Exelon Generation

May 31, 2017

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

Peach Bottom Atomic Power Station Units 2 and 3
Independent Spent Fuel Storage Installation (ISFSI)
Facility Operation License DPR-12, DPR-44 and DPR-56
NRC Docket 50-171, 50-277 and 50-278 and ISFSI Docket 72-29

Subject: Annual Radiological Environmental Operating Report 74
January 1, 2016 through December 31, 2016

In accordance with the requirements of Section 5.6.2 of the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3 Technical Specifications, this letter submits the Annual Radiological Environmental Operation Report 74. This report provides the 2016 results for the Radiological Environmental Monitoring Program (REMP) as called for in the Offsite Dose Calculation Manual.

In assessing the data collected for the REMP, we have concluded that the operation of PBAPS, Units 2 and 3, had no adverse impact on the environment. There are no commitments contained in this letter.

If you have any questions or require additional information, please do not hesitate to contact Dr. Amber Donley at 717-456-3056.

Sincerely,

Matthew J. Herr, Plant Manager
Peach Bottom Atomic Power Station

MJH/JMA/SMO/GRS/JCC/ASD/asd

Enclosure (1)

cc: USNRC Region I, Regional Administrator (Daniel H. Dorman)
USNRC Senior Resident Inspector, PBAPS (Justin Heinly)
USNRC Region I Inspector (Bruce Dionne)

CCN 17-53

Docket No: 50-277
50-278

# PEACH BOTTOM ATOMIC POWER STATION

# UNITS 2 and 3

Annual Radiological
Environmental Operating Report

Report No. 74
January 1 through December 31, 2016

**Prepared By**
Teledyne Brown Engineering
Environmental Services

Exelon Generation®

Peach Bottom Atomic Power Station
Delta, PA 17314

**May 2017**

Intentionally Left Blank

TABLE OF CONTENTS

Appendices

Figures

Intentionally Left Blank

## I. Executive Summary

The 2016 Annual Radiological Environmental Operating Report (AREOR) describes the results of the Radiological Environmental Monitoring Program (REMP) conducted for Peach Bottom Atomic Power Station (PBAPS) by Exelon Nuclear and covers the period of 1 January 2016 through 31 December 2016. Throughout that time period, 1,293 analyses were performed on 1,001 samples. In assessing all the data gathered for this report and comparing these results with preoperational data, it was evident that the operation of PBAPS had no adverse radiological impact on the environment.

The various media collected in the REMP include aquatic, terrestrial, airborne, and ambient radiation. The corresponding analyses performed on the collected specimen were:

Aquatic:

- Surface water samples were analyzed for concentrations of tritium (H-3) and gamma-emitting nuclides. All nuclides were below minimum detectable activity.
- Drinking water samples were analyzed for concentrations of gross beta, Iodine-131 (I-131), H-3, and gamma-emitting nuclides. All nuclides were below minimum detectable activity. Any gross beta activity detected was not above the reporting limit and therefore, likely background.
- Precipitation samples were analyzed under the Radiological Groundwater Protection Program (RGPP) in 2016.
- Fish and sediment samples were analyzed for concentrations of gamma-emitting nuclides. Fish samples showed no detectable fission or activation products, while Cesium-137 (Cs-137) activity was found at one of three sediment locations. The level of Cs-137 was well below the reporting level.

Terrestrial:

- Milk samples were analyzed for low level concentrations of I-131 and gamma-emitting nuclides. Food product samples were analyzed for concentrations of gamma-emitting nuclides. All nuclides were below minimum detectable activity.

Airborne:

- Air particulates and air iodine samples were analyzed for gross beta, gamma-emitting nuclides, and low level I-131. All nuclides were below minimum detectable activity. The gross beta results were less than reportable levels and there were no notable differences between control and indicator locations.

Ambient Radiation:

- Ambient gamma radiation levels were measured quarterly. Average measurements were 10.1 mR/standard month, consistent with those measured in previous years, indicating that the Independent Spent Fuel Storage Installation (ISFSI) had no measurable impact to the environs.

In 2016, the doses from both liquid and gaseous effluents were conservatively calculated for the Maximum Exposed Member of the Public for PBAPS. Doses calculated were well below all Offsite Dose Calculations Manual (ODCM) limits. The results of those calculations were as follows:

| Effluent | Applicable Organ | Estimated Dose | Age Group | Location | | % of Applicable Limit | Limit | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | Distance (meters) | Direction (toward) | | | |
| Noble Gas | Gamma - Air Dose | 2.53E-01 | All | 1.10E+03 | SSE | 1.26E+00 | 2.00E+01 | mrad |
| Noble Gas | Beta - Air Dose | 1.73E-01 | All | 1.10E+03 | SSE | 4.32E-01 | 4.00E+01 | mrad |
| Noble Gas | Total Body (gamma) | 2.45E-01 | All | 1.10E+03 | SSE | 2.45E+00 | 1.00E+01 | mrem |
| Noble Gas | Skin (Beta) | 3.19E-01 | All | 1.10E+03 | SSE | 1.06E-01 | 3.00E+01 | mrem |
| Gaseous Iodine, Particulate, Carbon-14 & Tritium | Bone | 5.95E-01 | Child | 1.10E+03 | SSE | 1.98E+00 | 3.00E+01 | mrem |
| Gaseous Iodine, Particulate, & Tritium | Thyroid | 3.74E-03 | Infant | 1.10E+03 | SSE | 1.16E-02 | 3.00E+01 | mrem |
| Liquid | Total Body (gamma) | 1.36E-04 | Child | Site Boundary | | 2.26E-03 | 6.00E+00 | mrem |
| Liquid | Liver | 2.43E-04 | Child | Site Boundary | | 1.21E-03 | 2.00E+01 | mrem |
| Direct Radiation | Total Body | 0.00E+00 | All | 1.15E+03 | SSE | 0.00E+00 | 2.20E+01 | mrem |

| 40 CFR Part 190 Compliance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Effluent | Applicable Organ | Estimated Dose | Age Group | Location | | % of Applicable Limit | Limit | Unit |
| | | | | Distance (meters) | Direction (toward) | | | |
| Total Dose | Total Body | 2.45E-01 | All | 1.15E+03 | SSE | 9.79E-01 | 2.50E+01 | mrem |
| Total Dose | Thyroid | 3.47E-03 | All | 1.15E+03 | SSE | 4.63E-03 | 7.50E+01 | mrem |
| Total Dose | Bone | 5.95E-01 | All | 1.15E+03 | SSE | 2.38E+00 | 2.50E+01 | mrem |
| Total Dose | Total Body | 2.45E-01 | All | 1.15E+03 | SSE | 8.16E+00 | 3.00E+00 | mrem |
| Total Dose | Bone | 5.95E-01 | All | 1.15E+03 | SSE | 1.98E+01 | 3.00E+00 | mrem |
| Total Dose | Thyroid | 2.56E-01 | All | 1.15E+03 | SSE | 4.66E-01 | 5.50E+01 | mrem |

## II. Introduction

PBAPS is located along the Susquehanna River between Holtwood and Conowingo Dams in Peach Bottom Township, York County, Pennsylvania. PBAPS Units 2 and 3 are boiling water reactors, each with a rated full-power output of approximately 3,951 MWth and one decommissioned 200 MWth High Temperature, Gas-cooled Reactor (HTGR). The initial environmental monitoring program began 5 February 1966. A summary of the Unit 1 preoperational monitoring program was presented in a previous report (1). Preoperational summary reports (2)(3) for Units 2 and 3 have been previously issued and summarize the results of all analyses performed on samples collected from 5 February 1966 through 8 August 1973.

The sampling and analysis requirements for REMP are contained in the PBAPS Offsite Dose Calculations Manual (ODCM). This AREOR covers those analyses performed by Teledyne Brown Engineering (TBE), Landauer, and Environmental Inc. (EI, Midwest Labs) on samples collected during the period 01 January 2016 through 31 December 2016.

### A. Objectives

The objectives of the REMP are:

1. Provide data on measurable levels of radiation and radioactive materials in the publicly-used environs;

2. Evaluate the principal pathways of exposure to the public as described in the ODCM and determine the relationship between quantities of radioactive material released from the plant and resultant radiation doses to members of the public.

### B. Implementation of the Objectives

Implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways;

2. Establishing baseline radiological data of media within those pathways;

3. Continuously monitoring those media before and during plant operation to assess station radiological effects (if any) on man and the environment.

C. Radiation and Radioactivity

All matter is made of atoms. An atom is the smallest part into which matter can be broken down and still maintain all its chemical properties. Nuclear radiation is energy, in the form of waves or particles that is given off by unstable, radioactive atoms. Radioactive material exists naturally and has always been a part of our environment. The earth's crust, for example, contains radioactive uranium, radium, thorium and potassium. Some radioactivity is a result of nuclear weapons testing. Examples of radioactive fallout that is normally present in environmental samples are Cs-137 and Strontium-90 (Sr-90). Some examples of radioactive materials released from a nuclear power plant are Cs-137, I-131, Sr-90 and Cobalt-60 (Co-60).

Radiation is measured in units of millirem; much like temperature is measured in degrees. A millirem is a measure of the biological effect of the energy deposited in tissue. The natural and man-made radiation dose received in one year by the average American is 300 to 400 mrem (References 2, 3, 4 in Table 1 below). Radioactivity is measured in curies. A curie is that amount of radioactive material needed to produce 37,000,000,000 nuclear disintegrations per second. This is an extremely large amount of radioactivity in comparison to environmental radioactivity. That is why radioactivity in the environment is measured in picocuries. One picocurie is equal to 1.00E-12 (one trillionth) of a curie.

D. Sources of Radiation

As mentioned previously, naturally occurring radioactivity has always been a part of our environment. Table I shows the typical doses received from natural and man-made sources.

