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TALEN ENERGY

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Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

10 CFR 50.4

SUSQUEHANNA STEAM ELECTRIC STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT
PLA-8174

Docket No. 50-387
50-388

In accordance with the Susquehanna Steam Electric Station (SSES) Units 1 and 2 Technical Specification 5.6.2, the SSES Annual Radiological Environmental Operating Report is hereby submitted for the 2024 calendar year.

There are no new or revised regulatory commitments contained in this submittal.

Should you have any questions regarding this submittal, please contact Ms. Melisa Krick, Manager – Nuclear Regulatory Affairs, at (570) 542-1818.

E. Casulli

Attachment: 2024 Annual Radiological Environmental Operating Report

Copy: NRC Region I
Ms. J. England, NRC Senior Resident Inspector
Ms. A. Klett, NRC Project Manager
Mr. M. Shields, PA DEP/BRP

Attachment to PLA-8174

2024 Annual Radiological Environmental Operating Report

SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

2024

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SUSQUEHANNA STEAM ELECTRIC STATION

Units 1 & 2

2024 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1 TO DECEMBER 31, 2024

Susquehanna Nuclear, LLC
Berwick, PA
April, 2024

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I. Summary

During normal operations of a nuclear power generating station there are permitted releases of small amounts of radioactive material to the environment. To monitor and determine the effects of these releases a Radiological Environmental Monitoring Program (REMP) has been established around the Susquehanna Steam Electric Station (SSES). The results of the REMP are published annually, providing a summary and interpretation of the data collected.

Applied Ecoscience, Inc. was responsible for the collection of environmental samples during 2024. Teledyne Brown Engineering (TBE) was responsible for the analysis of environmental samples during 2024. The results are discussed in this report**.** Landauer provided the dosimetry services for SSES during 2024.

This Annual Radiological Environmental Operating Report (AREOR) conducted for SSES covers the period January 1, 2024 through December 31, 2024. During that time period,1344 analyses were performed on 1144 samples.

Historically, Tritium (H-3) has been the only man-made radionuclide detected in the environment by the Susquehanna Steam Electric Station (SSES) Radiological Environmental Monitoring Program (REMP) that is attributable to station operations.

Based on data from the 2024 Radioactive Effluent Monitoring and Control program, approximately 18 Curies of H-3 were discharged in liquid radwaste releases to the Susquehanna River and approximately 142 Curies of H-3 were discharged from the station in airborne effluent releases. H-3 was not identified in any REMP surface water samples taken from the Susquehanna River during 2024. The 2024 average dilution factor for the Susquehanna River was 646, based on the annual average river flow of 7.50E+06 gpm and

the annual average cooling tower blowdown flow of 1.16E+04 gpm.

H-3 was identified above analysis detection levels in precipitation samples taken on-site during 2024. Precipitation is analyzed to assess the impact of airborne effluent H-3 on groundwater activities.

Low levels of H-3 were identified in on-site groundwater samples during 2024. Assuming a Member of the Public was consuming water with the highest detected concentration of H-3 of an onsite monitoring well sample, the theoretical dose to the total body and maximum organ using the H-3 concentration of 372 pCi/liter and Regulatory Guide 1.109 methodology [Reference 9] was determined to illustrate the effect. The calculated dose would be <0.02 mrem to the child total body and <0.02 mrem to the child liver (critical age group/organ) which is well below SSES Technical Requirements Manual (TRM) limits and applicable regulatory limits.

The REMP Sample Equipment Operability and year-to-year trend comparison is located in Appendix E, Table E-1.

The REMP was conducted in accordance with the SSES Technical Requirements Manual (TRM) and the Offsite Dose Calculation Manual (ODCM) [Reference 5] which are based on the design objectives in 10CFR Part 50, Appendix I, Sections IV.B.2, IV.B.3 and IV.C. The Lower Limit of Detection (LLD) values required by the TRM and SSES ODCM were achieved for the 2024 reporting period. The REMP objectives were also met during this period. The concentration of radioactive material in the environment that could be attributable to SSES operations was only a small fraction of the concentration of naturally occurring and man-made radioactivity. Since these results were comparable to the results obtained during the preoperational phase of the program and combined with historical results collected since commercial operation, it can be concluded that the levels and fluctuations were as expected and that the operation of the SSES

had no significant radiological impact on the environment. Additionally, the REMP sample results for 2024 verify the adequacy of the SSES radioactive effluent control systems.

Samples of air particulates, air iodine, milk, groundwater, drinking water, food products, surface water, fish and sediment were collected and analyzed. External radiation dose measurements were also made in the vicinity of SSES using passive dosimeters.

Air particulate samples were analyzed for concentrations of gross beta weekly and gamma emitting nuclides quarterly. Gross beta and cosmogenically produced beryllium-7 (Be-7) were detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Air charcoal cartridge samples were analyzed for iodine-131 (I-131). All results were less than the minimum detectable concentration.

Environmental gamma radiation measurements were performed quarterly using optically stimulated luminescent dosimeters (OSLD). The levels of radiation detected were consistent with those observed in previous years.

Cow milk samples were analyzed for gamma emitting nuclides. High sensitivity I-131 analyses were performed on cow milk samples. All I-131 results were below the minimum detectable concentration. Naturally occurring potassium-40 (K-40) was detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Groundwater samples were analyzed for concentrations of tritium and gamma emitting nuclides. Tritium activities detected were consistent with those detected in previous years. Naturally occurring K-40 and thorium-228 (Th-228) were detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Drinking water samples were analyzed for concentrations of tritium, gross beta and gamma emitting nuclides. Tritium activities were not detected above the minimum detectable concentration. Gross beta activities detected were consistent with those detected in previous years. Naturally occurring K-40 was detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Food product (fruits, vegetables and broadleaf vegetation) samples were analyzed for concentrations of gamma emitting nuclides. Naturally occurring Be-7 and K-40 were detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Surface water samples were analyzed for concentrations of tritium, gross beta and gamma emitting nuclides. Tritium activities were not detected above the minimum detectable concentration. Low level gross beta activities detected were as expected for environmental surface water samples. Naturally occurring K-40 was detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Fish and shoreline sediment samples were analyzed for concentrations of gamma emitting nuclides. Naturally occurring K-40 was detected at levels consistent with those detected in previous years. Naturally occurring radium-226 (Ra-226), actinium-228 (Ac-228), and Th-228 were detected in shoreline sediment at levels consistent with results in previous years. No fission or activation products were detected in fish or sediment samples.

II. The Radiological Environmental Monitoring Program

The Susquehanna Steam Electric Station (SSES) is a nuclear electrical generating station located approximately 5 miles northeast of Berwick, in Luzerne County, Pennsylvania. The station consists of two boiling-water reactor generating units. The SSES is located on approximately a 1,087-acre tract just west of the Susquehanna River. The station was constructed in the 1970's, with Unit 1 beginning commercial operation on June 8, 1983, and Unit 2 beginning commercial operation on February 12, 1985. Units 1 and 2 each generate a net 1,350 megawatts (MWe), for a total station output of 2,700 MWe.

In the 4th quarter of 2021, Susquehanna Nuclear, LLC land ownership was reduced due to land transfers to other Talen Energy entities. Impacts to the SSES REMP resulting from the above referenced land ownership changes are being implemented as appropriate by SSES Chemistry personnel.

In total Susquehanna Nuclear, LLC presently owns 1,152 acres of land. Generally, this land is characterized by open deciduous woodlands interspersed with grasslands. The area around the site is primarily rural, consisting predominately of forest and agricultural lands.

Approximately 1,087 acres of land is jointly owned between Susquehanna Nuclear, LLC (90%) and Allegheny Electric Cooperative (10%). The land use includes generation and associated maintenance facilities, laydown areas, parking lots, roads, a nature preserve (the Susquehanna Riverlands), and agricultural leases to local farmers.

To the north of the station along the Susquehanna River, Susquehanna Nuclear, LLC owns 100% of the 65-acre Gould Island.

More specific information on the demography, hydrology, meteorology, and land use characteristics of the area in the vicinity of the SSES can be found

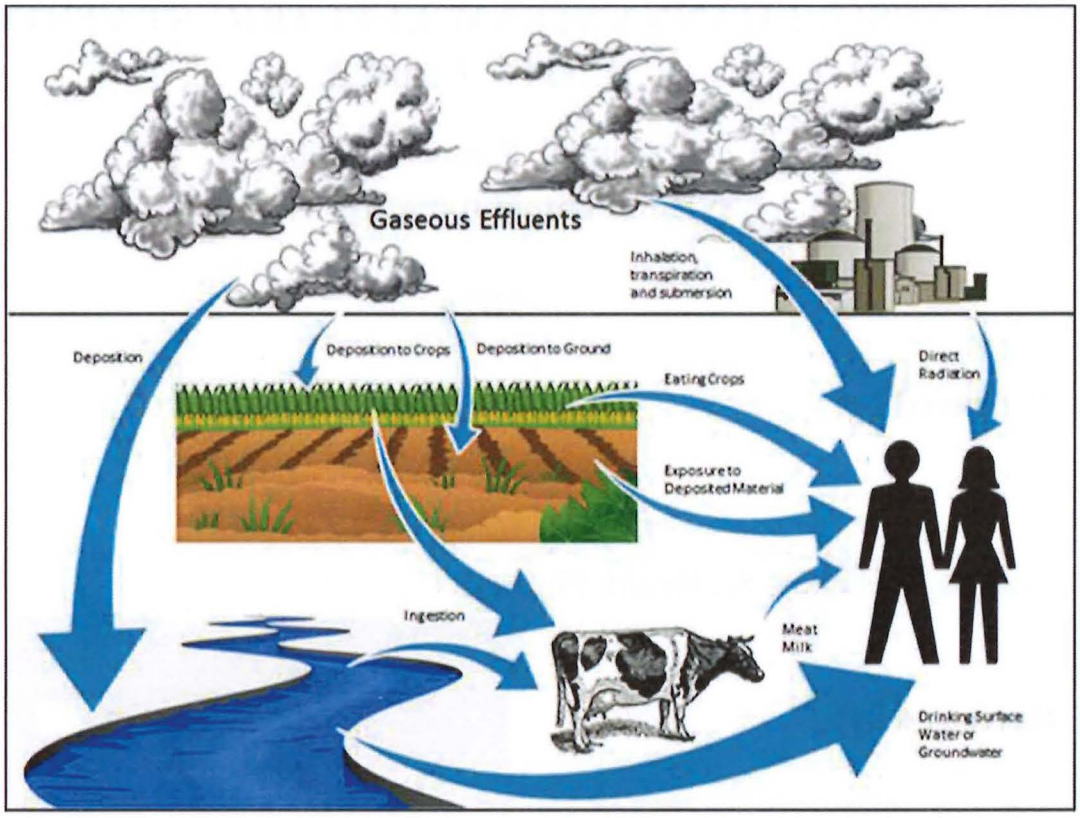
in the Environmental Report [Reference 1], the Final Safety Analysis Report [Reference 2] and the Final Environmental Statement [Reference 3] for the SSES.

The SSES has maintained a Radiological Environmental Monitoring Program (REMP) since April 1972, prior to construction of both units and ten years prior to the initial operation of Unit 1 in September 1982. The purpose of the preoperational REMP (April, 1972 to September, 1982) was to establish a baseline for radioactivity in the local environment that could be compared with the radioactivity levels observed in various environmental media throughout the operational lifetime of the SSES. This comparison facilitates assessments of the radiological impact of the SSES operation.

The REMP supplements the results of the radioactive effluent-monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation in the environment are not higher than expected based on the effluent measurements and modeling of the environment in the vicinity of the SSES.

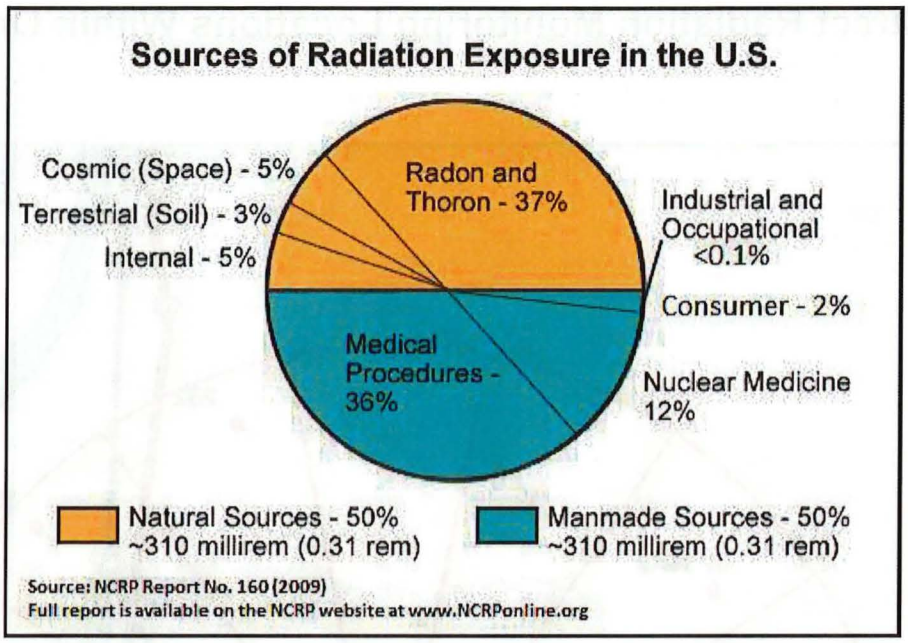
The pathways through which radiation or radioactive material may reach the public from nuclear power plants are direct exposure from the station, atmospheric, terrestrial, and aquatic pathways. (Figure 1 depicts these pathways)

Figure 1 – Radiation Pathways



People are exposed to radiation every day of their lives and have been since the dawn of mankind. Some of this radiation is naturally occurring while some is manmade. There are many factors that will determine the amount of radiation individuals will be exposed to such as where they live, medical treatments, etc. The average person in the United States is exposed to approximately 620 mrem each year. 310 mrem comes from natural sources and 310 from man-made sources. Figure 2 shows what the typical sources of radiation in the U.S.

Figure 2 – Sources of Radiation Exposure in the U.S.



Radioanalytical data from samples collected under the REMP were compared with results from the preoperational phase and historical results during operations. Differences between these periods were examined statistically to determine the effects of station operations. This report presents the results from January 1 through December 31, 2024, for the SSES Radiological Environmental Monitoring Program (REMP).

A. Objectives of the Operational REMP

The objectives of the Operational REMP are to:

1. Document compliance with SSES REMP Technical Requirements and radiological environmental surveillances.

2. Verify proper implementation of SSES radiological effluent controls.

3. Identify, measure and evaluate trends of radionuclide concentrations in environmental pathways near SSES

4. Assess impact of SSES Effluents on the Environment and the public.

5. Verify that SSES operations have no detrimental effects on the health and safety of the public or on the environment.

B. Implementation of the Objectives

1. In order to meet the objectives, an operational REMP was developed. Samples of various media were selected for monitoring due to the radiological dose impact to humans and other organisms. The selection of samples was based on:

   (a) Established critical pathways for the transfer of radionuclides through the environment to man, and

   (b) Experience gained during the preoperational phase. Sampling locations were determined based on local meteorology, Susquehanna River hydrology, local demography, and land uses.

2. Sampling locations were divided into two classes, indicator and control. Indicator locations were sited where it is expected that radiation and radioactive material that might originate from the station would be detectable. Control locations were selected in areas where they would be unaffected by station operations (i.e. Susquehanna River upstream from the station, >10 miles from the station in least prevalent wind directions). Fluctuations in the levels of radionuclides and direct radiation at indicator locations were evaluated with respect to analogous fluctuations

at control locations. Indicator and control location data were also evaluated relative to preoperational data.

3. Appendix A, Program Summary, describes and summarizes the analytical results in accordance with the SSES Technical Specifications.

4. Appendix B, Sample Designation and Locations, describes the coding system which identifies sample type and location. Table B-1 lists the location codes, locations, latitude, longitude, and the types of samples collected at each location. Table B-2 contains sample medium, analysis and sampling details.

5. The sampling locations are indicated on the following maps:

   Map B-1, Direct Radiation Monitoring Locations Within One Mile
   Map B-2, Direct Radiation Monitoring Locations From One to Five Miles
   Map B-3, Direct Radiation Monitoring Locations Greater Than Five Miles
   Map B-4, Environmental Sampling Locations Within One Mile
   Map B-5, Environmental Sampling Locations From One to Five Miles
   Map B-6, Environmental Sampling Locations Greater Than Five Miles

III. Program Description

A. Data Interpretation

Results of analyses are grouped according to sample type and presented in Appendix C, Data Tables. All results above the Lower

Limit of Detection (LLD) are at a confidence level of ± 2 sigma. This represents the range of values into which 95% of repeated analyses of the same sample should fall. As defined in U.S. Nuclear Regulatory Commission Regulatory Guide 4.8 [Reference 6], LLD is 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." LLD is normally calculated as 4.66 times the standard deviation of the background counting rate, or of the blank sample count, as appropriate, divided by counting efficiency, sample size, 2.22 (dpm per picocurie), the radiochemical yield when applicable, the radioactive decay constant and the elapsed time between sample collection and time of counting. LLD represents the capability of the measurement system.

The Minimum Detectable Concentration (MDC) is defined as the smallest concentration of radioactive material that can be detected at a given confidence level. The MDC differs from the LLD in that the MDC takes into consideration the interference caused by the presence of other nuclides while the LLD does not. MDC is an indicator of the performance of the measurement system. The MDC is set to be below the LLD.

Summaries of the radionuclide average picocurie activities and ranges are included in Table A. If a radionuclide was not detected, zero was used for that isotope in dose calculations and the activity is listed as “<MDC” (less than the minimum detectable concentration) in Table A. <MDC indicates that no activity was positively detected in any sample when samples were analyzed with techniques which achieved the required Lower Limits of Detection (LLD). The following are typical measurement laboratory MDCs for airborne and waterborne REMP samples.

Airborne REMP Typical MDCs

Radionuclide	MDC (pCi/cu.m.)
Mn-54	1.2 E-03
Fe-59	7.9 E-03
Co-58	1.9 E-03
Co-60	1.2 E-03
Zn-65	2.9 E-03
Cs-134	1.1 E-03
Cs-137	1.0 E-03
I-131	4.2 E-01

Waterborne REMP Typical MDCs

Radionuclide	MDC (pCi/L.)
H-3 (DIST)	3.6 E+02
Mn-54	4.0 E+00
Fe-59	1.1 E+01
Co-58	4.1 E+00
Co-60	4.4 E+00
Zn-65	8.5 E+00
Cs-134	3.9 E+00
Cs-137	4.1 E+00
I-131	9.9 E+00
H-3	3.5 E+02
Gross Beta	2.1 E+00

The grouped data were averaged and standard deviations calculated. Thus, the ± 2 sigma of the averaged data represent sample and not analytical variability. For reporting and calculation of averages, any result occurring at or below the LLD is considered to be at the LLD level.

B. Program Exceptions

See Exceptions Table 2024 REMP Atypical Sampling Occurrences

C. Program Changes

In 2024, Direct Radiation Monitoring location 11A1 was added to the REMP. Gross beta analysis of Surface water control samples was initiated in the 2nd quarter of 2024 to coincide with an update to the SSES Technical Requirements Manual (TRM).

2024 REMP Atypical Sampling Occurrences

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
JAN	Air	8G1	01/23/24 to 01/31/24, 01/31/24 to 02/07/24, and 02/07/24 to 02/14/24 Power outage began on 01/27/24 @ 0437 hours. Outage due to electrical work performed in the area. PPL unable to access source of power loss problem underground due to freezing temps. Loss of 103.2 hours, as determined by timer box. No sample for sampling period 01/31/24 to 02/07/24 due to lack of power to sampling unit. Non-continuous sampler operation.	CA #24-02 CR 2024-01776 02/09/24: PPL installed heavy duty power cord and restored power to sampler @ 1204 hours. 02/09/24: Operability verified @ 1456 hours. 07/03/24: Permanent power restored to sampler @ 1217 hours. *Less than ideal sample collected for sample period 01/23/24 to 01/31/24: 12,300 cf.* *Ideal sample collected for sample period 02/09/24 to 02/14/24: 16,200 cf.*
FEB	Air	10S3	02/07/24 to 02/14/24 Power outage- date and time unknown. Loss of 6.0 hours, as determined by timer box during weekly collection. Non-continuous sampler operation.	CA #24-03 CR 2024-02500 02/14/24: No action required. Air monitor resumed normal operation when power was restored. 02/14/24: Operability verified @ 1003 hours. *Ideal sample collected for sample period: 20,300 cf.*
	Air	9B1	02/07/24 to 02/14/24 Diminished flow rate upon arrival (1.9 cfm), below the procedural range of 2.0-2.4 cfm. Continuous sampling during sample period.	CA #24-04 CR 2024-02501 02/14/24: Flow rate adjusted to within procedural range (2.2 cfm). 02/14/24: Operability verified @ 1046 hours. *Ideal sample collected for sample period: 21,000 cf.*

2024 REMP Atypical Sampling Occurrences (continued)

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
FEB (cont.)	Drinking Water	12H2	02/20/24 to 02/27/24 (week 4 February composite) Composite sampler at Danville Water Company turned off on 02/27/24 @ 0953 hours for maintenance on wells. Week 4 composite sample was used in February composite with known stop date and time.	CA #24-05 CR 2024-03059 02/27/24: Sampler returned to service @ 1317 hours (week 1 March start). 02/27/24: Operability verified @ 1345 hours. *Ideal sample collected for week 4 sample period.*
MAR	Air	12E1	03/20/24 to 03/27/24 Power outage- date and time unknown. Loss of 1.3 hours, as determined by timer box during weekly collection. Non-continuous sampler operation.	CA #24-06 CR 2024-04625 03/27/24: No action required. Air monitor resumed normal operation when power was restored. 03/27/24: Operability verified @ 1016 hours. *Ideal sample collected for sample period: 22,200 cf.*
JUN	Air	12S1	05/29/24 to 06/05/24 (Loss of 12kV power) Loss of power on 06/01/24. Loss of 15.2 hours, as determined by timer box. Non-continuous sampler operation.	CA #24-07 CR 2024-08883 06/02/24: Air monitor resumed normal operation when power was restored. 06/02/24: Operability verified @ 1647 hours. *Ideal sample collected for sample period: 19,500 cf.*

2024 REMP Atypical Sampling Occurrences (continued)

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
JUN (cont.)	Surface Water	6S6	06/04/24 to 06/11/24 (week 2 June composite) ACS plastic dosing chamber found disconnected from dosing chamber flange during week 2 June collection. Week 2 composite sample with unknown stop date and time was used in June composite.	CA #24-08 CR 2024-09354 06/11/24: Reattached dosing chamber flange. 06/11/24: Sampler restored to service @ 1200 hours. 06/11/24: Grab sample collected @ 5S9 @ 1230 hours for comparative analysis. *Ideal sample volume collected for week 2 June composite.*
	Air	12S1	06/18/24 to 06/26/24 (momentary loss of 12kV power) Momentary loss of power on 06/22/24 @ 1730 hours. No loss of sampling time as determined by timer box. Non-continuous sampler operation.	CA #24-09 CR 2024-09738 06/22/24: No action required. Air monitor resumed normal operation when power was restored. 06/23/24: Operability verified @ 0927 hours. *Ideal sample collected for sample period: 23,800 cf.*
	Air	12S1	06/26/24 to 07/03/24 (loss of 12kV power) Power outage on 06/26/24 @ 1800 hours. Loss of 120.6 hours for sampling period, as determined by timer box. Non-continuous sampler operation.	CA #24-10 CR 2024-09959 07/01/24: Air monitor resumed normal operation when power was restored at approximately 0911 hours. 07/01/24: Operability verified @ 1035 hours. *Less than ideal sample collected for sample period: 7,700 cf.*

2024 REMP Atypical Sampling Occurrences (continued)

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
JUN (cont.)	Air	13S6, 10S3, 12E1	06/26/24 to 07/03/24 Power outages from storm began at approx. 1800 hours on 06/26/24 at 13S6 and 10S3. Loss of 28.8 hours at 13S6, loss of 120.2 hours at 10S3, and 8.0 hours at 12E1, as determined by timer boxes during weekly collection. Non-continuous sampler operation.	CA #24-11 CR 2024-09997 06/27/24: Air monitor 12E1 resumed normal operation when power was restored. Operability verified @ 1016 hours for 12E1. 07/01/24: Air monitor 13S6 resumed normal operation when power was restored. Operability verified @ 1031 hours for 13S6. 07/03/24: Air monitor 10S3 resumed normal operation when power was restored. Operability verified @ 1011 hours for 10S3. *Ideal samples collected for sample period: 20,200 cf (12E1), and 18,300 cf (13S6)* *Less than ideal sample collected for sample period: 6,000 cf (10S3).*
JUL	Air	3S2, 9B1	06/26/24 to 07/03/24 Power outages- dates and times unknown. Loss of 0.3 hours, as determined by timer boxes during weekly collection. Non-continuous sampler operation.	CA #24-12 CR 2024-10275 07/03/24: No action required. Air monitors resumed normal operation when power was restored. 07/03/24: Operability verified @ 0950 hours for 3S2, and 1024 hours for 9B1. *Ideal samples collected for sample period: 21,500 cf (3S2) and 21,400 cf (9B1).*

