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SUSQUEHANNA STEAM ELECTRIC STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT
PLA-6720

Docket Nos. 50-387
and 50-388

The Susquehanna Steam Electric Station Annual Radiological Environmental Operating Report is hereby submitted for the calendar year 2010 in accordance with Technical Specification 5.6.2.

Should you have any questions or require additional information, please contact Mr. John J. Petrilla, Acting Manager - Nuclear Regulatory Affairs at (570) 542-3796.

T. S. Rausch

Attachment

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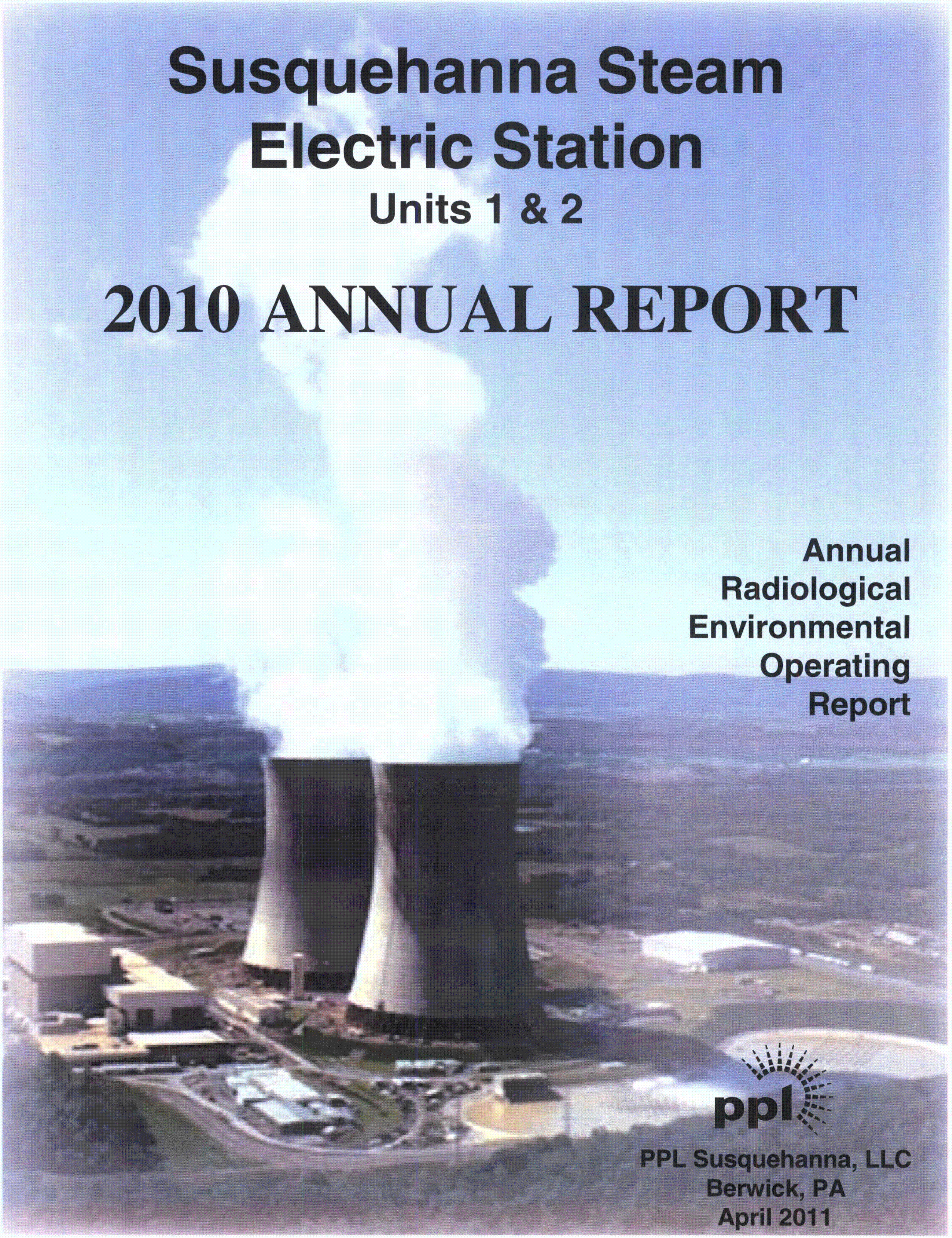
IE25
NRR

Susquehanna Steam Electric Station

Units 1 & 2

2010 ANNUAL REPORT



Annual Radiological Environmental Operating Report

PPL Susquehanna, LLC
Berwick, PA
April 2011

SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

2010

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SUMMARY AND CONCLUSIONS

Radiological Dose Impact

This report on the Radiological Environmental Monitoring Program covers the year 2010.

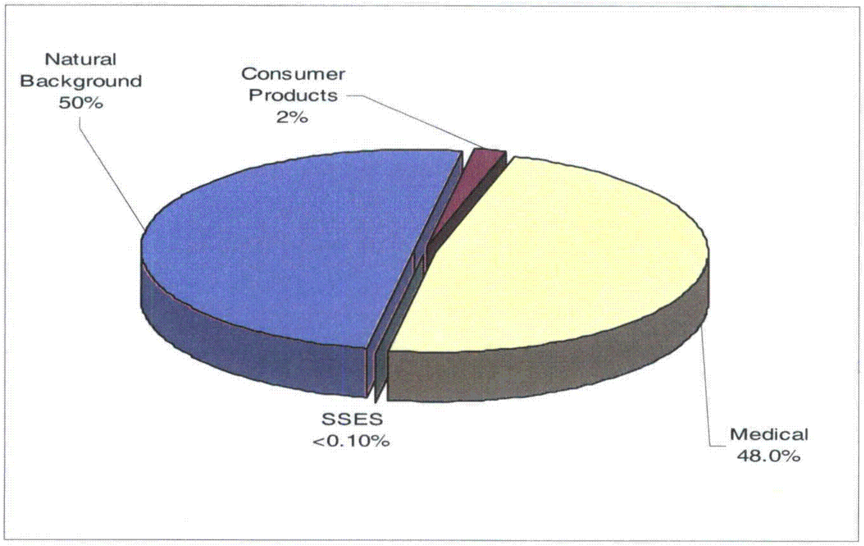
During that period, 1370 analyses were performed on 1081 samples at 49 sampling locations. Additionally, 226 TLD direct radiation measurements were performed at 57 locations around the site.

In assessing all the data gathered and comparing with SSES pre-operational data, it was concluded that the operation of SSES had no adverse radiological impact on the health and safety of the public or the environment.

The total whole body dose from both ingested radionuclides and direct radiation from SSES Operations is negligible compared to the public's exposure from natural background radiation, medical irradiation, and radiation from consumer products is 620 millirem/year.

The following graph compares public dose from SSES operation to that from other sources of radioactivity and radiation.

COMPARISON OF PERCENT OF AVERAGE ANNUAL PUBLIC EFFECTIVE DOSE-EQUIVALENT FROM OTHER SOURCES WITH WHOLE-BODY DOSE FROM THE SSES (NCRP REPORT NO. 160-2009)



Ambient Gamma Radiation

Environmental direct radiation measurements were performed quarterly on and around the SSES site using thermoluminescent dosimeters (TLDs).

The maximum direct radiation dose from SSES operation to a member of the public was approximately 6.99E-01 mrem for all of 2010. This dose represents approximately 2.8% of the 25-mrem whole-body SSES Technical Requirements (TRO 3.11.3) limit for all SSES sources of radioactivity and radiation.

Aquatic Environment

Surface water samples were analyzed for concentrations of tritium, and gamma emitting nuclides. Drinking water samples were analyzed for concentrations of gross beta, tritium and gamma emitting nuclides. Gross beta activities detected in drinking water were consistent with those reported in previous years.

Tritium activity attributable to SSES operation was detected in the aquatic pathway to man. The maximum dose from the ingestion of tritium was estimated at the nearest downriver municipal water supplier via the drinking water pathway and near the outfall of the SSES discharge to the Susquehanna River via the fish pathway. The maximum whole body and organ dose due to tritium identified via REMP samples is approximately 9.77E-04 mrem/year. This dose is less than one-tenth of one percent of the dose guidelines stated in 10 CFR 50, Appendix I.

Fish samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were detected in fish.

Sediment samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of naturally occurring K-40, radium-226, and actinium-thorium-228 were found consistent with those detected in previous years. No fission or activation products were detected in sediment.

Atmospheric Environment

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. Cosmogenic Be-7 was detected at levels consistent with those detected in previous years.

Air iodine samples were analyzed for concentrations of iodine-131. All results were less than the MDC.

Terrestrial Environment

Soil samples were analyzed for concentrations of gamma emitting nuclides. Cesium-137 was observed in 3 of 4 soil samples and attributed to non-SSES sources (residual fallout from atmospheric weapons testing). Concentrations of naturally occurring K-40 were consistent with those detected in previous years.

Concentrations of naturally occurring actinium-thorium-228 and radium-226 were consistent with those of previous years.

Cow milk samples were analyzed for concentrations of iodine-131 as well as other gamma emitting nuclides. All iodine results were less than the MDC. Concentrations of naturally occurring K-40, and thorium-228 were consistent with those detected in previous years. No fission or activation products were detected.

Potatoes, green beans, pumpkins, soybeans and field corn which were irrigated with Susquehanna River water downstream of the SSES were sampled. These food products were sampled during the harvest season and analyzed for concentrations of gamma emitting nuclides. Concentration of naturally occurring K-40 was found consistent with those in previous years.
No fission or activation products were detected.

Ground Water

Ground water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Tritium was observed in 22 of 61 samples above analysis MDC's in 2010. The activity was slightly above MDC. The source of the tritium can be attributed to routine airborne effluent releases from Susquehanna operations due to recapture and washout into precipitation. This tritiated precipitation makes its way into surface water and soil where it eventually seeps into shallow ground water. No fission or activation products were detected.

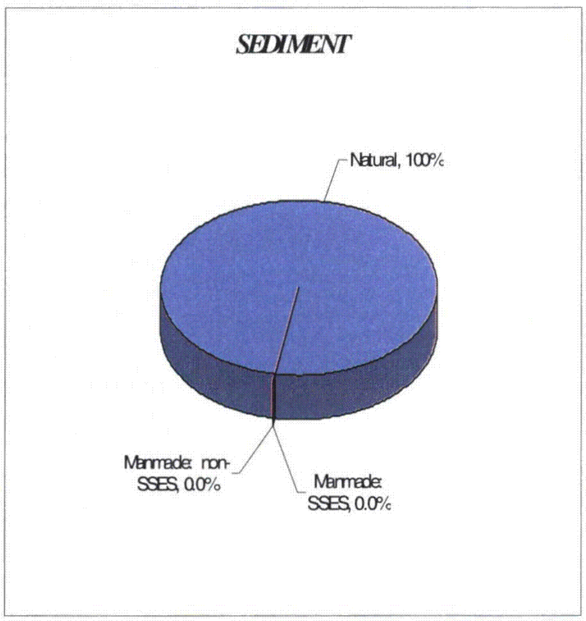
Relative Radionuclide Activity Levels in Selected Media

Some media monitored in the environment are significant for the numbers of gamma-emitting radionuclides routinely measured at levels exceeding analysis MDCs. Sediment in the aquatic pathway and soil in the terrestrial pathway are two such media.

The following graphs show the relative activity contributions for the types of gamma-emitting radionuclides reported at levels above the analysis MDCs in sediment and soil at indicator locations during 2010.

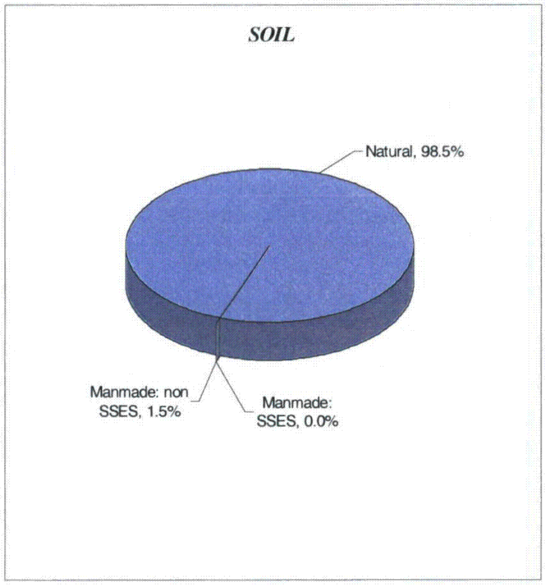
AQUATIC PATHWAY

PERCENT TOTAL GAMMA ACTIVITY



TERRESTRIAL PATHWAY

PERCENT TOTAL GAMMA ACTIVITY



Naturally occurring radionuclides accounted for over 98% of the gamma-emitting activity in both sediment and soil in 2010. Man-made radionuclides of SSES origin accounted for 0.0% of the gamma-emitting activity in sediment and soil during 2010.

Radionuclides Contributing to Dose from SSES Operation

Of the two man-made radionuclides reported in the environment by the SSES REMP (i.e. H-3 and Cs-137), 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 blowdown samples was 9.77E-04 mrem.

Tritium was included in the dose calculation because it was identified in the REMP samples of water being discharged to the river. The concentration of tritium in the water and the volume of water discharged 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. These assumptions are based on the fact that tritium does not emit gamma radiation and the beta radiation emitted by tritium is not sufficiently penetrating to reach an individual on the shore.

INTRODUCTION

Radiological Environmental Monitoring Program (REMP)

The SSES is located on approximately an 1500-acre tract along the Susquehanna River, five miles northeast of Berwick in Salem Township, Luzerne County, Pennsylvania. The area around the site is primarily rural, consisting predominately of forest and agricultural lands. (More specific information on the demography, hydrology, meteorology, and land use characteristics of the area in the vicinity of the SSES can be found in the Environmental Report (Reference 1), the Final Safety Analysis Report (Reference 2), and the Final Environmental Statement (Reference 3) for the SSES.)

The SSES implements the REMP in accordance with Technical Specifications, Technical Requirements Manual and the Offsite Dose Calculation Manual, which are based on the design objectives in 10CFR Part 50 Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

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

Key objectives of the SSES REMP are as follows:

- Document compliance with SSES REMP Technical Requirements radiological environmental surveillances
- Verify proper implementation of SSES radiological effluent controls
- Identify, measure, and evaluate trends of radionuclide concentrations in environmental pathways near SSES
- Assess impact of SSES Effluents on the environment and the public

PPL has maintained a Radiological Environmental Monitoring Program (REMP) in the vicinity of the Susquehanna Steam Electric Station Units 1 and 2 since April, 1972, prior to construction of both units and ten years prior to the initial operation of Unit 1 in September, 1982. The purpose of the preoperational REMP (April, 1972 to September, 1982) was to establish a baseline for radioactivity in the local environment that could be compared with the radioactivity levels observed in various environmental media throughout the operational lifetime of the SSES. This comparison facilitates assessments of the radiological impact of the SSES operation.

Potential Exposure Pathways

The three pathways through which radioactive material may reach the public from nuclear power plants are the atmospheric, terrestrial, and aquatic pathways. (Figure 1 depicts these pathways for the intake of radioactive materials.)

Mechanisms by which people may be exposed to radioactivity and radiation in the environment vary with the pathway. Three mechanisms by which a member of the public has the potential to be exposed to radioactivity or radiation from nuclear power plants such as the SSES are as follows:

- inhalation (breathing)
- ingestion (eating and drinking), and
- whole body irradiation directly from a plant or from immersion in the radioactive effluents.

REMP Scope

The scope of the SSES REMP was developed based on the NRC's Radiological Assessment Branch Technical Position on radiological environmental monitoring, as described in Revision 1, November 1979 (Reference 4). However, the REMP conducted by PPL for the SSES exceeds some of the monitoring suggested by the NRC's branch technical position, in terms of the number of monitoring locations, the frequency of certain monitoring, the types of analyses required for the samples, and the achievable analysis sensitivities.

During the operational period of the SSES, two different categories of monitoring locations, called control and indicator locations, were established to further assist in assessing the impact of station operation. Control locations are located at sites where it is considered unlikely that radiation or radioactive material from normal station operation would be detected. Indicator locations are sited where it is expected that radiation and radioactive material that might originate from the station would be most readily detectable.

Control locations for the atmospheric and terrestrial pathways are more than 10 miles from the station. Preferably, the controls also are in directions from the station less likely to be exposed to wind blowing from the station than are the indicator locations. Control locations for the aquatic pathway, the Susquehanna River, are upstream of the station's discharge to the river.

Indicator locations are selected primarily on the basis of proximity to the station, although factors such as meteorology, topography, and sampling practicality also are considered. Indicator locations for the atmospheric and terrestrial pathways are typically less than 10 miles from the station. Most often, they are within 5 miles of the station. Indicator locations in the Susquehanna River are downstream of the station's discharge. Monitoring results from indicator locations are compared with results from control locations. These comparisons are made to discern any differences in the levels and/or types of radioactive material and/or radiation that might exist between indicators and controls and that could be attributable to the station.

In 2010, the SSES REMP collected 1081 samples at 49 locations and performed 1,370 analyses. In addition, the REMP monitors ambient radiation levels using thermoluminescent dosimeters (TLDs) at 57 indicator and control locations, resulting in 226 radiation level measurements in 2010. The media monitored and analyses performed are summarized in the table below. Figures 2 through 7 display the REMP TLDs and sampling locations in the vicinity of the SSES. Appendix C provides directions, distances, and a brief description of each of the locations in Figures 2 through 7.

REMP Monitoring Sensitivity

Detection of radiation and radioactive material from the SSES in the environment is complicated by the presence of naturally occurring radiation and radioactive materials from both terrestrial and cosmic sources. Man-made radiation and radioactive material from non-SSES sources, such as fallout from previous nuclear weapons tests and medical wastes, also can make identification of SSES radiation and radioactive material difficult. Together, this radiation and radioactive material present background levels from which an attempt is made to distinguish relatively small contributions from the SSES. This effort is further complicated by the natural variations that typically occur from both monitoring location to location and with time at the same locations.

The naturally occurring radionuclides potassium-40, beryllium-7, actinium-228, thorium-228, and tritium are routinely observed in certain environmental media. Potassium-40 has been observed in all monitored media and is routinely seen at readily detectable levels in such media as milk, fish, fruits and vegetables. Seasonal variations in beryllium-7 in air samples are regularly observed. Man-made radionuclides, such as cesium-137 left over from nuclear weapons testing are often observed as well. In addition, the radionuclide tritium, produced by both cosmic radiation interactions in the upper atmosphere as well as man-made (nuclear weapons), is another radionuclide typically observed.

SSES REMP	
Type of Monitoring	**Media Monitored**
Gross Beta Activity	Drinking Water and Air Particulates
Gamma-Emitting Radionuclide Activities	All Media
Tritium Activity	All Waters
Iodine-131 Activity (by Isotopic Analysis except Milk by Low Level Analysis)	All Media
Gamma Radiation Exposure (by TLD)	Ambient Radiation Levels

Radioactivity levels in environmental media are usually so low that their measurements, even with state-of-the-art measurement methods, typically have significant degrees of uncertainty associated with them (Reference 5). As a result, expressions are often used when referring to these measurements that convey information about the levels being measured relative to the measurement sensitivities. Terms such as "minimum detectable concentration" (MDC) are used for this purpose. The MDC is an "a priori" estimate of the capability for detecting an activity concentration by a given measurement system, procedure, and type of sample. Counting statistics of the appropriate instrument background are used to compute the MDC for each specific analysis. The formulas used to calculate MDCs may be found in procedures referenced in Appendix A.

The methods of measurement for sample radioactivity levels used by PPL's contracted REMP radioanalytical laboratories are capable of meeting the analysis sensitivity requirements found in the SSES Technical Requirements.