Table 1

Radiation Sources and Corresponding Doses [1]

| NATURAL | | MAN-MADE | |
|---|---|---|---|
| Source | Radiation Dose (millirem/year) | Source | Radiation Dose (millirem/year) |
| Internal, inhalation [2] | 228 | Medical [3] | 300 |
| External, space | 33 | Consumer [4] | 13 |
| Internal, ingestion | 29 | Industrial[5] | 0.3 |
| External, terrestrial | 21 | Occupational | 0.5 |
| | | Weapons Fallout | <1 |
| | | Nuclear Power Plants | <1 |
| Approximate Total | 311 | Approximate Total | 314 |

(1) Information from NCRP Reports 160 and 94

(2) Primarily from airborne radon and its radioactive progeny

(3) Includes CT (147 mrem), nuclear medicine (77 mrem), interventional fluoroscopy (43 mrem) and conventional radiography and fluoroscopy (33 mrem)

(4) Primarily from cigarette smoking (4.6 mrem), commercial air travel (3.4 mrem), building materials (3.5 mrem), and mining and agriculture (0.8 mrem)

(5) Industrial, security, medical, educational, and research

Cosmic radiation from the sun and outer space penetrates the earth's atmosphere and continuously bombards earth with rays and charged particles. Some of this cosmic radiation interacts with gases and particles in the atmosphere, making them radioactive. These radioactive byproducts from cosmic ray bombardment are referred to as cosmogenic radionuclides. Isotopes such as Beryllium-7 (Be-7) and Carbon-14 (C-14) are formed in this way. Exposure to cosmic and cosmogenic sources of radioactivity results in about 33 mrem of radiation dose per year.

Additionally, natural radioactivity is in our body and in the food we eat (about 29 millirem/yr), the ground we walk on (about 21 millirem/yr) and the air we breathe (about 228 millirem/yr). The majority of a person's annual dose results from exposure to radon and thoron in the air we breathe. These gases and their radioactive decay products arise from the decay of naturally occurring uranium, thorium and radium in the soil and building products such as brick, stone and concrete. Radon and thoron levels vary greatly with location, primarily due to changes in the concentration of uranium and thorium in the soil. Residents at some locations in Colorado, New York, Pennsylvania, and New Jersey have a higher annual dose as a result of higher levels of radon/thoron gases in these areas. In total, these various sources of naturally occurring radiation and radioactivity contribute to a total dose of about 311 mrem per year.

In addition to natural radiation, we are normally exposed to radiation from a number of man-made sources. The single largest dose from man-made sources result from therapeutic and diagnostic applications of x-rays and radiopharmaceuticals. The annual dose to an individual in the U.S. from medical and dental exposure is about 300 mrem. Consumer products, such as televisions and smoke detectors, contribute about 13 mrem/yr. Much smaller doses result from weapons fallout (less than 1 mrem/yr) and nuclear power plants. Typically, the average person in the United States receives about 314 mrem per year from man-made sources.

III. Program Description

A. Sample Collection

Normandeau Associates Inc., (NAI), collected samples for the PBAPS REMP for Exelon Nuclear. This section describes the general collection methods used by NAI to obtain environmental samples for the PBAPS REMP in 2016. Sample locations and descriptions can be found in Table B-1 and Figures B-1 through B-3, Appendix B. The collection procedures used by NAI are listed in Table B-2, Appendix B.

<u>Aquatic Environment</u>

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, precipitation, fish and sediment. Surface water is sampled from two locations as prescribed by the ODCM: one upstream (1LL) and one downstream (1MM) of the plant discharge canal. Drinking water is sampled from a control location (6I) and up to three locations nearest to public drinking water supplies. Two locations are identified in the ODCM as the closest drinking water supplies, the Conowingo Dam (4L) and Chester Water Authority (13B). All samples were collected weekly by automatic sampling equipment or as grab samples. Weekly samples from each location were composited into two one-gallon monthly samples for analysis. A separate quarterly composite of the monthly samples was also collected.

Fish sample collection locations required by the ODCM are in an area close to the discharge of PBAPS (4) and a control location, unaffected by plant discharge (6). These samples should be comprised of the flesh of commercially and recreationally important species specific to the environs around PBAPS. Fish samples were collected semiannually from two groups: Bottom Feeder (channel catfish, flathead catfish, carp, and shorthead redhorse) and Predator (smallmouth bass and largemouth bass). The total weight of fish flesh was approximately 1000 grams. The samples were preserved on ice for shipping to the laboratory.

The ODCM requires one sediment sample to be collected downstream of the plant in an area with existing or potential recreational value. The REMP collects samples from three locations (4J, 4T and 6F; 6F is the control). Sediment samples, composed of recently deposited substrate, were collected semiannually. Multiple grab samples of the sediment were collected to obtain an approximately homogenous, representative sample totaling 1000 grams of sediment at those three locations.

Terrestrial Environment

The terrestrial environment was evaluated by performing radiological analyses on milk and food product samples. The ODCM requires milk samples at three locations within three miles of PBAPS with the highest dose potential, and one sample at a control location. The REMP meets these requirements and samples extra locations. Milk samples were collected biweekly at five locations (J, R, S, U, X and V; V is the control) from April through November and monthly from December through March. Six additional locations (C, D, E, L, P and W; C and E are the controls) were sampled quarterly. All samples were collected in new unused two-gallon plastic bottles from the bulk tank at each location, preserved with sodium bisulfite and shipped promptly to the laboratory.

Food products are only required if milk sampling was not performed. The ODCM only requires two gardens located in the area of highest dose impact and a control location. However, the REMP has five gardens, two of which are maintained by the site. Food product samples, comprised of annual broad green leaf vegetation, were collected monthly at five locations (1C, 2B, 2Q, 3Q and 55; 55 is the control) in June through September. Typically, the 'planting' season starts late April/early May, with the plants gaining sufficient mass for collection in late June or July. Approximately 1000 g of unwashed samples were collected in new unused plastic bags and shipped promptly to the laboratory.

Airborne Environment

The airborne atmospheric environment was evaluated by performing radiological analyses on air particulate and radioiodine samples. The ODCM requires sampling from five locations, three of the highest site boundary locations with greatest dose impact, one location within a local community with highest dose impact, and one control location. Air particulate and radioiodine samples were collected and analyzed weekly from five locations (1B, 1C, 1Z/1A, 3A and 5H2; 5H2 is the control, 1A is the duplicate QA location). Airborne iodine and particulate samples were obtained at each location using a vacuum pump with charcoal and glass fiber filters attached. The pumps were run continuously and sampled air at the rate of approximately 1 cubic foot per minute to obtain a minimum total volume of 280 cubic meters. The weekly filters were composited for a quarterly sample.

Ambient Gamma Radiation

The ambient gamma radiation in the areas surrounding PBAPS for the REMP is measured using dosimeters, which are exposed in the field for a quarter and then exchanged. The ODCM requires at least 40 routine monitoring stations with two or more dosimeters for continuous monitoring. The REMP contains 48 dosimeter monitoring locations. The dosimeters are located (geography dependent) at the site boundary in the 16 meteorological sectors and within a three to six mile radius from the plant.

Optically-Stimulated Luminescent Dosimeters (OSLD) replaced the Thermo-Luminescent Dosimeter (TLD) type in the field starting in 2012. However, PBAPS decided to continue using TLD in addition to OSLD to compare the two technologies. Therefore, both technologies are employed at PBAPS, but the primary data reported after 2012 is from OSLD. Additionally, only the “gross” OSLD exposure (i.e. no background or control subtraction) is reported in this report; prior to 2012, “net’ TLD exposures data were reported. This explains the increase in ambient radiation levels displayed in Figures C-7 and C-8.

The OSLD locations were placed on and around the PBAPS site as follows:

A site boundary ring, consisting of 19 locations (1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H, 1I, 1J, 1K, 1L, 1M, 1NN, 1P, 1Q, 1R, 2, and 40), near and within the site perimeter representing fence post doses (i.e., at locations where the doses will be potentially greater than maximum annual off-site doses) from PBAPS releases.

An intermediate distance ring, consisting of 23 locations (14, 15, 17, 22, 23, 26, 27, 31A, 32, 3A, 42, 43, 44, 45, 46, 47, 48, 49, 4K, 5, 50, 51 and 6B), extending to approximately 5 miles from the site and designed to measure possible exposures to close-in population.

Six locations (16, 18, 19, 24, 2B and 1T) represent control and special interests areas such as population centers, schools, and nearest residents.

The specific dosimeter locations were determined by the following criteria:

1. The presence of relatively dense population, nearby residences, schools, and control locations;

2. Site meteorological data taking into account distance and elevation for each of the sixteen 22.5 degree sectors around the site, where estimated annual dose from PBAPS, if any, would be more significant;

3. And on hills free from local obstructions and within sight of the vents (where practical).

Each dosimetry location in the environment has either 2 or 4 OSLD and 2 TLD dosimeters which are enclosed in plastic as a moisture barrier. These dosimeters are protected from the environment in either a small Formica box or a polyethylene jar approximately six feet above the ground level. These dosimeters are exchanged quarterly and sent to an off-site laboratory for analysis.

B. Sample Analysis

This section describes the general analytical methods used by TBE and EI to analyze the environmental samples for radioactivity. The analytical procedures used by the laboratories are listed in Table B-2, Appendix B.

The required OCDM analyses include:

1. Concentrations of beta emitters in drinking water and air particulates;
2. Concentrations of gamma-emitting nuclides in surface and drinking water, air particulates, milk, fish, sediment and food products;
3. Concentrations of tritium in surface and drinking water;
4. Concentrations of I-131 in air, milk, and food products. Although not required by the ODCM, I-131 is also analyzed in drinking and surface water;
5. Ambient gamma radiation levels at various site environs.

C. Data Interpretation

The radiological and direct radiation data collected prior to PBAPS becoming operational was used as a baseline with which these operational data were compared. For the purpose of this report, PBAPS was considered operational at initial criticality. In addition, data were compared to previous years' operational data for consistency and trending. Several factors are important in the interpretation of the data.

1. <u>Lower Limit of Detection and Minimum Detectable Concentration</u>

The lower limit of detection (LLD) is defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) detectable with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is intended as a "before-the-fact" (*a priori*) estimate of a system (including instrumentation, procedure and sample type) and not as an "after-the-fact" (*a posteriori*) measurement for the presence of activity. All analyses are designed to achieve the required PBAPS ODCM detection capabilities for environmental sample analysis.

The minimum detectable concentration or activity (MDC or MDA) is defined similarly as above for LLD; however, the MDC is the “after-the-fact” (*a posteriori*) estimate determined during the analysis of the sample.