2024 REMP Atypical Sampling Occurrences (continued)

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
JUL (cont.)	Surface Water	6S6	07/02/24 to 07/09/24 (week 2 July composite) Less than normal sample volume and diminished flow rate at ACS during week 2 July collection. Continuous sampler operation.	CA #24-13 CR 2024-10468 07/09/24: Request I&C/FIN perform maintenance ASAP. 07/09/24: Grab sample collected @ 5S9 @ 1255 hours. 07/11/24: I&C performed maintenance and restored sampler to service @ 1055 hours. 07/11/24: Operability verified @ 1300 hours. *Ideal sample volume collected for week 2 July.*
AUG	Air	12S1	08/07/24 to 08/14/24 (momentary loss of 12kV power) Momentary loss of power on 08/07/24 @ 2251 hours. No loss of sampling time as determined by timer box. Non-continuous sampler operation.	CA #24-14 CR 2024-11840 08/07/24: No action required. Air monitor resumed normal operation when power was restored. 08/08/24: Operability verified @ 0831 hours. *Ideal sample collected for sample period: 22,900 cf.*
	Air	10S3	08/14/24 to 08/20/24 Pump providing inadequate flow rate upon arrival (<0.1 cfm), below the procedural range of 2.0-2.4 cfm. Adequate flow could not be achieved with maximum flow settings. Continuous sampling during sample period.	CA #24-15 CR 2024-12303 08/20/24: Pump was replaced, and air flow restored to within procedural range. 08/20/24: Operability verified @ 1034 hours. *Ideal sample collected for sample period: 17,400 cf.*

2024 REMP Atypical Sampling Occurrences (continued)

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
SEP	Air	3S2	08/28/24 to 09/04/24 Blank/unused charcoal cartridge shipped to analytical vendor on 09/04/24 instead of cartridge that was in the field for sampling period 08/28/24 to 09/04/24. Incorrect exchange was discovered while performing a verification of cartridges before field deployment on 09/11/24. No effect on analysis of sample.	CA #24-16 CR 2024-13405 09/11/24: Chemistry support notified. Analytical vendor verified incorrect 3S2 charcoal cartridge was shipped on 09/04/24. 09/12/24: 3S2 charcoal cartridge filter that was in the field for sampling period 08/28/24 to 09/04/24 was shipped to analytical vendor to be analyzed. LLD for I-131 was met within this timeframe. *Sample collected for sample period: 20,900 cf.*
	Air	12S1	09/17/24 to 09/24/24 (loss of 12kV power) Power outage beginning on 09/21/24. Loss of 33.2 hours for sampling period, as determined by timer box. Non-continuous sampler operation.	CA #24-17 CR 2024-13773 09/22/24: Air monitor resumed normal operation when power was restored at approximately 1440 hours. 09/22/24: Operability verified @ 1738 hours. *Ideal sample collected for sample period: 19,200 cf.*
OCT	Surface Water	6S6	09/24/24 to 09/30/24 (week 1 October composite) ACS plastic dosing chamber found disconnected from dosing chamber flange during week 1 October collection. Week 1 composite sample with unknown stop date and time was used in October composite.	CA #24-18 CR 2024-14097 09/30/24: Reattached dosing chamber flange. 09/30/24: Sampler restored to service @ 1130 hours. 09/30/24: Grab sample collected @ 5S9 @ 1200 hours for comparative analysis. *Ideal sample volume collected for week 1 October composite.*

2024 REMP Atypical Sampling Occurrences (continued)

Date	Sample Type	Location Code(s)	Sample Period Reason for Occurrence(s)	Corrective Action
4th Q	Direct Radiation	6E1	4th Quarter 2024 Environmental dosimeters were missing at REMP location 6E1 during the 4th quarter exchange.	CR 2025-00656 01/09/25: 1st quarter 2025 dosimeters installed at sampling location.

D. Quality Assurance Program

Teledyne Brown Engineering

The quality of the results obtained by TBE is ensured by the implementation of the Quality Assurance Program as described in the Teledyne Brown Engineering Quality Assurance Manual and the Teledyne Brown Engineering Procedure Manual.

E. Summary of Results – Inter-Laboratory Comparison Program

The Teledyne Brown Engineering Environmental Services (TBE-ES) laboratory analyzed Performance Evaluation (PE) samples of air particulate (AP), milk, soil, vegetation, and water matrices that represent test and matrix combinations available for REMP programs. The PE samples supplied by Eckert & Ziegler (E&Z) Analytics Inc., Environmental Resource Associates (ERA), and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

1. E&Z Analytics Evaluation Criteria

   Analytics' evaluation report provides a ratio of TBE's result and E&Z Analytics' known value. Since flag values are not assigned by E&Z Analytics, TBE evaluates the reported ratios based on internal QC requirements based on the DOE MAPEP criteria.

2. ERA Evaluation Criteria

   ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the US EPA, National

Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (PT) program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

3. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

- Acceptable (flag = "A") - result within ± 20% of the reference value
- Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
- Not Acceptable (flag = "N") – bias is greater than 30% of the reference value

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not always resemble typical environmental samples obtained at commercial nuclear power facilities.

Teledyne Brown Engineering

For the TBE laboratory, 152 out of 167 analyses performed met the specified acceptance criteria. Fifteen analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. A summary is found below:

1. NCR 24-02: ERA March MRAD-40 study with Air Particulate AM-241 evaluated as “Not Acceptable.” TBE reported 38.8 pCi/filter and the known value returned at 55.0 pCi/filter (range 39.3-73.3). The root cause investigation determined that the sample was not logged into the system correctly and therefore not prepared with the required tracer. To correct and prevent recurrence, personnel involved are to utilize a template to ensure all analyses are logged as required and the QA Manager will perform sample log review as a back up to ensure accuracy. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

2. NCR 24-03: ERA March MRAD-40 air particulate study GR-B evaluated as “Not Acceptable.” TBE reported 42.1 pCi/filter and the known value returned at 22.2 pCi/filter (range 13.5-33.5). The root cause investigation determined that alpha-to-beta crosstalk was more significant than normal which caused the beta activity to report falsely high data. To correct and prevent recurrence, personnel involved are to adjust the alpha-to-beta crosstalk via correction calculation measures when high alpha activities are observed. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

3. NCR 24-05: ERA April RAD-137 water study GR-A evaluated as “Not Acceptable.” TBE reported 35.2 pCi/L and the known value returned at 52.6 pCi/L (range 39.6-65.6). The root cause investigation determined that the provided samples contained a solids content that was

significantly higher than the typical client samples tested by the laboratory. A set aliquot volume for prior ERA samples was used and not adjusted to account for the sudden increase in solid content. To correct and prevent recurrence, new sample types were ordered from ERA that used Am-231 to better reflect client sample testing and acceptable results were achieved. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

4. NCR 24-06: E&Z Analytics March E14092 air particulate study Co-60 evaluated as “Not Acceptable.” TBE reported 168 pCi and the known value returned at 126 pCi. Additionally, March E14093 soil Ce-141 evaluated as “Not Acceptable.” TBE reported 0.106 pCi/g and the known value returned at 0.071pCi/g. The root cause investigation was unable to determine any anomaly thus no proposed corrective action. No recurrence has occurred.

5. CAR 24-02 (CAR 23-31): MAPEP February 24-MaS50 soil study Fe-55 evaluated as “Not Acceptable.” TBE reported 297 Bq/Kg and the known value returned at 650 Bq/Kg (range 455-845). The root cause investigation suspects that the current analytical procedure is not sufficient to add the interferences added to the sample by MAPEP. This investigation is still ongoing (See NCR 24-16) as the suggested corrective action did not provide desired results.

6. NCR 24-08: MAPEP February 24-MaS50 soil study Ni-63 evaluated as “Not Acceptable.” TBE reported 1070

Bq/Kg and the known value returned at 1530 Bq/Kg (range 1071-1989). The root cause investigation suspected that the sample contained added interferences that are not typically seen in client samples. All QC efforts associated with the sample were acceptable and no anomalies found, even after reanalysis. To correct and prevent recurrence, samples suspected of additional interferences will include the addition of Ni-59 tracer to determine yield results when calculating results. TBE analytical procedure TBE-2013 was updated to include this change.

7. NCR 24-09: MAPEP February 24-MaSU50 urine study Zn-65 evaluated as “Not Acceptable.” The root cause investigation determined that the sample was spiked lower than TBE’s typical detection limit and client requirements. The report was revised by MAPEP indicating “Not Evaluated,” resulting in this nuclide to not be considered a failure.

8. NCR 24-10: MAPEP February 24-MaW50 water study Tc-99 evaluated as “Not Acceptable.” TBE reported 9.95 Bq/L and the known value returned 7.47 Bq/L (range 5.23-9.71). The root cause investigation suspects Thorium interference that was not removed during the column separation process of the analytical procedure; however, it cannot be confirmed as all QC efforts associated with the sample were acceptable and with no anomalies found. To potentially correct and prevent recurrence, an additional rinse step was added to the procedure. Acceptable results returned in a later sample

study, supporting effectiveness of corrective action.

9. NCR 24-11: MAPEP February 24-RdV50 vegetation study Sr-90 evaluated as “Not Acceptable.” TBE reported 0.276 Bq/sample and the known value returned 0.529 Bq/sample (range 0.370-0.688). The root cause investigation determined a laboratory accident resulting in a spilled (loss) of sample. No corrective action was performed as the cause was an unintentional sample spill.

10. NCR 24-14: ERA September MRAD-41 air particulate study U-234/238 evaluated as “Not Acceptable.” TBE reported 14.0/14.2 pCi/filter and the known value returned at 31.1/30.9 pCi/filter (range 23.1-36.9). The root cause investigation determined that the laboratory technician placed double the amount of tracer in the sample by error. To correct and prevent recurrence, samples that have been digested/leached with carrier/tracer added will have a label placed over the cap indicating it has already been added. Additionally, the beaker that aliquot is put in should have markings to indicate carrier/tracer has already been added to the sample.

11. NCR 24-15: ERA September MRAD-41 water study Fe-55 evaluated as “Not Acceptable.” TBE reported 615 pCi/L and the known value returned at 1230 pCi/L (range 723-1790). The root cause is still under investigation.

12. NCR 24-16: MAPEP August 24-MaS51 soil study Fe-55 evaluated as “Not Acceptable.” TBE did not report a

value and the known value returned 780 Bq/Kg (range 546-1014). The root cause is still under investigation.

13. NCR 24-17: MAPEP August 24-RdV51 vegetation study Sr-90 evaluated as “Not Acceptable.” TBE reported 0.95 Bq/sample and the known value returned 2.39 Bq/sample (range 1.67-3.11). The root cause is still under investigation.

The Inter-Laboratory Comparison Program provides evidence of “in control” counting systems and methods, and that the laboratories are producing accurate and reliable data.

IV. Results and Discussion

The analytical results of the 2024 REMP samples are divided into categories based on exposure pathways: atmospheric, direct radiation, terrestrial, and aquatic. The analytical results for the 2024 REMP are summarized in Appendix A, Program Summary. The data for individual samples are presented in Appendix C, Data Tables. The data are compared to the formal preoperational environmental monitoring program data (April 1972 to September 1982) and to data during operations. The data collected demonstrates that the SSES REMP was conducted in compliance with the TRM and the SSES ODCM.

A. Atmospheric

Atmospheric REMP sampling included the collection of air particulates, air iodine and direct radiation samples.

1. Air Particulates

Air particulate samples were collected weekly at six indicator locations (3S2, 9B1, 10S3, 12E1, 12S1 and 13S6) and one

control locations (8G1). Each of the samples collected for the year were analyzed for gross beta. Quarterly composites of the weekly samples from each location were analyzed for specific gamma emitters.

Gross Beta

Gross beta activity was detected in 312 of 312 of the indicator location samples at concentrations ranging from 6 to 25 E-3 pCi/m^3 with an average concentration of 14 E-3 pCi/m^3, and in 51 of 51 of the control location samples at concentrations ranging from 6 to 21 E-3 pCi/m^3 with an average of 13 E-3 pCi/m^3. The maximum preoperational level detected was 102 E-3 pCi/m^3 with an average concentration of 62 E-3 pCi/m^3. (Table C–1, Appendix C); Historical levels of gross beta are shown in Figure C-1. Results for gross beta analysis from 1974 to current year are plotted.

Gamma Spectrometry

Gamma spectrometry was performed on each of the 28 quarterly composite samples. Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in all 24 indicator location composites at concentrations ranging from 48 E-3 to 133 E-3 pCi/m^3 with an average concentration of 82 E-3 pCi/m^3, and in the four control location composites ranging in concentration from 54 to 89 E-3 pCi/m^3 with an average concentration of 74 E-3 pCi/m^3.

The maximum preoperational level detected was 85 E-3 pCi/m^3 with an average concentration of 74 E-3 pCi/m^3. (Table C–2, Appendix C)

All other gamma emitters were less than the LLD.

2. Air Iodine

Filtered air iodine samples were collected weekly at six indicator locations (3S2, 9B1, 10S3, 12E1, 12S1, and 13S6) and one control locations (8G1). Each of the samples collected for the year were analyzed for I-131.

Iodine-131

Iodine-131 was not detected in any indicator location samples or control location samples. Preoperational data is not available for comparison. (Table C–3, Appendix C)

B. Direct Radiation

Ambient radiation levels in the environs were measured at each monitoring location with a pair of optically stimulated luminescent dosimeters (OSLD) composed of aluminum oxide crystals supplied and processed by Landauer. The Landauer OSLD is designed to meet the ANSI N545 Standard and ANSI/HPS Standard N13.37-2014. Packets containing OSLDs for quarterly exposure were placed in the owner-controlled area and around the site at various distances and in each land-based meteorological sector. Emphasis was placed on special interest areas such as population centers, nearby residences, and schools.

A total of 60 locations were monitored for direct radiation during 2024, including 35 site boundary locations, 14 outer distant locations, six special interest locations and five control locations.

Environmental monitoring of ambient radiation levels began prior to the commencement of SSES operation. The preoperational monitoring period data used in the calculation of dose attributable the SSES operation is from 1980-1981. The availability of preoperational direct radiation monitoring data and data for control direct radiation monitoring locations provides a basis for distinguishing between the portions of dose received from exposure to sources of natural radiation and that which might have been from man-made sources of radiation.

Pre-operational and operational data are compared for the purpose of determining if dosimeter data may indicate a dose contribution from SSES operation. Ratios of doses for specific indicator locations to the average of the doses for control locations from operational periods are compared to their counterparts from the preoperational period. Comparison of these ratios is performed in lieu of comparing the actual operational and preoperational doses. All indicator-to-control-average dose ratios for operational periods are compared to expected ranges from 1980-81 data for indicator-to-control-average dose ratios from the same locations. If preoperational data does not exist for the location of interest, indicator-to-control-average dose ratios for operational periods are compared to data for control locations monitored during 1980-81. The purpose for these comparisons is to flag possible SSES direct radiation dose contributions and to provide input, if appropriate, for the calculation of SSES direct radiation dose contributions.

Additional details on the statistical method used for determination of direct radiation dose to a member of the public due to SSES operation (based on environmental dosimeter data) can be found in Engineering Calculation EC-ENVR-1012, Interpretation of Environmental Direct

Radiation Monitoring Results - Estimation of Direct Radiation Dose to Members of the Public Attributable to SSES Fuel Cycle Operations Rev. 2 [Reference 8].

The indicator locations annual average dose rate was 16.9 milliroentgen per standard quarter. The annual average dose rate for the control locations was 13.7 milliroentgen per standard quarter. The preoperational average for the quarterly direct radiation readings was 17.6 milliroentgen per standard quarter.

In 2024, the maximum direct radiation dose to a member of the public calculated using the methodology in EC-ENVR-1012 [Reference 8] was 0.801 mrem.

The results of the direct radiation measurements for 2024 confirmed that the radiation levels in the vicinity of the SSES were similar to previous years. (Table C–4, Appendix C); Figure C-2 – Ambient Radiation Levels Based on Environmental Dosimetry Data from 1973 to current year are plotted as quarterly averages.

C. Terrestrial

Terrestrial REMP sampling included the collection of milk, groundwater, drinking water, and food products.

1. Milk

Milk samples were collected biweekly when cows were on pasture and monthly when cows were not grazing on pasture. Animals are considered on pasture from April to October of each year. Samples were collected in new polyethylene containers and transported in ice chests with preservatives added to the milk.

Milk samples were collected at local dairy farms from 2 indicator locations (5E2 and 13E3) and one control location (10G1). Each sample was analyzed for I-131 and gamma emitters.

Iodine-131

Iodine-131 was not detected above minimum detectable concentration in any of the 60 samples analyzed. Preoperational data is not available for comparison. (Table C-5, Appendix C); Figure C-3 – Iodine-131 Activity in Milk results from 1976 to 2024 are plotted.

Gamma Spectrometry

Naturally occurring K-40 was detected in all 60 samples with concentrations for the 40 indicator location samples ranging from 942 to 1,524 pCi/L with an average concentration of 1,244 pCi/L, and the 20 control location sample concentrations ranging from 1,221 to 1,521 pCi/L with an average concentration of 1,343 pCi/L. The maximum preoperational level detected was 1,500 pCi/L with an average concentration of 1,358 pCi/L. (Table C-5, Appendix C).

All other gamma emitters were less than the LLD.

2. Groundwater

An expanded groundwater monitoring network was initiated in 2006 for the SSES as part of a site-wide hydrogeological investigation in accordance with the Nuclear Energy Institute (NEI) Groundwater Protection Initiative (GPI). The additional groundwater monitoring wells are sampled as part of the

Radiological Environmental Monitoring Program (REMP) to regularly assess groundwater quality and provide early detection of any inadvertent leaks or spills of radioactive materials that could reach groundwater. Groundwater is sampled quarterly and analyzed for H-3 and gamma activity. Additionally, precipitation sampling was initiated in 2007 and analyzed for H-3 activity to assess the influence of station airborne H-3 emissions on groundwater H-3 activities.

Precipitation washout monitoring data is not used in dose calculations; however, the data does give a gross indication of H-3 which makes its way into surface water and soil where it eventually seeps into shallow groundwater. The annual average H-3 concentrations in precipitation, groundwater monitoring wells and surface water are summarized in Table C-7 and graphically depicted in Figure C-4 - Annual Average Tritium Activity (pCi/L) in Precipitation and Surface Water Versus Groundwater.

Groundwater samples were collected quarterly at 10 indicator locations (1S3, 1S4, 4S8, 4S9, 8S4, 7S10, 2S8, 6S11A, 6S12 and 7S11) and one control station (13S7). Each sample was analyzed for H-3 and gamma emitters.

Tritium

Tritium activity was detected in three of the 40 indicator location samples with concentrations ranging from 251 pCi/L to 372 pCi/L with an average concentration of 292 pCi/L. Tritium was not detected in any of the four control location samples. The maximum preoperational level detected was 119 pCi/L. (Table C–6, Appendix C); Figure C-4 – Annual Average Tritium Activity (pCi/L) in Precipitation and Surface Water Versus Groundwater

results from 2007 to 2024 are plotted.

Gamma Spectrometry

Naturally occurring K-40 was detected in one of the indicator samples with a concentration of 354 pCi/L. The Preoperational data is not available for comparison. (Table C-6, Appendix C) All other gamma emitters were less than the LLD.

3. Drinking Water

Drinking water samples were collected monthly from one location (12H2). Each sample was analyzed for gross beta, H-3 and gamma emitters. Drinking Water control samples have not been obtained/analyzed because there are no upstream locations available in reasonable proximity to SSES. As an alternative to an upstream control location, Surface Water pathway control samples are obtained from the Susquehanna River via an auto-composite sampler at the SSES Intake Structure. Surface Water control samples serve as control samples for the Drinking Water pathway since the Surface Water control samples are from the Susquehanna River.

Gross Beta

Gross beta activity was detected in five of the 12 drinking water samples. Sample concentrations ranged from 2.1 to 3.4 pCi/L with an average concentration of 2.6 pCi/L. The maximum preoperational level detected was 2.8 pCi/L with an average concentration of 1.8 pCi/L. (Table C–8, Appendix C); Figure C-5 – Gross Beta Activity in Drinking Water results from 1977 to 2024 are plotted.

Tritium

Tritium activity was not detected in any of the samples. The maximum preoperational level detected was 194 pCi/L with an average of 132 pCi/L. (Table C–8, Appendix C)

Gamma Spectrometry

Naturally occurring K-40 was detected in one of the 12 indicator samples with a concentration of 41 pCi/L. Preoperational data is not available for comparison. (Table C–8, Appendix C)

All other gamma emitters were less than the LLD.

4. Food Products

Food products from one indicator location (11S6) were collected throughout the growing season. All samples were analyzed for gamma emitters and included Swiss chard and collards.

Gamma Spectrometry

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in three of the eight indicator location samples with concentrations ranging from 323 to 878 pCi/kg wet with an average concentration of 527 pCi/kg wet. Preoperational data is not available for comparison.

Naturally occurring K-40 was detected in all eight indicator location samples with concentrations ranging from 2,590 to 3,996 pCi/kg wet with an average concentration of 3,211 pCi/kg

wet. The maximum preoperational level detected was 4,800 pCi/kg wet with an average concentration of 2,140 pCi/kg wet.

Naturally occurring Ac-228 was not detected in any of the indicator or control locations. Preoperational data is not available for comparison.

Naturally occurring Th-228 was not detected in any of the indicator or control locations. Preoperational data is not available for comparison. (Table C-9, Appendix C)

All other gamma emitters were less than the LLD.

D. Aquatic

Aquatic samples include surface water, fish, and sediment samples.

1. Surface Water

Surface water samples were collected routinely at three indicator locations (6S5, 4S7, and LTAW) and two control locations (6S6 and 5S9). Each sample was analyzed for H-3 and gamma emitters and nine samples were analyzed for gross beta.

Gross Beta

Gross beta analysis of Surface water control samples was initiated in the 2nd quarter of 2024 to coincide with an update to the SSES Technical Requirements Manual (TRM). Gross beta activity was detected in four of the nine surface water samples. Sample concentrations ranged from 2.7 to 4.4 pCi/L with an average concentration of 3.3 pCi/L.

Tritium

Tritium activity was not detected in any of the 20 indicator location samples. Tritium was not detected in any of the 15 control location samples. The maximum preoperational level detected was 319 pCi/L, with an average concentration of 140 pCi/L. (Table C-10, Appendix C) Figure C-6 – Tritium Activity in Surface Water, results from 1972 to 2024 are plotted.

Gamma Spectrometry

Naturally occurring K-40 was not detected in any of the indicator location samples. One control locator sample had K-40 detected with a concentration 36.5 pCi/L. Preoperational data is not available for comparison. Iodine-131 was not detected in any of the indicator or control samples. Naturally occurring Th-228 was not detected in any of the indicator or control samples. The maximum preoperational level detected was 0.43 pCi/L, with an average concentration of 0.33 pCi/L. (Table C-10, Appendix C)

All other gamma emitters were less than the LLD.

2. Fish

Edible species of fish were collected in the spring and fall of 2024 at two indicator locations (IND [Susquehanna River] and LTAW (only collected in the fall) and one control location (2H [Susquehanna River]). Each sample was analyzed for gamma emitters.

Gamma Spectrometry

Naturally occurring K-40 was detected in all indicator location samples at concentrations ranging from 2,849 to 4,335 pCi/kg wet with an average concentration of 3,706 pCi/kg wet, and in all control location samples at concentrations ranging from 2,122 to 3,456 pCi/kg wet with an average concentration of 2,978 pCi/kg wet. The maximum preoperational level detected was 3,600 pCi/kg dry with an average concentration of 3,871 pCi/kg dry. (Table C–11, Appendix C)

All other gamma emitters were less than the LLD.

3. Shoreline Sediment

Sediment samples were collected from the Susquehanna River in the spring and fall at two indicator locations (7B and 12F) and one control location (2B). Each sample was analyzed for gamma emitters.

Gamma Spectroscopy

Naturally occurring K-40 was detected in all four of the indicator location samples at concentrations ranging from 6,594 to 7,370 pCi/kg dry with an average concentration of 6,856 pCi/kg dry, and in all of the control location samples with concentrations ranging from 10,370 to 10,450 pCi/kg dry with an average concentration of 10,410 pCi/kg dry. The maximum preoperational level detected was 11,000 pCi/kg dry with an average concentration of 8,500 pCi/kg dry.