Exposure Pathways to Humans

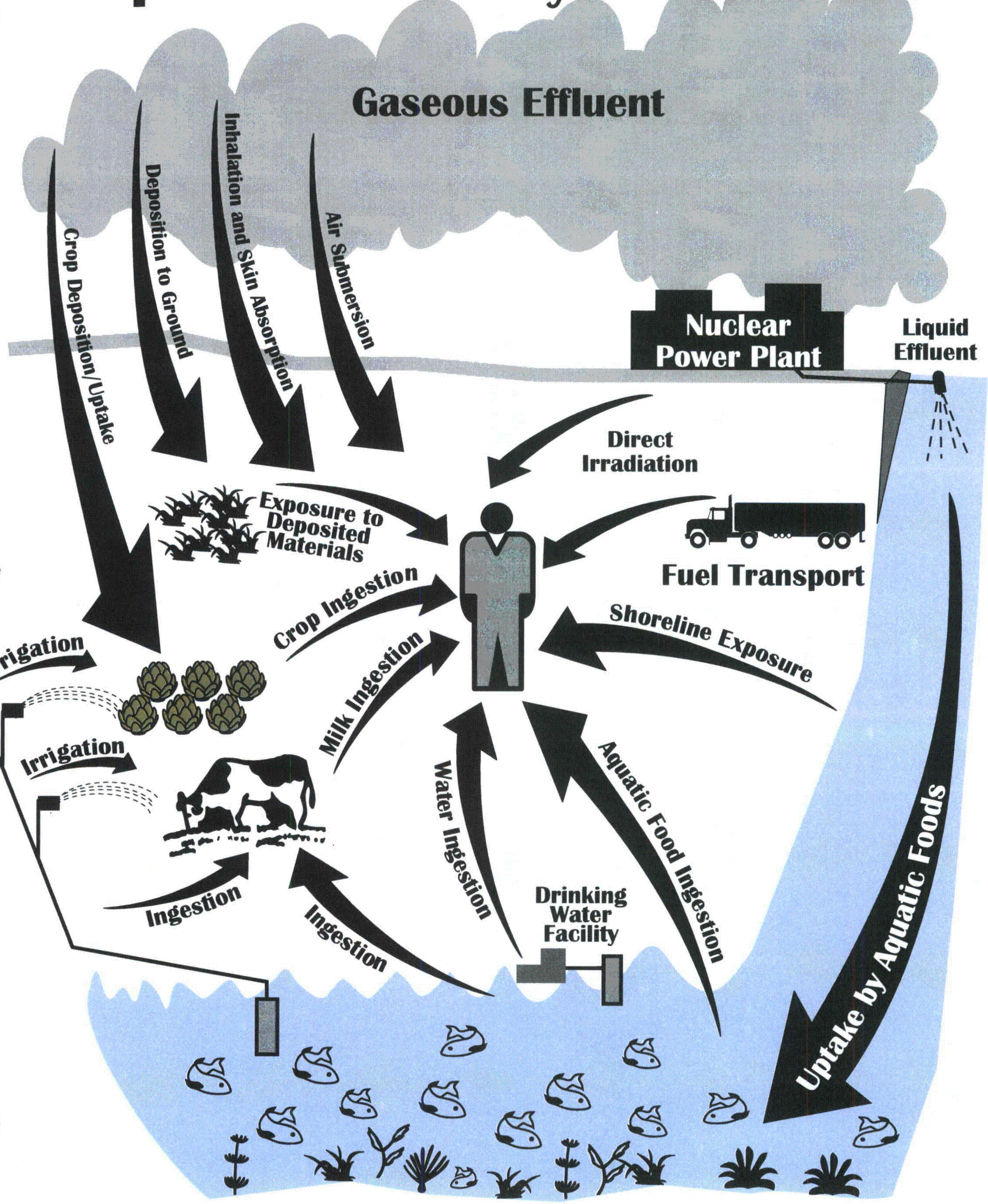


Figure 1

FIGURE 2
2010 TLD MONITORING LOCATIONS
WITHIN ONE MILE

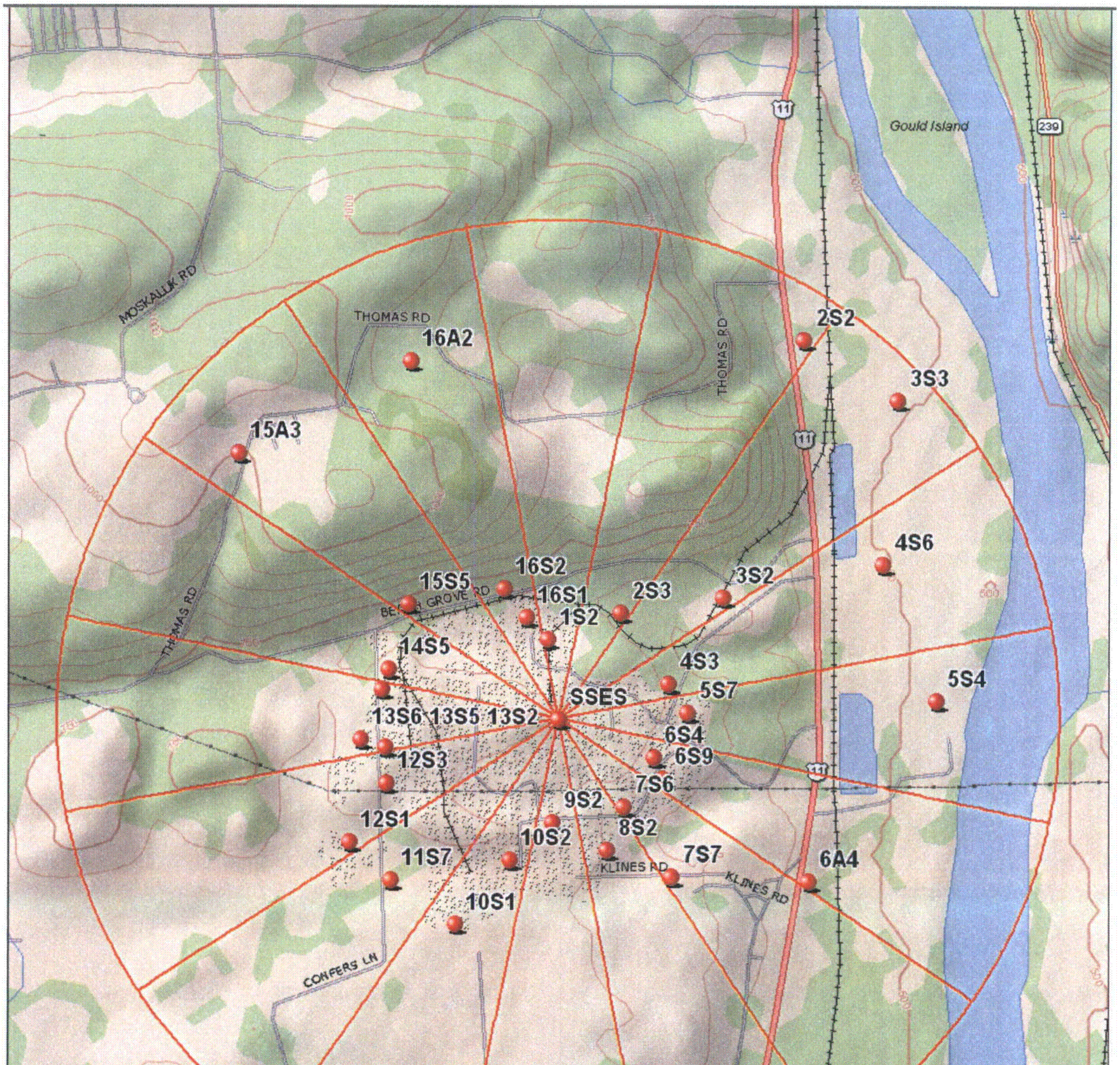


FIGURE 3
2010 TLD MONITORING LOCATIONS
FROM ONE TO FIVE MILES

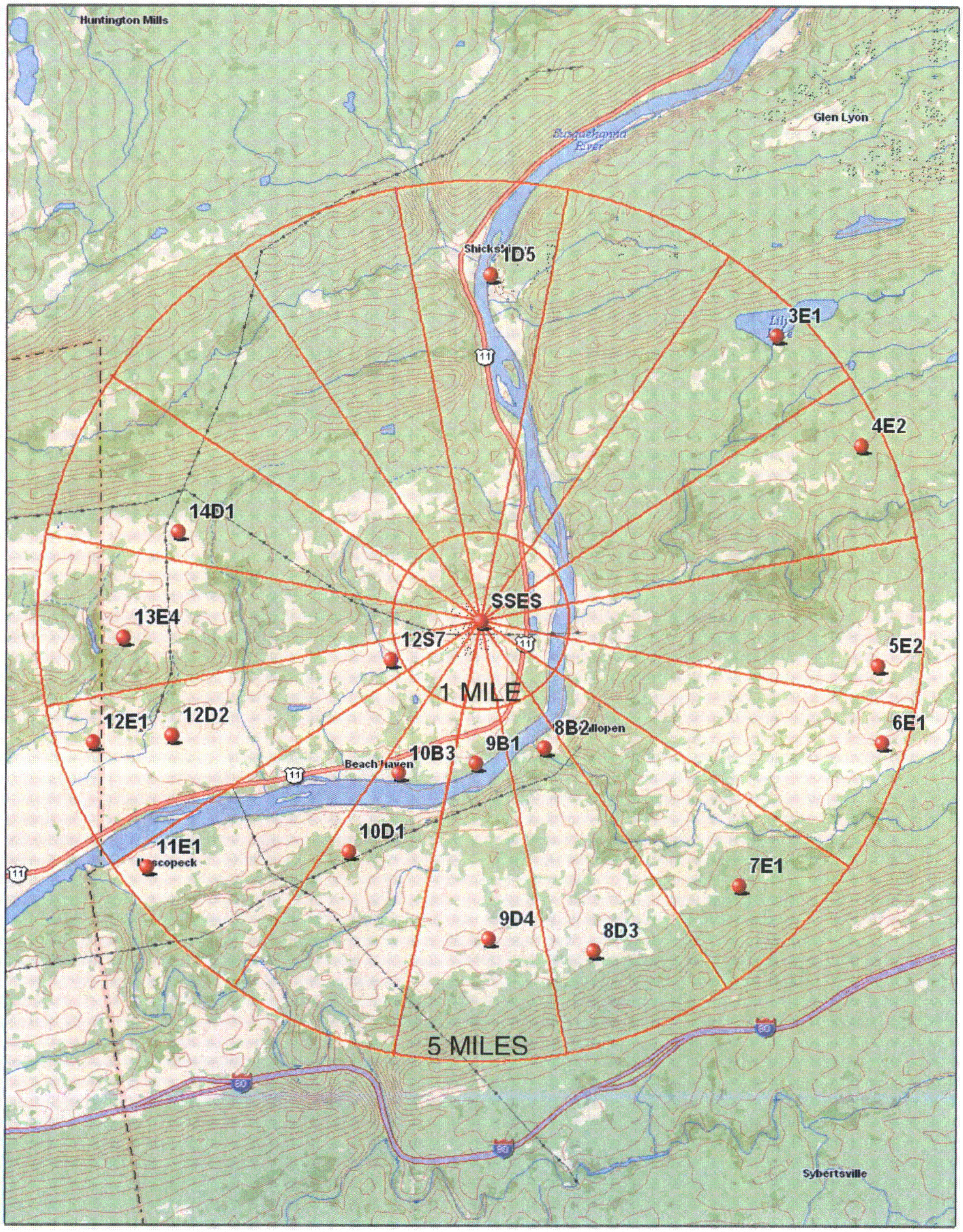


FIGURE 4
2010 TLD MONITORING LOCATIONS
GREATER THAN FIVE MILES

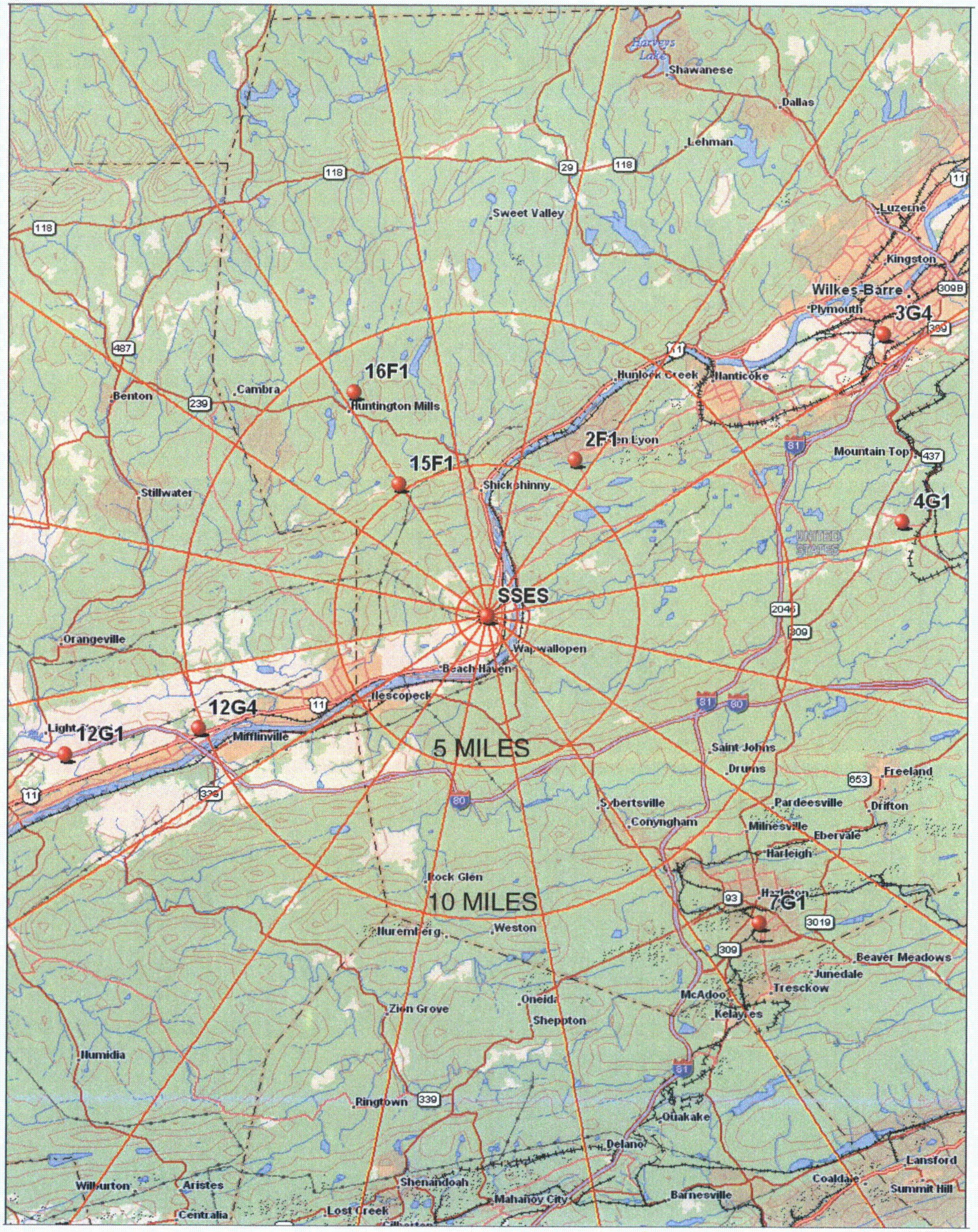


FIGURE 5
2010 ENVIRONMENTAL SAMPLING LOCATIONS
WITHIN ONE MILE

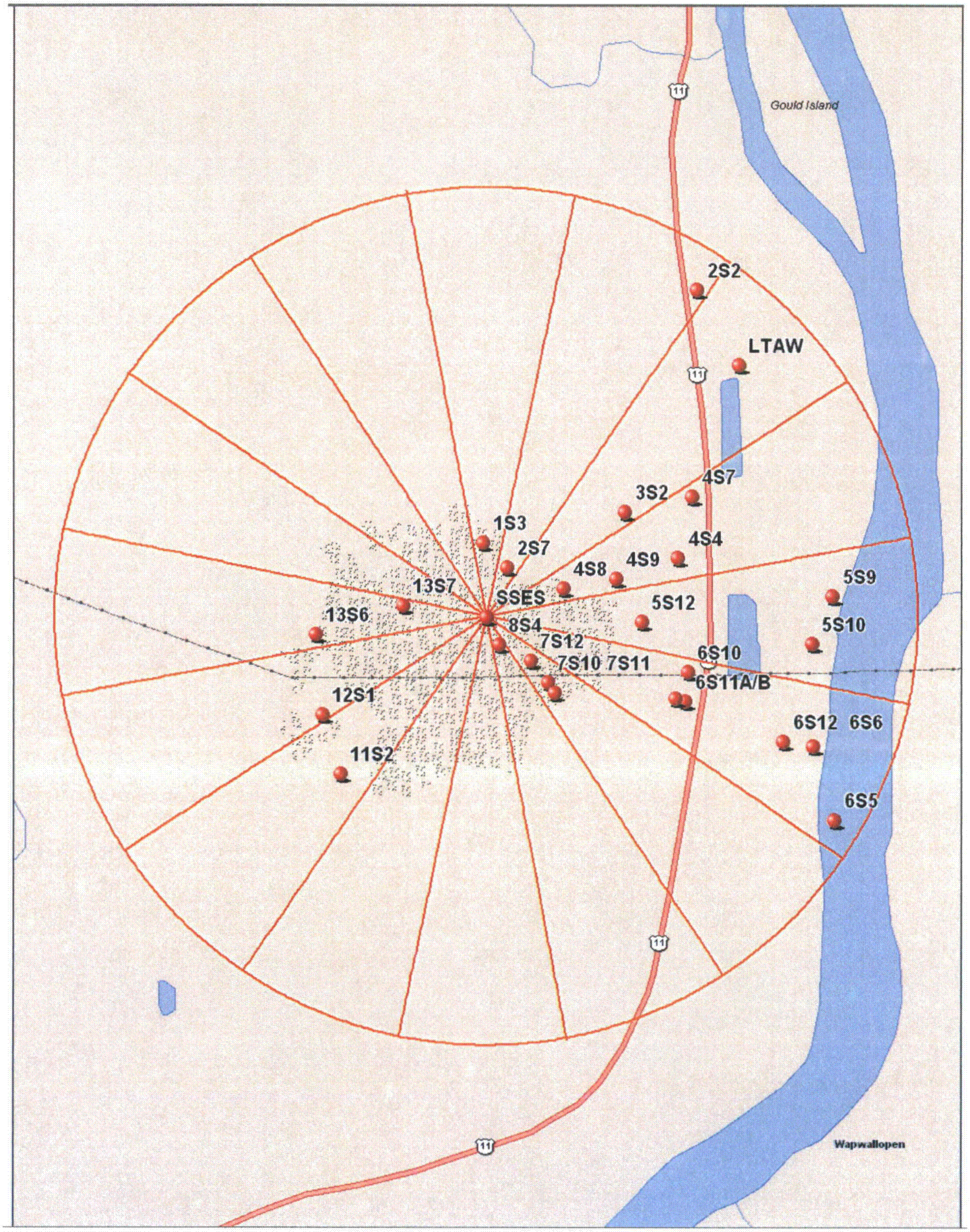


FIGURE 6
2010 ENVIRONMENTAL SAMPLING LOCATIONS FROM ONE TO FIVE MILES

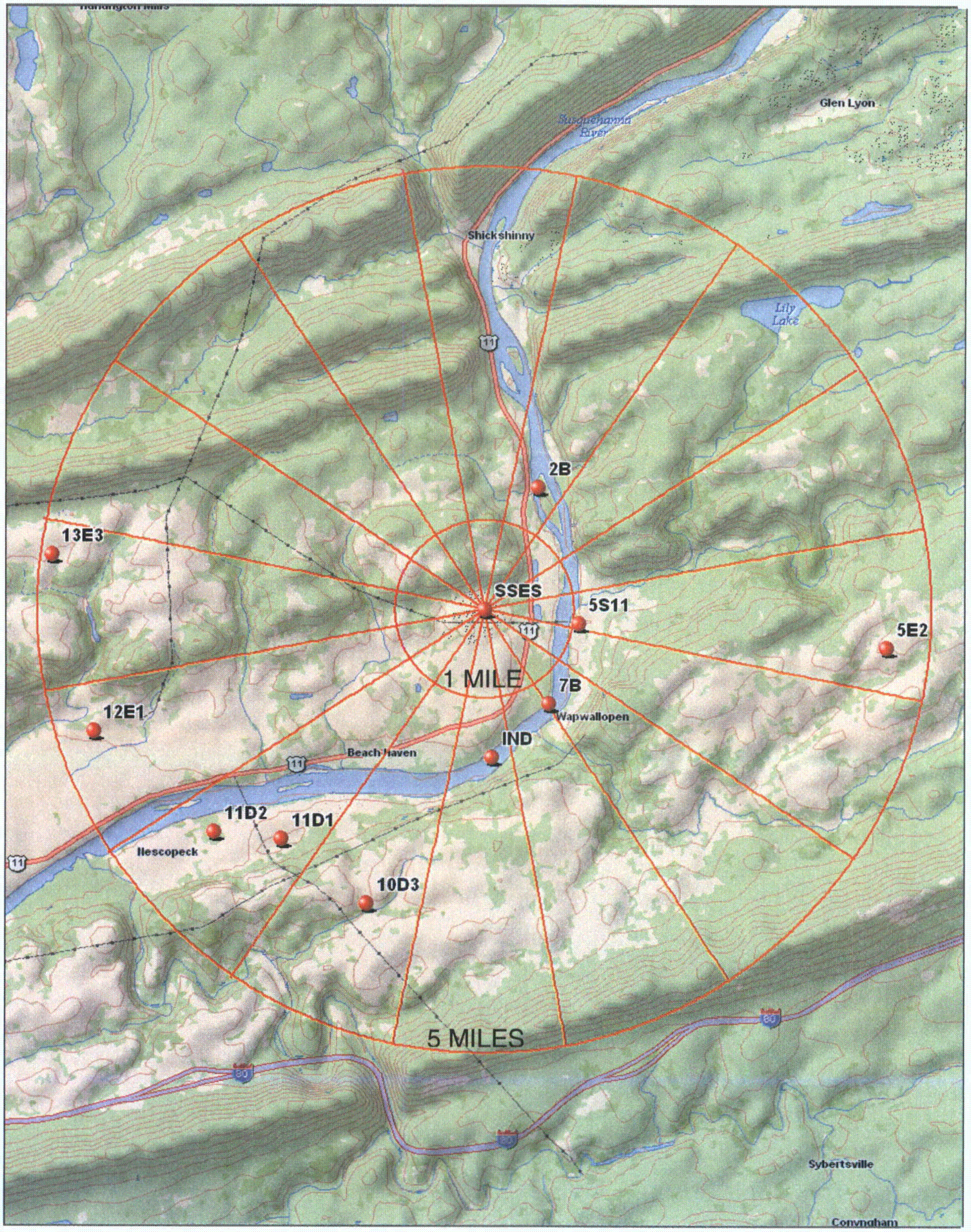
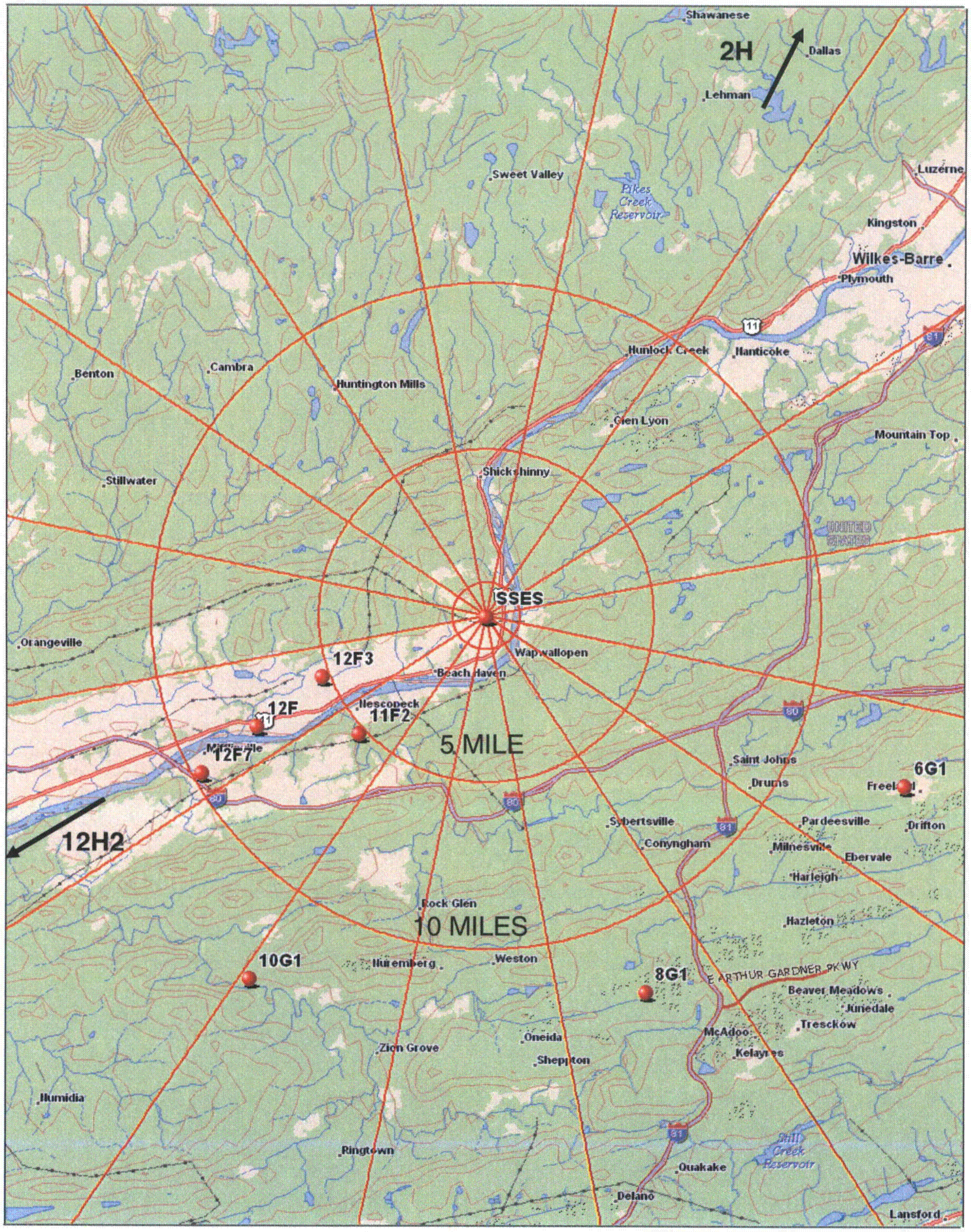


FIGURE 7
2010 ENVIRONMENTAL SAMPLING LOCATIONS
GREATER THAN FIVE MILES



AMBIENT RADIATION MONITORING

INTRODUCTION

The primary method for the SSES REMP measurement of ambient radiation levels is the use of thermoluminescent dosimeters (TLDs). The TLDs are crystals (calcium sulfate) capable of detecting and measuring low levels of radiation by absorbing a portion of the radiation's energy that is incident upon them and storing the captured energy until the TLDs are processed (read). Processing involves heating the TLDs to release their stored energy in the form of light and measuring the intensity of the light that they emit. The intensity of the emitted light is proportional to the amount of radiation to which they were exposed. Calibration of the TLD processors permits a reliable relationship to be established between the light emitted and the amount of radiation dose received by the TLDs. The result permits accurate measurements of the ambient radiation in the environment.

Environmental TLDs are continually exposed to natural radiation from the ground (terrestrial radiation) and from the sky (cosmic) radiation. In addition, they also may be exposed to man-made radiation. Most of the environmental TLD's natural radiation exposure comes from sources in the ground. These terrestrial sources vary naturally with time due to changes in soil moisture, snow cover, etc. The natural-radiation picture is complicated because the factors affecting radiation reaching the TLDs from the ground vary differently with time from one location to another due to locational differences in such factors as soil characteristics (amounts of organic matter, particle size, etc.), drainage opportunities, and exposure to sunlight. Environmental TLDs can also be affected by direct radiation (shine) from the SSES turbine buildings during operation, radwaste transfer and storage, and radioactive gaseous effluents from the SSES.

Unfortunately, TLDs do not have any inherent ability to indicate the source of the radiation to which they are exposed. The placement of numerous TLDs in the environment can facilitate decision-making about the possible radiation sources to which TLDs are exposed. However, a method for evaluating TLD data is still required. The SSES REMP relies on a statistically based approach to simultaneously compare indicator TLD data with control TLD data and operational TLD data with preoperational TLD data. This approach permits the flagging of environmental TLD doses that might have been produced by both man-made sources of radiation, as well as natural radiation sources. It also provides a means for attributing a portion of the total TLD dose to SSES operation if appropriate.

Interpretation of environmental TLD results is described in PPL Nuclear Engineering Study, EC-ENVR-1012 (Revision 1, January 2009).

Scope

Direct radiation measurements were made using Panasonic 710A readers and Panasonic UD-814 (calcium sulfate) thermoluminescent dosimeters (TLD). During 2010, the SSES REMP had 46 indicator, 6 special interest and 5 control TLD locations. Refer to Table C1 for TLD measurement locations. The TLD locations are placed on and around the SSES site as follows:

A site boundary ring (i.e. an inner ring) with at least 1 TLD in each of the 16 meteorological sectors, in the general area of the site boundary. Currently there are 30 locations. They are: (1S2, 2S2, 2S3, 3S2, 3S3, 4S3, 4S6, 5S4, 5S7, 6S4, 6S9, 7S6, 7S7, 8S2, 8A3, 9S2, 9B1, 10S1, 10S2, 11S7, 12S1, 12S3, 12S7, 13S2, 13S5, 13S6, 14S5, 15S5, 16S1 and 16S2) near and within the site perimeter representing fence post doses from a SSES release.

An outer distance ring with at least 1 TLD in each of the 16 meteorological sectors, in the 3 to 9 mile range from the site. Currently there are 16 locations. They are: (1D5, 2F1, 3E1, 4E2, 5E2, 6E1, 7E1, 8D3, 9D4, 10D1, 11E1, 12D2, 13E4, 14D1, 15F1 and 16F1). These TLD's are located to measure possible exposures to close-in population.

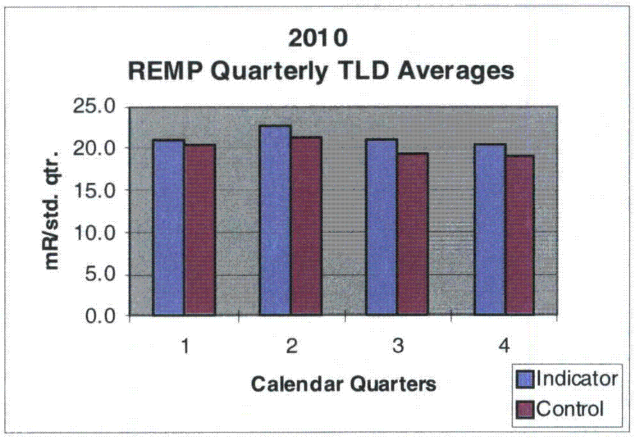
The balance of TLD locations represents the special interest areas such as population centers, schools, residences and control locations. Currently there are six special interest locations (6A4, 15A3, 16A2, 8B2, 10B3 and 12E1) and 5 control locations (3G4, 4G1, 7G1, 12G1 and 12G4).

The specific locations were determined according to the criteria presented in the NRC Branch Technical Position on Radiological Monitoring (Revision 1, November 1979).

Monitoring Results

TLDs

The TLDs were exchanged quarterly and processed by the SSES Health Physics Dosimetry Group. Average quarterly ambient gamma radiation levels measured by environmental TLDs is shown in the bar graph below.



The average environmental results for all indicator and control TLD were 21.3 +/- 8.9 and 19.9 +/- 3.4 (mR/std.qtr.), respectively.

Indicator environmental TLD results for 2010 were examined quarterly on an individual location basis and compared with both current control location results and preoperational data. Very small SSES exposure contributions were identified during 2010 at nine onsite locations as follows: 1S2, 2S3, 6S4, 6S9, 7S6, 9S2, 10S2, 13S2, 13S5.

The highest, estimated, gamma radiation dose of 6.99 E-01 mrem for 2010 was at location 9S2. It is assumed that the occupancy time for a member of the public is no more than twenty hours each calendar quarter at location 9S2. This dose is approximately 2.80% of the 25 mrem whole-body SSES Technical Requirements (TRO 3.11.3) limit for all SSES sources of radioactivity and radiation.

Refer to the following for results of TLD measurements for 2010:

- Figure 8, trends quarterly TLD results for both preoperational and operational periods

- Appendix G, Table G Summary of Data Table, shows the averages for TLD indicator and control locations for the entire year.

- Appendix H, Table H1, shows a comparison of the 2010 mean indicator and control TLD results with the means for the preoperational and operational periods at the SSES.

- Appendix I, Table I-1, shows TLD results for all locations for each quarter of 2010.

FIGURE 8 - AMBIENT RADIATION LEVELS BASED ON TLD DATA

AQUATIC PATHWAY MONITORING

INTRODUCTION

In 2010 the SSES REMP monitored the following media in the aquatic pathway: surface water, drinking water, fish, sediment, fruits and vegetables. Some of the media (e.g., drinking water and fish) provide information that can be especially useful to the estimation of possible dose to the public from potentially ingested radioactivity, if detected. Other media, such as sediment, can be useful for trending radioactivity levels in the aquatic pathway, primarily because of their tendency to assimilate certain materials that might enter the surface water to which they are exposed. The results from monitoring all of these media provide a picture of the aquatic pathway that is clearer than that which could be obtained if one or more were not included in the REMP.

SSES Technical Requirements only require that fruit and vegetables be sampled at locations irrigated by Susquehanna River water from points downstream of the SSES discharge to the River. The land use census (Reference 11) conducted in 2010 identified two farms within 10 miles downriver of PPL Susquehanna that used Susquehanna River water for irrigation. Zehner Farm (location 11D1, 3.3 miles SW) irrigated pumpkins and soy beans and Lupini Farm – Mifflinville Field (location 12F7, 8.3 miles WSW) irrigated potatoes, green beans, and field corn. No other fields within 10 miles downriver of Susquehanna SES were irrigated in 2010.

The aquatic pathway in the vicinity of the SSES is the Susquehanna River. Monitoring of all of the aquatic media, except drinking water, is conducted both downstream and upstream of the location from which occasional SSES low-level radioactive discharges enter the river. The upstream monitoring locations serve as controls to provide data for comparison with downstream monitoring results. The potential exists for radioactive material that might be present in SSES airborne releases to enter the Susquehanna River upstream of the plant through either direct deposition (e.g., settling or washout) or by way of runoff from deposition on land adjacent to the river. However, direct deposition and runoff are considered to be insignificant as means of entry for SSES radioactivity into the Susquehanna River when compared to liquid discharges under normal conditions.

Lake Took-a-While (LTAW), which is located in PPL's Riverlands Recreation Area adjacent to the Susquehanna River, is also considered to be part of the aquatic pathway for monitoring purposes. Although it is not in a position to receive water discharged to the river from the SSES, it does receive storm runoff from the SSES. The C-1 Pond (5S12) and the S-2 Pond (7S12) are sedimentation ponds which also receive storm runoff from the site.

Storm runoff from the SSES site should not normally contain any measurable radioactivity from the plant. However, the SSES REMP, consistent with other aspects of aquatic monitoring and the REMP, in general, goes beyond its requirements by monitoring LTAW, C-1 Pond (5S12) and S-2 Pond (7S12).

Scope

Surface Water

Surface water was routinely sampled from the Susquehanna River at one indicator location (6S5/Outfall Area) and one control location (6S6/River Water Intake Line) during 2010. Sampling also took place at the following additional indicator locations: the SSES discharge line to the river (2S7), Lake Took-A-While (LTAW), Peach Stand Pond (4S7), C-1 Pond (5S12) and S-2 Pond (7S12).

Drinking Water

Drinking water samples were collected at location 12H2, the Danville Municipal Water Authority's treatment facility on the Susquehanna River, in 2010. Treated water is collected from the end of the processing flowpath, representing finished water that is suitable for drinking. This is the nearest point downstream of the SSES discharge to the River at which drinking water is obtained. No drinking water control location is sampled. For all intents and purposes, control surface water sampling location (6S6) would be suitable for comparison.

Fish

Fish were sampled from the Susquehanna River in the spring and fall of 2010, at one indicator location, IND, downstream of the SSES liquid discharge to the River and one control location, 2H, sufficiently upstream to essentially preclude the likelihood that fish caught there would spend any time below the SSES discharge. In addition, fish were also sampled in the fall from PPL's Lake Took-a-While, location LTAW. This location is not downstream of the SSES discharge. It is sampled because of its potential for receiving runoff from the SSES. LTAW is considered an indicator location.

Sediment

Sediment sampling was performed in the spring and fall at indicator locations 7B and 12F and control location 2B on the Susquehanna River.

Fruits and Vegetables

Potatoes, green beans and field corn were sampled at indicators location 12F7 and pumpkins and soy beans were sampled at 11D1 because these locations were irrigated with Susquehanna River water in 2010.

Sampling

Surface Water

Weekly water samples were collected at indicator location 6S5 for both biweekly and monthly compositing. Location 6S5 was considered a backup for location 2S7 in the event that water could not be obtained from the automatic sampler at this location.

Routine samples for 6S5 were collected from a boat, unless river conditions prohibited boating. When this occurs, samples are collected from an alternate shoreline site located below the Susquehanna SES discharge diffuser. The shoreline samples are collected at the Wetlands Cottage area, approximately 100-150 yards down river from the 6S5 site.

Indicator location 2S7 the SSES Cooling Tower Blowdown Discharge (CTBD) line, and control location 6S6, the SSES River Water Intake structure, were time -proportionally sampled using automatic continuous samplers. The samplers were typically set to obtain 30-60 ml aliquots every 20-25 minutes. Weekly, the water obtained by these samplers was retrieved for both biweekly and monthly compositing.

The other surface water monitoring locations, LTAW, Peach Stand Pond (4S7), C-1 Pond (5S12) and S-2 Pond (7S12) were grab sampled once each quarter.

Drinking Water

Treated water was time-proportionally sampled by an automatic sampler. The sampler was typically set to obtain three 12-ml aliquots every twenty minutes. Weekly, the water obtained by this sampler was retrieved for monthly compositing.

Fish

Fish were obtained by electrofishing. Electrofishing stuns the fish and allows them to float to the surface so that those of the desired species and sufficient size can be sampled. Sampled fish include recreationally important species, such as largemouth bass, smallmouth bass, and also channel catfish and shorthead redhorse. The fish are filleted and the edible portions are kept for analysis.

Sediment

Shoreline sediment was collected to depths of four feet of water.

Fruits and Vegetables

Potatoes, green beans, field corn, pumpkins and soy beans which were irrigated with river water downstream from SSES, were sampled during the harvest season.

Sample Preservation and Analysis

Surface and Drinking Water

Surface water samples were analyzed monthly for gamma-emitting radionuclides and tritium. Drinking water samples were analyzed monthly for gross beta, gamma-emitting radionuclides, and tritium.

Sediment and Fish

Fish are frozen until shipment. All samples are analyzed by gamma spectroscopy for the activities of any gamma emitting radionuclides that may be present.

Monitoring Results

Surface Water

Refer to the following for results of surface water analyses for 2010:

- Appendix G, Table G, shows a summary of the 2010 surface water data.
- Appendix H, Table H 4, shows comparisons of tritium monitoring results against past years data.
- Appendix I, Table I-2 shows specific results for tritium and gamma spectroscopic analyses of surface water samples.

The Nuclear Regulatory Commission (NRC) requires that averages of the activity levels for indicator environmental monitoring locations and for control environmental monitoring locations of surface water, as well as other monitored media, be reported annually. Data from the following six surface water monitoring locations were averaged together as indicators for reporting purposes: location (6S5) on the Susquehanna River downstream of the SSES, Lake-Took-a While (LTAW) adjacent to the river, and the SSES cooling tower blowdown discharge (CTBD) line to the river (2S7), and the Peach Stand Pond (4S7), C-1 Pond (5S12) and S-2 Pond (7S12).

Technically, the CTBD line is not part of the environment. The CTBD line is a below ground pipe to which the public has no access, contrary to the other environmental monitoring locations on the Susquehanna River to which the public does have access. However, currently there is no automatic composite sampling of an indicator location on the Susquehanna River, so the CTBD line from the SSES is included as an indicator monitoring location in the radiological environmental monitoring program.

Most of the water entering the Susquehanna River through the SSES CTBD line is simply water that was taken from the river upstream of the SSES, used for cooling purposes without being radioactively contaminated by SSES operation, and returned to the river. Batch discharges of relatively small volumes of slightly radioactively contaminated water are made to the river through the SSES CTBD at times throughout each year. The water is released from tanks of radioactively contaminated water on site to the CTBD and mixes with the noncontaminated water already present in the CTBD. Flow rates from the tanks containing radioactively contaminated water being discharged to the CTBD vary based on the radioactivity level of the batch release. In addition, the minimum flow rate for the returning water in the CTBD is maintained at a flow rate of 5,000 gpm or higher. These requirements are in place to ensure adequate dilution of radioactively contaminated water in the CTBD prior to entering the river.

At the point that CTBD water enters the river, additional, rapid dilution of the discharged water by the river is promoted by releasing it through a diffuser. The diffuser is a large pipe with numerous holes in it that is positioned near the bottom of the river.

CTBD discharges exit the diffuser through the many holes, enhancing the mixing of the discharge and river waters. The concentrations of contaminants are reduced significantly as the discharged water mixes with the much larger flow of river water. The mean flow rate of the Susquehanna River in 2010 was approximately 6,350,000 gpm. The CTBD average flow during 2010 was 9,721 gpm. Based on the average river flow and the average CTBD flow during 2010, liquid discharges from the SSES blowdown line were diluted by approximately a factor of 653 after entering the river. The amount of radioactively contaminated water being discharged is small. Nevertheless, sensitive analyses of the water samples can often detect the low levels of certain types of radioactivity in the CTBD water following dilution. Though the levels of radioactivity measured in the CTBD water are generally quite low, they tend to be higher than those in the river downstream of the SSES.

When the radioactivity levels from the CTBD samples throughout the year are averaged with those obtained from actual downstream monitoring locations, the result is an overall indicator location average that is too high to be representative of the actual average radioactivity levels of the downstream river water. As the following discussions are reviewed, consideration should be given to this inflation of average radioactivity levels from the inclusion of CTBD (location 2S7) results in the indicator data.

Surface Water Tritium

Quarterly samples from all surface water locations were analyzed for concentrations of tritium activity (Table I-2 and Table G). Tritium was detected in the indicator location above MDC. The 2010 indicator values ranged from -72.1 to 12,500 pCi/l compared to -91 to 7,500 for 2009. Comparison of the 2010 mean tritium activity of 868 pCi/l for all indicator locations to the average of the annual preoperational control mean of 171 pCi/l indicates a contribution of tritium activity from the SSES.

Refer to Figure 10 which trends tritium activity levels separately for surface water indicator and control locations from 1972 through 2010.

The much higher levels of tritium observed in the CTBD line (location 2S7), when averaged with the low levels from the downstream location 6S5 sample analysis results distort the real environmental picture. The mean tritium activity level from indicator location 6S5 for 2010 was 9.5 pCi/liter, which is slightly greater than the mean tritium activity of 7.2 pCi/l for the control location and is below the annual preoperational control mean of 171 pCi/l.

Tritium activity levels reported for 2S7 are from the discharge line prior to dilution in the river. The highest quarterly average tritium activity reported at 2S7 during 2010 was approximately 5,238 pCi/liter for the second quarter. This is well below the NRC Reporting Levels for quarterly average activity levels of 20,000 pCi/liter when a drinking water pathway exists or 30,000 pCi/liter when no drinking water pathway exists.

The tritium activity reported in the CTBD line from location 2S7 is attributable to the SSES. Refer to the "Dose from the Aquatic Pathway" discussion at the end of this section for additional information on the projected dose to the population from tritium and other radionuclides in the aquatic pathway attributable to the SSES.

No gamma-emitting radionuclides were detected in surface water samples above MDC, with the exception of naturally occurring K-40 and Th-228.

Drinking Water

Drinking water was monitored during 2010 at the Danville Water Company's facility 26 miles WSW of the SSES on the Susquehanna River at location 12H2.

There are no known drinking water supplies in Pennsylvania on the Susquehanna River upstream of the SSES and therefore no drinking water control monitoring locations. Danville drinking water analysis results may be compared to the results for surface water control monitoring locations.

