor startup P Prior to each radioactive release Z During startup, prior to exceeding 30% of RATED THERMAL POWER, if not performed within the previous 7 days Reason: These notations are not applicable to REMP Activity	Editorial
9.	35	13	Moved Figure 5.1-1 to the end of Section 1 Definitions. Renamed Figure to Figure 1.1-1 and updated Area Plot Plan of Site to remove the wording (Property of the U.S. Government) Reason: Section 5.0 Design Features was eliminated from the ODCM as not needed. That section is in Tech Specs and is overriding. The Figure 5.1-1 name changed to Figure 1.1-1, because the figure was moved from Section 5 (which is deleted) to Section 1 (Definitions). Figure was updated because land was transferred to the State of New Jersey.	Editorial
10.	22	22	Changed the sampling and analysis frequency Food Products c.2 and c.3 from Monthly to Quarterly. Also, added a note to (see REMP sample discussion in Appendix E. Reason: The Food Products category are not required because milk sampling is being performed per the requirements of NUREG 1301/1302. In addition, the annual Land Use Census has not identified any gardens of > 500 square feet.	Editorial
11.	24	24	Revised footnote (10) to address the change from monthly to quarterly for sampling and analysis.	Editorial
12.	24	24	Revised footnote (11) to add the following information “municipality are collected monthly”	Editorial
13.	24	24	Revised footnote (12) to provide additional information on the size of the onsite gardens.	Editorial
14.	33-35	33	Section 5.0 Design Features was eliminated from the ODCM as not needed. That section is in Tech Specs and is overriding. Left a Page with [Intentionally Deleted]	Editorial
15.	38	35	Removed the requirement to include in the AREOR a report of when the HC specific activity exceeds the limit in TS section 3.4.5. ITS section 3.4.7 directs all actions and completion times when Dose Equivalent I-131 is > 0.2 uCi/gm.	Editorial
16.	54	51	Clarified information on Potable water	Editorial

Item No.	Rev. 0 page No.	Rev. 1 page No.	Description of Change(s)	Type of Change
17.	55	52	Clarified that the Broad Leaf Vegetation (FPL) samples are part of the management audit program, because milk sampling is ongoing.	Editorial
18.	56	53	Control milk farm 03G1 went out of business and was replaced by 02G3.	Editorial
19.	57	54	TLD 01X2 was relocated to a lamp post north of the cooling tower. The coordinates have been updated.	Editorial
20.	57	54	TLD 02X4 was relocated to the North side of the access road. The coordinates have been updated.	Editorial
21.	57	54	TLD 06X2 was moved from near the heliport pad to a security fence nearby. The coordinates have been updated.	Editorial
22.	57	54	TLD 16X3 was moved to a lamp post. The coordinates have been updated.	Editorial
23.	57	54	The description for TLD location 10D1 was clarified. No change to the physical location was made.	Editorial
24.	59	56	The description for APT/AIO location 06S1 was clarified. No change to the physical location was made. Added co-located APT/AIO location 05S2. Removed location 15S1 from APT/AIO because it is only a TLD location. APT/AIO location 15S2 is located at TLD location 15S1 and not at TLD location 15S2. Changed the coordinates for APT/AIO location 15S2 to those of TLD location 15S1.	Editorial
25.	61	57	Milk Location 13E3 distance of 5.0 miles was changed to 4.9 miles to align with the results of the Land Use Census.	Editorial
26.	61	57	Control Milk Location 02G3 located at 11.6 miles from the site in the NE sector replaced Milk location 03G1, which went out of business.	Editorial
27.	62	59	Rearranged Table E-2 and added Broad Leaf Vegetation to the table.	Editorial
28.	64	61	Updated Figure E-1 to show the correct location for APT/AIO 15S2.	Editorial
29.	66	63	Updated Figure E-3 with the replacement milk location.	Editorial

REMP ODCM

Revision 1

Radiological Environmental Monitoring Program Offsite Dose Calculation Manual

For PSEG Nuclear Common

(Salem 1 & 2, and Hope Creek Generating Stations)

PSEG COMMON
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
(SALEM 1 & 2 and HOPE CREEK REMP ODCM)

INTRODUCTION

The PSEG Common Radiological Environmental Monitoring Program Offsite Dose Calculation Manual (REMP ODCM) for Salem Generating Station (SGS) and Hope Creek Generating Station (HCGS) is a supporting document to the Salem and Hope Creek Technical Specifications.

Historically Salem and Hope Creek had individual ODCMs that included site-specific Radioactive Effluent Controls (REC) and Radiological Environmental Monitoring Program (REMP) Controls. Both stations sit on the same site and share a common REMP that was duplicated in its entirety in each stations' ODCM. Any revision to the REMP program needed to be revised in both stations' ODCM, and they needed to be implemented simultaneously.

To improve efficiency of ODCM revisions, The ODCM is now broken down into three manuals:

- Salem REC ODCM
- Hope Creek REC ODCM
- Common REMP ODCM (this document)

This document conforms to the requirements of 10CFR20, 10CFR72.44 and 40CFR190 as well as the guidance of Regulatory Guides 4.1, 4.13, 4.15, and NUREGs 1301 & 1302, and includes the items required by Tech Spec or Generic Letter 89-01, as applicable.

A. This document **DOES** contain:

- Description of the methodologies and parameters used for the PSEG Nuclear common Radiological Environmental Monitoring Program (REMP) requirements established by Salem {CTS: and Hope Creek} {ITS: NA} Technical Specifications 6.8.4.h {ITS: and as stated in definition 1.20, "REMP" for Hope Creek}.
- CONTROLS, ACTIONS, CALCULATIONS, and BASES for the PSEG Common REMP for Salem and Hope Creek Nuclear Generating Stations.
- Lists and graphical descriptions of the specific sample locations for the REMP
- Description of information that should be included in the PSEG common Annual Radiological Environmental Operating Report as required by Salem Technical Specification 6.9.1.7, and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}.
- Because Salem Units 1 and 2 were built and operated prior to the Hope Creek Unit 1 construction and operations, the REMP locations, distances, and sectors are oriented to the midpoint of Salem's two units.

B. This document **DOES NOT** contain:

- Description of the methodologies and parameters used for the Radiological Effluent Controls (REC) requirements established by Salem Technical Specifications 6.8.4.g and Hope Creek Technical Specification {CTS: 6.8.4.g} {ITS: 5.5.3}.
- CONTROLS, ACTIONS, CALCULATIONS, and BASES for the for Salem and Hope Creek REC, including:
    - The calculation of radioactive liquid and gaseous effluent monitoring instrumentation alarm and/or trip setpoints, or conservative defaults.
    - The calculation of radioactive liquid and gaseous concentrations, dose rates, cumulative quarterly and yearly doses, and projected doses.
    - The information that should be included in the Annual Radioactive Effluent Release Report required by Salem Technical Specification 6.9.1.8, and Hope Creek Technical Specification {CTS: 6.9.1.7} {ITS: 5.6.2}.
    - Maximum Permissible Concentrations (MPCs) for radioactive liquid effluent concentration limits.

Conversely, the above methodologies and parameters pertaining to radioactive effluent CONTROLS, ACTIONS, CALCULATIONS, and BASES for each station can be found in the individual stations' Radioactive Effluent Controls Offsite Dose Calculation Manual (Salem or Hope Creek's REC ODCM).

PART – I

CONTROLS

PART I

SECTION 1.0

DEFINITIONS

1.0 DEFINITIONS

The following terms are defined so that uniform interpretation of these CONTROLS may be achieved. The defined terms appear in capitalized type and are applicable throughout this ODCM.

1.1 ACTION

ACTION shall be that part of a CONTROL which prescribes remedial measures required under designated conditions.

1.2 *a priori*

Before the fact limit representing the capability of a measurement system and not as an after the fact (a posteriori) limit for a particular measurement.

1.3 ANALYSIS

Analysis refers to the identification or quantification process for determining a radionuclide in a radionuclide/matrix combination.

1.4 APV

Any Positive Value that is statistically greater than the MDC.

1.5 AREOR

Annual Radiological Environmental Operating Report. This report details REMP activities for the reporting period.

1.6 ARERR

Annual Radioactive Effluent Release Report. This report details REC activities for the reporting period.

1.7 COMPOSITE

A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. In this program composite sample aliquots shall be collected at time intervals that are very short relative to the compositing period in order to assure obtaining a representative sample.

1.8 CONTROL

The Limiting Conditions for Operation (LCOs) that were contained in the Radiological Effluent Technical Specifications were transferred to the OFFSITE DOSE CALCULATION MANUAL (ODCM) and were renamed CONTROLS. This is to distinguish between those LCOs that were retained in the Technical Specifications and those LCOs or CONTROLS that were transferred to the ODCM.

1.9 DEVIATION

A DEVIATION is a Missed Sample(s) or exception to the program.

In accordance with NUREG 1301 and 1302, deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, and malfunction of automatic sampling equipment.

If specimens are unobtainable due to sampling equipment malfunction, effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification 6.9.1.8 and Hope Creek Technical Specification **{CTS:** 6.9.1.6**} {ITS:** 5.6.1**}**.

For air samples, a brief loss of power whereby the LLD is met will not affect the viability of the sample or the representativeness. As such it IS NOT considered a deviation and it is not necessary to account for these outages in the AREOR.

Conversely, if the LLD is not met or if the entire specimen is "unobtainable", these samples will be included in the AREOR as a deviation. An example would include the following:

- During winter months when conditions exist where surface water samples may not be able to be obtained due to ice buildup on the river.
- Forgetting to install a particulate and/or iodine filter cartridge in an air sampler.

1.10 FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

1.11 {ITS: FUNCTIONAL/FUNCTIONALITY (only applicable to Hope Creek)

A system, structure, or component is FUNCTIONAL or has FUNCTIONALITY when it is capable of performing its function(s) as described in the design and licensing basis. FUNCTIONALITY includes the ability of required support systems to perform their related support function(s) for equipment required to be OPERABLE by the TS.**}**

1.12 GROUND LEVEL RELEASE

Taken from Regulatory Guide 1.111, where effluents released from points:

- less than the height of adjacent solid structures; or
- from vents or other points at or above the level of adjacent solid structures, but that the effluent plume vertical exit velocity is less than five times the horizontal wind speed at the height of release.

Salem and Hope Creek are both considered to be Ground Level Releases by this definition (insufficient height and vertical exit velocity).

1.13 LOWER LIMIT OF DETECTION (LLD)

As Defined by Reg Guide 1.21 Rev 2: The *a priori* smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only a 5% probability of falsely concluding that a blank observation represents a real signal (see NUREG-1301, NUREG-1302, and NUREG/CR-4007, "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," issued September 1984 (Ref.51).