2. Net Activity Calculation and Reporting of Results

Net activity for a sample is calculated by subtracting background activity from the sample activity. Since the REMP measures extremely small changes in radioactivity in the environment, background variations can result in sample activity being lower than the background activity causing a negative number. MDC is reported in all cases where positive activity was not detected.

Gamma spectroscopy results for each type of sample were grouped as follows:

- For surface and drinking water, twelve nuclides, Manganese-54 (Mn-54), Cobalt-58 (Co-58), Iron-59 (Fe-59), Cobalt-60 (Co-60), Zinc-65 (Zn-65), Zirconium-95 (Zr-95), Niobium-95 (Nb-95), I-131, Cesium-134 (Cs-134), Cs-137, Barium-140 (Ba-140), and Lanthanum-140 (La-140) were reported.
- For fish, eight nuclides, Potassium-40 (K-40), Mn-54, Co-58, Fe-59, Co-60, Zn-65, Cs-134 and Cs-137 were reported.
- For sediment, seven nuclides, K-40, Mn-54, Co-58, Co-60, I-131, Cs-134 and Cs-137 were reported.
- For air particulates, six nuclides, Beryllium-7 (Be-7), Mn-54, Co-58, Co-60, Cs-134 and Cs-137 were reported.
- For milk, six nuclides, K-40, I-131, Cs-134, Cs-137, Ba-140 and La-140 were reported.
- For food products, eight nuclides, Be-7, K-40, Mn-54, Co-58, Co-60, I-131, Cs-134 and Cs-137 were reported.

Means and standard deviations of the results were calculated. The standard deviations represent the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

For 2016 the PBAPS REMP had a sample collection recovery rate of 100%. The exceptions to this program are listed below:

Table 2 LIST OF SAMPLE ANOMALIES

| Sample Type | Location Code | Collection Date | Reason |
|---|---|---|---|
| AP/AI* | 3A | 08/11/16-08/18/16 | Found with no power to the pump, sample volume was acceptable |
| Drinking Water | 13B | 10/06/16-10/13/16 | Power failure at Chester Water Co. - no weekly sample, monthly composite still acceptable |

**AP/AI = Air Particulates/Air Iodine*

Table 3 LIST OF MISSING SAMPLES

| Sample Type | Location Code | Collection Date | Reason |
|---|---|---|---|
| Surface Water | 1MM | 02/25/16-03/03/16 | Frozen water, grab sample obtained |
| AP/AI* | 1C | 07/21/16-07/28/16 | Pump seized, unknown volume of sample |
| Dosimeters | 4K | 11/23/16 | Discovered one of two OSLDs missing due to work being performed at location |
| Food Products | 1C | June 2016 | Only 1 type of sample collected, rather than 3; plants still too small for harvesting |
| Food Products | 1C | Sept 2016 | Only 2 types of sample collected, rather than 3, due to insect predation |

**AP/AI = Air Particulates/Air Iodine*

Each program exception was reviewed to understand the causes of the program exception. Sampling and maintenance errors were reviewed with the personnel involved to prevent a recurrence. Occasional equipment breakdowns and power outages were unavoidable.

IV. Program Changes

There were no program changes to report for the 2016 reporting period.

V. Results and Discussion

A. Aquatic Environment

1. Surface Water

A summary of the 2016 analysis results for surface water samples from stations 1LL and 1MM are listed below:

Tritium

Monthly samples from both locations were composited quarterly and analyzed for tritium activity (Table C-I.1, Appendix C). No tritium activity was detected and the required LLD was met.

Iodine

Monthly samples from both locations were analyzed for I-131. All results were less than the MDC and the required LLD was met. (Table C-I.2, Appendix C).

Gamma Spectrometry

Monthly samples from both locations were analyzed for gamma-emitting nuclides (Table C-I.3, Appendix C). All nuclides were less than the MDC and all required LLDs were met.

2. Drinking Water

The results from the drinking water samples collected in 2016 from stations 13B, 4L and 6I are described below:

Gross Beta

Samples from all locations were analyzed monthly for concentrations of gross beta activity (Table C-II.1 and Figure C-1 Appendix C). Gross beta was detected in 23 of 36 samples. The values ranged from 1.9 to 5.4 pCi/L with a mean value of 2.8 ± 1.8 pCi/L. Concentrations detected were generally below those detected in previous years.

Tritium

Monthly samples from three locations were composited quarterly and analyzed for tritium activity (Table C-II.2, Appendix C). Tritium activity was not detected in any samples and the required LLD was met.

Iodine

Monthly samples from the three locations were analyzed for I-131 (Table C-II.3, Appendix C). All results were less than the MDC and the required LLD was met.

Gamma Spectrometry

Samples from the three locations were analyzed monthly for gamma-emitting nuclides (Table C-II.4, Appendix C). All nuclides were less than the MDC and all required LLDs were met.

3. Precipitation

Precipitation sample results can be found in the RGPP portion of this report.

4. Fish

Results from fish samples collected at locations 4 and 6 in 2016 are described below:

Gamma Spectrometry

The edible portions of the collected fish samples from both locations was analyzed semiannually for gamma-emitting nuclides (Table C-III.1, Appendix C). Naturally occurring K-40 was found at all stations and ranged from 2,586 to 3,949 pCi/kg wet, with a mean value of 3290 ± 932 pCi/kg wet, consistent with levels detected in previous years. No fission or activation products, due to plant operations were found in 2016 and all required LLDs were met. Historical levels of Cs-137 are shown in Figure C-2, Appendix C. There have been no detectable levels of Cs-137 in fish since 1983.

5. Sediment

Sediment samples were collected at locations 6F, 4J, and 4T and the results are described below:

Gamma Spectrometry

Sediment samples were semiannually analyzed for gamma-emitting nuclides (Table C-IV.1, Appendix C). K-40 was found in all locations and ranged from 9,115 to 25,700 pCi/kg dry with a mean value of 16,299 ± 12,023 pCi/kg dry. The fission product Cs-137 was detected in 1 of the 6 samples at a concentration of 167 pCi/kg dry, which is below the required LLD of 180 pCi/kg dry. The positive results indicate the sensitivity of the detection method. Historical levels of Cs-137 are shown in Figure C-3, Appendix C. The last 10 years of Cs-137 activity have been around the LLD value, indicating a new background level of Cs-137. No other fission or activation products were found and all LLDs were met.

B. Atmospheric Environment

1. Airborne Particulates

Continuous air particulate samples were collected from five locations. The five locations were separated into three groups: Group I represents locations within the PBAPS site boundary (1B, 1C and 1Z/1A), Group II represents the location of the closest local community (3A) and Group III represents the control location at a remote distance from PBAPS (5H2). 1A results will be discussed in Appendix D. The results from samples collected in 2016 are described below:

Gross Beta

Weekly samples were analyzed for concentrations of beta-emitters (Tables C-V.1 and C-V.2, Appendix C). Detectable gross beta activity was observed at all locations. The results from Group I ranged from 7E-3 to 28E-3 pCi/m$^3$, with a mean of 15E-3 ± 5E-3 pCi/m$^3$. The results from Group II ranged from 6E-3 to 23E-3 pCi/m$^3$ with a mean of 14E-3 ± 5E-3 pCi/m$^3$. The results from the Group III ranged from 7E-3 to 28E-3 pCi/$m^3$ with a mean of 15E-3 ±4E-3 pCi/$m^3$.

The mean value from all three groups are the same within error, indicating the gross beta activity is not a result of the operation of PBAPS, as shown in Figure C-4, Appendix C. In addition, a comparison of the 2016 air particulate data with historical data indicates a decreasing trend in gross beta activity since initial operation of the plant (Figure C-5, Appendix C).

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma-emitting nuclides (Table C-V.3, Appendix C). Naturally occurring Be-7 due to cosmic ray activity was detected in all 20 samples. The values ranged from 42E-3 to 100E-3 pCi/$m^3$, with a mean value of 71E-3 ± 31E-3pCi/$m^{3.}$ All other nuclides were less than the MDC and all required LLDs were met.

2. Airborne Iodine

Continuous air samples were collected from five locations and analyzed weekly for I-131 (Table C-VI.1, Appendix C). All results were less than the MDC for I-131 and the required LLD was met.

C. Terrestrial

1. Milk

During 2016, 156 milk samples were collected and analyzed. The results are described below:

Iodine-131

Milk samples from all locations were analyzed for concentrations of I-131 (Tables C-VII.1, Appendix C). All results were less than the MDC for I-131 and all required LLDs were met.

Gamma Spectrometry

Milk samples from all locations were analyzed for concentrations of gamma-emitting nuclides (Table C-VII.2, Appendix C). Naturally occurring K-40 was found in all samples and ranged from 941 to 3,040 pCi/l, with a mean value of 1319 ± 445 pCi/L. All other nuclides were less than the MDC and all required LLDs were met.

Historical concentrations of Cs-137 in milk is plotted in Figure C-6, Appendix C. Since PBAPS started operation, the activity of Cs-137 has been less than the required LLD. The values reported before 2000 were the actual measured activity value, while those reported after 2000 are the instrumentation detection level. This prevents negative values from being plotted in the figure.

2. Food Products

Throughout 2016, 59 samples of various green leafy vegetation (kale, cabbage, collard greens, corn, broccoli, cauliflower, etc.) were collected and analyzed for concentrations of gamma-emitting nuclides (Table C-VIII.1, Appendix C). The results are discussed below:

Gamma Spectrometry

Naturally occurring Be-7 activity was found in 16 of 59 samples and ranged from 300 to 2,315 pCi/kg wet, with a mean of 947 ± 1457 pCi/kg wet. Also, naturally occurring K-40 activity was found in all samples and ranged from 709 to 10,350 pCi/kg wet, with a mean of 3599 ± 4161 pCi/kg wet. All other nuclides were less than the MDC and all required LLDs were met.

D. Ambient Gamma Radiation

Results of OSLD measurements are listed in Tables C-IX.1 through C-IX.3 and Figure C-7, Appendix C.

