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U. S. Nuclear Regulatory Commission
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SUSQUEHANNA STEAM ELECTRIC STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT **Docket Nos. 50-387**
PLA-7310 **and 50-388**

The Susquehanna Steam Electric Station Annual Radiological Environmental Operating Report is hereby submitted for the calendar year 2014 in accordance with Technical Specification 5.6.2.

Should you have any questions or require additional information, please contact Mr. Jeffery Grisewood, Manager – Nuclear Regulatory Affairs at (570) 542-1330.

This letter contains no new regulatory commitments.

Jon A. Franke

Attachment - 2014 Annual Radiological Environmental Operating Report

Copy: NRC Region I
Mr. J. E. Greives, NRC Sr. Resident Inspector
Mr. J. A. Whited, NRC Project Manager
Mr. L. J. Winker, PA DEP/BRP

Attachment to PLA-7310

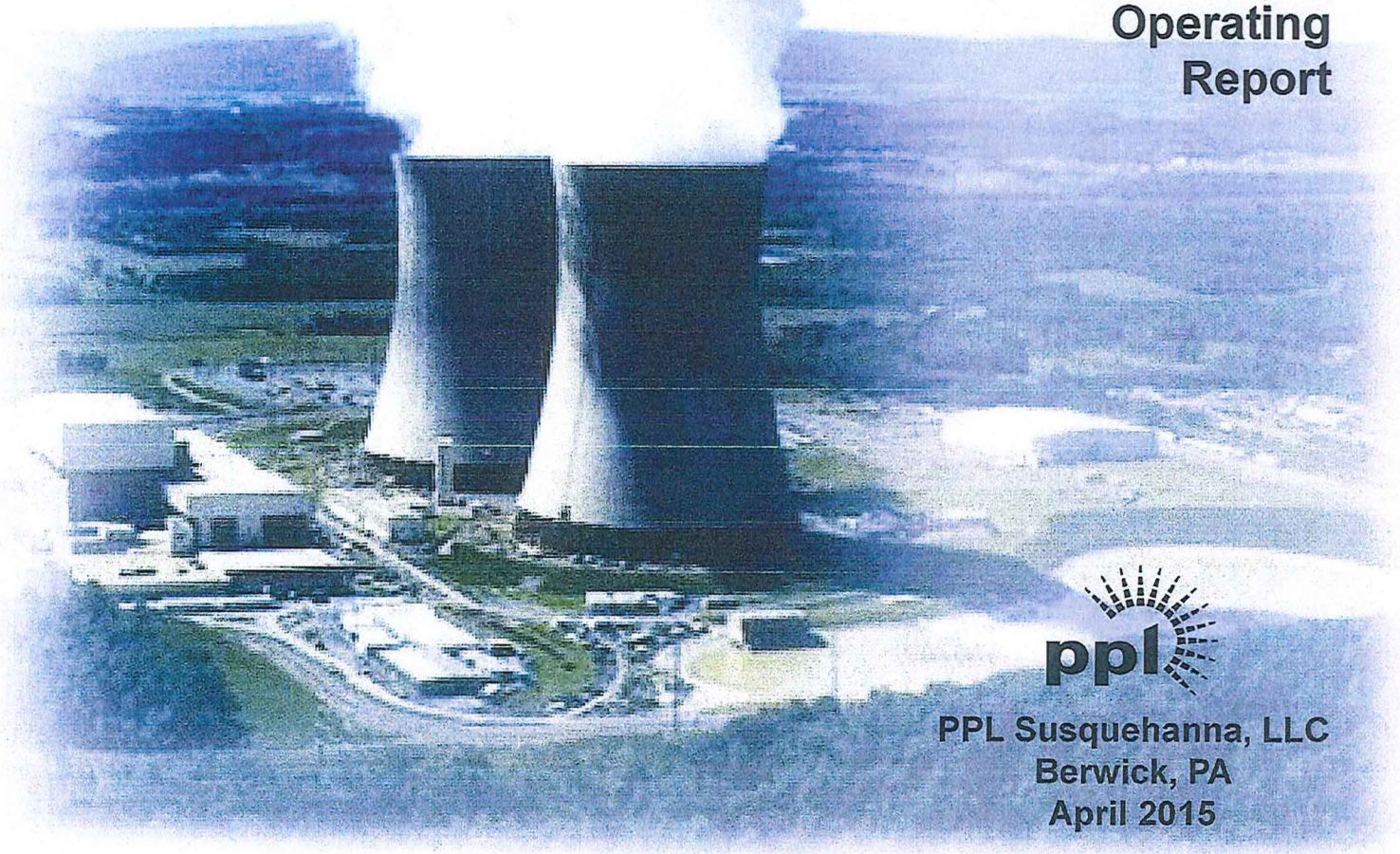
2014 Annual Radiological Environmental Operating Report

Susquehanna Steam Electric Station

Units 1 & 2

2014 ANNUAL REPORT

Annual Radiological Environmental Operating Report



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PPL Susquehanna, LLC
Berwick, PA
April 2015

SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

2014

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SUSQUEHANNA STEAM ELECTRIC STATION

Units 1 & 2

2014 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1 TO DECEMBER 31, 2014

PPL Susquehanna, LLC
Berwick, PA
April, 2015

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

LIST OF TABLES

LIST OF TABLES (cont'd)

LIST OF TABLES (cont'd)

LIST OF MAPS

LIST OF FIGURES

LIST OF FIGURES (cont'd)

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.

Ecology III was responsible for the collection of environmental samples during 2014. Teledyne Brown Engineering (TBE) was responsible for the analysis of environmental samples during 2014. The results are discussed in this report. Landauer provided the dosimetry services for SSES during 2014.

This Annual Radiological Environmental Operating Report (AREOR) conducted for SSES covers the period January 1, 2014 through December 31, 2014. During that time period, 1366 analyses were performed on 1065 samples.

Of the two man-made radionuclides (tritium [H-3] and cesium-137 [Cs-137]) detected in the environment by the Susquehanna Steam Electric Station (SSES) Radiological Environmental Monitoring Program (REMP), tritium is the only radionuclide attributable to SSES operation. The whole body and organ dose to members of the public attributable to tritium identified in REMP cooling tower blowdown samples was 9.42E-04 mRem. Tritium was included in the dose calculation because it was identified in the REMP samples of permitted water being discharged to the Susquehanna River. The 2014 average concentration of tritium in the cooling tower blowdown water and the 2014 average cooling tower blowdown flow were used to determine the amount of tritium released. The presumed exposure pathways to the public from this radionuclide were drinking water taken from the Susquehanna River

at Danville, PA and eating fish caught near the SSES discharge to the river. Dose from ground plane deposition (shoreline exposure) is not applicable because tritium does not emit gamma radiation and the beta radiation emitted by tritium is not sufficiently penetrating to reach an individual on the shore.

Based on the above outlined methodology, the total tritium activity released from the SSES to the Susquehanna River in 2014 was 66.5 curies.

The 2014 average dilution factor for the Susquehanna River was 413, based on the annual average river flow of 6.53E+06 gpm and the annual average cooling tower blowdown flow of 1.17E+04 gpm.

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 respective station Offsite Dose Calculation Manual (ODCM) 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 2014 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 2014 verify the adequacy of the SSES radioactive effluent control systems.

Samples of air particulates, air iodine, milk, groundwater, drinking water, vegetation, soil, 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.

High sensitivity iodine-131 (I-131) analyses were performed on weekly air samples. 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 concentrations of I-131 and gamma emitting nuclides. 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. No fission or activation products were detected.

Drinking water samples were analyzed for concentrations of tritium, gross beta and gamma emitting nuclides. Tritium and gross beta activities detected were 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 potassium-40 was detected at levels consistent with those detected in previous years. No fission or activation products were detected.

Soil samples were analyzed for concentrations of gamma emitting nuclides. In addition to the naturally occurring isotopes (i.e. K-40, thorium-228 [Th-228], radium-226 [Ra-226] and actinium-228 [Ac-228]), Cs-137 was detected in one or more of the soil samples. The sample data is consistent with historical and preoperational data which indicates that the presence of Cs-137 in the soil is due to residual fallout from atmospheric nuclear weapons testing in the 1970s and early 1980s and the Chernobyl and Fukushima events.

Surface water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Tritium activities detected were 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. No fission or activation products were detected in fish or sediment samples.

II. The Radiological Environmental Monitoring Program

PPL's Susquehanna Steam Electric Station (SSES) is a nuclear electrical generating facility with two boiling-water reactors and generators located just west of the Susquehanna River, approximately 5 miles northeast of Berwick, in Luzerne County, Pennsylvania. 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 total PPL Susquehanna, LLC presently owns 2,347 acres of land on both sides of the Susquehanna River. Generally, this land is characterized by open deciduous woodlands interspersed with grasslands and orchards.

On the west side of the river, 1,605 (1,670 minus 65 acre Gould Island) acres of land is jointly owned between PPL Susquehanna, LLC (90%) and Allegheny Electric Cooperative (10%). The land uses on the west side of the river include generation & 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 river, PPL Susquehanna, LLC owns 100% of the 65-acre Gould Island. On the east side of the river, and across the river from the Station, PPL Susquehanna, LLC is the 100% owner of 677 acres that are maintained as undeveloped land, natural recreational areas, wildlife areas, and leases to local farmers.

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.

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, 2014, 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. To 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 site meteorology, Susquehanna River hydrology, local demography, and land uses.

2. Sampling locations were divided into two classes, indicator and control. Indicator locations are sited where it is expected that radiation and radioactive material that might originate from the station would be detectable. Control locations are 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 are evaluated with respect to analogous fluctuations at control locations. Indicator and control location data are 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, 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. The LLD is an "a priori" number which 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. The MDC is an "a posteriori" number which is an indicator of the performance of the measurement system. The MDC is set to be below the LLD.

The grouped data were averaged and standard deviations calculated. Thus, the ± 2 sigma deviations 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 that level.

B. Program Exceptions

Date	Sample Type	Location	Exception	Corrective Action
12/31/13 to 01/07/14	Surface Water	6S6	Week 1 of the January composite start date was delayed to 01/03/14 due to blockage in sample line.	CR 2013-07175 12/31/13: I&C performed maintenance, but unsuccessful in removing blockage to sample line. CR - 2013-07238 1/03/14: FIN performed maintenance to unblock sample line. Flow restored to required 1.5 gpm. 1/07/14: Operability verified.

Date	Sample Type	Location	Exception	Corrective Action
01/07/14 to 01/14/14	Surface Water	2S7	Week 2 of the January composite delayed the start date for 2 weeks due to a frozen sample line due to low thermostat setting. Sampler inoperable from 1/07/14 @ 1411 to 1/08/14 @ 0930.	AR 2014-00936 1/07/14: Sampler turned off and thermostat setting increased to thaw out frozen sample line. Replaced sample line tubing and restored sampler to service @ 0930. 01/07/14: Operability verified.
01/07/14 to 01/14/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 2 of the January composite.	CR 2014-01438 1/14/14: Adequate sample volume was collected during sampling period. Unable to obtain procedural aliquot. 1/15/14: FIN performed maintenance and flow restored to required 1.5 gpm. 1/21/14: Operability- ACS still diminished flow (<1.5 gpm).
01/14/14 to 01/21/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) due to blockage in sample line for Weeks 3 and 4 of the January composite.	CR 2014-02222 1/21/14 & 1/28/14: Adequate sample volume collected during sample period. Procedural aliquot obtained. 1/22/14: I&C performed maintenance but were unsuccessful in removing blockage to sample line. CR 2014-02382 1/27/14: Maintenance performed again (RTPM 1667128) and flow restored to required 1.5 gpm. 1/28/14: Operability verified.

Date	Sample Type	Location	Exception	Corrective Action
1st Quarter 2014	Ground-Water	2S8 (MW-7)	Sample unavailable due to insufficient groundwater (water level below pump).	AR 2014-16224 2/24/14: Notified PPL Chemistry. Will sample next quarter (May 2014).
01/28/14 to 02/11/14	Drinking Water	12H2	Week 1 of the February composite was delayed due to power outage at Danville Water Company.	AR 2014-03906 2/04/14: Danville Water company will institute emergency power between 1100-1200 hours. Power may be intermittent on 2/04/14 to 2/05/14 until problem is resolved. ACS resumed normal operation when power was restored. 2/11/14: Operability verified.
03/04/14 to 03/11/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 1 of the March composite.	CR 2014-07961 3/11/14: Adequate sample volume collected during sample period. Procedural aliquot obtained. . 3/12/14: FIN performed maintenance and restored flow to required 1.5 gpm. 3/18/14: Operability - ACS still at diminished flow (<1.5 gpm).
03/05/14 to 03/12/14	AP/C	13S6Q	Pump malfunction. Pump would not restart for next sample period. Also noticed timer box electrical cord was worn. No effect on continuous sampler operation for sample period.	3/12/14: Replaced pump and timer box. Operability verified.

Date	Sample Type	Location	Exception	Corrective Action
03/11/14 to 03/18/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 2 of the March composite.	CR 2014-08761 3/18/14: Adequate sample volume collected during sample period. Procedural aliquot obtained. 3/18/14: Operability – ACS still at diminished flow (<1.5 gpm) 3/19/14: Maintenance performed (RTPM 1699444) and flow restored to required 1.5 gpm. 3/25/14: Operability verified.
03/11/14 to 03/18/14	Surface Water	2S7	Week 2 of the March composite was not collected by the ACs for the sample period. Reason unknown.	CR 2014-08764 3/18/14: Grab sample collected @ 0957 for week 2 of the March composite. Replaced tubing and recalibrated sampler. Sampler resumed normal operation. Grab sample (for comparison) also collected at 6S6 as per REMP procedures.
03/18/14 to 03/25/14	Surface Water	2S7	The composite overflowed the composite container resulting in a non-representative sample for Week 3 of the March composite. Reason unknown.	CR 2014-09912 3/25/14: Grab sample collected @1112 for Week 3 of the March composite. Recalibrated sampler. Sampler resumed normal operation. Grab sample (for comparison) also collected as 6S6 as per REMP procedures. 3/27/14: Checked sampler and malfunction still exists. Reconfigured sampler and checked tubing and rollers. Sampler resumed normal operation. Will continue to monitor.

Date	Sample Type	Location	Exception	Corrective Action
03/25/14 to 04/01/14	Surface Water	2S7	The composite overflowed the composite container resulting in a non-representative sample for Week 4 of the March composite. Reason unknown.	CR 2014-10410 4/01/14: Grab sample collected @1023 for week 4 of the March compite. Recalibrated sampler. Sampler resumed normal operation. New liquid detector ordered and will be installed upon receipt. Grab sample (for comparison) also collected at 6S6 as per REMP procedures.
03/25/14 to 04/01/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 4 of the March composite.	CR 2014-10403 04/01/14: Adequate sample volume collected during sample period. Unable to obtain procedural aliquot. Maintenance requested. 4/01/14: Operability – ACS still at diminished flow (<1.5 gpm)
04/01/14 to 04/08/14	Surface Water	2S7	The composite overflowed the composite container resulting in a non-representative sample for Week 1 of the April composite. Reason unknown.	CR 2014-11188 04/04/14: New liquid detector installed; sampler recalibrated. Sampler resumed normal operation. 04/08/14: Grab sample collected @1025 for week 1 of the April composite. Grab sample (for comparison) also collected at 6S6 as per REMP procedures. Recalibrated sampler. Sampler resumed normal operation.
04/01/14 to 04/08/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 1 of the April composite.	CR 2014-11180 Adequate sample volume collected during sample period. Unable to obtain procedural aliquot. Maintenance requested.
04/08/14 to 04/15/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 2 of the April composite.	CR 2014-12027 Adequate sample volume collected during sample period. Unable to obtain procedural aliquot. Maintenance requested.

Date	Sample Type	Location	Exception	Corrective Action
04/08/14 to 04/29/14	Surface Water	2S7	The composite overflowed the composite container resulting in a non-representative sample for Weeks 2, 3 and 4 of the April composite. Reason unknown. 4/17/14 to 4/29/14 – Sampler out of service for further testing and repair.	CR 2014-12033 4/10/14: Sampler reinitialized and resumed normal operation with ideal aliquot. 4/14/14: FIN blew out both bottom lines to sampler with nitrogen using a stroking rig, both lines were not blocked. 4/15/14: Grab sample collected @1018 for week 2-Apr comp. Recalibrated sampler. Sampler resumed normal operation. Grab sample (for comparison) also collected at 6S6 as per REMP procedures. 4/17/14: Checked sampler and malfunction still exists. Removed sampler from site for further monitoring at Environmental Lab. 4/22/14: Grab sample collected @ 0928 for week 3 of the April composite. Grab sample (for comparison) also collected at 6S6 as per REMP procedures. 4/28/14: Sampler sent to Teledyne Isco for repair. 4/29/14: Grab sample collected @ 0945 for week 4 of the April composite. Grab sample (for comparison) also collected at 6S6 as per REMP procedures

Date	Sample Type	Location	Exception	Corrective Action
04/29/14 to 06/03/14	Surface Water	2S7	Weeks 1, 2 and 3 of the May composite samples unavailable. Sampler out of service for repair. 5/27/14 to 6/03/14 – Week 5-May comp Repaired sampler still not working properly. Taken out of service. Weekly composites unavailable.	CR 2014-12033 Grab samples collected to meet TRM requirements. Grab sample (for comparison) also collected at 6S6 as per REMP procedure. 5/06/14 @ 0919 – Week 1 May comp. 5/13/14 @ 0953 – Week 2 May comp 5/19/14 @ 0829 – Week 3 May comp 6/03/14 @0842 – Week 5 May comp. 5/20/14: Repaired sampler installed but delayed start date of 5/22/14 due to incorrect settings. 5/27/14: Valid sample collected for 5/22/14 to 5/27/14 – Week 4 May comp. 5/29/14: Sampler taken out of service again. New ISCO sampler ordered.
05/13/14 to 05/19/14	Surface Water	6S6	Diminished flow rate (<1.5 gpm) for Week 3 of the May composite.	CR 2014-16878 5/19/14: Adequate sample collected for sample period. Unable to obtain procedural aliquot. Maintenance requested. 5/27/14: I&C performed maintenance. Installed new float and restored required flow. 6/03/14: Operability verified.
06/03/14 to 07/01/14	Surface Water	2S7	Weeks 1, 2, 3 and 4 of the June composite samples unavailable. Sampler out of service due to inoperability.	CR 2014-12033 New sampler ordered. Grab samples collected to meet TRM requirements. Grab sample (for comparison also collected at 6S6 as per REMP procedure. 6/10/14 @ 0945 – Week 1 Jun comp. 6/17/14 @ 0947 – Week 2 Jun comp 6/24/14 @ 1017 – Week 3 Jun comp 7/01/14 @ 0955 – Week 4 Jun comp

Date	Sample Type	Location	Exception	Corrective Action
07/01/14 to 07/29/14	Surface Water	2S7	Week 1 of the July composite sample unavailable. Sampler out of service due to inoperability. 07/07/14 to 07/29/14 – Representative grab samples collected for weeks 2, 3 and 4 of the July composite.	CR 2014-12033 New sampler ordered. Grab sample collected to meet TRM requirements. Grab sample (for comparison) also collected at 6S6 as per REMP procedure. 7/08/14 @ 1223 – Week 1 for July composite. AR 2014-23370 7/07/14: New sampler installed and put in service @ 1054 hours.
07/30/14 to 08/06/14	AP/C	6G1	Timer box malfunction – digits failed to advance properly. No effect on continuous sampler operation for sample period.	AR 2014-25387 8/06/14: Timer box replaced. Operability verified.
10/14/14 to 10/21/14	Surface Water	6S6	Week 3 of the October composite sample unavailable. No sample flow available at ACS, possibly due to blocked sample line. Non-representative composite for sample period.	CR 2014-32645 10/21/14 @ 1145: Grab sample collected at alternate location 5S9 to meet TRM requirements. Requested maintenance.
10/21/14 to 10/27/14	Surface Water	6S6	Week 4 of the October composite sample unavailable. No sample flow available at ACS, possibly due to blocked sample line. Non-representative composite for sample period.	CR 2014-33340 10/27/14 @ 0940: Grab sample collected at alternate location 5S9 to meet TRM requirements. Maintenance requested to clear blockage in line. FIN currently awaiting clearance order to complete work.

Date	Sample Type	Location	Exception	Corrective Action
10/27/14 to 11/04/14	Surface Water	6S6	Week 1 of the November composite sample had insufficient volume due to start date and time unknown and insufficient sample volume. Grab sample collected for Week 1.	CR 2014-34496 11/04/14 @ 1505: Grab sample collected at alternate location 5S9 to meet TRM requirements. 10/29/14: FIN was unsuccessful in removing sample line blockage. Maintenance ordered. Sometime between 10/29/14 and 11/04/14, the sample line cleared itself and the ACS became operational. 11/04/14: ACS reset to start week 2 Nov comp.
11/05/14 to 11/12/14	AP/C	3S2	11/05/14 to 11/12/14 Timer box malfunction – digits failed to advance properly. No effect on continuous sampler operation for sample period.	AR 2014-35344 11/12/14: Replaced timer box. Verified operability.
12/09/14 to 12/17/14	AP/C	13S6	Pump malfunction – inadequate flow rate (below procedural 2.0-2.4 cfm) as discovered during weekly change out. No effect on continuous sampler operation for sample period.	AR 2014-38538 12/17/14: Replaced pump and verified air flow.

2014 Totals: 14 occurrences resulted in entry into TRO 3.11.4.1 Condition A

All remaining occurrences were non-TRO events. Actions to prevent recurrence were not applicable to any of the occurrences in 2014.

C. Program Changes

Three broadleaf locations, 11S6, 3S3 and 8G1 were added to the

program in 2014. Leafy vegetation is collected at these locations in response to the loss of a milk sampling location (10S3).

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 TBE laboratory performed 169 analyses of Performance Evaluation (PE) containing spiked samples of air particulate, air iodine, milk, soil, vegetation and water matrices, as part of the Teledyne Quality Control Spike Program. (Appendix D, Tables D-1 through D-3),

The PE samples, supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following acceptance criteria:

1. Analytics Evaluation Criteria

   Analytics' evaluation report provides a ratio of reported result and Analytics' known value. Since flag values are not assigned by Analytics, TBE evaluates the reported ratios based on internal QC requirements, which are 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 United States Environmental Protection Agency (USEPA), National Environmental Laboratory Conference (NELAC) performance testing (PT) program requirements or ERA's standard operating procedure (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.

The MAPEP defines three levels of performance: Acceptable (flag = "A"), Acceptable with Warning (flag = "W"), and Not Acceptable (flag = "N"). Performance is considered acceptable when a mean result for the specified analyte is ± 20% of the reference value. Performance is acceptable with warning when a mean result falls in the range from ± 20% to ± 30% of the reference value (i.e., 20% < bias < 30%). If the bias is greater than 30%, the results are deemed not acceptable.

Teledyne Brown Engineering

In reviewing our environmental inter-laboratory crosscheck programs, we identified 1) duplication of efforts on some matrices and isotopes and 2) that we are performing crosscheck samples on some matrices

and isotopes that we do not perform for clients. Since the DOE MAPEP is designed to evaluate the ability of analytical facilities to correctly analyze for radiological constituents representative of those at DOE sites, the needed changes were made to the MAPEP program. Therefore, the following isotopes were removed from the MAPEP program:

Soil – gamma – will be provided by Analytics twice per year, starting in 2015. For 2014, one soil gamma is provided by MAPEP, the 2nd soil gamma is provided by Analytics.

AP – gamma – is currently provided by Analytics.

Water – gamma, H-3, Sr-90, uranium, gross alpha and gross beta currently provided by ERA.

MAPEP evaluates non-reported (NR) analyses as failed if they were reported in the previous series.

For the TBE laboratory, 163 out of 169 analyses performed met the specified acceptance criteria. Six analyses (Ni-63, K-40 and I-131 in water, and two Sr-90s and one Gross Alpha in AP samples) did not meet the specified acceptance criteria for the following reasons:

1. Teledyne Brown Engineering's MAPEP March 2014 Ni-63 in water result of 32.7 ± 1.69 Bq/L was overlooked when reporting the data but would have passed the acceptance range of 23.9 – 44.2 Bq/L.