Refer to the following for results of surface water analyses for 2010:

- Figure 11 trends gross beta activity levels for drinking water location 12H2 from 1977 through 2010.
- Appendix G, Table G, shows a summary of the 2010 drinking water data.
- Appendix H, Table H 6 and H 7, show comparisons of gross beta and tritium activity in drinking water for 2010 against past years' data.
- Appendix I, Table I-4 shows specific results of gross beta, tritium and gamma spectroscopic analyses of drinking water

Drinking Water Gross Beta

Monthly samples from the 12H2 drinking water location were analyzed for concentrations of gross beta activity (Table I-4). Beta activity was detected in the 12H2 location above MDC for 2010. The 2010 values ranged from -.7 to 4.5 pCi/l compared to 1.16 to 4.45 for 2009.

Gross beta activity has been monitored in drinking water since 1977. Gross beta activity is typically measured at levels exceeding the MDCs in drinking water samples. The 2010 mean gross beta activity of 2 pCi/l is below the mean gross beta activity of 2.5 for 2009 and below the preoperational (1977-81) values of 2.2 to 3.2 pC/l.

Drinking Water Tritium

Monthly samples from the 12H2 drinking water location were analyzed for concentrations of tritium activity (Table I-4). Tritium activity was not detected above MDC in any of the 12 drinking water samples in 2010. The 2010 values ranged from -77.3 to 122 pCi/l compared to -95 to 97 for 2009.

The 2010 mean tritium activity of 27 pCi/l for drinking water was greater than the mean tritium activity of 14.1 pCi/l for 2009 and is less than the preoperational (1977-81) values of 101 to 194 pCi/l.

Drinking Water Gamma Spectroscopic

No gamma-emitting radionuclides attributable to SSES were detected in drinking water samples above the MDC. Naturally occurring Th-228 was detected and is not attributable to the liquid discharges from the SSES to the Susquehanna River.

Fish

Refer to the following for results of fish analyses for 2010:

- Table G shows a summary of the 2010 fish data.
- Table H 8 shows comparisons of potassium-40 monitoring results against past years' data.
- Table I-5 shows specific results of gamma spectroscopic analyses of fish.

Fish Gamma Spectroscopic

Semi-annual samples from the indicator (IND) and control (2H) fish locations were analyzed for concentrations of gamma activity (Table I-5).

Three species of fish were sampled at each of one indicator location and one control location on the Susquehanna River in spring 2010 and again in fall 2010. The species included the following: smallmouth bass, channel catfish, and shorthead redhorse. In addition, one largemouth bass was sampled from PPL's LTAW in October 2010. A total of 14 fish were collected and analyzed.

The only gamma-emitting radionuclide reported in excess of analysis MDCs in fish during 2010 was naturally occurring potassium-40. The 2010 indicator values ranged from 2,800 to 3,830 pCi/kg compared to 2,770 to 4,100 for 2009. The 2010 indicator and control means for the activity levels of potassium-40 in fish were 3,340 pCi/kg and 3,210 pCi/kg, respectively. Naturally occurring potassium-40 in fish is not attributable to the liquid discharges from the SSES to the Susquehanna River.

Sediment

Refer to the following for results of sediment analyses for 2010:

- Appendix G, Table G, shows a summary of the 2010 sediment data.
- Appendix H, Tables H 9, 10, 11 and 12, shows comparisons of potassium-40, radium-226, thorium-228, and cesium-137 monitoring results against past years' data.
- Appendix I, Table I-6 shows specific results of gamma spectroscopic analyses of sediment samples.

Sediment Gamma Spectroscopic

Semi-annual samples from all sediment locations were analyzed for concentrations of gamma activity (Table I-6). Naturally occurring potassium-40, radium-226, Actinium-228, and thorium-228 were measured at activity levels above MDCs in some shoreline sediment samples in 2010. The naturally occurring radionuclides in sediment are not attributable to the liquid discharges from the SSES to the Susquehanna River.

Fruits and Vegetables

Refer to the following for results of fruits and vegetables for SSES:

- Appendix G, Table G, shows a summary of the 2010 fruits and vegetables.
- Appendix I, Table I-12 shows specific gamma spectroscopic analysis of fruit/vegetable samples.

Fruit /Vegetable Gamma Spectroscopic

Potatoes, green beans and field corn samples were collected in 2010 from location 12F7, and pumpkin and soybeans were collected from location 11D1 and analyzed for concentrations of gamma emitting nuclide activity (Table I-12). Potassium-40 was the only gamma-emitting radionuclide measured in fruits and vegetables at an activity level above MDC during 2010. The average potassium-40 concentration for the indicator sample was 6,060 pCi/kg compared to 4,480 pCi/kg for 2009.

Potassium-40 in fruits and vegetables is not attributable to SSES operation because it is a naturally occurring radionuclide.

Dose from the Aquatic Pathway

Tritium was the only radionuclide identified in 2010 by the SSES REMP in the aquatic pathway that was attributable to SSES operation and also included in the pathway to man.

The total tritium activity released from the SSES for the year was estimated based on REMP monitoring results and used in projecting maximum doses to the public. The annual mean activity level of tritium in the CTBD line (monitoring location 2S7) for 2010 was 2,710 pCi/l. The annual mean activity of tritium for control location 6S6 was 7.2 pCi/l. For the purpose of performing the dose calculation, tritium was assumed to be present continuously in the CTBD line throughout 2010 at a level equivalent to the annual mean activity of 2,710 pCi/l. The annual mean flow rate for the CTBD line was 9,721 gpm. Using the proper unit conversions and multiplying 9,721 gpm times 2,710 pCi/l yields a value of 52.1 curies for the estimate of tritium released from SSES during 2010. This estimate is 5.2 curies less than the 57.3 curies of tritium determined by effluent monitoring that was released to the river by the SSES in 2010.

Given the total tritium activity released, the maximum whole-body and organ doses to hypothetical exposed individuals in four age groups (adult, teenager, child, and infant) were determined according to the methodology of the Offsite Dose Calculation Manual using the RETDAS computer program. This is in accordance with SSES Technical Requirement 3.11.4.1.3.

The maximum dose obtained from the ingestion of tritium was estimated at the nearest downriver municipal water supplier via the drinking water pathway and near the outfall of the SSES discharge to the Susquehanna River via the fish pathway. The maximum whole body and organ doses (child) were each calculated as 9.77E-4 mrem (based on the annual mean tritium concentration in the CTBD Line)

FIGURE 10 - TRITIUM ACTIVITY IN SURFACE WATER

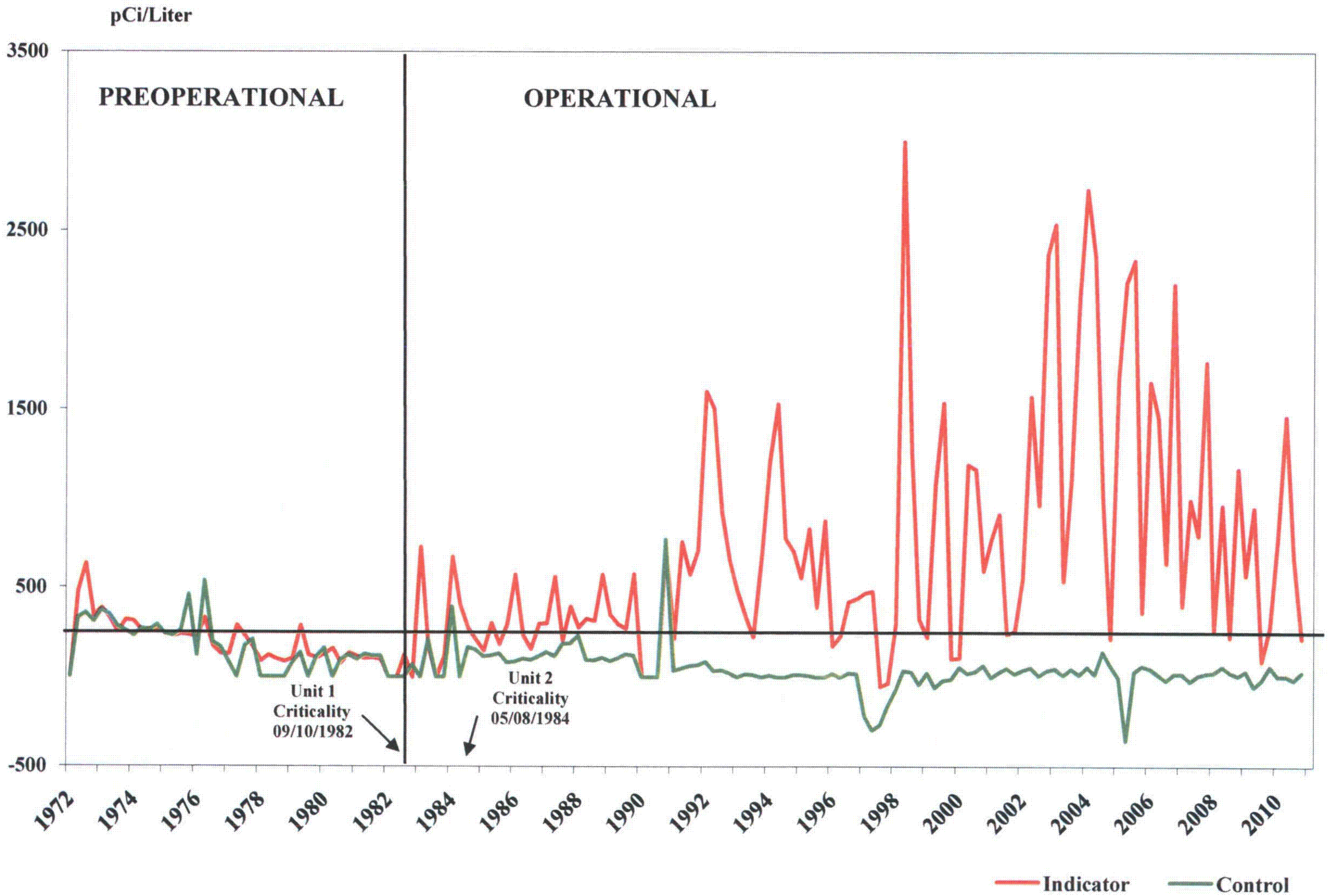
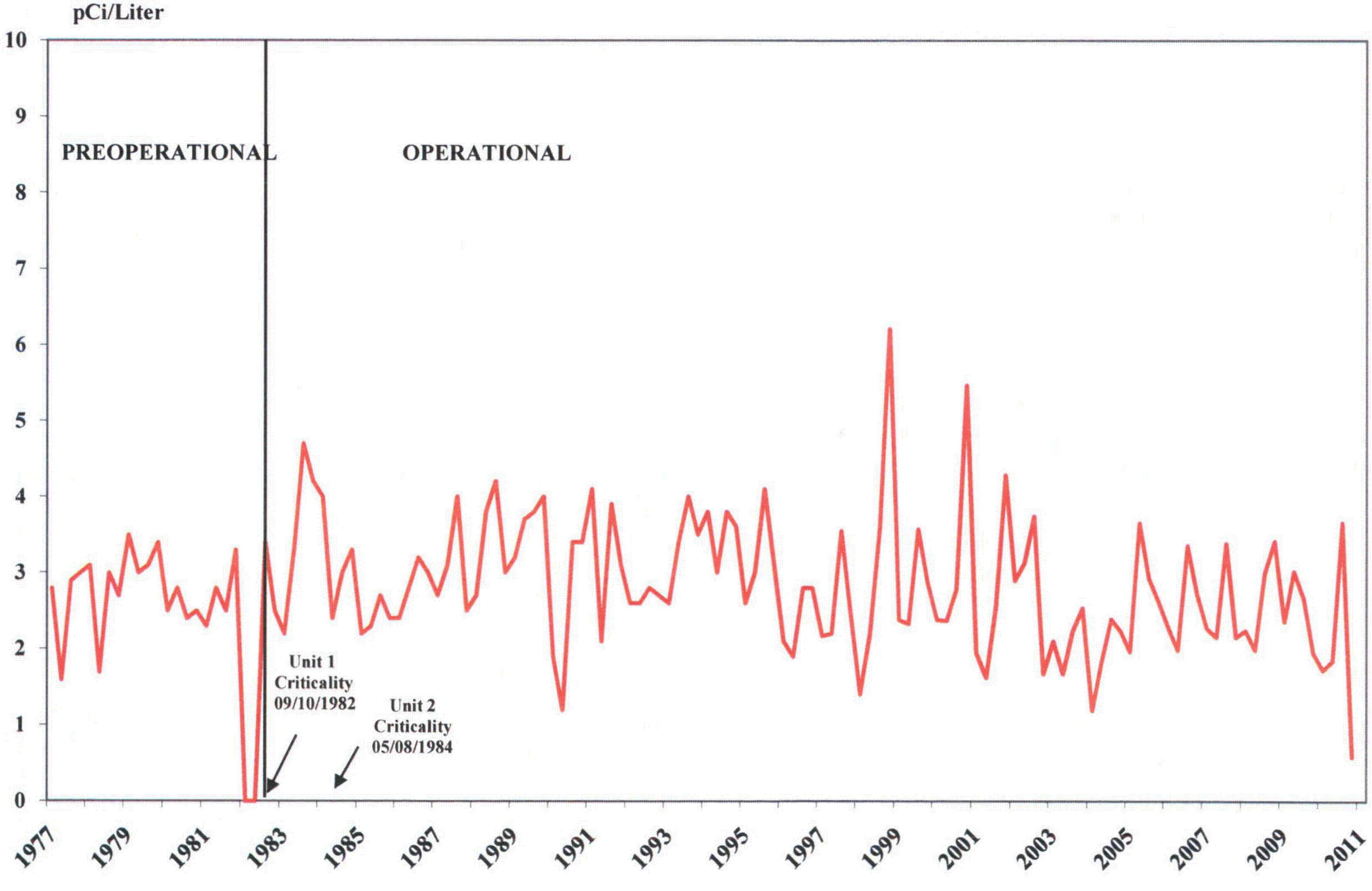


FIGURE 11 - GROSS BETA ACTIVITY IN DRINKING WATER



ATMOSPHERIC PATHWAY MONITORING

INTRODUCTION

Atmospheric monitoring by the SSES REMP involves the sampling and analysis of air. Because the air is the first medium that SSES vent releases enter in the pathway to man, it is fundamental that it be monitored. Mechanisms do exist for the transport of airborne contaminants to other media and their concentration in them. For example, airborne contaminants may move to the terrestrial environment and concentrate in milk. Concentrations of radionuclides can make the sampling and analysis of media like milk more sensitive approaches for the detection of radionuclides, such as iodine-131, in the pathway to man than the monitoring of air directly. (PPL also samples milk; refer to the Terrestrial Pathway Monitoring section of this report.) Nevertheless, the sensitivity of air monitoring can be optimized by the proper selection of sampling techniques and the choice of the proper types of analyses for the collected samples.

Scope

Air samples were collected on particulate filters and charcoal cartridges at indicator locations 3S2, 12S1, 13S6 and 12E1, and control locations 6G1 and 8G1.

Sampling and Analysis

Air

The SSES REMP monitored the air at four indicator locations and two control locations during 2010. The SSES Technical Requirements require monitoring at only a total of five sites. Monitoring is required at three locations at the SSES site boundary in different sectors with the greatest predicted sensitivities for the detection of SSES releases (3S2, 12S1, 13S6). Monitoring must be performed at the community in the vicinity of the SSES with the greatest predicted sensitivity (12E1). A control location that is expected to be unaffected by any routine SSES releases must be monitored (6G1, 8G1).

Airborne particulates were collected on glass fiber filters using low volume (typically 2.0 to 2.5 cfm sampling rates) air samplers that run continuously. Air iodine samples were collected on charcoal cartridges, placed downstream of the particulate filters.

Particulate filters and charcoal cartridges were exchanged weekly at the air monitoring sites. Sampling times were recorded on elapsed-time meters. Air sample volumes for particulate filters and charcoal cartridges were measured with dry-gas meters.

Air filters were analyzed weekly for gross beta activity, then composited quarterly and analyzed for the activities of gamma-emitting radionuclides. The charcoal cartridges were analyzed weekly for iodine-131.

Monitoring Results

Air Particulates

Refer to the following for results of air particulate analyses for 2010:

- Figure 12 trends gross beta activities separately for air particulate indicator and control locations from 1974 through 2010.
- Appendix G, Table G shows a summary of the 2010 air particulate data.
- Appendix H, Tables H 13 and 14 show comparisons of gross beta and Beryllium-7 monitoring results against past years' data.
- Appendix I, Table I-8, shows specific sample results of gross beta analyses for air particulate filters.

Air Particulate Gross Beta

Weekly samples from all air particulate filter locations were analyzed for concentrations of gross beta activity (Table I-8). Gross beta activity was observed at all locations above MDC for 2010. The 2010 indicator values ranged from 3.54E-3 to 28.3E-3 pCi/m^3, compared to 5.69E-3 to 24.7E-3 pCi/m^3 for 2009. The 2010 mean gross beta activity of 13.5E-3 pCi/m^3 for all indicator locations compared to the average of the annual preoperational control mean of 62E-3 pCi/m^3 indicates activity detected below the preoperational control. In addition, a comparison of the 2010 indicator mean of 13.5E-3 pCi/m^3 with the 2010 control locations mean of 12.7E-3 pCi/m^3 indicates no appreciable effects from the operation of SSES.

Gross beta activity is normally measured at levels in excess of the analysis MDCs on the fiber filters. The highest gross beta activity levels that have been measured during the operational period of the SSES were obtained in 1986 following the Chernobyl accident in the former Soviet Union.

Note that prior to SSES operation, before 1982, the unusually high gross beta activities were generally attributable to fallout from atmospheric nuclear weapons tests. Typical gross beta activities measured on air particulate filters are the result of naturally occurring radionuclides associated with dust particles suspended in the sampled air. They are thus terrestrial in origin.

The SSES Technical Requirements Manual requires radionuclide analysis if any weekly gross beta result was greater than ten times the most recent years annual mean gross beta value for all air particulate sample control locations. This condition did not occur during 2010.

Air Particulate Gamma Spectroscopic

Quarterly gamma spectroscopic measurements of composited filters often show the naturally occurring radionuclide beryllium-7. Occasionally, other naturally occurring radionuclides, potassium-40, radium-226, actinium-228, and thorium-228 are also observed. Beryllium-7 is cosmogenic in origin, being produced by the interaction of cosmic radiation with the earth's atmosphere. The other four gamma-emitting radionuclides originate from soil and rock.

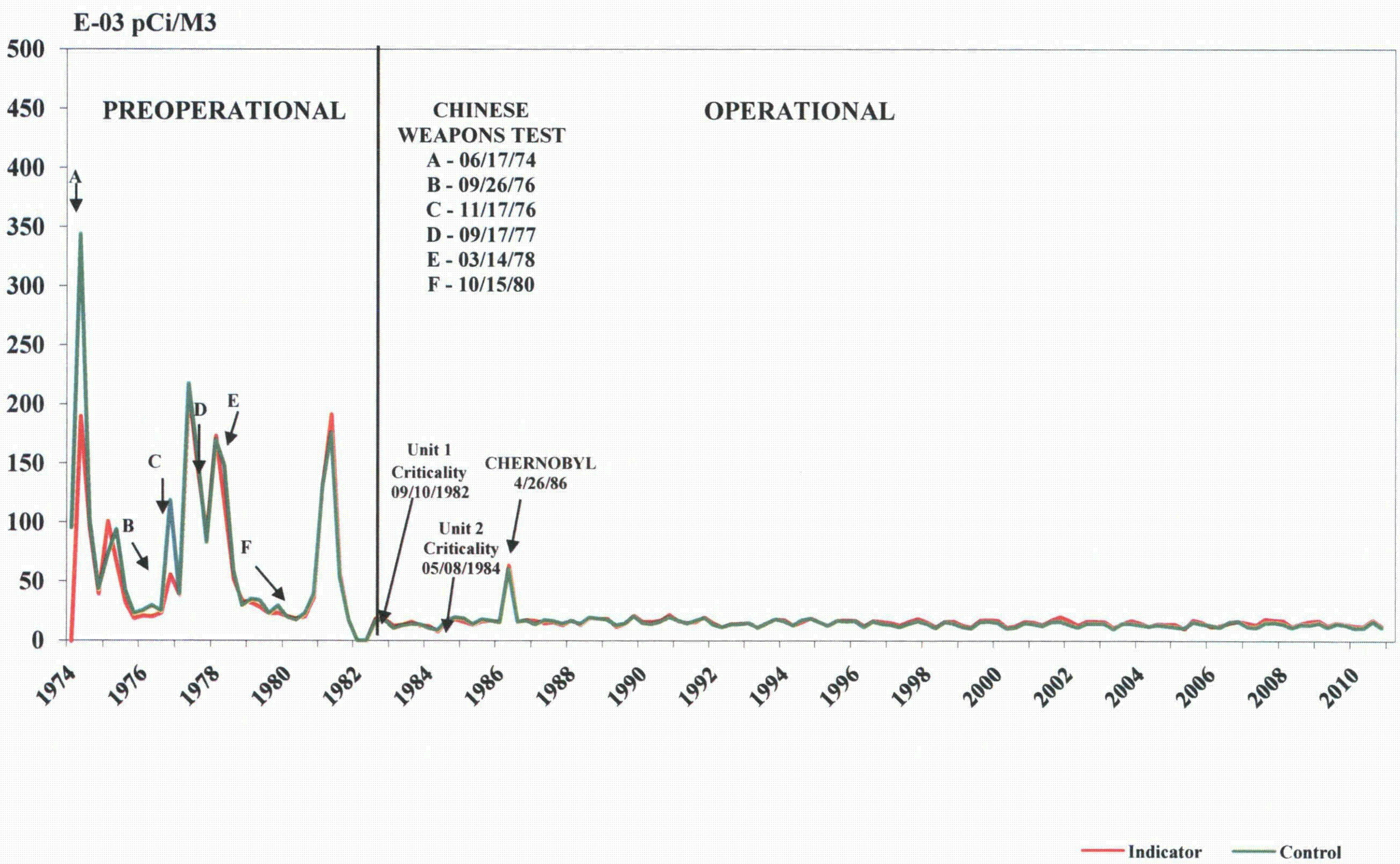
Beryllium-7 was measured above analysis MDCs for all quarterly composite samples in 2010. The 2010 indicator and control means for beryllium-7 activity were 128E-3 and 130E-3 pCi/m^3, respectively. Beryllium-7 activity levels for each 2010 calendar quarter at each monitoring location are presented in Table I-9 of Appendix I. Comparisons of 2010 beryllium-7 analysis results with previous years may be found in Table H 14 of Appendix H.

No other gamma-emitting radionuclides were reported for air in 2010. Beryllium-7 is not attributable to SSES operation.

Air Iodine

Iodine-131 has been detected infrequently from 1976, when it was first monitored, through 2010. Since operation of the SSES began in 1982, iodine-131 has only been positively detected in air samples in 1986 due to the Chernobyl accident. No iodine-131 was reported for the 2010 air monitoring results.

FIGURE 12 - GROSS BETA ACTIVITY IN AIR PARTICULATES



TERRESTRIAL PATHWAY MONITORING

INTRODUCTION

Soil and milk were monitored in the Terrestrial Pathway in 2010.

Soil can be a great accumulator of man-made radionuclides that enter it. The extent of the accumulation in the soil depends of course on the amount of the radionuclides reaching it, but it also depends on the chemical nature of those radionuclides and the particular characteristics of the soil. For example, the element cesium, and, therefore, cesium-137 can be bound very tightly to clay in soils. The amount of clay in soil can vary greatly from one location to another. In clay soils, cesium-137 may move very slowly and also may be taken up very slowly in plants as they absorb soil moisture.

Any medium, such as soil, that tends to accumulate radioactive materials can also provide more sensitivity for radionuclide detection in the environment than those media that don't. Such a medium facilitates the early identification of radionuclides in the environment, as well as awareness of changes that subsequently may occur in the environmental levels of the identified radionuclides.

The SSES REMP samples soil near two of the six REMP air-sampling stations. The purpose for soil sampling near the air sampling sites is to make it easier to correlate air sampling results with soil sampling results if any SSES related radioactive material were found in either medium. Sampling is performed at different depths near the surface to help provide information on how recently certain radioactive materials may have entered the soil. Sampling at more than one depth also may help ensure the detection of materials that move relatively quickly through the soil. Such quick-moving materials may have already passed through the topmost layer of soil at the time of sampling.

Milk was sampled at four locations in 2010. SSES Technical Requirements require that the SSES REMP sample milk at the three most sensitive monitoring locations near the SSES and one control location distant from the SSES.

No requirement exists for the SSES REMP to monitor soil. All monitoring of the terrestrial pathway that is conducted by the SSES REMP in addition to milk (and broad leaf vegetation in certain cases when milk sampling not performed) is voluntary and reflects PPL's willingness to exceed regulatory requirements to ensure that the public and the environment are protected.

Scope

Soil

Soil was sampled in September 2010 in accordance with its scheduled annual sampling frequency, at the following two REMP air sampling locations: 12S1 (indicator) and 8G1 (control).

Several soil plugs were taken at selected spots at each monitoring location. The plugs were separated into "top" (0-2 inches) and "bottom" (2-6 inches) segments. Each set of top and bottom segments was composited to yield 2 soil samples from each location for analysis. Since there are two monitoring locations, a total of 4 soil samples were analyzed in 2010.

Milk

Milk was sampled at least monthly at the following locations in 2010: 5E2, 10D3 13E3 and 10G1.

Milk was sampled bi-weekly from April through October when cows were more likely to be on pasture and monthly at other times. Locations 5E2, 10D3, and 13E3 are believed to be the most sensitive indicator sites available for the detection of radionuclides released from the SSES. Location 10G1 is the control location.

Sample Preservation and Analysis

All media in the terrestrial pathway are analyzed for the activities of gamma-emitting radionuclides using gamma spectroscopy. The other analysis that is routinely performed is the radiochemical analysis for iodine-131 in milk.

Monitoring Results

Refer to the following for results of the terrestrial pathway analyses for 2010:

- Figure 13 trends iodine-131 activities separately for milk
- Appendix G, Table G, shows a summary of the 2010 terrestrial monitoring results for milk and soil.
- Appendix H, Tables H-15 through H-19, shows comparisons of terrestrial pathway monitoring results against past years' data.
- Appendix I, Tables I-10 and I-11, shows results of specific sample analyses for terrestrial pathway media.

The only man-made radionuclides normally expected at levels in excess of analysis MDCs in the terrestrial pathway are strontium-90 and cesium-137. Both of these radionuclides are present in the environment as a residual from previous atmospheric nuclear weapons testing. Strontium-90 analyses are not routinely performed for any media samples in the terrestrial pathway. Strontium-90 activity would be expected to be found in milk. SSES Technical Requirements do not require that milk be analyzed for strontium-90. Strontium-90 analyses may be performed at any time if the results of other milk analyses would show detectable levels of fission product activity, such as I-131, which might suggest the SSES as the source.

Cesium-137 normally has been measured in excess of analysis MDCs in most soil samples.

Certain naturally occurring radionuclides are also routinely found above anaylsis MDCs. Potassium-40, a primordial and very long-lived radionuclide, which is terrestrial in origin, is observed in all terrestrial pathway media. Other naturally occurring radionuclides often observed in soil are thorium-228 and radium-226.

Soil

Annual samples from the 12S1 and 8G1 soil locations were analyzed for concentrations of gamma emitting nuclides (Table I-11). The following gamma-emitting radionuclides are routinely measured in soil at levels exceeding analysis MDCs: naturally occurring potassium-40, radium-226, actinium-228, thorium-228 and man-made cesium-137. The 2010 analysis results were similar to those for previous years. No other gamma-emitting radionuclides were reported at levels above analysis MDCs.

The 2010 means for indicator and control location potassium-40 activity were 10,700 pCi/kg and 10,300 pCi/kg, respectively. This is not the result of SSES operation because the potassium-40 is naturally occurring.

The 2010 means for indicator and control location radium-226 activity were 1,470 pCi/kg and 2,070 pCi/kg, respectively. Radium-226 in soil is not the result of SSES operation because it is naturally occurring.

The 2010 means for indicator and control actinium-228 activity were 743 pCi/kg and 852 pCi/kg, respectively.

The 2010 means for indicator and control location thorium-228 activity were 804 pCi/kg and 929 pCi/kg, respectively. Thorium-228 in soil is not the result of SSES operation because it is naturally occurring.

The 2010 means for indicator and control location cesium-137 activity were 131 pCi/kg and 146 pCi/kg, respectively. The 2010 indicator values ranged from 109 to 153 pCi/kg, compared to 78 to 369 pCi/kg for 2009. Cesium-137 was observed in preoperational control samples at 200 to 1200 pCi/kg as well as prior operational years in the 70 to 1200 pCi/kg range. The measured activities of cesium-137 were also detected in previous years at expected levels due to residual fall out from past atmospheric weapons testing and the Chernobyl event. As a general rule, it takes approximately ten half lives for a radionuclide to decay to non-detectable levels. Cesium-137 with its 30 year half life (300 years to decay to non-detectable) would still be present in samples in 2010. Cesium-137 in soil, although man-made, is not from Susquehanna station operations.

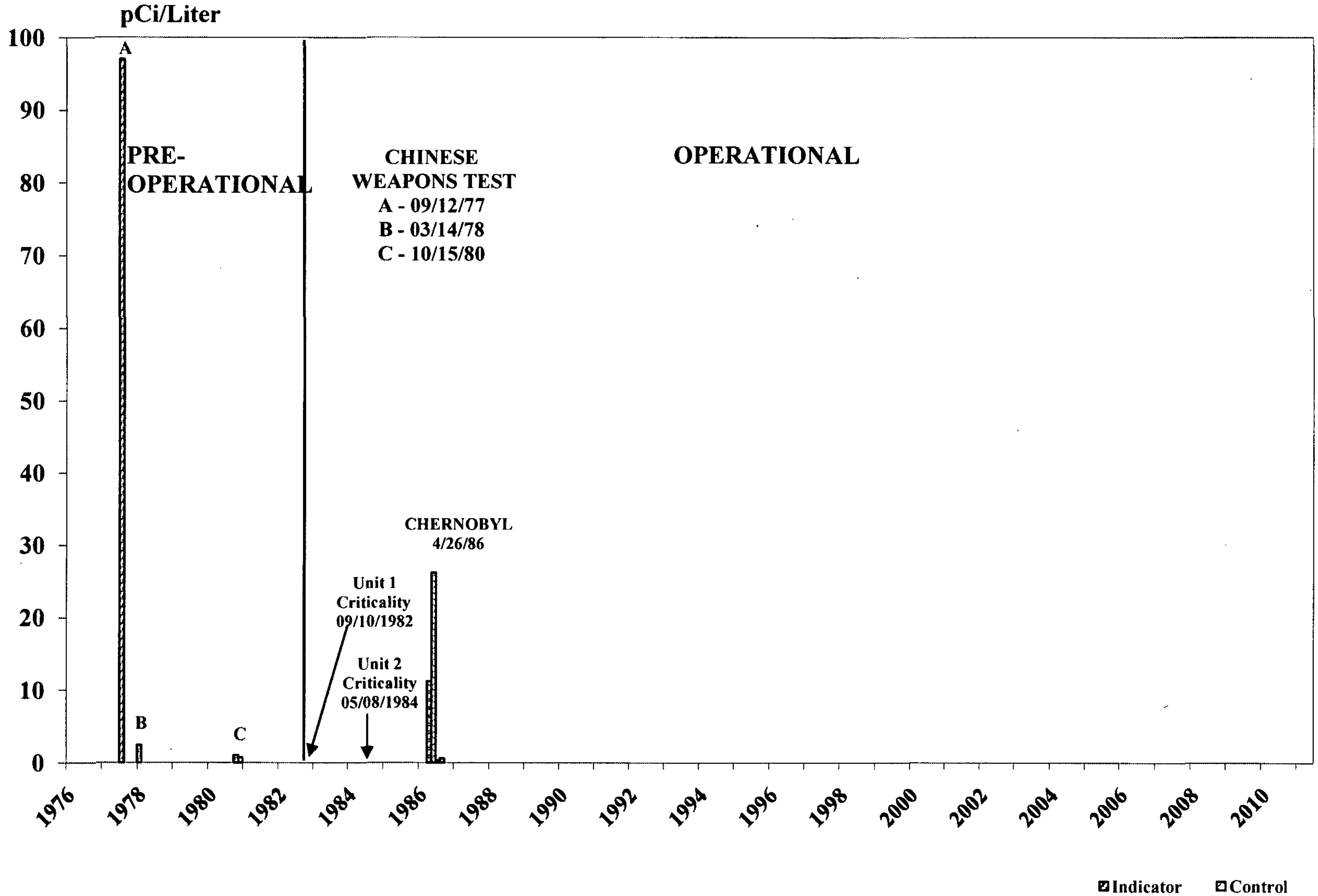
Milk

Semi-monthly or monthly samples from all milk locations were analyzed for concentrations of iodine-131 and other gamma-emitting nuclide activity (Table I-10). No detectable iodine-131 activity above MDC was observed at any location for 2010. The 2010 indicator values ranged from -0.39 to 0.97 pCi/l, compared to -0.51 to 0.52 pCi/l for 2009. Iodine-131 has been chemically separated in milk samples and counted routinely since 1977. Refer to Figure 13 which trends iodine-131 activity in milk for indicator and control locations from 1977 through 2010.