The mean gross OSLD measurement was 10.1 mRem per standard month, with a range of 6.6 to 13.6 mRem per standard month. The period mean for the control locations (16, 18, 19 and 24) is the same, within error, of the OSLDs located within the site boundary and intermediate distances. These results indicate PBAPS operation had no impact on the ambient gamma radiation levels in the areas surrounding PBAPS. This low impact trend has occurred throughout the history of the plant and can be seen in Figure C-7, Appendix C. The increase in ambient radiation reading in 2012, seen in Figure C-7, was due to the change from TLD to OSLD monitoring and the reporting of gross rather than net measurement values.

E. Independent Spent Fuel Storage Installation (ISFSI)

ISFSI began at PBAPS in June 2000. Five new casks were added to the ISFSI pad in 2016. Site boundary OSLDs which measure the ambient gamma radiation closest to ISFSI are locations 1A, 1D, 1M, 1P, 1Q, 1R, with 1R being the closest.  Location 2B is the nearest real resident that could be impacted by ISFSI.  Location 1R, showed a general increase of 1 to 3 mRem per standard month from pre-ISFSI loading (Figure C-8, Appendix C).  Location 2B, follows closely with values from locations 1A, 1D, and controls, indicating no impact from ISFSI on nearest real resident.  Data from location 2B is used to demonstrate compliance to both 40CFR190 and 10CFR72.104 limits. All radiation levels are well-below regulatory limits.

Pre-operational ambient gamma radiation levels are shown on Figure C-8. TLD data, except for 2006, were below pre-operational levels indicating ISFSI is not impacting the ambient gamma levels around PBAPS.  The large increase in multiple direct radiation locations after 2012 is a result of the transition from TLD to OSLD and the use of "gross" data rather than "net".  The transient background values were added to the pre-operational value to display the actual ambient gamma background for the OSLDs.  Location 1R is approaching the pre-operational levels, but the other locations around ISFSI are still well below background levels.

F. Land Use Census

A Land Use Survey, conducted during the fall of 2016, was performed by NAI Environmental Services Division, to comply with Section 3.8.E.2 of PBAPS's ODCM Specifications.  The survey documented the nearest milk-producing and meat animal, nearest residence, and garden larger than 500 square feet in each of the sixteen meteorological sectors out to five miles.  Also, because PBAPS is an elevated release facility, an additional requirement of identifying all gardens larger than 500 square feet and every dairy operation within three (3) miles was included in the 2016 survey.  The distance and direction of all locations were positioned using Global Positioning System (GPS) technology.  The results of this survey are summarized below. A new gated community was located in the SE sector near the river, with one home closer than identified in previous years; it also has the nearest garden for the SE sector.  A total of six new gardens were located in 2016.  The closest milk-producing animals and meat animals in each sector for the 2016 report remains the same as the previous year.

| Location of the Nearest Residence, Garden, Milk, Meat, Animal within a Five-Mile Radius of PBAPS Reactor Building Exhaust Vents | | | | |
|---|---|---|---|---|
| Sector | | Residence Feet | Garden Feet | Milk Farm Feet |
| 1 | N | 12,362 | 14,003 | 14,455 |
| 2 | NNE | 11,112 | 11,041 | 10,843 |
| 3 | NE | 10,080 | 10,004 | 10,492 |
| 4 | ENE | 10,495 | 11,554 | 10,925 |
| 5 | E | 10,066 | 14,540 | 14,471 |
| 6 | ESE | 16,085 | 20,374 | 20,154 |
| 7 | SE | 10,772 | 10,772 | 19,134 |
| 8 | SSE | 3,912 | 3,912 | - |
| 9 | S | 5,545 | 5,545 | - |
| 10 | SSW | 6,072 | 8,167 | 11,602 |
| 11 | SW | 4,755 | 4,865 | 4,860 |
| 12 | WSW | 4,036 | 9,072 | - |
| 13 | W | 5,327 | 5,327 | 5,136 |
| 14 | WNW | 2,928 | 4,192 | 22,124 |
| 15 | NW | 2,948 | 9,545 | 9,545 |
| 16 | NNW | 5,124 | - | - |

G. Errata Data

There is no errata data for 2016.

H. Quality Control (QC) Laboratory Analysis

The Appendix D section of this report presents the results of data analysis performed by the QC laboratory, Environmental Inc. Duplicate samples were obtained from several locations and media and split between the primary laboratory, Teledyne Brown Engineering (TBE) and the QC laboratory, Environmental Inc. Comparisons of the results for all media were within expected ranges.

I. Inter-Laboratory Comparison Program

The primary and secondary laboratories analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, food products and water matrices (Appendix E). The PE samples, supplied by Eckert & Ziegler Analytics, Inc., Environmental Resource Associates (ERA) and DOE's Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against a pre-set acceptance criteria described in Appendix E.

For the Teledyne Brown Engineering (TBE) laboratory, 156 out of 160 analyses performed met the specified acceptance criteria. Four analyses (Milk - Sr-90 for two different samples/dates, Vegetation - Sr-90, and Water - H-3 samples) did not meet the specified acceptance criteria and are documented in Appendix E. TBE has addressed each issue through the TBE Corrective Action Program.

For the EIML laboratory, 198 of 203 analyses met the specified acceptance criteria. Five analyses (Water - Ba-133, Co-57; Soil - Ni-63, U-233/234, U-238) did not meet the specified acceptance criteria for the reasons described in Appendix E.

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

## VI. References


1. Preoperational Environs Radioactivity Survey Summary Report, March 1960 through January 1966. (September 1967).

2. Interex Corporation, Peach Bottom Atomic Power Station Regional Environs Radiation Monitoring Program Preoperational Summary Report, Units 2 and 3, 5 February 1966 through 8 August 1973, June 1977, Natick, Massachusetts.

3. Radiation Management Corporation Publication, Peach Bottom Atomic Power Station Preoperational Radiological Monitoring Report for Unit 2 and 3, January 1974, Philadelphia, Pennsylvania.

Intentionally left blank

# APPENDIX A

# RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE PEACH BOTTOM ATOMIC POWER STATION, 2016

| | | | |
|---|---|---|---|
| NAME OF FACILITY: | PEACH BOTTOM ATOMIC POWER STATION | DOCKET NUMBER: | 50-277 & 50-278 |
| LOCATION OF FACILITY: | YORK COUNTY , PA | REPORTING PERIOD: | 2016 |

| MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)* | TYPES OF ANALYSIS PERFORMED | NUMBER OF ANALYSIS PERFORMED | REQUIRED LOWER LIMIT OF DETECTION (LLD) | INDICATOR LOCATIONS MEAN (M) (F) *RANGE* | CONTROL LOCATION MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): STATION # NAME DISTANCE AND DIRECTION | NUMBER OF NONROUTINE REPORTED MEASUREMENTS |
|---|---|---|---|---|---|---|---|---|
| SURFACE WATER *(PCI/LITER)* | H-3 | 8 | 200 | <LLD | <LLD | - | | 0 |
| | I-131 | 24 | 1 | <LLD | <LLD | - | | 0 |
| | GAMMA | 24 | | | | | | |
| | *Mn-54* | | 15 | <LLD | <LLD | - | | 0 |
| | *Co-58* | | 15 | <LLD | <LLD | - | | 0 |
| | *Fe-59* | | 30 | <LLD | <LLD | - | | 0 |
| | *Co-60* | | 15 | <LLD | <LLD | - | | 0 |
| | *Zn-65* | | 30 | <LLD | <LLD | - | | 0 |
| | *Nb-95* | | 15 | <LLD | <LLD | - | | 0 |
| | *Zr-95* | | 30 | <LLD | <LLD | - | | 0 |
| | *Cs-134* | | 15 | <LLD | <LLD | - | | 0 |
| | *Cs-137* | | 18 | <LLD | <LLD | - | | 0 |
| | *Ba-140* | | 60 | <LLD | <LLD | - | | 0 |
| | *La-140* | | 15 | <LLD | <LLD | - | | 0 |
| DRINKING WATER *(PCI/LITER)* | GR-B | 36 | 4 | 2.9 (15/24) *1.9 - 5.4* | 2.6 (8/12) *1.9 - 3.3* | 3.4 (7/12) *2.3 - 5.4* | 13B INDICATOR CHESTER WATER AUTH. SUSQUEHANNA PUMPING STA. 13306 FEET ESE | 0 |
| | H-3 | 12 | 200 | <LLD | <LLD | - | | 0 |
| | I-131 (LOW LVL) | 36 | 1 | <LLD | <LLD | - | | 0 |
| | GAMMA | 36 | | | | | | |
| | *MN-54* | | 15 | <LLD | <LLD | - | | 0 |
| | *CO-58* | | 15 | <LLD | <LLD | - | | 0 |
| | *FE-59* | | 30 | <LLD | <LLD | - | | 0 |
| | *CO-60* | | 15 | <LLD | <LLD | - | | 0 |
| | *ZN-65* | | 30 | <LLD | <LLD | - | | 0 |
| | *NB-95* | | 15 | <LLD | <LLD | - | | 0 |
| | *ZR-95* | | 30 | <LLD | <LLD | - | | 0 |
| | *CS-134* | | 15 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 18 | <LLD | <LLD | - | | 0 |
| | *BA-140* | | 60 | <LLD | <LLD | - | | 0 |
| | *LA-140* | | 15 | <LLD | <LLD | - | | 0 |

*(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.*

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR
THE PEACH BOTTOM ATOMIC POWER STATION, 2016