Cesium-137 was not detected in any of the indicator or control location samples. The maximum preoperational level detected

was 210 pCi/kg dry with an average concentration of 110 pCi/kg dry.

Naturally occurring Ra-226 was detected in one of the control location samples with a concentration of 4,211 pCi/kg dry and none of the indicator location samples. The maximum preoperational level detected was 1,900 pCi/kg dry with an average concentration of 700 pCi/kg dry.

Naturally occurring Ac-228 was detected in all four indicator location samples at concentrations ranging from 575 to 871 pCi/kg dry with an average concentration of 732 pCi/kg dry, and in both of the control location samples at concentrations ranging from 881 to 1,225 pCi/kg dry with an average concentration of 1,053 pCi/kg dry. Preoperational data is not available for comparison.

Naturally occurring Th-228 was detected in all of the four indicator location samples at concentrations ranging from 478 to 873 pCi/kg dry with an average concentration of 649 pCi/kg dry, and in both of the control location samples at concentrations ranging from 738 and 982 pCi/kg dry with an average concentration of 860 pCi/kg dry. The maximum preoperational level detected was 3,200 pCi/kg dry with an average concentration of 1,300 pCi/kg dry. (Table C 12, Appendix C)

All other gamma emitters were less than the LLD.

E. Land Use Census

SYNOPSIS OF 2024 LAND USE CENSUS

Applied Ecoscience, Inc. conducted a Land Use Census during the 2024 growing season around SSES to comply with the ODCM. The purpose of the survey was to document the nearest milk animal, residence and garden greater than 50 m^2 (approximately 500 ft^2) producing broad leaf vegetation within a distance of 8 km (approximately 5 miles) in each of the 16 meteorological sectors surrounding the SSES.

Distance in Miles from the SUSQUEHANNA NUCLEAR Reactor Buildings				
Meteorological Sector		Nearest Residence Jul-Oct, 2024 miles	Nearest Garden Jul-Oct, 2024 miles	Nearest Dairy Farm July-Nov, 2024 miles
1	N	1.3	4.6	>5.0
2	NNE	1.0	2.3 [a,c,e]	>5.0
3	NE	0.9	2.7	>5.0
4	ENE	2.1	2.4 [a,c]	>5.0
5	E	1.6	4.9	4.5 [d]
6	ESE	0.5	3.1	>5.0
7	SE	0.6	0.6	>5.0
8	SSE	0.7	2.9	>5.0
9	S	1.1	3.5	>5.0
10	SSW	0.9	1.3	>5.0 [d]
11	SW	1.5	4.2	>5.0
12	WSW	1.3	1.3	1.7
13	W	1.4	3.2	5.0
14	WNW	1.1	3.6	>5.0
15	NW	0.8	2.3	>5.0
16	NNW	0.7	4.0	>5.0

a Chickens raised for consumption at this location
b Ducks raised for consumption at this location
c Eggs consumed from chickens at this location
d Fruits/vegetables raised for consumption at this location
e Beef cattle raised for consumption at this location
f Rabbits raised for consumption at this location.

The 2024 Land Use Census results are summarized in the above table.

V. Annotations to Previous AREOR

There are no annotations to the previous AREOR.

VI. Conclusions

The Radiological Environmental Monitoring Program for SSES was conducted during 2024 in accordance with the SSES TRM and ODCM. The LLD values required by the TRM and ODCM were achieved for this reporting period (See Appendix A and Appendix C). The objectives of the program were also met during this period. The data collected assists in demonstrating that SSES was operated in compliance with TRM and ODCM requirements.

The concentration of radioactive material in the environment that could be attributable to SSES operations was only a small fraction of the concentration of naturally occurring and man-made radioactivity. Since these results were comparable to the results obtained during the preoperational phase of the program, which ran from 1972 to 1982, and with results collected since commercial operation, it is concluded that operation of the SSES had no significant radiological impact on the health and safety of the public or the environment.

From the results obtained, it can be concluded that the levels and fluctuations of radioactivity in environmental samples were as expected for the environment surrounding the SSES.

VII. References

[1] Annual Radiological Environmental Operating Report, January 1 to December 31, 2024, prepared by Teledyne Brown Engineering, Knoxville TN.

[2] Final Safety Analysis Report

[3] Final Environmental Statement

[4] Susquehanna Steam Electric Station, 2024 Land Use Census. Prepared for Susquehanna Nuclear, LLC, Berwick, PA. December 2024. Applied Ecoscience, Inc. Berwick, PA.

[5] Susquehanna Nuclear, LLC. Radiological Environmental Monitoring Program, ODCM-QA-008, Rev. 21.

[6] United States Nuclear Regulatory Commission. “An Acceptable Radiological Environmental Monitoring Program.” Radiological Assessment Branch Technical Position. November 1979, Revision 1. USNRC, Washington, DC.

[7] NCRP Report No. 160, “Ionizing Radiation Exposure of the Population of the United States”, (2009).

[8] Engineering Calculation EC-ENVR-1012, Interpretation of Environmental Direct Radiation Monitoring Results – Estimation of Direct Radiation Dose to Members of the Public Attributable to SSES Fuel Cycle Operations, Rev. 2. May 2013

[9] Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Rev. 1 October 1977

APPENDIX A

PROGRAM SUMMARY

TABLE A
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 26, 2023 to December 31, 2024

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Air Particulates	GR-B	363	10	1.395E+01 (312/312)	10S3	1.462E+01	(52/52)	1.287E+01 (51/51)	0
(E-3 pCi/m^3)				(5.690E+00 - 2.460E+01)	0.6 MILES SSW	(6.880E+00 - 2.390E+01)		(6.380E+00 - 2.120E+01)	
	GAMMA	28							
	BE-7	28	N/A	8.187E+01 (24/24)	10S3	9.491E+01	(4/4)	7.359E+01 (4/4)	0
				(4.773E+01 - 1.334E+02)	0.6 MILES SSW	(5.692E+01 - 1.334E+02)		(5.354E+01 - 8.926E+01)	
	K-40	28	N/A	<MDC (0/24)		<MDC		<MDC (0/4)	0
	CS-134	28	50	<MDC (0/24)		<MDC		<MDC (0/4)	0
	CS-137	28	60	<MDC (0/24)		<MDC		<MDC (0/4)	0
Charcoal	GAMMA	363							
(E-3 pCi/m^3)	I-131	363	70	<MDC (0/312)		<MDC		<MDC (0/51)	0
Ambient Radiation	OSLD	239	N/A	1.689E+01 (219/219)	9S2	3.867E+01	(4/4)	1.370E+01 (20/20)	0
(mR/std. qtr.)				(6.388E+00 - 4.111E+01)	0.2 MILES S	(3.589E+01 - 4.111E+01)		(8.386E+00 - 1.775E+01)	
Milk	I-131	60	1	<MDC (0/40)		<MDC		<MDC (0/20)	0
(pCi/Liter)									
	GAMMA	60							
	K-40	60	N/A	1.244E+03 (40/40)	10G1 C	1.343E+03	(20/20)	1.343E+03 (20/20)	0
				(9.424E+02 - 1.524E+03)	14 MILES SSW	(1.221E+03 - 1.521E+03)		(1.221E+03 - 1.521E+03)	
	CS-134	60	15	<MDC (0/40)		<MDC		<MDC (0/20)	0

TABLE A
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 26, 2023 to December 31, 2024

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Milk (cont'd) (pCi/Liter)	CS-137	60	18	<MDC	(0/40)	<MDC			<MDC	(0/20)	0
	BA-140	60	60	<MDC	(0/40)	<MDC			<MDC	(0/20)	0
	LA-140	60	15	<MDC	(0/40)	<MDC			<MDC	(0/20)	0
	TH-228	60	N/A	<MDC	(0/40)	<MDC			<MDC	(0/20)	0
Ground Water (pCi/Liter)	H-3	44	2000	2.923E+02 (2.510E+02 - 3.720E+02)	(3/40)	8S4 0.1 MILES SSE	3.720E+02 (3.720E+02)	(1/4)	<MDC	(0/4)	0
	GAMMA	44									
	K-40	44	N/A	3.542E+02 (3.542E+02)	(1/40)	4S9 0.3 MILES E	3.542E+02 (3.542E+02)	(1/4)	<MDC	(0/4)	0
	MN-54	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	CO-58	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	FE-59	44	30	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	CO-60	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0

TABLE A
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 26, 2023 to December 31, 2024

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Ground Water (cont'd) (pCi/Liter)	ZN-65	44	30	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	NB-95	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	ZR-95	44	30	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	I-131	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	CS-134	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	CS-137	44	18	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	BA-140	44	60	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	LA-140	44	15	<MDC	(0/40)	<MDC			<MDC	(0/4)	0
	TH-228	44	N/A	4.657E+01 (4.657E+01)	(1/40)	4S9 0.3 MILES E	4.657E+01 (4.657E+01)	(1/4)	<MDC	(0/4)	0
Drinking Water (pCi/Liter)	GR-B	12	4	2.564E+00 (2.120E+00 - 3.370E+00)	(5/12)	12H2 26 MILES WSW	2.564E+00 (2.120E+00 - 3.370E+00)	(5/12)	N/A		0
	H-3	12	2000	<MDC	(0/12)	<MDC			N/A		0

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Drinking Water (cont'd)	GAMMA	12								
(pCi/Liter)	K-40	12	N/A	4.111E+01 (1/12) (4.111E+01)		12H2 26 MILES WSW	4.111E+01 (4.111E+01)	(1/12)	N/A	0
	MN-54	12	15	<MDC	(0/12)	<MDC			N/A	0
	CO-58	12	15	<MDC	(0/12)	<MDC			N/A	0
	FE-59	12	30	<MDC	(0/12)	<MDC			N/A	0
	CO-60	12	15	<MDC	(0/12)	<MDC			N/A	0
	ZN-65	12	30	<MDC	(0/12)	<MDC			N/A	0
	NB-95	12	15	<MDC	(0/12)	<MDC			N/A	0
	ZR-95	12	30	<MDC	(0/12)	<MDC			N/A	0
	I-131	12	15	<MDC	(0/12)	<MDC			N/A	0
	CS-134	12	15	<MDC	(0/12)	<MDC			N/A	0

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LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 26, 2023 to December 31, 2024

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Drinking Water (cont'd) (pCi/Liter)	CS-137	12	18	<MDC	(0/12)	<MDC		N/A	0
	BA-140	12	60	<MDC	(0/12)	<MDC		N/A	0
	LA-140	12	15	<MDC	(0/12)	<MDC		N/A	0
Food/Garden Crops (pCi/kg wet)	GAMMA	8							
	BE-7	8	N/A	5.274E+02 (3.231E+02 - 8.781E+02)	(3/8)	11S6 0.5 MILES SW	5.274E+02 (3.231E+02 - 8.781E+02)	(3/8)	N/A	0
	K-40	8	N/A	3.211E+03 (2.590E+03 - 3.996E+03)	(8/8)	11S6 0.5 MILES SW	3.211E+03 (2.590E+03 - 3.996E+03)	(8/8)	N/A	0
	MN-54	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	CO-58	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	FE-59	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	CO-60	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	ZN-65	8	N/A	<MDC	(0/8)	<MDC		N/A	0

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Food/Garden Crops (cont'd) (pCi/kg wet)	NB-95	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	ZR-95	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	I-131	8	60	<MDC	(0/8)	<MDC		N/A	0
	CS-134	8	60	<MDC	(0/8)	<MDC		N/A	0
	CS-137	8	80	<MDC	(0/8)	<MDC		N/A	0
	BA-140	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	LA-140	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	AC-228	8	N/A	<MDC	(0/8)	<MDC		N/A	0
	TH-228	8	N/A	<MDC	(0/8)	<MDC		N/A	0

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Surface Water (pCi/Liter)	GR-B	9	4	N/A		6S6 C 0.8 MILES ESE	3.308E+00 (2.710E+00 - 4.370E+00)	(4/9)	3.308E+00 (2.710E+00 - 4.370E+00)	(4/9)	0
	H-3	35	2000	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	GAMMA	35									
	K-40	35	N/A	<MDC	(0/20)	6S6 C 0.8 MILES ESE	3.647E+01 (3.647E+01)	(1/12)	3.647E+01 (3.647E+01)	(1/15)	0
	MN-54	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	CO-58	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	FE-59	35	30	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	CO-60	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	ZN-65	35	30	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	NB-95	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	ZR-95	35	30	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	I-131	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0

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Reporting Period: December 26, 2023 to December 31, 2024

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Surface Water (cont'd) (pCi/Liter)	CS-134	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	CS-137	35	18	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	BA-140	35	60	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	LA-140	35	15	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
	TH-228	35	N/A	<MDC	(0/20)	<MDC			<MDC	(0/15)	0
Fish (pCi/kg wet)	GAMMA	14									
	K-40	14	N/A	3.706E+03 (2.849E+03 - 4.335E+03)	(8/8)	IND 0.9-1.4 MILES ESE	3.730E+03 (2.849E+03 - 4.335E+03)	(6/6)	2.978E+03 (2.122E+03 - 3.456E+03)	(6/6)	0
	MN-54	14	130	<MDC	(0/8)	<MDC			<MDC	(0/6)	0
	CO-58	14	130	<MDC	(0/8)	<MDC			<MDC	(0/6)	0
	FE-59	14	260	<MDC	(0/8)	<MDC			<MDC	(0/6)	0
	CO-60	14	130	<MDC	(0/8)	<MDC			<MDC	(0/6)	0

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Fish (cont'd) (pCi/kg wet)	ZN-65	14	260	<MDC (0/8)		<MDC	<MDC (0/6)	0
	CS-134	14	130	<MDC (0/8)		<MDC	<MDC (0/6)	0
	CS-137	14	150	<MDC (0/8)		<MDC	<MDC (0/6)	0
Sediment (pCi/kg dry)	GAMMA	6						
	K-40	6	N/A	6.856E+03 (4/4) (6.594E+03 - 7.370E+03)	2B 1.6 MILES NNE	1.041E+04 (2/2) (1.037E+04 - 1.045E+04)	1.041E+04 (2/2) (1.037E+04 - 1.045E+04)	0
	CS-134	6	150	<MDC (0/4)		<MDC	<MDC (0/2)	0
	CS-137	6	180	<MDC (0/4)		<MDC	<MDC (0/2)	0
	RA-226	6	N/A	<MDC (0/4)	2B C 1.6 MILES NNE	4.211E+03 (1/2) (4.211E+03)	4.211E+03 (1/2)	0
	AC-228	6	N/A	7.315E+02 (4/4) (5.747E+02 - 8.707E+02)	2B C 1.6 MILES NNE	1.053E+03 (2/2) (8.808E+02 - 1.225E+03)	1.053E+03 (2/2) (8.808E+02 - 1.225E+03)	0
	TH-228	6	N/A	6.494E+02 (4/4) (4.784E+02 - 8.733E+02)	2B C 1.6 MILES NNE	8.598E+02 (2/2) (7.380E+02 - 9.815E+02)	8.598E+02 (2/2) (7.380E+02 - 9.815E+02)	0

1. The total number of analyses does not include duplicates, splits or repeated analyses.
2. The Technical Requirement LLDs are shown when applicable.
3. The mean and range are based on all results above MDC. The ratio indicated in parentheses is the total number of results used to calculate the mean to the total number of samples.
4. USNRC Reporting Levels are specified in the Technical Requirements (i.e., when Reporting Levels in Technical Requirements are exceeded).

APPENDIX B

SAMPLE DESIGNATION

AND

LOCATIONS

SAMPLE DESIGNATION

All distances from the SSES to monitoring locations are measured from the standby gas treatment vent at 44200/N34117 (Pa. Grid System). The location codes are based on both distance and direction from the SSES. The letters in the location codes indicate if the monitoring locations are on site (within the site boundary) or, if they are not on site, the approximate distances of the location from the SSES as described below:

S	=	On site	E	=	4 – 5 miles
A	=	< 1 mile	F	=	5 – 10 miles
B	=	1 – 2 miles	G	=	10 – 20 miles
C	=	2 – 3 miles	H	=	> 20 miles
D	=	3 – 4 miles			

The numbers preceding the letters in the location codes provide the direction of the monitoring locations from the SSES by indicating the sectors in which they are located. A total number of 16 sectors (numbered one through 16) equally divide an imaginary circle on a map of the SSES and its vicinity, with the SSES at the center of the circle. The middle of sector one is directed due North (N). Moving clockwise from sector one, the sector immediately adjacent to sector one is sector two, the middle of which is directed due north, north east (NNE). Continuing to move clockwise the sector number increases to 16, which is the north northwest sector (NNW).

TABLE B-1

SAMPLING LOCATIONS

Specific information about the individual sampling locations are given in Table B-1. Maps B-1 through B-6 show the locations of sampling stations with respect to the Site. A Portable Global Positioning System (GPS) was used to provide the coordinates of sampling locations.

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
LESS THAN ONE MILE FROM THE SSES		DEG.	DEG.	
6S5	0.9 mi.ESE;	41.084639	-76.130642	Surface water
6S6 **	0.8 mi.ESE;	41.088115	-76.131637	Surface water
5S9**	0.8 mi. E	41.093292	-76.130472	Surface water
LTAW	0.7 mi.NE-ESE;	41.098356	-76.135401	Fish. Surface water
4S7	0.4 mi. ENE	41.094418	-76.138236	Surface water
10S3	0.6 mi. SSW;	41.085264	-76.152128	Air
12S1	0.4 mi.WSW;	41.088436	-76.154314	Air
13S6	0.4 mi.W;	41.091771	-76.153869	Air
3S2	0.5 mi NE;	41.095716	-76.140207	Air
1S4	0.1 mi N;	41.093302	-76.145853	Ground water
2S8	0.1 mi.NNE;	41.094991	-76..044207	Ground water
6S11A	0.4 mi.ESE;	41.083448	-76.133412	Ground water
6S12	0.8 mi.ESE;	41.083411	-76.116935	Ground water
7S11	0.3 mi.SE;	41.083527	-76.133513	Ground water
1S3	0.1 mi N;	41.093640	-76.146076	Ground water
4S8	0.1 mi.ENE;	41.092306	-76.144283	Ground water
4S9	0.3 mi.E;	41.093369	-76.141644	Ground water
8S4	0.1 mi.SSE;	41.091424	-76.145531	Ground water
7S10	0.3 mi.SE;	41.089736	-76.142783	Ground water
13S7**	0.2 mi.W;	41.091236	-76.149647	Ground water
11S6	0.5 mi.SW;	41.085305	-76.152022	Broadleaf
Site 1	0.1 mi.ESE;	41.092275	-76.145022	Precipitation
Site 2	0.1 mi.SSE;	41.091309	-76.145708	Precipitation
Site 3	0.1 mi.WSW;	41.091243	-76.147345	Precipitation
Site 4	0.1 mi.NW;	41.093321	-76.147316	Precipitation

**** Control Location**

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
FROM ONE to FIVE MILES FROM THE SSES		DEG.	DEG.	
IND	0.9 mi.ESE;	41.085141	-76.130174	Fish
IND	1.4 mi.ESE;	41.075618	-76.132682	Fish
2B **	1.6 mi.NNE;	41.112441	-76.134758	Sediment
7B	1.2 mi.SE;	41.078924	-76.131548	Sediment
9B1	1.3 mi. SSW;	41.085264	-76.152128	Air
12E1	4.7 mi.WSW;	41.072418	-76.230554	Air
5E2	4.5 mi.E;	41.085184	-76.061099	Milk
13E3	5.0 mi.W;	41.100259	-76.241102	Milk
11D1	3.3 mi.SW;	41.055212	-76.186797	Food Products
** Control Location				
GREATER THAN FIVE MILES FROM THE SSES				
12H2	26 mi.WSW;	40.947192	-76.604524	Drinking water
2H **	30 mi.NNE;	41.459508	-75.853096	Fish
12F	6.9 mi.WSW;	41.041323	-76.255396	Sediment
12F7	8.3 mi.WSW	41.036689	-76.286776	Food Products
8G1 **	12 mi.SSE;	40.928886	-76.055092	Air
10G1 **	14 mi.SSW;	40.934847	-76.284449	Milk

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
OSLD LOCATIONS				
LESS THAN ONE MILE FROM THE SSES		DEG.	DEG.	
1S2	0.2 mi.N;	41.09566	-76.146121	OSLD
2S2	0.9 mi.NNE;	41.10207	-76.141192	OSLD
2S3	0.2 mi.NNE;	41.09486	-76.144101	OSLD
3S2	0.5 mi.NE;	41.09574	-76.140086	OSLD
3S3	0.9 mi.NE;	41.10183	-76.133127	OSLD
4S3	0.2 mi.ENE;	41.09322	-76.141934	OSLD
4S6	0.7 mi.ENE;	41.09687	-76.133807	OSLD
5S4	0.8 mi.E;	41.09286	-76.131604	OSLD
5S7	0.3 mi.E;	41.09199	-76.141165	OSLD
6S4	0.2 mi.ESE;	41.09132	-76.142616	OSLD
6S9	0.2 mi.ESE;	41.09067	-76.142966	OSLD
7S6	0.2 mi.SE;	41.08972	-76.14359	OSLD
7S7	0.4 mi.SE;	41.08745	-76.142033	OSLD
8S2	0.2 mi.SSE;	41.08907	-76.14437	OSLD
9S2	0.2 mi.S;	41.08952	-76.14322	OSLD
9S3	0.3 mi. S	41.087544	-76.145369	OSLD
9S4	0.4 mi. S	41.086672	-76.146280	OSLD
10S1	0.4 mi.SSW;	41.08663	-76.150082	OSLD
10S2	0.2 mi.SSW;	41.08894	-76.147881	OSLD
11S7	0.4 mi.SW;	41.08832	-76.15297	OSLD
12S1	0.4 mi.WSW;	41.0887	-76.154112	OSLD
12S3	0.4 mi.WSW;	41.08968	-76.153192	OSLD
13S2	0.4 mi.W;	41.09198	-76.153166	OSLD
13S5	0.4 mi.W;	41.09179	-76.153167	OSLD
13S6	0.4 mi.W;	41.09177	-76.154073	OSLD
14S5	0.5 mi.WNW;	41.09503	-76.153787	OSLD
15S5	0.4 mi.NW;	41.09576	-76.15103	OSLD
16S1	0.3 mi.NNW;	41.09611	-76.147388	OSLD
16S2	0.3 mi.NNW;	41.09599	-76.148922	OSLD
6A4 *	0.6 mi.ESE;	41.08791	-76.136795	OSLD

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
LESS THAN ONE MILE FROM THE SSES		DEG.	DEG.	
8A3	0.9 mi.SSE;	41.07982	-76.1139078	OSLD
11A1	0.6 mi.SW	41.08536	-76.15326	OSLD
15A3 *	0.9 mi.NW;	41.10003	-76.1585	OSLD
16A2 *	0.8 mi.NNW;	41.1025	-76.151595	OSLD
FROM ONE to FIVE MILES FROM THE SSES				
12S7	1.1 mi.WSW;	41.08621	-76.165914	OSLD
8B2 *	1.4 mi.SSE;	41.07483	-76.130724	OSLD
9B1	1.3 mi.S;	41.07356	-76.147874	OSLD
10B3 *	1.7 mi.SSW;	41.07064	-76.156646	OSLD
1D5	4.0 mi.N;	41.14936	-76.144346	OSLD
8D3	4.0 mi.SSE;	41.03824	-76.121683	OSLD
9D4	3.6 mi.S;	41.04015	-76.144529	OSLD
10D1	3.0 mi.SSW;	41.05446	-76.175026	OSLD
12D2	3.7 mi.WSW;	41.07363	-76.213306	OSLD
14D1	3.6 mi.WNW;	41.10706	-76.211891	OSLD
3E1	4.7 mi NE;	41.13953	-76.082398	OSLD
4E2	4.7 mi.ENE;	41.12157	-76.064115	OSLD
5E2	4.5 mi. E;	41.08539	-76.060486	OSLD
6E1	4.7 mi.ESE;	41.07275	-76.059529	OSLD
7E1	4.2 mi.SE;	41.04891	-76.090309	OSLD
11E1	4.7 mi. SW;	41.05188	-76.218713	OSLD
12E1 *	4.7 mi.WSW;	41.0725	-76.230331	OSLD
13E4	4.1 mi.W;	41.08962	-76.223726	OSLD

* Special Interest Area (other than controls)

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
GREATER THAN FIVE MILES FROM THE SSES		DEG.	DEG.	
2F1	5.9 mi.NNE;	41.16796	-76.09146	OSLD
15F1	5.4 mi.NW;	41.15595	-76.202506	OSLD
16F1	7.8 mi.NNW;	41.18985	-76.229283	OSLD
3G4 **	17 mi.NE;	41.23431	-76.869061	OSLD
4G1 **	14 mi.ENE;	41.13898	-75.885121	OSLD
7G1 **	14 mi.SE;	40.94636	-76.974184	OSLD
12G1 **	15 mi.WSW;	41.0262	-76.411566	OSLD
12G4 **	10 mi. WSW;	40.03868	-76.327731	OSLD