The LLD is more simply an *a priori* (predefined) limit representing the required capability of a measurement for a system or methodology. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions for the concentration at which the analyte will no longer be reliably detected with certainty (i.e., method must be able to detect the analyte with certainty to a value at or below the LLD).

1.14 MEMBER(S) OF THE PUBLIC

MEMBER(S) OF THE PUBLIC means any individual except when that individual is receiving an occupational dose. (10CFR20)

1.15 MINIMUM DETECTABLE CONCENTRATION / ACTIVITY (MDC / MDA)

As defined by Reg Guide 4.15 Rev 2, "The minimum detectable value of the analyte concentration in a sample. The smallest (true) value of the net state variable that gives a specified probability that the value of the response variable will exceed its critical value (i.e., that the material analyzed is not blank)."

The *a posteriori* minimum concentration that is practically achievable with certainty by an analytical method (i.e., not a predefined limit or goal).

1.16 OFFSITE DOSE CALCULATION MANUAL (ODCM)

The OFFSITE DOSE CALCULATION MANUAL (ODCM) is separated into three separate documents.

The first two documents, the Salem and Hope Creek Generating Station Radioactive Effluent Controls (REC) ODCMs, shall contain the methodology and parameters used in the calculation of offsite doses due to radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm/trip setpoints, The REC ODCMs shall also contain (1) the Radioactive Effluent Controls required by Salem Technical Specification Section 6.8.4.g and Hope Creek Technical Specification {CTS: 6.8.4.g} {ITS: 5.5.3} and (2) descriptions of the information that should be included in the Annual Radioactive Effluent Release Reports required by Salem Technical Specification Section 6.9.1.8 and Hope Creek Technical Specification {CTS: 6.9.1.7} {ITS: 5.6.2}, respectively.

The third document, The Salem and Hope Creek Generating Station Common Radiological Environmental Monitoring Program (REMP) ODCM, shall contain the conduct of the radiological environmental monitoring program. The Common REMP ODCM shall also contain (1) the Radiological Environmental Monitoring Program required by Salem Technical Specification Section 6.8.4.h and Hope Creek {CTS: Technical Specification 6.8.4.h} {ITS: as defined within this document,} and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating Report required by Salem Technical Specification Section 6.9.1.7 and {CTS: Hope Creek Technical Specification 6.9.1.6} {ITS: 5.6.1}, respectively.

1.17 OPERABLE / OPERABILITY

A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

{CTS: Hope Creek}

{A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).}

{ITS: Hope Creek}

{ITS: A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all

necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).}

1.18 OPERATIONAL CONDITION (CONDITION)

An OPERATIONAL CONDITION (i.e., CONDITION) shall be any one inclusive combination of mode switch position and average reactor coolant temperature as specified in Table 1.2.

1.19 RATED THERMAL POWER

The total reactor core heat transfer rate to the reactor coolant.

1.20 REC

Radioactive Effluent Controls program. The program required by the Nuclear Regulatory Commission for the licensee to monitor and report on releases of radioactive effluents. The REC requires the licensee to monitor effluent releases at every significant release point at the facility. Detailed information about the REC program is contained in the licensee's Offsite Dose Calculation Manual (REC ODCM).

The program conforms to the requirements of 10CFR50, as well as the guidance of Regulatory Guides 1.111, 1.112, 1.113, 1.109, and NUREG 0133 as applicable.

1.21 REMP

Radiological Environmental Monitoring Program: A program required by the Nuclear Regulatory Commission for the licensee to monitor the radiation and radionuclides in the environs of the plant. The program shall provide representative measurements of radioactivity in the highest potential exposure pathways and verification of the accuracy of the effluent monitoring program and modeling of environmental exposure pathways.

The program shall be contained in the REMP ODCM, conform to the requirements of 10CFR20, 10CFR72.44 and 40CFR190 as well as the guidance of Regulatory Guides 4.1, 4.13, 4.15, and Appendix I to 10 CFR 50, 10 CFR 72.44 and 40 CFR 190 as well as the guidance of Regulatory Guides 4.1, 4.13, 4.15, and NUREGs 1301 & 1302, and include the items required by Technical Specifications or Generic Letter 89-01, as applicable. The program shall include the following:

1) Monitoring, sampling, analysis, and reporting of radiation and radionuclides in the environment in accordance with the methodology and parameters in the ODCM,
2) A Land Use Census to ensure that changes in the use of areas at and beyond the site boundary are identified and that modifications to the monitoring program are made if required by the results of this census, and
3) Participation in an Interlaboratory Comparison Program to ensure that independent checks on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring.

1.22 REPORTABLE EVENT

A REPORTABLE EVENT shall be any of those conditions specified in Section 50.73 to 10CFR Part 50 or 10CFR 72.75.

1.23 SAMPLE

The portion of material selected from a larger quantity of material.

A set of individual samples or measurements drawn from a population whose properties are studied to gain information about the entire population. Samples for the REMP are further defined as:

REMP Samples:

REQUIRED by the REMP Program and are implemented via the requirements of Table 3.12.1. Are designated in Table E-1.

Management Audit Samples:

ARE NOT REQUIRED to meet the requirements of the REMP as defined in REMP ODCM Table 3.12-1. The locations for these samples may or may not be listed in the REMP ODCM, but will be designated in Table E-1 as "MA".

Any Management Audit samples that may be discussed in this document are for INFORMATIONAL PURPOSE ONLY, and may be skipped, postponed, omitted, deleted, re-located, or otherwise deviated from without approval.

Grab Sample:

A small representative subset of a larger quantity, concentration or measurement that is taken at a specific time.

Composite Sample:

A collection of individual samples obtained at regular intervals and combined with the others in proportion to the rate the sample was collected.

Split Samples:

Multiple samples from the same material and location that are sent to different laboratories for analysis.

1.24 SITE BOUNDARY

The SITE BOUNDARY shall be that line beyond which the land or property is neither owned, nor leased, nor otherwise controlled by the licensee. (10CFR20) (See Figure 1.1-1)

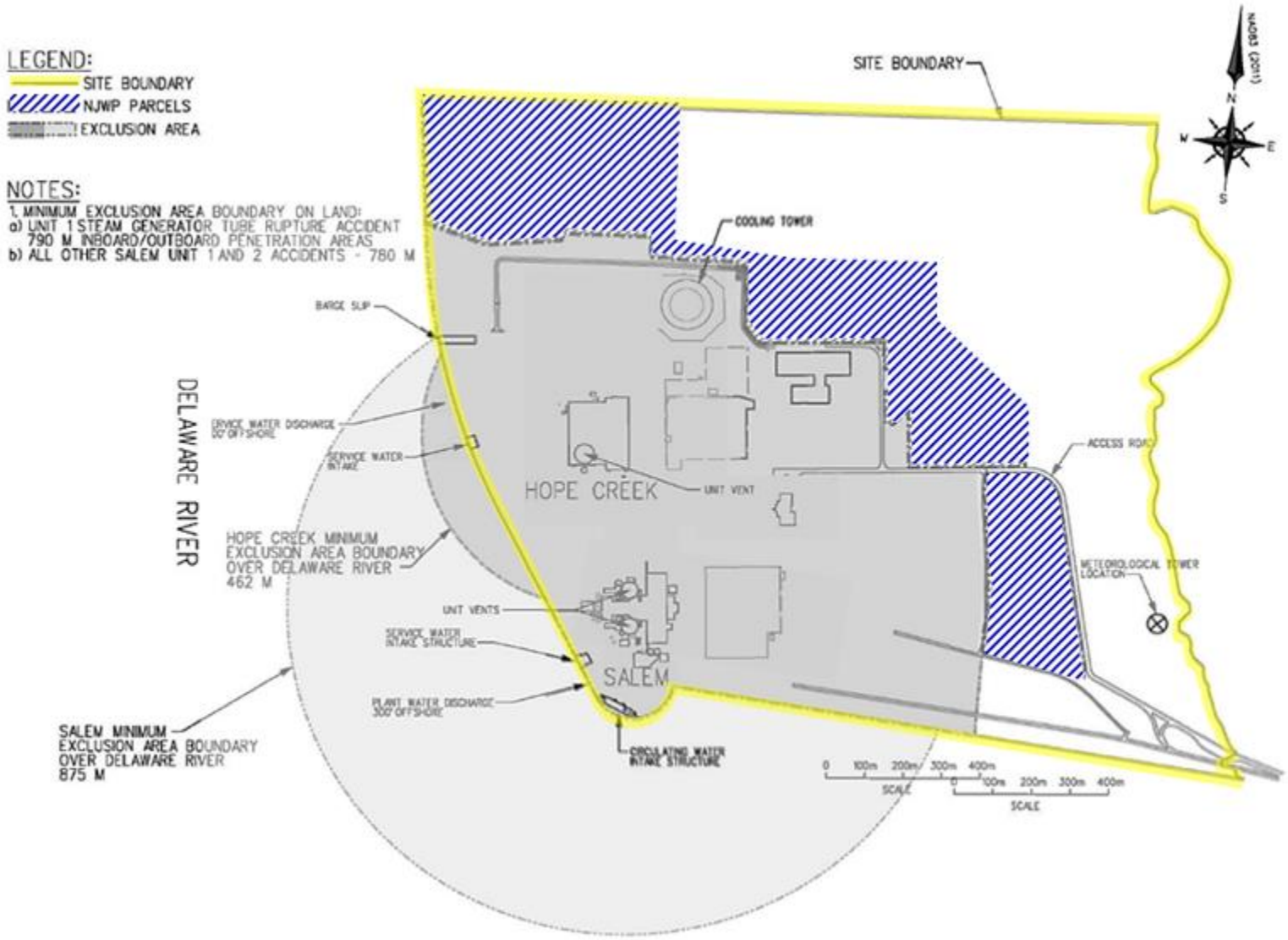
1.25 UNRESTRICTED AREA

An UNRESTRICTED AREA is an area, access to which is neither limited nor controlled by the licensee. (10CFR20) (See Figure 1.1-1)

TABLE 1.1: REMP SURVEILLANCE FREQUENCY NOTATION

NOTATION	FREQUENCY
W	At least once per 7 days
M	At least once per 31 days
Q	At least once per 92 days
SA	At least once per 184 days
A	At least once per 366 days
N/A	Not Applicable

FIGURE 1.1-1: AREA PLOT PLAN OF SITE



PART I

Section 2.0

[INTENTIONALLY OMITTED]

PART I

Section 3.0 and 4.0 (3/4)

CONTROLS (3.0) AND SURVEILLANCE REQUIREMENTS (4.0)

3/4.12.1 MONITORING PROGRAM

CONTROLS

3.12.1. In accordance with Salem Technical Specification 6.8.4.h.1 {CTS: and Hope Creek Technical Specifications 6.8.4.h.1} {ITS: and the REMP, definition 1.20, item 1) for Hope Creek}, the radiological environmental monitoring program shall be conducted as specified in Table 3.12-1.