NAME OF FACILITY: PEACH BOTTOM ATOMIC POWER STATION — DOCKET NUMBER: 50-277 & 50-278

LOCATION OF FACILITY: YORK COUNTY , PA — REPORTING PERIOD: 2016

| MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)* | TYPES OF ANALYSIS PERFORMED | NUMBER OF ANALYSIS PERFORMED | REQUIRED LOWER LIMIT OF DETECTION (LLD) | INDICATOR LOCATIONS MEAN (M) (F) *RANGE* | CONTROL LOCATION MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): STATION # NAME DISTANCE AND DIRECTION | NUMBER OF NONROUTINE REPORTED MEASUREMENTS |
|---|---|---|---|---|---|---|---|---|
| BOTTOM FEEDER | GAMMA | 4 | | | | | | |
| *(PCI/KG WET)* | *K-40* | | NA | 3232 | 2894 | 3232 | 4 INDICATOR | 0 |
| | | | | (2/2) | (2/2) | (2/2) | CONOWINGO POND | |
| | | | | *3086 - 3378* | *2586 - 3201* | *3086 - 3378* | 7162 FEET SE | |
| | *MN-54* | | 130 | <LLD | <LLD | - | | 0 |
| | *CO-58* | | 130 | <LLD | <LLD | - | | 0 |
| | *FE-59* | | 260 | <LLD | <LLD | - | | 0 |
| | *CO-60* | | 130 | <LLD | <LLD | - | | 0 |
| | *ZN-65* | | 260 | <LLD | <LLD | - | | 0 |
| | *CS-134* | | 130 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 150 | <LLD | <LLD | - | | 0 |
| PREDATOR | GAMMA | 4 | | | | | | |
| *(PCI/KG WET)* | *K-40* | | NA | 3642 | 3391 | 3642 | 4 INDICATOR | 0 |
| | | | | (2/2) | (2/2) | (2/2) | CONOWINGO POND | |
| | | | | *3335 - 3949* | *2885 - 3897* | *3335 - 3949* | 7162 FEET SE | |
| | *MN-54* | | 130 | <LLD | <LLD | - | | 0 |
| | *CO-58* | | 130 | <LLD | <LLD | - | | 0 |
| | *FE-59* | | 260 | <LLD | <LLD | - | | 0 |
| | *CO-60* | | 130 | <LLD | <LLD | - | | 0 |
| | *ZN-65* | | 260 | <LLD | <LLD | - | | 0 |
| | *CS-134* | | 130 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 150 | <LLD | <LLD | - | | 0 |
| SEDIMENT | GAMMA | 6 | | | | | | |
| *(PCI/KG DRY)* | *K-40* | | NA | 17730 | 13438 | 22110 | 4T INDICATOR | 0 |
| | | | | (4/4) | (2/2) | (2/2) | CONOWINGO POND NEAR CONOWINGO DAM | |
| | | | | *10500 - 25700* | *9115 - 17760* | *18520 - 25700* | 41818 FEET SE | |
| | *MN-54* | | NA | <LLD | <LLD | - | | 0 |
| | *CO-58* | | NA | <LLD | <LLD | - | | 0 |
| | *CO-60* | | NA | <LLD | <LLD | - | | 0 |
| | *CS-134* | | 150 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 180 | <LLD | 167 | 167 | 6F CONTROL | 0 |
| | | | | | (1/2) | (1/2) | HOLTWOOD DAM | |
| | | | | | | | 31469 FEET NW | |

*(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.*

## TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE PEACH BOTTOM ATOMIC POWER STATION, 2016

| | | | |
|---|---|---|---|
| NAME OF FACILITY: | PEACH BOTTOM ATOMIC POWER STATION | DOCKET NUMBER: | 50-277 & 50-278 |
| LOCATION OF FACILITY: | YORK COUNTY , PA | REPORTING PERIOD: | 2016 |

| MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)* | TYPES OF ANALYSIS PERFORMED | NUMBER OF ANALYSIS PERFORMED | REQUIRED LOWER LIMIT OF DETECTION (LLD) | INDICATOR LOCATIONS MEAN (M) (F) *RANGE* | CONTROL LOCATION MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): STATION # NAME DISTANCE AND DIRECTION | NUMBER OF NONROUTINE REPORTED MEASUREMENTS |
|---|---|---|---|---|---|---|---|---|
| AIR PARTICULATE *(E-3 PCI/CU.METER)* | GR-B | 259 | 10 | 15 (206/207) *6 - 28* | 16 (49/52) *7 - 28* | 16 (52/52) *7 - 24* | 1C INDICATOR PEACH BOTTOM SOUTH SUB STATION 4513 FEET SSE | 0 |
| | GAMMA | 20 | | | | | | |
| | *BE-7* | | NA | 71 (16/16) *42 - 100* | 69 (4/4) *58 - 82* | 83 (4/4) *58 - 100* | 1B INDICATOR WEATHER STATION #2 2587 FEET NW | 0 |
| | *MN-54* | | NA | <LLD | <LLD | - | | 0 |
| | *CO-58* | | NA | <LLD | <LLD | - | | 0 |
| | *CO-60* | | NA | <LLD | <LLD | - | | 0 |
| | *CS-134* | | 50 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 60 | <LLD | <LLD | - | | 0 |
| AIR IODINE *(E-3 PCI/CU.METER)* | GAMMA | 260 | | | | | | |
| | *I-131* | | 70 | <LLD | <LLD | - | | 0 |
| MILK *(PCI/LITER)* | I-131 (LOW LVL) | 156 | 1 | <LLD | <LLD | - | | 0 |
| | GAMMA | 156 | | | | | | |
| | *K-40* | | NA | 1322 (127/127) *941 - 3040* | 1288 (30/30) *1069 - 1474* | 1445 (23/23) *1036 - 3040* | J INDICATOR 5119 FEET W | 0 |
| | *CS-134* | | 15 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 18 | <LLD | <LLD | - | | 0 |
| | *BA-140* | | 60 | <LLD | <LLD | - | | 0 |
| | *LA-140* | | 15 | <LLD | <LLD | - | | 0 |

*(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.*

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR
THE PEACH BOTTOM ATOMIC POWER STATION, 2016

| | | | |
|---|---|---|---|
| NAME OF FACILITY: | PEACH BOTTOM ATOMIC POWER STATION | DOCKET NUMBER: | 50-277 & 50-278 |
| LOCATION OF FACILITY: | YORK COUNTY , PA | REPORTING PERIOD: | 2016 |

| MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)* | TYPES OF ANALYSIS PERFORMED | NUMBER OF ANALYSIS PERFORMED | REQUIRED LOWER LIMIT OF DETECTION (LLD) | INDICATOR LOCATIONS MEAN (M) (F) *RANGE* | CONTROL LOCATION MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): MEAN (M) (F) *RANGE* | LOCATION WITH HIGHEST ANNUAL MEAN (M): STATION # NAME DISTANCE AND DIRECTION | NUMBER OF NONROUTINE REPORTED MEASUREMENTS |
|---|---|---|---|---|---|---|---|---|
| VEGETATION | GAMMA | 59 | | | | | | |
| *(PCI/KG WET)* | *BE-7* | | NA | 876 | 1179 | 1340 | 1C INDICATOR | 0 |
| | | | | (13/47) | (4/12) | (5/11) | PEACH BOTTOM SOUTH SUB STATION | |
| | | | | *300 - 2315* | *417 - 2043* | *344 - 2315* | 4513 FEET SSE | |
| | *K-40* | | NA | 3131 | 5432 | 5432 | 55 CONTROL | 0 |
| | | | | (47/47) | (12/12) | (12/12) | NE SECTOR | |
| | | | | *709 - 6278* | *1750 - 10350* | *1750 - 10350* | 52272 FEET NE | |
| | *MN-54* | | NA | <LLD | <LLD | - | | 0 |
| | *CO-58* | | NA | <LLD | <LLD | - | | 0 |
| | *CO-60* | | NA | <LLD | <LLD | - | | 0 |
| | *I-131* | | 60 | <LLD | <LLD | - | | 0 |
| | *CS-134* | | 60 | <LLD | <LLD | - | | 0 |
| | *CS-137* | | 80 | <LLD | <LLD | - | | 0 |
| DIRECT RADIATION | OSLD-QUARTERLY | 192 | NA | 10.2 | 9.8 | 13.4 | 1R INDICATOR | 0 |
| *(MILLI-ROENTGEN/STD.MO.)* | | | | (176/176) | (16/16) | (4/4) | TRANSMISSION LINE HILL | |
| | | | | *6.6 - 13.6* | *8.3 - 10.7* | *12.9 - 13.6* | 2798 FEET SSE | |

*(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.*

Intentionally left blank

# APPENDIX B

# SAMPLE DESIGNATION
# AND LOCATIONS

TABLE B-1 Radiological Environmental Monitoring Program – Sampling Locations, Distance and Direction from Reactor Buildings, Peach Bottom Atomic Power Station, 2016

| Location | Location Description | Distance & Direction from Site per PBAPS ODCM |
|---|---|---|
| A. Surface Water | | |
| 1LL | Peach Bottom Units 2 and 3 Intake - Composite (Control) | 1,200 feet ENE |
| 1MM | Peach Bottom Canal Discharge -Composite | 5,500 feet SE |
| B. Drinking (Potable) Water | | |
| 4L | Conowingo Dam EL 33' MSL - Composite | 45,900 feet SE |
| 6I | Holtwood Dam Hydroelectric Station - Composite (Control) | 30,500 feet NW |
| 13B | Chester Water Authority (CWA) Susquehanna Pumping Station- Composite | 13,300 feet ESE |
| C. Fish | | |
| 4 | Conowingo Pond | 6,000 – 10,000 feet SE |
| 6 | Holtwood Pond (Control) | 50,000 – 70,000 feet NNW |
| D. Sediment | | |
| 4J | Conowingo Pond near Berkin's Run | 7,400 feet SE |
| 4T | Conowingo Pond near Conowingo Dam | 41,800 feet SE |
| 6F | Holtwood Dam (Control) | 31,500 feet NW |
| E. Air Particulate - Air Iodine | | |
| 1B | Weather Station #2 | 2,500 feet NW |
| 1Z | Weather Station #1 | 1,500 feet SE |
| 1A | Weather Station #1 | 1,500 feet SE |
| 1C | Peach Bottom South Sub Station | 4,700 feet SSE |
| 3A | Delta, PA – Substation | 19,300 feet SW |
| 5H2 | Manor Substation (Control) | 162,400 feet NE |
| F. Milk – bi-weekly / monthly | | |
| J | | 5,100 feet W |
| R | | 4,900 feet SW |
| S | | 19,100 feet SE |
| U | | 11,200 feet SSW |
| V | (Control) | 32,600 feet W |
| X | | 9,500 feet NW |
| G. Milk – quarterly | | |
| C | (Control) | 5,000 feet NW |
| D | | 18,500 feet NE |
| E | (Control) | 46,100 feet N |
| L | | 11,200 feet NE |
| P | | 11,000 feet ENE |
| W | | 89,200 feet S |