2. Teledyne Brown Engineering's MAPEP March 2014 K-40 in water result of 1.63 ± 2.49 Bq/L was overlooked when reporting

the data but would have passed the false positive test. NCR 14-04

3. Teledyne Brown Engineering's ERA November 2014 I-131 in water result of 15.8 pCi/L was lower than the known value of 20.3 pCi/L, failing below the lower acceptance limit of 16.8. The result was evaluated as failed with a found to known ratio of 0.778. No cause could be found for the slightly low result. All ERA I-131 evaluations since 2004 have been acceptable. NCR 14-08

4. Teledyne Brown Engineering's MAPEP March 2014 Sr-90 in AP result of 0.822 Bq/sample was lower than the known value of 1.18 Bq/sample, falling below the lower acceptance limit of 0.83 Bq/sample. The rerun result was still low, but fell within the lower acceptance range of 0.836. The rerun result was statistically the same number as the original result. No cause could be found for the slightly low results. NCR 14-04

5. Teledyne Brown Engineering's MAPEP September 2014 Sr-90 in AP result of 0.310 Bq/sample was lower than the known value of 0.703 Bq/sample. The gravimetric yield of 117% was very high (we normally see yields of 60% to 70 %) and could account for the low activity. NCR 14-09

6. Teledyne Brown Engineering's MAPEP September 2014 Gr-Alpha in AP result of 0.153 Bq/sample was lower than the known value of 0.53 Bq/sample. The AP sample was counted on the wrong side. The AP was flipped over and recounted with acceptable results. NCR 14-09

In addition, PPL's REMP Laboratory Spike Program provided independently procured Analytics spiked samples as part of PPL's Quality Control Spike Program.

The criteria for the acceptability of the spiked analysis results were established by PPL and are based on criteria originally developed by the NRC. The criteria are based on an empirical relationship that combines prior experience and accuracy needs. As the resolution of the measurement process improves, the criteria for determining acceptability become tighter. Conversely, as the resolution of the process becomes poorer, the criteria for determining acceptability become wider.

The TBE laboratory performed 144 analyses of Performance Evaluation (PE) containing spiked samples of air particulate, air iodine, milk, soil and water matrices. (Appendix D, Table D-4)

For the TBE laboratory, 138 out of 141 analyses performed met the specified acceptance criteria. Six analyses (three Co-60 and one Ce-141 in an air particulate, a Cr-51 in soil and an I-131 in milk) did not meet the specified acceptance criteria or internal QA requirements. The TBE laboratory initiated Nonconformance Report 15-04 to address the failures.

IV. Results and Discussion

The analytical results of the 2014 REMP samples are divided into categories based on exposure pathways: atmospheric, direct radiation, terrestrial, and aquatic. The analytical results for the 2014 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 historical 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 includes the collection of air particulate, air iodine and direct radiation samples.

1. Air Particulates

Air particulate samples were collected weekly at four indicator locations (3S2, 12E1, 12S1 and 13S6) and two control locations (6G1 and 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 208 of 208 of the indicator location samples at concentrations ranging from 6 to 26 E-3 pCi/m^3 with an average concentration of 13 E-3 pCi/m^3, and in 104 of 104 of the control location samples at concentrations ranging from 7 to 23 E-3 pCi/m^3 with an average of 12 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 spectroscopy was performed on each of the 24 quarterly composite samples.

Beryllium-7, attributed to cosmic ray activity in the atmosphere, was detected in all 16 indicator location composites at concentrations ranging from 52 E-3 to 125 E-3 pCi/m^3 with an average concentration of 92 E-3 pCi/m^3, and in the eight control location composites ranging in concentration from 75 to 131 E-3 pCi/m^3 with an average concentration of 103 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 four indicator locations (3S2, 12E1, 12S1 and 13S6) and two control locations (6G1 and 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 with a pair of optically stimulated luminescent dosimeters (OSLD) composed of aluminum oxide crystals supplied and processed by Landauer. 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 57 locations were monitored for direct radiation during 2014, including 30 site boundary locations, 16 outer distance locations, six special interest locations and five control locations.

The average dose rate for the 206 indicator dosimeters was 20.4 milliroentgen per standard quarter. The average control dose rate for the 19 control dosimeters was 18.4 milliroentgen per standard quarter. The preoperational average for the quarterly direct radiation readings was 17.6 milliroentgen per standard quarter. The results of the direct radiation measurements for 2014 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 includes the collection of milk, groundwater, drinking water, vegetation and soil samples.

1. Milk

Milk samples were collected semi-monthly when cows were on pasture and monthly when cows were not grazing on open 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 no 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 2014 are plotted.

Gamma Spectrometry

Naturally occurring K-40 was detected in all 60 samples with concentrations for the 40 indicator location samples ranging from 1,171 to 1,576 pCi/L with an average concentration of 1,340 pCi/L, and the 20 control location sample concentrations ranging from 1,009 to 1,401 pCi/L with an average concentration of 1,254 pCi/L. The maximum preoperational level detected was 1,500 pCi/L with an average concentration of 1,358 pCi/L. Naturally occurring Th-228 was not detected in any of the samples. Preoperational data is not available for comparison. (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 provides 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 concentrations which makes its way into surface water and soil where it eventually seeps into shallow groundwater. The annual average H-3 concentration in precipitation, perimeter drain manholes, groundwater monitoring wells and surface water is summarized in Table C-7 and graphically depicted in Figure C-4 - Annual Average Tritium Activity (pCi/L) in precipitation, Perimeter Drain, Surface Water Versus Ground Water.

Ground water samples were collected quarterly at 14 indicator locations (2S2, 4S4, 6S10, 11S2, 1S3, 4S8, 4S9, 8S4, 7S10, 13S7, 2S8, 6S11A, 6S12 and 7S11) and one control location, (12F3). Each sample was analyzed for H-3 and gamma emitters.

Tritium

Tritium activity was detected above the minimum detectable concentration in 4 of the 55 indicator location samples with concentrations ranging from 201 to 224 pCi/L with an average concentration of 214 pCi/L. No Tritium was 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, Perimeter Drain, Surface Water Versus Ground Water results from 2007 to 2014 are plotted.

Gamma Spectrometry

Naturally occurring K-40 was detected in two of the 55 indicator samples. Sample concentrations ranged from 46 to 54 pCi/L with an average concentration of 50 pCi/L. No K-40 was detected in any of the four control location samples.

Naturally occurring Th-228 was detected in one of 55 indicator samples at a concentration of 5 pCi/L. No Th-228 was detected in any of the four control location stations. 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.

Gross Beta

Gross beta activity was detected in five of the 12 drinking water samples. Sample concentrations ranged from 2.0 to 3.3 pCi/L with an average concentration of 2.4 pCi/L. The maximum preoperational level detected was 3.2 pCi/L with an average concentration of 2.7 pCi/L. (Table C–8, Appendix C); Figure

C-5 – Gross Beta Activity in Drinking Water results from 1977 to 2014 are plotted.

Tritium

Tritium activity was not detected in any of the drinking water 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 not detected in any of the samples. 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 two indicator locations (3S3 and 11S6) and one control location (8G1) were collected throughout the growing season. All samples (vegetable and broadleaf) were analyzed for gamma emitters and included green beans, potatoes, field corn, kale, swiss chard and collards.

Gamma Spectrometry

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in 16 of the 31 indicator location samples with concentrations ranging from 154 to 725 pCi/kg wet with an average concentration of 396 pCi/kg wet, and in seven 12 control location samples with concentrations ranging from 211 to 532 pCi/kg wet with an average concentration of

366 pCi/kg wet. Preoperational data is not available for comparison.

Naturally occurring K-40 was detected in all 31 indicator location samples with concentrations ranging from 3,837 to 8,566 pCi/kg wet with an average concentration of 6,034 pCi/kg wet, and in all 12 control location samples with concentrations ranging from 3,397 to 6,548 pCi/kg wet with an average concentration of 4,945 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 detected in one of the 31 indicator location samples at a concentration of 96 pCi/kg wet. No Ac-228 was detected in any of the 12 control location samples. Preoperational data is not available for comparison.

Naturally occurring Th-228 was detected in one of the 31 indicator location samples at a concentration of 63 pCi/kg wet. No Th-228 was detected in the control location samples. Preoperational data is not available for comparison. (Table C-9, Appendix C)

All other gamma emitters were less than the LLD.

5. Soil

Soil samples were collected annually from one indicator location (12S1) and one control location (8G1). Each sample was analyzed for gamma emitters.

Gamma Spectrometry

Naturally occurring K-40 was detected in all three indicator

location samples at concentrations ranging from 12,820 to 15,520 pCi/kg dry with an average concentration of 13,907 pCi/kg dry, and in all three control location samples at concentrations ranging from 7,911 to 13,930 pCi/kg dry with an average concentration of 11,877 pCi/kg dry. The maximum preoperational level detected was 1,100 pCi/kg dry with an average concentration of 9,800 pCi/kg dry.

Cesium-137 was detected in one of the three indicator location samples at a concentration of 176 pCi/kg dry. No Cs-137 was detected in the control location samples. The maximum preoperational level detected was 1,200 pCi/kg dry with an average concentration of 700 pCi/kg dry.

Naturally occurring Ra-226 was detected in one of the three indicator location samples at a concentration of 2,456 pCi/kg dry. The maximum preoperational level detected was 1,300 pCi/kg dry with an average concentration of 1,100 pCi/kg dry.

Naturally occurring Ac-228 was detected in all of the three indicator location samples at concentrations ranging from 1,022 to 1,151 pCi/kg dry with an average concentration of 1,100 pCi/kg dry, and in two of the three control location samples at concentrations ranging from 767 to 1,393 pCi/kg dry with an average concentration of 1,080 pCi/kg dry. Preoperational data is not available for comparison.

Naturally occurring Th-228 was detected in all of the three indicator location samples at concentrations ranging from 977 to 1,600 pCi/kg dry and an average concentration of 1,298 pCi/kg dry, and in two of the three control location samples at concentrations ranging from 1,101 to 1,565 pCi/kg dry with an

average concentration of 1,333 pCi/kg dry. The maximum preoperational level detected was 1,300 pCi/kg dry with an average concentration of 1,100 pCi/kg dry. (Table C–10, 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 seven indicator locations (6S5, 2S7, LTAW, 4S7, 5S9, 5S12 and 7S12) and one control location (6S6). Each sample was analyzed for H-3 and gamma emitters.

Tritium

Tritium activity was detected in 17 of 45 indicator location samples with concentrations ranging from 167 to 11,500 pCi/L with an average concentration of 2,387 pCi/L. The range of H-3 levels in surface water are biased high due to inclusion of samples from the cooling tower blowdown line (CTBD; location 2S7). Routine station operation includes infrequent batch releases of slightly radioactive water which are discharged into the CTBD. When the H-3 concentration from CTBD samples is averaged with those obtained from Susquehanna River downstream monitoring locations, the result is an overall indicator location average that is higher than the actual average H-3 levels of the downstream river water. No radioactivity attributable to station operations was identified above analysis

detection levels in any samples from the Susquehanna River in 2014. Tritium was not detected in any of the control location samples. The maximum preoperational level detected was 319 pCi/L, with an average concentration of 140 pCi/L. (Table C-11, Appendix C) [Figure C-6 – Tritium Activity in Surface Water, results from 1972 to 2014 are plotted.]

Gamma Spectrometry

Naturally occurring K-40 was detected in 3 of the 45 indicator location samples with concentrations ranging from 42 to 44 pCi/L with an average concentration of 43 pCi/L, and in one of the 17 control location samples at a concentration of 90 pCi/L. Preoperational data is not available for comparison.

Naturally occurring Th-228 was detected in one of the 45 indicator location samples at a concentration of 5 pCi/L, and in one of the 17 control location samples at a concentration of 4 pCi/L. Preoperational data is not available for comparison. (Table C-11, Appendix C)

Iodine-131

Iodine-131 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-11, 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 2014 at two indicator locations (IND [Susquehanna River] and

LTAW) and one control location (2H [Susquehanna River]). Each sample was analyzed for gamma emitters.

Gamma Spectrometry

Naturally occurring K-40 was detected in all eight indicator location samples at concentrations ranging from 3,103 to 6,178 pCi/kg wet with an average concentration of 4,185 pCi/kg wet, and in all seven control location samples at concentrations ranging from 2,636 to 5,083 pCi/kg wet with an average concentration of 4,084 pCi/kg wet. The maximum preoperational level detected was 3,600 pCi/kg dry with an average concentration of 3,200 pCi/kg dry. (Table C–12, 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 10,620 to 14,120 pCi/kg dry with an average concentration of 12,268 pCi/kg dry, and in all three control location samples with concentrations ranging from 13,970 to 16,860 pCi/kg dry with an average concentration of 15,873 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 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 two of the four indicator location samples at concentrations of 1,677 and 2,378 pCi/kg dry with an average concentration of 2,028 pCi/kg dry, and in two of the three control location samples with concentrations of 1,915 and 2,524 p/Ci/kg dry with an average concentration of 2,220 pCi/kg dry. 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 1,021 to 1,223 pCi/kg dry with an average concentration of 1,130 pCi/kg dry, and in all three of the control location samples at concentrations ranging from 943 to 1,423 pCi/kg dry with an average concentration of 1,262 pCi/kg dry. Preoperational data is not available for comparison. (Table C-13, Appendix C)

Naturally occurring Th-228 was detected in all of the four indicator location samples at concentrations ranging from 1,027 to 1,628 pCi/kg dry with an average concentration of 1,269 pCi/kg dry, and in all three of the control location samples at concentrations ranging from 1,221 and 1,858 pCi/kg dry with an average concentration of 1,538 pCi/kg dry. The maximum preoperational level detected was 3,200 pCi/kg dry with an average concentration of 1,300 pCi/kg dry.

All other gamma emitters were less than the LLD.

E. Land Use Census

SYNOPSIS OF 2014 LAND USE CENSUS

Ecology III, Inc. conducted a Land Use Census during the 2014 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 PPL Reactor Buildings				
Meteorological Sector		Nearest Residence Sept, 2014 miles	Nearest Garden Sept, 2014 miles	Nearest Dairy Farm Sept, 2014 miles
1	N	1.3	3.2	>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,b,c]	>5.0
5	E	1.4	4.3	4.5 [d]
6	ESE	0.5	3.1	>5.0
7	SE	0.5	0.6	>5.0
8	SSE	0.6	2.9	>5.0
9	S	1.0	3.1	>5.0
10	SSW	0.9	1.3	>5.0
11	SW	1.5	1.9	>5.0
12	WSW	1.3	1.3	1.7 [d]
13	W	1.2	2.0	5.0
14	WNW	1.1	1.3	>5.0
15	NW	0.8	0.9 [a,c]	>5.0
16	NNW	0.6	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

The 2014 Land Use Census results are summarized in the above table.

There were two changes in the nearest garden census. Two new owners were identified for sectors 5 and 9.

V. Annotations to Previous AREOR

There are no annotations to previous AREOR.

VI. Conclusions

The Radiological Environmental Monitoring Program for SSES was conducted during 2014 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 historical 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

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[8] United States Geological Survey. 1976. Berwick Quadrangle Topographic Map. 7.5 minute series. USGS, Reston, VA.

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APPENDIX A

PROGRAM SUMMARY

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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 31, 2013 to January 09, 2015

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
Air Particulates (E-3 pCi/m^3)	GR-B	312	10	1.279E+01 (208/208) (5.850E+00 - 2.620E+01)	12E1 4.7 MILES WSW	1.346E+01 (52/52) (8.040E+00 - 2.620E+01)	1.206E+01 (104/104) (7.210E+00 - 2.270E+01)	0
	GAMMA	24						
	BE-7	24	N/A	9.204E+01 (16/16) (5.176E+01 - 1.245E+02)	8G1 12 MILES SSE	1.072E+02 (4/4) (8.125E+01 - 1.305E+02)	1.025E+02 (8/8) (7.504E+01 - 1.305E+02)	0
	K-40	24	N/A	5.526E+00 (16/16) (-3.116E+00 - 1.903E+01)	12E1 4.7 MILES WSW	1.047E+01 (4/4) (4.210E+00 - 1.903E+01)	2.134E+00 (8/8) (-7.821E+00 - 1.061E+01)	0
	CS-134	24	50	2.083E-01 (16/16) (-7.791E-01 - 1.323E+00)	8G1 12 MILES SSE	5.745E-01 (4/4) (-1.340E-01 - 1.656E+00)	4.723E-01 (8/8) (-1.340E-01 - 1.656E+00)	0
	CS-137	24	60	1.774E-02 (16/16) (-5.534E-01 - 3.369E-01)	12S1 0.4 MILES WSW	1.813E-01 (4/4) (-1.536E-02 - 3.369E-01)	-2.856E-01 (8/8) (-6.181E-01 - 3.742E-01)	0
Charcoal (E-3 pCi/m^3)	GAMMA	312						
	I-131	312	70	-7.098E-02 (208/208) (-1.503E+01 - 1.075E+01)	3S2 0.5 MILES NE	2.392E-01 (52/52) (-1.472E+01 - 9.831E+00)	-8.529E-01 (104/104) (-1.329E+01 - 1.112E+01)	0
Ambient Radiation (mR/std. qtr.)	OSLD	226	N/A	20.4 (206/206) (12.5 - 48.9)	9S2 0.2 MILES S	42.4 (4/4) (39.0 - 48.9)	18.4 (19/19) (13.6 - 25.4)	0
Milk (pCi/l)	I-131	60	1	-1.751E-01 (40/40) (-7.160E-01 - 1.440E-01)	10G1 14 MILES SSW	-1.155E-01 (20/20) (-3.750E-01 - 2.130E-01)	-1.155E-01 (20/20) (-3.750E-01 - 2.130E-01)	0
	GAMMA	60						
	K-40	60	N/A	1.340E+03 (40/40) (1.171E+03 - 1.576E+03)	13E3 5.0 MILES W	1.343E+03 (20/20) (1.171E+03 - 1.576E+03)	1.254E+03 (20/20) (1.009E+03 - 1.401E+03)	0
	CS-134	60	15	-1.647E+00 (40/40) (-8.591E+00 - 3.323E+00)	5E2 4.5 MILES E	-1.580E+00 (20/20) (-8.591E+00 - 3.323E+00)	-2.071E+00 (20/20) (-5.901E+00 - 9.930E-01)	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 31, 2013 to January 09, 2015

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
Milk (cont'd) (pCi/l)	CS-137	60	18	2.657E-01 (40/40) (-3.494E+00 - 3.727E+00)	10G1 14 MILES SSW	3.911E-01 (20/20) (-3.068E+00 - 3.488E+00)	3.911E-01 (20/20) (-3.068E+00 - 3.488E+00)	0
	BA-140	60	60	3.720E-01 (40/40) (-1.949E+01 - 1.710E+01)	10G1 14 MILES SSW	4.435E+00 (20/20) (-7.567E+00 - 1.983E+01)	4.435E+00 (20/20) (-7.567E+00 - 1.983E+01)	0
	LA-140	60	15	-3.036E-01 (40/40) (-7.380E+00 - 3.880E+00)	5E2 4.5 MILES E	3.612E-01 (20/20) (-4.934E+00 - 3.805E+00)	-8.719E-01 (20/20) (-7.461E+00 - 4.385E+00)	0
	TH-228	60	N/A	1.365E+00 (40/40) (-6.931E+00 - 9.891E+00)	5E2 4.5 MILES E	1.957E+00 (20/20) (-4.043E+00 - 7.407E+00)	3.568E-01 (20/20) (-4.444E+00 - 7.027E+00)	0
Ground Water (pCi/l)	H-3	59	2000	6.618E+01 (55/55) (-1.020E+02 - 2.240E+02)	4S8 0.1 MILES ENE	1.867E+02 (4/4) (9.370E+01 - 2.240E+02)	-2.573E+01 (4/4) (-4.490E+01 - 2.410E+01)	0
	GAMMA	59						
	K-40	59	N/A	1.027E+01 (55/55) (-4.557E+01 - 1.013E+02)	6S11A	3.950E+01 (4/4) (-2.014E+01 - 1.013E+02)	1.639E+01 (4/4) (-7.285E+01 - 5.531E+01)	0
	MN-54	59	15	-6.711E-02 (55/55) (-2.899E+00 - 1.988E+00)	12F3 5.2 MILES WSW	1.234E+00 (4/4) (-2.449E+00 - 4.516E+00)	1.234E+00 (4/4) (-2.449E+00 - 4.516E+00)	0
	CO-58	59	15	-3.638E-01 (55/55) (-3.243E+00 - 2.345E+00)	6S10 0.4 MILES ESE	6.573E-01 (4/4) (-1.380E+00 - 2.158E+00)	-1.262E+00 (4/4) (-2.043E+00 - 3.860E-02)	0
	FE-59	59	30	4.389E-01 (55/55) (-1.158E+01 - 6.619E+00)	2S2 0.9 MILES NNE	4.939E+00 (4/4) (2.728E+00 - 6.619E+00)	6.933E-01 (4/4) (-3.741E+00 - 3.341E+00)	0
	CO-60	59	15	2.962E-01 (55/55) (-4.106E+00 - 5.000E+00)	2S2 0.9 MILES NNE	9.561E-01 (4/4) (1.719E-01 - 2.025E+00)	-3.085E-01 (4/4) (-2.503E+00 - 2.149E+00)	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 31, 2013 to January 09, 2015

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
Ground Water (cont'd) (pCi/l)	ZN-65	59	30	-3.256E+00 (55/55) (-1.063E+01 - 3.444E+00)	1S3 0.1 MILES N	-2.933E-01 (4/4) (-4.706E+00 - 3.444E+00)	-5.287E+00 (4/4) (-1.214E+01 - 1.509E+00)	0
	NB-95	59	15	4.793E-01 (55/55) (-5.307E+00 - 4.254E+00)	6S10 0.4 MILES ESE	2.159E+00 (4/4) (6.514E-01 - 3.671E+00)	1.003E+00 (4/4) (-3.144E+00 - 3.401E+00)	0
	ZR-95	59	30	-4.386E-01 (55/55) (-7.789E+00 - 6.424E+00)	12F3 5.2 MILES WSW	1.314E+00 (4/4) (-2.707E+00 - 4.230E+00)	1.314E+00 (4/4) (-2.707E+00 - 4.230E+00)	0
	I-131	59	15	4.536E-01 (55/55) (-1.120E+01 - 8.701E+00)	7S11	2.854E+00 (4/4) (1.215E+00 - 4.462E+00)	-2.303E+00 (4/4) (-3.782E+00 - -4.517E-01)	0
	CS-134	59	15	-1.202E+00 (55/55) (-7.009E+00 - 2.310E+00)	7S10 0.3 MILES SE	4.910E-01 (4/4) (-5.939E-01 - 2.310E+00)	-1.375E+00 (4/4) (-6.878E+00 - 1.547E+00)	0
	CS-137	59	18	-3.649E-01 (55/55) (-5.956E+00 - 3.140E+00)	7S11	7.196E-01 (4/4) (-7.209E-01 - 3.140E+00)	-1.244E+00 (4/4) (-3.034E+00 - 1.296E-01)	0
	BA-140	59	60	4.853E-01 (55/55) (-2.274E+01 - 1.680E+01)	7S11	3.970E+00 (4/4) (-2.118E+00 - 1.009E+01)	-5.153E+00 (4/4) (-2.182E+01 - 5.189E+00)	0
	LA-140	59	15	-1.903E-01 (55/55) (-5.338E+00 - 5.774E+00)	7S11	1.781E+00 (4/4) (-1.412E+00 - 5.774E+00)	4.828E-01 (4/4) (-2.975E+00 - 4.087E+00)	0
	TH-228	59	N/A	4.262E-01 (55/55) (-9.340E+00 - 6.755E+00)	6S11A	2.238E+00 (4/4) (-3.195E+00 - 6.755E+00)	2.134E+00 (4/4) (-2.408E+00 - 8.274E+00)	0
Potable Water (pCi/l)	GR-B	12	4	1.842E+00 (12/12) (9.640E-01 - 3.320E+00)	12H2 26 MILES WSW	1.842E+00 (12/12) (9.640E-01 - 3.320E+00)	.000E+00	0
	H-3	12	2000	1.931E+01 (12/12) (-8.280E+01 - 7.740E+01)	12H2 26 MILES WSW	1.931E+01 (12/12) (-8.280E+01 - 7.740E+01)	.000E+00	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 31, 2013 to January 09, 2015

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
Potable Water (cont'd)	GAMMA	12						
(pCi/l)	K-40	12	N/A	-8.802E+00 (12/12) (-1.264E+02 - 4.268E+01)	12H2 26 MILES WSW	-8.802E+00 (12/12) (-1.264E+02 - 4.268E+01)	.000E+00	0
	MN-54	12	15	6.455E-02 (12/12) (-3.737E-01 - 8.250E-01)	12H2 26 MILES WSW	6.455E-02 (12/12) (-3.737E-01 - 8.250E-01)	.000E+00	0
	CO-58	12	15	8.895E-02 (12/12) (-6.293E-01 - 7.961E-01)	12H2 26 MILES WSW	8.895E-02 (12/12) (-6.293E-01 - 7.961E-01)	.000E+00	0
	FE-59	12	30	3.757E-01 (12/12) (-1.801E+00 - 4.212E+00)	12H2 26 MILES WSW	3.757E-01 (12/12) (-1.801E+00 - 4.212E+00)	.000E+00	0
	CO-60	12	15	4.205E-01 (12/12) (-4.212E-01 - 1.612E+00)	12H2 26 MILES WSW	4.205E-01 (12/12) (-4.212E-01 - 1.612E+00)	.000E+00	0
	ZN-65	12	30	-1.108E+00 (12/12) (-6.013E+00 - 1.274E+00)	12H2 26 MILES WSW	-1.108E+00 (12/12) (-6.013E+00 - 1.274E+00)	.000E+00	0
	NB-95	12	15	5.191E-01 (12/12) (-4.532E-02 - 1.697E+00)	12H2 26 MILES WSW	5.191E-01 (12/12) (-4.532E-02 - 1.697E+00)	.000E+00	0
	ZR-95	12	30	2.979E-03 (12/12) (-1.850E+00 - 1.658E+00)	12H2 26 MILES WSW	2.979E-03 (12/12) (-1.850E+00 - 1.658E+00)	.000E+00	0
	I-131	12	15	1.843E-01 (12/12) (-2.154E+00 - 3.847E+00)	12H2 26 MILES WSW	1.843E-01 (12/12) (-2.154E+00 - 3.847E+00)	.000E+00	0
	CS-134	12	15	-6.900E-01 (12/12) (-3.169E+00 - 1.477E-01)	12H2 26 MILES WSW	-6.900E-01 (12/12) (-3.169E+00 - 1.477E-01)	.000E+00	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 31, 2013 to January 09, 2015