* Special Interest Area (other than controls)

** Control Location

TABLE B-2

SUSQUEHANNA STEAM ELECTRIC STATION RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Analytical Procedure Number
Ambient Radiation	Dosimeter	Quarterly	SSES, HP-TP-205	Landauer Procedure L313, Inlight Dosimeter Analysis
Air	Gross Beta	Weekly	Applied Ecoscience, Appendix 2	TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices.
Air	I-131	Weekly	Applied Ecoscience, Appendix 2	TBE-2012 Radioiodine in Various Matrices
Air	Gamma	Quarterly	Applied Ecoscience, Appendix 2	TBE-2007 Gamma Emitting Radioisotope Analysis
Drinking Water	Gross Beta	Monthly	Applied Ecoscience, Appendix 4 & 5	TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices.
Surface & Drinking Water	Tritium	Monthly	Applied Ecoscience, Appendix 3, 4, 5, 13	TBE-2010 Beta Activity by Liquid Scintillation (Direct Prep & Simple Distillation)
Surface & Drinking Water	Gamma	Monthly	Applied Ecoscience, Appendix 3, 4, 5, 13	TBE-2007 Gamma Emitting Radioisotope Analysis.
Ground Water	Tritium	Quarterly	Applied Ecoscience, Appendix 6	TBE-2010 Beta Activity by Liquid Scintillation (Direct Prep & Simple Distillation)
Ground Water	Gamma	Quarterly	Applied Ecoscience, Appendix 6	TBE-2007 Gamma Emitting Radioisotope Analysis

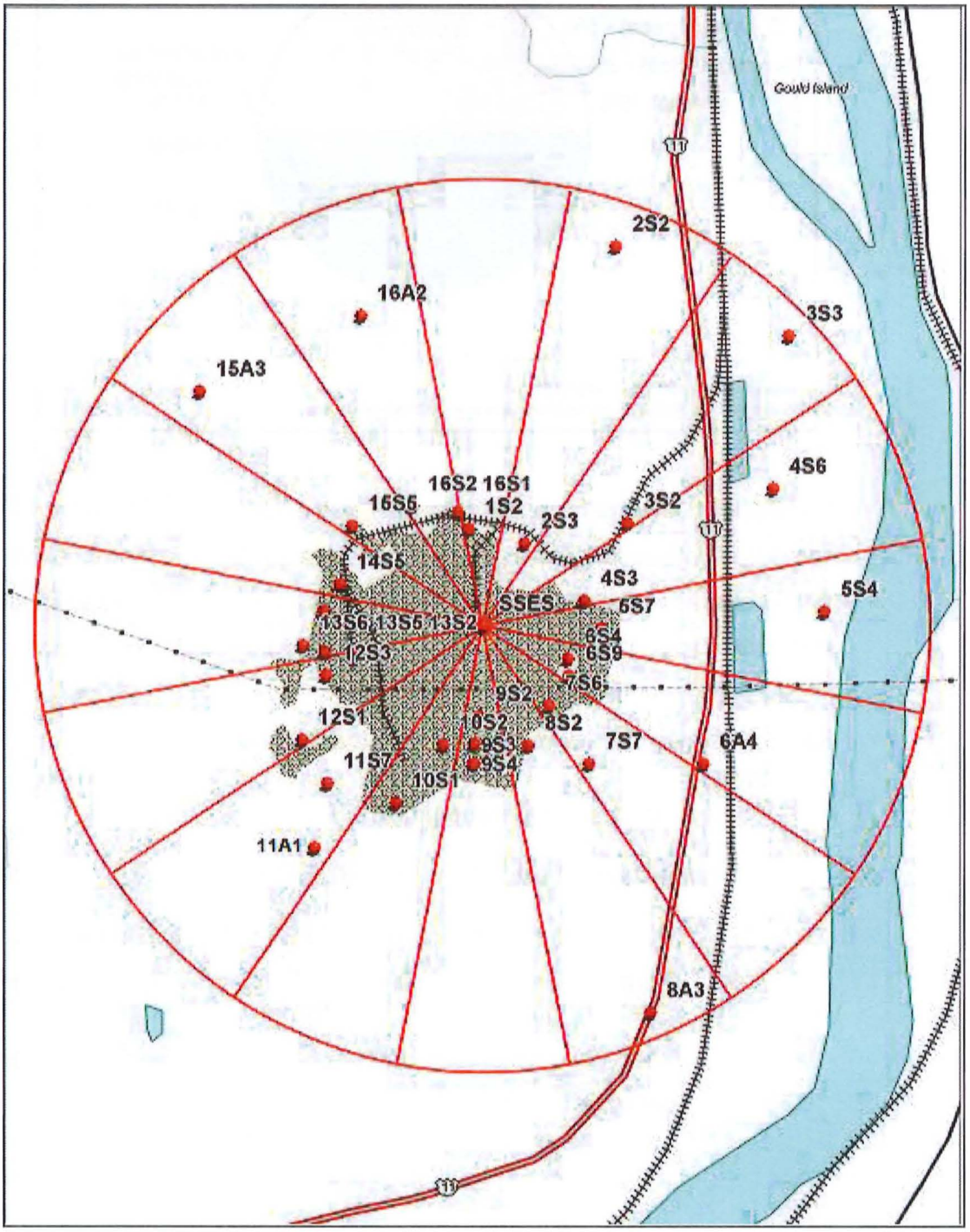
TABLE B-2 (cont'd)

SUSQUEHANNA STEAM ELECTRIC STATION RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Analytical Procedure Number
Precipitation	Tritium	Monthly (Apr – Nov) / Quarterly	Applied Ecoscience, Appendix 8	TBE-2010 Beta Activity by Liquid Scintillation (Direct Prep & Simple Distillation)
Milk	Gamma	Monthly/Bi-Weekly	Applied Ecoscience, Appendix 7	TBE-2007 Gamma Emitting Radioisotope Analysis
Milk	I-131	Monthly/Bi-Weekly	Applied Ecoscience, Appendix 7	TBE-2012 Radioiodine in Various Matrices
Fish	Gamma	Semi-Annually (Spring/Fall)	Applied Ecoscience, Appendix 9	TBE-2007 Gamma Emitting Radioisotope Analysis
Sediment	Gamma	Semi-Annually (Spring/Fall)	Applied Ecoscience, Appendix 10	TBE-2007 Gamma Emitting Radioisotope Analysis
Fruits & Vegetables	Gamma	In Season (When available)	Applied Ecoscience, Appendix 11 Applied Ecoscience, Appendix 12	TBE-2007 Gamma Emitting Radioisotope Analysis

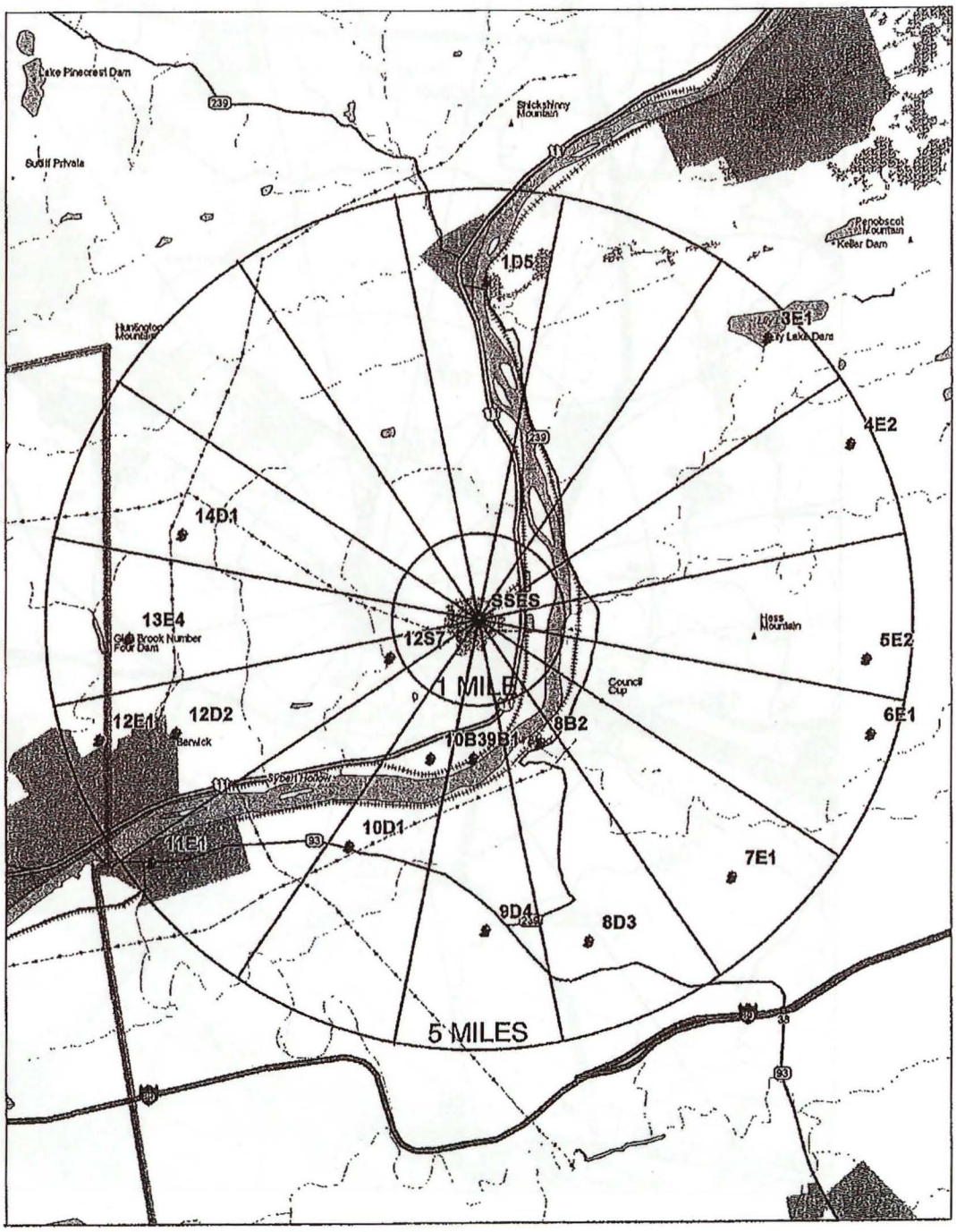
MAP B-1

Direct Radiation Monitoring Locations Within One Mile



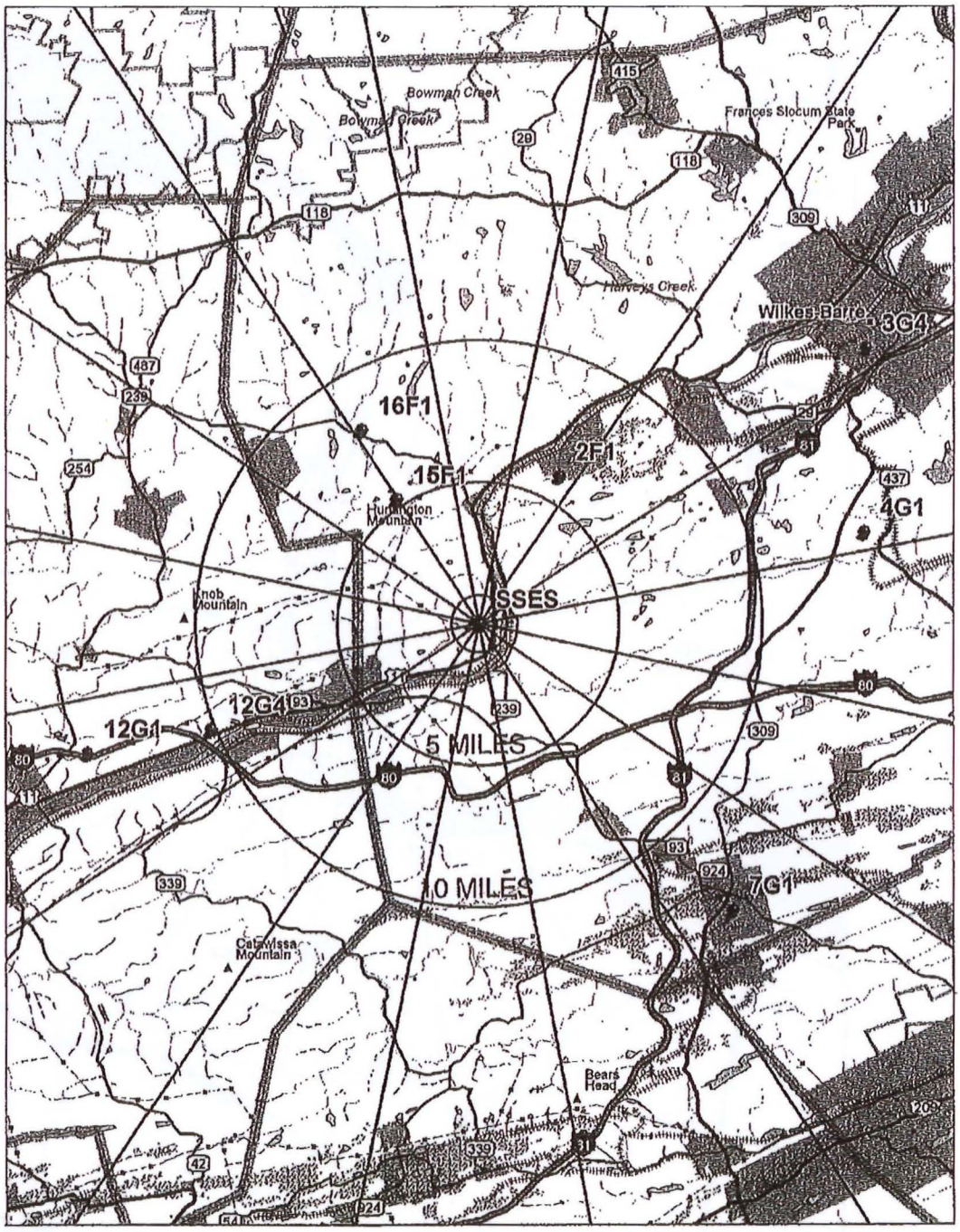
MAP B-2

Direct Radiation Monitoring Locations From One to Five Miles



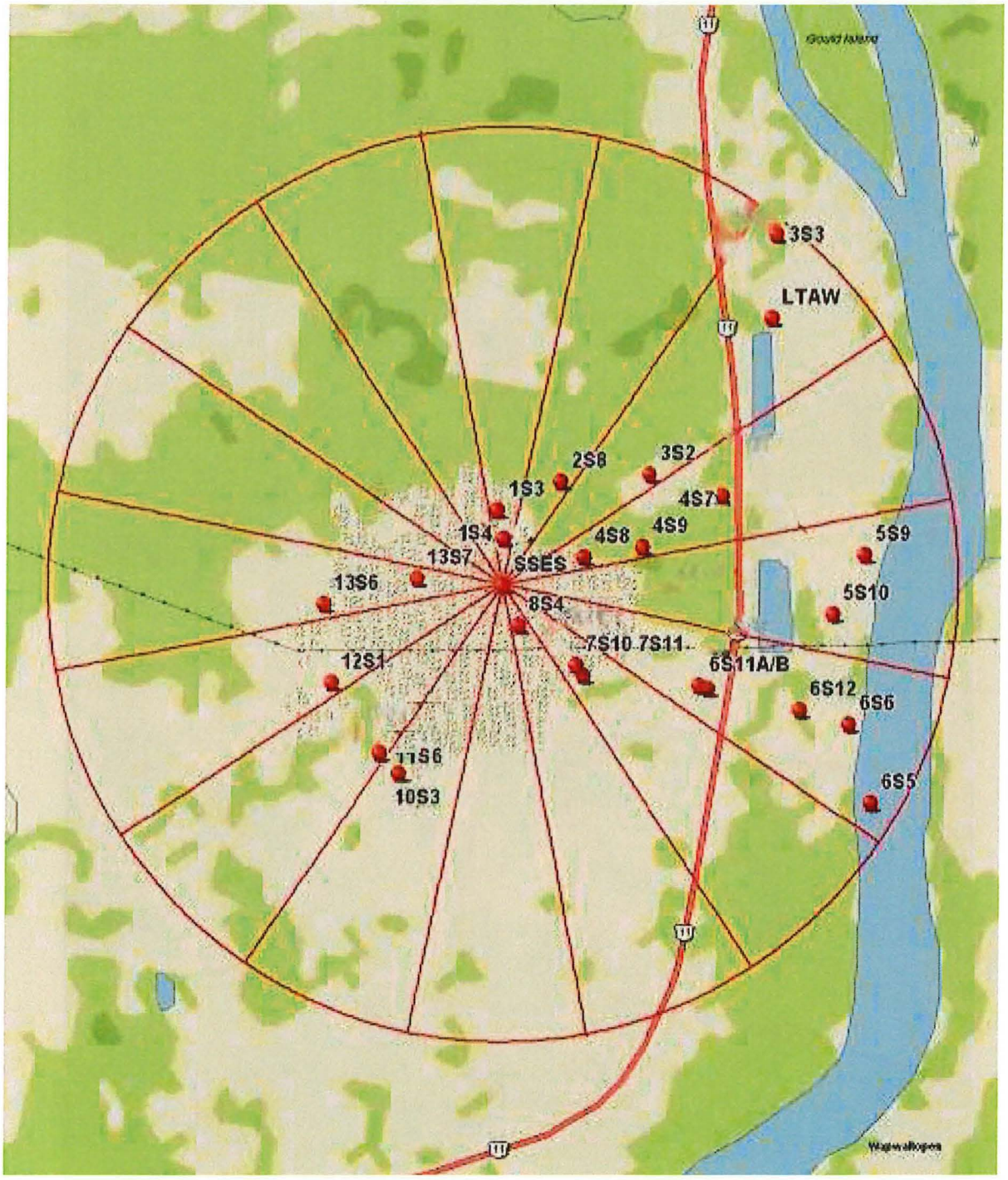
MAP B-3

Direct Radiation Monitoring Locations Greater Than Five Miles



MAP B-4

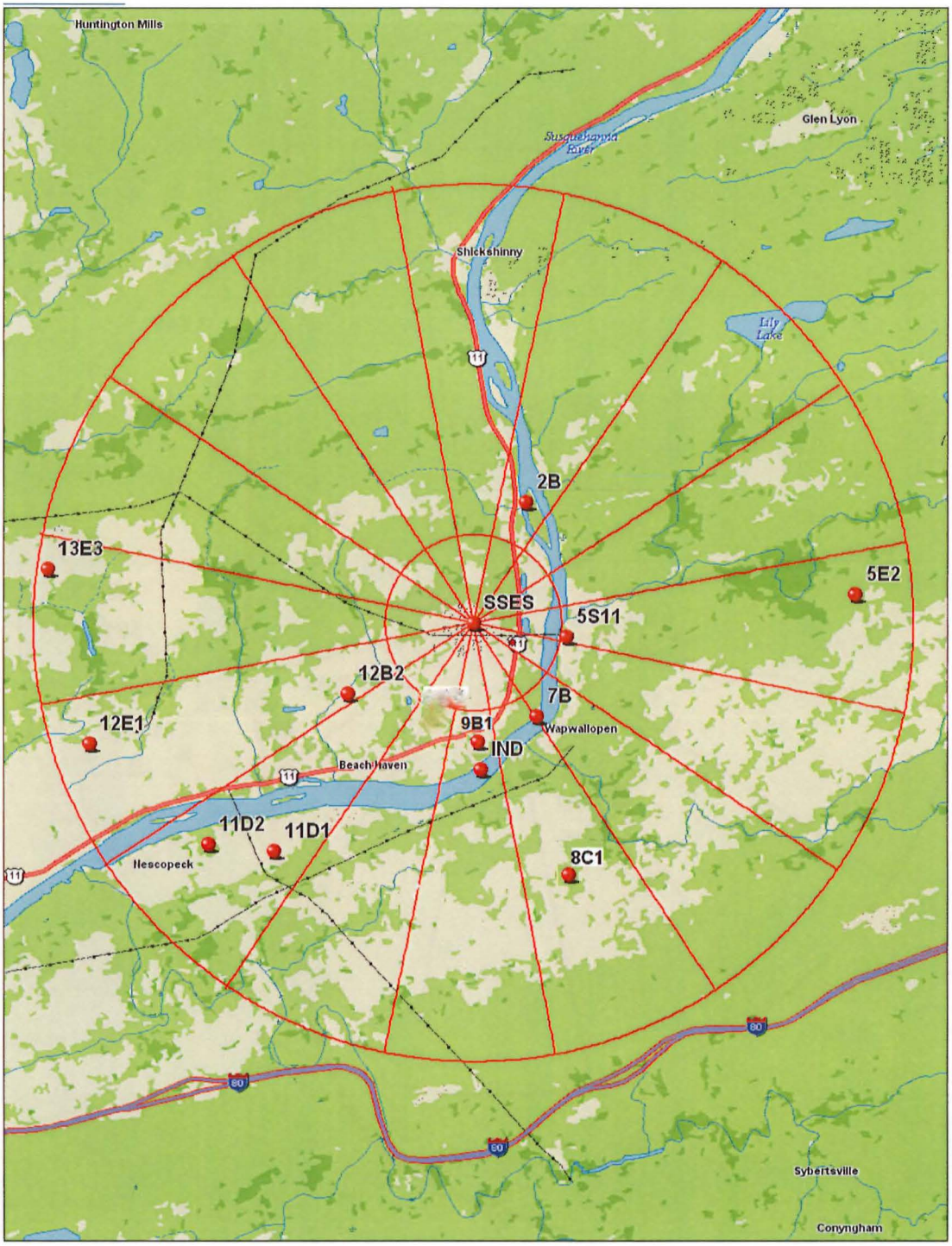
Environmental Sampling Locations Within One Mile



MAP B-5

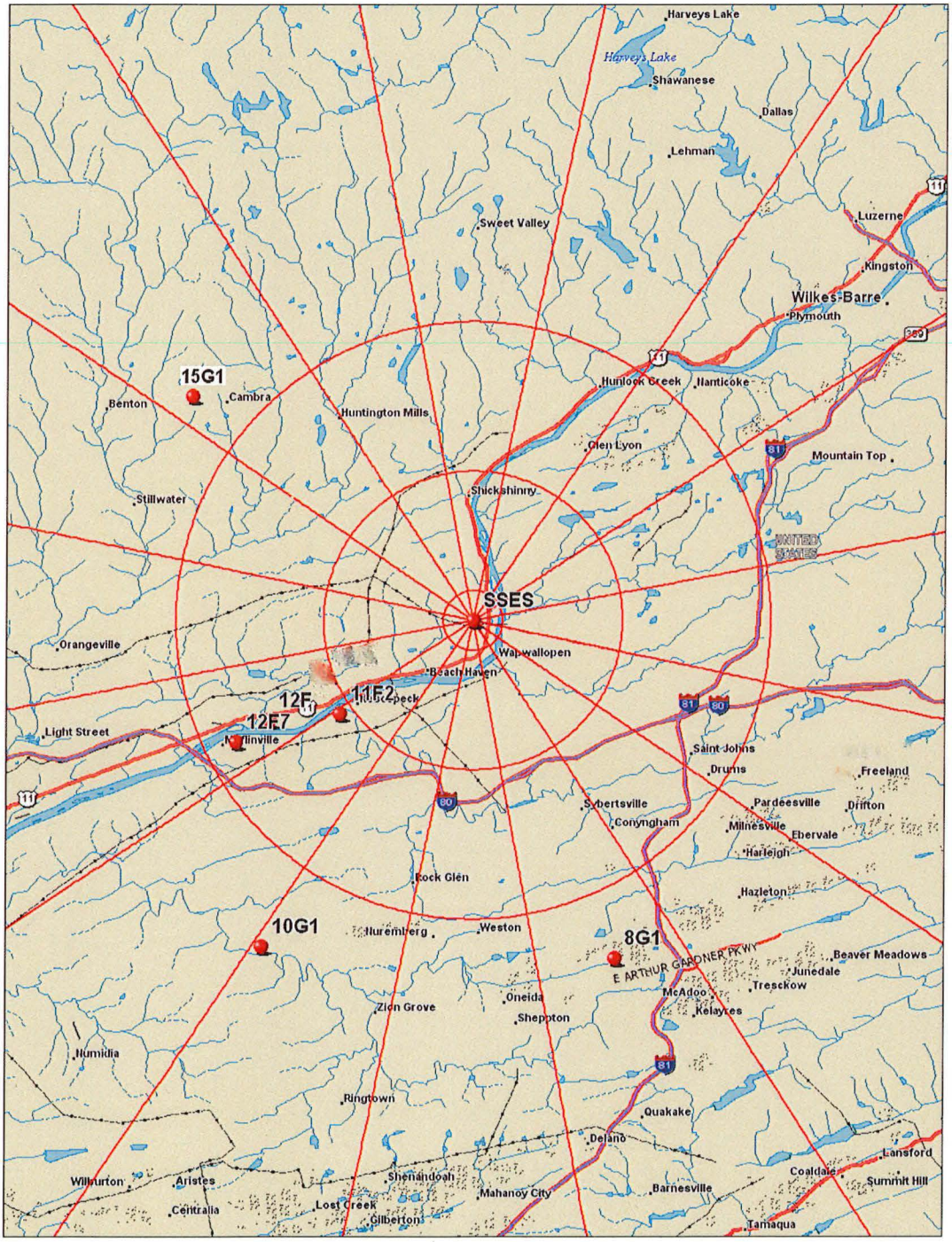
Environmental Sampling Locations

From One to Five Miles



MAP B-6

Environmental Sampling Locations Greater Than Five Miles



APPENDIX C

DATA TABLES

TABLE C-1 **GROSS BETA ANALYSES OF AIR PARTICULATE FILTERS**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in units of E-03 pCi/cu.m. ± 2 sigma