The preoperational years 1976, 1978, and 1980 were exceptional years in the sense that iodine-131 activity was observed in excess of MDCs due to fallout from atmospheric nuclear weapons testing. Iodine-131 activity was also measured at levels exceeding MDCs in milk samples in 1986 in the vicinity of the SSES as a result of the Chernobyl incident.

With the exception of the naturally occurring potassium-40, and thorium-228 no gamma-emitting radionuclides were measured in excess of analysis MDCs in 2010. The 2010 means for indicator and control location potassium-40 activity were 1,300 pCi/liter and 1,310 pCi/liter, respectively. The potassium-40 activity in milk is not attributable to SSES operation because it is naturally occurring.

FIGURE 13 - IODINE-131 ACTIVITY IN MILK



GROUND WATER MONITORING

INTRODUCTION

Normal operation of the SSES does not involve the release of radioactive material to ground water directly, or indirectly through the ground. As a result, there are no effluent monitoring data to compare with REMP ground water monitoring results. Ground water could conceivably become contaminated by leakage or spills from the plant or by the washout or deposition of radioactive material that might be airborne. If deposited on the ground, precipitation/soil moisture could aid in the movement of radioactive materials through the ground to water that could conceivably be pumped for drinking purposes. No use of ground water for irrigation near the SSES has been identified.

Primary release paths for recent groundwater contamination events at other nuclear facilities have been: 1) spent fuel pool leakage; 2) leaks from liquid radwaste discharge lines and; 3) leaks from cooling tower blowdown lines. The physical location of the spent fuel pools at Susquehanna and the fuel pool leakage collection system make it highly unlikely that the fuel pools would be a radiological contamination source for groundwater. Leaks from the liquid radwaste discharge line or the cooling tower blowdown line could impact ground water, but to date, there has been no indication of any radiological impacts on groundwater due to station operations.

Scope

Ground water in the SSES vicinity was sampled 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) during 2010.

With the exception of locations 4S4 and 12F3, untreated ground water was sampled. Untreated means that the water has not undergone any processing such as filtration, chlorination, or softening. At location 4S4, the SSES Learning Center, well water actually is obtained from on-site and piped to the Learning Center after treatment. This treatment would not affect tritium analysis. This sampling is performed as a check to ensure that water has not been radioactively contaminated. Sampling is performed at the Learning Center to facilitate the sample collection process.

Sample Preservation & Analysis

Ground water samples were analyzed for gamma-emitting radionuclide and tritium activities. Gamma spectrometric analyses of ground water began in 1979 and tritium analyses in 1972, both prior to SSES operation.

Monitoring Results

Gamma-emitting radionuclides in excess of MDCs have been found in only a few samples in all the years that these analyses have been performed. The naturally occurring radionuclides potassium-40, thorium-228 and actinium-228 have been measured above their MDCs occasionally in ground water. Thorium-228 was found in 1985 and 1986. The man-made radionuclide cesium-137 has been detected only occasionally since 1979. Its presence has always been attributed to residual fallout from previous atmospheric nuclear weapons tests.

Results for the 2010 specific ground water sample analyses may be found in Table I-7 of Appendix I. A summary of the 2010 ground water monitoring data may be located in Appendix G. Comparisons of 2010 monitoring results for tritium with those of past years may be found in Table H 20 of Appendix H.

In 2010, tritium was measured above MDC, in twenty-five samples at indicator locations 13S7, 1S3, 4S8, 4S9, 8S4, 7S10, 13S7 and 6S11A. The activities were slightly above the detection limit. The 2010 indicator values ranged from -76.9 to 281 pCi/l, compared to -131 to 300 pCi/l for 2009. The 2010 mean tritium activity levels for indicator and control monitoring locations were 96.2 and -1.95 pCi/l, respectively.

The only REMP monitored pathway where tritium has been identified as a result of station operations is in the surface water pathway (Susquehanna River) downstream of the site and at some groundwater monitoring locations (perimeter drains, 1S3, 4S8, 4S9, 8S4, 7S10, 13S7, 6S11A and 6S12) due to precipitation washout from routine airborne effluent releases.

Monitoring Wells and Precipitation

An expanded groundwater-monitoring network was initiated in 2006 for the Station 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 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 tritium and gamma activity. Additionally, precipitation sampling was initiated in 2007 and collected monthly and analyzed for tritium activity to assess the influence of station airborne tritium emissions on groundwater tritium activities.

Precipitation washout monitoring data is not used in dose calculations; however, the data does give a gross indication of tritium concentrations which makes its way into surface water and soil where it eventually seeps into shallow groundwater. The average annual tritium concentrations in precipitation, perimeter drain manholes, groundwater monitoring wells, and surface water results are detailed below in Table GW 1 and graphically in Figure 14.

Table GW 1 – 2007, 2008, 2009 and 2010 Annual Average Tritium Concentration (pCi/l) in Precipitation, Perimeter Drain, Monitoring Wells and LTAW Surface Water

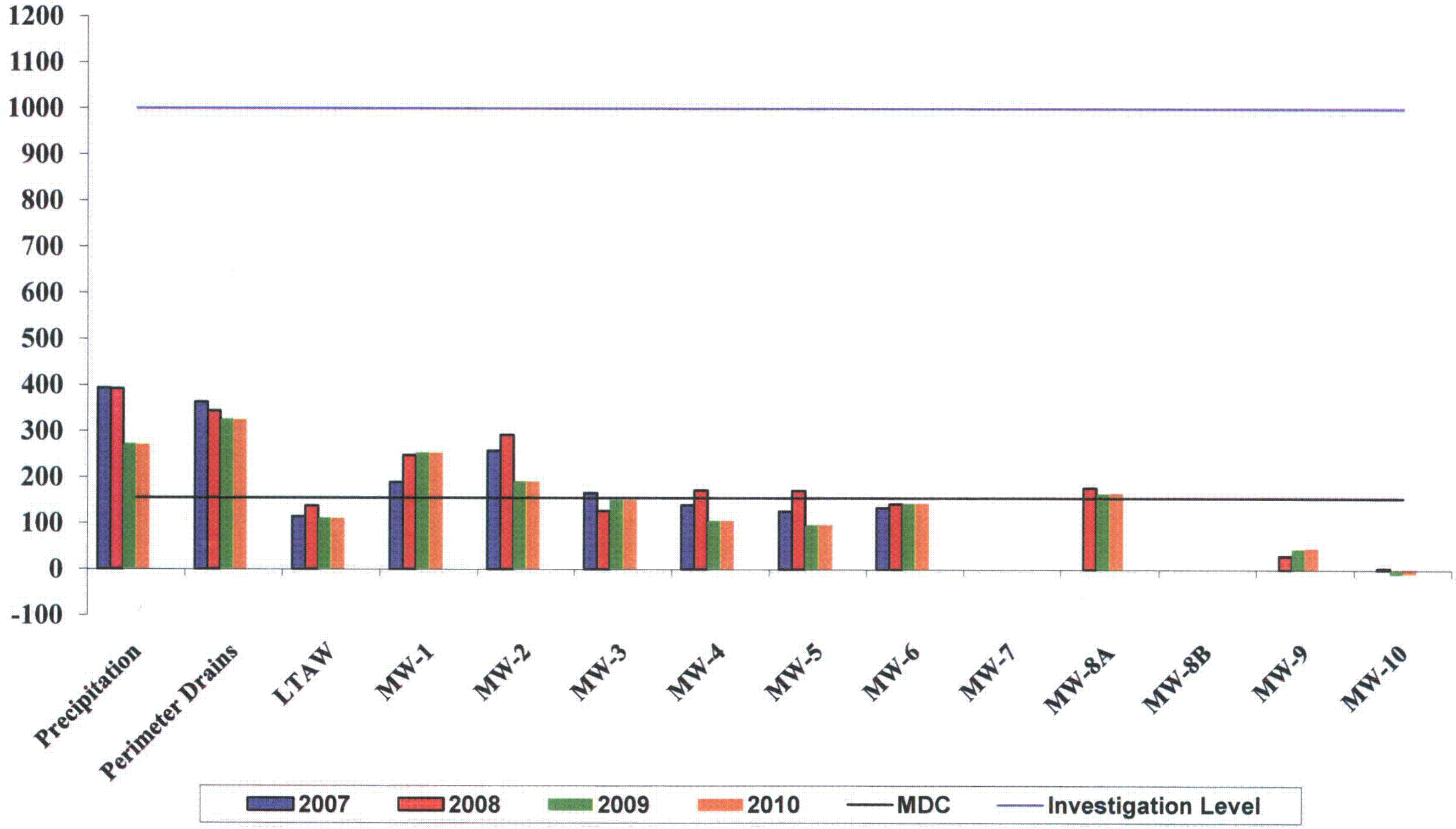
Site	2007	2008	2009	2010
Precip Sites 3S2,12S1,8G1 (off-site, controls)	59*	62*	49	40
Precip Sites 1 and 2 (on-site, East of Station Reactor Buildings)	370	370	230*	193
Precip Sites 3 and 4 (on-site, West of Station Reactor Buildings)	416	414	404*	350
Perimeter Drain manholes (below grade, 28')	363	344	304	325
1S3 - MW-1 (43')	189	248	150	252
4S8 - MW-2 (45')	257	292	154	190
4S9 - MW-3 (94')	166	127	54	150
8S4 - MW-4 (111')	140	172	66	105
7S10 - MW-5 (36')	126	171	69	96
13S7 - MW-6 (16')	134	142	134	143
2S8 - MW-7 (not installed)	N/A (not installed)	N/A (not installed)	N/A (not installed)	N/A (not installed)
6S11A - MW-8A (14')	N/A (not installed)	177	82	165
MW-8B (19')	N/A (not installed)	N/A (well dry)	N/A (well dry)	N/A (well dry)
6S12 - MW-9 (28')	N/A (not installed)	30	-44	45
7S11 - MW-10 (132')	N/A (not installed)	3	-27	-9
12F3 – Groundwater Control (5.2 miles from Site)	28	26	-53	-2
LTAW: Surface Water	174	179	104	110

*Revised values to reflect full scope of precipitation data.

Precipitation will invariably become groundwater via infiltration through soil and into groundwater. The highest average tritium concentration in precipitation on-site was 350 pCi/l from Sites 3 and 4 located on the west side of the station reactor buildings. In 2010, the tritium in rainwater samples ranged from -54.8 to 1070 pCi/l compared to 28 to 1350 pCi/l in 2009. Liquid is not always present in the collection devices during dry months, thus quarterly and annual tritium averages are generally only representative of wetter months. The decreasing trend in tritium in the perimeter drain system parallels the decrease in tritium in precipitation seen in Figure 14.

The perimeter foundation drain system is below grade (approximately 28 feet) and serves to reduce hydrostatic pressure from groundwater on the building structures. Precipitation and storm water runoff may also enter these drains via infiltration. Groundwater results from the perimeter drains and monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-10, MW-6, MW-8A) have tritium concentrations that are slightly above MDC. The source of the tritium at these locations can be attributed to precipitation washout of tritium from routine airborne effluent releases. Its evident that elevated tritium levels found within sub-surface groundwater in close proximity to the station is influenced by station airborne emissions and tritiated precipitation washout. The impact of the station tritium emissions on groundwater activities is dependent on the distance from the station, groundwater depth and general dispersion conditions around the station. The pre-operational groundwater background (12F3 control) from 1980-81 was approximately 120 pCi/l and is located 5.2 miles WSW of the Susquehanna site.

FIGURE 14 - ANNUAL AVERAGE TRITIUM CONCENTRATION (pCi/l) IN PRECIPITATION, PERIMETER DRAIN, SURFACE WATER VERSUS GROUND WATER



REFERENCES

1. Pennsylvania Power and Light Company, "Susquehanna Steam Electric Station, Environmental Report, Operating License Stage," May 1978.

2. Pennsylvania Power and Light Company, "Susquehanna Steam Electric Station, Final Safety Analysis Report".

3. United States Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, "Final Environmental Statement Related to the Operation of Susquehanna Steam Electric Station, Units 1 and 2," Docket Nos. 50-387 and 50-388, June 1981.

4. United States Nuclear Regulatory Commission, "An Acceptable Radiological Environmental Monitoring Program," Radiological Assessment Branch Technical Position, November 1979, Revision 1.

5. National Council on Radiation Protection and Measurements, "Environmental Radiation Measurement," NCRP Report No. 50, Washington, D.C., December 27, 1976.

6. Oakley, D.C., "Natural Radiation Exposure in the United States," ORP/SID 72-1 Office of Radiation Programs, U.S. Environmental Protection Agency, Washington, D.C., June 1972.

7. Denham, D.H., Roberts, M.C., Novitsky, W.M., Testa, E.D., "Investigation of Elevated Cesium-137 Concentrations in Small Game in Luzerne County, Pennsylvania." Proceedings of Papers presented at Health Physics Society Tenth Midyear Topical Symposium, October 11-13, 1976, pgs. 271-279.

8. Currie L.A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007, September 1984.

9. PPL, "Susquehanna Steam Electric Station, 2009 Annual Radiological Environmental Operating Report," April 2010.

10. PPL, "Susquehanna Steam Electric Station, Radioactive Effluent Release Report," Data Period: January – December 2010, April 2011.

11. Ecology III, "Susquehanna Steam Electric Station, 2010 Land Use Census," (November 2010).

12. PPL, "Engineering Study, EC-ENVR-1012 (Revision 1, January 2009)," Interpretation of Environmental TLD Results.

13. PPL, Tritium Release REMP Calculation (RETDAS V.3.6.6) – December 2010.

14. NCRP Report No. 160, "Ionizing Radiation Exposure of the Population of the United States " (2009).

APPENDIX A

2010 REMP SAMPLE COLLECTION, ANALYSIS TYPE, ANALYTICAL METHODS, PROGRAM CHANGES AND EXCEPTIONS

REMP Sample Collection, Analyses and Methods

An independent consulting group, Ecology III, working at Susquehanna's Environmental Laboratory, located approximately ¾ miles east of the SSES, collects and prepares the samples (except for TLD's which are handled by HP). Samples are brought to the laboratory, stored, and shipped to an outside independent analytical laboratory. The following table summarizes the REMP sample collection/analyses performed by Teledyne Brown Engineering, the independent radioanalytical laboratory for 2010. Note that TBE represents Teledyne Brown Engineering and E-III represents Ecology III, Inc.

TABLE A1
(Page 1 of 2)

SOURCE OF REMP DATA FOR MONITORING YEAR 2010				
Sample Medium	**Analysis**	**Analysis Frequency**	**Collection Procedure Number**	**Analytical Procedure Number**
Ambient Radiation	TLD	Quarterly	SSES, HP-TP-205	SSES,HP-TP-159 & 190
Air	Gross Beta	Weekly	E-III, Appendix 2	TBE-2008 Gross Alpha and/or 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 Beta Activity in Various Matrices
All Waters	Tritium	Monthly (LTAW, 4S7, 5S12, 7S12 and Groundwater Quarterly)	E-III, Appendix 3, 4, 5, 6, 7 & 8	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

TABLE A1
(Page 2 of 2)

Sample Medium	Analysis	Analysis Frequency	Collection Procedure Number	Analytical Procedure Number
Ground Water	Gamma	Quarterly	E-III, Appendix 8	TBE-2007 Gamma Emitting Radioisotope Analysis
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 irrigated)	E-III, Appendix 13	TBE-2007 gamma Emitting Radioisotope Analysis
Soil	Gamma	Annually	E-III, Appendix 14	TBE-2007 Gamma Emitting Radioisotope Analysis

PROGRAM CHANGES:

Updated U.S Population Exposure from all sources of ionizing radiation

NCRP Report No. 160 published in 2009, revised its assessment of radiation exposure to the general public. The average American's dose has increased from 360 mrem/yr in 1986 to 620 mrem/yr, due to increase in medical exposure over the past two decades. Dose from natural sources of radiation account for approximately 300 mrem/yr, compared to less than 1 mrem/yr from nuclear power.

Direct Radiation Monitoring

No changes in 2010.

Air Monitoring

No changes in 2010.

Surface Water and Drinking Water Monitoring

Drinking water pathway dose was less than 1 mrem/year for each month of the quarter for 2010. Based on dose, the bi-weekly composite I-131 analysis was not required. Therefore Table I-3 "Iodine-131 Analyses of Surface Water" in Appendix I of this report was intentionally left blank.

Milk

No changes in 2010.

Ground Water Monitoring

New monitoring well 2S8 (MW-7) was installed in fall of 2010 and will be sampled beginning in 2011 on a quarterly basis.

Fruits & Vegetables

Two farms irrigated crops using Susquehanna River water downriver from Susquehanna in 2010. The Zehner Farm (11D1, 3.3 miles SW – pumpkin and soybean) and Lupini Farm – Mifflinville Field (12F7, 8.3 miles WSW – potato, greenbeans and field corn).

Soil Monitoring

No changes in 2010.

Sediment Monitoring

No changes in 2010.

Fish Monitoring

No changes in 2010.

Precipitation Monitoring

Precipitation sampling is not required per the Susquehanna Off Site Dose Calculation Manual (ODCM) however rainwater is being sampled and analyzed for tritium for purposes of trending and evaluation of tritium washout from station airborne routine effluent releases.

PROGRAM EXCEPTIONS

The following are sampling and analysis exceptions for 2010.

TABLE A2
TRM SAMPLING DEVIATIONS
(Page 1 of 2)

Sample Type	Date	Location	Explanation
Air (Particulate & Iodine)	May	12S1	Due to an electrical storm and momentary loss of 12kV power, air monitoring stations 12S1 was inoperative for approximately 2 seconds on 5/29/2010. No corrective action needed. Air monitor restarted when power restored. Required sample volume collected and operability verified during routine sample collection. Actions to prevent recurrence are not applicable.
	June	12S1	Power outage for approximately 5.6 hours due to loss of 12 kV power during storm on 6/6/2010. No corrective action needed. Air monitor restarted when power restored. Required sample volume collected and operability verified during routine sample collection. Actions to prevent recurrence are not applicable.
	September	12S1	Power outage less than 6 minutes due to loss of 12 kV power during storm on 9/22/2010. No corrective action needed. Air monitor restarted when power restored. Required sample volume collected and operability verified during routine sample collection. Actions to prevent recurrence are not applicable.
	November	3S2	Power outage for approximately 3.5 hours on 12/1/2010. No corrective action needed. Air monitor restarted when power restored. Required sample volume collected and operability verified during routine sample collection. Actions to prevent recurrence are not applicable.
	November	12S1	Timer box reading showed 0.6 hours difference from run time indicating a power interruption – reason unkown. No corrective action needed. Air monitor restarted when power restored. Required sample volume collected and operability verified during routine sample collection. Actions to prevent recurrence are not applicable.

TABLE A2 (Page 2 of 2)			
Sample Type	**Date**	**Location**	**Explanation**
Ambient Radiation	1Q 10	15F1	TLD 15F1 located in the NW sector at 5.4 miles from the site was found missing during the exchange of the first quarter 2010 TLD period. Corrective actions were initiated with placement of a new TLD at 15F1 for the second quarter of 2010. Occasional vandalism is unavoidable. Actions to prevent recurrence are not practical.
Surface Water	October	2S7	2S7 composite sampler on 10/28/2010 tracked per record 0-TR-10-0281 due to both Units blowdown flow being isolated. Sampler remained functional during this period. The required sample volume was collected and sampler operation verified during routine sample collection. Actions to prevent recurrence are not applicable.
Surface Water	November	2S7	2S7 composite sampler on 11/16/2010 tracked per record 0-TR-0297 due to both Units blowdown flow being isolated. Sampler remains functional during the period. The required sample volume was collected and sampler operation verified during routine sample collections. Actions to prevent recurrence are not applicable

TABLE A3
(Page 1 of 2)

NON-TRM SAMPLING OCCURRENCES

Sample Type	Date	Location	Explanation
Surface Water	June		Composite water sampler (located in blowdown line) was not restarted after calibration on 6/29/2010 due to human error. Grab sample collected at 0911 hours to represent week 4, June composite. Sampler was reset and restored to operation at 0914 hours. Operability verified. Corrective action taken – training held to discuss corrective action. Peer checking between sample collectors would prevent recurrence.

TABLE A3 (Page 2 of 2)			
Air (Particulate & Iodine)	June	8G1	Power outage for 24 hours from 6/28/10 to 6/29/10 due to yard lighting circuit breaker trip at Humboldt facility. Backup sampler 6G1 was operable and used to satisfy the TRM requirements. No corrective action needed. Air monitor restarted when power restored. Required sample volume collected and operability verified during routine sample collection. Actions to prevent recurrence are not applicable.
Ambient Radiation	1Q10	9B1	TLD 9B1 located in the South sector at 1.3 miles from the site was found missing during the exchange of the first quarter 2010 TLD period. 9B1 is a backup TLD for the required 9S2 TLD location in the S sector. 9S2 was collected and analyzed. Occasional vandalism is unavoidable. Actions to prevent recurrence are not practical.

In 2010 the SSES REMP overall performance was as follows:

Sample Collection and Analysis

1081 of 1081 samples were collected for 100 % sample collection recovery.

1370 of 1370 analyses were performed for 100 % analysis data recovery.

	# of Samples Collected	# of Analyses
Primary	897 of 897	1133 of 1133
Replicate	39 of 39	52 of 52
Split/Duplicate	145	185
Total	1081 of 1081	1370 of 1370

TLD Direct Radiation Measurements

226 of 228 TLDs placed in the field were recovered and analyzed for 99 % data recovery.

Equipment Operability Trending

Table A4 below depicts trending of REMP continuous air and automatic water composite sampling equipment operability on a year by year basis. Each discrepancy was reviewed to understand the causes of the program exception. It should be noted that deviations from continuous sampling are permitted for routine maintenance or equipment malfunctions for periods not to exceed 4 hours. Occasional equipment power outages/breakdowns were unavoidable.

Table A4
EQUIPMENT OPERABILITY TRENDING
(Page 1 of 1)

Sampling Medium	**Sample Location**	**Description**	Percent (%) Operability		
			2008	2009	2010
Air Particulate & Charcoal	3S2	SSES Backup Met. Tower	99.9	97.8	99.9
	12S1	West Building	99.9	95.5	99.9
	13S6	Former Laydown Area, West of Confers Lane	99.9	100	100
	12E1	Berwick Hospital	99.9	96.2	100
	6G1	Freeland Substation	100	99.2	100
Air Particulate & Charcoal	8G1	PPL Sys. Facilities Cntr, Humbolt Industrial Park	99.9	100	99.7
Drinking Water	12H2	Danville Water Company	100	100	100
Surface Water	2S7	Cooling Tower Blowdown Discharge Line	96	97.5	98
	6S6	River Water Intake Line	87	77.5	100

APPENDIX B

2010 REMP MONITORING SCHEDULE
(SAMPLING AND ANALYSIS)

TABLE B1
(Page 1 of 2)

Annual Analytical Schedule for the PPL Susquehanna Steam Electric Station Radiological Environmental Monitoring Program – 2010

Media	No. of Locations	Sample Freq.(a)	Analyses Required	Analysis Freq. (a)
Airborne Particulates	6	W	Gross Beta (b)	W
		QC	Gamma Spectrometry	Q
Airborne Iodine	6	W	I-131	W
Sediment	3	SA	Gamma Spectrometry	SA
Fish	2	SA	Gamma Spectrometry	SA
	1	A	(on edible portion)	A
Surface Water (c)	7	W for MC	Gamma Spectrometry	M, Q LTAW/4S7/5S12/7S12
			Tritium	M, Q LTAW/4S7/5S12/7S12
Ground Water (Well)	15	Q	Gamma Spectrometry	Q
			Tritium	Q
Drinking Water (d)	1	W for MC	Gross Beta	M
			Gamma Spectrometry	M
			Tritium	M
Cow Milk	4(e)	M, BW(e)	I-131	M, BW
			Gamma Spectrometry	M, BW
Food Products (f)	2	A	Gamma Spectrometry	A
Soil	2	A	Gamma Spectrometry	A
Direct Radiation	57	Q	TLD	Q

(a) W = weekly, BW = bi-weekly, M = monthly, SM = semi-monthly, Q = quarterly, QC = quarterly composite , SA = semi-annually, A = annually, MC = monthly composite.

(b) If the gross beta activity were greater than 10 times the yearly mean of the control sample, gamma analysis would be performed on the individual filter. Gross beta analysis performed 24 hours or more following filter change to allow for radon and thorium daughter decay.

(c) Locations 6S6 and 2S7 are automatic composite samplers and time-proportional sampling was performed at these locations the entire year. Samples are collected weekly for monthly composite samples. Location 6S5 is a sample from the Susquehanna River downriver of the SSES discharge diffuser. Station 6S5 was grab sampled weekly. Locations 4S7, 5S12, 7S12, and LTAW were grab sampled quarterly.

(d) Water from location 12H2 was retrieved weekly. Composite samples of the weekly collections at this location were made monthly (MC) for analysis. Sampling at 12H2 was performed using an automatic composite sampler (ACS) that was operated in the time-proportional mode.

(e) Locations 5E2, 10D3, 10G1, and 13E3 were sampled bi-weekly from April through October when cows are on pasture, monthly otherwise.

(f) Zehner Farm (11D1) grew pumpkins and soy beans and Lupini Farm – Mifflinville Field (12F7) grew potatoes, green beans, and field corn irrigated with Susquehanna River water taken downstream of the SSES. No other fields were identified using river water downstream of the SSES in 2010.

APPENDIX C

2010
REMP MONITORING LOCATION DESCRIPTIONS

TABLE C 1
(Page 1 of 5)

TLD Locations for the SSES Radiological Environmental Monitoring Program – 2010

Less Than One Mile from the SSES - See Figure 2

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
1S2	0.2	N (41.09566° / -76.146121°)	Perimeter Fence
2S2	0.9	NNE (41.10207° / -76.141192°)	Thomas Road
2S3	0.2	NNE (41.09486° / -76.144101°)	Perimeter Fence
3S2	0.5	NE (41.09574° / -76.140086°)	SSES Backup Met Tower
3S3	0.9	NE (41.10183° / -76.133127°)	Riverlands Garden (Abandoned)
4S3	0.2	ENE (41.09322° / -76.141934°)	Post, West of SSES APF
4S6	0.7	ENE (41.09687° / -76.133807°)	Riverlands
5S4	0.8	E (41.09286° / -76.131604°)	West of Environmental Laboratory
5S7	0.3	E (41.09199° / -76.141165°)	Perimeter Fence
6S4	0.2	ESE (41.09132° / -76.142616°)	Perimeter Fence (north)
6S9	0.2	ESE (41.09067° / -76.142966°)	Perimeter Fence (south)
7S6	0.2	SE (41.0898° / -76.143449°)	Perimeter Fence
7S7	0.4	SE (41.08745° / -76.142033°)	End of Kline's Road
8S2	0.2	SSE (41.08903° / -76.144467°)	Perimeter Fence
9S2	0.2	S (41.08946° / -76.146454°)	Security Fence
10S1	0.4	SSW (41.08663° / -76.150082°)	Post - south of switching station
10S2	0.2	SSW (41.08894° / -76.147881°)	Security Fence
11S7	0.4	SW (41.08832° / -76.15297°)	SSES Access Road Gate #50
12S1	0.4	WSW (41.0887° / -76.154112°)	SSES West Building

TABLE C 1
(Page 2 of 5)

TLD Locations for the SSES
Radiological Environmental Monitoring Program – 2010

Less Than One Mile from the SSES - See Figure 2

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
12S3	0.4	WSW (41.08968° / -76.153192°)	Confer's Lane (east side)
13S2	0.4	W (41.09198° / -76.153166°)	Perimeter Fence
13S5	0.4	W (41.09179° / -76.153167°)	Perimeter Fence
13S6	0.4	W (41.09177° / -76.154073°)	Former Laydown Area - west of Confer's Lane
14S5	0.5	WNW (41.09503° / -76.153787°)	Beach Grove Road/Confer's Lane
15S5	0.4	NW (41.09576° / -76.15103°)	Perimeter Fence
16S1	0.3	NNW (41.09611° / -76.147388°)	Perimeter Fence (east)
16S2	0.3	NNW (41.09599° / -76.148922°)	Perimeter Fence (west)
6A4*	0.6	ESE (41.08791° / -76.136795°)	Restaurant (U.S. Route 11)
8A3	0.9	SSE (41.07982° / -76.139078°)	PPL Wetlands Sign (U. S. Route 11)
15A3*	0.9	NW (41.10003° / -76.1585°)	Hosler Residence
16A2*	0.8	NNW (41.1025° / -76.151595°)	Benkinney Residence

TABLE C 1
(Page 3 of 5)

TLD Locations for the SSES Radiological Environmental Monitoring Program – 2010

From One to Five Miles from the SSES - See Figure 3

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
12S7	1.1	WSW (41.08621° / -76.165914°)	Former Kisner Property
8B2*	1.4	SSE (41.07483° / -76.130724°)	Lawall Residence
9B1	1.3	S (41.07356° / -76.147874°)	Transmission Line - east of Route 11
10B3*	1.7	SSW (41.07064° / -76.156646°)	Castek Inc.
1D5	4.0	N (41.14936° / -76.144346°)	Shickshinny/Mocanaqua Sewage Treatment Plt.
8D3	4.0	SSE (41.03824° / -76.121683°)	Mowry Residence
9D4	3.6	S (41.04015° / -76.144529°)	Country Folk Store
10D1	3.0	SSW (41.05446° / -76.175026°)	R. & C. Ryman Farm
12D2	3.7	WSW (41.07363° / -76.213306°)	Dagostin Residence
14D1	3.6	WNW (41.10706° / -76.211891°)	Moore's Hill/Mingle Inn Roads Intersection
3E1	4.7	NE (41.13953° / -76.082398°)	Webb Residence - Lilly Lake
4E2	4.7	ENE (41.12157° / -76.064115°)	Ruckles Hill/Pond Hill Roads Intersection
5E2	4.5	E (41.08539° / -76.060486°)	Bloss Farm
6E1	4.7	ESE (41.07275° / -76.059529°)	St. James Church
7E1	4.2	SE (41.04891° / -76.090309°)	Harwood Transmission Line Pole #2
11E1	4.7	SW (41.05188° / -76.218713°)	Thomas Residence
12E1*	4.7	WSW (41.0725° / -76.230331°)	Berwick Hospital
13E4	4.1	W (41.08962° / -76.223726°)	Kessler Farm

TABLE C 1
(Page 4 of 5)

TLD Locations for the SSES Radiological Environmental Monitoring Program – 2010

Greater than Five Miles from the SSES - See Figure 4

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
2F1	5.9	NNE (41.16796° / -76.09146°)	St. Adalberts Cemetery
15F1	5.4	NW (41.15595° / -76.202506°)	Zawatski Farm
16F1	7.8	NNW (41.18985° / -76.229283°)	Hidlay Residence
3G4**	17	NE (41.23431° / -76.869061°)	Wilkes Barre Service Center
4G1**	14	ENE (41.13898° / -75.885121°)	Mountaintop - Crestwood Industrial Park
7G1**	14	SE (40.94636° / -75.974184°)	Hazleton PP&L Complex
12G1**	15	WSW (41.0262° / -76.411566°)	PPL Service Center, Bloomsburg
12G4**	10	WSW (41.03868° / -76.327731°)	Naus Residence

TABLE C 1
(Page 5 of 5)

TLD Locations for the SSES Radiological Environmental Monitoring Program – 2010

a) 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 locations 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	*- Special interest areas (other than controls)
	** - Control TLDs

The numbers preceding the letters in the location codes provide the directions of the monitoring locations from the SSES by indicating the sectors in which they are located. A total of 16 sectors (numbered 1 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 1 is directed due north (N). Moving clockwise from sector 1, the sector immediately adjacent to sector 1 is sector 2, the middle of which is directed due north, northeast (NNE). Continuing to move clockwise, the sector numbers increase to 16, which is the north, northwest sector.