APPLICABILITY: At all times.

ACTION:

a. With the radiological environmental monitoring program not being conducted as specified in Table 3.12-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report (AREOR) required Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 3.12-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days, pursuant to Salem Technical Specification 6.9.2 and Hope Creek Technical Specification {CTS: 6.9.2} {ITS: 10 CFR 50.4}, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of the REC ODCM CONTROLS 3.11.1.2, 3.11.2.2, and 3.11.2.3. When more than one of the radionuclides in Table 3.12-2 are detected in the sampling medium, this report shall be submitted if:

$$\left[\frac{concentration(1)}{reporting\ Level\ (1)}\right] + \left[\frac{concentration\ (2)}{reporting\ Level\ (2)}\right] + \cdots \geq 1.0$$

When radionuclides other than those in Table 3.12-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to a MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of REC ODCM CONTROLS 3.11.1.2, 3.11.2.2, and 3.11.2.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in PSEG's Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}.

* *The methodology used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in any Special Report submission.*

3/4.12.1 MONITORING PROGRAM (Continued)

ACTION: (Continued)

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 3.12-1, identify specific locations for obtaining replacement samples and add them to the radiological environmental monitoring program within 30 days. The specific locations from which samples were unavailable may then be deleted from the monitoring program.

Pursuant to Salem Technical Specification 6.9.1.8 and Hope Creek Technical Specification {CTS: 6.9.1.7} {ITS: 5.6.2}, identify the cause of the unavailability of samples and the new location(s) for obtaining replacement samples in the next Annual Radioactive Effluent Release Report (ARERR), and also include in the report a revised figure(s) and table for the REMP ODCM reflecting the new location(s).

SURVEILLANCE REQUIREMENTS

4.12.1 The radiological environmental monitoring samples shall be collected pursuant to Table 3.12.1 from the specific locations given in the table and figure(s) in the ODCM and shall be analyzed pursuant to the requirements of Table 3.12-1, and the detection capabilities required by Table 4.12-1.

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM			
EXPOSURE PATHWAY AND/OR SAMPLE	**NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS(1)**	**SAMPLING AND COLLECTION FREQUENCY**	**TYPE AND FREQUENCY OF ANALYSIS**
1. Directed Radiation			
TLDs(2)	Fifty-seven (57) monitoring stations with two or more dosimeters placed as follows: 1) An inner ring of stations, one in each of the land-based meteorological sectors in the general area of the SITE BOUNDARY; and 2) An outer ring of stations, one in each of the land-based meteorological sectors in the 5 to 11 km range from the site; and 3) The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations. In accordance with NUREGs 1301 & 1302, the requirement of 40 TLDs providing coverage in each of the land-based meteorological sectors for direct radiation monitoring stations may be reduced according to geo-graphical limitations (e.g., some sectors may be over a body of water, such that the number of dosimeters or sectors covered may be reduced).	Quarterly	Gamma dose quarterly

See also Appendix E, Table E-2 *REMP Sample Collection and Analysis* for additional sample collection details.

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)			
EXPOSURE PATHWAY AND/OR SAMPLE	**NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS(1)**	**SAMPLING AND COLLECTION FREQUENCY**	**TYPE AND FREQUENCY OF ANALYSIS**
2. Airborne			
Radioiodine and Particulates	Samples from 5(3) locations meeting the following criteria: 1) Samples from three locations that are: • Close to the SITE BOUNDARY, and • Are in different sectors of the highest calculated annual average ground level D/Q 2) One sample from the vicinity of a community having a highest calculated annual average ground- level D/Q; and 3) One sample from a control location, as for example 15-30 km distant and in the least prevalent wind direction.	Continuous: Sampler operation with sample collection weekly (more frequent collection may be required from dust loading of the particulate filter).	Weekly: • I-131 analysis of the Radioiodine Canister (Charcoal Cartridge) • Gross beta radio-activity analysis of the Particulate Filter following change(4) Quarterly: Gamma isotopic analysis(5) of composite (by location).

See also Appendix E, Table E-2 *REMP Sample Collection and Analysis* for additional sample collection details.

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)			
EXPOSURE PATHWAY AND/OR SAMPLE	**NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS(1)**	**SAMPLING AND COLLECTION FREQUENCY**	**TYPE AND FREQUENCY OF ANALYSIS**
3. Waterborne			
a. Surface(6)	• One sample upstream • One sample downstream • One sample outfall • One sample cross-stream	Semi-monthly: Grab sample	Monthly: Composite for gamma isotopic analysis (5) Quarterly: Composite for tritium analysis quarterly
b. Groundwater	• Samples from one or two sources only if likely to be affected(8)	Monthly: Grab sample	Monthly: Gamma isotopic analysis(5) Quarterly: Tritium analysis
c. Drinking Water(11)	• One sample of the nearest water supply affected by its discharge	Bi-weekly: Composite sample(7) when I-131 analysis is required to be performed; otherwise Monthly: Composite	Bi-weekly: I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year(8) Monthly: Gross beta and gamma isotopic analysis(5) of composite Quarterly: Tritium analysis of composite

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)			
EXPOSURE PATHWAY AND/OR SAMPLE	**NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS(1)**	**SAMPLING AND COLLECTION FREQUENCY**	**TYPE AND FREQUENCY OF ANALYSIS**
3. Waterborne (cont.)			
d. Sediment	One river sediment sample from each of the following locations: • One sample downstream area • One sample cross-stream area • One sample from outfall area • One sample from upstream area • A control location • One sample from shoreline area	Semi-annually Grab sample	Semi-annually Gamma isotopic analysis(5)
4. Ingestion			
a. Milk	1. Samples from milking animals in three locations: • having the highest dose potential • and are within 5 km distance **OR**, IF there are none, THEN: Samples from milking animals in three locations: • where doses are calculated to be greater than 1 mrem/yr(9) • and are between 5 to 8 km distant 2. One sample from milking animals at a control location 15 to 30 km distant	Semi-monthly: Grab sample when animals are on pasture (*typically* Apr – Nov) Monthly: Grab sample when animals are not grazing (fodder/silage fed)	Semi-monthly: Gamma isotopic (5) and I-131 analysis when animals are on pasture Monthly: Gamma isotopic (5) and I-131 analysis when animals are not grazing (fodder/silage fed)

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)			
EXPOSURE PATHWAY AND/OR SAMPLE	**NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS(1)**	**SAMPLING AND COLLECTION FREQUENCY**	**TYPE AND FREQUENCY OF ANALYSIS**
4. Ingestion (cont.)			
b. Fish and Invertebrates	1. One sample of each commercially and recreationally important species in vicinity of plant discharge area. 2. One sample of same species in area not influenced by the plant discharge.	Seasonally: Species dependent, OR Semiannually: If not seasonal	Seasonally and/or Semiannually: Gamma isotopic analysis(5) on edible portions
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.	Seasonally: At time of harvest (10)	Seasonally: Gamma isotopic analysis(5) on edible portions
	2. Samples of three different kinds of broad leaf grown nearest each of two different offsite locations of highest predicted annual ground level D/Q if milk sampling is not performed. *(See REMP sample discussion in Appendix E)*	Quarterly: During growing season (12)	Quarterly: Gamma isotopic analysis(5) on edible portions
	3. One sample of each similar broadleaf vegetation grown 15 to 30 km distant in the least prevalent wind direction if milk sampling is not performed. A control can be used closer to the site if appropriately evaluated *(See REMP sample discussion in Appendix E)*	Quarterly: During growing season (12)	Quarterly: Gamma isotopic analysis(5) on edible portions

See also Appendix E, Table E-2 *REMP Sample Collection and Analysis* for additional sample collection details.

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)

(1) Specific parameters of distance and direction sector from the midpoint of a line between the center of the Salem units 1 & 2 containment domes and additional description where pertinent, shall be provided for each and every sample location in Table 3.12-1 in a table and figure(s) in the ODCM. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability and malfunction of automatic sampling equipment. If specimens are unobtainable due to sampling equipment malfunction, effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable specific alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program given in the ODCM. Pursuant to Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}, submit in the next Radioactive Effluent Release Report documentation for a change in the ODCM including revised figure(s) and table for the ODCM reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples for the pathway and justifying the selection of the new location(s) for obtaining samples.

(2) One or more instruments, such as pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a passive dosimeter (PD) a device meeting the criteria of ANSI N13.37 is considered a device consisting of one or more detectors, which can be mounted in one or more holders functioning as a single unit (appropriate for the application), intended to be placed in a location in the environment for the purpose of measuring ambient dose equivalent at the location where it is place. Film badges shall not be used for measuring direct radiation. The frequency of analysis or readout for dosimetry systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading. The 57 stations (40 as required by NUREGs 1301 & 1302) is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., at an ocean site, some sectors will be over water so that the number of dosimeters may be reduced accordingly.

(3) There are four additional air sample locations – a "duplicate" air sampler at location 05S2, 05D1, 01F1 and 02F6 which are maintained for their historical data.

(4) 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. If gross beta activity in air particulate is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

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

TABLE 3.12- 1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)

(6) 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. "Upstream" samples in an estuary must be taken far enough upstream to be beyond the plant influence. Saltwater shall be sampled only when the receiving water is utilized for recreational activities.

(7) A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. In this program composite sample aliquots shall be collected at time intervals that are very short relative to the compositing period in order to assure obtaining a representative sample.

(8) 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.

(9) The dose shall be calculated for the maximum organ and age group using the methodology and parameters in the ODCM. There are no farms that meet the 5 km requirement and it is unlikely that any releases from the site will approach the 1 mrem criteria at 5 to 8 km. To meet this pathway:

- Milk samples will be taken (owner obliging) within 8 km, and other Management Audit samples will be taken within 16 km.
- Broad leaf vegetation shall be taken within 8 km.

(10) If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be quarterly. Attention shall be paid to include samples of tuberous and root food products. The Delaware River and Bay at the location of Salem and Hope Creek Nuclear Generating Stations, and downstream is a brackish or saltwater source. No irrigation of food products is performed using water in the vicinity from which liquid plant wastes have been discharged, thus this pathway does not exist, and PSEG is not required to obtain irrigated food per Regulatory Guide 4.1 Rev 2 Section 3. However, 12 Management Audit food samples are collected from various locations.

(11) No groundwater samples are required as liquid effluents discharged from Salem and Hope Creek Generating Stations do not directly affect this pathway. However, for management audit, one raw and one treated ground water sample from the nearest municipality are collected monthly.