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
Potable Water (cont'd) (pCi/l)	CS-137	12	18	6.925E-02 (12/12) (-9.473E-01 - 8.542E-01)	12H2 26 MILES WSW	6.925E-02 (12/12) (-9.473E-01 - 8.542E-01)	.000E+00	0
	BA-140	12	60	-1.865E+00 (12/12) (-1.298E+01 - 4.632E+00)	12H2 26 MILES WSW	-1.865E+00 (12/12) (-1.298E+01 - 4.632E+00)	.000E+00	0
	LA-140	12	15	1.879E-02 (12/12) (-2.452E+00 - 2.258E+00)	12H2 26 MILES WSW	1.879E-02 (12/12) (-2.452E+00 - 2.258E+00)	.000E+00	0
Food/Garden Crops (pCi/kg wet)	GAMMA	43						
	BE-7	43	N/A	2.676E+02 (31/31) (-7.527E+01 - 7.254E+02)	3S3 0.9 MILES NE	3.296E+02 (16/16) (-3.024E+00 - 7.254E+02)	2.684E+02 (12/12) (2.424E+01 - 5.316E+02)	0
	K-40	43	N/A	6.034E+03 (31/31) (3.837E+03 - 8.566E+03)	11S6 0.5 MILES SW	6.048E+03 (15/15) (3.837E+03 - 8.566E+03)	4.945E+03 (12/12) (3.397E+03 - 6.548E+03)	0
	MN-54	43	N/A	-1.729E+00 (31/31) (-1.124E+01 - 9.815E+00)	11S6 0.5 MILES SW	-1.214E+00 (15/15) (-1.028E+01 - 9.815E+00)	-2.006E+00 (12/12) (-6.834E+00 - 4.982E+00)	0
	CO-58	43	N/A	1.210E+00 (31/31) (-1.378E+01 - 1.305E+01)	3S3 0.9 MILES NE	2.542E+00 (16/16) (-4.598E+00 - 1.305E+01)	-1.239E+00 (12/12) (-9.362E+00 - 8.917E+00)	0
	FE-59	43	N/A	5.537E+00 (31/31) (-1.931E+01 - 5.459E+01)	3S3 0.9 MILES NE	7.635E+00 (16/16) (-1.931E+01 - 5.459E+01)	-3.334E-01 (12/12) (-1.957E+01 - 1.554E+01)	0
	CO-60	43	N/A	4.354E-01 (31/31) (-9.726E+00 - 2.910E+01)	8G1 12 MILES SSE	2.827E+00 (12/12) (-5.741E+00 - 9.391E+00)	2.827E+00 (12/12) (-5.741E+00 - 9.391E+00)	0
	ZN-65	43	N/A	-1.521E+01 (31/31) (-6.832E+01 - 1.286E+01)	8G1 12 MILES SSE	-1.119E+01 (12/12) (-3.571E+01 - 1.240E+01)	-1.119E+01 (12/12) (-3.571E+01 - 1.240E+01)	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 31, 2013 to January 09, 2015

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		CONTROL LOCATION MEAN (3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS
Food/Garden Crops (cont'd) (pCi/kg wet)	NB-95	43	N/A	3.896E+00 (-9.075E+00 -	(31/31) 2.819E+01)	8G1 12 MILES SSE	6.361E+00 (-5.951E+00 -	(12/12) 2.408E+01)	6.361E+00 (-5.951E+00 -	(12/12) 2.408E+01)	0
	ZR-95	43	N/A	-4.594E+00 (-4.471E+01 -	(31/31) 2.062E+01)	11S6 0.5 MILES SW	-1.510E+00 (-2.943E+01 -	(15/15) 2.062E+01)	-3.606E+00 (-1.742E+01 -	(12/12) 1.349E+01)	0
	I-131	43	60	1.109E+00 (-1.460E+01 -	(31/31) 2.736E+01)	8G1 12 MILES SSE	3.918E+00 (-2.101E+01 -	(12/12) 1.921E+01)	3.918E+00 (-2.101E+01 -	(12/12) 1.921E+01)	0
	CS-134	43	60	-6.011E+00 (-2.824E+01 -	(31/31) 1.189E+01)	8G1 12 MILES SSE	-4.311E+00 (-1.691E+01 -	(12/12) 1.043E+01)	-4.311E+00 (-1.691E+01 -	(12/12) 1.043E+01)	0
	CS-137	43	80	4.107E-01 (-1.281E+01 -	(31/31) 1.004E+01)	3S3 0.9 MILES NE	5.340E-01 (-8.977E+00 -	(16/16) 1.004E+01)	5.073E-01 (-1.423E+01 -	(12/12) 8.437E+00)	0
	BA-140	43	N/A	4.095E+00 (-3.395E+01 -	(31/31) 5.377E+01)	8G1 12 MILES SSE	1.103E+01 (-4.126E+01 -	(12/12) 4.971E+01)	1.103E+01 (-4.126E+01 -	(12/12) 4.971E+01)	0
	LA-140	43	N/A	-8.006E-01 (-1.969E+01 -	(31/31) 1.119E+01)	3S3 0.9 MILES NE	2.451E-02 (-1.969E+01 -	(16/16) 1.119E+01)	-4.344E-01 (-9.554E+00 -	(12/12) 8.407E+00)	0
	AC-228	43	N/A	1.014E+01 (-5.352E+01 -	(31/31) 9.599E+01)	3S3 0.9 MILES NE	1.208E+01 (-4.094E+01 -	(16/16) 9.599E+01)	3.504E+00 (-3.536E+01 -	(12/12) 4.671E+01)	0
	TH-228	43	N/A	1.046E+01 (-2.046E+01 -	(31/31) 6.337E+01)	8G1 12 MILES SSE	1.362E+01 (-4.155E+00 -	(12/12) 3.961E+01)	1.362E+01 (-4.155E+00 -	(12/12) 3.961E+01)	0
Soil (pCi/kg dry)	GAMMA	6									
	K-40	6	N/A	1.391E+04 (1.282E+04 -	(3/3) 1.552E+04)	12S1 0.4 MILES WSW	1.391E+04 (1.282E+04 -	(3/3) 1.552E+04)	1.188E+04 (7.911E+03 -	(3/3) 1.393E+04)	0
	CS-134	6	150	2.867E+00 (-5.293E+01 -	(3/3) 7.844E+01)	8G1 12 MILES SSE	3.611E+01 (-2.275E+01 -	(3/3) 1.370E+02)	3.611E+01 (-2.275E+01 -	(3/3) 1.370E+02)	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 31, 2013 to January 09, 2015

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
Soil (cont'd) (pCi/kg dry)	CS-137	6	180	1.027E+02 (3/3) (3.359E+01 - 1.756E+02)	12S1 0.4 MILES WSW	1.027E+02 (3/3) (3.359E+01 - 1.756E+02)	5.091E+01 (3/3) (3.599E+01 - 7.834E+01)	0
	RA-226	6	N/A	1.714E+03 (3/3) (7.506E+02 - 2.456E+03)	8G1 12 MILES SSE	2.057E+03 (3/3) (3.736E+02 - 3.122E+03)	2.057E+03 (3/3) (3.736E+02 - 3.122E+03)	0
	AC-228	6	N/A	1.100E+03 (3/3) (1.022E+03 - 1.151E+03)	12S1 0.4 MILES WSW	1.100E+03 (3/3) (1.022E+03 - 1.151E+03)	9.595E+02 (3/3) (7.185E+02 - 1.393E+03)	0
	TH-228	6	N/A	1.298E+03 (3/3) (9.770E+02 - 1.600E+03)	12S1 0.4 MILES WSW	1.298E+03 (3/3) (9.770E+02 - 1.600E+03)	1.062E+03 (3/3) (5.208E+02 - 1.565E+03)	0
Surface Water (pCi/l)	H-3	62	2000	9.186E+02 (45/45) (-7.330E+01 - 1.150E+04)	2S7 0.1 MILES NNE	2.676E+03 (15/15) (7.370E+01 - 1.150E+04)	1.825E+01 (17/17) (-8.000E+01 - 1.130E+02)	0
	GAMMA	62						
	K-40	62	N/A	-3.091E-02 (45/45) (-1.446E+02 - 5.416E+01)	5S9 0.8 MILES E	2.416E+01 (2/2) (9.515E+00 - 3.881E+01)	-9.996E+00 (17/17) (-1.222E+02 - 8.986E+01)	0
	MN-54	62	15	-2.277E-01 (45/45) (-3.102E+00 - 2.213E+00)	LTAW 0.7 MILES NE	4.853E-02 (4/4) (-1.543E+00 - 8.776E-01)	1.001E-02 (17/17) (-8.428E-01 - 8.827E-01)	0
	CO-58	62	15	1.027E-01 (45/45) (-4.326E+00 - 3.272E+00)	4S7 0.4 MILES ENE	1.488E+00 (4/4) (3.528E-01 - 3.272E+00)	-7.428E-02 (17/17) (-1.619E+00 - 9.776E-01)	0
	FE-59	62	30	-9.799E-02 (45/45) (-8.763E+00 - 4.240E+00)	LTAW 0.7 MILES NE	2.244E+00 (4/4) (-8.753E-02 - 4.240E+00)	-2.639E-02 (17/17) (-2.153E+00 - 2.974E+00)	0
	CO-60	62	15	1.872E-01 (45/45) (-3.462E+00 - 2.901E+00)	5S12 0.4 MILES E	8.048E-01 (4/4) (-4.814E-01 - 1.995E+00)	3.989E-01 (17/17) (-5.821E-01 - 1.754E+00)	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 31, 2013 to January 09, 2015

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
Surface Water (cont'd) (pCi/l)	ZN-65	62	30	-1.853E+00 (45/45) (-8.975E+00 - 5.301E+00)	7S12 0.3 MILES SE	9.220E-01 (4/4) (-2.043E+00 - 5.301E+00)	-7.112E-01 (17/17) (-3.865E+00 - 2.529E+00)	0
	NB-95	62	15	2.968E-01 (45/45) (-3.352E+00 - 4.606E+00)	7S12 0.3 MILES SE	1.309E+00 (4/4) (-2.273E+00 - 4.606E+00)	4.255E-01 (17/17) (-4.640E-01 - 1.732E+00)	0
	ZR-95	62	30	3.242E-01 (45/45) (-2.960E+00 - 7.017E+00)	7S12 0.3 MILES SE	2.211E+00 (4/4) (-2.293E+00 - 7.017E+00)	4.194E-01 (17/17) (-1.960E+00 - 3.161E+00)	0
	I-131	61	15	5.014E-01 (44/44) (-6.590E+00 - 7.356E+00)	5S9 0.8 MILES E	4.775E+00 (1/1) (4.775E+00)	7.522E-01 (17/17) (-7.222E+00 - 1.127E+01)	0
	CS-134	62	15	-1.264E+00 (45/45) (-8.213E+00 - 2.938E+00)	6S5 0.9 MILES ESE	-5.320E-01 (12/12) (-2.941E+00 - 3.227E-01)	-9.929E-01 (17/17) (-3.560E+00 - 7.650E-01)	0
	CS-137	62	18	8.895E-02 (45/45) (-3.873E+00 - 3.084E+00)	5S12 0.4 MILES E	7.478E-01 (4/4) (-6.704E-01 - 3.084E+00)	-3.778E-02 (17/17) (-6.782E-01 - 5.440E-01)	0
	BA-140	62	60	1.015E+00 (45/45) (-1.646E+01 - 1.719E+01)	7S12 0.3 MILES SE	3.342E+00 (4/4) (-5.520E+00 - 1.719E+01)	2.072E+00 (17/17) (-7.534E+00 - 8.427E+00)	0
	LA-140	62	15	-5.522E-01 (45/45) (-6.013E+00 - 3.583E+00)	LTAW 0.7 MILES NE	1.950E-03 (4/4) (-2.869E+00 - 3.583E+00)	-2.951E-01 (17/17) (-5.267E+00 - 2.599E+00)	0
	TH-228	63	N/A	2.101E-01 (46/46) (-7.178E+00 - 5.771E+00)	7S12 0.3 MILES SE	9.741E-01 (4/4) (2.861E-01 - 1.941E+00)	4.604E-01 (17/17) (-4.408E+00 - 3.997E+00)	0
Fish (pCi/kg wet)	GAMMA	15						
	K-40	15	N/A	4.185E+03 (8/8) (3.103E+03 - 6.178E+03)	IND 0.9-1.4 MILES ESE	4.313E+03 (7/7) (3.103E+03 - 6.178E+03)	4.084E+03 (7/7) (2.636E+03 - 5.083E+03)	0
	MN-54	15	130	-4.662E+00 (8/8) (-2.533E+01 - 2.151E+01)	IND 0.9-1.4 MILES ESE	-1.709E+00 (7/7) (-1.681E+01 - 2.151E+01)	-2.030E+00 (7/7) (-2.870E+01 - 3.452E+01)	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 31, 2013 to January 09, 2015

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
Fish (cont'd) (pCi/kg wet)	CO-58	15	130	-9.167E+00 (8/8) (-2.904E+01 - 3.049E+01)	2H 30 MILES NNE	1.752E+01 (7/7) (-3.479E+00 - 6.651E+01)	1.752E+01 (7/7) (-3.479E+00 - 6.651E+01)	0
	FE-59	15	260	1.690E+01 (8/8) (-8.308E+01 - 6.687E+01)	LTAW 0.7 MILES NE	4.898E+01 (1/1) (4.898E+01)	-1.575E+01 (7/7) (-9.126E+01 - 4.909E+01)	0
	CO-60	15	130	-1.255E-01 (8/8) (-2.503E+01 - 2.269E+01)	2H 30 MILES NNE	7.097E+00 (7/7) (-1.425E+01 - 3.607E+01)	7.097E+00 (7/7) (-1.425E+01 - 3.607E+01)	0
	ZN-65	15	260	-6.021E+01 (8/8) (-1.153E+02 - 2.040E+01)	LTAW 0.7 MILES NE	5.417E+00 (1/1) (5.417E+00)	-1.634E+01 (7/7) (-7.934E+01 - 4.821E+01)	0
	CS-134	15	130	-1.883E+01 (8/8) (-5.200E+01 - 2.159E+01)	LTAW 0.7 MILES NE	-1.168E+01 (1/1) (-1.168E+01)	-2.069E+01 (7/7) (-9.304E+01 - 1.916E+01)	0
	CS-137	15	150	1.096E+01 (8/8) (-4.966E+01 - 6.935E+01)	IND 0.9-1.4 MILES ESE	1.416E+01 (7/7) (-4.966E+01 - 6.935E+01)	-1.975E+01 (7/7) (-5.620E+01 - 2.742E+01)	0
Sediment (pCi/kg dry)	GAMMA	7						
	K-40	7	N/A	1.227E+04 (4/4) (1.062E+04 - 1.412E+04)	2B 1.6 MILES NNE	1.587E+04 (3/3) (1.397E+04 - 1.686E+04)	1.587E+04 (3/3) (1.397E+04 - 1.686E+04)	0
	CS-134	7	150	-1.038E+00 (4/4) (-2.696E+01 - 3.375E+01)	2B 1.6 MILES NNE	1.864E+01 (3/3) (-1.709E+00 - 4.202E+01)	1.864E+01 (3/3) (-1.709E+00 - 4.202E+01)	0
	CS-137	7	180	2.104E+01 (4/4) (-1.115E+01 - 6.190E+01)	2B 1.6 MILES NNE	4.220E+01 (3/3) (3.632E+01 - 4.676E+01)	4.220E+01 (3/3) (3.632E+01 - 4.676E+01)	0
	RA-226	7	N/A	1.468E+03 (4/4) (7.992E+02 - 2.378E+03)	2B 1.6 MILES NNE	2.128E+03 (3/3) (1.915E+03 - 2.524E+03)	2.128E+03 (3/3) (1.915E+03 - 2.524E+03)	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 31, 2013 to January 09, 2015

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
Sediment (cont'd) (pCi/kg dry)	AC-228	7	N/A	1.130E+03 (1.021E+03 -	(4/4) 1.223E+03)	2B 1.6 MILES NNE	1.262E+03 (9.428E+02 -	(3/3) 1.423E+03)	1.262E+03 (9.428E+02 -	(3/3) 1.423E+03)	0
	TH-228	7	N/A	1.269E+03 (1.027E+03 -	(4/4) 1.628E+03)	2B 1.6 MILES NNE	1.538E+03 (1.221E+03 -	(3/3) 1.858E+03)	1.538E+03 (1.221E+03 -	(3/3) 1.858E+03)	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 available measure results. 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 Requirmeents (i.e., when Reporting Levels in Technical Requirements are exceeded).

APPENDIX B

SAMPLE DESIGNATION AND LOCATIONS

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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.	
2S7	0.1 mi.NNE	41.093540	-76.144773	Surface water
5S9	0.8 mi.E;	41.093292	-76.130472	Surface water
5S12	0.4 mi.E;	41.092540	-76.138704	Surface water
7S12	0.3 mi.SE;	41.088507	-76.143270	Surface water
6S5	0.9 mi.ESE;	41.084639	-76.130642	Surface water
6S6 **	0.8 mi.ESE;	41.088115	-76.131637	Surface water
LTAW	0.7 mi.NE-ESE;	41.098356	-76.135401	Surface water
4S7	0.4 mi.ENE;	41.094418	-76.138236	Surface water
LTAW	0.7 mi.NE-ESE;	41.098356	-76.135401	Fish
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
12S1	0.4 mi.WSW;	41.088436	-76.154314	Soil
2S8	0.1 mi.NNE;	41.094991	-76..044207	Ground water
2S2	0.9 mi.NNE;	41.102243	-76.136702	Ground water
4S4	0.5 mi.ENE;	41.095471	-76.138798	Ground water
6S10	0.4 mi.ESE;	41.090511	-76.137802	Ground water
6S11A	0.4 mi.ESE;	41.083448	-76.133412	Ground water
6S11B	0.4 mi.ESE;	41.083448	-76.133411	Ground water
6S12	0.8 mi.ESE;	41.083411	-76.116935	Ground water
7S11	0.3 mi.SE;	41.083527	-76.133513	Ground water
11S2	0.4 mi.SW;	41.088816	-76.152793	Ground water
1S3	0.1 mi N;	41.093640	-76.146076	Ground water

** Control Location

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
LESS THAN ONE MILE FROM THE SSES		DEG.	DEG.	
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
3S2	0.5 mi.NE;	41.095716	-76.140207	Precipitation
12S1	0.4 mi.WSW;	41.088436	-76.154314	Precipitation
11S6	0.5 mi.SW;	41.085305	-76.152022	Broadleaf
3S3	0.9 mi.NE;	41.101856	-76.133090	Broadleaf
5S10	0.7 mi.E;	41.0.93899	-76.132814	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
FROM ONE to FIVE MILES FROM THE SSES				
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
12E1	4.7 mi.WSW;	41.072418	-76.230554	Air
5E2	4.5 mi.E;	41.085184	-76.061099	Milk
8C1	2.9 mi.SSE;	41.054518	-76.129027	Broadleaf
10B5	1.3 mi.SSW;	41.075404	-76.157422	Broadleaf
10D3	3.5 mi.SSW;	41.045449	-76.171899	Milk
13E3	5.0 mi.W;	41.100259	-76.241102	Milk
11D1	3.3 mi.SW;	41.055212	-76.186797	Food Products
11D2	3.5 mi.SW;	41.054827	-76.205081	Food products

** Control Location

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL	LONGITUDINAL	SAMPLE TYPE
GREATER THAN FIVE MILES FROM THE SSES		DEG.	DEG.	
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
6G1 **	13.5 mi.ESE;	41.018989	-75.906515	Air
8G1 **	12 mi.SSE;	40.928886	-76.055092	Air
8G1 **	12 mi.SSE;	40.928886	-76.055092	Soil
8G1 **	12 mi.SSE;	40.928886	-76.055092	Precipitation
8G1 **	12 mi.SSE;	40.928886	-76.055092	Broadleaf
10G1 **	14 mi.SSW;	40.934847	-76.284449	Milk
12F3 **	5.2 mi.WSW;	41.054491	-76.232176	Ground water
12F7	8.3 mi.WSW;	41.036689	-76.286776	Food Products
11F2	5.5 mi.SW;	41.045741	-76.242128	Food products
15G1 **	11.4 mi.NW;	41.188578	-76.324598	Broadleaf
OSLD LOCATIONS				
LESS THAN ONE MILE FROM THE SSES				
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

** Control Location

TABLE B-1 (cont'd)

SAMPLING LOCATIONS

STATION CODE	STATION LOCATION	LATITUDINAL DEG.	LONGITUDINAL DEG.	SAMPLE TYPE
LESS THAN ONE MILE FROM THE SSES				
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
10S1	0.4 mi.SSW;	41.08663	-76.150082	OSLD
10S2	0.2 mi.SSW;	41.08894	-76.147881	OSLD
11S7	0.4 mi.SWN;	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
8A3	0.9 mi.SSE;	41.07982	-76.1139078	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

* Special Interest Area (other than controls)

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.	
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
GREATER THAN FIVE MILES FROM THE SSES				
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	E-III, Appendix 2	TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices.
Air	I-131	Weekly	E-III, Appendix 2	TBE-2012 Radioiodine in Various Matrices
Air	Gamma	Quarterly	E-III, Appendix 2	TBE-2007 Gamma Emitting Radioisotope Analysis
Drinking Water	Gross Beta	Monthly	E-III, Appendix 5	TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices.
Surface & Drinking Water	Tritium	Monthly (LTAW, 4S7, 5S12 and 7S12 Quarterly)	E-III, Appendix 3, 4, 5, 6, & 7	TBE-2010 Tritium and Carbon-14 Analysis by Liquid Scintillation.
Surface & Drinking Water	Gamma	Monthly (LTAW, 4S7, 5S12 and 7S12 Quarterly)	E-III, Appendix 3, 4, 5, 6, & 7	TBE-2007 Gamma Emitting Radioisotope Analysis.
Ground Water	Tritium	Quarterly	E-III, Appendix 8	TBE-2010 Tritium and Carbon-14 Analysis by Liquid Scintillation
Ground Water	Gamma	Quarterly	E-III, Appendix 8	TBE-2007 Gamma Emitting Radioisotope Analysis

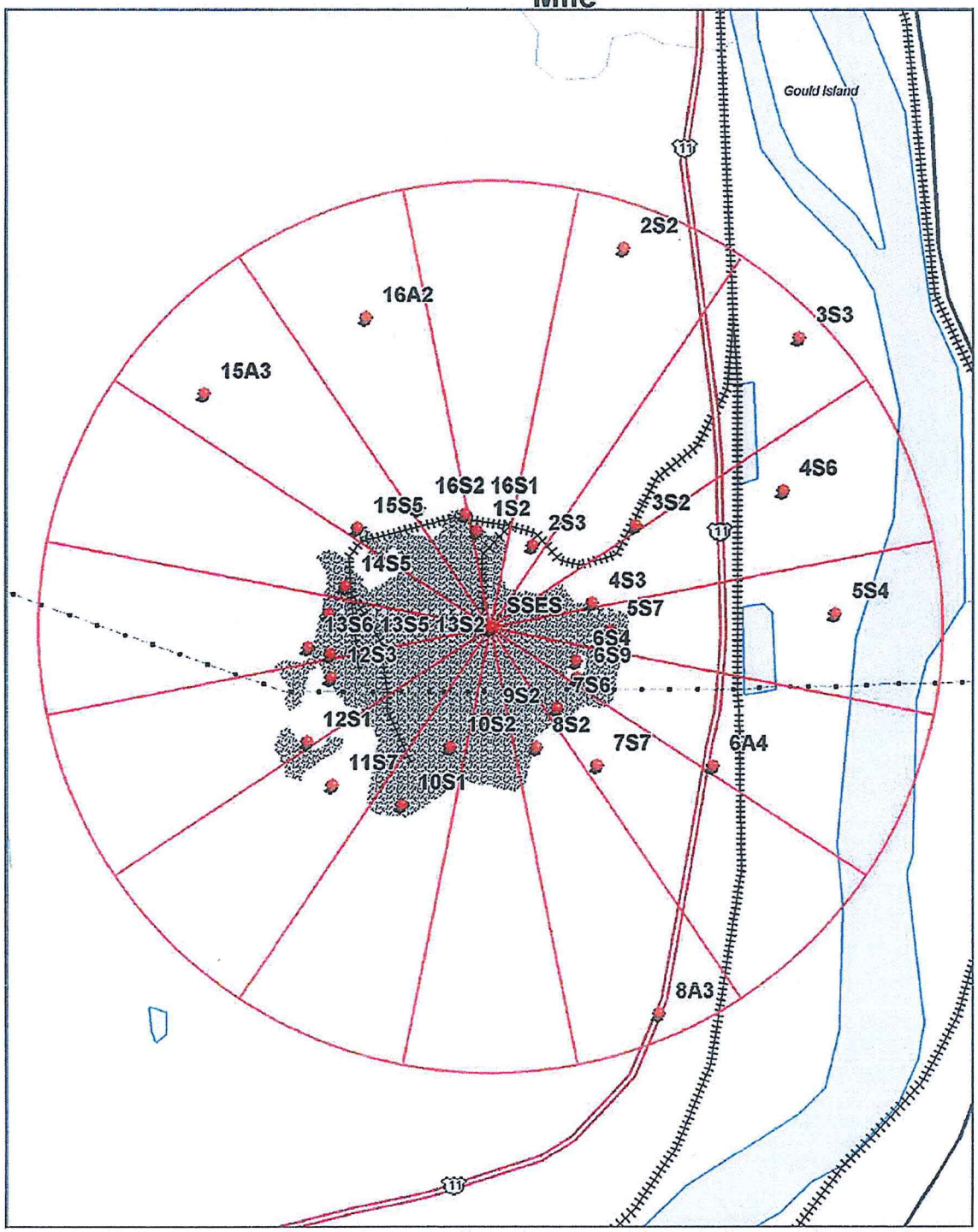
TABLE B-2 (cont'd)