The numbers following the letters in the location codes are used to differentiate sampling locations found in the same sectors at approximately the same distances from the SSES.

TABLE C 2
(Page 1 of 5)

Sampling Locations for the SSES Radiological Environmental Monitoring Program – 2010

Less Than One Mile from the SSES - See Figure 5

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
		SURFACE WATER	
2S7	0.1	NNE (41.093540° / - 76.144773°)	Cooling Tower Blowdown Line
5S9	0.8	E (41.093292° / -76.130472°)	Environmental Lab Boat Ramp (alternate for 6S6)
5S12	0.4	E (41.092540° / -76.138704°)	C-1 Pond
7S12	0.3	SE (41.088507° / -76.143270°)	S-2 Pond
6S5	0.9	ESE (41.084639° / -76.130642°)	Outfall Area
6S6*	0.8	ESE (41.088115° / -76131637°)	River Water Intake Line
LTAW	0.7	NE (41.098356° / -76.135401°)	Lake Took-A-While (on site)
4S7	0.4	ENE (41.094418° / -76.138326°)	Peach Stand Pond
		FISH	
LTAW	0.7	NE – ESE (41.098356° / -76.135401°)	Lake Took-A-While (on site)
		AIR	
12S1	0.4	WSW (41.088436° / -76.154314°)	SSES West Building
13S6	0.4	W (41.091771° / -76.153869°)	Former Laydown Area, West of Confers Lane
3S2	0.5	NE (41.095716° / -76.140207°)	Back-up Meteorological Tower
		FRUITS / VEGETABLES	
5S10	0.7	E (41.093899° / -76.132814°)	PPL Riverlands – Parcel 30
		SOIL	
12S1	0.4	WSW (41.088436° / -76.154314°)	SSES West Building

TABLE C 2
(Page 2 of 5)

Sampling Locations for the SSES Radiological Environmental Monitoring Program – 2010

Less Than One Mile from the SSES - See Figure 5

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
GROUND WATER			
2S2	0.9	NNE (41.102243° / -76.136702°)	SSES Energy Information Center
4S4	0.5	ENE (41.095471° / -76.138798°)	SSES Learning Center
6S10	0.4	ESE (41.090511° / -76.137802°)	Sewage Treatment Plant (STP) Well
6S11A	0.4	ESE (41.083448 ° / -76.133412°)	Monitoring Well (MW-8A)
6S11B	0.4	ESE (41.083448° / -76.133411°)	Monitoring Well (MW-8B)
6S12	0.8	ESE (41.083411° / -76.116935°)	Monitoring Well (MW-9)
7S11	0.3	SE (41.083527° / -76.133513°)	Monitoring Well (MW-10)
11S2	0.4	SW (41.088816° / -76.152793°)	Tower's Club (Well)
1S3	0.1	N (41.093640° / -76.146076°)	MW-1 (N of Radwaste Bldg.)
4S8	0.1	ENE (41.092306° / -76.144283°)	MW-2 (SE of E. Diesel Generator Building)
4S9	0.3	E (41.093292° / -76.130472°)	MW-3 (N of Access Processing Facility)
8S4	0.1	SSE (41.091424° / -76.145531°)	MW-4 (E of Unit 2 CST)
7S10	0.3	SE (41.089736° / -76.142783°)	MW-5 (N of S-2 Pond)
13S7	0.2	W (41.091236° / -76.149647°)	MW-6 (Laydown area behind cooling towers)
PRECIPITATION			
3S2	0.5	NE (41.095716° / -76.140207°)	Back-up Met Tower
12S1	0.4	WSW (41.088436° / -76.154314°)	West Building (Performance Improvement Center)
Site 1	0.1	ESE (41.092275° / -76.145022°)	On-site – Southwest of E Diesel Bldg.
Site 2	0.1	SSE (41.091309 ° / -76.145708°)	On-site – East of Unit 2 CST
Site 3	0.1	WSW (41.091243° / -76.147345°)	On-site – South of Circ Water Pumphouse
Site 4	0.1	NW (41.093321° / -76.147316°)	On-site – North of Circ Water Pumphouse

TABLE C 2
(Page 3 of 5)

Sampling Locations for the SSES Radiological Environmental Monitoring Program – 2010

From One to Five Miles From the SSES – See Figure 6			
FISH[(b)]			
IND	0.9 – 1.4	ESE (41.085141° / -76.130174° to 41.075618° / -76.132682°)	At or Below the SSES Discharge Diffuser
SEDIMENT[©]			
2B*	1.6	NNE (41.112441° / -76.134758°)	Gould Island
7B	1.2	SE (41.078924° / -76.131548°)	Bell Bend
AIR			
12E1	4.7	WSW (41.072418° / -76.230554°)	Berwick Hospital
MILK			
5E2	4.5	E (41.085184° / -76.061099°)	Bloss Farm
10D3	3.5	SSW (41.045449° / -76.171899°)	Kevin & Charles Drasher
13E3	5.0	W (41.100259° / -76.241102°)	Dent Farm
FRUITS/VEGETABLES			
11D1	3.3	SW (41.055212° / -76.186797°)	Zehner Farm
11D2	3.5	SW (41.054827° / -76.205081 °)	Lupini Field – Route 93
5S11	1.1	E (41.089775° / -76.125938°)	PPL Susquehanna Project East Side Parcel 25

Location Code[(a)]	**Distance[(a)] (miles)**	**Direction Latitude / Longitude**	**Description**
Greater than Five Miles from the SSES - See Figure 7			
DRINKING WATER			
12H2	26	WSW (40.947192° / -76.604524°)	Danville Water Co. (treated)
FISH			
2H*	30	NNE (41.459508° / -75.853096°)	Near Falls, Pa.
SEDIMENT[(c)]			
12F	6.9	WSW (41.041323° / -76.255396°)	Old Berwick Test Track
AIR			
6G1*	13.5	ESE (41.018989° / -75.906515°)	Freeland Substation
8G1*	12	SSE (40.928886° / -76.055092°)	PPL SFC - Humbolt Industrial Park
SOIL			
8G1*	12	SSE (40.928886° / -76.055092°)	PPL SFC - Humbolt Industrial Park

TABLE C 2
(Page 4 of 5)

Sampling Locations for the SSES Radiological Environmental Monitoring Program – 2010

MILK			
10G1*	14	SSW (40.934847° / -76.284449°)	Davis Farm
GROUND WATER			
12F3*	5.2	WSW (41.054491° / -76.232176°)	Berwick Water Company
FRUITS/VEGETABLES			
11F2	5.5	SW (41.045741° / -76.242128°)	Chapin (Drake) Field
12F7	8.3	WSW (41.036689° / -76.286776°)	Lupini Farm - Mifflinville
PRECIPITATION			
8G1	12	SSE (40.928886 ° / -76.055092°)	PPL System Facilities Center – Humbolt Industrial Park

TABLE C 2
(Page 5 of 5)

Sampling Locations for the SSES Radiological Environmental Monitoring Program – 2010

a) 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 locations 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	* - Control locations

The numbers preceding the letters in the location codes provide the directions of the monitoring locations from the SSES by indicating the sectors in which they are located. A total of 16 sectors (numbered 1 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 1 is directed due north (N). Moving clockwise from sector 1, the sector immediately adjacent to sector 1 is sector 2, the middle of which is directed due north, northeast (NNE). Continuing to move clockwise, the sector numbers increase to 16, which is the north, northwest sector.

The numbers following the letters in the location codes are used to differentiate sampling locations found in the same sectors at approximately the same distances from the SSES.

b) No actual location is indicated since fish are sampled from the Susquehanna River at or below the SSES discharge diffuser.

c) No permanent locations exist; samples are taken based on availability. Consequently, it is not necessary to assign a number following the letter in the location code.

APPENDIX D

2010
LAND USE CENSUS RESULTS

2010 LAND USE CENSUS RESULTS

Ecology III, Inc. conducted a Land Use Census, during the 2010 growing season around the SSES, to comply with the Offsite Dose Calculation Manual. The purpose of the survey was to document the nearest milk animal, residence, and garden greater than 50 m^2 (approx. 500 ft^2) producing broad leaf vegetation within a distance of 8 km (approx. 5 miles) in each of the 16 meteorological sectors surrounding the SSES.

SUMMARY OF CHANGES FROM 2009 TO 2010

Since the 2009 census, there was one change in the nearest residence, four changes in the nearest garden, and one change in dairy farms within the 5 mile radius.

Residence Census:
The residence census was conducted from 24 August through 27 September 2010. Distances of the nearest residences from the Susquehanna SES in the 16 different sectors ranged from 0.5 (J.Futoma, Sector 7 and R. Panetta, Sector 6) to 2.1 miles (R. Dickosky, Sector 4), with an average of approximately 1.0 miles.

The only change from the 2009 census was a new resident in sector 4 (Dickosky replacing Barberi).

Garden Census:
The garden census was conducted from 24 August through 27 September 2010. Distances of the nearest gardens from the Susquehanna SES in the 16 different sectors ranged from 0.6 miles (T. Scholl, Sector 7) to 4.0 miles (P. Culver, Sector 16), with an average of 2.1 miles.

Changes from the 2009 census included:

- Sector 3 – M. Welch replaced F. Kremski
- Sector 5 – L. Kozlowski/W. Witts replaced W. Daily
- Sector 11 – R. Broody replaced D. Bankes
- Sector 15 – D. Goff replaced R. Reider

F. Kremski did not plant a garden in 2010, F. Kozlowski/W. Witts, R. Broody, and D. Goff planted gradens that were closer to Susquehanna SES (all have had gardens in previous years).

Dairy Animal Census:
Five dairy animal sites were identified in the census conducted on 26 July 2010. The Davis farm (sector 10) was included in the dairy census because they participated as a milk sampling control location. Cows were present at all sites; no dairy goats found.

There was one change in dairy farm locations from 2009 to 2010: F. Rinehimer (Sector 6) stopped milking operations in October 2009.

Irrigation

Two farms irrigated crops using Susquehanna River water downriver from the Susquehanna SES in 2010: Zehner Farm (location 11D1, 3.3 miles SW) irrigated pumpkins and soy beans and Lupini Farm-Mifflinville Field (location 12F7, 8.3 miles WSW) irrigated potatoes, green beans, and field corn. No control samples were collected during the 2010 growing season because no irrigation with river water had taken place at the control site.

No other crops or fields were irrigated because soil moisture was adequate. Overall results of the survey are summarized below:

TABLE D1

(Page 1 of 1)

Nearest residence, garden, and dairy animal in each of the 16 meteorological sectors within a 5-mile radius of the Susquehanna Steam Electric Station, 2010 .

SECTOR	DIRECTION	NEAREST RESIDENCE	NEAREST GARDEN	NEAREST DAIRY ANIMAL
1	N	1.3 mi	3.2 mi	>5.0 mi
2	NNE	1.0 mi	2.3 mi [i]	>5.0 mi
3	NE	0.9 mi	2.7 mi	>5.0 mi
4	ENE	2.1 mi	2.4 mi [j,l]	>5.0 mi
5	E	1.4 mi	1.4 mi	4.5 mi. [g]
6	ESE	0.5 mi	3.1 mi [a,c]	>5.0 mi
7	SE	0.5 mi	0.6 mi	>5.0 mi
8	SSE	0.6 mi	2.9 mi	>5.0 mi
9	S	1.0 mi	2.7 mi	>5.0 mi
10	SSW	0.9 mi	1.2 mi	3.5 mi [i]
11	SW	1.5 mi	1.9 mi	>5.0 mi
12	WSW	1.3 mi	1.3 mi	1.7 mi [i,g]
13	W	1.2 mi	1.2 mi	5.0 mi
14	WNW	0.8 mi	1.3 mi	>5.0 mi
15	NW	0.7 mi	1.8 mi	>5.0 mi
16	NNW	0.6 mi	4.0 mi	>5.0 mi

[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] Geese raised for consumption at this location.*
[e] Pigs raised for consumption at this location.*
[f] Turkeys raised for consumption at this location.*

[g] Fruits/vegetables raised for consumption at this location.
[h] Rabbits raised for consumption at this location.*
[i] Beef cattle raised for consumption at this location.
[j] Goats (no milk)raised for consumption at this location.*
[k] Pheasants raised for consumption at this location.*
[l] Sheep raised for consumption at this location.
[m] Guinea hen raised for consumption at this location.*

*No locations were identified as raising rabbits, dairy goats, pheasants, geese, turkeys, pigs, ducks and guinea hens during 2010.

APPENDIX E

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APPENDIX F

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APPENDIX G

2010 SSES REMP SUMMARY OF DATA

The averages for indicator and control locations reported in the Summary of Data Table, which summarizes the entire year's results for the SSES REMP, were calculated using all measured values, when available, whether or not they were reported in Appendix I tables. Values below the MDCs, even zeroes and negatives, were part of the averaging process for these analysis results. When no measured results are available in these cases, "LLD" is reported.

Preferably, the averages reported in the Summary of Data table for sample media that are normally collected continuously are determined using only results from continuously collected samples. Occasionally, grab samples are taken for these media when equipment malfunctions or other anomalies preclude or otherwise perturb routine continuous sampling. These grab samples are taken to minimize the time periods when no sampling is being performed, or, in some instances, when continuous sampling is considered to be nonrepresentative.

Because grab samples are snapshots of the media over brief periods, it is preferable not to average the analysis results of these samples with those for continuously collected composite samples. However, when equipment malfunctions are protracted, relatively large periods of time could be entirely unrepresented by averages if the results from grab sample analyses are not considered.

Allowing analysis results for grab samples to be weighted equally with those representing relatively large periods of time would tend to bias the resulting averages unjustifiably towards the conditions at the times that the grabs are obtained. Averages obtained in this way might less accurately reflect the conditions for the combined period of continuous sampling and grab sampling than if only the results from continuous sampling were used. On the other hand, using weighting factors for the analysis results of grab samples derived from the actual time it takes to collect those samples would lead to the grab sample analysis results having a negligible effect on the overall average and not justifying the effort involved.

Grab samples collected in lieu of normal continuous sampling are typically obtained at regular intervals corresponding to the intervals (weekly) at which the continuously collected samples would usually be retrieved for eventual compositing. For example, grab samples are collected once a week but may be composited monthly in place of continuously collected samples that would normally be retrieved weekly and composited monthly. Since each grab sample is used to represent an entire week, albeit imperfect, it is reasonable to weight the analysis results the same. Thus, the results of one weekly grab are given approximately one-fourth the weight of the results for a monthly composite sample collected continuously for each of the four weeks in a month. Similarly, the analysis results of a composite of four weekly grab samples would carry the same weight as the analysis results for a composite of four weeks of continuously collected sample.

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE		CONTROL LOCATION MEAN (3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS
Ambient Radiation	TLD	226	N/A	2.13E+01	(206/206)	9S2	4.35E+01	(4/4)	2.00E+01	(20/20)	0
(mR/std.qtr.)				(1.55E+01 - 4.51E+01)		0.2 MILES S	(4.14E+01 - 4.51E+01)		(1.89E+01 - 2.13E+01)		
Surface Water	H-3	53	2000	8.68E+02	(41/41)	2S7	2.71E+03	(13/13)	7.19E+00	(12/12)	0
(pCi/l)				(-7.21E+01 - 1.25E+04)		0.1 MILES NNE	(-3.04E+01 - 1.25E+04		(-3.71E+01 - 6.94E+01)		
	GAMMA	53									
	K-40	53	N/A	9.66E+00	(41/41)	LTAW	2.01E+01	(4/4)	5.36E+00	(12/12)	0
				(-5.19E+01 - 4.69E+01)		0.7 MILES NE	(4.55E+00 - 3.56E+01)		(-4.22E+01 - 3.79E+01)		
	MN-54	53	15	-1.69E-02	(41/41)	4S7	4.21E-01	(4/4)	-2.07E-01	(12/12)	0
				(-1.71E+00 - 2.03E+00)		0.4 MILES ENE	(-7.81E-01 - 1.46E+00)		(-9.68E-01 - 4.27E-01)		
	CO-58	53	15	-1.69E-01	(41/41)	LTAW	2.24E-01	(4/4)	-1.81E-02	(12/12)	0
				(-3.32E+00 - 1.84E+00)		0.7 MILES NE	(8.77E-03 - 4.76E-01)		(-7.92E-01 - 8.97E-01)		
	FE-59	53	30	7.00E-01	(41/41)	LTAW	3.18E+00	(4/4)	-2.41E-02	(12/12)	0
				(-6.10E+00 - 7.75E+00)		0.7 MILES NE	(6.48E-02 - 7.75E+00)		(-3.27E+00 - 2.86E+00)		
	CO-60	53	15	-1.11E+00	(41/41)	LTAW	1.03E+00	(4/4)	4.25E-02	(12/12)	0
				(-2.97E+01 - 3.11E+00)		0.7 MILES NE	(-2.41E-01 - 2.10E+00)		(-9.01E-01 - 1.48E+00)		
	ZN-65	53	30	-1.63E+00	(41/41)	LTAW	1.46E+00	(4/4)	-1.47E+00	(12/12)	0
				(-1.03E+01 - 9.76E+00)		0.7 MILES NE	(-3.18E+00 - 9.76E+00		(-8.57E+00 - 2.12E+00)		
	NB-95	53	15	9.35E-01	(41/41)	LTAW	3.31E+00	(4/4)	5.74E-01	(12/12)	0
				(-1.18E+00 - 8.89E+00)		0.7 MILES NE	(1.56E-01 - 8.89E+00)		(-2.75E-01 - 1.37E+00)		
	ZR-95	53	30	-1.06E-01	(41/41)	4S7	1.18E+00	(4/4)	1.96E-01	(12/12)	0
				(-5.03E+00 - 3.49E+00)		0.4 MILES ENE	(-7.97E-01 - 2.42E+00)		(-2.32E+00 - 2.58E+00)		
	CS-134	53	15	-4.07E-01	(41/41)	LTAW	1.89E+00	(4/4)	-8.00E-01	(12/12)	0
				(-4.24E+00 - 7.03E+00)		0.7 MILES NE	(-1.40E-01 - 7.03E+00)		(-8.17E+00 - 8.61E-01)		

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Surface Water (cont.) (pCi/l)	CS-137	53	18	-2.43E-01 (41/41) (-1.07E+01 - 3.70E+00)	LTAW 0.7 MILES NE	1.47E+00 (4/4) (1.60E-01 - 3.70E+00)	3.29E-01 (12/12) (-3.37E-01 - 8.84E-01)	0
	BA-140	53	60	-1.13E+00 (41/41) (-2.61E+01 - 1.39E+01)	6S6 0.8 MILES ESE	1.85E+00 (12/12) (-3.90E+00 - 1.08E+01	1.85E+00 (12/12) (-3.90E+00 - 1.08E+01)	0
	LA-140	53	15	-6.21E-01 (41/41) (-5.66E+00 - 3.25E+00)	LTAW 0.7 MILES NE	8.30E-01 (4/4) (-1.52E+00 - 2.64E+00	-7.90E-01 (12/12) (-2.82E+00 - 2.42E+00)	0
	RA-226	53	N/A	-1.13E+00 (41/41) (-1.24E+02 - 4.82E+01)	5S12 0.4 MILES E	1.75E+01 (4/4) (-2.08E+01 - 4.18E+01	2.14E+00 (12/12) (-2.33E+01 - 3.75E+01)	0
	AC-228	53	N/A	-3.71E-01 (41/41) (-9.93E+00 - 1.27E+01)	LTAW 0.7 MILES NE	2.40E+00 (4/4) (-2.09E+00 - 8.24E+00	1.17E+00 (12/12) (-4.58E+00 - 7.03E+00)	0
	TH-228	53	N/A	2.34E+00 (41/41) (-9.93E+00 - 1.27E+01)	LTAW 0.7 MILES NE	8.38E+00 (4/4) (-2.09E+00 - 8.24E+00	1.77E+00 (12/12) (-4.58E+00 - 7.03E+00)	0
Potable Water (pCi/l)	GR-B	12	4	1.97E+00 (12/12) (-7.07E-01 - 4.45E+00)	12H2 26 MILES WSW	1.97E+00 (12/12) (-7.07E-01 - 4.45E+00;	Only Indicator Stations sampled for this medium.	0
	H-3	12	2000	2.70E+01 (12/12) (-7.73E+01 - 1.22E+02)	12H2 26 MILES WSW	2.70E+01 (12/12) (-7.73E+01 - 1.22E+02)		0
	GAMMA	12						
	K-40	12	N/A	1.67E+01 (12/12) (-4.12E+00 - 4.34E+01)	12H2 26 MILES WSW	1.67E+01 (12/12) (-4.12E+00 - 4.34E+01)		0
	MN-54	12	15	1.08E-02 (12/12) (-1.02E+00 - 1.14E+00)	12H2 26 MILES WSW	1.08E-02 (12/12) (-1.02E+00 - 1.14E+00)		0
	CO-58	12	15	-2.74E-01 (12/12) (-2.04E+00 - 8.65E-01)	12H2 26 MILES WSW	-2.74E-01 (12/12) (-2.04E+00 - 8.65E-01)		0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Potable Water (cont.) (pCi/l)	FE-59	12	30	1.42E-01 (12/12) (-1.54E+00 - 2.81E+00)	12H2 26 MILES WSW	1.42E-01 (12/12) (-1.54E+00 - 2.81E+00)		0
	CO-60	12	15	5.35E-01 (12/12) (-4.18E-01 - 1.11E+00)	12H2 26 MILES WSW	5.35E-01 (12/12) (-4.18E-01 - 1.11E+00)		0
	ZN-65	12	30	-1.53E+00 (12/12) (-7.24E+00 - 1.42E+00)	12H2 26 MILES WSW	-1.53E+00 (12/12) (-7.24E+00 - 1.42E+00)		0
	NB-95	12	15	4.84E-01 (12/12) (-8.91E-01 - 2.29E+00)	12H2 26 MILES WSW	4.84E-01 (12/12) (-8.91E-01 - 2.29E+00)		0
	ZR-95	12	30	1.05E-01 (12/12) (-1.50E+00 - 2.04E+00)	12H2 26 MILES WSW	1.05E-01 (12/12) (-1.50E+00 - 2.04E+00)		0
	CS-134	12	15	-8.95E-01 (12/12) (-5.10E+00 - 5.29E-01)	12H2 26 MILES WSW	-8.95E-01 (12/12) (-5.10E+00 - 5.29E-01)		0
	CS-137	12	18	-2.95E-01 (12/12) (-1.07E+00 - 4.44E-01)	12H2 26 MILES WSW	-2.95E-01 (12/12) (-1.07E+00 - 4.44E-01)		0
	BA-140	12	60	3.77E+00 (12/12) (-6.13E+00 - 9.14E+00)	12H2 26 MILES WSW	3.77E+00 (12/12) (-6.13E+00 - 9.14E+00)		0
	LA-140	12	15	-9.85E-01 (12/12) (-2.51E+00 - 1.01E+00)	12H2 26 MILES WSW	-9.85E-01 (12/12) (-2.51E+00 - 1.01E+00)		0
	RA-226	12	N/A	-3.04E+00 (12/12) (-5.19E+01 - 4.07E+01)	12H2 26 MILES WSW	-3.04E+00 (12/12) (-5.19E+01 - 4.07E+01		0
	AC-228	12	N/A	7.69E-01 (12/12) (-7.04E+00 - 1.00E+01)	12H2 26 MILES WSW	7.69E-01 (12/12) (-7.04E+00 - 1.00E+01)		0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Potable Water (cont.) (pCi/l)	TH-228	12	N/A	1.33E+00 (12/12) (-1.47E+00 - 4.25E+00)	12H2 26 MILES WSW	1.33E+00 (12/12) (-1.47E+00 - 4.25E+00)		0
Fish (pCi/kg wet)	GAMMA	15						
	K-40	15	N/A	3.34E+03 (9/9) (2.80E+03 - 3.83E+03)	LTAW 0.7 MILES NE	3.57E+03 (2/2) (3.36E+03 - 3.78E+03)	3.21E+03 (6/6) (2.54E+03 - 3.59E+03)	0
	MN-54	15	130	-5.10E+00 (9/9) (-2.90E+01 - 2.00E+01)	2H 30 MILES NNE	6.67E+00 (6/6) (-4.07E+00 - 1.19E+01	6.67E+00 (6/6) (-4.07E+00 - 1.19E+01)	0
	CO-58	15	130	6.16E+00 (9/9) (-1.06E+01 - 2.55E+01)	IND 0.9-1.4 MILES ESE	6.19E+00 (7/7) (-1.06E+01 - 2.55E+01	-4.94E+00 (6/6) (-2.48E+01 - 1.20E+01)	0
	FE-59	15	260	5.10E+00 (9/9) (-5.25E+01 - 4.94E+01)	2H 30 MILES NNE	2.00E+01 (6/6) (-7.03E+00 - 8.47E+01	2.00E+01 (6/6) (-7.03E+00 - 8.47E+01)	0
	CO-60	15	130	-8.88E-01 (9/9) (-2.12E+01 - 1.33E+01)	LTAW 0.7 MILES NE	9.25E-01 (2/2) (-1.14E+00 - 2.99E+00	-6.33E-01 (6/6) (-1.80E+01 - 1.83E+01)	0
	ZN-65	15	260	-1.98E+01 (9/9) (-8.61E+01 - 6.20E+01)	LTAW 0.7 MILES NE	2.70E+01 (2/2) (-7.97E+00 - 6.20E+01	-3.11E+01 (6/6) (-6.70E+01 - -4.35E+00)	0
	NB-95	15	N/A	1.40E+01 (9/9) (6.52E+00 - 3.51E+01)	LTAW 0.7 MILES NE	2.26E+01 (2/2) (1.01E+01 - 3.51E+01)	1.26E+01 (6/6) (-1.11E+01 - 3.33E+01)	0
	ZR-95	15	N/A	7.99E+00 (9/9) (-1.34E+01 - 3.23E+01)	LTAW 0.7 MILES NE	2.16E+01 (2/2) (1.15E+01 - 3.16E+01)	5.93E+00 (6/6) (-1.26E+01 - 2.96E+01)	0
	CS-134	15	130	-2.60E+01 (9/9) (-6.62E+01 - -1.63E+00)	2H 30 MILES NNE	4.22E+00 (6/6) (-1.29E+01 - 3.37E+01	4.22E+00 (6/6) (-1.29E+01 - 3.37E+01)	0
	CS-137	15	150	-3.13E-01 (9/9) (-1.95E+01 - 2.22E+01)	LTAW 0.7 MILES NE	1.38E+01 (2/2) (5.35E+00 - 2.22E+01)	-2.29E+00 (6/6) (-1.05E+01 - 6.21E+00)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Fish (cont.) (pCi/kg wet)	BA-140	15	N/A	3.41E+01 (9/9) (-1.31E+02 - 2.09E+02)	LTAW 0.7 MILES NE	3.90E+01 (2/2) (-1.31E+02 - 2.09E+02	4.03E+00 (6/6) (-7.22E+01 - 6.71E+01)	0
	LA-140	15	N/A	-2.59E+01 (9/9) (-1.18E+02 - 4.09E+01)	2H 30 MILES NNE	2.64E+01 (6/6) (-1.27E+01 - 1.10E+02	2.64E+01 (6/6) (-1.27E+01 - 1.10E+02)	0
	RA-226	15	N/A	-5.72E+00 (9/9) (-3.70E+02 - 4.76E+02)	IND 0.9-1.4 MILES ESE	3.50E+01 (7/7) (-3.70E+02 - 4.76E+02	-9.14E+00 (6/6) (-5.85E+02 - 4.02E+02)	0
	AC-228	15	N/A	-5.89E+00 (9/9) (-7.33E+01 - 6.31E+01)	IND 0.9-1.4 MILES ESE	-3.69E+00 (7/7) (-7.33E+01 - 6.31E+01	-1.44E+01 (6/6) (-7.92E+01 - 3.88E+01)	0
	TH-228	15	N/A	1.94E+01 (9/9) (-1.44E+01 - 7.59E+01)	LTAW 0.7 MILES NE	5.66E+01 (2/2) (3.72E+01 - 7.59E+01)	2.28E+01 (6/6) (-2.65E+01 - 8.18E+01)	0
Sediment	GAMMA	6						
(pCi/kg dry)	BE-7	6	N/A	8.61E+02 (4/4) (2.16E+02 - 1.82E+03)	12F 6.9 MILES WSW	1.02E+03 (2/2) (2.16E+02 - 1.82E+03)	3.66E+02 (2/2) (3.46E+02 - 3.85E+02)	0
	K-40	6	N/A	1.21E+04 (4/4) (8.07E+03 - 1.49E+04)	2B 1.6 MILES NNE	1.43E+04 (2/2) (1.37E+04 - 1.49E+04)	1.43E+04 (2/2) (1.37E+04 - 1.49E+04)	0
	MN-54	6	N/A	2.07E+01 (4/4) (-1.78E+01 - 5.94E+01)	12F 6.9 MILES WSW	3.48E+01 (2/2) (1.02E+01 - 5.94E+01)	1.90E+01 (2/2) (1.08E+01 - 2.72E+01)	0
	CO-58	6	N/A	-1.02E+01 (4/4) (-2.31E+01 - 1.34E+00)	7B 1.2 MILES SE	-1.52E+00 (2/2) (-4.38E+00 - 1.34E+00	-2.31E+01 (2/2) (-2.37E+01 - -2.24E+01)	0
	FE-59	6	N/A	1.16E+01 (4/4) (-6.31E+01 - 5.62E+01)	12F 6.9 MILES WSW	2.66E+01 (2/2) (1.78E+01 - 3.54E+01)	-4.33E+01 (2/2) (-8.22E+01 - -4.31E+00)	0
	CO-60	6	N/A	1.47E+01 (4/4) (-8.97E+00 - 7.49E+01)	12F 6.9 MILES WSW	3.30E+01 (2/2) (-8.97E+00 - 7.49E+01	-7.69E+00 (2/2) (-1.33E+01 - -2.07E+00)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Sediment (cont.) (pCi/kg dry)	ZN-65	6	N/A	2.22E+01 (4/4) (-2.81E+01 - 8.11E+01)	12F 6.9 MILES WSW	4.20E+01 (2/2) (2.86E+00 - 8.11E+01)	3.61E+01 (2/2) (2.46E+01 - 4.75E+01)	0
	NB-95	6	N/A	1.18E+01 (4/4) (-1.52E+01 - 5.16E+01)	12F 6.9 MILES WSW	1.94E+01 (2/2) (-1.29E+01 - 5.16E+01	-1.02E+01 (2/2) (-6.14E+01 - 4.11E+01)	0
	ZR-95	6	N/A	1.18E+01 (4/4) (6.00E-01 - 2.83E+01)	12F 6.9 MILES WSW	1.45E+01 (2/2) (6.00E-01 - 2.83E+01)	-4.58E+01 (2/2) (-7.85E+01 - -1.31E+01)	0
	CS-134	6	150	1.15E+00 (4/4) (-3.43E+01 - 2.58E+01)	12F 6.9 MILES WSW	1.09E+01 (2/2) (-3.92E+00 - 2.58E+01	2.86E+00 (2/2) (-1.10E+00 - 6.82E+00)	0
	CS-137	6	180	3.65E+01 (4/4) (-2.15E+01 - 7.56E+01)	2B 1.6 MILES NNE	5.52E+01 (2/2) (2.24E+01 - 8.79E+01)	5.52E+01 (2/2) (2.24E+01 - 8.79E+01)	0
	BA-140	6	N/A	4.42E+01 (4/4) (-9.15E+01 - 1.88E+02)	7B 1.2 MILES SE	1.34E+02 (2/2) (8.09E+01 - 1.88E+02)	-6.48E+01 (2/2) (-1.07E+02 - -2.26E+01)	0
	LA-140	6	N/A	-6.74E+01 (4/4) (-9.40E+01 - -5.41E+01)	2B 1.6 MILES NNE	-4.62E+01 (2/2) (-6.09E+01 - -3.14E+0	-4.62E+01 (2/2) (-6.09E+01 - -3.14E+01)	0
	RA-226	6	N/A	3.17E+03 (4/4) (2.41E+03 - 3.73E+03)	12F 6.9 MILES WSW	3.28E+03 (2/2) (2.96E+03 - 3.59E+03)	1.92E+03 (2/2) (1.82E+03 - 2.02E+03)	0
	AC-228	6	N/A	1.10E+03 (4/4) (1.02E+03 - 1.33E+03)	2B 1.6 MILES NNE	1.31E+03 (2/2) (1.23E+03 - 1.39E+03)	1.31E+03 (2/2) (1.23E+03 - 1.39E+03)	0
	TH-228	6	N/A	1.11E+03 (4/4) (7.44E+02 - 1.32E+03)	7B 1.2 MILES SE	1.25E+03 (2/2) (1.18E+03 - 1.32E+03)	1.16E+03 (2/2) (8.50E+02 - 1.47E+03)	0
Ground Water (pCi/l)	H-3	61	2000	9.62E+01 (57/57) (-7.69E+01 - 2.81E+02)	1S3 0.1 MILES N	2.52E+02 (4/4) (2.03E+02 - 2.81E+02)	-1.95E+00 (4/4) (-7.02E+01 - 4.62E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Ground Water (cont.)	GAMMA	61						
(pCi/l)	BE-7	61	N/A	1.35E-01 (57/57) (-2.82E+01 - 2.77E+01)	13S7 0.2 MILES W	1.05E+01 (5/5) (-5.60E+00 - 2.77E+01	1.60E+00 (4/4) (-1.94E+01 - 1.85E+01)	0
	K-40	61	N/A	9.80E+00 (57/57) (-5.13E+01 - 9.03E+01)	4S8 0.1 MILES ENE	3.57E+01 (5/5) (4.27E+00 - 7.49E+01)	1.10E+01 (4/4) (2.34E+00 - 1.86E+01)	0
	MN-54	61	15	-3.19E-01 (57/57) (-4.63E+00 - 2.88E+00)	12F3 5.2 MILES WSW	8.34E-01 (4/4) (-5.46E-01 - 1.40E+00)	8.34E-01 (4/4) (-5.46E-01 - 1.40E+00)	0
	CO-58	61	15	-3.94E-01 (57/57) (-3.27E+00 - 3.13E+00)	8S4 0.1 MILES SSE	8.76E-01 (5/5) (-1.24E+00 - 3.13E+00	-1.34E+00 (4/4) (-4.02E+00 - 1.48E+00)	0
	FE-59	61	30	2.27E-01 (57/57) (-6.38E+00 - 7.81E+00)	13S7 0.2 MILES W	1.99E+00 (5/5) (1.02E+00 - 2.72E+00)	1.05E+00 (4/4) (-1.65E-01 - 1.74E+00)	0
	CO-60	61	15	1.98E-01 (57/57) (-6.47E+00 - 5.69E+00)	8S4 0.1 MILES SSE	1.41E+00 (5/5) (-4.68E-01 - 5.69E+00)	-2.80E-01 (4/4) (-2.34E+00 - 1.68E+00)	0
	ZN-65	61	30	-1.05E+00 (57/57) (-1.48E+01 - 2.38E+01)	4S9 0.3 MILES ENE	1.44E+00 (5/5) (-6.76E-01 - 5.03E+00)	-1.53E-01 (4/4) (-5.57E+00 - 6.79E+00)	0
	NB-95	61	15	9.30E-01 (57/57) (-2.11E+00 - 7.58E+00)	12F3 5.2 MILES WSW	3.45E+00 (4/4) (8.50E-02 - 1.07E+01)	3.45E+00 (4/4) (8.50E-02 - 1.07E+01)	0
	ZR-95	61	30	-2.50E-01 (57/57) (-7.02E+00 - 4.67E+00)	6S10 0.4 MILES ESE	6.55E-01 (4/4) (-1.74E+00 - 3.56E+00	5.26E-01 (4/4) (-2.42E+00 - 5.99E+00)	0
	CS-134	61	15	1.22E-01 (57/57) (-1.17E+01 - 3.82E+01)	8S4 0.1 MILES SSE	7.14E+00 (5/5) (-1.58E+00 - 3.82E+01	2.07E+00 (4/4) (-4.43E-01 - 8.16E+00)	0
	CS-137	61	18	-1.26E-01 (57/57) (-4.50E+00 - 4.13E+00)	2S2 0.9 MILES NNE	1.02E+00 (4/4) (-5.27E-01 - 2.68E+00)	-6.98E-01 (4/4) (-4.58E+00 - 8.26E-01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Ground Water (cont.) (pCi/l)	BA-140	61	60	1.43E+00 (57/57) (-8.53E+00 - 1.55E+01)	6S10 0.4 MILES ESE	7.14E+00 (4/4) (-3.27E+00 - 1.55E+01	2.65E+00 (4/4) (-4.16E+00 - 7.75E+00)	0
	LA-140	61	15	-3.43E-01 (57/57) (-5.36E+00 - 6.02E+00)	2S2 0.9 MILES NNE	1.42E+00 (4/4) (-2.31E+00 - 6.02E+00	-1.58E+00 (4/4) (-3.44E+00 - -6.27E-01)	0
	RA-226	61	N/A	6.13E+00 (57/57) (-6.22E+01 - 8.47E+01)	6S12	2.20E+01 (4/4) (1.06E+01 - 3.60E+01)	1.51E+01 (4/4) (-4.77E+01 - 5.92E+01)	0
	AC-228	61	N/A	-6.48E-01 (57/57) (-1.98E+01 - 1.63E+01)	4S8 0.1 MILES ENE	4.80E+00 (5/5) (-2.39E+00 - 1.63E+01	1.64E+00 (4/4) (-2.89E+00 - 8.44E+00)	0
	TH-228	61	N/A	3.97E+00 (57/57) (-6.52E+00 - 1.59E+01)	7S10 0.3 MILES SE	6.48E+00 (5/5) (-1.00E+00 - 1.59E+01	4.30E+00 (4/4) (1.26E-01 - 1.03E+01)	0
Air Particulates (E-3 pCi/m^3)	GR-B	312	10	1.35E+01 (208/208) (3.54E+00 - 2.83E+01)	3S2 0.5 MILES NE	1.37E+01 (52/52) (4.33E+00 - 2.78E+01)	1.27E+01 (104/104) (3.90E+00 - 2.79E+01)	0
Air Iodine (E-3 pCi/m^3)	GAMMA	312						
	I-131	312	70	-2.55E-01 (208/208) (-1.02E+01 - 9.65E+00)	6G1 13.5 MILES ESE	3.42E-01 (52/52) (-9.27E+00 - 8.96E+00	3.21E-01 (104/104) (-9.27E+00 - 8.96E+00)	0
Air Particulates Quarterly Composites (E-3 pCi/m3)	GAMMA	24						
	BE-7	24	N/A	1.28E+02 (16/16) (8.20E+01 - 1.69E+02)	13S6 0.4 MILES W	1.36E+02 (4/4) (1.21E+02 - 1.69E+02)	1.30E+02 (8/8) (1.06E+02 - 1.56E+02)	0
	K-40	24	N/A	3.01E+00 (16/16) (-6.92E+00 - 1.57E+01)	6G1 13.5 MILES ESE	9.18E+00 (4/4) (3.52E+00 - 1.22E+01)	5.77E+00 (8/8) (-2.82E-01 - 1.22E+01)	0
	MN-54	24	N/A	1.19E-01 (16/16) (-7.75E-01 - 8.01E-01)	6G1 13.5 MILES ESE	4.45E-01 (4/4) (6.87E-02 - 6.87E-01)	6.72E-02 (8/8) (-6.64E-01 - 6.87E-01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Air Particulates (cont.) Quarterly Composites (E-3 pCi/m^3)	CO-58	24	N/A	-9.15E-02 (16/16) (-2.35E+00 - 2.08E+00)	13S6 0.4 MILES W	5.83E-01 (4/4) (-5.94E-01 - 2.08E+00)	-2.82E-01 (8/8) (-1.45E+00 - 9.50E-01)	0
	FE-59	24	N/A	6.62E-01 (16/16) (-4.19E+00 - 4.41E+00)	12S1 0.4 MILES WSW	3.34E+00 (4/4) (1.14E+00 - 4.41E+00)	-2.18E+00 (8/8) (-5.14E+00 - -9.98E-01)	0
	CO-60	24	N/A	2.83E-02 (16/16) (-3.53E-01 - 4.71E-01)	6G1 13.5 MILES ESE	3.42E-01 (4/4) (-3.49E-01 - 7.59E-01)	1.47E-01 (8/8) (-5.03E-01 - 7.59E-01)	0
	ZN-65	24	N/A	3.61E-01 (16/16) (-1.90E+00 - 2.89E+00)	13S6 0.4 MILES W	7.04E-01 (4/4) (-8.33E-01 - 2.89E+00)	2.26E-01 (8/8) (-2.14E+00 - 1.90E+00)	0
	NB-95	24	N/A	3.25E-01 (16/16) (-1.56E+00 - 1.79E+00)	13S6 0.4 MILES W	7.37E-01 (4/4) (-6.15E-02 - 1.79E+00)	2.05E-01 (8/8) (-3.76E-01 - 1.21E+00)	0
	ZR-95	24	N/A	-5.05E-01 (16/16) (-3.84E+00 - 1.41E+00)	12S1 0.4 MILES WSW	5.99E-01 (4/4) (2.40E-01 - 1.41E+00)	-5.09E-01 (8/8) (-3.03E+00 - 9.78E-01)	0
	CS-134	24	50	2.89E-01 (16/16) (-1.04E+00 - 1.14E+00)	6G1 13.5 MILES ESE	4.51E-01 (4/4) (-1.65E-01 - 8.08E-01)	2.55E-01 (8/8) (-6.70E-01 - 8.08E-01)	0
	CS-137	24	60	4.79E-02 (16/16) (-6.59E-01 - 4.51E-01)	3S2 0.5 MILES NE	1.07E-01 (4/4) (-8.69E-02 - 4.51E-01)	-1.83E-01 (8/8) (-6.35E-01 - 3.19E-01)	0
	BA-140	24	N/A	1.42E+00 (16/16) (-1.20E+02 - 9.48E+01)	3S2 0.5 MILES NE	5.18E+01 (4/4) (-2.45E+01 - 7.80E+01)	1.76E+01 (8/8) (-5.63E+01 - 1.07E+02)	0
	LA-140	24	N/A	1.03E+00 (16/16) (-7.57E+01 - 6.41E+01)	8G1 12 MILES SSE	4.00E+01 (4/4) (-1.70E+01 - 7.18E+01)	2.06E+01 (8/8) (-1.70E+01 - 7.18E+01)	0
	RA-226	24	N/A	3.16E+00 (16/16) (-1.05E+01 - 1.50E+01)	13S6 0.4 MILES W	7.66E+00 (4/4) (-4.98E+00 - 1.50E+01)	1.51E+00 (8/8) (-9.49E+00 - 9.36E+00)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Air Particulates (cont.) Quarterly Composites (E-3 pCi/m^3)	AC-228	24	N/A	3.86E-01 (16/16) (-1.84E+00 - 2.93E+00)	12S1 0.4 MILES WSW	1.19E+00 (4/4) (1.34E-01 - 2.93E+00)	2.86E-01 (8/8) (-1.19E+00 - 1.74E+00)	0
	TH-228	24	N/A	2.64E-01 (16/16) (-1.18E+00 - 1.35E+00)	6G1 13.5 MILES ESE	5.52E-01 (4/4) (-6.65E-01 - 1.82E+00)	3.50E-01 (8/8) (-6.65E-01 - 1.82E+00)	0
Milk (pCi/l)	I-131	80	1	7.94E-02 (60/60) (-3.90E-01 - 9.68E-01)	10D3 3.5 MILES SSW	9.71E-02 (20/20) (-3.32E-01 - 5.24E-01)	1.14E-02 (20/20) (-4.98E-01 - 4.26E-01)	0
	GAMMA	80						
	K-40	80	N/A	1.30E+03 (60/60) (1.11E+03 - 1.45E+03)	13E3 5.0 MILES W	1.34E+03 (20/20) (1.16E+03 - 1.45E+03)	1.31E+03 (20/20) (1.09E+03 - 1.48E+03)	0
	MN-54	80	N/A	-1.60E-01 (60/60) (-4.66E+00 - 6.07E+00)	5E2 4.5 MILES E	6.71E-01 (20/20) (-2.91E+00 - 4.70E+00	-3.44E-01 (20/20) (-4.22E+00 - 3.73E+00)	0
	CO-58	80	N/A	-5.55E-01 (60/60) (-5.87E+00 - 4.44E+00)	10D3 3.5 MILES SSW	-2.34E-01 (20/20) (-2.84E+00 - 1.84E+00	-1.01E+00 (20/20) (-4.46E+00 - 1.69E+00)	0
	FE-59	80	N/A	8.09E-01 (60/60) (-1.22E+01 - 1.77E+01)	5E2 4.5 MILES E	2.18E+00 (20/20) (-1.03E+01 - 1.77E+01	1.41E+00 (20/20) (-6.96E+00 - 1.50E+01)	0
	CO-60	80	N/A	-3.49E-01 (60/60) (-2.92E+01 - 4.84E+00)	10G1 14 MILES SSW	7.13E-01 (20/20) (-6.40E+00 - 8.27E+00	7.13E-01 (20/20) (-6.40E+00 - 8.27E+00)	0
	ZN-65	80	N/A	-3.43E+00 (60/60) (-2.35E+01 - 6.25E+00)	13E3 5.0 MILES W	-3.28E+00 (20/20) (-2.35E+01 - 5.10E+00	-4.36E+00 (20/20) (-2.70E+01 - 9.86E+00)	0
	NB-95	80	N/A	1.21E+00 (60/60) (-3.08E+00 - 6.23E+00)	10D3 3.5 MILES SSW	1.97E+00 (20/20) (-2.95E+00 - 6.23E+00	1.53E+00 (20/20) (-3.66E+00 - 1.21E+01)	0
	ZR-95	80	N/A	5.37E-01 (60/60) (-6.45E+00 - 6.91E+00)	13E3 5.0 MILES W	1.53E+00 (20/20) (-4.58E+00 - 6.91E+00	-9.76E-01 (20/20) (-7.45E+00 - 6.51E+00)	0