(12) Although listed in the PSEG REMP ODCM, the PSEG-operated gardens may be Management Audit samples due to the fact that they are not required while milk sampling is being performed. However, if there is an inadequate milk sampling program, then these locations are required by the REMP. The three gardens located at (16S1, 06S1, and 10D1) should be approximately 100 to 150 ft^2 (at least 20% of the 500 ft^2 residential garden) and contain salt tolerant vegetables, such as beets, broccoli, cabbage, kale, spinach, squash and potatoes. The leaves of these plants are considered broad and therefore would meet the requirements of the program if they were to be required.

TABLE 3.12- 2 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

REPORTING LEVELS

Analysis	Water (pCi/L)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/Kg, wet)	Milk (pCi/L)	Food Products (pCi/Kg, wet)
H-3	30,000 [1]				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr/Nb-95	400				
I-131	20 [1]	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba/La-140	200			300	

*Note **1***: No drinking water exposure pathway exists on site or downstream. If a drinking water pathway existed, then the water reporting limit would be 20,000 pCi/L for H-3 and 2 pCi/L for I-131.

TABLE 4.12- 1 DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS (1),(2)

ENVIRONMENTAL LOWER LIMITS OF DETECTION (LLD) (4)

Analysis	Water (pCi/L)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/Kg wet)	Milk (pCi/L)	Food Products (pCi/Kg, wet)	Sediment (pCi/Kg, dry)
Gross Beta	4	0.01				
H-3	3,000 (3)					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr/Nb-95	15					
I-131	15 (3)	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		

TABLE 4.12- 1 DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS (1),(2) LOWER LIMITS OF DETECTION (LLD) (3) – TABLE NOTATIONS

(1) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1.

(2) Required detection capabilities for dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.

(3) No drinking water exposure pathway exists on site or downstream. If a drinking water pathway existed, then the water LLD would be 2,000 pCi/L for H-3 and 1 pCi/L for I-131

(4) The LLD is defined, for purposes of these CONTROLS as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 * S_b + [\frac{2.71}{t}]}{E * V * 2.22 * Y * \exp(-\lambda * \Delta t)}$$

Where:

- ***LLD*** = the "a priori" lower limit of detection as defined above, as picocuries per unit mass or volume
- **4.66** = the statistical factor from NUREGs 1301 & 1302
- S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute)
- **2.71** = the Poisson-Normal approximation[1]
- **t** = the count time in minutes
- E = the counting efficiency, as 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 (sec^{-1})
- Δt = elapsed time for environmental samples between sample collection, or end of the sample collection period, and time of counting (sec)

Typical values of **E, V**, **Y**, and **Δt** should be used in the calculation.

For low count rates, the term $[\frac{2.71}{t}]$ may be added to the numerator.

It should be recognized that the LLD is defined in Section 1.0 as an *a priori* (predefined) limit representing the required capability of a measurement system or methodology. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological

[1] Lloyd A. Currie, Limits for Qualitative Detection and Quantitative Determination: Application to Radiochemistry, Anal. Chem. 40, 586-593 (1968).

Environmental Operating Report pursuant to the Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}..

3/4.12.2 LAND USE CENSUS

CONTROLS

3.12.2 In accordance with the Salem Technical Specifications 6.8.4.h.2 and the Hope Creek Technical Specifications {CTS 6.8.4.h.2} {ITS: NA} {ITS: and the REMP, definition 1.20, item 2) for Hope Creek}, a land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden* of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

APPLICABILITY: At all times.

ACTION:

a. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Radioactive Effluent CONTROL 3.11.2.3, identify the new location(s) in the next Annual Radioactive Effluent Release Report, pursuant to Salem Technical Specification 6.9.1.8 and Hope Creek Technical Specification {CTS: 6.9.1.7} {ITS: 5.6.2}.

b. With a land use census identifying a location(s)** that yields a calculated dose or dose commitment (via the same exposure pathway) 20 percent greater than at a location from which samples are currently being obtained in accordance with CONTROL 3.12.1, add the new location(s) to the radiological environmental monitoring program within 30 days. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted. Pursuant to Salem Technical Specification 6.9.1.8 and Hope Creek Technical Specification {CTS: 6.9.1.7} {ITS: 5.6.2}, identify the new location(s) in the next Annual Radioactive Effluent Release Report (ARERR) and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

SURVEILLANCE REQUIREMENTS

4.12.2 The land use census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, visual survey, aerial survey, or by consulting local agriculture authorities. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification CONTROL 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.7} {ITS: 5.6.2}.

* *Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Q's in lieu of the garden census. CONTROLS for broadleaf vegetation sampling in Table 3.12-1, Part 4.c shall be followed, including analysis of control samples.*

** *New receptor locations must be on land and not over water to be considered in dose calculations.*

3/4.12.3 INTERLABORATORY COMPARISON PROGRAM

CONTROLS

3.12.3 In accordance with Salem Technical Specifications 6.8.4.h.2 and the Hope Creek Technical Specifications {CTS 6.8.4.h.2} {ITS: NA} {ITS: and the REMP, definition 1.20, item 2) for Hope Creek}, analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program that is traceable to NIST and that correspond to samples required by Table 3.12-1.

APPLICABILITY: At all times.

ACTION:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}.

SURVEILLANCE REQUIREMENTS

4.12.3 The Interlaboratory Comparison Program shall be described in the ODCM. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Salem Technical Specification 6.9.1.7 and Hope Creek Technical Specification {CTS: 6.9.1.6} {ITS: 5.6.1}.

PART I

BASES

FOR SECTION 3.0 AND 4.0 (3/4)

CONTROLS (3.0) AND

SURVEILLANCE REQUIREMENTS (4.0)

NOTE: The BASES contained in the succeeding pages summarize the reasons for the CONTROLS of Sections 3.0 and 4.0, but are not considered a part of these CONTROLS.

BASES

3/4.12.1 MONITORING PROGRAM

The radiological environmental monitoring program required by this CONTROL provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. For guidance regarding this monitoring program, refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979 The initially specified monitoring program will be effective for at least the first three years of commercial operation. Following this period, program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLDs). The LLDs required by Table 4.12-1 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and the HASL Procedures Manual, HASL-300 (revised annually).

3/4.12.2 LAND USE CENSUS

This CONTROL is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the results of this census. The best information from the door-to-door survey, from aerial survey, from visual survey or consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than $50 m^2$ provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) a vegetation yield of 2 kg/m^2.

3/4.12.3 INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

PART I

SECTION 5.0 Design

[Intentionally Omitted]

PART I

SECTION 6.0

ADMINISTRATIVE CONTROLS

6.0 ADMINISTRATIVE CONTROLS

6.9.1.7 (SA 1&2),
{CTS: 6.9.1.6 (HC)} {ITS: 5.6.1 (HC)} ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

In accordance with Salem Technical Specifications 6.9.1.7 and Hope Creek Technical Specifications {CTS: 6.9.1.6} {ITS: 5.6.1}, the Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted prior to May 1st of each year*.

The Annual Radiological Environmental Operating Reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, with operational controls (as appropriate), and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by CONTROL 3.12.2. If harmful effects or evidence of irreversible damage are detected by the monitoring, the report shall provide an analysis of the problem and a planned course of action to alleviate the problem.

Refer to NUREG-0133*, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants,"* October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979 for annual REMP reporting requirements. The Annual Radiological Environmental Operating Reports shall include summarized and tabulated results for all of the radiological environmental samples taken during the report period pursuant to the table and figures in the environmental radiation section of the ODCM. Deviations from the sampling program identified in CONTROL 3.12.1 shall be reported.

In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following:

- a summary description of the radiological environmental monitoring program
- at least two legible maps keyed to a table giving distances and directions from midpoint of a line between the center of the Salem units 1 & 2 containment domes.
    - one covering sampling locations near the SITE BOUNDARY
    - one covering the more distant locations
- the results of licensee participation in the Interlaboratory Comparison Program, as required by CONTROL 3.12.3
- a discussion of all analyses in which the LLD required by Table 4.12-1 was not achieved.

* *A single submittal may be made for a multiple unit site. The submittal should combine those sections that are common to all units at the site.*

PART – II

METHODOLOGIES

PART II

SECTION 1.0

[INTENTIONALLY OMITTED]

PART II

SECTION 2.0

[INTENTIONALLY OMITTED]

PART II

SECTION 3.0

[INTENTIONALLY OMITTED]

PART II

SECTION 4.0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

4.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

4.1 Sampling Program

The operational phase of the Radiological Environmental Monitoring Program (REMP) is conducted in accordance with the requirements of ODCM CONTROL 3.12. The objectives of the program are:

- To determine whether any significant increases occur in the concentration of radionuclides in the critical pathways of exposure in the vicinity of Artificial Island.
- To determine if the operation of the Salem or Hope Creek Generating Stations has resulted in any increase in the inventory of long-lived radionuclides in the environment.
- To detect any changes in the ambient gamma radiation levels; and
- To verify that Salem and Hope Creek Nuclear Generating Station operations have no detrimental effects on the health and safety of the public or on the environment.

The sampling requirements (e.g. type of samples, collection frequency, and analysis) and sample locations are presented in Appendix E.

NOTE:

No public drinking water samples or irrigation water samples are required as these pathways are not directly affected by liquid effluents discharged from Salem or Hope Creek Nuclear Generating Stations.

4.2 Interlaboratory Comparison Program

4.2.1 CONTROLS

CONTROL 3.12.3 from Part I of this ODCM requires analyses be performed on radioactive material supplied as part of an Interlaboratory Comparison Program. Participation in an approved Interlaboratory Comparison Program provides a check on the precision and accuracy of measurements of radioactive materials in environmental samples.

A summary of the Interlaboratory Comparison Program results will be provided in the Annual Radiological Environmental Operating Report (AREOR) pursuant to Salem Technical Specifications 6.9.1.7 and Hope Creek Technical Specifications {CTS: 6.9.1.6} {ITS: 5.6.1}.

4.2.2 OBJECTIVE

The objective of this program is to evaluate the total laboratory analysis process by comparing results with results obtained by a separate laboratory or laboratories for an equivalent sample.

4.2.3 PROGRAM

4.2.3.1 Environmental Sample Analyses Comparison Program

PSEG Nuclear uses an industry recognized vendor to perform radiochemical analysis of REMP samples. The Interlaboratory program is described and implemented in accordance with the vendor's Quality Assurance Manual, which has been approved by PSEG Nuclear.

Additionally, another industry recognized vendor is utilized as a QA check to validate results of the primary vendor above. Like the primary vendor, their Interlaboratory program is described and implemented in accordance with the QA vendor's Quality Assurance Manual, which has been approved by PSEG Nuclear.