COLLECTION PERIOD	3S2	8G1	12E1	12S1	13S6	9B1
01/03/24 - 01/10/24	11 ± 2	8 ± 2	10 ± 2	9 ± 2	12 ± 2	10 ± 2
01/10/24 - 01/17/24	16 ± 2	15 ± 2	15 ± 2	17 ± 2	17 ± 2	17 ± 2
01/17/24 - 01/23/24	14 ± 2	15 ± 2	16 ± 3	13 ± 2	18 ± 3	15 ± 3
01/23/24 - 01/31/24	8 ± 2	12 ± 3	9 ± 2	9 ± 2	9 ± 2	9 ± 2
01/31/24 - 02/07/24	8 ± 2	(a)	13 ± 2	10 ± 2	10 ± 2	14 ± 2
02/07/24 - 02/14/24	13 ± 2	11 ± 3	12 ± 2	11 ± 2	13 ± 2	12 ± 2
02/14/24 - 02/21/24	11 ± 2	10 ± 2	12 ± 2	10 ± 2	12 ± 2	13 ± 2
02/21/24 - 02/28/24	14 ± 2	11 ± 2	13 ± 2	14 ± 2	13 ± 2	12 ± 2
02/28/24 - 03/06/24	9 ± 2	7 ± 2	6 ± 2	7 ± 2	9 ± 2	9 ± 2
03/06/24 - 03/13/24	10 ± 2	9 ± 2	10 ± 2	9 ± 2	9 ± 2	9 ± 2
03/13/24 - 03/20/24	14 ± 2	15 ± 2	14 ± 2	14 ± 2	15 ± 2	13 ± 2
03/20/24 - 03/27/24	9 ± 2	8 ± 2	9 ± 2	10 ± 2	10 ± 2	9 ± 2
03/27/24 - 04/02/24	13 ± 2	10 ± 2	11 ± 2	12 ± 2	13 ± 2	11 ± 2
04/02/24 - 04/10/24	6 ± 1	7 ± 2	6 ± 1	6 ± 1	6 ± 1	6 ± 2
04/10/24 - 04/16/24	13 ± 2	11 ± 2	11 ± 2	12 ± 2	13 ± 2	12 ± 2
04/16/24 - 04/24/24	10 ± 2	10 ± 2	12 ± 2	8 ± 2	11 ± 2	10 ± 2
04/24/24 - 05/01/24	17 ± 2	15 ± 2	14 ± 2	12 ± 2	16 ± 2	15 ± 2
05/01/24 - 05/08/24	11 ± 2	10 ± 2	11 ± 2	10 ± 2	10 ± 2	10 ± 2
05/08/24 - 05/15/24	8 ± 2	6 ± 2	7 ± 2	6 ± 2	6 ± 2	7 ± 2
05/15/24 - 05/22/24	14 ± 2	9 ± 2	10 ± 2	12 ± 2	12 ± 2	9 ± 2
05/22/24 - 05/29/24	14 ± 2	15 ± 2	16 ± 2	13 ± 2	15 ± 2	15 ± 2
05/29/24 - 06/05/24	16 ± 2	17 ± 2	15 ± 2	15 ± 2	16 ± 2	15 ± 2
06/05/24 - 06/12/24	7 ± 2	8 ± 2	9 ± 2	8 ± 2	10 ± 2	9 ± 2
06/12/24 - 06/18/24	14 ± 3	15 ± 3	17 ± 3	15 ± 3	15 ± 3	14 ± 3
06/18/24 - 06/26/24	19 ± 2	17 ± 2	20 ± 2	19 ± 2	19 ± 2	19 ± 2
06/26/24 - 07/03/24	10 ± 2	9 ± 2	12 ± 2	14 ± 4	12 ± 2	11 ± 2
07/03/24 - 07/10/24	19 ± 3	17 ± 2	20 ± 3	18 ± 2	18 ± 3	19 ± 3
07/10/24 - 07/17/24	13 ± 2	13 ± 2	15 ± 2	13 ± 2	15 ± 2	15 ± 2
07/17/24 - 07/24/24	12 ± 2	12 ± 2	16 ± 2	13 ± 2	13 ± 2	16 ± 2
07/24/24 - 07/31/24	16 ± 2	15 ± 2	16 ± 2	24 ± 3	18 ± 2	16 ± 2
07/31/24 - 08/07/24	17 ± 2	18 ± 2	19 ± 2	17 ± 2	19 ± 3	19 ± 3
08/07/24 - 08/14/24	10 ± 2	10 ± 2	12 ± 2	8 ± 2	10 ± 2	11 ± 2
08/14/24 - 08/20/24	16 ± 3	15 ± 2	16 ± 2	15 ± 2	16 ± 2	19 ± 3
08/20/24 - 08/28/24	23 ± 3	21 ± 2	22 ± 2	20 ± 2	20 ± 2	21 ± 2
08/28/24 - 09/04/24	15 ± 2	11 ± 2	13 ± 2	13 ± 2	14 ± 2	14 ± 2
09/04/24 - 09/11/24	12 ± 2	13 ± 2	13 ± 2	13 ± 2	11 ± 2	13 ± 2
09/11/24 - 09/17/24	23 ± 3	21 ± 3	24 ± 3	22 ± 3	24 ± 3	25 ± 3
09/17/24 - 09/24/24	22 ± 3	18 ± 2	23 ± 3	20 ± 3	21 ± 3	21 ± 3
09/24/24 - 10/02/24	8 ± 2	10 ± 2	10 ± 2	10 ± 2	9 ± 2	9 ± 2
10/02/24 - 10/09/24	19 ± 2	18 ± 2	17 ± 2	16 ± 2	20 ± 2	19 ± 2
10/09/24 - 10/15/24	11 ± 2	13 ± 2	12 ± 2	12 ± 2	12 ± 2	14 ± 2
10/15/24 - 10/23/24	20 ± 2	19 ± 2	21 ± 2	24 ± 2	23 ± 3	20 ± 2
10/23/24 - 10/30/24	17 ± 2	14 ± 2	18 ± 2	19 ± 2	14 ± 2	16 ± 2
10/30/24 - 11/06/24	20 ± 2	14 ± 2	19 ± 2	18 ± 2	17 ± 2	19 ± 2
11/06/24 - 11/13/24	13 ± 2	11 ± 2	13 ± 2	14 ± 2	12 ± 2	13 ± 2
11/13/24 - 11/20/24	18 ± 3	16 ± 2	18 ± 2	17 ± 2	17 ± 2	16 ± 2
11/20/24 - 11/26/24	12 ± 2	12 ± 2	12 ± 2	12 ± 2	13 ± 2	12 ± 2
11/26/24 - 12/04/24	16 ± 2	14 ± 2	14 ± 2	15 ± 2	16 ± 2	16 ± 2
12/04/24 - 12/11/24	19 ± 2	18 ± 2	15 ± 2	17 ± 2	18 ± 2	18 ± 2
12/11/24 - 12/17/24	13 ± 2	10 ± 2	13 ± 2	12 ± 2	17 ± 2	11 ± 2
12/17/24 - 12/23/24	12 ± 2	10 ± 2	13 ± 2	13 ± 2	12 ± 2	15 ± 3
12/23/24 - 12/31/24	12 ± 2	11 ± 2	14 ± 2	11 ± 2	12 ± 2	12 ± 2
AVERAGE	14 + 8	13 + 7	14 + 8	13 + 9	14 + 8	13.9 + 8

(a) Sample unable to be obtained due to no power at the station.

TABLE C-1 **GROSS BETA ANALYSES OF AIR PARTICULATE FILTERS**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in units of E-03 pCi/cu.m. ± 2 sigma

COLLECTION PERIOD	10S3
01/03/24 - 01/10/24	11 ± 2
01/10/24 - 01/17/24	17 ± 2
01/17/24 - 01/23/24	19 ± 3
01/23/24 - 01/31/24	8 ± 2
01/31/24 - 02/07/24	12 ± 2
02/07/24 - 02/14/24	13 ± 2
02/14/24 - 02/21/24	12 ± 2
02/21/24 - 02/28/24	15 ± 2
02/28/24 - 03/06/24	7 ± 2
03/06/24 - 03/13/24	10 ± 2
03/13/24 - 03/20/24	14 ± 2
03/20/24 - 03/27/24	8 ± 2
03/27/24 - 04/02/24	14 ± 2
04/02/24 - 04/10/24	7 ± 2
04/10/24 - 04/16/24	12 ± 2
04/16/24 - 04/24/24	11 ± 2
04/24/24 - 05/01/24	15 ± 2
05/01/24 - 05/08/24	14 ± 2
05/08/24 - 05/15/24	8 ± 2
05/15/24 - 05/22/24	14 ± 2
05/22/24 - 05/29/24	15 ± 2
05/29/24 - 06/05/24	16 ± 2
06/05/24 - 06/12/24	11 ± 2
06/12/24 - 06/18/24	17 ± 3
06/18/24 - 06/26/24	21 ± 2
06/26/24 - 07/03/24	17 ± 5
07/03/24 - 07/10/24	20 ± 3
07/10/24 - 07/17/24	15 ± 2
07/17/24 - 07/24/24	14 ± 2
07/24/24 - 07/31/24	16 ± 2
07/31/24 - 08/07/24	21 ± 3
08/07/24 - 08/14/24	12 ± 2
08/14/24 - 08/20/24	17 ± 3
08/20/24 - 08/28/24	23 ± 3
08/28/24 - 09/04/24	15 ± 2
09/04/24 - 09/11/24	13 ± 2
09/11/24 - 09/17/24	24 ± 3
09/17/24 - 09/24/24	21 ± 2
09/24/24 - 10/02/24	9 ± 2
10/02/24 - 10/09/24	16 ± 2
10/09/24 - 10/15/24	12 ± 2
10/15/24 - 10/23/24	22 ± 2
10/23/24 - 10/30/24	18 ± 2
10/30/24 - 11/06/24	21 ± 3
11/06/24 - 11/13/24	13 ± 2
11/13/24 - 11/20/24	18 ± 2
11/20/24 - 11/26/24	13 ± 2
11/26/24 - 12/04/24	16 ± 2
12/04/24 - 12/11/24	16 ± 2
12/11/24 - 12/17/24	13 ± 2
12/17/24 - 12/23/24	9 ± 2
12/23/24 - 12/31/24	15 ± 2
AVERAGE	15 + 8

TABLE C-2 GAMMA SPECTROSCOPIC ANALYSES OF COMPOSITED AIR PARTICULATE FILTERS SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in units of E-03 pCi/cu.m. ± 2 sigma

SITE	COLLECTION PERIOD	Be-7	K-40	Cs-134	Cs-137
8G1	01/03/24 - 04/02/24	69 ± 16	< 17	< 1	< 1
	04/02/24 - 07/03/24	83 ± 20	< 16	< 1	< 1
	07/03/24 - 10/02/24	89 ± 21	< 20	< 1	< 1
	10/02/24 - 12/31/24	54 ± 14	< 11	< 1	< 1
	AVERAGE	74 + 32	-	-	-
3S2	01/03/24 - 04/02/24	61 ± 18	< 20	< 1	< 1
	04/02/24 - 07/03/24	95 ± 22	< 22	< 2	< 1
	07/03/24 - 10/02/24	112 ± 33	< 24	< 2	< 2
	10/02/24 - 12/31/24	65 ± 15	< 19	< 1	< 1
	AVERAGE	83 + 49	-	-	-
12E1	01/03/24 - 04/02/24	61 ± 18	< 24	< 1	< 1
	04/02/24 - 07/03/24	91 ± 19	< 16	< 1	< 1
	07/03/24 - 10/02/24	74 ± 18	< 16	< 1	< 1
	10/02/24 - 12/31/24	64 ± 18	< 20	< 1	< 1
	AVERAGE	73 + 27	-	-	-
12S1	01/03/24 - 04/02/24	49 ± 15	< 14	< 1	< 1
	04/02/24 - 07/03/24	88 ± 15	< 17	< 1	< 1
	07/03/24 - 10/02/24	95 ± 17	< 13	< 1	< 1
	10/02/24 - 12/31/24	63 ± 15	< 15	< 1	< 1
	AVERAGE	74 + 43	-	-	-
13S6	01/03/24 - 04/02/24	79 ± 20	< 13	< 1	< 1
	04/02/24 - 07/03/24	119 ± 23	< 14	< 1	< 1
	07/03/24 - 10/02/24	88 ± 23	< 18	< 1	< 1
	10/02/24 - 12/31/24	48 ± 13	< 16	< 1	< 1
	AVERAGE	84 + 59	-	-	-
9B1	01/03/24 - 04/02/24	68 ± 14	< 14	< 1	< 1
	04/02/24 - 07/03/24	97 ± 21	< 20	< 1	< 1
	07/03/24 - 10/02/24	102 ± 26	< 16	< 1	< 1
	10/02/24 - 12/31/24	65 ± 16	< 16	< 1	< 1
	AVERAGE	83 + 38	-	-	-
10S3	01/03/24 - 04/02/24	85 ± 20	< 22	< 1	< 1
	04/02/24 - 07/03/24	104 ± 31	< 35	< 2	< 2
	07/03/24 - 10/02/24	133 ± 29	< 42	< 2	< 2
	10/02/24 - 12/31/24	57 ± 14	< 20	< 1	< 1
	AVERAGE	95 + 64	-	-	-

TABLE C-3 **IODINE-131 ANALYSES OF AIR IODINE SAMPLES**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in units of E-03 pCi/cu.m. ± 2 sigma

COLLECTION PERIOD	3S2	8G1	12E1	12S1	13S6	9B1
01/03/24 - 01/10/24	< 18	< 19	< 19	< 8	< 18	< 20
01/10/24 - 01/17/24	< 24	< 9	< 20	< 21	< 24	< 21
01/17/24 - 01/23/24	< 29	< 29	< 29	< 31	< 30	< 30
01/23/24 - 01/31/24	< 14	< 16	< 17	< 17	< 14	< 17
01/31/24 - 02/07/24	< 16	(a)	< 33	< 34	< 33	< 34
02/07/24 - 02/14/24	< 19	< 15	< 9	< 19	< 19	< 17
02/14/24 - 02/21/24	< 14	< 21	< 18	< 18	< 18	< 22
02/21/24 - 02/28/24	< 13	< 18	< 28	< 27	< 31	< 27
02/28/24 - 03/06/24	< 17	< 13	< 20	< 20	< 17	< 20
03/06/24 - 03/13/24	< 12	< 25	< 25	< 19	< 12	< 25
03/13/24 - 03/20/24	< 24	< 33	< 34	< 33	< 25	< 34
03/20/24 - 03/27/24	< 15	< 23	< 23	< 23	< 16	< 23
03/27/24 - 04/02/24	< 10	< 15	< 16	< 15	< 15	< 23
04/02/24 - 04/10/24	< 26	< 10	< 26	< 26	< 26	< 7
04/10/24 - 04/16/24	< 7	< 18	< 17	< 18	< 11	< 11
04/16/24 - 04/24/24	< 30	< 20	< 19	< 20	< 31	< 9
04/24/24 - 05/01/24	< 8	< 15	< 15	< 15	< 7	< 10
05/01/24 - 05/08/24	< 12	< 10	< 9	< 10	< 13	< 6
05/08/24 - 05/15/24	< 26	< 34	< 25	< 26	< 11	< 33
05/15/24 - 05/22/24	< 22	< 23	< 22	< 23	< 21	< 17
05/22/24 - 05/29/24	< 23	< 32	< 30	< 31	< 23	< 13
05/29/24 - 06/05/24	< 21	< 28	< 21	< 24	< 9	< 27
06/05/24 - 06/12/24	< 28	< 22	< 21	< 22	< 27	< 16
06/12/24 - 06/18/24	< 18	< 18	< 18	< 18	< 13	< 18
06/18/24 - 06/26/24	< 59	< 59	< 60	< 61	< 58	< 25
06/26/24 - 07/03/24	< 26	< 29	< 32	< 56	< 31	< 30
07/03/24 - 07/10/24	< 17	< 18	< 18	< 12	< 17	< 19
07/10/24 - 07/17/24	< 24	< 25	< 11	< 22	< 23	< 28
07/17/24 - 07/24/24	< 34	< 25	< 23	< 33	< 34	< 25
07/24/24 - 07/31/24	< 22	< 13	< 14	< 21	< 22	< 9
07/31/24 - 08/07/24	< 26	< 27	< 17	< 26	< 12	< 28
08/07/24 - 08/14/24	< 12	< 20	< 21	< 22	< 22	< 11
08/14/24 - 08/20/24	< 19	< 12	< 12	< 18	< 19	< 22
08/20/24 - 08/28/24	< 12	< 21	< 15	< 20	< 10	< 22
08/28/24 - 09/04/24	< 23	< 32	< 17	< 23	< 24	< 31
09/04/24 - 09/11/24	< 21	< 20	< 18	< 19	< 22	< 19
09/11/24 - 09/17/24	< 14	< 27	< 17	< 17	< 18	< 18
09/17/24 - 09/24/24	< 11	< 22	< 20	< 18	< 12	< 20
09/24/24 - 10/02/24	< 20	< 17	< 12	< 18	< 19	< 18
10/02/24 - 10/09/24	< 28	< 29	< 13	< 25	< 26	< 28
10/09/24 - 10/15/24	< 8	< 23	< 10	< 23	< 9	< 23
10/15/24 - 10/23/24	< 21	< 17	< 20	< 14	< 21	< 16
10/23/24 - 10/30/24	< 11	< 23	< 25	< 25	< 25	< 23
10/30/24 - 11/06/24	< 12	< 8	< 17	< 16	< 12	< 17
11/06/24 - 11/13/24	< 30	< 22	< 22	< 23	< 29	< 17
11/13/24 - 11/20/24	< 31	< 18	< 24	< 25	< 29	< 24
11/20/24 - 11/26/24	< 21	< 13	< 18	< 18	< 18	< 18
11/26/24 - 12/04/24	< 27	< 12	< 24	< 24	< 24	< 24
12/04/24 - 12/11/24	< 22	< 14	< 19	< 20	< 22	< 20
12/11/24 - 12/17/24	< 11	< 10	< 19	< 20	< 21	< 9
12/17/24 - 12/23/24	< 15	< 12	< 21	< 21	< 22	< 13
12/23/24 - 12/31/24	< 26	< 18	< 18	< 17	< 26	< 11
AVERAGE	-	-	-	-	-	-

(a) Sample unable to be obtained due to no power at the station.

TABLE C-3 **IODINE-131 ANALYSES OF AIR IODINE SAMPLES**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in units of E-03 pCi/cu.m. ± 2 sigma

COLLECTION PERIOD	10S3
01/03/24 - 01/10/24	< 20
01/10/24 - 01/17/24	< 21
01/17/24 - 01/23/24	< 13
01/23/24 - 01/31/24	< 17
01/31/24 - 02/07/24	< 14
02/07/24 - 02/14/24	< 21
02/14/24 - 02/21/24	< 20
02/21/24 - 02/28/24	< 29
02/28/24 - 03/06/24	< 21
03/06/24 - 03/13/24	< 26
03/13/24 - 03/20/24	< 15
03/20/24 - 03/27/24	< 10
03/27/24 - 04/02/24	< 16
04/02/24 - 04/10/24	< 12
04/10/24 - 04/16/24	< 18
04/16/24 - 04/24/24	< 21
04/24/24 - 05/01/24	< 16
05/01/24 - 05/08/24	< 10
05/08/24 - 05/15/24	< 27
05/15/24 - 05/22/24	< 23
05/22/24 - 05/29/24	< 32
05/29/24 - 06/05/24	< 22
06/05/24 - 06/12/24	< 23
06/12/24 - 06/18/24	< 18
06/18/24 - 06/26/24	< 60
06/26/24 - 07/03/24	< 45
07/03/24 - 07/10/24	< 18
07/10/24 - 07/17/24	< 23
07/17/24 - 07/24/24	< 33
07/24/24 - 07/31/24	< 21
07/31/24 - 08/07/24	< 27
08/07/24 - 08/14/24	< 22
08/14/24 - 08/20/24	< 20
08/20/24 - 08/28/24	< 22
08/28/24 - 09/04/24	< 23
09/04/24 - 09/11/24	< 14
09/11/24 - 09/17/24	< 17
09/17/24 - 09/24/24	< 20
09/24/24 - 10/02/24	< 18
10/02/24 - 10/09/24	< 25
10/09/24 - 10/15/24	< 22
10/15/24 - 10/23/24	< 20
10/23/24 - 10/30/24	< 26
10/30/24 - 11/06/24	< 17
11/06/24 - 11/13/24	< 23
11/13/24 - 11/20/24	< 25
11/20/24 - 11/26/24	< 18
11/26/24 - 12/04/24	< 24
12/04/24 - 12/11/24	< 20
12/11/24 - 12/17/24	< 20
12/17/24 - 12/23/24	< 21
12/23/24 - 12/31/24	< 17
AVERAGE	-

TABLE C-4 ENVIRONMENTAL OPTICALLY STIMULATED LUMINESCENCE DOSIMETRY RESULTS SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results (1) are in mR/std. qtr (2) ± 2 sigma (3)

LOCATION	First Quarter 1/5/2024 to 4/19/2024	Second Quarter 4/19/2024 to 7/3/2024	Third Quarter 7/3/2024 to 10/2/2024	Fourth Quarter 10/2/2024 to 1/15/2025
ONSITE				
1S2	21.8 ± 1.5	28.1 ± 0.2	28.0 ± 1.0	26.7 ± 3.6
2S2	9.9 ± 2.0	11.6 ± 0.3	14.6 ± 0.1	14.3 ± 1.6
2S3	19.6 ± 1.5	25.4 ± 3.3	24.4 ± 3.1	23.7 ± 2.4
3S2	13.8 ± 1.7	11.3 ± 0.1	14.1 ± 1.4	15.2 ± 1.0
3S3	11.6 ± 2.6	14.1 ± 1.1	14.3 ± 0.0	15.1 ± 0.3
4S3	15.1 ± 0.8	19.5 ± 5.2	21.1 ± 0.8	22.3 ± 0.9
4S6	12.6 ± 0.1	15.9 ± 1.3	14.8 ± 0.2	16.2 ± 0.3
5S4	9.4 ± 0.5	10.3 ± 0.6	13.8 ± 0.4	13.8 ± 0.1
5S7	15.1 ± 0.9	16.1 ± 1.0	17.5 ± 0.4	16.9 ± 1.4
6S4	23.1 ± 0.9	20.8 ± 3.8	25.3 ± 1.1	23.6 ± 1.2
6S9	22.5 ± 0.7	22.3 ± 5.5	24.6 ± 1.9	25.2 ± 0.4
7S6	19.6 ± 0.2	21.8 ± 0.2	23.5 ± 1.3	21.5 ± 0.9
7S7	11.9 ± 0.6	10.6 ± 1.8	13.3 ± 0.1	14.6 ± 0.1
8S2	21.6 ± 0.3	21.6 ± 1.6	25.5 ± 4.2	22.6 ± 3.3
9S2	35.9 ± 0.1	37.1 ± 2.9	40.6 ± 1.1	41.1 ± 2.5
9S3	16.6 ± 0.3	16.4 ± 2.2	23.5 ± 0.4	22.5 ± 0.7
9S4	18.2 ± 0.1	15.2 ± 0.5	17.2 ± 1.5	17.9 ± 0.3
10S1	11.0 ± 1.1	11.5 ± 0.8	13.1 ± 0.4	14.3 ± 2.8
10S2	21.7 ± 0.6	23.4 ± 2.8	23.2 ± 2.8	24.7 ± 0.2
11S7	10.5 ± 0.5	13.0 ± 2.1	14.4 ± 0.7	16.1 ± 1.7
12S1	14.4 ± 1.9	13.2 ± 4.6	16.8 ± 0.3	17.4 ± 0.3
12S3	17.9 ± 2.2	16.7 ± 3.2	21.5 ± 0.1	22.2 ± 3.2
12S7	12.7 ± 0.7	10.5 ± 0.3	14.7 ± 1.6	15.4 ± 0.2
13S2	15.5 ± 2.3	18.4 ± 3.4	22.7 ± 2.1	23.2 ± 1.5
13S5	18.5 ± 0.4	19.2 ± 0.7	21.8 ± 1.9	23.5 ± 0.7
13S6	16.5 ± 2.5	18.3 ± 1.7	21.4 ± 0.4	19.2 ± 2.2
14S5	15.9 ± 0.9	18.3 ± 0.1	18.1 ± 1.1	19.9 ± 0.6
15S5	17.0 ± 0.9	16.3 ± 1.7	19.1 ± 2.1	17.1 ± 1.5
16S1	21.5 ± 0.9	26.8 ± 0.1	27.0 ± 0.9	25.9 ± 2.1
16S2	18.8 ± 0.9	15.5 ± 0.8	18.1 ± 0.7	21.5 ± 3.0

See the comments at the end of this table.