TABLE B-1 Radiological Environmental Monitoring Program – Sampling Locations, Distance and Direction from Reactor Buildings, Peach Bottom Atomic Power Station, 2016

| Location | Location Description | Distance & Direction from Site per PBAPS ODCM |
|---|---|---|
| H. Food Products – monthly when available | | |
| 1B | | 2,500 feet NW |
| 1C | | 4,700 feet SSE |
| 2Q | | 9,200 feet SW |
| 3Q | | 9,500 feet W |
| 55 | (Control) | 51,900 feet NE |
| J. Environmental Dosimetry - OSLD | | |
| Site Boundary | | |
| 1L | Peach Bottom Unit 3 Intake | 1,100 feet NE |
| 1P | Tower B & C Fence | 2,200 feet ESE |
| 1A | Weather Station #1 | 1,500 feet SE |
| 1Q | Tower D & E Fence | 3,300 feet SE |
| 1D | 140 $^{o}$ Sector | 3,500 feet SE |
| 2 | Peach Bottom 130$^{o}$ Sector Hill | 4,700 feet SE |
| 2B | Burk Property | 3,900 feet SSE |
| 1M | Discharge | 5,400 feet SE |
| 1R | Transmission Line Hill/ISFSI Pad | 2,800 feet SSE |
| 1I | Peach Bottom South Substation | 2,900 feet SSE |
| 1C | Peach Bottom South Substation | 4,700 feet SSE |
| 1J | Peach Bottom 180$^{o}$ Sector Hill | 4,000 feet S |
| 1K | Peach Bottom Site Area | 4,700 feet SW |
| 1F | Peach Bottom 200$^{o}$ Sector Hill | 2,900 feet SSW |
| 40 | Peach Bottom Site Area | 8,000 feet SW |
| 1NN | Peach Bottom Site | 2,700 feet WSW |
| 1H | Peach Bottom 270$^{o}$ Sector Hill | 3,200 feet W |
| 1G | Peach Bottom North Substation | 3,100 feet WNW |
| 1B | Weather Station #2 | 2,500 feet NW |
| 1E | Peach Bottom 350$^{o}$ Sector Hill | 3,000 feet NNW |
| Intermediate Distance | | |
| 5 | Wakefield, PA | 24,400 feet E |
| 15 | Silver Spring Rd | 19,300 feet N |
| 22 | Eagle Road | 12,500 feet NNE |
| 44 | Goshen Mill Rd | 26,700 feet NE |
| 32 | Slate Hill Rd | 14,400 feet ENE |
| 45 | PB-Keeney Line | 17,600 feet ENE |
| 14 | Peters Creek | 10,300 feet E |
| 17 | Riverview Rd | 21,500 feet ESE |
| 31A | Eckman Rd | 24,100 feet SE |
| 4K | Conowingo Dam Power House Roof | 45,900 feet SE |
| 23 | Peach Bottom 150$^{o}$ Sector Hill | 5,500 feet SSE |
| 27 | N. Cooper Road | 14,400 feet S |
| 48 | Macton Substation | 26,500 feet SSW |

TABLE B-1 Radiological Environmental Monitoring Program – Sampling Locations, Distance and Direction from Reactor Buildings, Peach Bottom Atomic Power Station, 2016

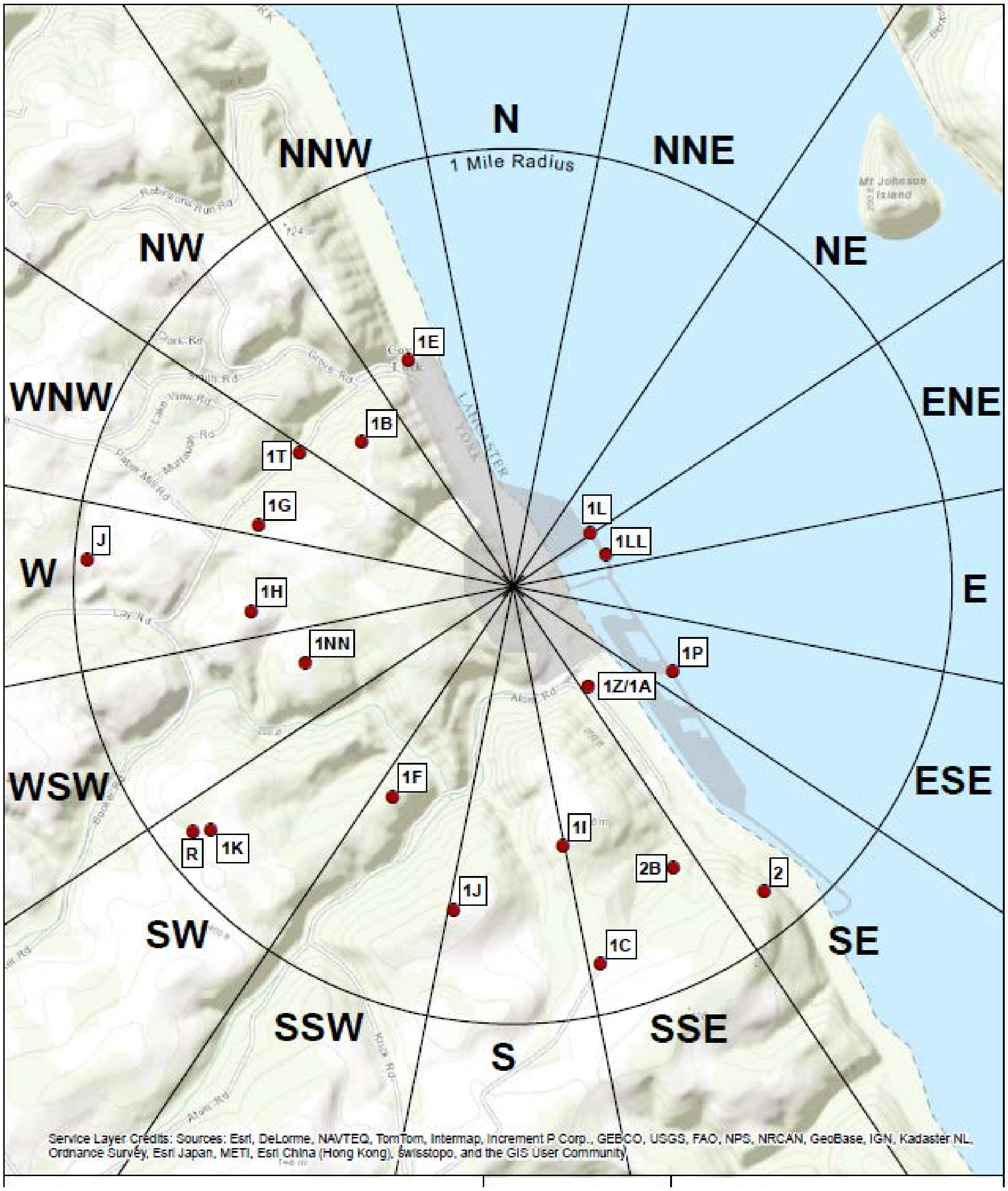
| Location | Location Description | Distance & Direction from Site per PBAPS ODCM |
|---|---|---|
| J. Environmental Dosimetry – OSLD (cont'd) | | |
| Intermediate Distance (cont'd) | | |
| 3A | Delta, PA Substation | 19,300 feet SW |
| 49 | PB-Conastone Line | 21,500 feet WSW |
| 50 | TRANSCO Pumping Station | 26,400 feet W |
| 51 | Fin Substation | 21,000 feet WNW |
| 26 | Slab Road | 22,300 feet NW |
| 6B | Holtwood Dam Power House Roof | 30,400 feet NW |
| 42 | Muddy Run Environ. Laboratory | 21,600 feet NNW |
| 43 | Drumore Township School | 26,200 feet NNE |
| 46 | Broad Creek | 23,800 feet SSE |
| 47 | Broad Creek Scout Camp | 22,700 feet S |
| 1T | Lay Road/LLRWSF | 3,100 feet WNW |
| Control | | |
| 16 | Nottingham, PA Substation (Control) | 67,100 feet E |
| 24 | Harrisville, MD Substation (Control) | 57,600 feet ESE |
| 18 | Fawn Grove, PA (Control) | 52,200 feet W |
| 19 | Red Lion, PA (Control) | 124,000 feet WNW |

TABLE B-2 Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Peach Bottom Atomic Power Station, 2016

| Sample Medium | Analysis | Sampling Method | Collection Procedure Number | Sample Size | Analytical Procedure Number |
|---|---|---|---|---|---|
| Surface Water | Gamma Spectroscopy | Monthly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2007 Gamma emitting radioisotope analysis<br>Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy |
| Surface Water | Tritium | Quarterly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 500 ml | TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation<br>Env. Inc., T-02 Determination of tritium in water (direct method) |
| Surface Water | I-131 | Monthly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2012 Radioiodine in various matrices<br>Env. Inc., I-131-01 Determination of I-131 in water by an ion exchange |
| Drinking Water | Gross Beta | Monthly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices<br>Env. Inc., W(DS)-01 Determination of gross alpha and/or gross beta in water (dissolved solids or total residue) |
| Drinking Water | I-131 | Monthly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2031 Radioiodine in drinking water<br>Env. Inc., I-131-01 Determination of I-131 in water by an ion exchange |
| Drinking Water | Gamma Spectroscopy | Monthly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2007 Gamma emitting radioisotope analysis<br>Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy |
| Drinking Water | Tritium | Quarterly composite from a continuous water compositor | NAI-ER15 Collection of water samples for radiological analysis (Peach Bottom Atomic Power Station) | 500 ml | TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation<br>Env. Inc., T-02 Determination of tritium in water (direct method) |