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	E-III, Appendix 10	TBE-2010 Tritium and Carbon-14 Analysis by Liquid Scintillation
Milk	Gamma	Monthly/Bi-Weekly	E-III, Appendix 9	TBE-2007 Gamma Emitting Radioisotope Analysis
Milk	I-131	Monthly/Bi-Weekly	E-III, Appendix 9	TBE-2012 Radioiodine in Various Matrices
Fish	Gamma	Semi-Annually (Spring/Fall)	E-III, Appendix 11	TBE-2007 Gamma Emitting Radioisotope Analysis
Sediment	Gamma	Semi-Annually (Spring/Fall)	E-III, Appendix 12	TBE-2007 Gamma Emitting Radioisotope Analysis
Fruits & Vegetables	Gamma	In Season (When available)	E-III, Appendix 13 E-III, Appendix 15	TBE-2007 Gamma Emitting Radioisotope Analysis
Soil	Gamma	Annually	E-III, Appendix 14	TBE-2007 Gamma Emitting Radioisotope Analysis

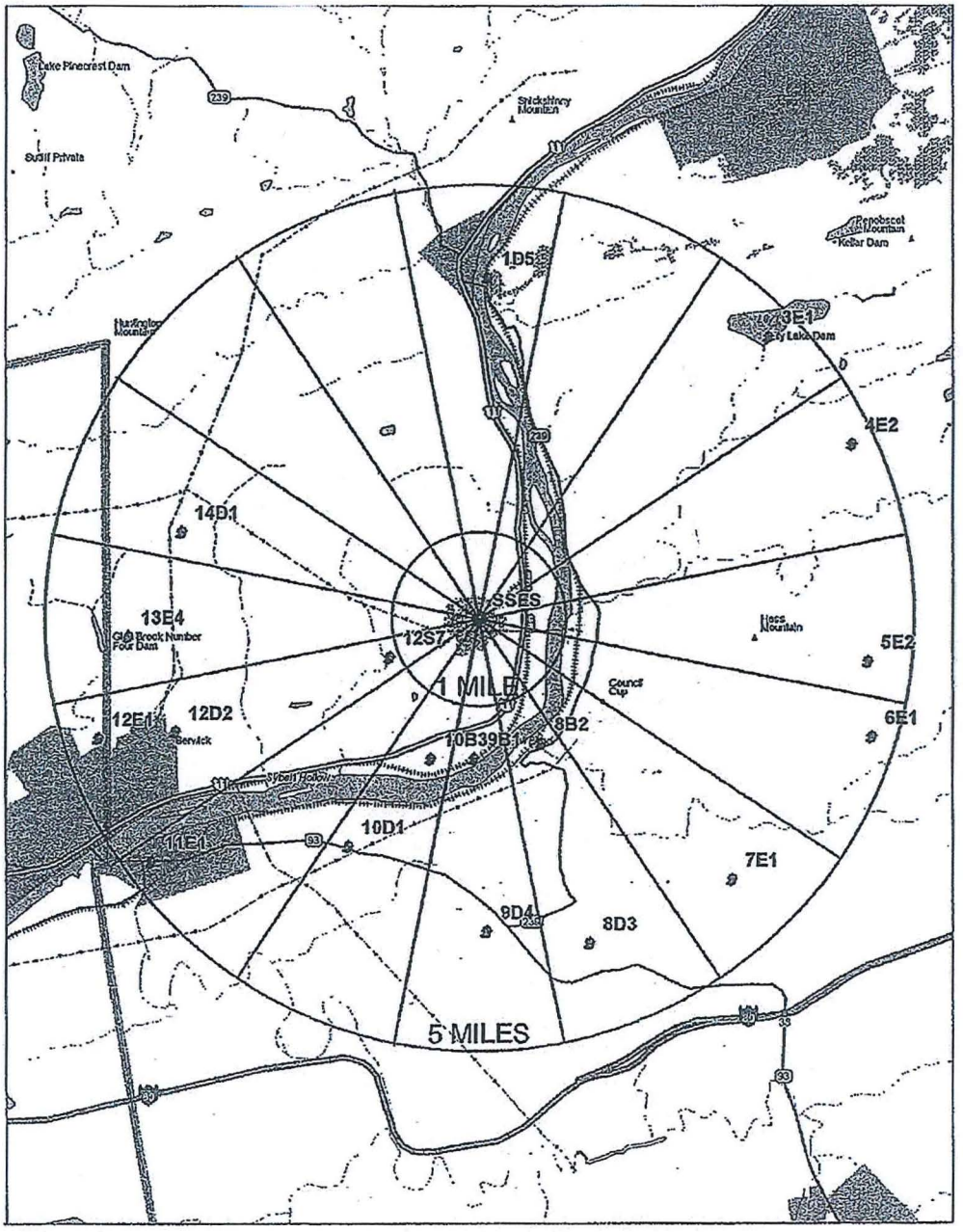
MAP B-1

Direct Radiation Monitoring Locations Within One Mile



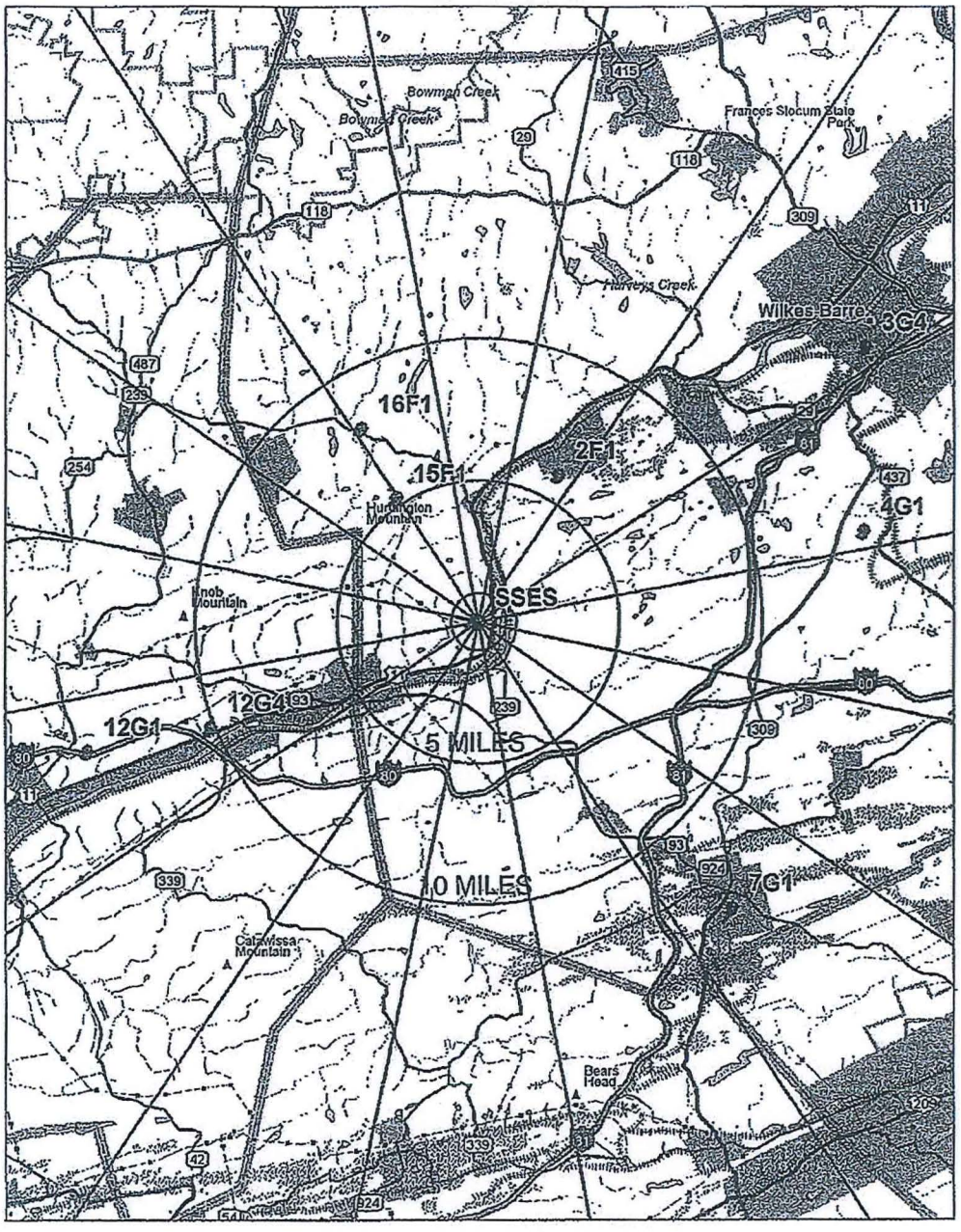
MAP B-2

Direct Radiation Monitoring Locations From One to Five Miles



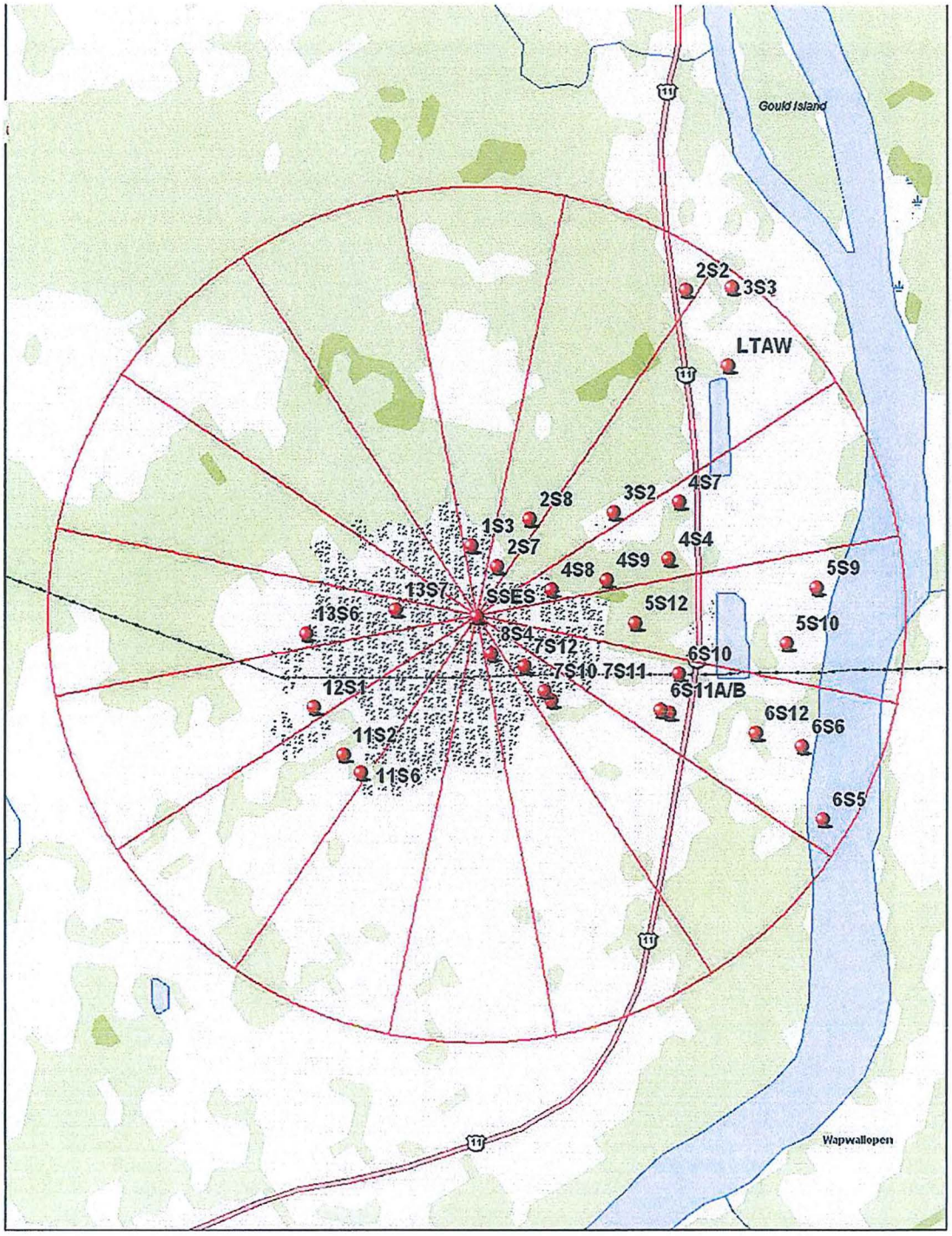
MAP B-3

Direct Radiation Monitoring Locations Greater Than Five Miles



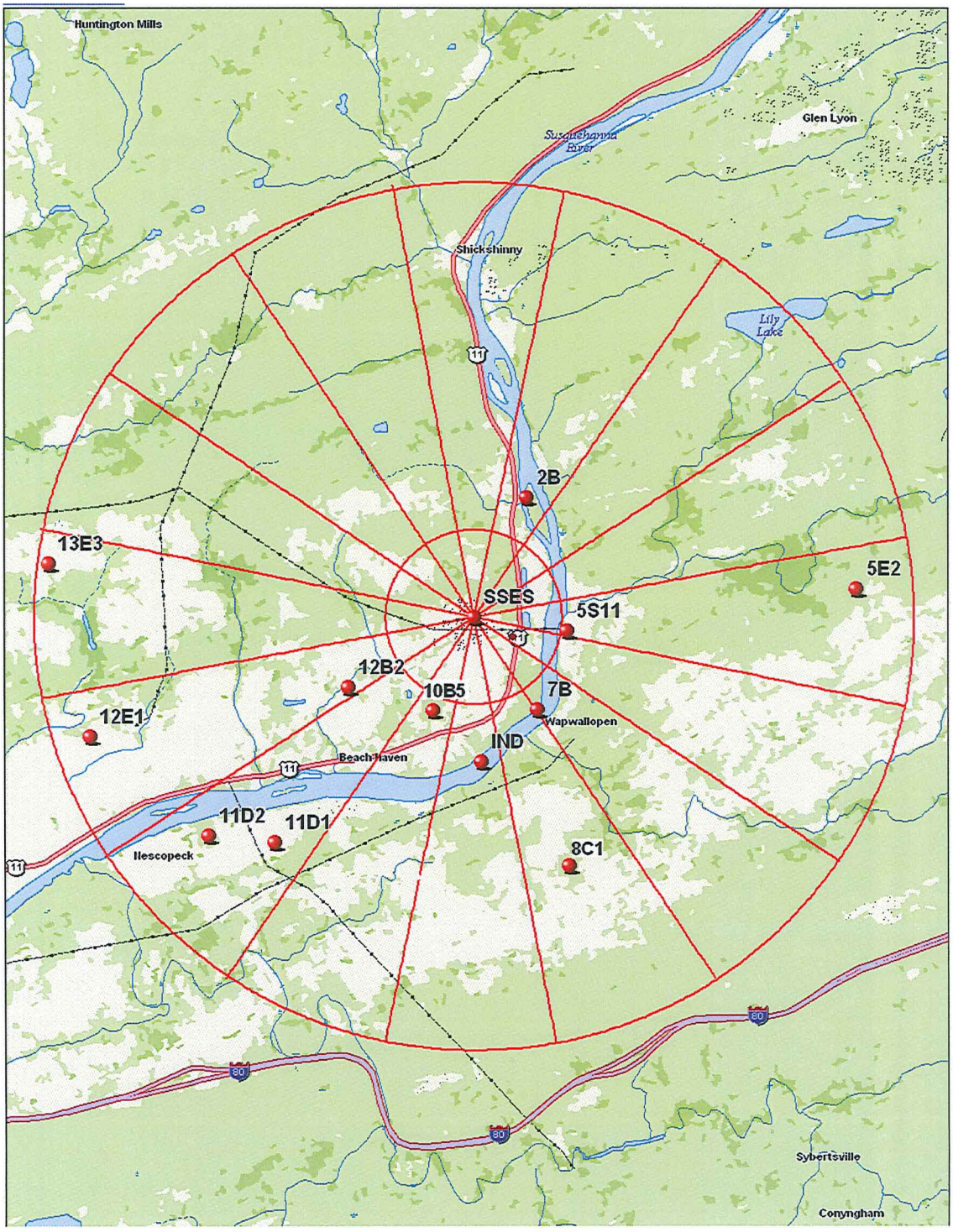
MAP B-4

Environmental Sampling Locations Within One Mile



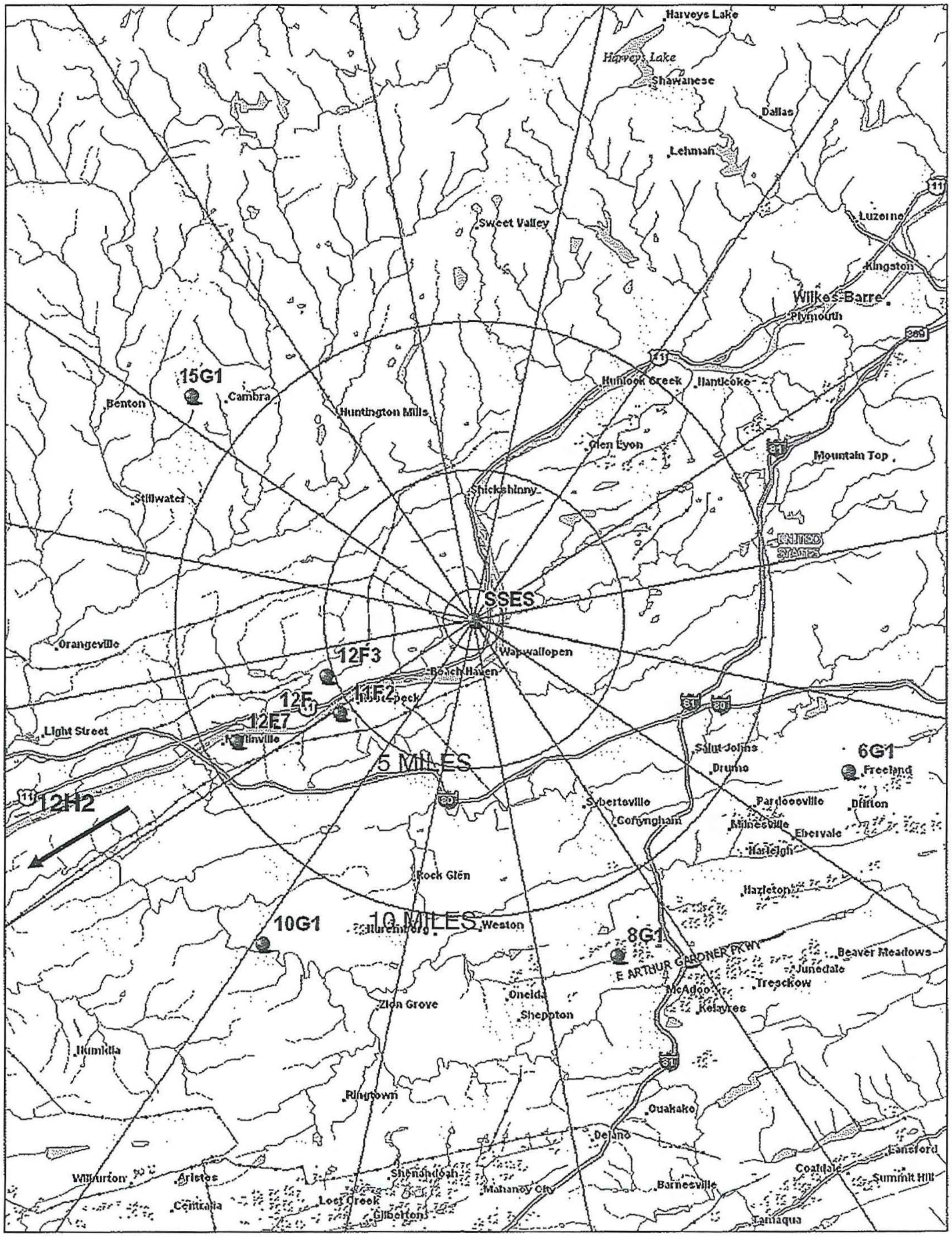
MAP B-5

Environmental Sampling Locations From One to Five Miles



MAP B-6

Environmental Sampling Locations Greater Than Five Miles



APPENDIX C

DATA TABLES

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

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

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

TABLE C-2 GAMMA SPECTROSCOPIC ANALYSES OF COMPOSITED AIR PARTICULATE FILTEF SUSQUEHANNA STEAM ELECTRIC STATION

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

SITE	COLLECTION PERIOD	Be-7	K-40	Cs-134	Cs-137
6G1	01/02/14 - 04/02/14	98 ± 23	< 17	< 1	< 1
	04/02/14 - 07/02/14	102 ± 25	< 13	< 1	< 1
	07/02/14 - 10/01/14	116 ± 21	< 23	< 1	< 1
	10/01/14 - 12/30/14	75 ± 20	< 28	< 2	< 2
	AVERAGE	98 ± 34	-	-	-
8G1	01/02/14 - 04/02/14	113 ± 26	< 25	< 2	< 2
	04/02/14 - 07/02/14	104 ± 29	< 33	< 2	< 2
	07/02/14 - 10/01/14	131 ± 26	< 18	< 1	< 1
	10/01/14 - 12/30/14	81 ± 17	< 17	< 1	< 1
	AVERAGE	107 ± 41	-	-	-
3S2	01/02/14 - 04/02/14	84 ± 19	< 20	< 1	< 1
	04/02/14 - 07/02/14	120 ± 24	< 21	< 1	< 1
	07/02/14 - 10/01/14	123 ± 25	< 5	< 1	< 1
	10/01/14 - 12/30/14	73 ± 19	< 16	< 1	< 1
	AVERAGE	100 ± 51	-	-	-
12E1	01/02/14 - 04/02/14	94 ± 20	< 21	< 1	< 1
	04/02/14 - 07/02/14	101 ± 23	< 8	< 1	< 1
	07/02/14 - 10/01/14	104 ± 26	< 12	< 2	< 1
	10/01/14 - 12/30/14	68 ± 22	< 21	< 1	< 1
	AVERAGE	92 ± 32	-	-	-
12S1	01/02/14 - 04/02/14	87 ± 28	< 36	< 2	< 2
	04/02/14 - 07/02/14	107 ± 21	< 15	< 1	< 1
	07/02/14 - 10/01/14	90 ± 19	< 16	< 1	< 1
	10/01/14 - 12/30/14	52 ± 16	< 23	< 1	< 1
	AVERAGE	84 ± 47	-	-	-
13S6	01/02/14 - 04/02/14	68 ± 22	< 26	< 1	< 1
	04/02/14 - 07/02/14	125 ± 23	< 16	< 1	< 1
	07/02/14 - 10/01/14	110 ± 23	< 23	< 1	< 1
	10/01/14 - 12/30/14	67 ± 18	< 5	< 1	< 1
	AVERAGE	93 ± 58	-	-	-