TABLE G
SUMMARY OF DATA FOR SSES
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NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
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Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Milk (cont.) (pCi/l)	CS-134	80	15	-6.77E-01 (60/60) (-7.64E+00 - 6.18E+00)	13E3 5.0 MILES W	-7.27E-02 (20/20) (-5.08E+00 - 6.18E+00	-3.78E-01 (20/20) (-7.32E+00 - 1.35E+01)	0
	CS-137	80	18	-3.36E-01 (60/60) (-1.20E+01 - 5.23E+00)	13E3 5.0 MILES W	8.64E-01 (20/20) (-4.82E+00 - 5.23E+00	-8.18E-01 (20/20) (-5.58E+00 - 2.71E+00)	0
	BA-140	80	60	-1.16E+00 (60/60) (-2.34E+01 - 2.70E+01)	10G1 14 MILES SSW	9.78E-01 (20/20) (-1.16E+01 - 1.50E+01	9.78E-01 (20/20) (-1.16E+01 - 1.50E+01)	0
	LA-140	80	15	-3.07E-01 (60/60) (-6.22E+00 - 5.15E+00)	5E2 4.5 MILES E	1.39E-02 (20/20) (-6.11E+00 - 4.70E+00	-2.23E-01 (20/20) (-5.43E+00 - 6.44E+00)	0
	RA-226	80	N/A	4.92E+00 (60/60) (-1.34E+02 - 1.35E+02)	5E2 4.5 MILES E	2.23E+01 (20/20) (-5.29E+01 - 1.35E+02	-1.96E+01 (20/20) (-1.67E+02 - 1.17E+02)	0
	AC-228	80	N/A	2.65E-01 (60/60) (-1.43E+01 - 2.51E+01)	5E2 4.5 MILES E	2.17E+00 (20/20) (-1.14E+01 - 2.51E+01	-4.30E-01 (20/20) (-1.27E+01 - 1.34E+01)	0
	TH-228	80	N/A	1.54E+00 (60/60) (-8.31E+00 - 1.53E+01)	10D3 3.5 MILES SSW	3.05E+00 (20/20) (-8.26E+00 - 1.53E+01	2.32E+00 (20/20) (-9.64E+00 - 1.24E+01)	0
Soil (pCi/kg dry)	GAMMA	4						
	K-40	4	N/A	1.07E+04 (2/2) (1.03E+04 - 1.11E+04)	12S1 0.4 MILES WSW	1.07E+04 (2/2) (1.03E+04 - 1.11E+04)	1.03E+04 (2/2) (9.77E+03 - 1.08E+04)	0
	MN-54	4	N/A	7.65E+00 (2/2) (-4.60E+00 - 1.99E+01)	8G1 12 MILES SSE	1.80E+01 (2/2) (1.15E-02 - 3.60E+01)	1.80E+01 (2/2) (1.15E-02 - 3.60E+01)	0
	CO-58	4	N/A	-1.22E+01 (2/2) (-1.37E+01 - -1.06E+01)	8G1 12 MILES SSE	-6.79E+00 (2/2) (-1.04E+01 - -3.18E+0	-6.79E+00 (2/2) (-1.04E+01 - -3.18E+00)	0
	FE-59	4	N/A	-2.11E+01 (2/2) (-4.71E+01 - 4.95E+00)	8G1 12 MILES SSE	1.49E+01 (2/2) (-4.11E+01 - 7.08E+01	1.49E+01 (2/2) (-4.11E+01 - 7.08E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2010
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Soil (cont.) (pCi/kg dry)	CO-60	4	N/A	1.43E+01 (2/2) (8.21E+00 - 2.04E+01)	8G1 12 MILES SSE	1.90E+01 (2/2) (7.13E+00 - 3.08E+01)	1.90E+01 (2/2) (7.13E+00 - 3.08E+01)	0
	ZN-65	4	N/A	4.18E+01 (2/2) (3.31E+01 - 5.05E+01)	12S1 0.4 MILES WSW	4.18E+01 (2/2) (3.31E+01 - 5.05E+01)	6.50E+00 (2/2) (-5.05E+01 - 6.35E+01)	0
	NB-95	4	N/A	1.34E+01 (2/2) (-4.53E+01 - 7.20E+01)	12S1 0.4 MILES WSW	1.34E+01 (2/2) (-4.53E+01 - 7.20E+01	-8.00E-01 (2/2) (-2.09E+01 - 1.93E+01)	0
	ZR-95	4	N/A	-3.26E+01 (2/2) (-4.21E+01 - -2.30E+01)	8G1 12 MILES SSE	-2.29E+01 (2/2) (-5.68E+01 - 1.10E+01	-2.29E+01 (2/2) (-5.68E+01 - 1.10E+01)	0
	CS-134	4	150	8.46E+00 (2/2) (-4.09E+00 - 2.10E+01)	8G1 12 MILES SSE	1.08E+01 (2/2) (7.08E+00 - 1.46E+01)	1.08E+01 (2/2) (7.08E+00 - 1.46E+01)	0
	CS-137	4	180	1.31E+02 (2/2) (1.09E+02 - 1.53E+02)	8G1 12 MILES SSE	1.46E+02 (2/2) (1.14E+02 - 1.78E+02)	1.46E+02 (2/2) (1.14E+02 - 1.78E+02)	0
	BA-140	4	N/A	-4.97E+01 (2/2) (-1.18E+02 - 1.86E+01)	12S1 0.4 MILES WSW	-4.97E+01 (2/2) (-1.18E+02 - 1.86E+01	-1.73E+02 (2/2) (-3.48E+02 - 1.48E+00)	0
	LA-140	4	N/A	-9.18E+01 (2/2) (-1.37E+02 - -4.66E+01)	8G1 12 MILES SSE	-4.02E+01 (2/2) (-4.99E+01 - -3.05E+0	-4.02E+01 (2/2) (-4.99E+01 - -3.05E+01)	0
	RA-226	4	N/A	1.47E+03 (2/2) (8.06E+02 - 2.14E+03)	8G1 12 MILES SSE	2.07E+03 (2/2) (1.64E+03 - 2.50E+03)	2.07E+03 (2/2) (1.64E+03 - 2.50E+03)	0
	AC-228	4	N/A	7.43E+02 (2/2) (6.78E+02 - 8.07E+02)	8G1 12 MILES SSE	8.52E+02 (2/2) (8.34E+02 - 8.70E+02)	8.52E+02 (2/2) (8.34E+02 - 8.70E+02)	0
	TH-228	4	N/A	8.04E+02 (2/2) (6.77E+02 - 9.31E+02)	8G1 12 MILES SSE	9.29E+02 (2/2) (8.07E+02 - 1.05E+03)	9.29E+02 (2/2) (8.07E+02 - 1.05E+03)	0

TABLE G
SUMMARY OF DATA FOR SSES
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NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
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Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Food/Garden Crops	GAMMA	5						
(pCi/kg wet)	BE-7	5	N/A	2.64E+01 (5/5) (-2.96E+01 - 6.39E+01)	11D1 3.3 MILES SW	5.16E+01 (2/2) (3.93E+01 - 6.39E+01)	Only Indicator Stations sampled for this medium.	0
	K-40	5	N/A	6.06E+03 (5/5) (1.36E+03 - 1.72E+04)	11D1 3.3 MILES SW	1.02E+04 (2/2) (3.11E+03 - 1.72E+04)		0
	MN-54	5	N/A	-5.15E+00 (5/5) (-1.72E+01 - 7.19E-01)	11D1 3.3 MILES SW	-3.70E+00 (2/2) (-6.52E+00 - -8.70E-01)		0
	CO-58	5	N/A	-3.56E+00 (5/5) (-1.30E+01 - 1.65E+00)	11D1 3.3 MILES SW	9.25E-01 (2/2) (1.99E-01 - 1.65E+00)		0
	FE-59	5	N/A	-1.20E+01 (5/5) (-3.45E+01 - 3.88E+00)	12F7 8.3 MILES WSW	-9.82E+00 (3/3) (-1.37E+01 - -4.56E+00)		0
	CO-60	5	N/A	3.71E+00 (5/5) (-2.84E+00 - 9.83E+00)	12F7 8.3 MILES WSW	5.13E+00 (3/3) (5.06E-01 - 9.83E+00)		0
	ZN-65	5	N/A	-1.97E+01 (5/5) (-5.45E+01 - -2.39E+00)	12F7 8.3 MILES WSW	-1.01E+01 (3/3) (-1.46E+01 - -2.39E+00)		0
	NB-95	5	N/A	5.47E+00 (5/5) (2.40E-01 - 1.42E+01)	12F7 8.3 MILES WSW	6.87E+00 (3/3) (2.40E-01 - 1.42E+01)		0
	ZR-95	5	N/A	1.96E+00 (5/5) (-1.07E+01 - 1.05E+01)	11D1 3.3 MILES SW	8.21E+00 (2/2) (5.92E+00 - 1.05E+01)		0
	I-131	5	60	2.27E+00 (5/5) (-6.78E+00 - 1.33E+01)	11D1 3.3 MILES SW	7.33E+00 (2/2) (1.36E+00 - 1.33E+01)		0
	CS-134	5	60	-1.26E+00 (5/5) (-5.58E+00 - 7.37E+00)	12F7 8.3 MILES WSW	-1.87E-01 (3/3) (-5.58E+00 - 7.37E+00)		0

TABLE G
SUMMARY OF DATA FOR SSES
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NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
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Reporting Period: December 30, 2009 to February 03, 2011

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED (1)		LOWER LIMIT OF DETECTION (LLD) (2)	ALL INDICIATOR LOCATIONS MEAN (3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	LOCATION WITH HIGHEST MEAN MEAN (3) RANGE	CONTROL LOCATION MEAN (3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS
Food/Garden Crops (cont.) (pCi/kg wet)	CS-137	5	80	-6.98E-01 (5/5) (-1.04E+01 - 6.68E+00)	11D1 3.3 MILES SW	3.86E+00 (2/2) (1.03E+00 - 6.68E+00)		0
	BA-140	5	N/A	-1.53E+01 (5/5) (-5.91E+01 - 3.22E+01)	12F7 8.3 MILES WSW	-1.10E+01 (3/3) (-3.56E+01 - 3.22E+01)		0
	LA-140	5	N/A	-8.20E+00 (5/5) (-1.24E+01 - -4.33E+00)	11D1 3.3 MILES SW	-5.54E+00 (2/2) (-6.75E+00 - -4.33E+00)		0
	AC-228	5	N/A	2.04E+01 (5/5) (-2.01E+00 - 4.99E+01)	11D1 3.3 MILES SW	2.39E+01 (2/2) (-2.01E+00 - 4.99E+01)		0
	TH-228	5	N/A	5.60E+00 (5/5) (-7.96E+00 - 3.32E+01)	12F7 8.3 MILES WSW	1.00E+01 (3/3) (-7.96E+00 - 3.32E+01)		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 measured 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 Requirements (i.e.; when Reporting Levels inTechnical Requirmenets are exceeded).

APPENDIX H

COMPARISON OF INDICATOR AND CONTROL 2010 REMP ANNUAL MEANS FOR SELECTED MEDIA ANALYSIS RESULTS WITH MEANS FROM PREOPERATIONAL AND PRIOR OPERATIONAL PERIODS

The data presented in the following tables were included if specific analysis results routinely exceeded the applicable MDCs in 2009 and/or routinely may have done so in previous years. The comparisons may be useful for observing any step changes that may occur in the environment over a long period. However, the importance attached to these comparisons should be tempered by the understanding that changes in methods of analysis, typical MDCs achieved by the analyses, and averaging methods over the years may tend to blur the picture in some cases.

AMBIENT RADIATION MONITORING

TABLE H 1

AMBIENT RADIATION LEVELS AS MEASURED BY TLDS (mR/STD QTR)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-09**	**2010**	**1978-81**	**1982-09**	**2010**
Range	18.5-19.2	14.7-24.3	--	15.0-17.9	14.8-23.1	--
Mean	18.9	19.1	21.3	16.3	18.6	20.0

AQUATIC PATHWAY MONITORING

TABLE H 3

SURFACE WATER IODINE-131 ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1979-81	**1982-07**	**2008***	**1979-81**	**1982-07**	**2008***
Range	0.24-0.37	0.06-1.00	--	0.29-0.43	0.03-1.0	--
Mean	0.29	0.39	0.48	0.36	0.34	0.34

* Iodine-131 analysis discontinued in 2009.

TABLE H 4

SURFACE WATER TRITIUM ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-09***	**2010**	**1978-81**	**1982-09***	**2010**
Range	101-122	126-2104	--	119-319	-239 - 212	--
Mean	109	799	868	171	43	7.19

*1990 results were not averaged with 1982-07 data because the validity of the 1990 values is questionable in some instances. Laboratory analysis error is suspected. See the 1990 Annual Report.

TABLE H 6

DRINKING WATER GROSS BETA ACTIVITIES (pCi/l)			
Period	**Preoperational**	**Operational**	
	1977 - 81	**1982-09**	**2010**
Range	2.2 - 3.2	1.9 - 5.4	--
Mean	2.7	3.0	2.0

TABLE H 7

DRINKING WATER TRITIUM ACTIVITIES (pCi/l)			
Period	Preoperational	Operational	
	1977 - 81	1982-09	2010
Range	101 – 194	-247 - 220	--
Mean	132	56	27

TABLE H 8

FISH POTASSIUM-40 ACTIVITIES (pCi/g wet)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1977-81	1982-09	2010	1977-81	1982-09	2010
Range	2.7 - 3.5	3.1 - 5.3	--	2.8 - 3.6	2.7 - 4.2	--
Mean	3.2	3.7	3.3	3.2	3.5	3.2

TABLE H 9

SEDIMENT POTASSIUM-40 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1978-81	1982-09	2010	1978-81	1982-09	2010
Range	8.6-10.4	7.4-13.8	--	7.5-11.0	6.2-15.7	--
Mean	9.3	11.0	12.1	7.7	11.3	14.3

TABLE H 10

SEDIMENT RADIUM-226 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1978-81	1982-09	2010	1978-81	1982-09	2010
Range	0.5-0.7	0.5-2.9	--	0.6-1.9	0.4-2.9	--
Mean	0.6	1.7	3.2	0.7	1.7	1.9

TABLE H 11

SEDIMENT THORIUM-228 ACTIVITIES (pCi/g dry)				
Location	Indicator		Control	
Period	1984 – 09*	2010	1984 - 09*	2010
Range	0.9 – 3.2	--	0.8 – 3.1	--
Mean	1.3	1.1	1.4	1.2

*Th-232 was reported instead of Th-228 in 1990.

TABLE H 12

SEDIMENT CESIUM-137 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1978-81	1982-09	2010	1978-81	1982-09	2010
Range	0.08-0.15	0.02-0.17	--	0.08-0.21	0.04-0.21	--
Mean	0.10	0.08	0.04	0.11	0.10	0.06

ATMOSPHERIC PATHWAY MONITORING

TABLE H 13

AIR PARTICULATE GROSS BETA ACTIVITIES (E-3 pCi/m3)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1978-81	1982-09	2010	1978-81	1982-09	2010
Range	24 - 97	13 – 28.8	--	24 - 102	12 – 27.7	--
Mean	61	15.9	13.5	62	15.1	12.7

TABLE H 14

AIR PARTICULATE BERYLLIUM-7 ACTIVITIES (E-3 pCi/m3)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1978-81	1982-09*	2010	1978-81	1982-09*	2010
Range	69 - 81	50 - 137	--	59 - 85	49 - 134	--
Mean	76	99	128	72	94	130

*1990 results were not averaged with 1982-07 data because the validity of the 1990 values is questionable in some instances. Laboratory analysis error is suspected. See the 1990 Annual Report.

TERRESTRIAL PATHWAY MONITORING

TABLE H 15

SOIL POTASSIUM-40 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1979&81	1984-09	2010	1979&81	1984-09	2010
Range	9.2 - 9.7	9.4-15.3	--	9.1-11.0	7.4-14.1	--
Mean	9.5	12.0	10.7	10.1	10.3	10.3

TABLE H 16

SOIL RADIUM-226 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1979&81	1984-09*	2010	1979&81	1984-09*	2010
Range	0.8 - 1.3	0.8 – 3.1	--	0.8 - 1.2	1.0 - 2.2	--
Mean	1.1	1.62	1.5	1.0	1.79	2.1

* Radium-226 was not detected (ND) in 2002, 2003, 2004, or 2005.

TABLE H 17

SOIL THORIUM-228 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1979&81	1984-09	2010	1979&81	1984-09	2010
Range	0.9 - 1.3	0.8 – 2.0	--	--	0.7 – 2.4	--
Mean	1.1	1.0	0.8	1.0	1.0	0.9

TABLE H 18

SOIL CESIUM-137 ACTIVITIES (pCi/g dry)						
Location	Indicator			Control		
Period	Pre-Op	Operational		Pre-Op	Operational	
	1979&81	1982-09	2010	1979&81	1982-09	2010
Range	0.5 - 0.7	0.02 - 0.45	--	0.2 - 1.2	0.07 - 1.2	--
Mean	0.6	0.18	0.13	0.7	0.31	0.15

TABLE H 19

MILK POTASSIUM-40 ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1985-09**	**2010**	**1978-81**	**1985-09**	**2010**
Range	1222-1500	1241-1422	--	1273-1500	1247-1472	--
Mean	1325	1331	1300	1390	1338	1310

TABLE H 20

GROUND WATER TRITIUM ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1980-81	**1982-09**	**2010**	**1980-81**	**1982-09**	**2010**
Range	94-109	-206 - +180	--	117 - 119	-206 - +260	--
Mean	101	56.6	96.2	118	50.3	-1.95

APPENDIX I

SPECIFIC ANALYSIS RESULTS TABULATED BY MEDIA AND SAMPLING PERIOD

Results of analyses are generally reported in the following tables to two significant figures. Random uncertainties of counting are reported to the same decimal place as the result.

Calculated values for analysis results are reported with the random uncertainty of counting at two standard deviations (2S), determined by considering both the sample and background count rates. The uncertainty of an activity is influenced by the volume or mass of the sample, the background count rate, the count times, the method used to round off the value obtained to reflect its degree of significance, and other factors. The uncertainties of activities determined by gamma spectrometric analyses are also influenced by the relative concentrations of the radionuclides in the sample, the energies and intensities of the gammas emitted by those radionuclides, and the assumptions used in selecting the radionuclides to be quantitatively determined.

Results reported as less than (<) in these tables are below the minimum detectable concentrations (MDCs). The MDC is an estimate of the detection capabilities of the overall measurement method, taking into account not only the counting system, but also the characteristics of the sample being counted. When the MDC is used as the level to decide whether or not to enter a measured value into a table, there is a 50% chance that the value will be entered when the actual sample activity is equivalent to the MDC. There is only a five percent chance that a value representing a fluctuation in background activity will be entered as sample activity in such an instance.