TABLE C-4 ENVIRONMENTAL OPTICALLY STIMULATED LUMINESCENCE DOSIMETRY RESULTS SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results (1) are in mR/std. qtr (2) ± 2 sigma (3)

LOCATION	First Quarter 1/5/2024 to 4/19/2024	Second Quarter 4/19/2024 to 7/3/2024	Third Quarter 7/3/2024 to 10/2/2024	Fourth Quarter 10/2/2024 to 1/15/2025
0-1 MILE OFFSITE				
6A4	16.4 ± 1.4	20.1 ± 0.0	16.2 ± 1.8	16.5 ± 2.6
8A3	13.6 ± 0.6	13.6 ± 1.8	17.8 ± 1.0	16.2 ± 0.3
11A1	14.4 ± 2.3	14.8 ± 0.9	17.3 ± 0.4	17.3 ± 0.2
15A3	11.3 ± 0.4	11.1 ± 0.5	14.3 ± 0.4	14.9 ± 1.2
16A2	9.3 ± 1.5	11.0 ± 1.3	15.4 ± 1.5	13.1 ± 0.9
1-2 MILES OFFSITE				
8B2	11.8 ± 1.5	11.1 ± 0.8	13.8 ± 1.1	15.4 ± 1.6
9B1	11.9 ± 1.0	11.0 ± 0.1	12.7 ± 0.0	14.1 ± 0.1
10B3	10.7 ± 1.4	14.0 ± 1.9	14.3 ± 0.1	14.6 ± 0.9
3-4 MILES OFFSITE				
1D5	13.3 ± 3.3	17.8 ± 1.7	16.5 ± 3.2	14.7 ± 0.7
8D3	11.0 ± 0.7	14.8 ± 5.0	14.7 ± 0.6	14.4 ± 1.8
9D4	12.3 ± 1.5	12.0 ± 1.5	17.1 ± 0.3	17.6 ± 0.4
10D1	11.3 ± 0.5	9.7 ± 1.0	14.8 ± 1.8	16.3 ± 1.0
12D2	15.9 ± 1.0	20.3 ± 2.3	21.8 ± 1.2	20.2 ± 2.6
14D1	12.4 ± 0.9	12.8 ± 1.6	15.3 ± 2.0	17.8 ± 0.6
4-5 MILES OFFSITE				
3E1	10.2 ± 1.4	11.4 ± 2.0	12.2 ± 0.6	13.3 ± 0.8
4E2	15.6 ± 0.9	13.0 ± 2.8	15.4 ± 0.7	16.7 ± 1.2
5E2	12.9 ± 2.3	16.0 ± 1.5	15.0 ± 1.9	15.3 ± 2.4
6E1	13.7 ± 1.9	12.8 ± 6.0	16.8 ± 0.7	(4) (4)
7E1	14.4 ± 0.0	13.3 ± 1.5	15.2 ± 1.3	14.4 ± 0.3
11E1	9.5 ± 1.4	6.4 ± 3.4	13.3 ± 0.4	11.0 ± 0.1
12E1	10.8 ± 2.9	11.1 ± 0.0	13.8 ± 0.3	14.0 ± 0.8
13E4	12.5 ± 1.4	14.4 ± 1.2	17.9 ± 1.8	20.2 ± 0.7

See the comments at the end of this table.

TABLE C-4 ENVIRONMENTAL OPTICALLY STIMULATED LUMINESCENCE DOSIMETRY RESULTS SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results (1) are in mR/std. qtr (2) ± 2 sigma (3)

LOCATION	First Quarter 1/5/2024 to 4/19/2024	Second Quarter 4/19/2024 to 7/3/2024	Third Quarter 7/3/2024 to 10/2/2024	Fourth Quarter 10/2/2024 to 1/15/2025
5-10 MILES OFFSITE				
2F1	12.0 ± 2.2	12.0 ± 0.3	14.3 ± 1.6	15.0 ± 0.1
15F1	15.6 ± 2.5	16.2 ± 4.0	19.1 ± 2.8	18.6 ± 0.1
16F1	16.4 ± 0.3	16.3 ± 1.5	17.1 ± 0.6	18.7 ± 0.4
10-20 MILES OFFSITE				
3G4	15.9 ± 2.9	14.0 ± 2.2	17.7 ± 0.9	15.5 ± 0.7
4G1	16.3 ± 0.5	14.1 ± 2.8	16.5 ± 1.1	14.9 ± 0.7
7G1	8.4 ± 0.6	11.4 ± 0.9	12.7 ± 0.2	11.7 ± 1.0
12G1	10.1 ± 1.1	10.4 ± 0.8	13.8 ± 0.1	13.6 ± 0.9
12G4	12.6 ± 0.4	13.7 ± 0.7	14.5 ± 0.6	16.1 ± 0.2

See the comments at the end of this table.

LOCATION				
INDICATOR				
Average (5)	15.1 ± 10.3	15.9 ± 17.1	18.2 ± 10.4	18.4 ± 11.4
CONTROL				
Average (5)	12.7 ± 3.2	12.7 ± 3.8	15.1 ± 1.6	14.4 ± 1.7

COMMENTS

(1) Individual monitor location results are normally the average of the elemental doses of four elements from the two dosimeters assigned to each monitoring location.

(2) A standard (std.) quarter (qtr.) is considered to be 91.25 days. Results obtained for monitoring periods of other durations are normalized by multiplying them by 91.25/x, where x is the actual duration in days of the period.

(3) Uncertainties for individual monitoring location results are two standard deviations of the elemental doses of four elements from the two dosimeters assigned to each monitoring location, representing the variability between the elemental doses of each of the four dosimeter elements.

(4) No measurement could be made at this location because the dosimeters were lost, stolen, or damaged. Refer to Appendix A of the Annual Radiological Environmental Operating Report for an explanation of program exceptions to REMP.

(5) Uncertainties associated with quarterly indicator and control averages are two standard deviations, representing the variability between the results of the individual monitoring locations.

TABLE C-5 IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

	COLLECTION		<----------GAMMA EMITTERS---------->					
SITE	DATE	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Th-228
10G1	01/08/24	< 0.9	1351 ± 175	< 8	< 9	< 32	< 11	< 17
	02/05/24	< 0.8	1521 ± 165	< 7	< 8	< 29	< 9	< 16
	03/04/24	< 0.8	1520 ± 166	< 8	< 8	< 25	< 11	< 13
	04/08/24	< 0.8	1248 ± 148	< 6	< 6	< 22	< 6	< 12
	04/22/24	< 0.9	1415 ± 135	< 5	< 5	< 21	< 7	< 9
	05/06/24	< 0.9	1343 ± 172	< 6	< 8	< 25	< 6	< 11
	05/20/24	< 0.6	1380 ± 166	< 6	< 7	< 31	< 8	< 14
	06/03/24	< 0.8	1458 ± 167	< 6	< 6	< 22	< 9	< 12
	06/17/24	< 0.8	1336 ± 164	< 6	< 7	< 25	< 10	< 14
	07/01/24	< 0.8	1323 ± 174	< 6	< 8	< 29	< 11	< 14
	07/15/24	< 0.8	1279 ± 176	< 6	< 7	< 29	< 9	< 13
	07/29/24	< 0.8	1374 ± 158	< 5	< 5	< 21	< 8	< 11
	08/12/24	< 0.9	1250 ± 168	< 5	< 8	< 26	< 10	< 14
	08/25/24	< 0.9	1221 ± 186	< 10	< 10	< 40	< 13	< 15
	09/09/24	< 0.7	1235 ± 154	< 6	< 7	< 27	< 7	< 15
	09/22/24	< 0.9	1416 ± 160	< 7	< 8	< 35	< 10	< 13
	10/07/24	< 0.7	1308 ± 190	< 6	< 8	< 34	< 12	< 17
	10/20/24	< 0.9	1314 ± 181	< 8	< 9	< 32	< 14	< 17
	11/04/24	< 0.9	1338 ± 174	< 7	< 7	< 25	< 7	< 13
	12/09/24	< 0.8	1231 ± 167	< 7	< 7	< 29	< 8	< 14
	AVERAGE	-	1343 + 179	-	-	-	-	-
13E3	01/08/24	< 0.9	1239 ± 150	< 10	< 8	< 32	< 10	< 16
	02/05/24	< 0.7	1148 ± 186	< 6	< 8	< 33	< 7	< 12
	03/04/24	< 0.8	1524 ± 168	< 6	< 8	< 24	< 9	< 13
	04/08/24	< 0.9	942 ± 212	< 8	< 7	< 26	< 9	< 12
	04/22/24	< 0.8	1316 ± 142	< 5	< 7	< 25	< 8	< 13
	05/06/24	< 0.9	1087 ± 142	< 6	< 7	< 26	< 8	< 11
	05/20/24	< 0.7	1399 ± 195	< 8	< 10	< 37	< 5	< 14
	06/03/24	< 0.8	1335 ± 173	< 8	< 7	< 26	< 10	< 12
	06/17/24	< 0.9	1379 ± 157	< 7	< 7	< 29	< 6	< 14
	07/01/24	< 0.8	1216 ± 191	< 6	< 8	< 35	< 14	< 14
	07/15/24	< 0.7	1297 ± 195	< 7	< 8	< 27	< 8	< 13
	07/29/24	< 0.8	1211 ± 200	< 6	< 6	< 28	< 10	< 13
	08/12/24	< 0.9	1287 ± 186	< 6	< 7	< 22	< 8	< 12
	08/25/24	< 0.8	1274 ± 169	< 7	< 9	< 31	< 9	< 13
	09/09/24	< 0.9	1144 ± 157	< 6	< 9	< 32	< 12	< 16
	09/22/24	< 0.6	1101 ± 164	< 8	< 8	< 35	< 9	< 14
	10/07/24	< 0.7	1516 ± 196	< 8	< 11	< 37	< 13	< 17
	10/20/24	< 0.9	1337 ± 164	< 6	< 8	< 31	< 7	< 13
	11/04/24	< 0.9	1227 ± 192	< 10	< 11	< 35	< 13	< 18
	12/09/24	< 0.9	1229 ± 173	< 5	< 7	< 26	< 7	< 13
	AVERAGE	-	1260 + 281	-	-	-	-	-

TABLE C-5 IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

	COLLECTION		<----------GAMMA EMITTERS---------->					
SITE	DATE	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Th-228
5E2	01/08/24	< 0.9	1030 ± 180	< 7	< 7	< 30	< 12	< 12
	02/05/24	< 0.7	1269 ± 191	< 7	< 9	< 34	< 9	< 14
	03/04/24	< 0.8	1094 ± 202	< 7	< 8	< 28	< 6	< 12
	04/08/24	< 0.8	1271 ± 159	< 6	< 7	< 21	< 9	< 11
	04/22/24	< 0.8	1197 ± 157	< 6	< 7	< 25	< 9	< 12
	05/06/24	< 0.8	1110 ± 122	< 5	< 6	< 22	< 7	< 11
	05/20/24	< 0.8	1329 ± 147	< 7	< 6	< 24	< 7	< 11
	06/03/24	< 0.7	1362 ± 173	< 7	< 8	< 31	< 8	< 15
	06/17/24	< 0.9	1325 ± 156	< 6	< 7	< 27	< 11	< 13
	07/01/24	< 0.6	1110 ± 179	< 6	< 7	< 31	< 7	< 13
	07/15/24	< 0.8	1236 ± 160	< 6	< 8	< 26	< 7	< 12
	07/29/24	< 0.9	1251 ± 180	< 7	< 8	< 28	< 11	< 12
	08/12/24	< 0.9	1313 ± 151	< 6	< 7	< 26	< 8	< 14
	08/25/24	< 0.8	1214 ± 165	< 8	< 7	< 30	< 11	< 13
	09/09/24	< 0.6	1255 ± 140	< 6	< 6	< 25	< 9	< 12
	09/22/24	< 0.7	1157 ± 181	< 6	< 11	< 41	< 11	< 17
	10/07/24	< 0.7	1277 ± 197	< 11	< 10	< 41	< 11	< 18
	10/20/24	< 0.8	1069 ± 146	< 7	< 7	< 27	< 11	< 14
	11/04/24	< 0.8	1413 ± 174	< 7	< 7	< 32	< 9	< 16
	12/09/24	< 0.9	1279 ± 129	< 4	< 5	< 17	< 7	< 10
	AVERAGE	-	1228 + 208	-	-	-	-	-

TABLE C-6 TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUNDWATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

	COLLECTION		<----------GAMMA EMITTERS---------->													
SITE	DATE	H-3	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Th-228
2S8	01/26/24	< 353	< 105	< 9	< 9	< 24	< 8	< 16	< 11	< 14	< 12	< 9	< 8	< 40	< 11	< 15
	04/12/24	< 363	< 151	< 6	< 8	< 17	< 8	< 19	< 9	< 15	< 14	< 7	< 8	< 35	< 12	< 16
	07/09/24	< 372	< 138	< 7	< 7	< 21	< 8	< 16	< 8	< 13	< 12	< 6	< 7	< 35	< 12	< 16
	10/16/24	< 269	< 124	< 7	< 6	< 13	< 9	< 13	< 7	< 10	< 14	< 5	< 7	< 34	< 11	< 14
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13S7	01/24/24	< 380	< 86	< 6	< 5	< 14	< 6	< 11	< 7	< 10	< 12	< 4	< 5	< 28	< 12	< 11
	04/17/24	< 389	< 100	< 5	< 6	< 12	< 5	< 11	< 7	< 10	< 9	< 7	< 6	< 32	< 10	< 12
	07/16/24	< 374	< 85	< 6	< 5	< 11	< 9	< 14	< 6	< 10	< 10	< 5	< 7	< 33	< 8	< 12
	10/14/24	< 305	< 139	< 7	< 8	< 14	< 7	< 15	< 8	< 12	< 11	< 7	< 8	< 33	< 12	< 13
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1S3	01/24/24	< 352	< 119	< 7	< 5	< 18	< 7	< 16	< 8	< 11	< 13	< 8	< 8	< 34	< 9	< 16
	04/17/24	< 370	< 101	< 7	< 6	< 18	< 6	< 15	< 7	< 11	< 9	< 6	< 5	< 31	< 10	< 11
	07/16/24	< 376	< 112	< 8	< 5	< 16	< 8	< 11	< 7	< 13	< 11	< 6	< 7	< 31	< 13	< 12
	10/11/24	251 ± 167	< 78	< 6	< 5	< 13	< 6	< 16	< 7	< 10	< 14	< 5	< 6	< 33	< 14	< 10
	AVERAGE	251 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4S8	01/24/24	< 355	< 109	< 7	< 7	< 18	< 8	< 15	< 7	< 11	< 10	< 7	< 7	< 29	< 10	< 12
	04/17/24	< 384	< 79	< 5	< 5	< 16	< 6	< 12	< 5	< 8	< 10	< 5	< 5	< 26	< 12	< 13
	07/16/24	< 383	< 132	< 6	< 4	< 20	< 8	< 14	< 6	< 12	< 11	< 7	< 8	< 33	< 14	< 13
	10/14/24	254 ± 165	< 127	< 7	< 4	< 17	< 8	< 20	< 8	< 11	< 13	< 7	< 6	< 31	< 9	< 15
	AVERAGE	254 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4S9	01/26/24	< 355	< 127	< 7	< 7	< 20	< 6	< 15	< 6	< 10	< 9	< 7	< 7	< 23	< 10	< 13
	04/12/24	< 372	< 105	< 5	< 5	< 11	< 5	< 9	< 5	< 8	< 9	< 5	< 5	< 23	< 8	< 11
	07/09/24	< 374	< 113	< 7	< 7	< 15	< 7	< 15	< 7	< 15	< 11	< 6	< 7	< 27	< 10	< 12
	10/16/24	< 270	354 ± 96	< 8	< 6	< 20	< 6	< 18	< 9	< 13	< 13	< 7	< 8	< 33	< 14	47 ± 10
	AVERAGE	-	354 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-
6S11A	01/26/24	< 359	< 109	< 8	< 6	< 19	< 6	< 13	< 9	< 15	< 11	< 7	< 7	< 33	< 8	< 13
	04/11/24	< 374	< 119	< 9	< 7	< 15	< 4	< 14	< 10	< 15	< 13	< 7	< 9	< 35	< 13	< 14
	07/08/24	< 379	< 90	< 5	< 7	< 20	< 6	< 8	< 6	< 10	< 9	< 5	< 5	< 26	< 11	< 12
	10/16/24	< 267	< 132	< 6	< 8	< 21	< 9	< 17	< 8	< 13	< 14	< 6	< 8	< 38	< 15	< 16
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-6 TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUNDWATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

	COLLECTION		<----------GAMMA EMITTERS---------->													
SITE	DATE	H-3	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Th-228
6S12	01/25/24	< 395	< 72	< 5	< 7	< 15	< 6	< 12	< 6	< 9	< 9	< 6	< 6	< 25	< 9	< 13
	04/11/24	< 372	< 123	< 7	< 6	< 18	< 6	< 16	< 7	< 13	< 11	< 6	< 7	< 30	< 13	< 14
	07/08/24	< 384	< 132	< 8	< 8	< 15	< 8	< 10	< 7	< 12	< 10	< 5	< 6	< 25	< 9	< 12
	10/14/24	< 250	< 106	< 8	< 7	< 20	< 8	< 17	< 8	< 13	< 13	< 7	< 9	< 38	< 12	< 14
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7S10	01/25/24	< 356	< 84	< 5	< 5	< 14	< 7	< 10	< 7	< 7	< 11	< 6	< 5	< 25	< 11	< 13
	04/11/24	< 365	< 88	< 6	< 6	< 19	< 6	< 11	< 6	< 10	< 12	< 6	< 6	< 29	< 13	< 10
	07/08/24	< 372	< 124	< 5	< 9	< 15	< 7	< 16	< 9	< 13	< 11	< 7	< 6	< 38	< 13	< 12
	10/10/24	< 248	< 30	< 3	< 3	< 9	< 3	< 7	< 3	< 6	< 8	< 3	< 3	< 19	< 6	< 5
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7S11	01/25/24 -	< 353	< 115	< 6	< 6	< 19	< 8	< 14	< 7	< 11	< 13	< 7	< 5	< 28	< 9	< 15
	04/11/24 -	< 359	< 100	< 6	< 7	< 13	< 6	< 11	< 6	< 10	< 9	< 5	< 5	< 32	< 12	< 11
	07/08/24 -	< 377	< 106	< 7	< 5	< 16	< 6	< 10	< 6	< 11	< 9	< 5	< 5	< 26	< 8	< 11
	10/10/24 -	< 240	< 24	< 3	< 3	< 9	< 3	< 6	< 3	< 5	< 7	< 3	< 3	< 18	< 6	< 6
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8S4	01/24/24	< 354	< 126	< 5	< 5	< 17	< 8	< 11	< 7	< 13	< 13	< 6	< 6	< 39	< 12	< 14
	04/17/24	< 347	< 119	< 7	< 7	< 20	< 9	< 14	< 8	< 11	< 10	< 5	< 7	< 31	< 10	< 11
	07/16/24	372 ± 196	< 145	< 7	< 6	< 20	< 10	< 17	< 9	< 11	< 14	< 7	< 8	< 27	< 15	< 12
	10/11/24	< 290	< 120	< 7	< 6	< 20	< 5	< 12	< 7	< 11	< 15	< 7	< 6	< 31	< 13	< 12
	AVERAGE	372 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1S4	01/24/24	< 354	< 97	< 5	< 5	< 11	< 4	< 9	< 5	< 8	< 10	< 5	< 5	< 25	< 9	< 10
	04/17/24	< 361	< 118	< 6	< 6	< 13	< 6	< 13	< 6	< 11	< 13	< 6	< 7	< 31	< 10	< 13
	07/16/24	< 372	< 152	< 7	< 6	< 17	< 6	< 17	< 7	< 10	< 13	< 7	< 6	< 33	< 12	< 14
	10/11/24	< 250	< 62	< 3	< 3	< 11	< 4	< 9	< 4	< 6	< 8	< 3	< 4	< 21	< 8	< 7
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-7

ANNUAL AVERAGE TRITIUM CONCENTRATION IN PRECIPITATION,
MONITORING WELLS AND LAKE TOOK-A-WHILE (LTAW) SURFACE WATER DATA
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

SITE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Precip Sites 3S2**, 12S1**, 8G1** (offsite, controls)	62*	49	40	38	82	63	51	39	45	32	45	**	**	**	**	**	**
Precip Sites 1 and 2 (onsite, East of Station Reactor Bldgs)	370	230*	193	216	242	182	142	250	206	251	325	333	252	336	273	275	635
Precipitation Sites 3 and 4 (onsite, West of Station Reactor Bldgs)	414	404*	350	233	169	151	231	258	197	383	494	355	350	382	467	387	416
1S3 - MW-1 (43')	248	150	252	131	164	197	115	169	175	130	218	253	200	187	182	168	197
1S4 - Tap Water Sample	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	Not sampled	28	44	-17	41	160
4S8 - MW-2 (45')	292	154	190	173	137	202	187	138	154	138	191	196	239	194	282	106	189
4S9 - MW-3 (94')	127	54	150	64	80	135	94	180	125	55	109	92	77	86	102	205	104
8S4 - MW-4 (111')	172	66	105	68	81	109	60	162	145	91	102	155	96	109	181	148	180
7S10 - MW-5 (36')	171	69	96	-6	74	106	68	70	73	51	93	125	86	82	62	207	190
13S7 - MW-6 (16')	142	134	143	34	80	111	71	79	111	107	122	120	150	110	83	179	101
2S8 - MW-7 (85')	Not installed	Not installed	Not installed	22	54	72	70	70	74	56	37	71	63	35	86	62	95
6S11A - MW-8A (14')	177	82	165	58	15	72	103	110	63	38	50	83	72	48	30	44	41
6S11B - MW-8B (19')	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well	Dry well
6S12 - MW-9 (28')	30	-44	45	18	6	60	21	57	70	5	27	50	47	41	9	76	81
7S11 - MW-10 (132')	3	-27	-9	1	-1	23	29	55	13	1	33	16	3	7	23	-29	34
**12F3 - Groundwater Control	26	-53	-2	5	-6	45	-26	20	41	61	82	**	**	**	**	**	**
**LTAW- Surface Water	179	104	110	132	132	145	27	73	89	77	135	**	**	**	**	20	65

* Revised values to reflect full scope of precipitation data.