The results of the primary and QA vendor laboratories' performances in the study will be provided to PSEG Nuclear Environmental Affairs and will be included in the Annual Radiological Environmental Operating Report. The results will be provided to the NRC upon request.

4.2.3.2 Abnormal Results

The vendor laboratory results shall be compared to the criteria established in the NRC Inspection Manual (Procedure 84750) for Radioactive Waste Treatment, Effluent, and Environmental Monitoring.

The referenced criteria is as follows:

a. Divide each standard result by its associated uncertainty to obtain resolution (the uncertainty is defined as the relative standard deviation, or sigma, of the standard result as calculated from counting statistics).

b. Divide each laboratory result by the corresponding standard result to obtain the ratio (laboratory result/standard).

c. The laboratory measurement is in agreement if the value of the ratio falls within the limits shown below for the corresponding resolution:

Resolution	Ratio
< 4	0.4 – 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
> 200	0.85 - 1.18

If the vendor laboratory results lie outside the ratio criteria, an evaluation will be performed to identify any recommended remedial actions to reduce anomalous errors.

Complete documentation of the evaluation will be available to Station personnel and will be provided to the NRC upon request.

Appendix A

[INTENTIONALLY OMITTED]

Appendix B

[INTENTIONALLY OMITTED]

Appendix C

[INTENTIONALLY OMITTED]

Appendix D

[INTENTIONALLY OMITTED]

Appendix E

SAMPLE TYPE, LOCATION AND ANALYSIS

PSEG COMMON
RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM

(SALEM UNITS 1 & 2 AND HOPE CREEK)

Samples are identified by a three part code.

1) The first two letters are the program identification code. Because of the proximity of the Salem and Hope Creek Stations, a common environmental surveillance program is conducted. The identification code "SA," has been applied to Salem and Hope Creek Stations.

2) The next three letters define the media type sampled.

Program and Media Code	
SA-AIO	Air - Iodine
SA-APT	Air - Particulate
SA-ECH	Hard Shell Blue Crab
SA-EOY	Oysters
SA-ESF	Edible Fish
SA-ESS	River Sediment
SA-FPL	Green Leafy Vegetation (broad-leaf)
SA-FPV	Vegetables (various)
SA-GAM	Game Meat (muskrat)
SA-IDM	Immersion Dose (TLDs)
SA-MLK	Milk
SA-PWR	Potable Water - Raw (drinking water)
SA-PWT	Potable Water - Treated (drinking water)
SA-SOL	Soils
SA-SWA	Surface Water (river/bay)
SA-VGT	Fodder Crops (various silage)
SA-WWA	Well Water (groundwater)

3) The last three or four symbols are a location code based on direction and distance from a standard reference point. The reference point is located at midpoint between the center of the Salem Unit 1 and Salem Unit 2 containments.

   a. The first two numbers represent each of the sixteen angular sectors of 22.5 degrees centered about the reactor site. Sector one is divided evenly by the north axis and other sectors are numbered in a clockwise direction.

   b. The succeeding letter represents the radial position from the reference point is located at midpoint between the center of the Salem Unit 1 and Salem Unit 2 containments.

   c. The last number is the station numerical designation within each sector and zone; e.g., 1,2,3, etc.

Sector Code	
01	N
02	NNE
03	NE
04	ENE
05	E
06	ESE
07	SE
08	SSE
09	S
10	SSW
11	SW
12	WSW
13	W
14	WNW
15	NW
16	NNW

Radius Code	
S	On-Site
X	Site Boundary (SB)
A	SB - 1 Mile
B	1 - 2 Miles
C	2 - 3 Miles
D	3 - 4 Miles
E	4 - 5 Miles
F	5 - 10 Miles
G	10 - 20 Miles
H	> 20 Miles
Q	Special Interest

EXAMPLE:

The sample designation **SA-IDM-03E1** would indicate the following about the sample:

- Collected as part of Salem and Hope Creek's REMP program (**SA-**)…
- Consisting of a TLD (**IDM-**), which had been collected at a location…
- Approximately 45 degrees (northeast sector) with respect to the site reference point (**03**), and...
- At a radial distance of 4 to 5 miles from the site reference point (**E**).
- The unique sampling station number for this location in the defined REMP zone 03E is (**1**).

SAMPLING LOCATIONS

1. All REMP sampling locations and specific information about the individual locations are described in Table E-1.
2. EN-AA-170-1000 contains a table of Management Audit locations (NOT REQUIRED by the REMP). Management Audit samples are for INFORMATIONAL PURPOSE or SPECIAL INTEREST ONLY, and may be skipped, postponed, omitted, deleted, re-located, or otherwise deviated from without approval.
3. Maps contained in FIGURES E-1, E-2 and E-3 show the locations of sampling stations with respect to the site.
4. Minimum sampling requirements are specified in Table 3.12-1 in the CONTROLS / ACTION section of this ODCM. Supplemental REMP sample collection details are outlined in Table E-2 of this appendix.

DISCUSSION ON SAMPLE RATIONALE IN THE REMP

TLDs for Direct Dose Measurement:

Sectors 9 and 13 do not have a TLD. However, sectors 13 and 14 to the west, and 8 and 9 to the south have a TLD placed near the bisect of these adjoining sectors. Sectors 6 through 15, are not required to have a TLD because the requirement for coverage in each of the land-based meteorological sectors for direct radiation monitoring stations may be reduced according to geographical limitations (e.g., some sectors may be over a significant body of water, such that the number of dosimeters or sectors covered may be reduced).

Similar to the rationale used above, sector 8 does not have a TLD in the outer ring because there is no land between 5 and 11 km for this sector.

The western and southern boundaries of the site meet this description due to site geography. The Delaware Bay, which opens up to the Atlantic Ocean, is to the south of the plant. Similarly, to the west of the site is the Delaware River, which is varies in width. Approximate distances of opposing shore line are listed below.

Direction from REMP Center Point	Approximate Distance to the opposite shore of the Delaware River/Bay (miles)
NNW	4.6
NW	3.7
WNW	3.2
W	3.0
WSW	2.5
SW	2.6
SSW	2.7
S	4.0
SSE	10.0

TLDs are located at sample locations near the site boundary in all sectors except 9 and 13. Additionally, the sectors with the highest X/Q and D/Q have TLDs located near the site boundary.

Drinking/Potable Water:

Per Regulatory Guide 4.1 Rev 2 Section 3 "*Routinely Monitored Exposure Pathway's,* subsection b, other exposure pathways and routes of exposure do not exist at all sites. If the exposure pathway and routes of exposure do not exist, then that pathway does not need to be sampled. For example, the REMP includes drinking water samples only if drinking water sources are present and are likely to be affected by effluents.

The Potable water pathway assumes that liquid effluents are discharged to a river or lake that a municipality withdrawals water from for drinking. No public drinking water samples or irrigation water samples are required as these pathways are not directly affected by liquid effluents discharged from Salem and Hope Creek Nuclear Generating Stations. Delaware River and Bay downstream of the plant is saltwater, and services no drinking water suppliers.

Groundwater:

Per Regulatory Guide 4.1 Rev 2 Section 3 "*Routinely Monitored Exposure Pathway's,* subsection b, other exposure pathways and routes of exposure do not exist at all sites. The groundwater requirements are for offsite wells sampled at nearby residences to determine if site effluents could affect down-gradient wells. An example of this would be akin to a station that discharges tritiated water to on-site ponds that then could enter the groundwater used by off-site residents who draw from groundwater for drinking. Additionally, water in the shallow groundwater aquifer and Vincentown aquifer are both brackish, making the water in each of these aquifers undesirable for drinking water.

In PSEG Nuclear's case, no groundwater water samples are required as these pathways are not directly affected by liquid effluents discharged from Salem and Hope Creek Nuclear Generating Stations. Site hydrogeology modeling and groundwater studies have proven the primary groundwater gradient to be from the site to the river, and not towards any private water supplies.

Broad-Leaf Vegetation (FPL):

Although listed in the PSEG REMP ODCM, the PSEG-operated gardens may be Management Audit samples due to the fact that they are not required while milk sampling is being performed. However, if there is an inadequate milk sampling program, then these locations are required by the REMP.

Due to the fact there are insufficient milking animal locations to credit; PSEG's REMP utilizes broad leaf gardens instead.

- The REMP is only required to have two gardens in the highest D/Q sectors, which are located on site near the site boundary within the sectors highest D/Q (06S1 and 16S1). There is also a control Garden at 10D1, approximately 3.9 miles SSW of the plant.
- The control for broadleaf vegetation should be 15 to 30 km (9.3 to 18.7 miles) distant. In the case of PSEG the control location (10D1) is only 3.9 miles distant. This is acceptable because:
    - The appropriately distant location with broad-leaf vegetation (01G1 at 10.9 miles) grew an insufficient variety of broad-leaf vegetation.
    - 10D1 will still serve as a good control indicator even if not in the specified range.
        - 10D1 has a D/Q approximately 10 times higher than the D/Q of the appropriately distant control location (01G1).
        - However, 10D1 has a D/Q 100 times less (or 1%) of the site boundary gardens.
        - Site boundary gardens are not showing plant related activity.
        - If 10D1 saw plant activity it would be from a world-wide event, or an obvious release event at Salem and/or Hope Creek.
    - The dose potential is highest at the site gardens.
    - There are no gardens within 5 miles.
- Each of these gardens is between 100 and 150 ft^2, which derives from NUREG 1301 & 1302 specification of a residential garden > 500 ft^2. NUREG 1301 & 1302 assumes that only 20% of the 500 ft^2 residential garden consists of broad leaf vegetation. **20% * 500 ft^2 = 100 ft^2**
- Planting salt-tolerant vegetables will help to increase yield, such as: beets, broccoli, cabbage, kale, spinach, squash, and potatoes. The leaves of these plants are considered broad and therefore would meet the requirements of the ODCM.

Other non-traditional edible plants include Hosta, which are perennials and will provide leafy matter from May – October. Similarly, Lamb's Ear (Stachys byzantina), is also an edible perennial. If these plants are used, then they should also be planted at all three locations for comparative purposes.

http://www.mofga.org/Publications/The-Maine-Organic-Farmer-Gardener/Spring-2013/Tip)

- Reg Guide 4.1 discusses Monitoring of vegetation at the site boundary can be performed in lieu of the garden census as identified in NUREG-1301/1302. The frequency of the land use census may be reduced provided that:
  (1) The frequency is outlined in the procedures (e.g., the ODCM and related procedures),
  (2) The licensee can demonstrate that there is no reduction in the effectiveness of the REMP, and,
  (3) Persons knowledgeable in land use census monitor usage characteristics based on knowledge gained during routine sample collection.

Milk:

The milk requirements from NUREG 1301/1302 are:

Samples from milking animals in three locations within 5 km distance having the highest dose potential.