Measured values for the activities of specific radionuclides, such as the man-made gamma-emitting radionuclides iodine-131 and cesium-137, only appear in the following tables for each specific medium when the levels that are measured exceed the MDC values for those measurements and those radionuclides are actually identified as present in the samples. Measured values for the analyses that are not radionuclide specific, such as gross alpha and beta analyses, also are presented in the tables for specific media only when the levels that are measured actually exceed the MDCs.

TABLE I-1
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY RESULTS
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results (1) are in mR/std. qtr (2) ± 2S (3)

Location	First Quarter 01/19/10 to 04/23/10	Second Quarter 04/22/10 to 07/15/10	Third Quarter 07/14/10 to 10/26/10	Fourth Quarter 10/25/10 to 02/03/11
ONSITE				
1S2	22.3 ± 0.6	24.7 ± 1.5	23.1 ± 0.9	23.9 ± 1.6
2S2	19.1 ± 1.4	21.0 ± 2.4	19.1 ± 1.4	18.2 ± 1.4
2S3	21.4 ± 1.6	24.8 ± 2.0	23.3 ± 2.9	21.8 ± 0.9
3S2	18.2 ± 1.0	20.2 ± 2.4	17.1 ± 1.6	17.3 ± 1.3
3S3	17.7 ± 1.2	18.9 ± 1.3	17.0 ± 0.9	17.3 ± 0.7
4S3	22.9 ± 1.0	25.4 ± 3.3	22.4 ± 2.0	22.5 ± 1.1
4S6	18.2 ± 0.6	20.6 ± 2.0	18.7 ± 2.1	17.7 ± 1.3
5S4	16.9 ± 0.8	18.0 ± 2.2	17.0 ± 0.7	15.7 ± 0.7
5S7	18.7 ± 1.4	23.2 ± 2.0	18.9 ± 1.4	18.4 ± 1.1
6S4	25.7 ± 1.7	29.9 ± 1.3	25.5 ± 1.4	25.5 ± 2.3
6S9	25.4 ± 0.8	27.3 ± 1.5	26.1 ± 1.6	25.4 ± 3.1
7S6	22.7 ± 0.8	24.7 ± 1.8	23.5 ± 0.9	25.8 ± 2.7
7S7	17.9 ± 1.6	20.0 ± 2.0	17.0 ± 1.8	17.4 ± 1.4
8S2	24.6 ± 1.9	26.2 ± 1.1	24.6 ± 0.9	23.7 ± 2.0
9S2	41.4 ± 4.1	44.7 ± 4.9	42.7 ± 3.9	45.1 ± 3.8
10S1	18.0 ± 1.4	19.0 ± 1.1	17.1 ± 0.9	17.4 ± 1.8
10S2	30.6 ± 1.4	32.3 ± 3.3	32.6 ± 1.6	31.6 ± 1.6
11S7	18.9 ± 1.6	20.6 ± 1.8	17.9 ± 1.1	18.3 ± 1.6
12S1	19.8 ± 1.6	22.3 ± 3.3	19.4 ± 0.9	18.8 ± 1.1
12S3	21.6 ± 1.7	23.4 ± 1.1	21.8 ± 0.7	21.1 ± 0.7
12S7	18.1 ± 1.4	19.3 ± 1.8	17.7 ± 1.1	16.7 ± 1.1
13S2	25.0 ± 1.9	28.0 ± 3.1	25.9 ± 1.8	26.3 ± 1.6
13S5	26.3 ± 1.2	29.5 ± 3.3	29.6 ± 1.6	26.7 ± 2.0
13S6	23.7 ± 1.2	24.8 ± 1.5	23.3 ± 1.3	23.0 ± 1.3
14S5	21.6 ± 0.8	23.6 ± 1.8	22.5 ± 0.9	21.6 ± 1.6
15S5	21.0 ± 2.3	21.8 ± 1.5	19.5 ± 1.4	19.4 ± 0.7
16S1	22.7 ± 2.3	24.7 ± 2.2	23.3 ± 1.3	22.6 ± 1.1
16S2	22.5 ± 0.8	24.7 ± 1.8	22.8 ± 0.9	22.3 ± 0.5

See the comments at the end of this table.

TABLE I-1
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY RESULTS
SUSQUEHANNA STEAM ELECTRIC STATION, 2010

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

Location	First Quarter 01/19/10 to 04/23/10	Second Quarter 04/22/10 to 07/15/10	Third Quarter 07/14/10 to 10/26/10	Fourth Quarter 10/25/10 to 02/03/11
0-1 MILE OFFSITE				
6A4	20.7 ± 0.8	21.9 ± 1.1	20.8 ± 2.1	19.8 ± 1.6
8A3	17.1 ± 1.4	19.2 ± 1.3	17.0 ± 1.1	17.1 ± 1.3
15A3	17.9 ± 0.6	19.8 ± 2.6	17.8 ± 1.6	17.5 ± 1.4
16A2	17.3 ± 0.6	18.8 ± 1.5	17.3 ± 0.9	15.9 ± 0.5
1-2 MILE OFFSITE				
8B2	18.3 ± 1.2	18.9 ± 1.1	18.2 ± 1.1	17.1 ± 1.5
9B1	(4)	24.5 ± 1.8	22.3 ± 2.3	21.7 ± 0.9
10B3	18.3 ± 0.8	19.0 ± 1.3	18.4 ± 1.6	16.7 ± 0.5
2-4 MILE OFFSITE				
1D5	20.9 ± 1.4	22.8 ± 2.4	20.5 ± 1.6	19.6 ± 0.6
8D3	19.8 ± 1.6	20.3 ± 0.9	19.5 ± 1.9	17.5 ± 1.1
9D4	20.2 ± 1.0	21.2 ± 1.5	20.3 ± 2.8	18.7 ± 0.9
10D1	19.5 ± 1.0	20.7 ± 0.7	19.5 ± 2.3	17.9 ± 1.3
12D2	20.1 ± 1.4	21.8 ± 2.2	20.2 ± 2.0	18.5 ± 1.3
14D1	19.9 ± 0.8	21.2 ± 0.9	19.7 ± 1.3	18.4 ± 0.7
4-5 MILE OFFSITE				
3E1	17.9 ± 1.4	17.8 ± 1.1	16.9 ± 1.6	17.0 ± 0.9
4E2	21.6 ± 1.6	21.3 ± 2.4	21.5 ± 1.9	18.6 ± 1.7
5E2	20.0 ± 2.6	20.8 ± 0.9	19.2 ± 1.1	18.6 ± 1.5
6E1	21.5 ± 1.8	23.9 ± 1.8	21.6 ± 1.8	19.8 ± 0.6
7E1	19.8 ± 0.8	22.2 ± 2.2	19.9 ± 2.5	19.4 ± 1.3
11E1	17.1 ± 0.4	17.9 ± 1.5	17.5 ± 0.5	15.5 ± 1.3
12E1	18.3 ± 1.6	19.3 ± 1.5	17.0 ± 1.4	16.7 ± 0.7
13E4	20.3 ± 1.0	22.1 ± 0.9	20.5 ± 0.9	20.1 ± 2.2

See the comments at the end of this table.

TABLE I-1
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY RESULTS
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results (1) are in mR/std. qtr (2) ± 2S (3)

Location	First Quarter 01/19/10 to 04/23/10	Second Quarter 04/22/10 to 07/15/10	Third Quarter 07/14/10 to 10/26/10	Fourth Quarter 10/25/10 to 02/03/11
5-10 MILE OFFSITE				
2F1	19.1 ± 1.6	20.3 ± 1.1	19.7 ± 2.1	18.0 ± 2.1
15F1	(4)	22.0 ± 0.4	21.5 ± 1.1	19.1 ± 1.3
16F1	21.8 ± 0.8	22.4 ± 1.8	21.3 ± 2.0	20.1 ± 1.4
10-20 MILE OFFSITE				
3G4	22.9 ± 1.4	21.3 ± 1.5	20.0 ± 1.6	19.4 ± 0.8
4G1	20.7 ± 2.4	22.0 ± 1.5	20.7 ± 1.5	18.9 ± 2.3
7G1	18.9 ± 1.8	20.2 ± 1.1	18.2 ± 1.1	18.0 ± 1.5
12G1	17.6 ± 0.8	20.0 ± 1.8	16.6 ± 1.8	16.1 ± 0.8
12G4	21.8 ± 2.8	22.8 ± 1.3	20.8 ± 1.8	21.9 ± 1.5

See the comments at the end of this table.

Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Indicator Average (5)	21.0 ± 10.2	22.8 ± 14.0	21.1 ± 11.6	20.4 ± 10.6
Control Average (5)	20.4 ± 4.4	21.3 ± 3.3	19.3 ± 3.5	18.9 ± 3.3

Comments

(1) Individual monitor location results are normally the average of the elemental doses of six calcium elements from the two TLDs 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 six calcium elements from the two TLDs assigned to each monitoring location, representing the variability between the elemental doses of each of the six TLD elements.
(4) No measurement could be made at this location because the TLDs were lost, stolen, or damaged. Refer to Appendix A of the Annual Radiological Environmental Operating Report for an explanation of program exceptions to REMP.
(5) Uncertainties associated with quarterly indicator and control averages are two standard deviations, representing the variability between the results of the individual monitoring locations.

TABLE I-2
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY		COMMENTS
6S6	12/29/09 - 01/26/10	< 134			
2S7	12/29/09 - 01/26/10	1260 ± 150			
6S5	01/05/10 - 01/26/10	< 135	TH-228	5 ± 3	
6S6	01/26/10 - 03/02/10	< 119	TH-228	7 ± 4	
2S7	01/26/10 - 03/02/10	1060 ± 128			
6S5	02/02/10 - 03/02/10	< 118	TH-228	4 ± 2	
4S7-GRAB	02/08/10 - 02/08/10	177 ± 78			
LTAW-GRAB	02/08/10 - 02/08/10	173 ± 81	TH-228	24 ± 10	
5S12-GRAB	02/08/10 - 02/08/10	< 117			
7S12-GRAB	02/08/10 - 02/08/10	148 ± 77			
6S6	03/02/10 - 03/30/10	< 127			
2S7	03/02/10 - 03/30/10	6210 ± 535			
6S5	03/09/10 - 03/30/10	< 125			
6S6	03/30/10 - 04/27/10	< 129			
2S7	03/30/10 - 04/27/10	12500 ± 1290	TH-228	6 ± 3	
6S5	04/06/10 - 04/27/10	< 127			
6S6	04/27/10 - 06/01/10	< 115			
2S7	04/27/10 - 06/01/10	3130 ± 285			
6S5	05/04/10 - 06/01/10	< 120			
4S7-GRAB	05/10/10 - 05/10/10	123 ± 79			
LTAW-GRAB	05/10/10 - 05/10/10	< 125			
5S12-GRAB	05/10/10 - 05/10/10	< 130			
7S12-GRAB	05/10/10 - 05/10/10	< 130			

TABLE I-2
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010

Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY		COMMENTS
6S6	06/01/10 - 06/29/10	< 131			
2S7	06/01/10 - 06/22/10	535 ± 115			
6S5	06/08/10 - 06/29/10	< 130			
2S7-GRAB	06/29/10 - 06/29/10	< 134	TH-228	10 ± 6	
6S6	06/29/10 - 07/27/10	< 146			
2S7	06/29/10 - 07/27/10	4140 ± 472			
6S5	07/06/10 - 07/27/10	< 150			
6S6	07/27/10 - 08/31/10	< 140			
2S7	07/27/10 - 08/31/10	2550 ± 248			
6S5	08/02/10 - 08/31/10	< 140	K-40	47 ± 26	
LTAW GRAB	08/02/10 - 08/02/10	< 134			
5S12 GRAB	08/03/10 - 08/03/10	< 135			
7S12 GRAB	08/03/10 - 08/03/10	141 ± 87	TH-228	4 ± 2	
4S7 GRAB	08/12/10 - 08/12/10	169 ± 84			
6S6	08/31/10 - 09/28/10	< 139			
2S7	08/31/10 - 09/28/10	691 ± 115			
6S5	09/07/10 - 09/28/10	< 142			
6S6	09/28/10 - 10/26/10	< 123	TH-228	7 ± 4	
2S7	09/28/10 - 10/26/10	200 ± 87			
6S5	10/05/10 - 10/26/10	< 124			
6S6	10/26/10 - 11/30/10	< 127	K-40	38 ± 25	
2S7	10/26/10 - 11/30/10	749 ± 111			
4S7 GRAB	11/01/10 - 11/01/10	231 ± 84			
LTAW GRAB	11/01/10 - 11/01/10	137 ± 81			
5S12 GRAB	11/01/10 - 11/01/10	132 ± 81			
7S12 GRAB	11/01/10 - 11/01/10	179 ± 85			
6S5	11/02/10 - 11/30/10	< 131			

TABLE I-2
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY	COMMENTS
6S6	11/30/10 - 12/28/10	< 144		
2S7	11/30/10 - 12/28/10	523 ± 115		
6S5	12/07/10 - 12/28/10	< 125		

TABLE I-3
IODINE-131 ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
RESULTS IN PCI/LITER ± 2S

LOCATION	COLLECTION DATE	I-131	COMMENTS
	INTENTIONALLY LEFT BLANK		DISCONTINUED I-131 ANALYSIS IN 2009

TABLE I-4
GROSS BETA,TRITIUM, GAMMA SPECTROSCOPIC ANALYSES OF DRINKING WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	Gr-Beta	H-3	OTHER ACTIVITY	COMMENTS
12H2	12/29/09 - 01/26/10	< 2.2	< 131		
12H2	01/26/10 - 03/02/10	< 4.0	< 116		
12H2	03/02/10 - 03/30/10	< 2.5	< 125		
12H2	03/30/10 - 04/27/10	< 2.4	< 124		
12H2	04/27/10 - 06/01/10	< 3.0	< 121		
12H2	06/01/10 - 06/29/10	< 2.5	< 127		
12H2	06/29/10 - 07/27/10	< 2.8	< 143		
12H2	07/27/10 - 08/31/10	3.8 ± 1.2	< 137	TH-228 4 ± 2	
12H2	08/31/10 - 09/28/10	4.5 ± 1.6	< 128		
12H2	09/28/10 - 10/26/10	2.7 ± 1.6	< 121		
12H2	10/26/10 - 11/30/10	< 3.3	< 127		
12H2	11/30/10 - 12/28/10	< 3.2	< 135		

TABLE I-5
GAMMA SPECTROSCOPIC ANALYSIS OF FISH
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/kg (wet) ± 2S

LOCATION	SAMPLE TYPE	COLLECTION DATE	K-40	OTHER ACTIVITY	COMMENTS
IND	smallmouth bass	04/29/10 - 04/29/10	3010 ± 638		
IND	channel catfish	04/29/10 - 04/29/10	3130 ± 686		
IND	shorthead redhouse	04/29/10 - 05/10/10	3440 ± 766		
2H	smallmouth bass	05/14/10 - 05/14/10	3590 ± 778		
2H	channel catfish	05/14/10 - 05/14/10	3270 ± 673		
2H	shorthead redhouse	05/18/10 - 05/19/10	3450 ± 540		
LTAW	largemouth bass	10/25/10 - 10/25/10	3360 ± 686		
IND	smallmouth bass	10/26/10 - 10/26/10	3540 ± 693		
IND	smallmouth bass	10/26/10 - 10/26/10	2800 ± 790		
IND	channel catfish	10/26/10 - 10/26/10	3830 ± 652		
IND	shorthead redhorse	10/26/10 - 10/26/10	3210 ± 845		
2H	smallmouth bass	10/27/10 - 10/28/10	2540 ± 670		
2H	channel catfish	10/27/10 - 10/27/10	3290 ± 818		
2H	shorthead redhorse	10/27/10 - 10/27/10	3090 ± 887		

TABLE I-6
GAMMA SPECTROSCOPIC ANALYSES OF SHORELINE SEDIMENT
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/kg (dry) ± 2S

LOCATION	COLLECTION DATE	K-40	Cs-137	Ra-226	Th-228	OTHER ACTIVITY			
2B	05/10/10	13700 ± 1370		2020 ± 1330	850 ± 122	AC-228	1390 ± 317		
7B	05/10/10	13100 ± 1600			1320 ± 141	AC-228	1030 ± 406		
12F	05/10/10	8070 ± 823		3590 ± 1260	744 ± 73	AC-228	1030 ± 178		
2B	10/18/10	14900 ± 1400			1470 ± 119	AC-228	1230 ± 349		
7B	10/18/10	14900 ± 1410		3730 ± 1270	1180 ± 122	AC-228	1020 ± 273	BE-7	1150 ± 532
12F	10/18/10	12200 ± 1430		2960 ± 1690	1200 ± 135	AC-228	1330 ± 439	BE-7	1820 ± 959

TABLE I-7
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY	
12F3	02/08/10	< 127		
2S2	02/08/10	< 128		
4S4	02/08/10	< 129		
6S10	02/08/10	< 129	TH-228	11 ± 7
11S2	02/08/10	< 130		
13S7	02/09/10	201 ± 80	TH-228	6 ± 3
4S8	02/09/10	260 ± 82		
8S4	02/09/10	132 ± 85		
1S3	02/11/10	281 ± 83	TH-228	6 ± 4
4S9	02/11/10	141 ± 78		
6S12	02/11/10	< 117		
7S10	02/12/10	< 117		
6S11	02/15/10	156 ± 79		
7S11	02/15/10	< 118		
12F3	05/10/10	< 139		
6S10	05/10/10	< 140		
11S2	05/10/10	< 141		
2S2	05/11/10	< 137		
4S4	05/11/10	< 140		
13S7	05/11/10	< 119		
1S3	05/11/10	203 ± 84		
4S8	05/11/10	231 ± 84		
6S12	05/11/10	< 123		
4S9	05/12/10	171 ± 83		
6S11	05/12/10	194 ± 84		
7S10	05/12/10	< 124		
7S11	05/12/10	< 128		
8S4	05/13/10	< 125		
13S7	05/27/10	< 124		

TABLE I-7
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY	
4S8	07/19/10	239 ± 86		
4S9	07/19/10	< 123		
8S4	07/19/10	< 123		
7S10	07/20/10	< 123		
4S8	08/03/10	< 141		
8S4	08/03/10	< 147	TH-228	14 ± 8
12F3	08/16/10	< 125		
2S2	08/16/10	< 124		
4S4	08/16/10	< 123		
6S10	08/16/10	< 133		
11S2	08/16/10	< 124		
13S7	08/17/10	231 ± 87		
1S3	08/17/10	244 ± 88		
6S12	08/17/10	< 130		
4S9	08/18/10	203 ± 86		
7S10	08/18/10	148 ± 83	TH-228	7 ± 3
7S11	08/18/10	< 127		
6S11	08/19/10	170 ± 88		
12F3	11/01/10	< 134		
2S2	11/01/10	< 144		
4S4	11/01/10	< 138		
6S10	11/01/10	< 136		
6S12	11/01/10	< 121		
11S2	11/01/10	< 135		
7S10	11/01/10	< 120	TH-228	16 ± 7
7S11	11/01/10	< 123		
13S7	11/02/10	157 ± 80		
1S3	11/02/10	281 ± 85	TH-228	12 ± 7

TABLE I-7
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2010

Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY	
4S8	11/02/10	167 ± 81	TH-228	11 ± 6
4S9	11/03/10	137 ± 80		
6S11	11/03/11	142 ± 80		
8S4	11/04/10	199 ± 84		

TABLE I-8
GROSS BETA ANALYSES OF AIR PARTICULATE FILTERS
SUSQUEHANNA STEAM ELECTRIC STATION, 2010

RESULTS IN E-03 PCI/CU. M. ± 2S

MONTH	COLLECTION DATE	3S2	6G1	8G1	12E1	12S1	13S6
JAN	12/30/09 - 01/06/10	10.9 ± 2.64	12.4 ± 2.58	10.0 ± 2.38	9.46 ± 2.51	12.0 ± 2.69	11.3 ± 2.44
JAN	01/06/10 - 01/13/10	14.5 ± 2.77	12.6 ± 2.53	13.6 ± 2.53	14.0 ± 2.71	13.8 ± 2.70	11.6 ± 2.41
JAN	01/13/10 - 01/20/10	20.3 ± 2.71	17.0 ± 2.42	17.6 ± 2.41	20.8 ± 2.72	19.4 ± 2.65	18.5 ± 2.45
JAN	01/20/10 - 01/27/10	11.4 ± 3.10	10.8 ± 2.90	11.7 ± 2.86	12.7 ± 3.13	10.0 ± 3.03	13.3 ± 2.92
JAN	01/27/10 - 02/03/10	13.4 ± 3.03	14.5 ± 2.89	11.8 ± 2.70	15.7 ± 3.04	15.3 ± 3.07	15.4 ± 2.83
FEB	02/03/10 - 02/09/10	16.0 ± 3.32	13.0 ± 2.99	10.8 ± 2.81	13.8 ± 3.14	17.5 ± 3.38	13.4 ± 2.95
FEB	02/09/10 - 02/17/10	10.0 ± 2.36	9.04 ± 2.17	7.91 ± 2.07	12.2 ± 2.42	12.1 ± 2.46	11.3 ± 2.23
FEB	02/17/10 - 02/24/10	8.34 ± 2.54	3.90 ± 2.18	6.50 ± 2.29	6.68 ± 2.43	8.99 ± 2.57	6.50 ± 2.23
FEB	02/24/10 - 03/03/10	4.33 ± 2.38	6.15 ± 2.31	6.42 ± 2.25	4.17 ± 2.29	5.48 ± 2.42	6.04 ± 2.27
MAR	03/03/10 - 03/10/10	13.9 ± 2.35	12.8 ± 2.20	14.8 ± 2.21	12.6 ± 2.30	13.1 ± 2.30	13.4 ± 2.14
MAR	03/10/10 - 03/17/10	9.38 ± 2.96	4.35 ± 2.55	10.3 ± 2.79	9.72 ± 2.95	11.0 ± 3.05	10.4 ± 2.78
MAR	03/17/10 - 03/24/10	17.6 ± 3.11	12.9 ± 2.77	17.3 ± 2.92	15.5 ± 3.01	13.6 ± 2.89	15.0 ± 2.79
MAR	03/24/10 - 03/31/10	9.22 ± 2.79	9.12 ± 2.66	10.3 ± 2.62	9.68 ± 2.77	10.1 ± 2.81	10.3 ± 2.61
APR	03/31/10 - 04/07/10	17.9 ± 3.24	13.1 ± 2.89	14.0 ± 2.81	17.1 ± 3.21	12.9 ± 2.99	12.9 ± 2.80
APR	04/07/10 - 04/14/10	9.33 ± 2.80	10.9 ± 2.75	13.2 ± 2.80	12.0 ± 2.95	12.3 ± 2.97	10.7 ± 2.73
APR	04/13/10 - 04/21/10	10.0 ± 2.33	8.27 ± 2.11	5.94 ± 1.93	9.47 ± 1.92	7.71 ± 2.21	7.43 ± 2.07
APR	04/21/10 - 04/28/10	8.49 ± 2.61	8.81 ± 2.48	9.42 ± 2.48	7.65 ± 2.31	12.4 ± 2.83	10.4 ± 2.56
MAY	04/28/10 - 05/05/10	15.8 ± 2.98	12.8 ± 2.71	13.3 ± 2.67	13.7 ± 2.62	14.9 ± 2.96	13.9 ± 2.77
MAY	05/05/10 - 05/12/10	9.77 ± 2.52	10.0 ± 2.41	9.32 ± 2.33	10.6 ± 2.33	10.8 ± 2.61	12.1 ± 2.52
MAY	05/12/10 - 05/19/10	7.22 ± 2.54	5.53 ± 2.31	8.24 ± 2.42	9.39 ± 2.50	8.10 ± 2.59	8.96 ± 2.47
MAY	05/19/10 - 05/26/10	14.4 ± 2.86	12.7 ± 2.65	13.2 ± 2.65	11.7 ± 2.59	10.1 ± 2.68	13.4 ± 2.73
MAY	05/26/10 - 06/02/10	11.9 ± 2.97	13.7 ± 2.93	12.4 ± 2.80	12.5 ± 2.84	14.5 ± 2.98	12.3 ± 2.88
JUN	06/02/10 - 06/09/10	12.0 ± 2.95	11.2 ± 2.82	10.7 ± 2.79	10.4 ± 2.79	13.2 ± 3.09	11.2 ± 2.92
JUN	06/09/10 - 06/16/10	10.7 ± 2.68	12.7 ± 2.67	10.4 ± 2.55	12.2 ± 2.66	10.8 ± 2.66	9.91 ± 2.63
JUN	06/16/10 - 06/23/10	15.7 ± 2.40	13.3 ± 2.20	14.2 ± 2.24	14.8 ± 2.27	12.2 ± 2.17	14.9 ± 2.35
JUN	06/23/10 - 06/30/10	16.3 ± 2.84	14.2 ± 2.67	17.1 ± 3.12	15.2 ± 2.69	12.9 ± 2.68	17.1 ± 2.88

TABLE I-8
GROSS BETA ANALYSES OF AIR PARTICULATE FILTERS
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
RESULTS IN E-03 PCI/CU. M. ± 2S

MONTH	COLLECTION DATE	3S2	6G1	8G1	12E1	12S1	13S6
JUL	06/30/10 - 07/07/10	18.0 ± 2.89	19.3 ± 2.88	19.9 ± 2.85	21.5 ± 2.96	21.2 ± 3.02	18.3 ± 2.90
JUL	07/07/10 - 07/14/10	19.2 ± 2.72	18.6 ± 2.60	17.1 ± 2.51	20.0 ± 2.67	18.5 ± 2.67	16.7 ± 2.59
JUL	07/14/10 - 07/21/10	17.8 ± 3.02	16.5 ± 2.88	18.5 ± 2.91	15.7 ± 2.81	24.5 ± 3.30	19.3 ± 3.08
JUL	07/21/10 - 07/28/10	12.8 ± 3.06	10.9 ± 2.87	11.1 ± 2.81	10.1 ± 2.82	10.8 ± 2.95	11.6 ± 3.02
AUG	07/28/10 - 08/04/10	15.3 ± 2.51	13.3 ± 2.33	13.5 ± 2.28	13.0 ± 2.34	14.1 ± 2.44	13.6 ± 2.42
AUG	08/04/10 - 08/11/10	26.0 ± 3.23	25.0 ± 3.09	27.9 ± 3.16	27.3 ± 3.17	24.9 ± 3.18	20.5 ± 2.99
AUG	08/11/10 - 08/18/10	14.7 ± 2.99	9.78 ± 2.64	13.4 ± 2.75	11.9 ± 2.74	10.7 ± 2.79	12.4 ± 2.91
AUG	08/18/10 - 08/25/10	15.7 ± 2.93	16.0 ± 2.82	15.8 ± 2.76	13.8 ± 2.73	16.7 ± 2.96	18.3 ± 3.07
AUG	08/25/10 - 09/01/10	21.3 ± 3.11	22.1 ± 3.03	22.7 ± 3.02	21.6 ± 2.99	19.8 ± 3.02	20.9 ± 3.12
SEP	09/01/10 - 09/08/10	27.8 ± 3.35	22.9 ± 3.04	27.8 ± 3.19	22.6 ± 3.00	25.3 ± 3.23	28.3 ± 3.41
SEP	09/08/10 - 09/15/10	11.8 ± 2.55	9.03 ± 2.30	10.1 ± 2.32	11.9 ± 2.47	11.5 ± 2.52	10.2 ± 2.53
SEP	09/15/10 - 09/22/10	14.4 ± 2.69	14.7 ± 2.61	13.5 ± 2.53	16.4 ± 2.67	14.1 ± 2.66	14.2 ± 2.73
SEP	09/22/10 - 09/29/10	15.1 ± 2.82	11.4 ± 2.54	14.3 ± 2.63	14.7 ± 2.70	17.2 ± 2.92	17.6 ± 2.99
OCT	09/29/10 - 10/06/10	6.15 ± 2.14	6.40 ± 2.07	7.01 ± 2.07	6.50 ± 2.07	6.97 ± 2.22	6.58 ± 2.23
OCT	10/06/10 - 10/13/10	20.2 ± 2.90	21.0 ± 2.85	16.0 ± 2.57	19.1 ± 2.75	18.2 ± 2.81	16.5 ± 2.81
OCT	10/13/10 - 10/20/10	9.34 ± 2.29	10.5 ± 2.28	12.8 ± 2.36	13.3 ± 2.40	12.5 ± 2.46	15.0 ± 2.65
OCT	10/20/10 - 10/27/10	13.9 ± 2.52	13.9 ± 2.46	12.1 ± 2.35	10.7 ± 2.42	15.1 ± 2.58	14.2 ± 2.63
OCT	10/27/10 - 11/03/10	10.9 ± 2.34	12.0 ± 2.33	10.6 ± 2.24	11.1 ± 2.40	10.3 ± 2.27	10.6 ± 2.40
NOV	11/03/10 - 11/10/10	7.11 ± 2.17	5.35 ± 1.98	4.08 ± 1.89	5.57 ± 2.10	3.54 ± 1.91	5.16 ± 2.14
NOV	11/10/10 - 11/17/10	15.7 ± 2.58	12.8 ± 2.39	11.4 ± 2.30	15.6 ± 2.70	13.7 ± 2.44	13.2 ± 2.55
NOV	11/17/10 - 11/23/10	22.9 ± 3.22	22.4 ± 3.15	26.4 ± 3.30	21.4 ± 3.22	21.0 ± 3.12	21.1 ± 3.29
NOV	11/23/10 - 12/01/10	13.5 ± 2.19	14.4 ± 2.19	10.2 ± 1.95	12.4 ± 2.16	9.52 ± 1.94	12.6 ± 2.21
DEC	12/01/10 - 12/08/10	9.01 ± 2.30	7.59 ± 2.16	10.0 ± 2.23	11.0 ± 2.45	8.22 ± 2.21	11.8 ± 2.55
DEC	12/08/10 - 12/15/10	11.4 ± 2.38	10.4 ± 2.22	10.5 ± 2.14	11.0 ± 2.35	9.62 ± 2.37	12.7 ± 2.54
DEC	12/15/10 - 12/22/10	19.5 ± 2.79	14.1 ± 2.46	12.5 ± 2.28	18.1 ± 2.76	14.5 ± 2.68	19.7 ± 2.91
DEC	12/22/10 - 12/29/10	5.17 ± 2.10	5.56 ± 2.07	4.50 ± 2.07	6.20 ± 2.19	4.00 ± 2.16	5.64 ± 2.25

TABLE I-9
GAMMA SPECTROSCOPIC ANALYSES OF COMPOSITED AIR PARTICULATE FILTERS
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in E-03 pCi/Cu. M. ± 2S

LOCATION	COLLECTION DATE	Be-7	OTHER ACTIVITY
6G1	12/30/09 - 03/31/10	106 ± 26	
8G1	12/30/09 - 03/31/10	133 ± 26	
3S2	12/30/09 - 03/31/10	146 ± 27	
12E1	12/30/09 - 03/31/10	111 ± 30	
12S1	12/30/09 - 03/31/10	151 ± 35	
13S6	12/30/09 - 03/31/10	121 ± 33	
6G1	03/31/10 - 06/30/10	156 ± 37	
8G1	03/31/10 - 06/30/10	126 ± 33	
3S2	03/31/10 - 06/30/10	110 ± 27	
12E1	03/31/10 - 06/30/10	139 ± 28	
12S1	03/31/10 - 06/30/10	125 ± 36	
13S6	03/31/10 - 06/30/10	169 ± 42	
6G1	06/30/10 - 09/29/10	136 ± 27	
8G1	06/30/10 - 09/29/10	130 ± 28	
3S2	06/30/10 - 09/29/10	132 ± 27	
12E1	06/30/10 - 09/29/10	156 ± 26	
12S1	06/30/10 - 09/29/10	133 ± 33	
13S6	06/30/10 - 09/29/10	132 ± 27	
6G1	09/29/10 - 12/29/10	136 ± 29	
8G1	09/29/10 - 12/29/10	115 ± 26	
3S2	09/29/10 - 12/29/10	123 ± 23	
12E1	09/29/10 - 12/29/10	98 ± 25	
12S1	09/29/10 - 12/29/10	82 ± 22	
13S6	09/29/10 - 12/29/10	122 ± 29	