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

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

COLLECTION PERIOD	3S2	6G1	8G1	12E1	12S1	13S6
01/02/14 - 01/08/14	< 17	< 16	< 17	< 17	< 16	< 17
01/08/14 - 01/15/14	< 10	< 8	< 8	< 7	< 9	< 10
01/15/14 - 01/22/14	< 8	< 7	< 7	< 7	< 8	< 8
01/22/14 - 01/29/14	< 8	< 9	< 9	< 8	< 8	< 8
01/29/14 - 02/04/14	< 10	< 10	< 10	< 10	< 10	< 10
02/04/14 - 02/12/14	< 12	< 10	< 10	< 10	< 12	< 12
02/12/14 - 02/19/14	< 12	< 9	< 8	< 10	< 12	< 12
02/19/14 - 02/26/14	< 9	< 10	< 10	< 9	< 10	< 9
02/26/14 - 03/05/14	< 10	< 9	< 9	< 9	< 10	< 9
03/05/14 - 03/12/14	< 9	< 9	< 8	< 8	< 9	< 9
03/12/14 - 03/19/14	< 19	< 18	< 17	< 18	< 20	< 19
03/19/14 - 03/26/14	< 19	< 18	< 18	< 17	< 19	< 19
03/26/14 - 04/02/14	< 10	< 9	< 9	< 9	< 11	< 11
04/02/14 - 04/09/14	< 11	< 10	< 10	< 9	< 10	< 11
04/09/14 - 04/16/14	< 7	< 8	< 8	< 7	< 7	< 7
04/16/14 - 04/23/14	< 12	< 9	< 9	< 8	< 11	< 12
04/23/14 - 04/30/14	< 9	< 9	< 9	< 8	< 8	< 9
04/30/14 - 05/07/14	< 8	< 9	< 9	< 8	< 8	< 8
05/07/14 - 05/14/14	< 8	< 9	< 8	< 9	< 8	< 8
05/14/14 - 05/21/14	< 9	< 10	< 9	< 10	< 10	< 10
05/21/14 - 05/28/14	< 16	< 15	< 19	< 20	< 17	< 17
05/28/14 - 06/04/14	< 4	< 8	< 8	< 8	< 8	< 7
06/04/14 - 06/11/14	< 15	< 17	< 17	< 17	< 16	< 16
06/11/14 - 06/18/14	< 10	< 10	< 10	< 10	< 9	< 9
06/18/14 - 06/25/14	< 10	< 10	< 10	< 10	< 9	< 9
06/25/14 - 07/02/14	< 8	< 8	< 9	< 9	< 8	< 8
07/02/14 - 07/09/14	< 7	< 7	< 8	< 8	< 7	< 7
07/09/14 - 07/16/14	< 13	< 12	< 13	< 13	< 13	< 13
07/16/14 - 07/23/14	< 7	< 8	< 8	< 9	< 8	< 8
07/23/14 - 07/30/14	< 15	< 17	< 18	< 18	< 15	< 15
07/30/14 - 08/06/14	< 9	< 10	< 10	< 11	< 9	< 9
08/06/14 - 08/13/14	< 14	< 9	< 9	< 9	< 10	< 10
08/13/14 - 08/20/14	< 10	< 10	< 10	< 10	< 10	< 10
08/20/14 - 08/27/14	< 18	< 18	< 18	< 19	< 18	< 18
08/27/14 - 09/03/14	< 12	< 15	< 15	< 16	< 12	< 12
09/03/14 - 09/10/14	< 16	< 13	< 13	< 14	< 16	< 16
09/10/14 - 09/17/14	< 10	< 11	< 10	< 11	< 10	< 10
09/17/14 - 09/24/14	< 15	< 18	< 18	< 19	< 15	< 15
09/24/14 - 10/01/14	< 18	< 20	< 19	< 19	< 18	< 18
10/01/14 - 10/08/14	< 10	< 10	< 10	< 11	< 10	< 10
10/08/14 - 10/15/14	< 11	< 11	< 11	< 12	< 11	< 11
10/15/14 - 10/22/14	< 19	< 19	< 19	< 20	< 19	< 19
10/22/14 - 10/29/14	< 9	< 9	< 9	< 9	< 9	< 8
10/29/14 - 11/05/14	< 19	< 19	< 19	< 19	< 19	< 19
11/05/14 - 11/12/14	< 9	< 11	< 11	< 11	< 9	< 9
11/12/14 - 11/19/14	< 17	< 14	< 14	< 14	< 17	< 17
11/19/14 - 11/25/14	< 12	< 13	< 13	< 13	< 11	< 11
11/25/14 - 12/03/14	< 9	< 10	< 10	< 10	< 9	< 9
12/03/14 - 12/09/14	< 12	< 12	< 12	< 12	< 12	< 12
12/09/14 - 12/17/14	< 10	< 9	< 9	< 9	< 9	< 15
12/17/14 - 12/23/14	< 8	< 18	< 15	< 17	< 8	< 8
12/23/14 - 12/30/14	< 16	< 18	< 16	< 16	< 16	< 17

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

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

LOCATION	First Quarter 01/30/14 to 04/10/14	Second Quarter 04/10/14 to 07/10/14	Third Quarter 07/10/14 to 10/24/14	Fourth Quarter 10/24/14 to 01/09/15
ONSITE				
1S2	30.0 ± 0.2	20.0 ± 0.1	25.4 ± 0.7	25.5 ± 0.7
2S2	21.5 ± 0.4	16.9 ± 1.4	15.6 ± 0.7	15.2 ± 0.2
2S3	25.3 ± 1.3	20.1 ± 0.2	19.2 ± 0.1	24.5 ± 0.4
3S2	20.7 ± 0.7	15.3 ± 1.8	14.3 ± 0.8	18.3 ± 0.8
3S3	18.6 ± 0.6	15.5 ± 0.5	14.6 ± 0.7	(4)
4S3	26.8 ± 0.1	19.1 ± 2.2	20.3 ± 1.6	24.6 ± 0.8
4S6	19.6 ± 0.3	16.7 ± 1.7	14.3 ± 1.2	17.9 ± 0.2
5S4	18.6 ± 0.2	13.8 ± 0.9	12.9 ± 0.2	15.8 ± 0.1
5S7	21.6 ± 0.6	16.2 ± 0.7	15.5 ± 0.7	18.6 ± 0.2
6S4	29.3 ± 0.2	25.8 ± 0.9	23.2 ± 1.5	27.8 ± 1.5
6S9	27.2 ± 0.8	22.6 ± 1.1	23.8 ± 2.5	25.3 ± 0.6
7S6	25.6 ± 0.1	22.1 ± 0.0	19.5 ± 1.2	24.8 ± 0.2
7S7	19.5 ± 0.3	16.5 ± 0.0	12.8 ± 0.1	16.5 ± 0.5
8S2	27.8 ± 0.2	23.0 ± 0.7	24.6 ± 1.2	30.6 ± 0.7
9S2	42.5 ± 0.6	39.4 ± 1.0	39.0 ± 0.9	48.9 ± 4.3
10S1	20.6 ± 0.4	14.8 ± 0.8	14.8 ± 0.3	17.1 ± 2.1
10S2	35.5 ± 0.6	32.2 ± 1.3	33.2 ± 2.2	37.3 ± 4.6
11S7	20.8 ± 0.8	14.8 ± 0.1	14.9 ± 0.2	18.0 ± 0.1
12S1	21.4 ± 0.1	17.0 ± 0.2	17.3 ± 0.1	19.7 ± 1.7
12S3	24.8 ± 0.6	20.8 ± 1.1	20.4 ± 0.1	(4)
12S7	19.7 ± 0.2	15.6 ± 1.1	14.5 ± 0.5	18.7 ± 1.0
13S2	29.3 ± 1.7	26.0 ± 2.9	24.1 ± 3.4	29.9 ± 1.8
13S5	30.9 ± 0.2	27.9 ± 0.2	28.0 ± 0.1	28.4 ± 0.9
13S6	25.8 ± 0.2	23.9 ± 0.6	20.4 ± 1.2	22.0 ± 0.2
14S5	25.2 ± 0.2	20.1 ± 2.1	21.7 ± 0.8	22.7 ± 0.6
15S5	22.4 ± 0.5	17.9 ± 0.4	17.1 ± 0.2	21.6 ± 2.3
16S1	27.7 ± 0.1	20.4 ± 0.8	22.3 ± 0.1	23.3 ± 0.8
16S2	27.4 ± 0.3	20.4 ± 0.2	21.5 ± 0.1	23.8 ± 0.2

See the comments at the end of this table.

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

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

LOCATION	First Quarter 01/30/14 to 04/10/14	Second Quarter 04/10/14 to 07/10/14	Third Quarter 07/10/14 to 10/24/14	Fourth Quarter 10/24/14 to 01/09/15
0-1 MILE OFFSITE				
6A4	22.4 ± 0.3	18.7 ± 0.1	16.7 ± 1.2	20.6 ± 1.3
8A3	19.2 ± 0.9	14.7 ± 0.0	13.4 ± 0.5	14.2 ± 2.2
15A3	18.5 ± 0.0	15.6 ± 0.3	13.3 ± 1.5	14.8 ± 0.5
16A2	17.8 ± 0.6	14.1 ± 0.6	13.3 ± 0.0	13.9 ± 0.1
1-2 MILES OFFSITE				
8B2	20.5 ± 0.2	15.3 ± 0.8	13.8 ± 1.1	15.8 ± 1.8
9B1	24.1 ± 0.1	20.7 ± 0.2	19.5 ± 0.5	21.4 ± 1.8
10B3	20.3 ± 0.6	15.0 ± 1.3	12.5 ± 0.4	18.8 ± 0.3
2-4 MILES OFFSITE				
1D5	23.7 ± 0.2	18.5 ± 0.9	18.7 ± 0.4	19.2 ± 1.7
8D3	22.5 ± 0.3	16.4 ± 1.0	15.6 ± 0.3	17.4 ± 1.1
9D4	22.4 ± 0.5	19.5 ± 0.1	19.3 ± 2.7	17.0 ± 1.1
10D1	21.8 ± 0.7	18.2 ± 0.0	15.6 ± 1.5	18.0 ± 1.2
12D2	21.0 ± 0.2	17.2 ± 1.8	14.5 ± 1.4	17.4 ± 0.8
14D1	21.1 ± 0.2	17.6 ± 0.1	15.7 ± 0.2	18.5 ± 0.0
4-5 MILES OFFSITE				
3E1	19.6 ± 0.3	14.5 ± 0.8	13.2 ± 1.3	13.9 ± 1.9
4E2	22.4 ± 0.2	18.6 ± 1.1	18.1 ± 1.6	16.2 ± 0.9
5E2	23.5 ± 0.7	17.9 ± 1.3	16.6 ± 1.5	17.0 ± 1.1
6E1	24.1 ± 0.7	20.0 ± 0.4	17.6 ± 0.9	18.7 ± 1.3
7E1	23.8 ± 1.2	18.5 ± 0.6	16.1 ± 0.5	17.9 ± 2.0
11E1	19.6 ± 0.0	16.2 ± 4.0	12.7 ± 1.0	13.4 ± 0.3
12E1	19.7 ± 0.1	14.5 ± 0.4	13.6 ± 0.1	16.9 ± 0.3
13E4	22.2 ± 0.3	19.2 ± 0.4	20.2 ± 1.8	20.9 ± 1.6

See the comments at the end of this table.

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

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

LOCATION	First Quarter 01/30/14 to 04/10/14	Second Quarter 04/10/14 to 07/10/14	Third Quarter 07/10/14 to 10/24/14	Fourth Quarter 10/24/14 to 01/09/15
5-10 MILES OFFSITE				
2F1	22.0 ± 0.4	17.5 ± 0.3	17.2 ± 0.6	17.4 ± 1.7
15F1	21.4 ± 0.6	18.7 ± 0.7	17.2 ± 0.8	20.6 ± 0.9
16F1	24.2 ± 0.2	18.2 ± 1.2	18.5 ± 0.4	19.3 ± 0.8
10-20 MILES OFFSITE				
3G4	25.4 ± 0.3	17.1 ± 0.7	17.9 ± 0.8	18.9 ± 1.1
4G1	24.1 ± 0.1	20.3 ± 0.6	19.1 ± 2.3	19.6 ± 1.6
7G1	22.2 ± 0.1	(4)	17.0 ± 0.2	17.1 ± 0.7
12G1	20.1 ± 0.6	14.2 ± 1.1	13.6 ± 1.1	14.3 ± 1.8
12G4	21.8 ± 0.2	16.3 ± 1.0	15.7 ± 0.1	15.9 ± 0.3

See the comments at the end of this table.

LOCATION				
INDICATOR				
Average (5)	23.5 ± 3.8	19.0 ± 8.2	18.2 ± 8.0	20.7 ± 11.3
CONTROL				
Average (5)	22.7 ± 0.7	17.0 ± 4.4	16.6 ± 2.6	17.2 ± 2.7

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 Section III, Program Description. 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**

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Th-228
10G1	01/06/14	< 0.7	1254 ± 130	< 4	< 5	< 38	< 12	< 9
	02/04/14	< 0.4	1168 ± 179	< 6	< 6	< 34	< 13	< 14
	03/10/14	< 0.7	1346 ± 166	< 6	< 7	< 27	< 5	< 11
	04/07/14	< 0.4	1350 ± 122	< 4	< 4	< 23	< 6	< 9
	04/21/14	< 0.4	1150 ± 143	< 6	< 7	< 38	< 12	< 12
	05/05/14	< 0.4	1222 ± 172	< 9	< 10	< 55	< 6	< 18
	05/19/14	< 0.6	1244 ± 151	< 6	< 7	< 30	< 8	< 11
	06/02/14	< 0.4	1267 ± 147	< 8	< 8	< 44	< 8	< 15
	06/16/14	< 0.4	1337 ± 170	< 7	< 8	< 39	< 14	< 13
	06/30/14	< 0.4	1357 ± 126	< 5	< 5	< 21	< 6	< 10
	07/15/14	< 0.5	1241 ± 174	< 6	< 6	< 26	< 11	< 12
	07/28/14	< 0.5	1212 ± 166	< 6	< 8	< 39	< 7	< 14
	08/11/14	< 0.2	1271 ± 114	< 4	< 5	< 23	< 7	< 9
	08/25/14	< 0.5	1219 ± 116	< 4	< 4	< 27	< 10	< 7
	09/08/14	< 0.8	1276 ± 165	< 7	< 7	< 38	< 9	< 15
	09/22/14	< 0.5	1307 ± 161	< 7	< 8	< 38	< 9	< 13
	10/07/14	< 0.3	1009 ± 157	< 6	< 9	< 51	< 15	< 11
	10/20/14	< 0.7	1298 ± 102	< 4	< 5	< 38	< 11	< 7
	11/10/14	< 0.4	1154 ± 150	< 6	< 7	< 37	< 7	< 12
	12/08/14	< 0.4	1401 ± 145	< 6	< 6	< 38	< 9	< 11
	AVERAGE	-	1254 ± 181	-	-	-	-	-
13E3	01/06/14	< 1.0	1341 ± 126	< 5	< 6	< 39	< 14	< 10
	02/04/14	< 0.5	1261 ± 146	< 7	< 9	< 35	< 13	< 14
	03/10/14	< 0.7	1395 ± 116	< 5	< 5	< 19	< 5	< 10
	04/07/14	< 0.4	1326 ± 104	< 4	< 4	< 24	< 6	< 9
	04/21/14	< 0.4	1309 ± 147	< 5	< 6	< 33	< 10	< 12
	05/05/14	< 0.4	1339 ± 177	< 6	< 7	< 40	< 11	< 13
	05/19/14	< 0.7	1273 ± 145	< 6	< 7	< 27	< 9	< 13
	06/02/14	< 0.4	1216 ± 186	< 8	< 9	< 47	< 12	< 14
	06/16/14	< 0.4	1171 ± 159	< 6	< 8	< 38	< 9	< 15
	06/30/14	< 0.4	1181 ± 159	< 6	< 6	< 23	< 3	< 10
	07/15/14	< 0.5	1176 ± 150	< 5	< 5	< 21	< 6	< 11
	07/28/14	< 0.5	1316 ± 145	< 5	< 6	< 30	< 6	< 11
	08/11/14	< 0.2	1357 ± 116	< 4	< 5	< 23	< 5	< 8
	08/25/14	< 0.6	1322 ± 100	< 4	< 4	< 31	< 7	< 7
	09/08/14	< 0.7	1576 ± 169	< 6	< 8	< 44	< 10	< 14
	09/22/14	< 0.5	1477 ± 136	< 5	< 5	< 28	< 6	< 10
	10/07/14	< 0.4	1347 ± 144	< 5	< 7	< 45	< 14	< 11
	10/20/14	< 0.9	1476 ± 99	< 4	< 4	< 34	< 9	< 8
	11/10/14	< 0.4	1446 ± 171	< 10	< 11	< 53	< 13	< 19
	12/08/14	< 0.2	1556 ± 155	< 6	< 7	< 38	< 9	< 12
	AVERAGE	-	1343 ± 235	-	-	-	-	-

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

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Th-228
5E2	01/06/14	< 0.8	1412 ± 114	< 5	< 5	< 40	< 11	< 10
	02/04/14	< 0.5	1383 ± 165	< 6	< 6	< 33	< 11	< 13
	03/10/14	< 0.7	1564 ± 164	< 6	< 6	< 24	< 9	< 13
	04/07/14	< 0.4	1295 ± 77	< 3	< 3	< 15	< 5	< 5
	04/21/14	< 0.5	1242 ± 101	< 4	< 4	< 24	< 7	< 7
	05/05/14	< 0.4	1296 ± 134	< 5	< 5	< 25	< 5	< 10
	05/19/14	< 0.5	1294 ± 152	< 7	< 8	< 34	< 10	< 13
	06/02/14	< 0.3	1457 ± 190	< 7	< 9	< 44	< 13	< 15
	06/16/14	< 0.4	1244 ± 152	< 5	< 6	< 34	< 6	< 12
	06/30/14	< 0.4	1291 ± 144	< 6	< 6	< 23	< 7	< 11
	07/15/14	< 0.4	1320 ± 155	< 9	< 9	< 41	< 9	< 17
	07/28/14	< 0.5	1192 ± 133	< 5	< 4	< 20	< 6	< 9
	08/11/14	< 0.2	1464 ± 94	< 3	< 4	< 19	< 5	< 7
	08/25/14	< 0.6	1354 ± 103	< 4	< 4	< 33	< 8	< 7
	09/08/14	< 0.6	1399 ± 128	< 5	< 5	< 20	< 8	< 9
	09/22/14	< 0.5	1219 ± 155	< 6	< 7	< 32	< 11	< 13
	10/07/14	< 0.4	1194 ± 129	< 6	< 7	< 49	< 14	< 12
	10/20/14	< 0.8	1356 ± 135	< 5	< 5	< 48	< 11	< 11
	11/10/14	< 0.3	1278 ± 143	< 4	< 5	< 29	< 9	< 9
	12/08/14	< 0.2	1485 ± 144	< 6	< 6	< 28	< 9	< 10
	AVERAGE	-	1337 ± 205	-	-	-	-	-

TABLE C-6 **TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER**
SUSQUEHANNA STEAM ELECTRIC STATION

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	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
12F3	02/03/14	< 140	< 128	< 6	< 6	< 18	< 6	< 13	< 8	< 14	< 15	< 6	< 7	< 35	< 11	< 13
	05/05/14	< 147	< 93	< 8	< 6	< 14	< 6	< 11	< 6	< 12	< 12	< 7	< 5	< 28	< 12	< 13
	08/21/14	< 125	< 78	< 5	< 3	< 11	< 5	< 9	< 5	< 7	< 7	< 4	< 4	< 20	< 5	< 8
	11/24/14	< 131	< 37	< 5	< 4	< 14	< 5	< 10	< 5	< 8	< 10	< 5	< 4	< 24	< 8	< 10
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2S2	02/03/14	< 139	< 86	< 4	< 5	< 13	< 5	< 10	< 5	< 9	< 13	< 5	< 6	< 29	< 8	< 10
	05/05/14	< 147	< 53	< 5	< 6	< 14	< 5	< 11	< 6	< 10	< 13	< 6	< 6	< 32	< 7	< 13
	08/21/14	< 125	< 95	< 6	< 6	< 18	< 6	< 11	< 6	< 11	< 10	< 5	< 7	< 28	< 8	< 12
	11/24/14	< 131	< 100	< 6	< 5	< 18	< 6	< 14	< 6	< 10	< 13	< 6	< 7	< 32	< 10	< 12
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2S8	05/21/14	< 146	< 43	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 19	< 6	< 4
	07/31/14	< 124	46 ± 28	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 10	< 1	< 1	< 15	< 4	< 3
	11/10/14	< 140	< 94	< 5	< 5	< 14	< 6	< 11	< 6	< 11	< 11	< 5	< 5	< 28	< 8	< 11
	AVERAGE	-	46 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-
4S4	02/03/14	< 136	< 102	< 6	< 7	< 17	< 4	< 13	< 7	< 11	< 15	< 6	< 6	< 35	< 13	< 12
	05/05/14	< 147	< 120	< 5	< 5	< 12	< 4	< 7	< 5	< 7	< 12	< 4	< 5	< 21	< 5	< 9
	08/21/14	< 125	< 91	< 5	< 4	< 10	< 5	< 8	< 5	< 8	< 8	< 5	< 5	< 21	< 5	< 10
	11/24/14	< 129	< 55	< 5	< 7	< 12	< 9	< 14	< 7	< 11	< 15	< 5	< 7	< 35	< 9	< 14
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6S10	02/03/14	< 139	< 67	< 5	< 6	< 15	< 5	< 9	< 6	< 11	< 12	< 5	< 5	< 37	< 13	< 12
	05/05/14	< 145	< 101	< 6	< 5	< 11	< 6	< 11	< 5	< 9	< 11	< 5	< 6	< 29	< 11	< 11
	08/21/14	< 127	< 107	< 5	< 6	< 17	< 5	< 10	< 6	< 9	< 8	< 5	< 6	< 26	< 7	< 9
	11/24/14	< 131	< 101	< 4	< 4	< 12	< 4	< 10	< 6	< 10	< 11	< 4	< 6	< 25	< 7	< 11
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11S2	02/03/14	< 141	< 91	< 5	< 4	< 13	< 5	< 9	< 5	< 7	< 12	< 4	< 5	< 27	< 8	< 9
	05/05/14	< 147	< 106	< 9	< 6	< 19	< 7	< 14	< 9	< 14	< 15	< 7	< 7	< 38	< 14	< 12
	08/21/14	< 126	< 61	< 6	< 4	< 15	< 5	< 12	< 6	< 10	< 9	< 5	< 5	< 28	< 9	< 13
	11/24/14	< 131	< 65	< 7	< 7	< 17	< 8	< 14	< 5	< 14	< 12	< 7	< 6	< 38	< 13	< 13
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-6 **TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER SUSQUEHANNA STEAM ELECTRIC STATION**

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	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
13S7	02/23/14	< 147	< 34	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 7	< 2	< 2	< 15	< 5	< 4
	05/20/14	< 143	< 14	< 2	< 2	< 6	< 2	< 3	< 2	< 4	< 11	< 2	< 2	< 19	< 5	< 4
	07/29/14	< 125	< 27	< 1	< 1	< 5	< 1	< 2	< 1	< 2	< 12	< 1	< 1	< 19	< 6	< 3
	10/28/14	< 141	< 32	< 2	< 2	< 7	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 19	< 6	< 4
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1S3	02/23/14	< 146	< 32	< 2	< 2	< 5	< 1	< 3	< 2	< 3	< 6	< 2	< 2	< 13	< 4	< 3
	05/20/14	< 145	< 10	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 8	< 1	< 1	< 13	< 4	< 2
	07/29/14	< 125	< 13	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 14	< 1	< 1	< 21	< 6	< 3
	10/28/14	< 141	< 23	< 2	< 3	< 8	< 2	< 6	< 3	< 5	< 13	< 2	< 3	< 24	< 9	< 4
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4S8	02/23/14	219 ± 100	< 17	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 8	< 2	< 2	< 16	< 4	< 4
	05/20/14	210 ± 100	< 19	< 2	< 3	< 7	< 2	< 5	< 3	< 5	< 14	< 2	< 2	< 24	< 6	< 5
	07/29/14	< 124	< 30	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 13	< 1	< 1	< 19	< 5	< 3
	10/28/14	224 ± 99	< 48	< 2	< 3	< 9	< 2	< 5	< 3	< 5	< 12	< 2	< 2	< 23	< 8	< 4
	AVERAGE	218 ± 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4S9	02/24/14	< 146	< 39	< 2	< 2	< 6	< 2	< 4	< 3	< 4	< 8	< 2	< 2	< 17	< 4	< 5
	05/19/14	< 146	< 31	< 1	< 2	< 5	< 2	< 3	< 2	< 3	< 10	< 1	< 2	< 17	< 5	< 3
	08/18/14	< 126	< 16	< 3	< 3	< 8	< 3	< 6	< 3	< 6	< 6	< 3	< 3	< 13	< 5	< 6
	10/30/14	< 142	< 17	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 10	< 2	< 2	< 18	< 5	5 ± 3
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 ± 0
6S11A	02/27/14	< 148	< 40	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 6	< 2	< 2	< 13	< 3	< 4
	06/02/14	< 147	< 66	< 6	< 7	< 19	< 7	< 15	< 7	< 10	< 14	< 8	< 8	< 28	< 10	< 14
	08/19/14	< 150	< 57	< 6	< 6	< 15	< 6	< 14	< 7	< 12	< 8	< 6	< 7	< 26	< 7	< 13
	11/03/14	< 145	< 75	< 4	< 4	< 10	< 4	< 7	< 4	< 7	< 15	< 4	< 4	< 28	< 9	< 8
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6S12	02/21/14	< 147	< 21	< 1	< 1	< 4	< 1	< 3	< 2	< 2	< 6	< 1	< 1	< 11	< 4	< 3
	05/12/14	< 148	< 11	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 14	< 1	< 1	< 19	< 6	< 3
	07/28/14	< 125	< 8	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 11	< 1	< 1	< 14	< 4	< 2
	10/27/14	< 143	< 13	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 8	< 1	< 1	< 14	< 4	< 2
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-6 **TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER**
SUSQUEHANNA STEAM ELECTRIC STATION