- We have no milk animal locations that meet this requirement.

If there are none, then one sample from milking animals in each of three areas between 5 to 8 km distant where doses are calculated to be Greater than 1 mrem per yr.

- We have only 1 farm 5 to 8 km (13E3 / 8 km), but calculated doses are < 1 mrem per year.
- One sample from milking animals at a control location (02G3 / 18.7 km NE).
- MA farms > 8 km.

Despite no viable milk source in the required area, an argument could be made that we do not meet the milk sampling requirements and therefore should be required to sample gardens.

Irrigated Food Products:

Per Regulatory Guide 4.1 Rev 2 Section 3 "*Routinely Monitored Exposure Pathway's,* subsection b, other exposure pathways and routes of exposure do not exist at all sites. The Delaware River at the location of Salem and Hope Creek Nuclear Power Plants is a brackish water source. No irrigation of food products is performed using water in the vicinity (or downstream) from which liquid plant wastes have been discharged. However, Management Audit food samples are collected from various locations.

TABLE E-1 REMP SAMPLE LOCATIONS

Station ID		Description and Physical Location*	Latitudinal	Longitudinal	Additional Info
A.	**Direct Radiation Monitoring Locations (IDM)**				
SA-IDM-	02S2a	0.41 mi. NNE; lamp pole 65 near HC switch yard	39.46835449	-75.53215083	**02 INNER RING**
	07S1	0.12 mi. SE; station personnel gate	39.46170664	-75.53413667	**07 INNER RING**
	08S1	0.14 mi. SSE; fuel oil storage	39.46124273	-75.53423655	**08 INNER RING**
	08S2	0.17 mi. SSE; fuel oil storage	39.46060452	-75.53490008	**08 INNER RING**
	10S1	0.11 mi. SSW; circulating water building	39.46140694	-75.53610957	**10 INNER RING**
	11S1	0.12 mi. SW; circulating water building	39.46169856	-75.53701531	**11 INNER RING**
	12S1	0.09 mi. WSW; outside security fence	39.46250773	-75.53727501	**12 INNER RING**
	14S2	0.12 mi. WNW; outside security fence	39.46333019	-75.5378332	**14 INNER RING**
	15S1	0.57 mi. NW; near river and HCGS barge slip	39.46933823	-75.54213002	**15 INNER RING**
	15S2	0.59 mi. NW; near river and HCGS barge slip	39.46990958	-75.54218236	**15 INNER RING**
	15S3	0.17 mi. NW; outside security fence	39.46473839	-75.53795435	**15 INNER RING**
	16S1	0.57 mi. NNW; on road near fuel oil storage tank	39.47036949	-75.54048241	**16 INNER RING**
	01X2	0.59 mi. N; Lamp post on access road, north of cooling tower.	39.47147222	-75.53486111	**01 INNER RING (SB)**
	02X4	0.65 mi. NNE; Northern side of access road	39.47172222	-75.53125000	**02 INNER RING (SB)**
	03X1	0.58 mi. NE; behind refrigeration building	39.46897404	-75.52795026	**03 INNER RING (SB)**
	04X1	0.60 mi. ENE; access road near intersection to LDC	39.46704750	-75.52572339	**04 INNER RING (SB)**
	05X1	0.86 mi. E; site access road	39.46113042	-75.51986444	**05 INNER RING (SB)**
	06X2	0.23 mi. ESE; security fence near helicopter pad	39.4620304	-75.5317636	**06 INNER RING (SB)**
	16X3	0.89 mi. NNW; lamp post	39.47466667	-75.54261111	**16 INNER RING (SB)**
	04D2	3.9 mi. ENE; Alloway Creek Neck Road	39.48817158	-75.46957631	**04 OUTER RING**
	05D1	3.5 mi. ENE; local farm along SGS/HCGS access road.	39.47306249	-75.47225339	**05 OUTER RING**
	10D1	3.9 mi. SSW; Cedar Swamp Rd. Townsend, DE	39.41018633	-75.56217728	**10 OUTER RING**

TABLE E-1 REMP SAMPLE LOCATIONS (Continued)

Station ID		Description and Physical Location*	Latitudinal	Longitudinal	Additional Info
A.	**Direct Radiation Monitoring Locations (IDM) - *Continued***				
SA-IDM-	14D1	3.3 mi. WNW; Bay View, DE	39.48375553	-75.59209305	**14 OUTER RING**
	15D1	3.7 mi. NW; Route 9, Augustine Beach, DE	39.50206173	-75.58382959	**15 OUTER RING**
	02E1	4.4 mi. NNE; local farm, NJ	39.52305001	-75.50713162	**02 OUTER RING**
	03E1	4.1 mi. NE; local farm, NJ	39.50163551	-75.47742975	**03 OUTER RING**
	12E1	4.4 mi. WSW; Thomas Landing, DE	39.44770681	-75.61616353	**12 OUTER RING**
	13E1	4.1 mi. W; Diehl House Lab, DE	39.46646957	-75.61228703	**13 OUTER RING**
	16E1	4.1 mi. NNW; Port Penn, DE	39.51303163	-75.57631528	**16 OUTER RING**
	11E2	5.0 mi. SW; Route 9, DE	39.40542776	-75.5924631	**11 OUTER RING**
	01F1	5.7 mi. N; Fort Elfsborg, NJ	39.54496843	-75.51867763	**01 OUTER RING**
	02F2	8.5 mi. NNE; Salem Substation, Salem NJ	39.57475270	-75.469164	**02 OUTER RING**
	02F5	7.3 mi. NNE; Salem High School, Salem, NJ	39.55745617	-75.47533792	**02 POPULATION**
	02F6	7.3 mi. NNE; Energy & Envmt Resource Center, Salem NJ	39.56189028	-75.48032697	**02 OUTER RING**
	03F2	5.1 mi. NE; Hancocks Bridge, NJ Munic Bldg	39.50681055	-75.45963497	**03 OUTER RING**
	03F3	8.6 mi. NE; Quinton Township Elem. School NJ	39.54358705	-75.41218199	**03 POPULATION**
	04F2	6.0 mi. ENE; Mays Lane, Harmersville, NJ	39.49922867	-75.43452064	**04 OUTER RING**
	05F1	6.4 mi. E; Canton, NJ	39.47271500	-75.417161	**05 OUTER RING**
	06F1	6.4 mi. ESE; Stow Neck Road, NJ	39.43990952	-75.41918057	**06 OUTER RING**
	07F2	9.3 mi. SE; Bayside, NJ	39.38474940	-75.39409543	**07 OUTER RING**
	09F1	5.3 mi. S; off Route #9, DE	39.38402433	-75.53496978	**09 OUTER RING**
	09F2	5.2 mi. S; Collins Beach Boat Ramp.	39.38810300	-75.527292	**09 OUTER RING**
	10F2	5.7 mi. SSW; Route #9, DE	39.38385854	-75.56922722	**10 OUTER RING**
	11F1	6.0 mi. SW; Taylor's Bridge, DE	39.41275579	-75.62723089	**11 OUTER RING**
	12F1	9.4 mi. WSW; Townsend Elementary School, DE	39.39629708	-75.68850358	**12 OUTER RING**

TABLE E-1 REMP SAMPLE LOCATIONS (Continued)

Station ID		Description and Physical Location*	Latitudinal	Longitudinal	Additional Info
A.	**Direct Radiation Monitoring Locations (IDM) - *Continued***				
SA-IDM-	13F2	6.5 mi. W; Odessa, DE	39.45493544	-75.65617957	**13 OUTER RING**
	13F3	9.3 mi. W; Redding Middle School, Middletown, DE	39.45358348	-75.7090908	**13 POPULATION**
	13F4	9.8 mi. W; Middletown, DE	39.44763225	-75.71855237	**13 POPULATION**
	14F2	6.7 mi. WNW; Route 13 and Boyds Corner Rd, DE	39.49962984	-75.65071902	**14 OUTER RING**
	15F3	5.4 mi. NW, Port Penn Rd. at Pole Bridge Rd., DE	39.51643810	-75.60982174	**15 OUTER RING**
	16F2	8.1 mi. NNW; Delaware City Public School, DE	39.57188303	-75.59055376	**16 POPULATION**
	01G3	19 mi. N; N. Church Street Wilmington, DE	39.73811448	-75.54189828	**01 CONTROL**
	03G1	16.5 mi. NE; local farm, NJ	39.59849749	-75.28004463	**03 OUTER RING**
	10G1	11.6 mi. SSW; Smyrna, DE	39.30370444	-75.60153449	**10 CONTROL**
	14G1	13.4 mi. WNW; Route 286, Bethel Church Road, DE	39.52147115	-75.77501363	**14 OUTER RING**
	16G1	15.1 mi. NNW; Wilmington Airport, DE	39.67727160	-75.59287587	**16 OUTER RING**
	03H1	33.1 mi. NE; National Park, NJ	39.85958217	-75.18545110	**03 CONTROL**
B.	**Air Sampling Locations (AIO, APT)**				
SA-AIO- SA-APT-	05X1	0.86 mi. E; site access road	39.46113042	-75.51986444	
	05S2	0.86 mi. E; site access road	39.46109600	-75.51981500	**DUPLICATE**
	06S1	0.19 mi. ESE; near FLEX storage, west of helo pads	39.46169169	-75.53256571	
	15S2	0.59 mi. NW; near river and HCGS barge slip	39.46990958	-75.54218236	
	05D1	3.5 mi. E; local farm along SGS/HCGS access road.	39.47306249	-75.47225339	
	16E1	4.1 mi. NNW; Port Penn, DE	39.51303163	-75.57631528	
	01F1	5.7 mi. N; Fort Elfsborg, NJ	39.54496843	-75.51867763	
	02F6	7.3 mi. NNE; Energy & Envmt Resource Center, Salem NJ	39.56189028	-75.48032697	
	14G1	13.4 mi. WNW; Route 286, Bethel Church Road, DE	39.52147115	-75.77501363	**CONTROL**

TABLE E-1 REMP SAMPLE LOCATIONS (Continued)

Station ID		Description and Physical Location*	Latitudinal	Longitudinal	Additional Info
C.	**Sediment Locations (ESS)**				
SA- ESS-	07E1	4.4 mi. SE; River Bank 1 mi. W of Mad Horse Creek	39.41800000	-75.47733333	
	05A1	0.89 mi. E, shoreline	39.46201948	-75.53156259	
	11A1	0.22 mi. SW; SGS outfall area	39.46051135	-75.53809583	
	12B1	1.8 mi. WSW; West bank of Delaware River	39.45366667	-75.56800000	
	15A1	0.69 mi. NW; HCGS outfall area	39.47090000	-75.54340000	
	15A2	0.66 mi. NW; South Storm Drain outfall	39.47066667	-75.54300000	
	16F1	6.9 mi. NNW; C&D Canal, DE	39.55857514	-75.57219841	
D.	**Invertebrate Locations (ECH)**				
SA-ECH-	11A1	0.22 mi. SW; SGS outfall area	39.46051135	-75.53809583	
	12B1	1.8 mi. WSW; West bank of Delaware River	39.45366667	-75.56800000	
E.	**Fish Locations (ESF)**				
SA-ESF-	07E1	4.4 mi. SE; River Bank 1 mi. W of Mad Horse Creek	39.41800000	-75.47733333	
	11A1	0.22 mi. SW; SGS outfall area	39.46051135	-75.53809583	**PLANT DISCHARGE**
	12B1	1.8 mi. WSW; West bank of Delaware River	39.45366667	-75.56800000	
F.	**Milk Locations (MLK)**				
SA-MLK-	13E3	4.9 mi. W; local farm, DE	39.45416863	-75.62748969	
	02G3	11.6 mi. NE; local farm, NJ	39.60098067	-75.41176334	**CONTROL**
	Milk animals are not prevalent in the vicinity of the plant. Only one farm met the requirements for milk. In lieu of milk samples, broad-leaf vegetation sampling is being conducted.				