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY	COMMENTS
10G1	01/04/10	< 0.3	1370 ± 94		
13E3	01/04/10	< 0.3	1450 ± 104		
10D3	01/04/10	< 0.3	1250 ± 96		
5E2	01/04/10	< 0.3	1210 ± 90		
10G1	02/01/10	< 0.4	1280 ± 132		
13E3	02/01/10	< 0.5	1310 ± 158		
10D3	02/01/10	< 0.5	1250 ± 146		
5E2	02/01/10	< 0.5	1260 ± 135		
10G1	03/01/10	< 0.6	1340 ± 132		
13E3	03/01/10	< 0.7	1310 ± 142		
10D3	03/01/10	< 0.5	1350 ± 139		
5E2	03/01/10	< 0.5	1330 ± 127		
10G1	04/05/10	< 0.6	1410 ± 136		
13E3	04/05/10	< 0.6	1380 ± 169		
10D3	04/05/10	< 0.6	1360 ± 155		
5E2	04/05/10	< 0.7	1340 ± 158		
10G1	04/19/10	< 0.6	1300 ± 166		
13E3	04/19/10	< 0.5	1280 ± 129		
10D3	04/19/10	< 0.6	1320 ± 141		
5E2	04/19/10	< 0.5	1330 ± 106		

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY	COMMENTS
10G1	05/03/10	< 0.6	1430 ± 120		
13E3	05/03/10	< 0.9	1420 ± 140		
10D3	05/03/10	< 0.5	1320 ± 125		
5E2	05/03/10	< 0.7	1380 ± 118		
10G1	05/17/10	< 0.6	1480 ± 136		
13E3	05/17/10	< 0.6	1370 ± 116		
10D3	05/17/10	< 0.6	1380 ± 142		
5E2	05/17/10	< 0.5	1300 ± 132		
10G1	05/31/10	< 0.7	1300 ± 100		
13E3	05/31/10	< 0.6	1330 ± 138		
10D3	05/31/10	< 0.8	1290 ± 139		
5E2	05/31/10	< 0.8	1240 ± 156		
10G1	06/14/10	< 0.7	1370 ± 126		
13E3	06/14/10	< 0.7	1330 ± 122		
10D3	06/14/10	< 0.6	1190 ± 138		
5E2	06/14/10	< 0.6	1280 ± 140		
10G1	06/28/10	< 0.5	1390 ± 217		
13E3	06/28/10	< 0.8	1310 ± 214		
10D3	06/28/10	< 0.7	1410 ± 207		
5E2	06/28/10	< 0.5	1230 ± 148		
10G1	07/12/10	< 0.6	1280 ± 137		
13E3	07/12/10	< 0.5	1450 ± 169		
10D3	07/12/10	< 0.6	1260 ± 155		
5E2	07/12/10	< 0.6	1390 ± 209		
10G1	07/26/10	< 0.5	1340 ± 157		
13E3	07/26/10	< 0.5	1160 ± 127		
10D3	07/26/10	< 0.6	1200 ± 166		
5E2	07/26/10	< 0.6	1260 ± 142		

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2010

Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY		COMMENTS
10G1	08/09/10	< 0.7	1170 ± 171			
13E3	08/09/10	< 0.6	1350 ± 168			
10D3	08/09/10	< 0.6	1230 ± 154			
5E2	08/09/10	< 0.6	1430 ± 159			
10G1	08/23/10	< 0.5	1090 ± 98			
13E3	08/23/10	< 0.6	1230 ± 119			
10D3	08/23/10	< 0.7	1140 ± 95	TH-228	15 ± 7	
5E2	08/23/10	< 0.8	1200 ± 134			
10G1	09/06/10	< 0.9	1340 ± 116	TH-228	12 ± 7	
10G1	09/20/10	< 0.9	1310 ± 105			
13E3	09/06/10	< 0.7	1380 ± 109			
13E3	09/20/10	< 1.0	1370 ± 112			
10D3	09/06/10	< 0.7	1260 ± 100			
5E2	09/06/10	< 0.7	1250 ± 120			
10D3	09/20/10	< 1.0	1250 ± 132			
5E2	09/20/10	< 0.7	1190 ± 120			
10G1	10/04/10	< 0.8	1300 ± 116			
13E3	10/04/10	< 0.4	1280 ± 152			
10D3	10/04/10	< 0.8	1160 ± 105			
5E2	10/04/10	< 0.7	1450 ± 158			
10G1	10/18/10	< 1.0	1140 ± 123			
13E3	10/18/10	< 0.7	1330 ± 156			
10D3	10/18/10	< 0.7	1290 ± 163			
5E2	10/18/10	< 0.7	1450 ± 152			
10G1	11/08/10	< 0.6	1310 ± 166			
13E3	11/08/10	< 0.7	1370 ± 151			
10D3	11/08/10	< 0.7	1280 ± 155			
5E2	11/08/10	< 1.0	1320 ± 156			

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY	COMMENTS
10G1	12/06/10	< 0.6	1280 ± 112		
13E3	12/06/10	< 0.7	1350 ± 133		
10D3	12/06/10	< 0.6	1110 ± 126		
5E2	12/06/10	< 0.7	1390 ± 152		

TABLE I-11
GAMMA SPECTROSCOPIC ANALYSES OF SOIL
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/kg (dry) ± 2S

LOCATION	COLLECTION DATE	K-40	Cs-137	Th-228	OTHER ACTIVITY	
8G1 TOP	09/15/10	9770 ± 1720		807 ± 201	AC-228	834 ± 359
8G1 BOTTOM	09/15/10	10800 ± 1600	178 ± 74	1050 ± 142	AC-228	870 ± 304
12S1 TOP	09/15/10	11100 ± 1110	109 ± 55	677 ± 85	AC-228	678 ± 257
12S1 BOTTOM	09/15/10	10300 ± 1580	153 ± 73	931 ± 128	AC-228	807 ± 299

TABLE I-12
GAMMA SPECTROSCOPIC ANALYSES OF FOOD PRODUCTS (FRUITS AND VEGETABLES)
SUSQUEHANNA STEAM ELECTRIC STATION, 2010
Results in pCi/kg (wet) ± 2S

LOCATION	SAMPLE TYPE	COLLECTION DATE	K-40	OTHER ACTIVITY
12F7	Potato	07/16/10	5190 ± 508	
12F7	Bean	07/16/10	1360 ± 392	
11D1	Pumpkin	10/15/10	3110 ± 300	
12F7	Field Corn	12/17/10	3460 ± 231	
11D1	Soybeans	12/22/10	17200 ± 539	

TABLE I-13
TYPICAL MINIMUM DETECTABLE CONCENTRATIONS OF NUCLIDES SEARCHED FOR BUT NOT FOUND BY GAMMA SPECTROMETRY
IN THE VICINITY OF SUSQUEHANNA STEAM ELECTRIC STATION, 2010

Nuclide	Fish (pCi/kg wet)	Sediment (pCi/kg dry)	Surface Water (pCi/l)	Ground Water (pCi/l)	Potable Water (pCi/l)	Air Particulate (E-3 pCi/m3)	Milk (pCi/l)	Fruit/Veg (pCi/kg wet)	Soil (pCi/kg dry)	Air Iodine (E-3 pCi/m3)
MN-54	41.0	71.4	2.3	4.2	1.6	1.5	5.9	17.7	68.2	
CO-58	44.7	68.5	2.5	4.3	1.8	2.4	6.0	17.7	67.3	
FE-59	124.5	200.1	7.0	11.3	5.3	10.9	18.0	48.4	215.8	
CO-60	40.8	69.7	2.4	4.4	1.7	1.3	6.2	19.8	68.5	
ZN-65	88.7	140.3	4.8	8.8	3.3	3.4	13.7	42.2	146.0	
NB-95	50.5	79.5	2.7	4.8	2.0	2.9	6.4	19.0	84.6	
ZR-95	80.6	125.1	4.4	7.6	3.4	4.6	10.6	31.8	128.1	
I-131	214.8	228.9	10.5	9.6	11.7	979.9	13.7	35.3	321.7	11.8
CS-134	40.2	63.3	2.3	4.2	1.5	1.4	5.5	17.1	55.4	
CS-137	43.4	74.8	2.5	4.6	1.7	1.3	6.3	18.3	73.8	
BA-140	382.3	472.8	19.3	23.4	19.2	275.0	33.1	92.4	580.7	
LA-140	114.7	140.5	5.9	7.4	6.0	101.6	9.2	23.8	164.3	

APPENDIX J

PERFORMANCE SUMMARY FOR THE RADIOANALYSES OF SPIKED ENVIRONMENTAL SAMPLE MEDIA – 2010

TELEDYNE BROWN ENGINEERING

The data in the tables that follow show how well Teledyne Brown Engineering Environmental Services (TBE) performed in the analysis of radioactively spiked media. Tables J-1 through J-4 provide the performance results for TBE. In addition to the Analytics' spikes analyzed as part of PPL's REMP Laboratory Spike Program (Table J-3), TBE analyzed spikes procured independently from Analytics as part of their respective Quality Control Spike Programs (Table J-2), as well as spikes prepared as part of the following programs:

1. The Proficiency Testing Program of Environmental Resource Associates (Table J-1)

2. The Mixed Analyte Performance Evaluation Program (MAPEP) of the DOE (Table J-4)

It should be noted that program #1 above only provides spiked water for analyses. No other media are included in the spikes provided by this program. The following characteristics are important for the spiked environmental media:

1. When practical, the level of activity in, at least, some of the spiked environmental media should be within the range between required analysis sensitivities for the SSES REMP and the Reporting Levels, if applicable, of the NRC.

2. The spikes should be preserved in a manner as similar as possible to the way that actual samples of those media are prepared.

3. The variety of radionuclides with which environmental media are spiked should be as extensive as practical, including as many of the activation and fission products that could be detected in the vicinity of the SSES as reasonable.

The spiked environmental media prepared by Analytics according to the requirements of PPL's REMP Laboratory Spike Program are intended to incorporate characteristics #1, #2, and #3 to the greatest degree that is practical.

The criteria for the acceptability of the analyses results for the spikes prepared as part of the PPL REMP Laboratory Spike Program (Table J-3) has been established by PPL. They are based on criteria that were originally developed by the NRC. The NRC bases these criteria on an empirical relationship that combines prior experience and accuracy needs. As the resolution of the measurement process improves (relative measurement uncertainty becomes smaller), the criteria for determining acceptability become tighter. Conversely, as the resolution of the process becomes poorer (relative measurement uncertainty becomes bigger), the criteria are widened.

The criteria for acceptability of DOE (MAPEP) program – Table J-4 is based on control limits based on percentiles of historic data distributions.

Note that comment numbers at the extreme right side of the tables denote unacceptable results in Tables J-1 through J-4. Discussions relevant to these comment numbers follow the presentations of the data, as applicable.

TABLE J-1
ENVIRONMENTAL RESOURCE ASSOCIATES (ERA)
PROFICIENCY TESTING PROGRAM - 2010
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
May 2010	RAD-81	Water	Sr-89	pCi/L	64.4	60.4	48.6 - 68.2	A
			Sr-90	pCi/L	37.8	41.3	30.4 - 47.4	A
			Ba-133	pCi/L	66.4	65.9	54.9 - 72.5	A
			Cs-134	pCi/L	66.43	71.6	58.4 - 78.8	A
			Cs-137	pCi/L	137.33	146	131 - 163	A
			Co-60	pCi/L	83.33	84.5	76.0 - 95.3	A
			Zn-65	pCi/L	177	186	167 - 219	A
			Gr-A	pCi/L	26.37	32.9	16.9 - 42.6	A
			Gr-B	pCi/L	28.77	37.5	24.7 - 45.0	A
			I-131	pCi/L	26.27	26.4	21.9 - 31.1	A
			H-3	pCi/L	12967	12400	10800 - 13600	A
November 2010	RAD-83	Water	Sr-89	pCi/L	77.8	68.5	55.8 - 76.7	N (1)
			Sr-90	pCi/L	39.3	43.0	31.7 - 49.3	A
			Ba-133	pCi/L	70.3	68.9	57.5 - 75.8	A
			Cs-134	pCi/L	39.9	43.2	34.5 - 47.5	A
			Cs-137	pCi/L	117	123	111 - 138	A
			Co-60	pCi/L	53.5	53.4	48.1 - 61.3	A
			Zn-65	pCi/L	11.0	102	91.8 - 122	N (2)
			Gr-A	pCi/L	35.1	42.3	21.9 - 53.7	A
			Gr-B	pCi/L	35.5	36.6	24.0 - 44.2	A
			I-131	pCi/L	27.9	27.5	22.9 - 32.3	A
			H-3	pCi/L	13233	12900	11200 - 14200	A

(1) Sr-89 TBE to known ratio of 1.14 fell within acceptable range of ± 20%. No action required. NCR 10-09
(2) Zn-65 result of 111 was incorrectly reported as 11.0. No action required. NCR 10-09
(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 J-2
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2010
TELEDYNE
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2010	E6978-396	Milk	Sr-89	pCi/L	89.3	92.8	0.96	A
			Sr-90	pCi/L	13.8	12.7	1.09	A
	E6979-396	Milk	I-131	pCi/L	65.2	74.0	0.88	A
			Ce-141	pCi/L	241	261	0.92	A
			Cr-51	pCi/L	388	361	1.07	A
			Cs-134	pCi/L	157	178	0.88	A
			Cs-137	pCi/L	150	158	0.95	A
			Co-58	pCi/L	143	143	1.00	A
			Mn-54	pCi/L	202	207	0.98	A
			Fe-59	pCi/L	146	137	1.07	A
			Zn-65	pCi/L	247	254	0.97	A
			Co-60	pCi/L	177	183	0.97	A
	E6981-396	AP	Ce-141	pCi	211	185	1.14	A
			Cr-51	pCi	304	255	1.19	A
			Cs-134	pCi	142	125	1.14	A
			Cs-137	pCi	131	111	1.18	A
			Co-58	pCi	119	101	1.18	A
			Mn-54	pCi	162	146	1.11	A
			Fe-59	pCi	110	97	1.14	A
			Zn-65	pCi	217	179	1.21	W
			Co-60	pCi	145	129	1.12	A
	E6980-396	Charcoal	I-131	pCi	80.2	85.6	0.94	A
June 2010	E7132-396	Milk	Sr-89	pCi/L	82.0	93.4	0.88	A
			Sr-90	pCi/L	15.8	16.7	0.95	A
	E7133-396	Milk	I-131	pCi/L	83.5	96.9	0.86	A
			Ce-141	pCi/L	107	110	0.97	A
			Cr-51	pCi/L	325	339	0.96	A
			Cs-134	pCi/L	114	126	0.90	A
			Cs-137	pCi/L	144	150	0.96	A
			Co-58	pCi/L	92.3	101	0.91	A
			Mn-54	pCi/L	165	169	0.98	A
			Fe-59	pCi/L	121	119	1.02	A
			Zn-65	pCi/L	197	206	0.96	A
			Co-60	pCi/L	190	197	0.96	A
	E7135-396	AP	Ce-141	pCi	88.4	91.6	0.97	A
			Cr-51	pCi	292	282	1.04	A
			Cs-134	pCi	101	105	0.96	A
			Cs-137	pCi	132	125	1.06	A
			Co-58	pCi	87.3	84.0	1.04	A
			Mn-54	pCi	150	140	1.07	A
			Fe-59	pCi	105	98.6	1.06	A
			Zn-65	pCi	168	171	0.98	A
			Co-60	pCi	170	163	1.04	A

TABLE J-2
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2010
TELEDYNE
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2010	E7134-396	Charcoal	I-131	pCi	76.4	79.9	0.96	A
September 2010	E7229-396	Milk	Sr-89	pCi/L	85.0	92.8	0.92	A
			Sr-90	pCi/L	12.6	14.7	0.86	A
	E7230-396	Milk	I-131	pCi/L	80.2	94.1	0.85	A
			Ce-141	pCi/L	130	130	1.00	A
			Cr-51	pCi/L	235	234	1.00	A
			Cs-134	pCi/L	83.2	93.0	0.89	A
			Cs-137	pCi/L	95.1	94.5	1.01	A
			Co-58	pCi/L	77.3	73.7	1.05	A
			Mn-54	pCi/L	121	119	1.02	A
			Fe-59	pCi/L	96.4	91.1	1.06	A
			Zn-65	pCi/L	216	204	1.06	A
			Co-60	pCi/L	172	171	1.01	A
	E7232-396	AP	Ce-141	pCi	122	119	1.03	A
			Cr-51	pCi	228	214	1.07	A
			Cs-134	pCi	79.9	85.3	0.94	A
			Cs-137	pCi	93.8	86.7	1.08	A
			Co-58	pCi	71.5	67.6	1.06	A
			Mn-54	pCi	113	110	1.03	A
			Fe-59	pCi	73.8	83.6	0.88	A
			Zn-65	pCi	186	187	0.99	A
			Co-60	pCi	163	157	1.04	A
	E7231-396	Charcoal	I-131	pCi/L	62.3	59.9	1.04	A
December 2010	E7375-396	Milk	Sr-89	pCi/L	92.7	98.0	0.95	A
			Sr-90	pCi/L	13.5	13.5	1.00	A
	E7376-396	Milk	I-131	pCi/L	87.9	96.9	0.91	A
			Ce-141	pCi/L	not provided by Analytics for this study			
			Cr-51	pCi/L	389	456	0.85	A
			Cs-134	pCi/L	137	157	0.87	A
			Cs-137	pCi/L	172	186	0.92	A
			Co-58	pCi/L	84.3	90.2	0.93	A
			Mn-54	pCi/L	120	120	1.00	A
			Fe-59	pCi/L	134	131	1.02	A
			Zn-65	pCi/L	162	174	0.93	A
			Co-60	pCi/L	284	301	0.94	A

TABLE J-2
ANALYTICS ENVIRONMENTAL RADIOACTIVTY CROSS CHECK PROGRAM - 2010
TELEDYNE
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2010	E7378-396	AP	Ce-141	pCi	not provided by Analytics for this study			
			Cr-51	pCi	387	365	1.06	A
			Cs-134	pCi	135	126	1.07	A
			Cs-137	pCi	157	149	1.05	A
			Co-58	pCi	73.6	72.3	1.02	A
			Mn-54	pCi	88.7	96	0.92	A
			Fe-59	pCi	127	105	1.21	W
			Zn-65	pCi	151	139	1.09	A
			Co-60	pCi	249	241	1.03	A
December 2010	E7377-396	Charcoal	I-131	pCi	79.6	84.2	0.95	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 J-3
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2010
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio	
March 2010	E7034-186	Soil	Ce-141	pCi/kg	452 ± 15	542 ± 36	1.20	
			Cr-51	pCi/kg	624 ± 21	792 ± 137	1.27	(1)
			Cs-134	pCi/kg	307 ± 10	328 ± 16	1.07	
			Cs-137	pCi/kg	364 ± 12	424 ± 25	1.16	
			Co-58	pCi/kg	247 ± 8	279 ± 23	1.13	
			Mn-54	pCi/kg	358 ± 12	410 ± 26	1.15	
			Fe-59	pCi/kg	237 ± 6	319 ± 32	1.35	(1)
			Zn-65	pCi/kg	439 ± 15	561 ± 44	1.28	(1)
			Co-60	pCi/kg	317 ± 11	348 ± 19	1.10	
March 2010	E7034-186	Milk	I-131	pCi/L	94.9 ± 3	93.0 ± 1	0.98	
			Ce-141	pCi/L	313 ± 11	287 ± 13	0.92	
			Cr-51	pCi/L	428 ± 15	438 ± 56	1.02	
			Cs-134	pCi/L	201 ± 7	195 ± 6	0.97	
			Cs-137	pCi/L	192 ± 6	194 ± 10	1.01	
			Co-58	pCi/L	173 ± 6	178 ± 10	1.03	
			Mn-54	pCi/L	253 ± 9	251 ± 11	0.99	
			Fe-59	pCi/L	167 ± 6	173 ± 14	1.04	
			Zn-65	pCi/L	300 ± 11	304 ± 23	1.01	
			Co-60	pCi/L	221 ± 8	227 ± 8	1.03	
September 2010	E7234-186	Milk	I-131	pCi/L	91 ± 3	79 ± 4	0.87	
			Ce-141	pCi/L	188 ± 6	162 ± 14	0.86	
			Cr-51	pCi/L	337 ± 11	337 ± 86	1.00	
			Cs-134	pCi/L	134 ± 4	120 ± 6	0.90	
			Cs-137	pCi/L	136 ± 5	138 ± 10	1.01	
			Co-58	pCi/L	106 ± 4	104 ± 10	0.98	
			Mn-54	pCi/L	172 ± 6	176 ± 10	1.02	
			Fe-59	pCi/L	131 ± 4	133 ± 17	1.02	
			Zn-65	pCi/L	294 ± 10	287 ± 22	0.98	
			Co-60	pCi/L	246 ± 8	239 ± 9	0.97	
December 2010	E7395-186	Milk	I-131	pCi/L	99.3 ± 3	99 ± 1	1.00	
			Ce-141	pCi/L				(2)
			Cr-51	pCi/L	3870 ± 129	4020 ± 153	1.04	
			Cs-134	pCi/L	1330 ± 44	1260 ± 21	0.95	
			Cs-137	pCi/L	1580 ± 53	1700 ± 25	1.08	
			Co-58	pCi/L	765 ± 26	796 ± 22	1.04	
			Mn-54	pCi/L	1020 ± 34	1030 ± 22	1.01	
			Fe-59	pCi/L	1110 ± 37	1170 ± 31	1.05	
			Zn-65	pCi/L	1480 ± 49	1400 ± 42	0.95	
			Co-60	pCi/L	2550 ± 85	2650 ± 21	1.04	

(a) Counting error is two standard deviations.
(1) NCR 11-05 initiated to address failures.
(2) Ce-141 was not added to the December milk sample.

TABLE J-3
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2010
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 2010	E7237-186	Ap Filter	Ce-141	pCi	126 ± 4	121 ± 2	0.96
			Cr-51	pCi	227 ± 8	218 ± 14	0.96
			Cs-134	pCi	90 ± 3	94 ± 9	1.04
			Cs-137	pCi	92 ± 3	89 ± 2	0.97
			Co-58	pCi	72 ± 3	67 ± 2	0.93
			Mn-54	pCi	116 ± 4	117 ± 2	1.01
			Fe-59	pCi	89 ± 3	89 ± 44	1.00
			Zn-65	pCi	198 ± 7	209 ± 31	1.06
			Co-60	pCi	166 ± 6	163 ± 2	0.98
	E7240-186	Ap Filter	Ce-141	pCi	101 ± 4	94 ± 4	0.93
			Cr-51	pCi	182 ± 6	163 ± 29	0.90
			Cs-134	pCi	73 ± 3	67 ± 9	0.92
			Cs-137	pCi	74 ± 3	72 ± 3	0.97
			Co-58	pCi	57 ± 2	54 ± 4	0.95
			Mn-54	pCi	93 ± 3	96 ± 15	1.03
			Fe-59	pCi	71 ± 2	67 ± 41	0.94
			Zn-65	pCi	159 ± 6	174 ± 7	1.09
			Co-60	pCi	133 ± 5	130 ± 3	0.98
	E7241-186	Ap Filter	Ce-141	pCi	111 ± 4	114 ± 3	1.03
			Cr-51	pCi	199 ± 7	219 ± 16	1.10
			Cs-134	pCi	79 ± 3	70 ± 7	0.89
			Cs-137	pCi	81 ± 3	88 ± 2	1.09
			Co-58	pCi	63 ± 2	65 ± 2	1.03
			Mn-54	pCi	102 ± 4	100 ± 11	0.98
			Fe-59	pCi	78 ± 3	53 ± 25	0.68
			Zn-65	pCi	174 ± 6	163 ± 25	0.94
			Co-60	pCi	146 ± 5	155 ± 2	1.06
December 2010	E7396-186	Ap Filter	Ce-141	pCi			(3)
			Cr-51	pCi	380 ± 13	383 ± 17	1.01
			Cs-134	pCi	131 ± 5	133 ± 10	1.02
			Cs-137	pCi	155 ± 5	153 ± 3	0.99
			Co-58	pCi	75 ± 3	74 ± 3	0.99
			Mn-54	pCi	100 ± 3	106 ± 15	1.06
			Fe-59	pCi	109 ± 4	114 ± 24	1.05
			Zn-65	pCi	145 ± 5	166 ± 6	1.14
			Co-60	pCi	251 ± 9	249 ± 3	0.99

(a) Counting error is two standard deviations.
(3) Ce-141 was not added to the December air particulate sample.

TABLE J-3
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM -2008
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 2010	E7397-186	Ap Filter	Ce-141	pCi			(3)
			Cr-51	pCi	501 ± 18	508 ± 21	1.01
			Cs-134	pCi	173 ± 6	159 ± 9	0.92
			Cs-137	pCi	205 ± 7	213 ± 5	1.04
			Co-58	pCi	99 ± 3	98 ± 4	0.99
			Mn-54	pCi	132 ± 5	136 ± 13	1.03
			Fe-59	pCi	144 ± 5	136 ± 23	0.94
			Zn-65	pCi	191 ± 7	184 ± 23	0.96
			Co-60	pCi	331 ± 12	336 ± 4	1.02
December 2010	E7398-186	Ap Filter	Ce-141	pCi			(3)
			Cr-51	pCi	492 ± 17	514 ± 25	1.04
			Cs-134	pCi	170 ± 6	158 ± 10	0.93
			Cs-137	pCi	201 ± 7	211 ± 4	1.05
			Co-58	pCi	97 ± 3	102 ± 4	1.05
			Mn-54	pCi	129 ± 5	131 ± 18	1.02
			Fe-59	pCi	141 ± 5	141 ± 27	1.00
			Zn-65	pCi	188 ± 7	199 ± 31	1.06
			Co-60	pCi	325 ± 11	334 ± 4	1.03
March 2010	E7039-186	Water	H-3	pCi/L	3410 ± 114	3750 ± 414	1.10
September 2010	E7236-186	Water	H-3	pCi/L	4020 ± 134	3910 ± 441	0.97
March 2010	E7035-186	Charcoal	I-131	pCi	85 ± 3	81 ± 3	0.95
March 2010	E7036-186	Charcoal	I-131	pCi	85 ± 3	82 ± 3	0.96
March 2010	E7037-186	Charcoal	I-131	pCi	86 ± 3	81 ± 5	0.94
June 2010	E7150-186	Charcoal	I-131	pCi	80 ± 3	76 ± 3	0.95
June 2010	E7151-186	Charcoal	I-131	pCi	80 ± 3	79 ± 3	0.99
June 2010	E7152-186	Charcoal	I-131	pCi	80 ± 3	76 ± 13	0.95
September 2010	E7235-186	Charcoal	I-131	pCi	60 ± 2	57 ± 9	0.95
September 2010	E7238-186	Charcoal	I-131	pCi	60 ± 2	57 ± 9	0.95
September 2010	E7239-186	Charcoal	I-131	pCi	60 ± 2	65 ± 12	1.08

(a) Counting error is two standard deviations.

(3) Ce-141 was not added to the December air particulate sample.

TABLE J-4
DOE - MAPEP
MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2010	10-MaW22	Water	Cs-134	Bq/L	-0.0942		(1)	A
			Cs-137	Bq/L	58.5	60.6	42.4 - 78.8	A
			Co-57	Bq/L	27.2	28.3	19.8 - 36.8	A
			Co-60	Bq/L	0.0226		(1)	A
			H-3	Bq/L	104	90.8	63.6 - 118.0	A
			Mn-54	Bq/L	26.6	26.9	18.8 - 35.0	A
			Sr-90	Bq/L	0.1029		(1)	A
			Zn-65	Bq/L	42.0	40.7	28.5 - 52.9	A
	10-GrW22	Water	Gr-A	Bq/L	0.5173	0.676	1.352	A
			Gr-B	Bq/L	3.98	3.09	1.55 - 4.64	A
	10-MaS22	Soil	Cs-134	Bq/kg	665	733	513 - 953	A
			Cs-137	Bq/kg	800	779	545 - 1013	A
			Co-57	Bq/kg	508	522	365 - 679	A
			Co-60	Bq/kg	648	622	435 - 809	A
			Mn-54	Bq/kg	893	849	594 - 1104	A
			K-40	Bq/kg	597	559	391 - 727	A
			Sr-90	Bq/kg	221	288	202 - 374	W
			Zn-65	Bq/kg	-4.97		(1)	A
	10-RdF22	AP	Cs-134	Bq/sample	1.81	2.13	1.49 - 2.77	A
			Cs-137	Bq/sample	1.70	1.53	1.07 - 1.99	A
			Co-57	Bq/sample	0.0056		(1)	A
			Co-60	Bq/sample	2.65	2.473	1.731 - 3.215	A
			Mn-54	Bq/sample	3.70	3.02	2.11 - 3.93	W
			Sr-90	Bq/sample	0.0523		(1)	A
			Zn-65	Bq/sample	-0.0627		(1)	A
	10-GrF22	AP	Gr-A	Bq/sample	0.1533	0.0427	0.854	A
			Gr-B	Bq/sample	1.240	1.29	0.65 - 1.94	A
	10-RdV22	Vegetation	Cs-134	Bq/sample	4.48	4.39	3.07 - 5.71	A
			Cs-137	Bq/sample	3.43	3.06	2.14 - 3.98	A
			Co-57	Bq/sample	-0.0117		(1)	A
			Co-60	Bq/sample	3.55	3.27	2.29 - 4.25	A
			Mn-54	Bq/sample	0.007		(1)	A
			Sr-90	Bq/sample	-0.0002		(1)	A
			Zn-65	Bq/sample	8.12	7.10	4.97 - 9.23	A
September 2010	10-MaW23	Water	Cs-134	Bq/L	27.1	31.4	22.0 - 40.8	A
			Cs-137	Bq/L	41.8	44.2	30.9 - 57.5	A
			Co-57	Bq/L	33.2	36.0	25.2 - 46.8	A
			Co-60	Bq/L	26.5	28.3	19.8 - 36.8	A
			H-3	Bq/L	500	453.4	317.4 - 589.4	A
			Mn-54	Bq/L	0.024		(1)	A
			Sr-90	Bq/L	8.10	8.3	5.8 - 10.8	A
			Zn-65	Bq/L	30.8	31.0	21.7 - 40.3	A
	10-GrW23	Water	Gr-A	Bq/L	2.36	1.92	0.58 - 3.26	A
			Gr-B	Bq/L	6.37	4.39	2.20 - 6.59	A

TABLE J-4
DOE - MAPEP
MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2010	10-MaS23	Soil	Cs-134	Bq/kg	837	940	658 - 1222	A
			Cs-137	Bq/kg	680	670	469 - 871	A
			Co-57	Bq/kg	2.78		(1)	A
			Co-60	Bq/kg	350	343	240 - 446	A
			Mn-54	Bq/kg	853	820	574 - 1066	A
			K-40	Bq/kg	721	699	489 - 909	A
			Sr-90	Bq/kg	2.24		(1)	A
			Zn-65	Bq/kg	287	265	186 - 345	A
	10-RdF23	AP	Cs-134	Bq/sample	2.31	2.98	2.09 - 3.87	W
			Cs-137	Bq/sample	-0.025		(1)	A
			Co-57	Bq/sample	0.0056	3.64	4.08	A
			Co-60	Bq/sample	2.81	2.92	2.04 - 3.80	A
			Mn-54	Bq/sample	3.19	3.18	2.23- 4.13	A
			Sr-90	Bq/sample	1.01	1.01	0.71 - 1.31	A
			Zn-65	Bq/sample	0.0310		(1)	A
	10-GrF23	AP	Gr-A	Bq/sample	0.004		(1)	A
			Gr-B	Bq/sample	0.473	0.50	0.25 - 0.75	A
	10-RdV23	Vegetation	Cs-134	Bq/sample	4.90	4.79	3.35 - 6.23	A
			Cs-137	Bq/sample	6.78	5.88	4.12 - 7.64	A
			Co-57	Bq/sample	10.2	8.27	5.79 - 10.75	W
			Co-60	Bq/sample	0.00		(1)	A
			Mn-54	Bq/sample	7.36	6.287	4.401 - 8.173	A
			Sr-90	Bq/sample	2.53	2.63	1.84 - 3.42	A
			Zn-65	Bq/sample	6.40	5.3900	3.77 - 7.01	A

(1) False positive test.
(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.