Results in pCi/Liter ± 2 sigma

SITE	COLLECTION PERIOD	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
7S10	02/27/14	< 149	< 46	< 2	< 2	< 6	< 2	< 4	< 2	< 3	< 6	< 2	< 2	< 12	< 4	< 4
	05/22/14	< 145	< 20	< 2	< 3	< 8	< 2	< 5	< 3	< 5	< 11	< 2	< 2	< 21	< 8	< 4
	08/01/14	< 123	< 30	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 10	< 1	< 1	< 15	< 5	< 2
	11/08/14	< 143	< 39	< 4	< 5	< 11	< 5	< 8	< 6	< 7	< 12	< 5	< 5	< 28	< 7	< 10
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7S11	02/25/14	< 146	< 34	< 2	< 2	< 5	< 2	< 4	< 2	< 3	< 6	< 2	< 2	< 13	< 4	< 4
	06/02/14	< 145	< 143	< 7	< 6	< 19	< 9	< 14	< 5	< 11	< 14	< 6	< 7	< 34	< 14	< 14
	08/18/14	< 126	< 79	< 4	< 4	< 9	< 4	< 7	< 4	< 6	< 7	< 3	< 4	< 20	< 6	< 8
	11/08/14	< 139	< 45	< 5	< 6	< 17	< 4	< 10	< 7	< 11	< 15	< 6	< 7	< 35	< 11	< 12
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8S4	02/23/14	< 144	< 15	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 6	< 2	< 2	< 13	< 4	< 3
	05/20/14	< 143	54 ± 28	< 2	< 2	< 7	< 2	< 5	< 3	< 4	< 13	< 2	< 2	< 22	< 7	< 4
	07/29/14	< 149	< 8	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 9	< 1	< 1	< 14	< 4	< 2
	10/28/14	201 ± 84	< 19	< 2	< 3	< 8	< 2	< 5	< 3	< 5	< 14	< 2	< 2	< 24	< 8	< 5
	AVERAGE	201 ± 0	54 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-7

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

Results in pCi/Liter ± 2 sigma

SITE	2008	2009	2010	2011	2012	2013	2014
Precip Sites 3S2, 12S1, 8G1 (offsite, controls)	62*	49	40	38	82	63	51
Precip Sites 1 and 2 (onsite, East of Station Reactor Bldgs)	370	230*	193	216	242	182	142
Precipitation Sites 3 and 4 (onsite, West of Station Reactor Bldgs)	414	404*	350	233	169	151	231
Perimeter Drain manholes (below grade, 28')	344	304	325	236	185	198	179
1S3 - MW-1 (43')	248	150	252	131	164	197	115
4S8 - MW-2 (45')	292	154	190	173	137	202	187
4S9 - MW-3 (94')	127	54	150	64	80	135	94
8S4 - MW-4 (111')	172	66	105	68	81	109	60
7S10 - MW-5 (36')	171	69	96	-6	74	106	68
13S7 - MW-6 (16')	142	134	143	34	80	111	71
2S8 - MW-7 (85')	Not installed	Not installed	Not installed	22	54	72	70
6S11A - MW-8A (14')	177	82	165	58	15	72	103
6S11B - MW-8B (19')	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
7S11 - MW-10 (132')	3	-27	-9	1	-1	23	29
12F3 - Groundwater Control	26	-53	-2	5	-6	45	-26
LTAW- Surface Water	179	104	110	132	132	145	27

* Revised values to reflect full scope of precipitation data.

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

Results in pCi/Liter ± 2 sigma

	SAMPLING PERIOD				<----------GAMMA EMITTERS---------->												
STATION ID	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	12/31/13 -	01/28/14	< 1.8	< 142	< 29	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 11	< 1	< 1	< 16	< 4
12H2	01/28/14 -	03/04/14	< 2.2	< 145	< 12	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 13	< 1	< 1	< 18	< 5
12H2	03/04/14 -	04/01/14	< 2.4	< 130	< 10	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 10	< 1	< 1	< 15	< 5
12H2	04/01/14 -	04/29/14	< 1.9	< 129	< 17	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 12	< 2	< 2	< 19	< 6
12H2	04/29/14 -	06/03/14	2.2 ± 1.3	< 139	< 31	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 13	< 1	< 2	< 19	< 6
12H2	06/03/14 -	07/01/14	< 2.0	< 126	< 31	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 14	< 2	< 2	< 21	< 7
12H2	07/01/14 -	07/29/14	2.3 ± 1.5	< 143	< 12	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 13	< 1	< 1	< 17	< 5
12H2	07/29/14 -	09/02/14	< 2.4	< 136	< 14	< 1	< 1	< 2	< 1	< 1	< 1	< 1	< 8	< 0	< 1	< 10	< 3
12H2	09/02/14 -	09/30/14	2.4 ± 1.5	< 128	< 17	< 1	< 1	< 3	< 1	< 1	< 1	< 2	< 10	< 1	< 1	< 14	< 4
12H2	09/30/14 -	10/27/14	3.3 ± 1.5	< 149	< 16	< 2	< 2	< 6	< 2	< 4	< 3	< 4	< 15	< 2	< 2	< 22	< 6
12H2	10/27/14 -	12/02/14	< 1.9	< 131	< 6	< 1	< 1	< 2	< 1	< 1	< 1	< 2	< 8	< 1	< 1	< 13	< 3
12H2	12/02/14 -	12/29/14	2.0 ± 1.3	< 133	< 21	< 2	< 3	< 6	< 3	< 5	< 3	< 5	< 15	< 2	< 2	< 26	< 10
		AVERAGE	2.4 ± 1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Results in pCi/kg (wet) ± 2 sigma

SITE	COLLECTION PERIOD	Be-7	K-40	I-131	Cs-134	Cs-137	Ac-228	Th-228
8G1	07/16/14	< 148	4363 ± 470	< 25	< 14	< 16	< 68	< 25
	07/16/14	< 136	4535 ± 352	< 27	< 14	< 15	< 63	< 28
	07/16/14	< 137	5545 ± 453	< 27	< 15	< 18	< 68	< 28
	08/20/14	< 211	3653 ± 521	< 33	< 25	< 22	< 109	< 40
	08/20/14	326 ± 200	5259 ± 688	< 54	< 28	< 34	< 121	< 52
	08/20/14	308 ± 160	6193 ± 604	< 30	< 18	< 20	< 74	< 26
	09/21/14	234 ± 104	6548 ± 399	< 38	< 12	< 15	< 61	< 22
	09/21/14	< 108	4097 ± 292	< 32	< 11	< 13	< 43	< 24
	09/21/14	211 ± 127	5710 ± 526	< 47	< 19	< 22	< 76	< 32
	10/19/14	506 ± 150	3397 ± 374	< 35	< 13	< 14	< 74	< 29
	10/19/14	532 ± 228	4948 ± 642	< 42	< 23	< 22	< 89	< 35
	10/19/14	443 ± 133	5087 ± 422	< 31	< 13	< 15	< 64	< 30
	AVERAGE	366 ± 257	4945 ± 1952	-	-	-	-	-
11S6	06/30/14	< 176	5544 ± 556	< 35	< 19	< 19	< 59	< 35
	06/30/14	< 123	5966 ± 484	< 32	< 18	< 19	< 66	< 35
	06/30/14	< 213	7302 ± 650	< 41	< 20	< 22	< 94	< 37
	07/16/14	175 ± 103	4541 ± 257	< 23	< 15	< 15	< 56	< 24
	07/16/14	190 ± 82	5972 ± 298	< 18	< 11	< 12	< 47	63 ± 18
	07/16/14	195 ± 96	6234 ± 333	< 16	< 9	< 10	< 43	< 17
	08/20/14	< 271	4299 ± 655	< 47	< 30	< 24	< 109	< 50
	08/20/14	< 172	7160 ± 625	< 32	< 21	< 24	< 103	< 43
	08/20/14	< 206	6675 ± 675	< 39	< 25	< 28	< 123	< 43
	09/21/14	< 144	3837 ± 341	< 35	< 12	< 16	< 58	< 22
	09/21/14	< 118	5739 ± 355	< 34	< 12	< 15	< 50	< 22
	09/21/14	< 184	7795 ± 501	< 51	< 16	< 18	< 62	< 35
	10/19/14	476 ± 183	4670 ± 593	< 39	< 22	< 22	< 80	< 42
	10/19/14	520 ± 161	6422 ± 533	< 39	< 17	< 18	< 82	< 38
	10/19/14	< 234	8566 ± 711	< 53	< 18	< 25	< 89	< 40
	AVERAGE	311 ± 343	5993 ± 2916	-	-	-	-	63 ± 0

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

Results in pCi/kg (wet) ± 2 sigma

SITE	COLLECTION PERIOD	Be-7	K-40	I-131	Cs-134	Cs-137	Ac-228	Th-228
3S3	06/30/14	< 124	4439 ± 371	< 28	< 12	< 13	< 57	< 29
	06/30/14	< 195	6289 ± 589	< 33	< 17	< 21	< 74	< 36
	06/30/14	< 230	7513 ± 627	< 40	< 19	< 24	< 92	< 40
	07/16/14	335 ± 89	4633 ± 232	< 15	< 9	< 9	< 41	< 18
	07/16/14	< 108	4877 ± 323	< 19	< 12	< 13	< 51	< 19
	07/16/14	154 ± 73	7059 ± 323	< 17	< 9	< 11	< 46	< 18
	08/20/14	458 ± 165	4640 ± 480	< 34	< 21	< 24	< 67	< 39
	08/20/14	580 ± 365	5302 ± 771	< 58	< 34	< 41	< 143	< 73
	08/20/14	< 234	5821 ± 609	< 30	< 19	< 20	< 86	< 33
	09/21/14	355 ± 140	5243 ± 460	< 35	< 16	< 17	96 ± 58	< 27
	09/21/14	430 ± 134	7352 ± 480	< 34	< 13	< 15	< 72	< 26
	09/21/14	257 ± 148	7940 ± 507	< 43	< 16	< 16	< 63	< 30
	09/21/14	433 ± 161	5777 ± 454	< 52	< 19	< 17	< 73	< 36
	10/19/14	642 ± 178	5903 ± 622	< 40	< 19	< 20	< 106	< 41
	10/19/14	725 ± 208	6164 ± 603	< 46	< 22	< 21	< 100	< 45
	10/19/14	402 ± 211	7378 ± 736	< 45	< 24	< 24	< 86	< 41
	AVERAGE	434 ± 333	6121 ± 2151	-	-	-	96 ± 0	-

TABLE C-10 GAMMA SPECTROSCOPIC ANALYSES OF SOIL SUSQUEHANNA STEAM ELECTRIC STATION

Results in pCi/kg (dry) ± 2 sigma

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ra-226	Ac-228	Th-228
8G1	09/17/14	13790 ± 2010	< 97	< 129	< 3272	767 ± 427	1101 ± 202
	09/17/14	13930 ± 1750	< 139	< 142	< 3063	1393 ± 491	1565 ± 271
	09/17/14	7911 ± 2497	< 104	< 179	< 2944	< 675	< 224
	MEAN	11877 ± 6871	-	-	-	1080 ± 885	1333 ± 656
12S1	09/17/14	13380 ± 1866	< 95	176 ± 90	< 1733	1128 ± 351	977 ± 171
	09/17/14	12820 ± 2134	< 96	< 147	< 2278	1022 ± 425	1600 ± 192
	09/17/14	15520 ± 1791	< 77	< 96	2456 ± 1409	1151 ± 410	1316 ± 127
	MEAN	13907 ± 2850	-	176 ± 0	2456 ± 0	1100 ± 138	1298 ± 624

TABLE C-11 **TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER**
SUSQUEHANNA STEAM ELECTRIC STATION, 2014

Results in pCi/liter ± 2S

SITE	COLLECTION PERIOD	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
6S6	01/03/14 - 01/28/14	< 143	< 10	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 8	< 1	< 1	< 13	< 4	< 2
	01/28/14 - 03/04/14	< 146	< 22	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 12	< 1	< 1	< 18	< 6	< 3
	03/04/14 - 04/01/14	< 130	< 40	< 2	< 2	< 7	< 2	< 5	< 2	< 5	< 15	< 2	< 2	< 23	< 7	< 4
	03/18/14 - 04/01/14	< 132	< 41	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 18	< 5	< 4
	04/01/14 - 04/29/14	< 130	< 30	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 12	< 2	< 2	< 19	< 7	< 3
	04/08/14 - 04/29/14	< 129	90 ± 28	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 10	< 2	< 2	< 17	< 6	< 4
	04/29/14 - 06/03/14	< 149	< 7	< 1	< 1	< 2	< 1	< 1	< 1	< 2	< 6	< 1	< 1	< 9	< 3	< 2
	05/06/14 - 06/03/14	< 144	< 18	< 2	< 2	< 6	< 2	< 3	< 2	< 4	< 10	< 1	< 2	< 16	< 6	< 3
	06/03/14 - 07/01/14	< 123	< 34	< 2	< 2	< 7	< 2	< 4	< 2	< 4	< 13	< 2	< 2	< 23	< 8	< 4
	06/10/14 - 07/01/14	< 129	< 32	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 17	< 7	< 3
	07/01/14 - 07/29/14	< 146	< 26	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 10	< 1	< 1	< 15	< 5	< 2
	07/08/14 - 07/08/14	< 147	< 22	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 15	< 1	< 1	< 19	< 5	< 2
	07/29/14 - 09/02/14	< 137	< 8	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 3	< 1	< 1	< 21	< 5	< 2
	09/02/14 - 09/30/14	< 128	< 48	< 2	< 2	< 8	< 2	< 5	< 2	< 4	< 12	< 2	< 2	< 23	< 7	< 3
	09/30/14 - 10/14/14	< 148	< 18	< 1	< 1	< 2	< 1	< 1	< 1	< 1	< 9	< 1	< 1	< 11	< 3	4 ± 3
	11/04/14 - 12/02/14	< 139	< 20	< 1	< 1	< 2	< 1	< 1	< 1	< 2	< 5	< 1	< 1	< 9	< 3	< 2
	12/02/14 - 12/29/14	< 123	< 13	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 9	< 1	< 1	< 15	< 5	< 3
	AVERAGE	-	90 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	4 ± 0
2S7	12/31/13 - 01/28/14	3040 ± 289	< 12	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 10	< 1	< 1	< 16	< 5	< 3
	01/28/14 - 03/04/14	1740 ± 181	< 31	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 13	< 2	< 2	< 20	< 6	5 ± 3
	03/04/14 - 03/11/14	< 135	< 28	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 13	< 1	< 1	< 15	< 4	< 2
	03/18/14 - 04/01/14	2900 ± 272	< 15	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 6	< 2	< 2	< 12	< 4	< 3
	04/08/14 - 04/29/14	433 ± 99	< 33	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 8	< 1	< 2	< 15	< 4	< 3
	05/06/14 - 06/03/14	11500 ± 952	< 15	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 13	< 2	< 2	< 21	< 5	< 4
	05/22/14 - 05/27/14	2860 ± 268	< 58	< 3	< 3	< 9	< 4	< 7	< 3	< 5	< 12	< 3	< 3	< 24	< 9	< 6
	06/10/14 - 07/01/14	491 ± 99	< 45	< 2	< 2	< 6	< 2	< 3	< 2	< 4	< 10	< 2	< 2	< 18	< 6	< 3
	07/07/14 - 07/29/14	1150 ± 146	< 22	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 8	< 1	< 1	< 12	< 4	< 2
	07/08/14 - 07/08/14	354 ± 108	< 17	< 1	< 1	< 3	< 1	< 1	< 1	< 2	< 13	< 1	< 1	< 16	< 4	< 1
	07/29/14 - 09/02/14	2020 ± 198	< 13	< 1	< 1	< 2	< 1	< 1	< 1	< 1	< 11	< 1	< 1	< 12	< 4	< 1
	09/02/14 - 09/30/14	2630 ± 306	< 17	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 11	< 1	< 2	< 17	< 6	< 3
	09/30/14 - 10/27/14	461 ± 115	< 47	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 22	< 6	< 4
	10/27/14 - 12/02/14	2600 ± 247	44 ± 26	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 11	< 1	< 1	< 15	< 4	< 2
	12/02/14 - 12/29/14	7880 ± 662	< 13	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 10	< 1	< 2	< 17	< 5	< 3
	AVERAGE	2861 ± 6286	44 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	5 ± 0

TABLE C-11 **TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER**
SUSQUEHANNA STEAM ELECTRIC STATION, 2014

Results in pCi/liter ± 2S

SITE	COLLECTION PERIOD	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
6S5	01/07/14 - 01/28/14	< 140	< 16	< 2	< 2	< 6	< 2	< 4	< 2	< 3	< 10	< 2	< 2	< 17	< 5	< 3
	02/04/14 - 03/04/14	< 147	< 31	< 2	< 2	< 6	< 2	< 3	< 2	< 4	< 11	< 2	< 2	< 18	< 6	< 3
	03/11/14 - 04/01/14	< 133	< 14	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 8	< 2	< 2	< 15	< 5	< 4
	04/08/14 - 04/29/14	< 130	42 ± 27	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 19	< 6	< 4
	05/06/14 - 06/03/14	< 144	< 16	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 18	< 6	< 3
	06/10/14 - 07/01/14	< 126	< 34	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 20	< 7	< 4
	07/08/14 - 07/29/14	< 147	< 8	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 8	< 1	< 1	< 12	< 4	< 2
	08/05/14 - 09/02/14	193 ± 95	< 18	< 1	< 1	< 2	< 1	< 1	< 1	< 1	< 9	< 1	< 1	< 11	< 3	< 2
	09/09/14 - 09/30/14	< 126	< 37	< 2	< 2	< 6	< 2	< 3	< 2	< 3	< 9	< 2	< 2	< 16	< 6	< 4
	10/07/14 - 10/27/14	< 145	< 29	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 17	< 6	< 3
	11/04/14 - 12/02/14	168 ± 86	42 ± 25	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 7	< 1	< 1	< 10	< 3	< 2
	12/09/14 - 12/29/14	< 145	< 32	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 8	< 2	< 2	< 15	< 5	< 3
	AVERAGE	181 ± 35	42 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-
4S7	02/03/14 - 02/03/14	< 142	< 20	< 2	< 3	< 7	< 2	< 4	< 3	< 4	< 9	< 2	< 2	< 19	< 6	< 4
	05/05/14 - 05/05/14	167 ± 98	< 98	< 5	< 6	< 17	< 5	< 9	< 6	< 9	< 13	< 6	< 5	< 33	< 8	< 10
	08/21/14 - 08/21/14	< 125	< 135	< 4	< 6	< 14	< 5	< 13	< 5	< 8	< 10	< 6	< 8	< 31	< 6	< 14
	11/24/14 - 11/24/14	< 133	< 65	< 6	< 6	< 17	< 6	< 11	< 6	< 11	< 13	< 5	< 6	< 31	< 10	< 13
	AVERAGE	167 ± 0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LTAW	02/03/14 - 02/03/14	< 142	< 27	< 1	< 1	< 4	< 2	< 3	< 1	< 2	< 4	< 1	< 1	< 8	< 3	< 3
	05/05/14 - 05/05/14	< 146	< 115	< 6	< 6	< 17	< 7	< 10	< 7	< 10	< 12	< 6	< 7	< 35	< 9	< 12
	08/21/14 - 08/21/14	< 131	< 47	< 5	< 5	< 19	< 4	< 13	< 5	< 11	< 11	< 6	< 5	< 29	< 5	< 12
	11/24/14 - 11/24/14	< 130	< 66	< 6	< 7	< 18	< 7	< 14	< 8	< 14	< 14	< 7	< 7	< 39	< 12	< 12
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5S12	02/03/14 - 02/03/14	< 139	< 30	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 6	< 1	< 2	< 12	< 3	< 3
	05/05/14 - 05/05/14	< 148	< 147	< 4	< 6	< 18	< 7	< 12	< 6	< 11	< 11	< 6	< 8	< 30	< 9	< 13
	08/21/14 - 08/21/14	< 128	< 174	< 7	< 7	< 14	< 8	< 14	< 7	< 10	< 12	< 5	< 7	< 40	< 9	< 13
	11/24/14 - 11/24/14	< 132	< 95	< 4	< 7	< 14	< 6	< 9	< 6	< 10	< 11	< 6	< 7	< 26	< 7	< 10
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-11 **TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER**
SUSQUEHANNA STEAM ELECTRIC STATION, 2014

Results in pCi/liter ± 2S

SITE	COLLECTION PERIOD	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
5S9	10/21/14 - 10/21/14	< 147	< 24	< 2	< 3	< 6	< 2	< 5	< 3	< 5	< 8	< 3	< 3	< 17	< 5	< 5
	11/04/14 - 11/04/14	< 131	< 7	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 6	< 1	< 1	< 19	< 6	< 1
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7S12	02/03/14 - 02/03/14	< 142	< 16	< 2	< 2	< 5	< 1	< 4	< 2	< 3	< 6	< 2	< 2	< 13	< 4	< 3
	05/05/14 - 05/05/14	< 147	< 100	< 5	< 5	< 14	< 6	< 12	< 4	< 10	< 12	< 5	< 6	< 27	< 8	< 11
	08/21/14 - 08/21/14	< 131	< 148	< 6	< 6	< 18	< 5	< 15	< 9	< 13	< 11	< 6	< 6	< 29	< 12	< 12
	11/24/14 - 11/24/14	< 128	< 37	< 4	< 5	< 12	< 4	< 10	< 5	< 8	< 11	< 5	< 5	< 28	< 7	< 10
	AVERAGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-12 **GAMMA SPECTROSCOPIC ANALYSIS OF FISH**
SUSQUEHANNA STEAM ELECTRIC STATION

Results in pCi/kg (wet) ± 2 sigma

SITE	COLLECTION PERIOD	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
2H									
smallmouth bass	04/28/14	4880 ± 1168	< 73	< 90	< 235	< 73	< 161	< 74	< 75
channel catfish	04/28/14	3521 ± 935	< 56	< 57	< 155	< 60	< 140	< 49	< 49
shorthead redhorse	04/28/14	3789 ± 1042	< 100	< 104	< 253	< 81	< 179	< 97	< 92
smallmouth bass	10/01/14	3793 ± 1022	< 63	< 85	< 241	< 61	< 151	< 67	< 62
channel catfish	10/01/14	2636 ± 975	< 64	< 69	< 225	< 65	< 135	< 56	< 58
shorthead redhorse	10/01/14	4888 ± 1302	< 50	< 77	< 123	< 73	< 103	< 58	< 46
shorthead redhorse	10/01/14	5083 ± 1096	< 73	< 73	< 187	< 72	< 139	< 59	< 67
	AVERAGE	4084 ± 1801	-	-	-	-	-	-	-
IND									
smallmouth bass	04/24/14	4359 ± 1005	< 73	< 71	< 228	< 70	< 125	< 67	< 60
channel catfish	04/24/14	3897 ± 950	< 57	< 60	< 177	< 66	< 143	< 57	< 48
shorthead redhorse	04/24/14	4671 ± 1128	< 65	< 71	< 255	< 43	< 131	< 74	< 60
smallmouth bass	09/29/14	3914 ± 1108	< 67	< 67	< 245	< 62	< 133	< 61	< 61
channel catfish	09/29/14	3103 ± 1315	< 68	< 73	< 236	< 85	< 200	< 86	< 97
shorthead redhorse	09/29/14	6178 ± 1449	< 65	< 67	< 243	< 49	< 120	< 49	< 56
shorthead redhorse	09/29/14	4070 ± 1122	< 78	< 90	< 257	< 75	< 174	< 74	< 100
	AVERAGE	4313 ± 1909	-	-	-	-	-	-	-
LTAW									
largemouth bass	10/02/14	3287 ± 1309	< 47	< 65	< 212	< 56	< 104	< 40	< 49
	AVERAGE	3287 ± 0	-	-	-	-	-	-	-