TABLE E-1 REMP SAMPLE LOCATIONS (Continued)

Station ID		Description and Physical Location*	Latitudinal	Longitudinal	Additional Info
G.	**Surface Water Locations (SWA)**				
SA-SWA-	11A1	0.22 mi. SW; SGS outfall area	39.46051135	-75.53809583	**PLANT DISCHARGE**
	11A1A	0.15 mi. SE; Located in the plant barge slip area	39.46145477	-75.53378443	**ALTERNATE** to 11A1
	12B1	1.8 mi. WSW; West bank of Delaware River	39.45366667	-75.56800000	
	12B1A	3.7 mi. NW; Tip of Augustine Beach Boat Ramp	39.50461492	-75.57981375	**ALTERNATE** to 12B1
	07E1	4.4 mi. SE; River Bank 1 mi. W of Mad Horse Creek	39.41800000	-75.47733333	
	07E1A	9.2 mi. SE; Located at the end of Bayside Road, NJ	39.37616667	-75.40400000	**ALTERNATE** to 07E1
	01F2	7.1 mi. N; midpoint of Delaware River	39.56783333	-75.55166667	
	16F1	6.9 mi. NNW; C&D Canal, DE	39.55857514	-75.57219841	
	16F1A	6.5 mi. NNW; Located at the C&D Canal Tip, DE	39.55566667	-75.55933333	**ALTERNATE** to 16F1
H.	**Broad-Leaf Vegetation (FPL)**				
SA-FPL-	06S1	0.19 mi. ESE	39.46169169	-75.53256571	
	16S1	0.57 mi. NNW	39.47036949	-75.54048241	
	10D1	3.91 mi. SSW Cedar Swamp Rd. Townsend, DE	39.41018633	-75.56217728	**CONTROL**
	Milk animals are not prevalent in the vicinity of the plant. Only one farm met the requirements for milk. In lieu of milk samples, broad-leaf vegetation sampling is being conducted.				

* All distances and directions for the Station Locations are referenced to the midpoint between Salem Unit 1 and Unit 2 containments. The WGS 84 coordinate for this site center point location is Latitude 39.462986 and Longitude -75.535645

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TABLE E-2 REMP SAMPLE COLLECTION AND ANALYSIS

REMP SAMPLE COLLECTION AND ANALYSIS

SAMPLE	COLLECTION METHOD	ANALYSIS
Direct Dose	• 2 TLD's will be collected from each location quarterly.	• Gamma dose quarterly.
Air Particulate	• Continuous low volume air sampler. • Sample collected every week along with the filter change.	• Gross Beta analysis on each weekly sample. • Gamma spectrometry shall be performed if gross beta exceeds10 times the yearly mean of the control station value. • Samples shall be analyzed 24 hours or more after collection to allow for radon and thorium daughter decay. • Gamma isotopic analysis on quarterly composites.
Air Iodine	• A TEDA impregnated charcoal cartridge is connected to air particulate air sampler and is collected weekly at filter change.	• Iodine 131 analysis is performed on each weekly sample. • Timely shipment should be considered to ensure I-131 LLD requirements.
Sediment	• Batch sediment samples are taken semi-annually.	• Gamma isotopic analysis semi-annually.
Crab and Fish	• Two batch samples are sealed in a plastic bag or jar and frozen semi-annually or when in season.	• Gamma isotopic analysis of edible port ion on collection.
Milk	• Batch samples of fresh milk are collected for each farm semi-monthly when cows are in pasture, monthly at other times.	• Gamma isotopic analysis and I-131 analysis is performed on each sample collection. • Timely shipment should be considered to ensure I-131 LLD requirements.
Water (Potable, Surface)	• Monthly, providing conditions allow (e.g. winter icing could prevent surface water sample to be collected).	• Gamma isotopic monthly • Monthly H-3 on groundwater • Quarterly H-3 on surface water sample
Broad Leaf Vegetation	• Quarterly during growing season.	• Gamma isotopic analysis of edible port ion on collection.

TABLE E-3 REMP SAMPLE LOCATION NAME CHANGES

For ODCM Rev 29 all REMP sample locations were re-mapped. As a result, some locations were re-named to maintain consistency with respect to the sector and radius they are in. This table is provided as a historical cross reverence when comparing prior data.

Station Location / Description All locations are referenced to the midpoint of the two SGS Units' Containments. The coordinates of this	OLD Station Code			OLD GPS Coordinates		NEW Station Code			UPDATED GPS Coordinates		Reason for Name Change
	Sector	Ring	Sample	Latitudinal	Longitudinal	Sector	Ring	Sample	Latitudinal	Longitudinal	
0.58 mi. N	01	S	1	39.471148	-75.537016	01	Q	1	39.47099621	-75.53701025	Old 01S1 had a both a TLD and Garden, but they were sufficiently far apart. The Special Interest TLD near ISFSI was renamed 01Q1 (not REMP req.)
0.58 mi. N	01	S	1	39.471148	-75.537016	01	S	3	39.47117000	-75.53699600	01S1 had a both a TLD and Garden, but they were sufficiently far apart. The garden was renamed 01S3 during the remapping project.
0.4 mi. NNE	02	S	2	39.4685	-75.53318333	02	S	2a	39.46835449	-75.53215083	The light pole 02S2 was attached to was perminantly removed as part of the Hope Creek Switchyard Project. 02S2 is a nearby placement.
0.17 mi. SE	07	S	2	39.46171667	-75.53255	06	S	1	39.46169169	-75.53256571	07S2 was renamed 06S1 because it falls in Sector 6, and there was already a 06S2.
0.17 mi. SSE	09	S	1	39.4606	-75.53485	08	S	2	39.46060452	-75.53490008	09S1 was renamed 08S2 because it falls in Sector 8, and there was already a 08S1.
0.11 mi. WNW	13	S	1	39.46335	-75.53778333	14	S	2	39.46333019	-75.53783320	13S1 was renamed14S2 because it falls in Sector 14, and there was already a 14S2 historical dataset that has been renamed 15S3.
0.17 mi. NNW	14	S	1	39.46476667	-75.53796667	15	S	3	39.46473839	-75.53795435	14S1 was renamed15S3 because it falls in Sector 15, and there was already a 15S1 and 15S2.
0.60 mi. N	16	S	2	39.47125	-75.5381	16	Q	2	39.47125650	-75.53804736	The Special Interest TLD near ISFSI was renamed 16Q2 (not REMP req.)
0.62 mi. N	01	S	2	39.47175	-75.536044	01	X	2	39.47172483	-75.53604683	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.6 mi. NNE	02	S	4	39.47071667	-75.53075	02	X	4	39.47071127	-75.53077223	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.58 mi. NE	03	S	1	39.46901667	-75.52796667	03	X	1	39.46897404	-75.52795026	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.60 mi. ENE	04	S	1	39.46705	-75.52573333	04	X	1	39.46704750	-75.52572339	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.86 mi. E	05	S	1	39.46113333	-75.51978333	05	X	1	39.46113042	-75.51986444	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.23 mi. ESE	06	S	2	39.46198333	-75.53186667	06	X	2	39.46201948	-75.53156259	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.74 mi NNW	16	S	3	39.47451667	-75.54283333	16	X	3	39.47448370	-75.54285650	These On-Site (S) locations were renamed with a new designator specific to the site boundary (X).
0.24 mi. NNW; south storm drain discharge line	16	A	1	39.47066667	-75.543	15	A	2	39.47066667	-75.54300000	16A1 was renamed15A2 because it falls in Sector 15, and there was already a 15A1.
3.14 mi. ENE	05	C	1	39.4735	-75.478598	04	C	1	39.47620600	-75.49378000	05C1 was renamed 04C1 because it falls in Sector 4
2.5 mi. WSW; west bank of Delaware River	12	C	1	39.45366667	-75.568	12	B	1	39.45366667	-75.56800000	12C1 was renamed 12B1 because it falls in radius B
3.7 mi. WSW; located at the tip of Augustine Beach Boat Ramp	12	C	01A	39.50472222	-75.58	12	B	1A	39.50461492	-75.57981375	Alternate Location 12C1a was renamed 12B1a to correspond with 12B1. Alternate location, does not require update per GIS data
5.2 mi. S; Collins Beach Boat Ramp.	08	F	1	39.33221667	-75.47438333	09	F	2	39.38810300	-75.52729200	08F1 was renamed 09F2 because it falls in Sector 9, and there was already a 09F1.