** Stations were discontinued after 5/30/18.

TABLE C-8 GROSS BETA, TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF DRINKING WATER SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

	COLLECTION PERIOD				<----------GAMMA EMITTERS---------->												
SITE	START	STOP	Gr-B	H-3	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
12H2	12/26/23	01/30/24	< 1.8	< 353	< 14	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 11	< 1	< 2	< 17	< 5
12H2	01/30/24	02/27/24	2.2 ± 1.4	< 386	< 11	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 5	< 1	< 1	< 9	< 3
12H2	02/27/24	03/26/24	< 2.0	< 390	< 17	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 6	< 1	< 2	< 13	< 5
12H2	03/26/24	04/30/24	2.1 ± 1.4	< 379	< 14	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 11	< 1	< 2	< 18	< 7
12H2	04/30/24	05/28/24	< 2.2	< 365	< 28	< 1	< 1	< 3	< 2	< 2	< 1	< 2	< 8	< 1	< 1	< 13	< 4
12H2	05/28/24	06/25/24	< 2.2	< 367	< 20	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 10	< 2	< 2	< 19	< 6
12H2	06/25/24	07/30/24	3.4 ± 1.4	< 263	41 ± 19	< 1	< 1	< 4	< 1	< 3	< 1	< 2	< 10	< 1	< 1	< 13	< 5
12H2	07/30/24	08/27/24	2.2 ± 1.3	< 363	< 14	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 9	< 1	< 2	< 17	< 5
12H2	08/27/24	09/24/24	< 2.1	< 367	< 13	< 1	< 1	< 5	< 1	< 3	< 2	< 3	< 8	< 1	< 1	< 13	< 5
12H2	09/24/24	10/29/24	< 3.3	< 250	< 16	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 11	< 1	< 2	< 19	< 6
12H2	10/29/24	11/25/24	3.0 ± 1.7	< 282	< 21	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 21	< 7
12H2	11/25/24	12/30/24	< 1.9	< 370	< 25	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 9	< 1	< 2	< 16	< 5
		AVERAGE	2.6 + 1.2	-	41 ± 0	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-9 **GAMMA SPECTROSCOPIC ANALYSES OF FOOD PRODUCTS (FRUITS, VEGETABLES AND BROADLEAF)**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/kg (wet) ± 2 sigma

SITE	COLLECTION DATE	SAMPLE TYPE	Be-7	K-40	I-131	Cs-134	Cs-137	Ac-228	Th-228
11S6	07/09/24	Swiss Chard	< 215	2987 ± 413	< 35	< 19	< 22	< 80	< 38
	07/09/24	Collard	< 190	3464 ± 446	< 29	< 19	< 19	< 91	< 32
	08/12/24	Swiss Chard	381 ± 205	2636 ± 424	< 24	< 21	< 17	< 95	< 37
	08/12/24	Collard	878 ± 341	3219 ± 487	< 29	< 19	< 27	< 103	< 45
	09/09/24	Swiss Chard	< 237	3124 ± 444	< 18	< 14	< 19	< 63	< 34
	09/09/24	Collard	< 303	3996 ± 587	< 33	< 27	< 26	< 91	< 44
	10/09/24	Swiss Chard	323 ± 140	2590 ± 349	< 22	< 15	< 17	< 70	< 30
	10/09/24	Collard	< 251	3674 ± 436	< 30	< 19	< 21	< 86	< 37
	AVERAGE		527 + 610	3211 + 976	-	-	-	-	-

TABLE C-10 **GROSS BETA, TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	Gr-B	H-3	<----------GAMMA EMITTERS----------> K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Th-228
6S6	12/26/23 - 01/30/24	-	< 370	< 34	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 15	< 2	< 2	< 22	< 7	< 4
	01/30/24 - 02/27/24	-	< 398	< 47	< 3	< 4	< 11	< 4	< 7	< 4	< 6	< 14	< 3	< 3	< 28	< 11	< 6
	02/27/24 - 03/26/24	-	< 398	< 15	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 7	< 1	< 2	< 12	< 4	< 3
	03/26/24 - 04/30/24	< 2.1	< 391	< 18	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 8	< 1	< 1	< 13	< 5	< 2
	04/30/24 - 05/28/24	< 2.2	< 371	< 29	< 2	< 2	< 7	< 2	< 4	< 2	< 4	< 13	< 2	< 2	< 21	< 9	< 3
	05/28/24 - 06/25/24	< 2.3	< 381	< 13	< 1	< 2	< 5	< 2	< 3	< 2	< 3	< 8	< 1	< 1	< 15	< 5	< 3
	06/25/24 - 07/30/24	2.8 ± 1.5	< 270	< 26	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 12	< 1	< 2	< 20	< 6	< 3
	07/30/24 - 08/27/24	4.4 ± 1.6	< 379	36 ± 17	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 8	< 1	< 1	< 14	< 5	< 2
	08/27/24 - 09/24/24	2.7 ± 1.6	< 375	< 15	< 1	< 2	< 5	< 2	< 3	< 2	< 3	< 8	< 1	< 1	< 14	< 5	< 3
	09/24/24 - 10/29/24	< 2.5	< 254	< 28	< 2	< 2	< 6	< 2	< 3	< 2	< 4	< 13	< 2	< 2	< 20	< 7	< 3
	10/29/24 - 11/25/24	3.4 ± 1.7	< 297	< 18	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 18	< 6	< 3
	11/25/24 - 12/30/24	< 1.9	< 375	< 10	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 7	< 1	< 1	< 11	< 4	< 2
	AVERAGE	3.3 + 1.5	-	36 + 0	-	-	-	-	-	-	-	-	-	-	-	-	-
6S5	01/02/24 - 01/30/24	-	< 365	< 33	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 18	< 6	< 3
	02/06/24 - 02/27/24	-	< 387	< 92	< 4	< 5	< 12	< 6	< 9	< 5	< 9	< 12	< 4	< 5	< 28	< 9	< 9
	03/05/24 - 03/26/24	-	< 398	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 6	< 2	< 2	< 13	< 4	< 3
	04/01/24 - 04/30/24	-	< 386	< 36	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 19	< 7	< 4
	05/07/24 - 05/28/24	-	< 372	< 29	< 2	< 2	< 6	< 2	< 4	< 2	< 3	< 10	< 2	< 2	< 17	< 7	< 3
	06/04/24 - 06/25/24	-	< 377	< 30	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 6	< 1	< 2	< 12	< 5	< 3
	07/02/24 - 07/30/24	-	< 271	< 34	< 2	< 2	< 7	< 2	< 5	< 2	< 4	< 11	< 2	< 2	< 19	< 7	< 4
	08/06/24 - 08/27/24	-	< 381	< 17	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 7	< 1	< 2	< 14	< 5	< 3
	09/03/24 - 09/24/24	-	< 367	< 16	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 6	< 2	< 2	< 13	< 5	< 3
	10/01/24 - 10/29/24	-	< 256	< 17	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 20	< 6	< 4
	11/05/24 - 11/25/24	-	< 292	< 87	< 4	< 6	< 8	< 6	< 11	< 5	< 6	< 14	< 4	< 5	< 33	< 8	< 11
	12/03/24 - 12/30/24	-	< 378	< 31	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 8	< 2	< 2	< 15	< 5	< 3
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4S7	01/29/24 - 01/29/24	-	< 361	< 101	< 7	< 7	< 14	< 11	< 17	< 8	< 11	< 8	< 8	< 9	< 28	< 10	< 12
	05/02/24 - 05/02/24	-	< 386	< 113	< 6	< 7	< 10	< 8	< 10	< 7	< 11	< 10	< 7	< 5	< 26	< 8	< 12
	07/15/24 - 07/15/24	-	< 376	< 110	< 6	< 7	< 20	< 8	< 16	< 7	< 13	< 13	< 8	< 7	< 36	< 13	< 12
	10/11/24 10/11/24	-	< 289	< 64	4	< 5	< 14	< 5	< 10	< 5	< 7	< 8	< 4	< 4	< 18	< 10	< 7
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-10 **GROSS BETA, TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	Gr-B	H-3	<----------GAMMA EMITTERS----------> K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Th-228
LTAW	01/29/24 - 01/29/24	-	< 391	< 113	< 8	< 7	< 18	< 6	< 13	< 7	< 11	< 8	< 7	< 7	< 25	< 8	< 12
	05/02/24 - 05/02/24	-	< 393	< 147	< 7	< 8	< 14	< 6	< 13	< 6	< 13	< 8	< 5	< 7	< 23	< 11	< 12
	07/15/24 - 07/15/24	-	< 349	< 85	< 6	< 6	< 14	< 6	< 11	< 7	< 10	< 10	< 6	< 5	< 29	< 12	< 8
	10/11/24 10/11/24	-	< 252	< 78	5	< 5	< 14	< 5	< 11	< 5	< 9	< 12	< 4	< 6	< 24	< 11	< 9
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5S9	06/11/24 - 06/11/24	-	< 385	< 32	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 8	< 2	< 2	< 16	< 5	< 3
	07/09/24 - 07/09/24	-	< 266	< 21	< 1	< 1	< 5	< 1	< 3	< 1	< 2	< 12	< 1	< 1	< 17	< 6	< 2
	09/30/24 - 09/30/24	-	< 257	< 9	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 20	< 1	< 1	< 22	< 8	< 2
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-11 **GAMMA SPECTROSCOPIC ANALYSIS OF FISH**
SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/kg (wet) ± 2 sigma

SITE	COLLECTION DATE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
2H									
Channel Catfish	05/03/24	2122 ± 997	< 70	< 78	< 187	< 74	< 139	< 68	< 68
Shorthead Redhorse	05/03/24	3251 ± 840	< 49	< 49	< 158	< 53	< 95	< 48	< 54
Smallmouth Bass	05/03/24	3456 ± 903	< 64	< 60	< 146	< 68	< 138	< 61	< 68
Channel Catfish	10/25/24	3436 ± 1219	< 65	< 73	< 236	< 64	< 100	< 45	< 66
Northern Hogsucker	10/25/24	2587 ± 800	< 36	< 66	< 187	< 72	< 102	< 62	< 53
Smallmouth Bass	10/25/24	3016 ± 1322	< 62	< 73	< 201	< 85	< 133	< 55	< 40
	AVERAGE	2978 + 1058	-	-	-	-	-	-	-
IND									
Channel Catfish	05/02/24	4335 ± 1268	< 73	< 80	< 144	< 77	< 165	< 72	< 66
Shorthead Redhorse	05/02/24	3900 ± 1070	< 46	< 68	< 190	< 69	< 117	< 59	< 63
Smallmouth Bass	05/02/24	3679 ± 810	< 57	< 49	< 151	< 49	< 112	< 57	< 61
Channel Catfish	10/24/24	2849 ± 859	< 60	< 58	< 141	< 82	< 157	< 54	< 60
Smallmouth Bass	10/24/24	3446 ± 995	< 63	< 70	< 191	< 60	< 157	< 62	< 64
Northern Hogsucker	10/25/24	4173 ± 980	< 82	< 85	< 228	< 95	< 190	< 84	< 85
	AVERAGE	3730 + 1077	-	-	-	-	-	-	-
LTAW									
Largemouth Bass	10/28/24	3923 ± 884	< 43	< 50	< 164	< 51	< 100	< 47	< 55
Rainbow Trout	10/28/24	3346 ± 1349	< 98	< 90	< 247	< 90	< 174	< 97	< 88
	AVERAGE	3635 + 816	-	-	-	-	-	-	-

TABLE C-12 GAMMA SPECTROSCOPIC ANALYSES OF SHORELINE SEDIMENT SUSQUEHANNA STEAM ELECTRIC STATION, 2024

Results in pCi/kg (dry) ± 2 sigma

SITE	COLLECTION DATE	K-40	Cs-134	Cs-137	Ra-226	Ac-228	Th-228
2B	04/01/24	10370 ± 1429	< 72	< 75	4211 ± 1715	1225 ± 264	738 ± 132
	11/05/24	10450 ± 2147	< 99	< 111	< 1742	881 ± 425	982 ± 176
	AVERAGE	10410 + 113	-	-	4211 ± 0	1053 + 487	860 + 344
7B	04/01/24	6594 ± 1136	< 51	< 78	< 1414	768 ± 295	548 ± 108
	11/05/24	7370 ± 1204	< 85	< 97	< 1791	713 ± 275	873 ± 175
	AVERAGE	6982 + 1097	-	-	-	740 + 78	710 + 461
12F	04/01/24	6617 ± 1579	< 72	< 78	< 1818	871 ± 283	699 ± 134
	11/05/24	6843 ± 1336	< 62	< 70	< 1121	575 ± 244	478 ± 108
	AVERAGE	6730 + 320	-	-	-	723 + 419	588 + 311