TABLE C-13 **GAMMA SPECTROSCOPIC ANALYSES OF SHORELINE SEDIMENT SUSQUEHANNA STEAM ELECTRIC STATION**

Results in pCi/kg (dry) ± 2 sigma

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ra-226	Ac-228	Th-228
2B	05/31/14	16860 ± 1581	< 66	< 90	2524 ± 1311	1423 ± 328	1536 ± 140
	05/31/14	16790 ± 1789	< 81	< 101	< 1785	1419 ± 580	1858 ± 249
	10/27/14	13970 ± 1241	< 62	< 77	1915 ± 1270	943 ± 311	1221 ± 108
	AVERAGE	15873 ± 3297	-	-	2220 ± 861	1262 ± 552	1538 ± 637
7B	05/31/14	10770 ± 1216	< 55	< 66	< 1283	1062 ± 245	1122 ± 143
	10/27/14	14120 ± 959	< 46	< 59	2378 ± 1244	1223 ± 242	1628 ± 126
	AVERAGE	12445 ± 4738	-	-	2378 ± 0	1143 ± 228	1375 ± 716
12F	05/31/14	13560 ± 1403	< 60	< 77	< 1452	1215 ± 337	1297 ± 122
	10/27/14	10620 ± 979	< 39	< 43	1677 ± 982	1021 ± 220	1027 ± 80
	AVERAGE	12090 ± 4158	-	-	1677 ± 0	1118 ± 274	1162 ± 382

FIGURE C-1 - GROSS BETA ACTIVITY (E-03 pCi/m^3) IN AIR PARTICULATES

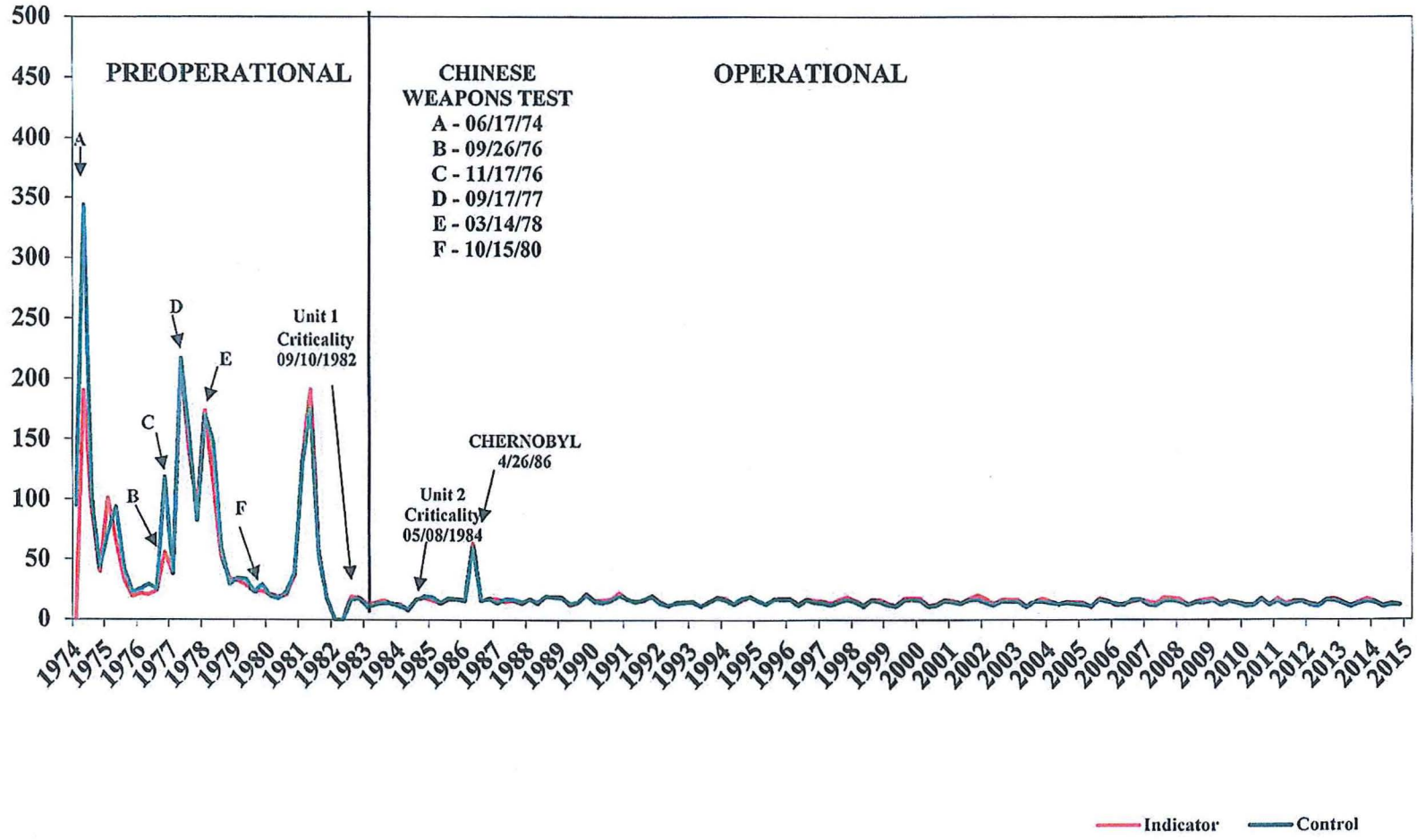


FIGURE C-2 - AMBIENT RADIATION LEVELS BASED ON ENVIRONMENTAL DOSIMETRY DATA

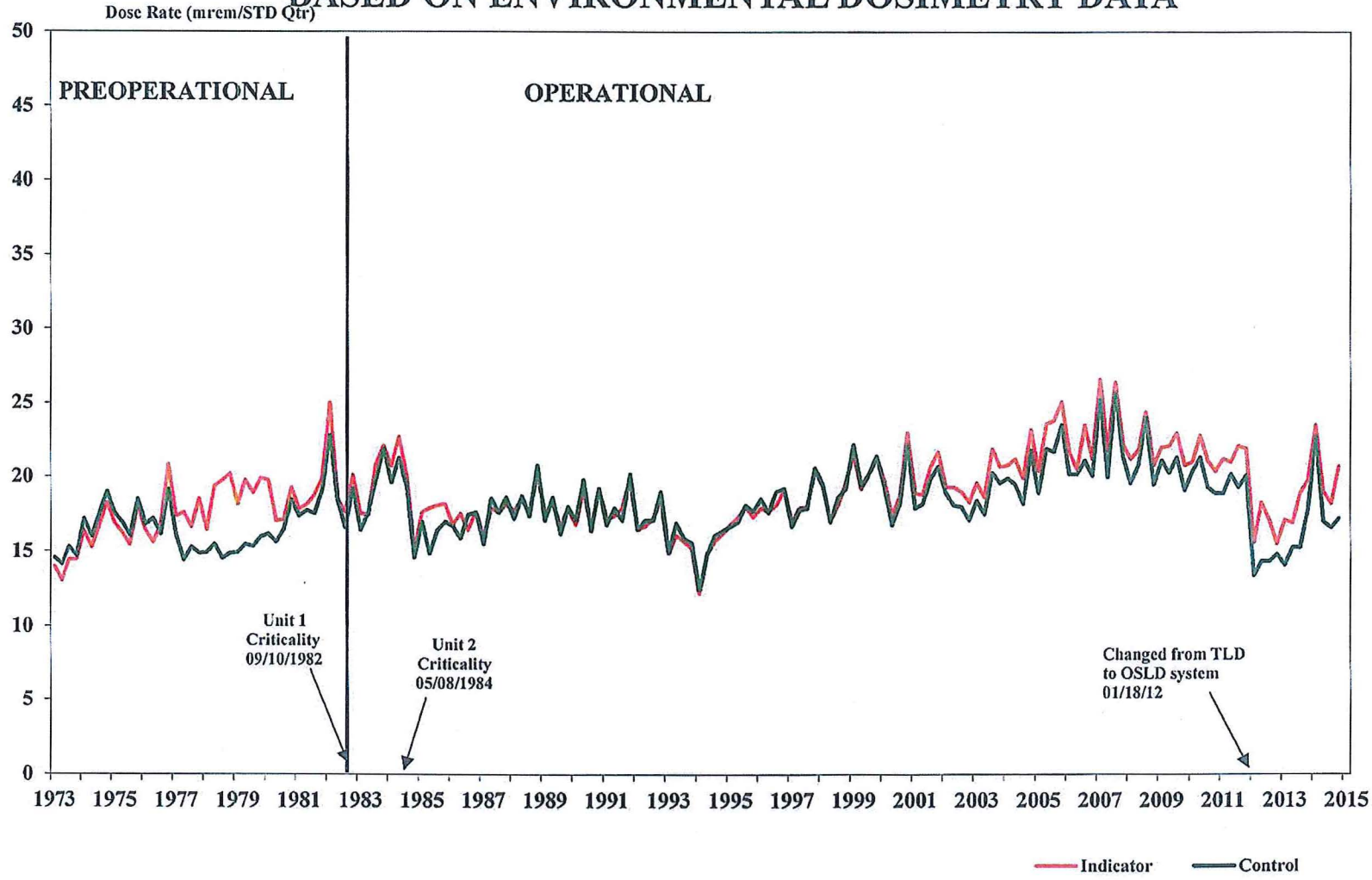


FIGURE C-3 - IODINE-131 ACTIVITY IN MILK

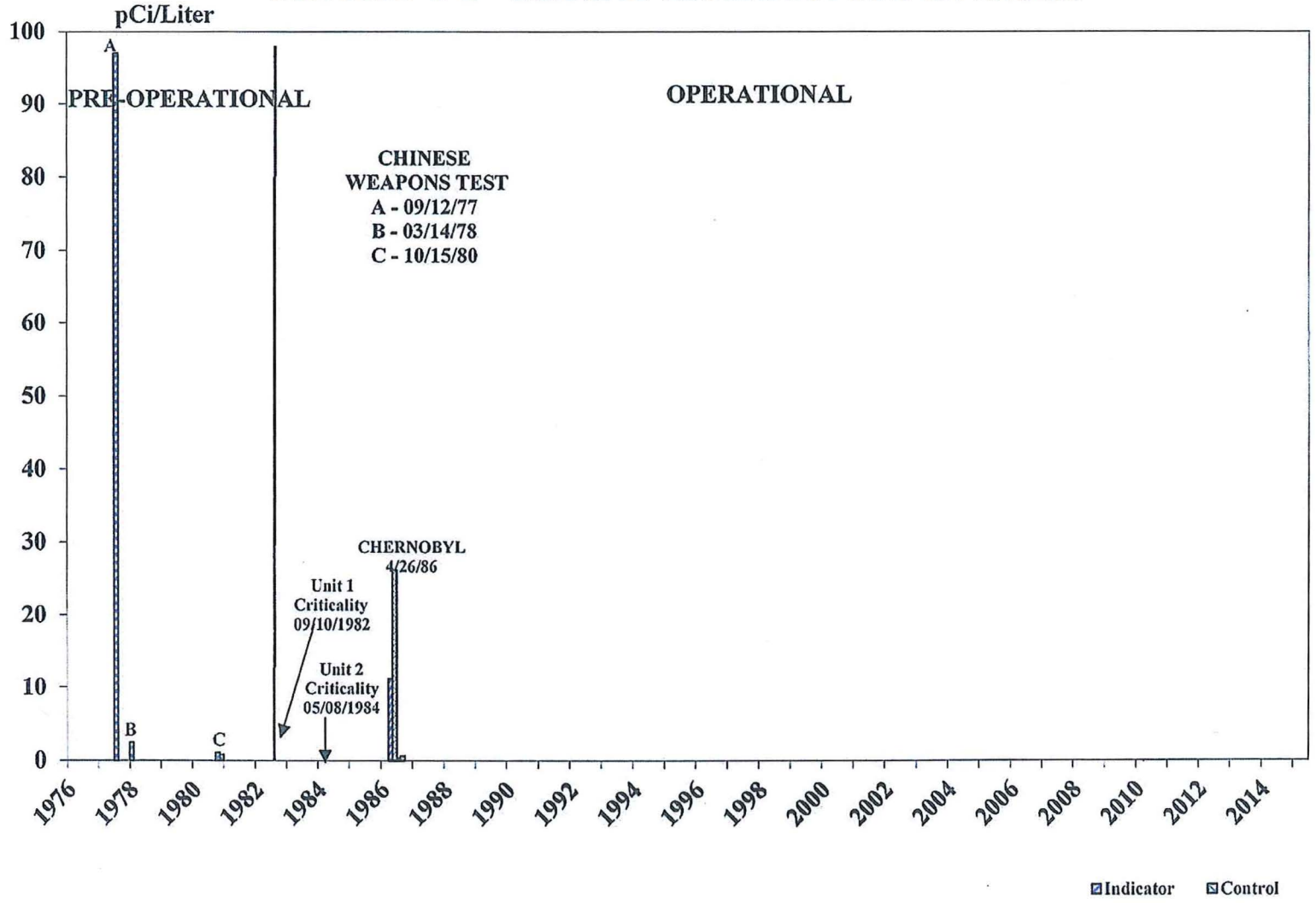


FIGURE C-4 - ANNUAL AVERAGE TRITIUM ACTIVITY (pCi/l) IN PRECIPITATION, PERIMETER DRAIN, SURFACE WATER VERSUS GROUND WATER

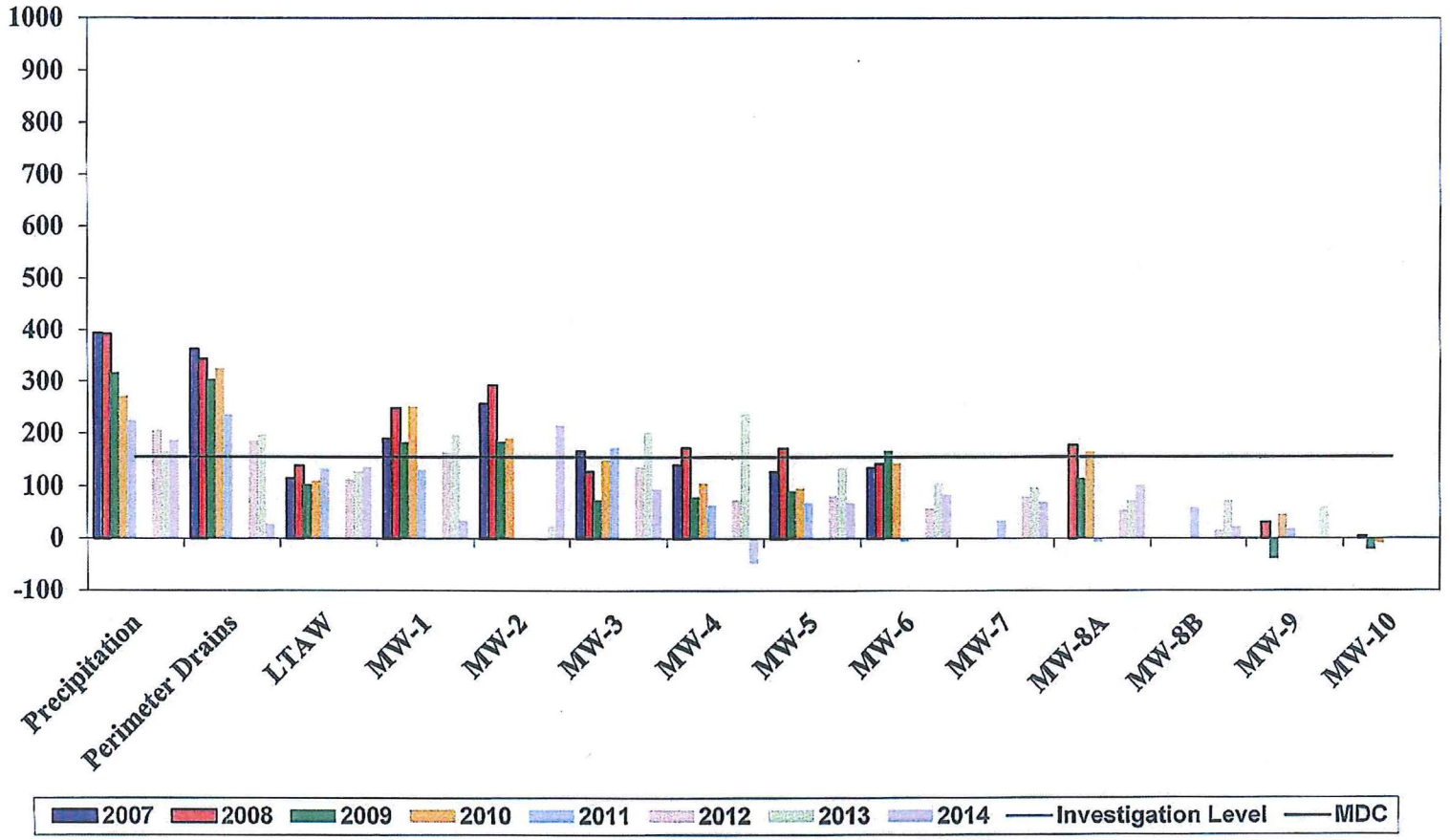
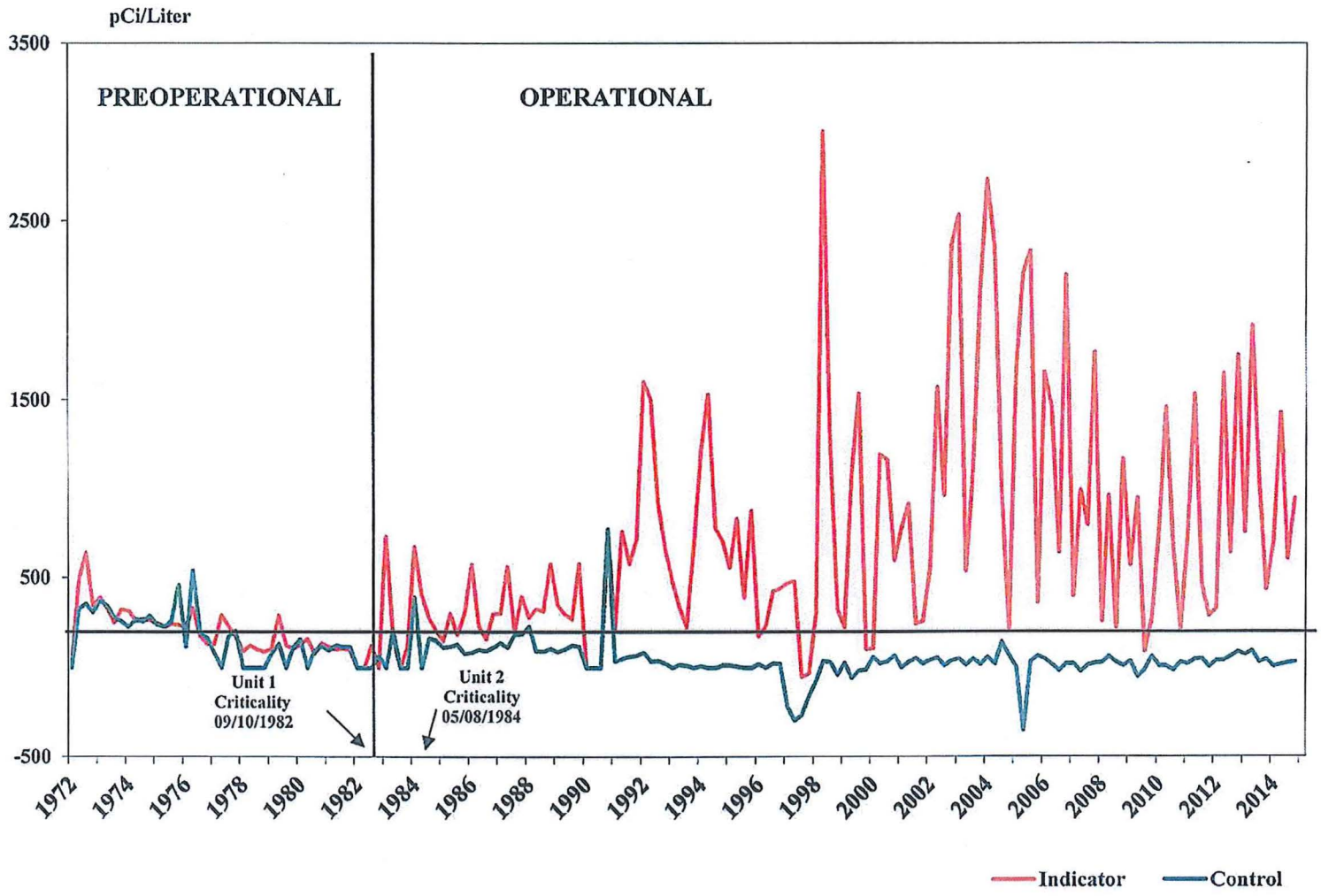


FIGURE C-6 - TRITIUM ACTIVITY IN SURFACE WATER



APPENDIX D

SUMMARY OF RESULTS FROM ANALYTICS, ENVIRONMENTAL RESOURCE ASSOCIATES (ERA), DEPARTMENT OF ENERGY (DOE) – MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP), AND PPL REMP LABORATORY QUALITY CONTROL SPIKE PROGRAM

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TABLE D-1
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2014	E10854	Milk	Sr-89	pCi/L	95.1	91.7	1.04	A
			Sr-90	pCi/L	10.9	15.1	0.72	W
	E10855	Milk	I-131	pCi/L	96.6	98.5	0.98	A
			Ce-141	pCi/L	112	119	0.94	A
			Cr-51	pCi/L	449	491	0.91	A
			Cs-134	pCi/L	186	210	0.89	A
			Cs-137	pCi/L	250	253	0.99	A
			Co-58	pCi/L	248	268	0.93	A
			Mn-54	pCi/L	292	297	0.98	A
			Fe-59	pCi/L	230	219	1.05	A
			Zn-65	pCi/L	312	323	0.97	A
			Co-60	pCi/L	321	337	0.95	A
	E10857	AP	Ce-141	pCi	53.0	53.9	0.98	A
			Cr-51	pCi	232	223	1.04	A
			Cs-134	pCi	100	95.3	1.05	A
			Cs-137	pCi	122	115	1.06	A
			Co-58	pCi	122	121	1.01	A
			Mn-54	pCi	135	135	1.00	A
			Fe-59	pCi	111	99.3	1.12	A
			Zn-65	pCi	140	147	0.95	A
			Co-60	pCi	187	153	1.22	W
	E10856	Charcoal	I-131	pCi	74.1	76.4	0.97	A
	E10858	Water	Fe-55	pCi/L	2090	1760	1.19	A
June 2014	E10913	Milk	Sr-89	pCi/L	85.9	91.3	0.94	A
			Sr-90	pCi/L	13.8	14.5	0.95	A
	E10914	Milk	I-131	pCi/L	86.5	90.9	0.95	A
			Ce-141	pCi/L	111	124	0.90	A
			Cr-51	pCi/L	255	253	1.01	A
			Cs-134	pCi/L	147	162	0.91	A
			Cs-137	pCi/L	123	120	1.03	A
			Co-58	pCi/L	105	112	0.94	A
			Mn-54	pCi/L	155	156	0.99	A
			Fe-59	pCi/L	106	102	1.04	A
			Zn-65	pCi/L	251	252	1.00	A
			Co-60	pCi/L	218	224	0.97	A
	E10916	AP	Ce-141	pCi	95.1	92.6	1.03	A
			Cr-51	pCi	215	190	1.13	A
			Cs-134	pCi	122	122	1.00	A
			Cs-137	pCi	95.1	89.8	1.06	A
			Co-58	pCi	88.7	84.1	1.05	A
			Mn-54	pCi	115	116	0.99	A
			Fe-59	pCi	72.6	76.7	0.95	A
			Zn-65	pCi	193	189	1.02	A
			Co-60	pCi	179	168	1.07	A
	E10915	Charcoal	I-131	pCi	85.6	85.2	1.00	A