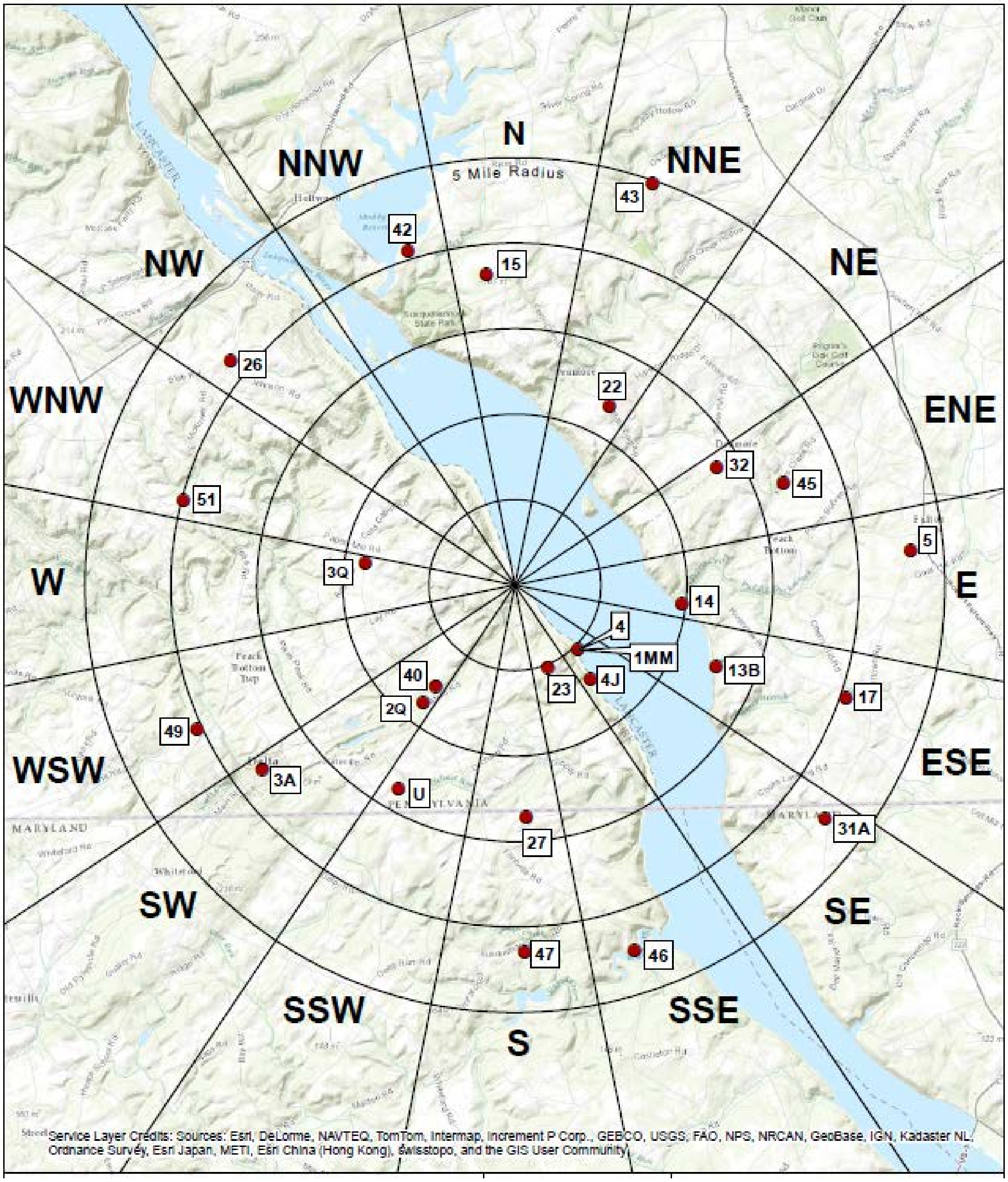
TABLE B-2 Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Peach Bottom Atomic Power Station, 2016

| Sample Medium | Analysis | Sampling Method | Collection Procedure Number | Sample Size | Analytical Procedure Number |
|---|---|---|---|---|---|
| Fish | Gamma Spectroscopy | Semi-annual samples collected via electroshocking or other techniques | NAI-ER3 Collection of fish samples for radiological analysis (Peach Bottom Atomic Power Station) | 1000 grams (wet) | TBE, TBE-2007 Gamma emitting radioisotope analysis |
| Air Particulates | Gamma Spectroscopy | Quarterly composite of each station | TBE, TBE-2023 Compositing of samples<br>Env. Inc., AP-03 Procedure for compositing air particulate filters for gamma spectroscopic analysis | 13 filters (approximately 3600 cubic meters) | TBE, TBE-2007 Gamma emitting radioisotope analysis<br>Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy |
| Air Iodine | Gamma Spectroscopy | One-week composite of continuous air sampling through charcoal filter | NAI-ER8 Collection of air particulate and air iodine samples for radiological analysis (Peach Bottom Atomic Power Station) | 1 filter (approximately 280 cubic meters weekly) | TBE, TBE-2007 Gamma emitting radioisotope analysis<br>Env. Inc., I-131-02 Determination of I-131 in charcoal canisters by gamma spectroscopy (batch method) |
| Milk | I-131 | Bi-weekly grab sample when cows are on pasture. Monthly all other times | NAI-ER10 Collection of milk samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2012 Radioiodine in various matrices<br>Env. Inc., I-131-01 Determination of I-131 in milk by an ion exchange |
| Milk | Gamma Spectroscopy | Bi-weekly grab sample when cows are on pasture. Monthly all other times | NAI-ER10 Collection of milk samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 gallon | TBE, TBE-2007 Gamma emitting radioisotope analysis<br>Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy |
| Food Products | Gamma Spectroscopy | Monthly when available | NAI-ER12 Collection of vegetation samples for radiological analysis (Peach Bottom Atomic Power Station) | 1000 grams | TBE, TBE-2007 Gamma emitting radioisotope analysis<br>Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy |
| OSLD | Optically Stimulated Luminescence Dosimetry | Quarterly OSLDs comprised of two $Al_2O_3$:C Landauer Incorporated elements. | NAI-ER9 Collection of OSLD samples for radiological analysis (Peach Bottom Atomic Power Station) | 2 dosimeters | Landauer Incorporated |



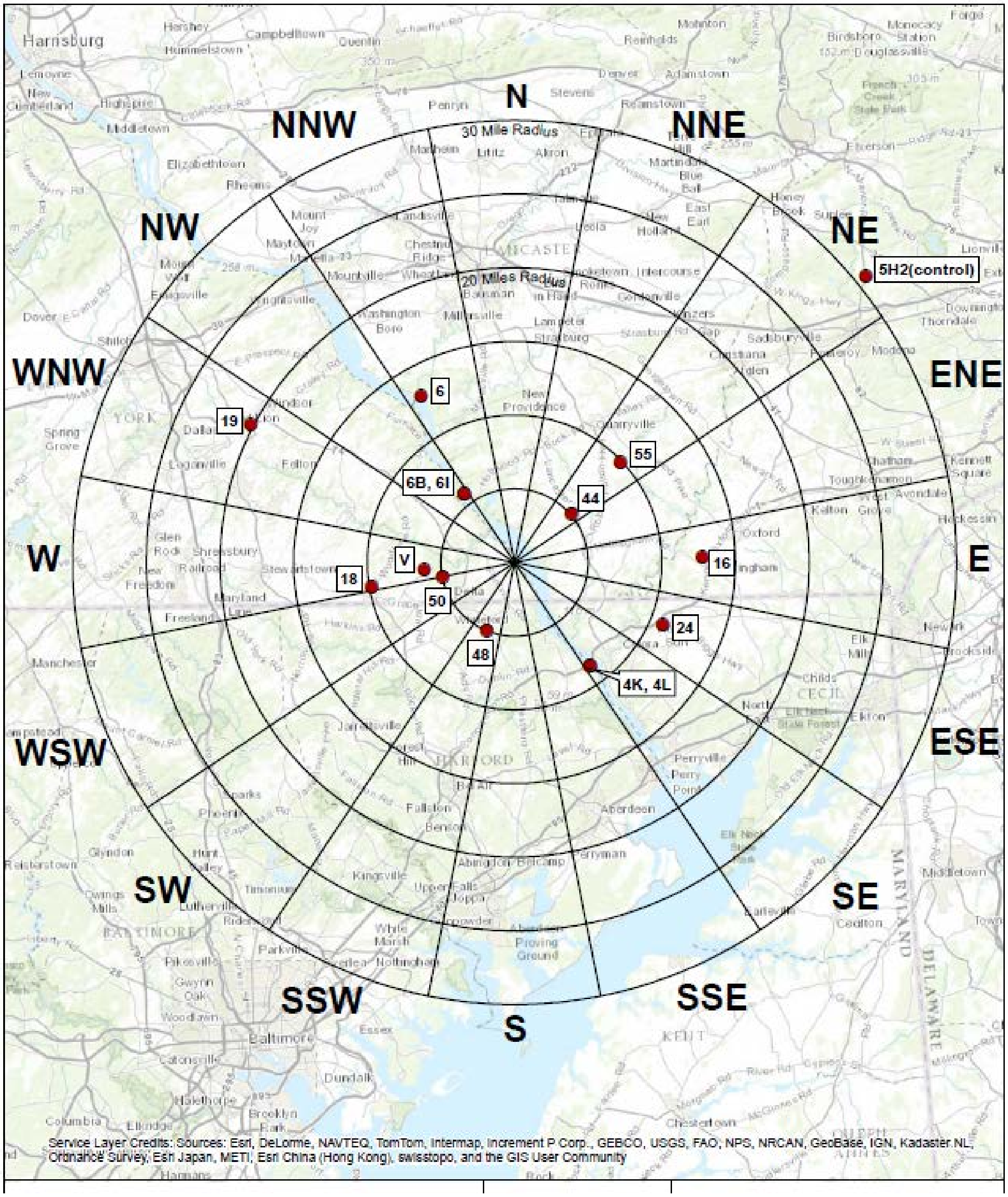

*Not all listed REMP locations are shown on the map.*
*Locations not displayed include: 1Q, 1D, 1M, 1R*

Figure B-1
Environmental Sampling Locations Within One
Mile of the Peach Bottom Atomic Power Station, 2016




*Not all listed REMP locations are shown on the map.*
*Locations not displayed include: 1X, S, C, D, L, P*

Figure B-2
Environmental Sampling Locations Between One and Approximately Five Miles of the Peach Bottom Atomic Power Station, 2016




*Not all listed REMP locations are shown on the map.*
*Locations not displayed include: 6F, 4T, E, W*

Figure B-3
Environmental Sampling Locations Greater Than
Five Miles from the Peach Bottom Atomic Power Station, 2016