FIGURE C-1 - GROSS BETA ACTIVITY IN AIR PARTICULATES

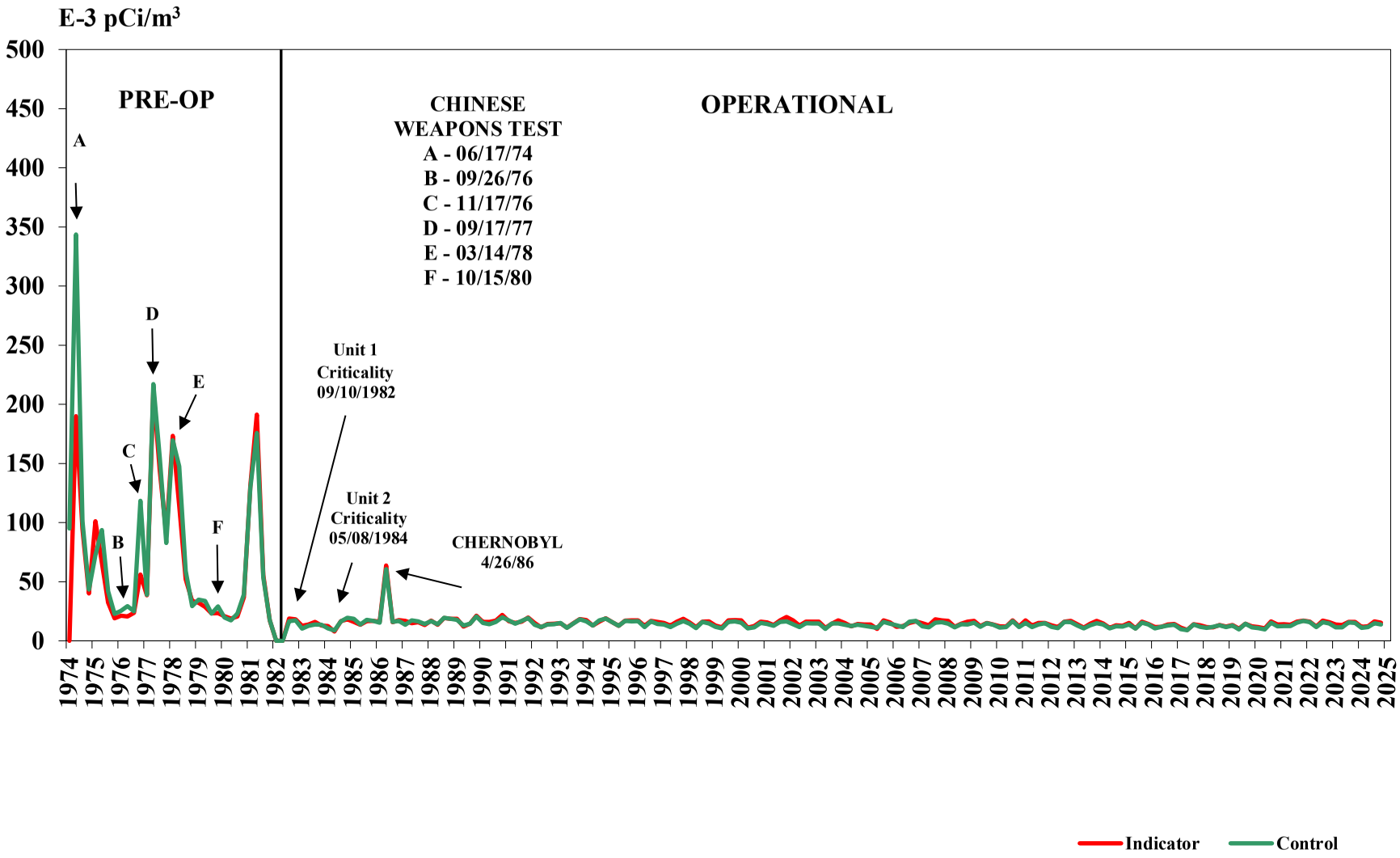


FIGURE C-2 - AMBIENT RADIATION LEVELS BASED ON ENVIRONMENTAL DOSIMETRY DATA

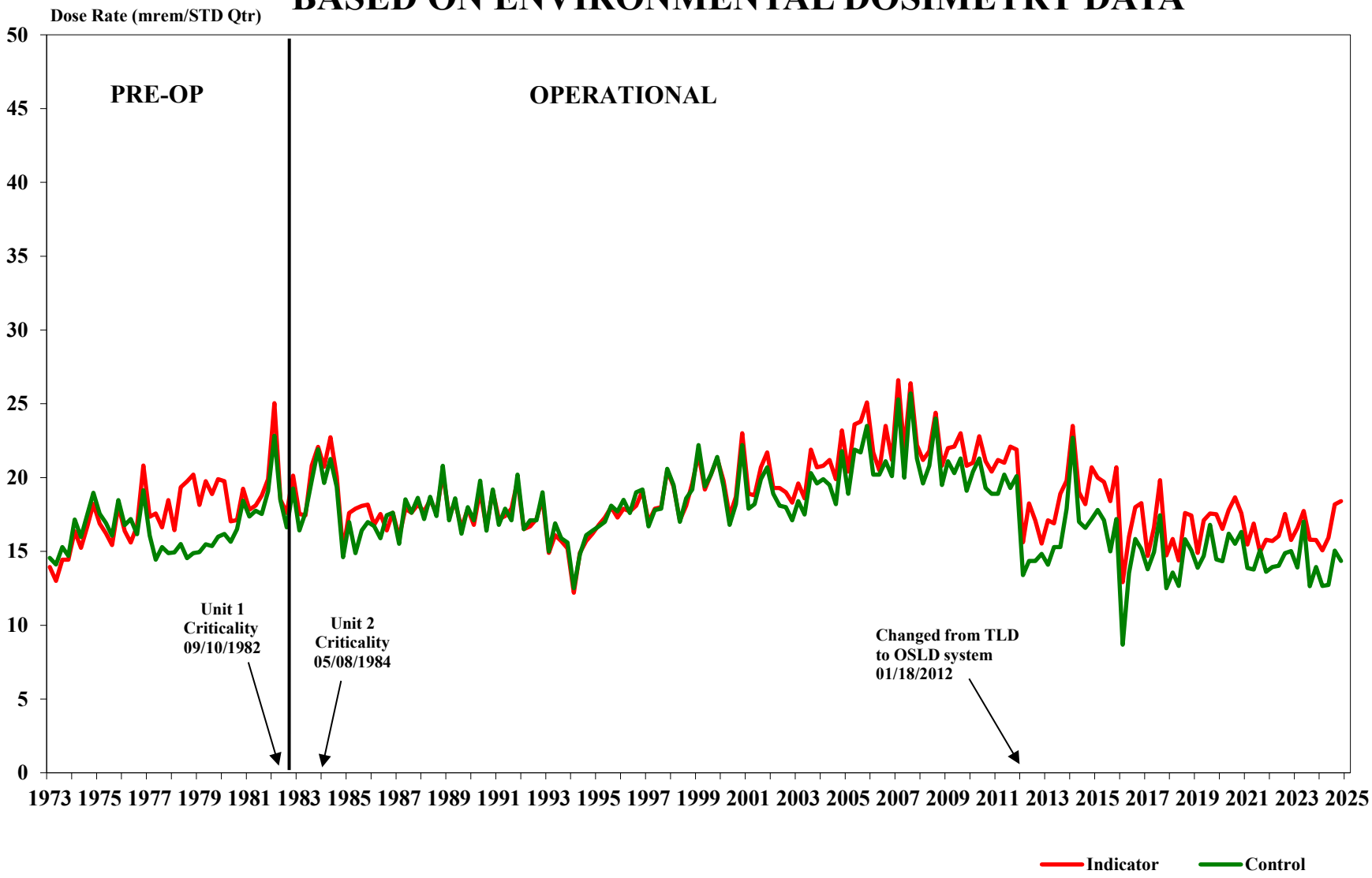


FIGURE C-3 - IODINE-131 ACTIVITY IN MILK

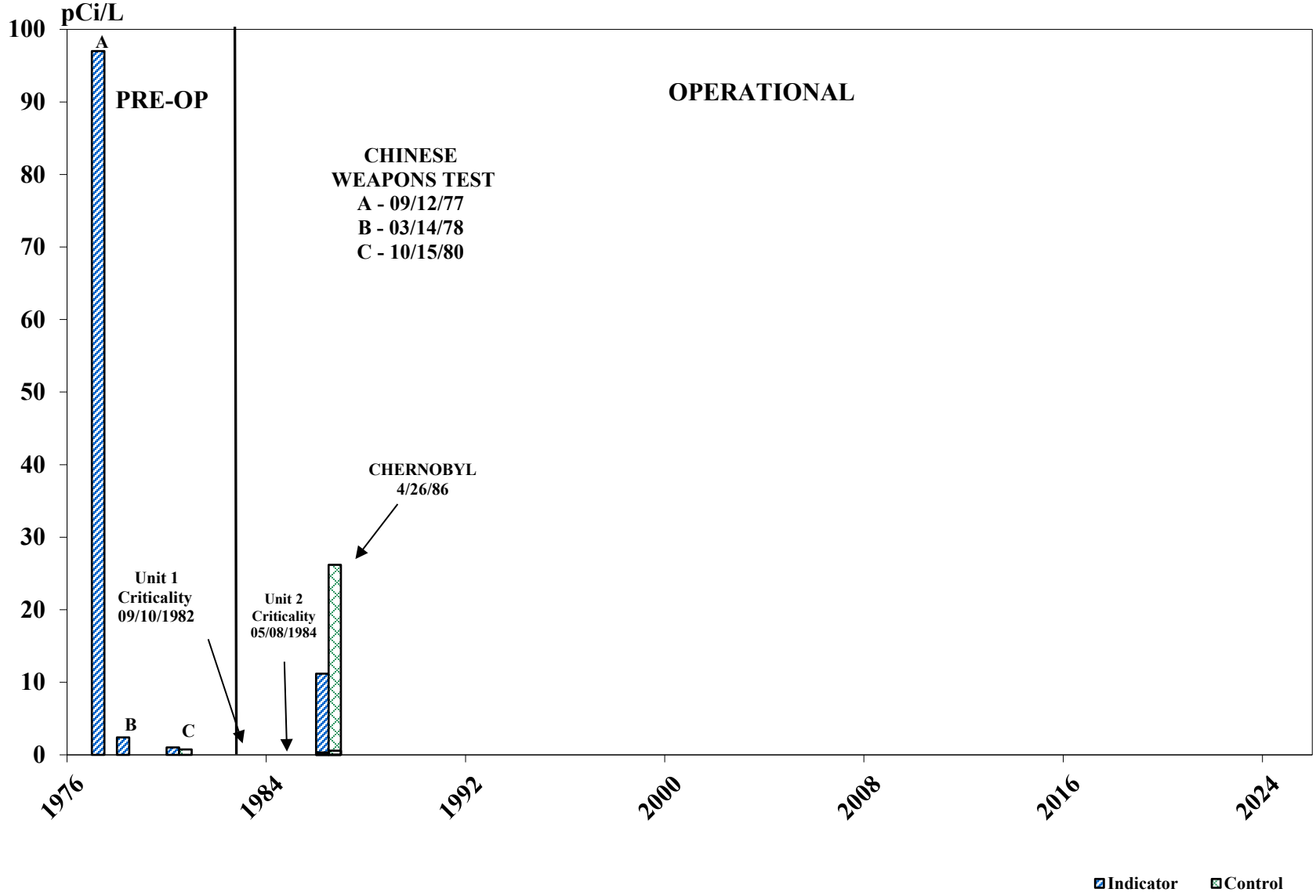


FIGURE C-4 - ANNUAL AVERAGE TRITIUM ACTIVITY IN PRECIPITATION AND SURFACE WATER VERSUS GROUND WATER

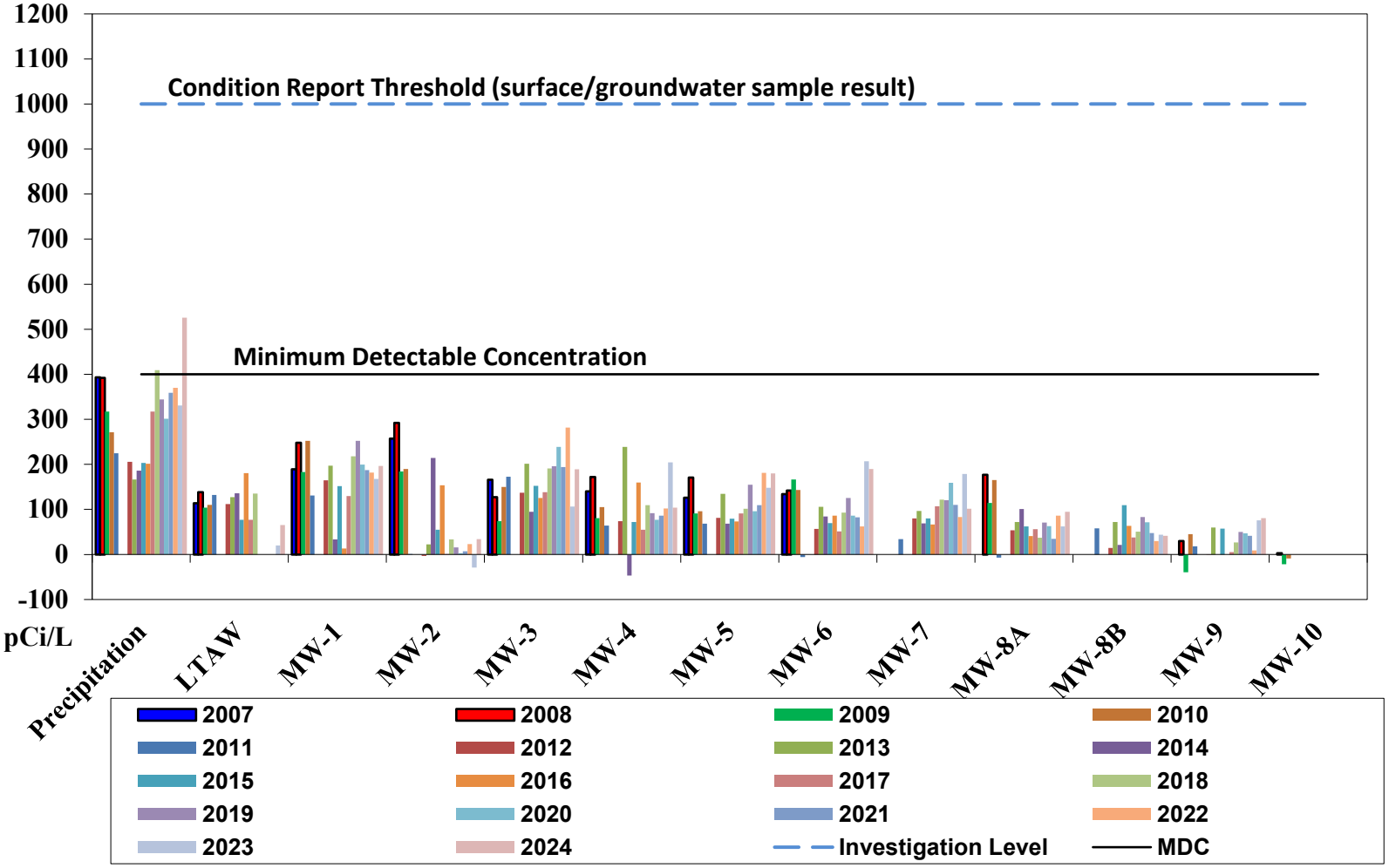


FIGURE C-5 - GROSS BETA ACTIVITY IN DRINKING WATER

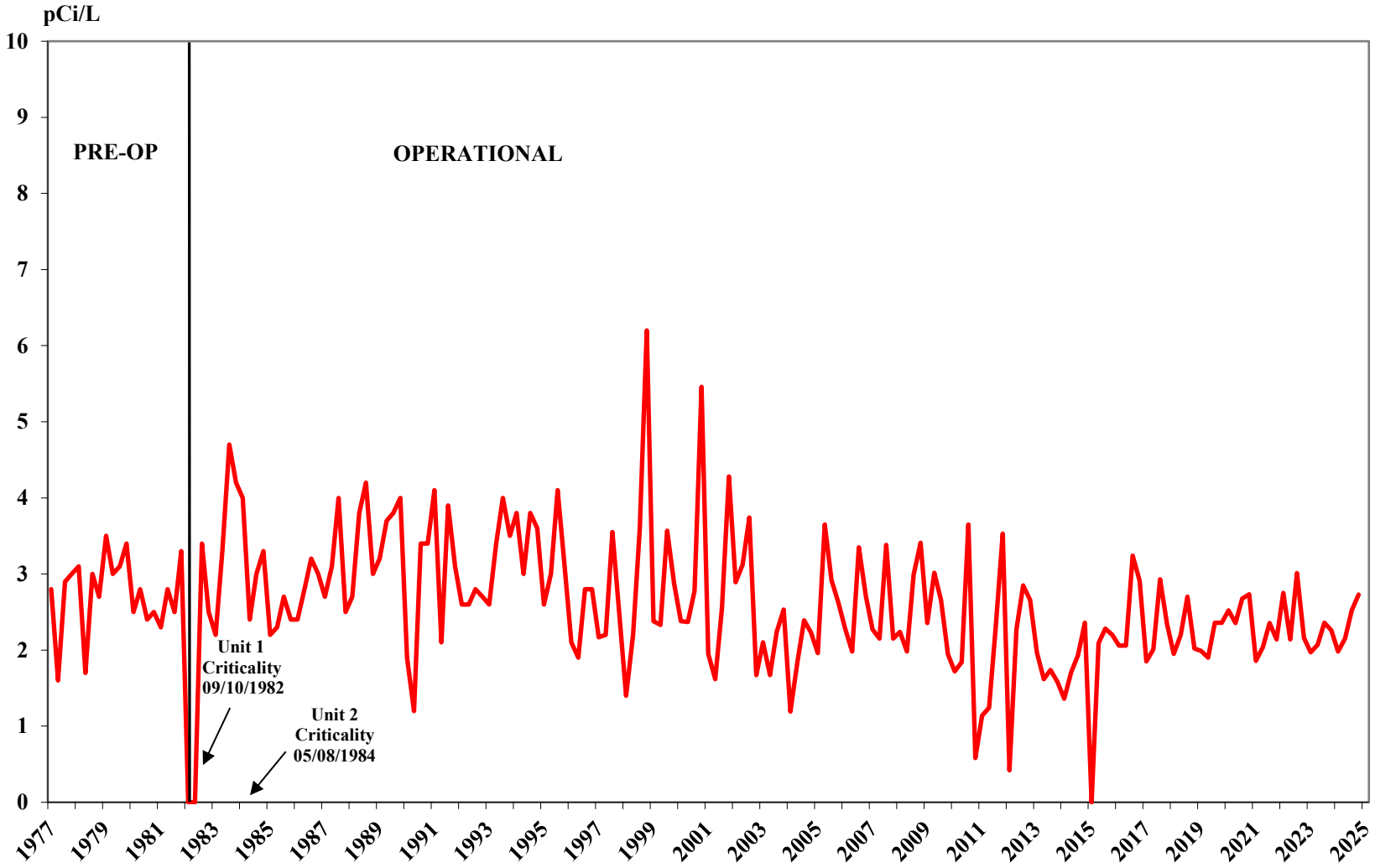
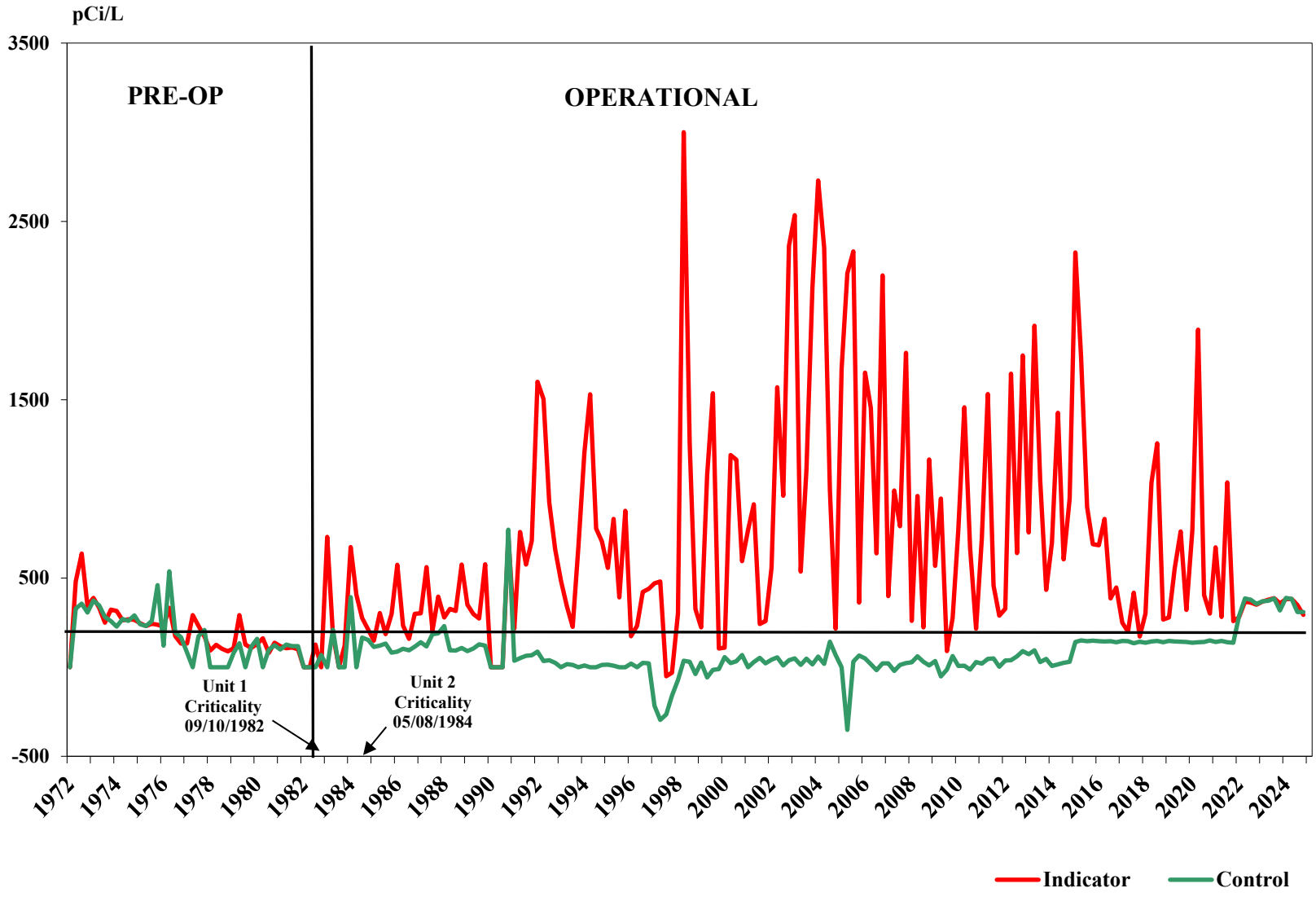


FIGURE C-6 - TRITIUM ACTIVITY IN SURFACE WATER



APPENDIX D

SUMMARY OF RESULTS FROM ANALYTICS, ENVIRONMENTAL RESOURCE ASSOCIATES (ERA), AND DEPARTMENT OF ENERGY (DOE) – MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)

Table D-1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
March 2024	E14089	Milk	Sr-89	pCi/L	79.6	78.2	1.02	A
			Sr-90	pCi/L	12.6	11.9	1.06	A
	E14090	Milk	Ce-141	pCi/L	75.6	85.0	0.89	A
			Co-58	pCi/L	-0.069	Not Measured		
			Co-60	pCi/L	139	158	0.88	A
			Cr-51	pCi/L	212	230	0.92	A
			Cs-134	pCi/L	167	198	0.84	A
			Cs-137	pCi/L	158	171	0.93	A
			Fe-59	pCi/L	81.1	86.5	0.94	A
			I-131	pCi/L	80.9	90.8	0.89	A
			Mn-54	pCi/L	173	183	0.95	A
			Zn-65	pCi/L	165	176	0.93	A
	E14091	Charcoal	I-131	pCi	90.1	90.3	1.00	A
	E14092	AP	Ce-141	pCi	68.1	67.5	1.01	A
			Co-58	pCi	1.73	Not Measured		
			Co-60	pCi	168	126	1.34	N(1)
			Cr-51	pCi	182	183	0.99	A
			Cs-134	pCi	157	157	1.00	A
			Cs-137	pCi	132	136.0	0.97	A
			Fe-59	pCi	70.3	68.6	1.02	A
			Mn-54	pCi	144	145	0.99	A
			Zn-65	pCi	125	140	0.89	A
	E14093	Soil	Ce-141	pCi/g	0.106	0.071	1.48	N(1)
			Co-58	pCi/g	-0.005	Not Measured		
			Co-60	pCi/g	0.121	0.133	0.91	A
			Cr-51	pCi/g	0.198	0.194	1.02	A
			Cs-134	pCi/g	0.206	0.166	1.24	W
			Cs-137	pCi/g	0.207	0.209	0.99	A
			Fe-59	pCi/g	0.063	0.073	0.87	A
			Mn-54	pCi/g	0.140	0.153	0.91	A
			Zn-65	pCi/g	0.149	0.148	1.01	A
	E14094	AP	Sr-89	pCi	83.9	90.6	0.93	A
			Sr-90	pCi	11.7	13.8	0.85	A
September 2024	E14095	Milk	Sr-89	pCi/L	88.0	92.3	0.95	A
			Sr-90	pCi/L	12.4	15.2	0.82	A
	E14096	Milk	Ce-141	pCi/L	124	124	1.00	A
			Co-58	pCi/L	154	150	1.03	A
			Co-60	pCi/L	232	236	0.98	A
			Cr-51	pCi/L	284	274	1.04	A

Table D-1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
	E14096	Milk (Cont'd)	Cs-134	pCi/L	180.0	187	0.96	A
			Cs-137	pCi/L	126	127	0.99	A
			Fe-59	pCi/L	127.0	113	1.12	A
			I-131	pCi/L	85.3	89.0	0.96	A
			Mn-54	pCi/L	162	162	1.00	A
			Zn-65	pCi/L	294	275	1.07	A
	E14097	Charcoal	I-131	pCi	98.8	92.6	1.07	A
	E14098	AP	Ce-141	pCi	82.0	76.7	1.07	A
			Co-58	pCi	91.0	92.6	0.98	A
			Co-60	pCi	180	146	1.23	W
			Cr-51	pCi	208	170	1.22	W
			Cs-134	pCi	116	116	1.00	A
			Cs-137	pCi	83.1	78.9	1.05	A
			Fe-59	pCi	75.6	70.2	1.08	A
			Mn-54	pCi	101	100	1.01	A
			Zn-65	pCi	167	170	0.98	A
	E14099	Soil	Ce-141	pCi/g	0.224	0.222	1.01	A
			Co-58	pCi/g	0.249	0.268	0.93	A
			Co-60	pCi/g	0.420	0.423	0.99	A
			Cr-51	pCi/g	0.492	0.492	1.00	A
			Cs-134	pCi/g	0.278	0.336	0.83	A
			Cs-137	pCi/g	0.276	0.295	0.94	A
			Fe-59	pCi/g	0.233	0.204	1.14	A
			Mn-54	pCi/g	0.279	0.290	0.96	A
			Zn-65	pCi/g	0.538	0.494	1.09	A
	E14100	AP	Sr-89	pCi	79.8	82.7	0.96	A
			Sr-90	pCi	12.0	13.6	0.88	A
	E14197	Liquid	Gr-A (Am241)	pCi/L	47.6	50.1	0.95	A
			Gr-B (Cs137)	pCi/L	248	270	0.92	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

Table D-2 **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2024	24-MaS50	Soil	Fe-55	Bq/kg	297	650	455 - 845	N[3]
			Ni-63	Bq/kg	1070	1530	1071 - 1989	N[4]
			Tc-99	Bq/kg	325	336	235 - 437	A
			Th-228	Bq/kg	34.6	48.8	34.2 - 63.4	W
			Th-230	Bq/kg	49.7	54.0	38.0 - 70.0	A
			Th-232	Bq/kg	36.4	45.1	31.6 - 58.6	A
	24-MaSU50	Urine	Cs-134	Bq/L	1.12	1.36	0.95-1.77	A
			Cs-137	Bq/L	2.00	2.23	1.56-2.90	A
			Co-57	Bq/L	1.06	1.26	0.88 - 1.64	A
			Co-60	Bq/L	2.26	2.38	1.67 - 3.09	A
			K-40	Bq/L	-1.80	NR	-	
			Mn-54	Bq/L	1.44	1.51	1.06 - 1.96	A
			U-234	Bq/L	0.00101		*(1)*	A
			U-238	Bq/L	0.00228		*(1)*	A
			Zn-65	Bq/L	-0.42	0.84	0.59-1.09	NE[5]
	24-MaW50	Water	Ni-63	Bq/L	0.338	0.80	*(2)*	A
			Tc-99	Bq/L	9.95	7.47	5.23 - 9.71	N[6]
	24-RdV50	Vegetation	Cs-134	Bq/sample	2.80	3.67	2.57 - 4.77	W
			Cs-137	Bq/sample	2.21	2.57	1.80 - 3.34	A
			Co-57	Bq/sample	2.23	2.53	1.77 - 3.29	A
			Co-60	Bq/sample	2.42	2.96	2.07 - 3.85	A
			Mn-54	Bq/sample	0.033		*(1)*	A
			Sr-90	Bq/sample	0.276	0.529	0.370 - 0.688	N[7]
			Zn-65	Bq/sample	6.83	8.02	5.61 - 10.43	A
August 2024	24-MaS51	Soil	Fe-55	Bq/kg	*(8)*	780	546-1014	N[9]
			Ni-63	Bq/kg	1140.00	1450.00	1015 - 1885	W
			Tc-99	Bq/kg	155.00	171.00	120 - 222	A
			Th-228	Bq/kg	38.00	43.30	30.3 - 56.3	A
			Th-230	Bq/kg	46.10	44.00	30.8 - 57.2	A
			Th-232	Bq/kg	38.90	42.60	29.8 - 55.4	A
	24-MaW51	Water	Ni-63	Bq/L	0.60	-	*(1)*	A
			Tc-99	Bq/L	11.90	11.20	7.8 - 14.6	A

Table D-2 **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
	24-RdV51	Vegetation	Cs-134	Bq/sample	3.12	2.89	2.02 - 3.76	A
			Cs-137	Bq/sample	2.18	1.91	1.34 - 2.48	A
			Co-57	Bq/sample	0.00	-	*(1)*	A
			Co-60	Bq/sample	2.24	2.01	1.41 - 2.61	A
			Mn-54	Bq/sample	3.76	3.53	2.47 - 4.59	A
			Sr-90	Bq/sample	0.95	2.39	1.67 - 3.11	N(10)
			Zn-65	Bq/sample	10.30	9.13	6.39 - 11.87	A

(a) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurement made during standard preparation

(b) DOE/MAPEP evaluation:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) False positive test

(2) Sensitivity evaluation

(3) See **CAR 23-31**

(4) See **NCR 24-08**

(5) Not Evaluated, re-reported as False Pos by MAPEP

(6) See **NCR 24-10**

(7) See **NCR 24-11**

(8) Not Reported

(9) See **NCR 24-16**

(10) See **NCR 24-17**

Table D-3 **ERA Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2024	MRAD-40	Water	Am-241	pCi/L	101	139	95.4 - 178	A
			Fe-55	pCi/L	2185	2480	1460- 3610	A
			Pu-238	pCi/L	62.0	70.4	42.3 - 91.2	A
			Pu-239	pCi/L	61.2	76.5	47.3 - 94.3	A
		Soil	Am-241	pCi/kg	NR	1880	1020 - 2660	
			Pu-238	pCi/kg	667	512	255 - 778	A
			Pu-239	pCi/kg	562	545	297 - 784	A
			Sr-90	pCi/kg	4050	3630	1130 - 5650	A
			U-234	pCi/kg	3040	4360	2040 - 5710	A
			U-238	pCi/kg	3270	4320	2370 - 5800	A
		AP	Am-241	pCi/filter	38.8	55.0	39.3 - 73.3	N[(1)]
			Fe-55	pCi/filter	387	386	141 - 616	A
			Pu-238	pCi/filter	45.9	41.1	31.0 - 50.5	A
			Pu-239	pCi/filter	54.9	56.1	41.9 - 67.7	A
			U-234	pCi/filter	11.1	11.6	8.60 - 13.6	A
			U-238	pCi/filter	12.8	11.5	8.68 - 13.7	A
			GR-A	pCi/filter	116	95.9	50.1 - 158	A
			GR-B	pCi/filter	42.1	22.2	13.5 - 33.5	N[(2)]
April 2024	RAD-137	Water	Ba-133	pCi/L	62.8	65.9	50.1 - 81.7	A
			Cs-134	pCi/L	51.0	57.8	42.8 - 72.8	A
			Cs-137	pCi/L	153	186	149 - 223	A
			Co-60	pCi/L	92.1	98.8	79.7 - 118	A
			Zn-65	pCi/L	208	240	188 - 292	A
			GR-A	pCi/L	35.2	52.6	39.6 - 65.6	N[(3)]
			GR-B	pCi/L	49	46.5	33.9 - 59.1	A
			U-Nat	pCi/L	56.0	59.3	52.8-65.8	A
			H-3	pCi/L	19,000	21,300	18,200 - 24,400	A
			Sr-89	pCi/L	48.9	52.2	37.8 - 66.6	A
			Sr-90	pCi/L	32.6	37.6	32.0 - 43.2	A
			I-131	pCi/L	21.8	25.1	21.7 - 28.5	A
September 2024	MRAD-41	Water	Am-241	pCi/L	108.0	117.0	80.3-150	A
			Fe-55	pCi/L	615	1230	723-1790	N[(4)]
			Pu-238	pCi/L	99	103	61.9-133	A
			Pu-239	pCi/L	123	133	82.3-164	A

Table D-3 **ERA Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [(a)]	Acceptance Limits	Evaluation [(b)]
September 2024	MRAD-41	Soil	Am-241	pCi/kg	1320	1110	599-1570	A
			Pu-238	pCi/kg	1380	1860	928-2830	A
			Pu-239	pCi/kg	796	1030	561-1480	A
			Sr-90	pCi/kg	3240	4730	1470-7370	A
			U-234	pCi/kg	2540	2860	1340-3750	A
			U-238	pCi/kg	2390	2840	1560-3810	A
		AP	Am-241	pCi/filter	27.0	29.1	20.8-38.8	A
			Fe-55	pCi/filter	644	800	292-1280	A
			Pu-238	pCi/filter	22.3	21.5	16.2-26.4	A
			Pu-239	pCi/filter	30.6	32.4	24.2-39.1	A
			U-234	pCi/filter	14.0	31.1	23.1-36.4	N[(5)]
			U-238	pCi/filter	14.2	30.9	23.3-36.9	N[(5)]
			GR-A	pCi/filter	80.0	72.4	37.8-119	A
			GR-B	pCi/filter	57.5	47.9	29.0-72.4	A
October 2024	RAD-139	Water	Ba-133	pCi/L	30.3	27.4	15.5-39.3	A
			Cs-134	pCi/L	73.3	80.2	63.0-97.4	A
			Cs-137	pCi/L	46.6	46.3	23.3-69.3	A
			Co-60	pCi/L	44.2	45.3	31.6-59.0	A
			Zn-65	pCi/L	104	114.0	75.0-153	A
			GR-A	pCi/L	47.6	51.7	38.9-64.5	A
			GR-B	pCi/L	44.2	48.1	35.2-61.0	A
			U-Nat	pCi/L	28.3	26.90	23.6-30.2	A
			H-3	pCi/L	4,690	5,320	3870-6770	A
			Sr-89	pCi/L	57.5	44.2	30.6-57.8	A
			Sr-90	pCi/L	37.3	35.6	30.2-41.0	A
			I-131	pCi/L	28.3	26.3	22.7-29.9	A

(a) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) ERA evaluation:

A = Acceptable - Reported value falls within the Acceptance Limits

N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 24-02***

*(2) See **NCR 24-03***

*(3) See **NCR 24-05***

*(4) See **NCR 24-15***

APPENDIX E

REMP SAMPLE EQUIPMENT OPERABILITY TRENDING

TABLE E-1
REMP SAMPLING EQUIPMENT OPERABILITY TRENDING
SUSQUEHANNA STEAM ELECTRIC STATION

Percent (%) Operability

SAMPLING MEDIA	SAMPLE LOCATION	DESCRIPTION	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Air Particulate & Charcoal	3S2	SSES Backup Met. Tower	100	99	100	99.9	99.9	100.0	99.4	99.9	95.5	99.7	99.9
	12S1	West Building	100	100	100	99.1	99.7	99.9	99.9	99.9	99.7	98.1	98.0
	13S6	Former Laydown Area, West of Confers Lane	100	97	100	100	99.9	99.9	99.9	99.9	99.9	100.0	99.7
	12E1	Berwick Hospital	100	98	99.1	100	100	100	100.0	100	100	100	99.9
	8G1	PPL System Facilities Center, Humboldt Industrial Park	100	100	99.2	99.9	99.9	99.9	99.9	99.9	100	100	98.8
	10S3	E of Confers Lane, S of Towers Club	-	-	100	99.5	99.9	99.2	98.9	99.9	99.7	99.9	98.6
	9B1	Transmission Line, E of Route 11	-	-	100	99.9	99.9	99.9	100.0	99.9	99.9	99.9	99.9
Drinking Water	12H2	Danville Water Company	100	100	100	100	100	98.1	100.0	100	100.0	100.0	99.9
Surface Water	6S6	River Water Intake Line	93	98	99.7	99.9	99.9	99.9	88.1***	94.0	99.4	94.0	99.9