FIGURE E-1: ON-SITE SAMPLING LOCATIONS (0 TO 1 MILE)

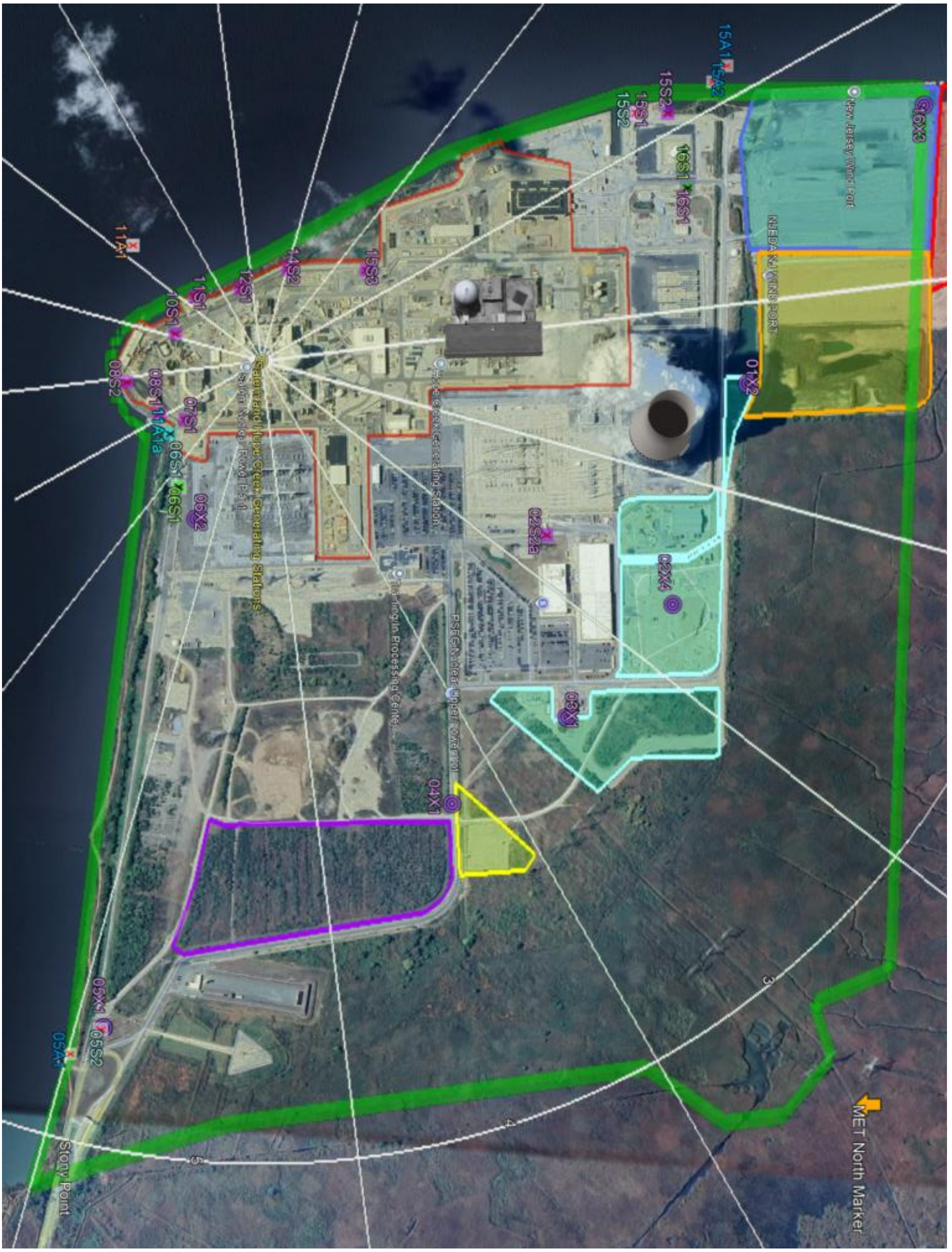


FIGURE E-2: INTERMEDIATE SAMPLING LOCATIONS (1 TO 10 MILES)

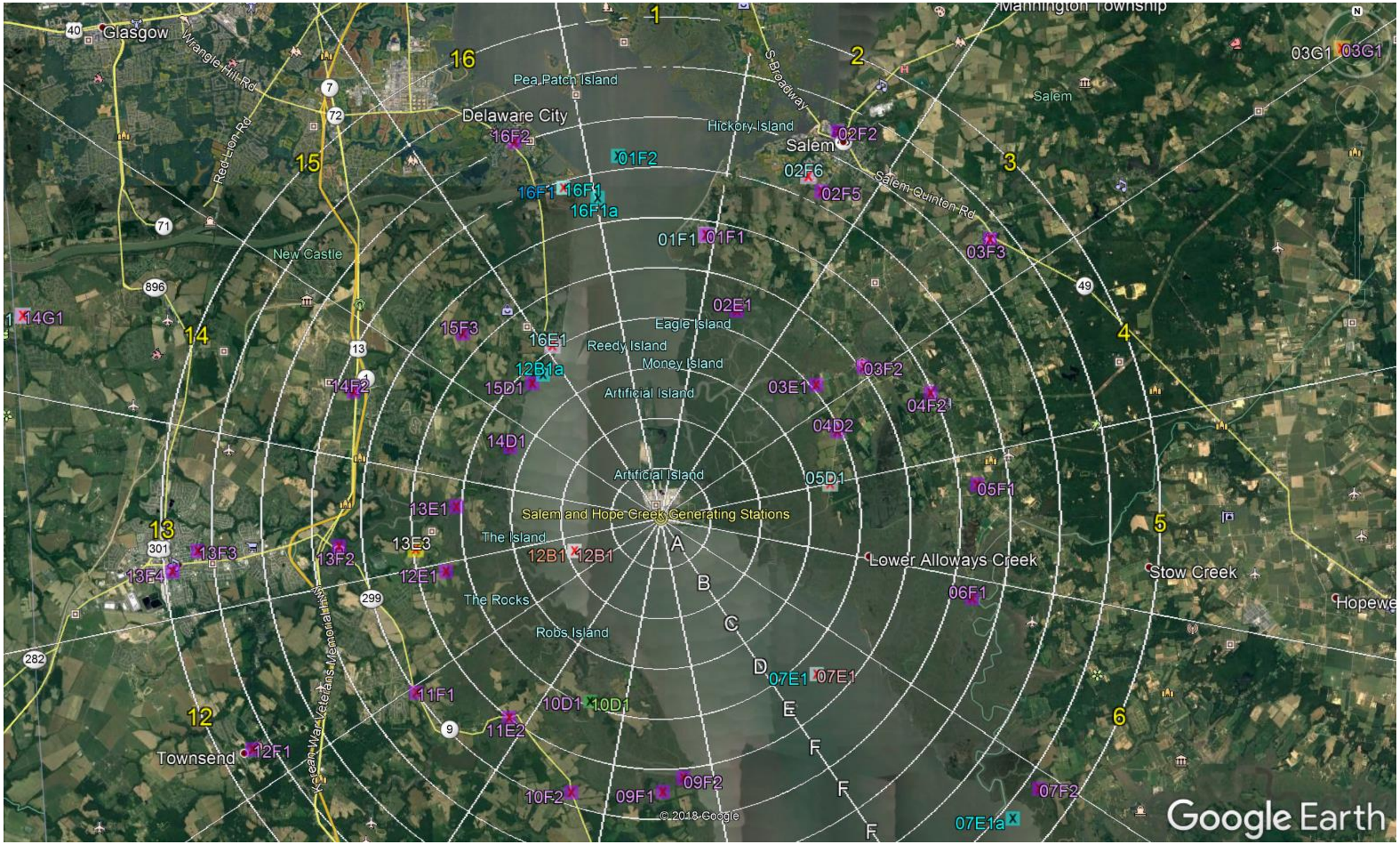
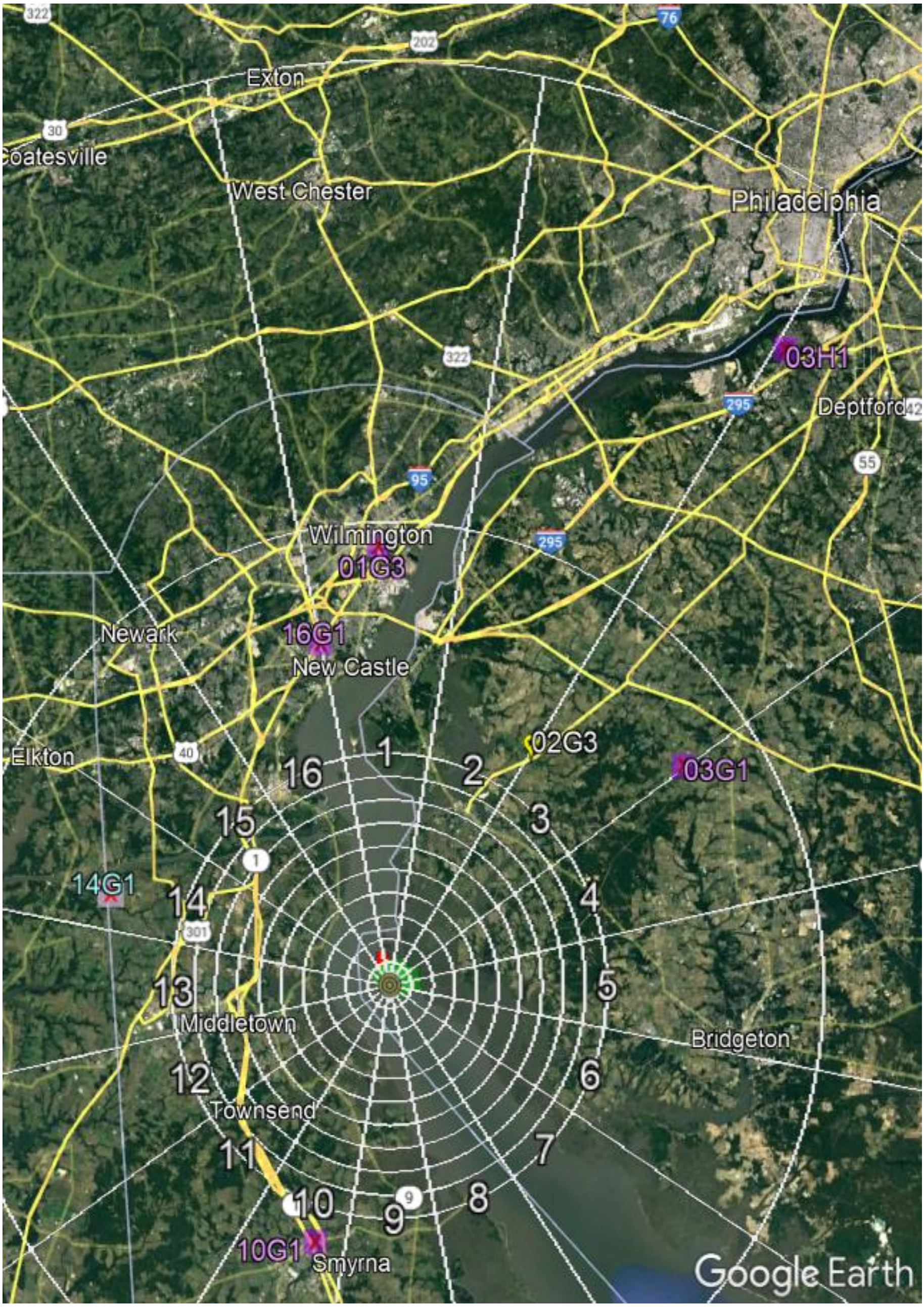


FIGURE E-3: OFF-SITE SAMPLING LOCATIONS (BEYOND 10 MILES)



Appendix F

[INTENTIONALLY OMITTED]