TABLE D-1
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2014	E10917	Water	Fe-55	pCi/L	1680	1810	0.93	A
September 2014	E10946	Milk	Sr-89	pCi/L	90.7	96.9	0.94	A
			Sr-90	pCi/L	14.0	16.4	0.85	A
	E10947	Milk	I-131	pCi/L	92.0	97.6	0.94	A
			Ce-141	pCi/L	117	126	0.93	A
			Cr-51	pCi/L	281	288	0.98	A
			Cs-134	pCi/L	141	158	0.89	A
			Cs-137	pCi/L	186	193	0.96	A
			Co-58	pCi/L	137	143	0.96	A
			Mn-54	pCi/L	138	142	0.97	A
			Fe-59	pCi/L	162	158	1.03	A
			Zn-65	pCi/L	75.2	73.0	1.03	A
			Co-60	pCi/L	286	297	0.96	A
	E10949	AP	Ce-141	pCi	97.8	82.1	1.19	A
			Cr-51	pCi	212	188	1.13	A
			Cs-134	pCi	106	103	1.03	A
			Cs-137	pCi	131	126	1.04	A
			Co-58	pCi	85.7	93.0	0.92	A
			Mn-54	pCi	92.8	92.3	1.01	A
			Fe-59	pCi	113	103	1.10	A
			Zn-65	pCi	53.2	47.5	1.12	A
			Co-60	pCi	202	193	1.05	A
	E10948	Charcoal	I-131	pCi	83.9	89.8	0.93	A
	E10950	Water	Fe-55	pCi/L	2010	1720	1.17	A
	E10951	Soil	Ce-141	pCi/g	0.208	0.186	1.12	A
			Cr-51	pCi/g	0.398	0.425	0.94	A
			Cs-134	pCi/g	0.216	0.233	0.93	A
			Cs-137	pCi/g	0.398	0.365	1.09	A
			Co-58	pCi/g	0.197	0.211	0.93	A
			Mn-54	pCi/g	0.242	0.209	1.16	A
			Fe-59	pCi/g	0.238	0.233	1.02	A
			Zn-65	pCi/g	0.117	0.108	1.08	A
			Co-60	pCi/g	0.447	0.438	1.02	A
December 2014	E11078	Milk	Sr-89	pCi/L	85.7	95.7	0.90	A
			Sr-90	pCi/L	12.9	15.6	0.83	A
	E11079	Milk	I-131	pCi/L	85.9	95.1	0.90	A
			Ce-141	pCi/L	205	219	0.94	A
			Cr-51	pCi/L	402	406	0.99	A
			Cs-134	pCi/L	156	164	0.95	A
			Cs-137	pCi/L	194	198	0.98	A
			Co-58	pCi/L	122	130	0.94	A
			Mn-54	pCi/L	220	225	0.98	A
			Fe-59	pCi/L	183	175	1.05	A
			Zn-65	pCi/L	287	297	0.97	A
			Co-60	pCi/L	224	235	0.95	A

TABLE D-1
ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2014	E11081	AP	Ce-141	pCi	96.4	102	0.95	A
			Cr-51	pCi	171	190	0.90	A
			Cs-134	pCi	73.1	76.9	0.95	A
			Cs-137	pCi	99.0	92.6	1.07	A
			Co-58	pCi	57.5	60.8	0.95	A
			Mn-54	pCi	107	105	1.02	A
			Fe-59	pCi	74.2	81.6	0.91	A
			Zn-65	pCi	144	139	1.04	A
			Co-60	pCi	114	110	1.04	A
	E11080	Charcoal	I-131	pCi	93.5	98.2	0.95	A
	E11082	Water	Fe-55	pCi/L	1760	1970	0.89	A

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) 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
ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2014	RAD-97	Water	Sr-89	pCi/L	38.25	36.7	27.5 - 43.6	A
			Sr-90	pCi/L	24.65	26.5	19.2 - 30.9	A
			Ba-133	pCi/L	89.1	87.9	74.0 - 96.7	A
			Cs-134	pCi/L	45.55	44.3	35.5 - 48.7	A
			Cs-137	pCi/L	91.15	89.1	80.2 - 101	A
			Co-60	pCi/L	65.10	64.2	57.8 - 73.1	A
			Zn-65	pCi/L	244	235	212 - 275	A
			Gr-A	pCi/L	45.65	61.0	31.9 - 75.8	A
			Gr-B	pCi/L	27.95	33.0	21.4 - 40.7	A
			I-131	pCi/L	23.75	25.7	21.3 - 30.3	A
			U-Nat	pCi/L	9.61	10.2	7.95 - 11.8	A
			H-3	pCi/L	8435	8770	7610 - 9650	A
	MRAD-20	Filter	Gr-A	pCi/filter	28.0	46.0	15.4 - 71.4	A
November 2014	RAD-99	Water	Sr-89	pCi/L	30.4	31.4	22.8 - 38.1	A
			Sr-90	pCi/L	18.6	21.8	15.6 - 25.7	A
			Ba-133	pCi/L	46.8	49.1	40.3 - 54.5	A
			Cs-134	pCi/L	88.0	89.8	73.7 - 98.8	A
			Cs-137	pCi/L	99.0	98.8	88.9 - 111	A
			Co-60	pCi/L	92.5	92.1	82.9 - 104	A
			Zn-65	pCi/L	325	310	279 - 362	A
			Gr-A	pCi/L	29.9	37.6	19.4 - 48.1	A
			Gr-B	pCi/L	27.5	27.4	17.3 - 35.3	A
			I-131	pCi/L	15.8	20.3	16.8 - 24.4	N (1)
			U-Nat	pCi/L	5.74	5.80	4.34 - 6.96	A
			H-3	pCi/L	6255	6880	5940 - 7570	A
	MRAD-21	Filter	Gr-A	pCi/filter	27.3	36.9	12.4 - 57.3	A

*(1) The **Iodine-131** was evaluated as failed with a ratio of 0.778. No cause could be found for the slighly low activity. TBE would evaluate this as acceptable with warning. A rerun was not possible due to I-131 decay. All previous ERA Iodine-131 evaluations since 2004 have been acceptable. NCR 14-08*

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

TABLE D-3
DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2014	14-MaW30	Water	Am-241	Bq/L	0.764	0.720	0.504 - 0.936	A
			Cs-134	Bq/L	20.7	23.1	16.2 - 30 0	A
			Cs-137	Bq/L	28.0	28.9	20.2 - 37.6	A
			Co-57	Bq/L	26.5	27.5	19.3 - 35.8	A
			Co-60	Bq/L	15.6	16.0	11.2 - 20.8	A
			H-3**	Bq/L	NR	321	225 - 417	N (3)
			Mn-54	Bq/L	13.5	13.9	9.7 - 18.1	A
			Ni-63	Bq/L	NR	34.0	23.8 - 44.2	N (3)
			Pu-238	Bq/L	0.911	0.828	0.580 - 1.076	
			Pu-239/240	Bq/L	0.751	0.676	0.473 - 0.879	
			K-40	Bq/L	NR		(1)	N (3)
			Sr-90**	Bq/L	NR	8.51	5.96 - 11.06	N (3)
			U-234/233**	Bq/L	NR	0.225	0.158 - 0.293	N (3)
			U-238**	Bq/L	NR	1.45	1.02 - 1.89	N (3)
			Zn-65	Bq/L	-0.201		(1)	A
	14-MaS30	Soil	Cs-134	Bq/kg	2.02		(1)	A
			Cs-137	Bq/kg	1300	1238	867 - 1609	A
			Co-57	Bq/kg	1069	966	676 - 1256	A
			Co-60	Bq/kg	1.32	1.22	(2)	A
			Mn-54	Bq/kg	1510	1430	1001 - 1859	A
			K-40	Bq/kg	669	622	435 - 809	A
			Sr-90	Bq/kg	4.14		(1)	A
			Zn-65	Bq/kg	763	695	487 - 904	A
	14-RdF30	AP	Cs-134**	Bq/sample	NR	1.91	1.34 - 2.48	N (3)
			Cs-137**	Bq/sample	NR	1.76	1.23 - 2.29	N (3)
			Co-57**	Bq/sample	NR		(1)	N (3)
			Co-60**	Bq/sample	NR	1.39	0.97 - 1.81	N (3)
			Mn-54**	Bq/sample	NR		(1)	N (3)
			Sr-90	Bq/sample	0.8220	1.18	0.83 - 1.53	N (3)
			Zn-65**	Bq/sample	NR		(1)	N (3)
	14-GrF30	AP	Gr-A	Bq/sample	0.606	1.77	0.53 - 3.01	A
			Gr-B	Bq/sample	0.7507	0.77	0.39 - 1.16	A
	14-RdV30	Vegetation	Cs-134	Bq/sample	5.96	6.04	4.23 - 7.85	A
			Cs-137	Bq/sample	5.06	4.74	3.32 - 6.16	A
			Co-57	Bq/sample	11.8	10.1	7.1 - 13.1	A
			Co-60	Bq/sample	7.34	6.93	4.85 - 9.01	A
			Mn-54	Bq/sample	8.95	8.62	6.03 - 11.21	A
			Sr-90	Bq/sample	1.23	1.46	1.02 - 1.90	A
			Zn-65	Bq/sample	8.91	7.86	5.50 - 10.22	A

TABLE D-3
DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2014	14-MaW31	Water	Am-241	Bq/L	0.705	0.88	0.62 - 1.14	A
			Cs-134***	Bq/L	NR		(1)	N (4)
			Cs-137***	Bq/L	NR	18.4	12.9 - 23.9	N (4)
			Co-57***	Bq/L	NR	24.7	17.3 - 32.1	N (4)
			Co-60***	Bq/L	NR	12.4	8.7 - 16.1	N (4)
			Mn-54***	Bq/L	NR	14.0	9.8 - 18.2	N (4)
			Ni-63	Bq/L	24.07	24.6	17.2 - 32.0	A
			Pu-238	Bq/L	0.591	0.618	0.433 - 0.803	A
			Pu-239/240	Bq/L	0.0153	0.0048	(2)	A
			K-40***	Bq/L	NR	161	113 - 209	N (4)
			Zn-65***	Bq/L	NR	10.9	7.6 - 14.2	N (4)
	14-MaS31	Soil	Cs-134***	Bq/kg	NR	622	435 - 809	N (4)
			Cs-137***	Bq/kg	NR		(1)	N (4)
			Co-57***	Bq/kg	NR	1116	781 - 1451	N (4)
			Co-60***	Bq/kg	NR	779	545 - 1013	N (4)
			Mn-54***	Bq/kg	NR	1009	706 - 1312	N (4)
			K-40***	Bq/kg	NR	824	577 - 1071	N (4)
			Sr-90	Bq/kg	694	858	601 - 1115	A
			Zn-65***	Bq/kg	NR	541	379 - 703	N (4)
	14-RdF31	AP	Sr-90	Bq/sample	0.310	0.703	0.492 - 0.914	N (4)
	14-GrF31	AP	Gr-A	Bq/sample	0.153	0.53	0.16 - 0.90	N (4)
			Gr-B	Bq/sample	0.977	1.06	0.53 - 1.59	A
September 2014	14-RdV31	Vegetation	Cs-134	Bq/sample	7.31	7.38	5.17 - 9.59	A
			Cs-137	Bq/sample	8.93	8.14	5.70 - 10.58	A
			Co-57	Bq/sample	10.8	9.2	6.4 - 12.0	A
			Co-60	Bq/sample	6.31	6.11	4.28 - 7.94	A
			Mn-54	Bq/sample	7.76	7.10	4.97 - 9.23	A
			Sr-90	Bq/sample	0.738	0.85	0.60 - 1.11	A
			Zn-65	Bq/sample	7.16	6.42	4.49 - 8.35	A

* The MAPEP cross check isotope list has been reduced due to duplication of effort or analysis not being performed for clients.

** Starting 2014, these nuclides will no longer be part of the TBE cross check program due to duplication of effort or analysis not being performed for clients. MAPEP evaluates non-reported analyses as failed if they were reported in the previous series.

*** All future gamma cross check samples for these isotopes will be provided by Analytics.

(1) False positive test.

(2) Sensitivity evaluation.

*(3) **Water, Ni-63** overlooked when reporting, but the result of 32.7 +- 1.69 would have passed the acceptance criteria. NCR 14-04*
***Water**, the non-detected **K-40** was overlooked when reporting, but would have passed the false positive test. NCR 14-04*
***AP, Sr-90** rerun was within the low range of the acceptqance criteria. The original and rerun results were statistically the same. No cause could be identified for the slightly low Sr-90 activity. NCR 14-04*
For non reported (NR) analyses, MAPEP evaluates as failed if they were reported in the previous series. NCR 14-04

*(4) **AP, Sr-90** gravimetric yield was very high at 117%. Could indicate larger than normal amounts of calcium in the AP. A second fuming HNO_3 separation would be required to remove the excess calcium. NCR 14-09*
***AP, Gr-Alpha** was counted on the wrong side. When flipped over and recounted the results were acceptable. NCR 14-09*
For non reported (NR) analyses, MAPEP evaluates as failed if they were reported in the previous series. NCR 14-09

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP 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.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

TABLE D-4
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2014
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio	
September 2014	E11015	Soil	Ce-141	pCi/kg	186 ± 6	221 ± 34	1.19	
			Cr-51	pCi/kg	425 ± 14	587 ± 170	1.38	(1)
			Cs-134	pCi/kg	233 ± 8	218 ± 16	0.94	
			Cs-137	pCi/kg	365 ± 12	382 ± 21	1.05	
			Co-58	pCi/kg	211 ± 7	214 ± 18	1.01	
			Mn-54	pCi/kg	209 ± 7	223 ± 20	1.07	
			Fe-59	pCi/kg	233 ± 8	240 ± 31	1.03	
			Zn-65	pCi/kg	108 ± 4	109 ± 33	1.01	
			Co-60	pCi/kg	438 ± 15	481 ± 17	1.10	
March 2014	E10827	Milk	I-131	pCi/L	94.8 ± 3	93 ± 4	0.98	
			Ce-141	pCi/L	90.6 ± 3	78 ± 10	0.86	
			Cr-51	pCi/L	374 ± 13	332 ± 62	0.89	
			Cs-134	pCi/L	160 ± 5	137 ± 58	0.86	
			Cs-137	pCi/L	193 ± 6	181 ± 9	0.94	
			Co-58	pCi/L	204 ± 7	190 ± 10	0.93	
			Mn-54	pCi/L	227 ± 8	204 ± 10	0.90	
			Fe-59	pCi/L	167 ± 6	166 ± 15	0.99	
			Zn-65	pCi/L	246 ± 8	228 ± 18	0.93	
			Co-60	pCi/L	257 ± 9	233 ± 7	0.91	
June 2014	E10928	Milk	I-131	pCi/L	94.7 ± 3	75.2 ± 2	0.79	(1)
			Ce-141	pCi/L	144 ± 5	126 ± 11	0.88	
			Cr-51	pCi/L	294 ± 10	274 ± 52	0.93	
			Cs-134	pCi/L	188 ± 6	158 ± 7	0.84	
			Cs-137	pCi/L	139 ± 5	142 ± 8	1.02	
			Co-58	pCi/L	130 ± 4	119 ± 8	0.92	
			Mn-54	pCi/L	181 ± 6	179 ± 9	0.99	
			Fe-59	pCi/L	119 ± 4	115 ± 10	0.97	
			Zn-65	pCi/L	293 ± 10	306 ± 20	1.04	
			Co-60	pCi/L	260 ± 9	242 ± 7	0.93	
September 2014	E11010	Milk	I-131	pCi/L	97.1 ± 3	85.6 ± 3	0.88	
			Ce-141	pCi/L	220 ± 7	217 ± 13	0.99	
			Cr-51	pCi/L	504 ± 17	509 ± 90	1.01	
			Cs-134	pCi/L	275 ± 9	252 ± 10	0.92	
			Cs-137	pCi/L	337 ± 11	335 ± 15	0.99	
			Co-58	pCi/L	250 ± 8	236 ± 14	0.94	
			Mn-54	pCi/L	248 ± 8	252 ± 16	1.02	
			Fe-59	pCi/L	276 ± 9	272 ± 19	0.99	
			Zn-65	pCi/L	128 ± 4	121 ± 30	0.95	
			Co-60	pCi/L	519 ± 17	514 ± 13	0.99	

(a) Counting error is two standard deviations.

(1) NCR 15-04 was inititiated to address the failure.

TABLE D-4
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2014
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio	
December 2014	E11099	Milk	I-131	pCi/L	94.9 ± 3	81.2 ± 3	0.86	
			Ce-141	pCi/L	216 ± 7	192 ± 9	0.89	
			Cr-51	pCi/L	399 ± 13	385 ± 48	0.96	
			Cs-134	pCi/L	162 ± 5	141 ± 5	0.87	
			Cs-137	pCi/L	195 ± 6	179 ± 9	0.92	
			Co-58	pCi/L	128 ± 4	116 ± 9	0.91	
			Mn-54	pCi/L	222 ± 7	201 ± 10	0.91	
			Fe-59	pCi/L	172 ± 5	161 ± 13	0.94	
			Zn-65	pCi/L	292 ± 10	273 ± 16	0.93	
			Co-60	pCi/L	231 ± 8	212 ± 7	0.92	
March 2014	E10828	Ap Filter	Ce-141	pCi/L	52.3 ± 2	62 ± 3	1.19	
			Cr-51	pCi/L	216 ± 8	218 ± 769	1.01	
			Cs-134	pCi/L	93 ± 3	89 ± 8	0.96	
			Cs-137	pCi/L	112 ± 4	116 ± 12	1.04	
			Co-58	pCi/L	118 ± 4	116 ± 14	0.98	
			Mn-54	pCi/L	131 ± 5	134 ± 15	1.02	
			Fe-59	pCi/L	97 ± 3	94 ± 18	0.97	
			Zn-65	pCi/L	142 ± 5	135 ± 26	0.95	
			Co-60	pCi/L	149 ± 5	204 ± 11	1.37	(1)
March 2014	E10829	Ap Filter	Ce-141	pCi	55.1 ± 2	63 ± 15	1.14	
			Cr-51	pCi	228 ± 8	232 ± 79	1.02	
			Cs-134	pCi	98 ± 3	100 ± 8	1.02	
			Cs-137	pCi	117 ± 4	122 ± 13	1.04	
			Co-58	pCi	124 ± 4	122 ± 15	0.98	
			Mn-54	pCi	138 ± 5	135 ± 12	0.98	
			Fe-59	pCi	102 ± 4	111 ± 19	1.09	
			Zn-65	pCi	150 ± 5	140 ± 34	0.93	
			Co-60	pCi	157 ± 5	215 ± 11	1.37	(1)
March 2014	E10830	Ap Filter	Ce-141	pCi	54.1 ± 2	68 ± 2	1.26	(1)
			Cr-51	pCi	224 ± 8	249 ± 65	1.11	
			Cs-134	pCi	96 ± 3	95 ± 6	0.99	
			Cs-137	pCi	115 ± 4	118 ± 10	1.03	
			Co-58	pCi	122 ± 4	118 ± 11	0.97	
			Mn-54	pCi	135 ± 5	136 ± 10	1.01	
			Fe-59	pCi	100 ± 3	95 ± 16	0.95	
			Zn-65	pCi	147 ± 5	130 ± 20	0.88	
			Co-60	pCi	154 ± 5	203 ± 9	1.32	(1)

(a) Counting error is two standard deviations.

(1) NCR 15-04 was inititiated to address the failure.

TABLE D-4
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2014
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 3 OF 5)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio
June 2014	E10929	Ap Filter	Ce-141	pCi	88.4 ± 3	99.7 ± 11	1.13
			Cr-51	pCi	181 ± 6	184 ± 59	1.02
			Cs-134	pCi	116 ± 4	121 ± 7	1.04
			Cs-137	pCi	86 ± 3	90 ± 11	1.05
			Co-58	pCi	80 ± 3	86 ± 12	1.08
			Mn-54	pCi	111 ± 4	118 ± 13	1.06
			Fe-59	pCi	73 ± 3	67 ± 13	0.92
			Zn-65	pCi	180 ± 6	189 ± 19	1.05
			Co-60	pCi	160 ± 6	185 ± 9	1.16
June 2014	E10930	Ap Filter	Ce-141	pCi	92.4 ± 3	87 ± 12	0.94
			Cr-51	pCi	189 ± 7	235 ± 71	1.24
			Cs-134	pCi	121 ± 4	121 ± 9	1.00
			Cs-137	pCi	90 ± 3	96 ± 12	1.07
			Co-58	pCi	84 ± 3	81 ± 11	0.96
			Mn-54	pCi	116 ± 4	119 ± 14	1.03
			Fe-59	pCi	76.5 ± 3	80 ± 16	1.05
			Zn-65	pCi	189 ± 7	185 ± 22	0.98
			Co-60	pCi	167 ± 6	183 ± 11	1.10
June 2014	E10931	Ap Filter	Ce-141	pCi	88.6 ± 3	87 ± 11	0.98
			Cr-51	pCi	182 ± 6	180 ± 61	0.99
			Cs-134	pCi	116 ± 4	116 ± 8	1.00
			Cs-137	pCi	85.9 ± 3	83 ± 14	0.97
			Co-58	pCi	80.5 ± 3	75 ± 12	0.93
			Mn-54	pCi	111 ± 4	117 ± 13	1.05
			Fe-59	pCi	73.4 ± 3	77 ± 18	1.05
			Zn-65	pCi	181 ± 6	181 ± 21	1.00
			Co-60	pCi	161 ± 6	174 ± 10	1.08
December 2014	E11100	Ap Filter	Ce-141	pCi	102 ± 4	106 ± 11	1.04
			Cr-51	pCi	189 ± 7	213 ± 57	1.13
			Cs-134	pCi	77 ± 3	83 ± 6	1.08
			Cs-137	pCi	92 ± 3	91 ± 9	0.99
			Co-58	pCi	61 ± 2	65 ± 9	1.07
			Mn-54	pCi	105 ± 4	103 ± 10	0.98
			Fe-59	pCi	82 ± 3	89 ± 15	1.09
			Zn-65	pCi	138 ± 5	133 ± 21	0.96
			Co-60	pCi	110 ± 4	118 ± 8	1.07

(a) Counting error is two standard deviations.

TABLE D-4
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2014
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 4 OF 5)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio
December 2014	E11101	Ap Filter	Ce-141	pCi	105 ± 4	125 ± 12	1.19
			Cr-51	pCi	194 ± 7	201 ± 66	1.04
			Cs-134	pCi	79 ± 3	89 ± 6	1.13
			Cs-137	pCi	95 ± 3	107 ± 10	1.13
			Co-58	pCi	62 ± 2	73 ± 10	1.18
			Mn-54	pCi	108 ± 4	126 ± 11	1.17
			Fe-59	pCi	84 ± 3	88 ± 17	1.05
			Zn-65	pCi	142 ± 5	175 ± 18	1.23
			Co-60	pCi	113 ± 4	132 ± 9	1.17
December 2014	E11102	Ap Filter	Ce-141	pCi	111 ± 4	112 ± 13	1.01
			Cr-51	pCi	205 ± 7	207 ± 76	1.01
			Cs-134	pCi	83 ± 3	86 ± 6	1.04
			Cs-137	pCi	100 ± 4	104 ± 12	1.04
			Co-58	pCi	66 ± 2	61 ± 11	0.92
			Mn-54	pCi	114 ± 4	118 ± 11	1.04
			Fe-59	pCi	88 ± 3	78 ± 17	0.89
			Zn-65	pCi	150 ± 5	164 ± 19	1.09
			Co-60	pCi	119 ± 4	132 ± 8	1.11
March 2014	E10834	Water	H-3	pCi/L	4000 ± 133	3990 ± 351	1.00
June 2014	E10932	Water	H-3	pCi/L	2160 ± 72	2170 ± 207	1.00
September 2014	E11014	Water	H-3	pCi/L	2510 ± 84	2280 ± 221	0.91
December 2014	E11106	Water	H-3	pCi/L	595 ± 20	552 ± 115	0.93
December 2014	E11106	Water	H-3	pCi/L	595 ± 20	497 ± 119	0.84
March 2014	E10831	Charcoal	I-131	pCi	75.2 ± 3	76.3 ± 4	1.01
March 2014	E10832	Charcoal	I-131	pCi	75.6 ± 3	77.3 ± 7	1.02
March 2014	E10833	Charcoal	I-131	pCi	75.3 ± 3	76.8 ± 4	1.02
September 2014	E11011	Charcoal	I-131	pCi	89.8 ± 3	92.7 ± 5	1.03
September 2014	E11012	Charcoal	I-131	pCi	90.1 ± 3	92.6 ± 4	1.03
September 2014	E11013	Charcoal	I-131	pCi	89.8 ± 3	85.8 ± 6	0.96

(a) Counting error is two standard deviations.

TABLE D-4
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2014
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 5 OF 5)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio
December 2014	E11103	Charcoal	I-131	pCi	98.2 ± 3	96.8 ± 4	0.99
December 2014	E11104	Charcoal	I-131	pCi	97.3 ± 3	96.6 ± 10	0.99
December 2014	E11105	Charcoal	I-131	pCi	98.2 ± 3	100 ± 6	1.02

(a) Counting error is two standard deviations.

APPENDIX E

REMP SAMPLE EQUIPMENT OPERABILITY TRENDING

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

Per Cent (%) Operability

SAMPLING MEDIA	SAMPLE LOCATION	DESCRIPTION	2010	2011	2012	2013	2014
Air Particulate & Charcoal	3S2	SSES Backup Met. Tower	99.9	99.3	98.9	99.9	100
	12S1	West Building	99.9	100	99.9	99.9	100
	13S6	Former Laydown Area, West of Confers Lane	100	99.7	99.1	99.9	100
	12E1	Berwick Hospital	100	100	99.9	100.0	100
	6G1	Freeland Substation	100	100	99.9	99.9	100
	8G1	PPL System Facilities Center, Humboldt Industrial Park	99.7	100	99.8	99.9	100
Drinking Water	12H2	Danville Water Company	100	100	100	100.0	100
Surface Water	2S7	Cooling Tower Blowdown Discharge Line	98.0	99.1	98.1	98.1	69*
	6S6	River Water Intake Line	100	95.5	93.4	93.2	93

* Auto-Composite sampler problems, March through June.
New Auto-Composite sampler installed in July.