Intentionally left blank

# APPENDIX C

# DATA TABLES AND FIGURES
# PRIMARY LABORATORY

## Table C-I.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

| COLLECTION PERIOD | 1LL | 1MM |
|---|---|---|
| 12/30/15 - 03/30/16 | < 198 | < 196 |
| 03/30/16 - 06/29/16 | < 181 | < 180 |
| 06/29/16 - 09/28/16 | < 186 | < 179 |
| 09/28/16 - 12/28/16 | < 177 | < 195 |
| *MEAN* | - | - |

## Table C-I.2 CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

| COLLECTION PERIOD | 1LL | 1MM |
|---|---|---|
| 12/30/15 - 01/27/16 | < 0.6 | < 0.6 |
| 01/27/16 - 02/24/16 | < 0.5 | < 0.6 |
| 02/24/16 - 03/30/16 | < 0.6 | < 0.7 |
| 03/30/16 - 04/27/16 | < 0.6 | < 0.7 |
| 04/27/16 - 06/01/16 | < 0.8 | < 0.8 |
| 06/01/16 - 06/29/16 | < 0.5 | < 0.8 |
| 06/29/16 - 07/27/16 | < 0.7 | < 0.6 |
| 07/27/16 - 08/31/16 | < 0.7 | < 0.7 |
| 08/31/16 - 09/28/16 | < 0.7 | < 0.6 |
| 09/28/16 - 10/26/16 | < 0.8 | < 0.8 |
| 10/26/16 - 11/30/16 | < 0.7 | < 0.7 |
| 11/30/16 - 12/28/16 | < 0.6 | < 0.7 |
| *MEAN* | - | - |

**Table C-I.3** **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Nb-95 | Zr-95 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1LL | 12/30/15 - 01/27/16 | < 6 | < 4 | < 14 | < 6 | < 8 | < 5 | < 11 | < 5 | < 5 | < 28 | < 11 |
| | 01/27/16 - 02/24/16 | < 4 | < 5 | < 9 | < 4 | < 8 | < 4 | < 7 | < 4 | < 4 | < 16 | < 7 |
| | 02/24/16 - 03/30/16 | < 6 | < 6 | < 14 | < 7 | < 10 | < 6 | < 10 | < 5 | < 6 | < 24 | < 9 |
| | 03/30/16 - 04/27/16 | < 6 | < 5 | < 12 | < 5 | < 9 | < 5 | < 8 | < 6 | < 7 | < 27 | < 10 |
| | 04/27/16 - 06/01/16 | < 2 | < 2 | < 4 | < 2 | < 4 | < 2 | < 4 | < 2 | < 2 | < 17 | < 5 |
| | 06/01/16 - 06/29/16 | < 7 | < 9 | < 16 | < 5 | < 10 | < 9 | < 10 | < 6 | < 7 | < 39 | < 10 |
| | 06/29/16 - 07/27/16 | < 1 | < 1 | < 3 | < 1 | < 3 | < 2 | < 2 | < 1 | < 1 | < 9 | < 3 |
| | 07/27/16 - 08/31/16 | < 7 | < 7 | < 12 | < 5 | < 12 | < 8 | < 11 | < 6 | < 6 | < 34 | < 12 |
| | 08/31/16 - 09/28/16 | < 5 | < 4 | < 9 | < 5 | < 10 | < 4 | < 8 | < 4 | < 5 | < 21 | < 7 |
| | 09/28/16 - 10/26/16 | < 5 | < 5 | < 11 | < 6 | < 13 | < 7 | < 9 | < 5 | < 5 | < 31 | < 9 |
| | 10/26/16 - 11/30/16 | < 7 | < 6 | < 17 | < 7 | < 13 | < 7 | < 13 | < 8 | < 7 | < 27 | < 6 |
| | 11/30/16 - 12/28/16 | < 4 | < 4 | < 9 | < 5 | < 9 | < 4 | < 7 | < 4 | < 4 | < 21 | < 6 |
| | *MEAN* | - | - | - | - | - | - | - | - | - | - | - |
| 1MM | 12/30/15 - 01/27/16 | < 4 | < 6 | < 14 | < 5 | < 10 | < 9 | < 11 | < 4 | < 9 | < 37 | < 9 |
| | 01/27/16 - 02/24/16 | < 5 | < 5 | < 10 | < 5 | < 11 | < 5 | < 10 | < 5 | < 4 | < 22 | < 7 |
| | 02/24/16 - 03/30/16 | < 6 | < 5 | < 13 | < 6 | < 12 | < 6 | < 12 | < 5 | < 7 | < 31 | < 9 |
| | 03/30/16 - 04/27/16 | < 5 | < 5 | < 12 | < 5 | < 9 | < 7 | < 12 | < 6 | < 7 | < 29 | < 9 |
| | 04/27/16 - 06/01/16 | < 3 | < 3 | < 6 | < 2 | < 6 | < 3 | < 5 | < 3 | < 3 | < 24 | < 6 |
| | 06/01/16 - 06/29/16 | < 7 | < 8 | < 16 | < 9 | < 17 | < 6 | < 13 | < 7 | < 8 | < 40 | < 12 |
| | 06/29/16 - 07/27/16 | < 2 | < 2 | < 4 | < 2 | < 3 | < 2 | < 3 | < 2 | < 2 | < 13 | < 4 |
| | 07/27/16 - 08/31/16 | < 6 | < 5 | < 10 | < 6 | < 11 | < 7 | < 9 | < 5 | < 6 | < 29 | < 11 |
| | 08/31/16 - 09/28/16 | < 5 | < 5 | < 12 | < 5 | < 11 | < 7 | < 8 | < 5 | < 6 | < 27 | < 8 |
| | 09/28/16 - 10/26/16 | < 5 | < 6 | < 12 | < 5 | < 12 | < 7 | < 12 | < 5 | < 6 | < 35 | < 13 |
| | 10/26/16 - 11/30/16 | < 8 | < 8 | < 16 | < 6 | < 17 | < 9 | < 12 | < 8 | < 9 | < 44 | < 8 |
| | 11/30/16 - 12/28/16 | < 7 | < 8 | < 12 | < 8 | < 13 | < 8 | < 12 | < 6 | < 7 | < 29 | < 9 |
| | *MEAN* | - | - | - | - | - | - | - | - | - | - | - |

**Table C-II.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 13B | 4L | 6I |
|---|---|---|---|
| 12/29/15 - 01/28/16 | 5.3 ± 1.5 | < 1.8 | 1.9 ± 1.1 |
| 01/25/16 - 02/25/16 | 2.9 ± 1.3 | 1.9 ± 1.3 | 2.7 ± 1.3 |
| 02/22/16 - 03/31/16 | 2.8 ± 1.4 | 2.2 ± 1.2 | 2.5 ± 1.3 |
| 03/28/16 - 04/28/16 | < 2.1 | < 2.0 | < 2.1 |
| 04/25/16 - 06/02/16 | < 2.3 | < 2.2 | < 2.2 |
| 5/312016 - 06/30/16 | < 2.0 | 2.0 ± 1.4 | 2.9 ± 1.5 |
| 06/27/16 - 07/28/16 | < 2.0 | < 2.1 | < 2.1 |
| 07/25/16 - 09/01/16 | < 2.0 | 2.6 ± 1.4 | 2.8 ± 1.5 |
| 08/29/16 - 09/29/16 | 2.3 ± 1.5 | 2.2 ± 1.5 | 2.3 ± 1.5 |
| 09/27/16 - 10/27/16 | 5.4 ± 1.8 | 3.9 ± 1.6 | 3.3 ± 1.5 |
| 10/24/16 - 12/01/16 | 2.5 ± 1.5 | 2.4 ± 1.4 | < 2.0 |
| 11/28/16 - 12/29/16 | 2.8 ± 1.5 | 2.4 ± 1.4 | 2.3 ± 1.4 |
| *MEAN ± 2 STD DEV* | 3.4 ± 2.6 | 2.5 ± 1.3 | 2.6 ± 0.9 |

**Table C-II.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 13B | 4L | 6I |
|---|---|---|---|
| 12/29/15 - 03/31/16 | < 193 | < 194 | < 192 |
| 03/28/16 - 06/30/16 | < 182 | < 180 | < 181 |
| 06/27/16 - 09/29/16 | < 183 | < 181 | < 180 |
| 09/27/16 - 12/29/16 | < 181 | < 182 | < 184 |
| *MEAN* | - | - | - |

**Table C-II.3 CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 13B | 4L | 6I |
|---|---|---|---|
| 12/29/15 - 01/28/16 | < 0.9 | < 0.6 | < 0.5 |
| 01/25/16 - 02/25/16 | < 0.7 | < 0.5 | < 0.6 |
| 02/22/16 - 03/31/16 | < 0.8 | < 0.6 | < 0.8 |
| 03/28/16 - 04/28/16 | < 0.6 | < 0.6 | < 0.4 |
| 04/25/16 - 06/02/16 | < 0.8 | < 1.0 | < 0.8 |
| 5/312016 - 06/30/16 | < 0.6 | < 0.6 | < 0.7 |
| 06/27/16 - 07/28/16 | < 0.8 | < 0.7 | < 0.9 |
| 07/25/16 - 09/01/16 | < 0.6 | < 0.6 | < 0.7 |
| 08/29/16 - 09/29/16 | < 1.0 | < 0.7 | < 0.8 |
| 09/27/16 - 10/27/16 | < 0.8 | < 0.7 | < 0.7 |
| 10/24/16 - 12/01/16 | < 0.8 | < 0.5 | < 0.6 |
| 11/28/16 - 12/29/16 | < 0.6 | < 0.5 | < 0.6 |
| *MEAN* | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**Table C-II.4** **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

| SITE | COLLECTION PERIOD | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Nb-95 | Zr-95 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13B | 12/29/15 - 01/25/16 | < 6 | < 8 | < 11 | < 6 | < 12 | < 6 | < 12 | < 5 | < 7 | < 34 | < 13 |
| | 01/25/16 - 02/22/16 | < 7 | < 7 | < 16 | < 5 | < 12 | < 8 | < 13 | < 7 | < 7 | < 31 | < 13 |
| | 02/22/16 - 03/28/16 | < 6 | < 5 | < 8 | < 5 | < 10 | < 6 | < 11 | < 4 | < 5 | < 30 | < 10 |
| | 03/28/16 - 04/25/16 | < 2 | < 2 | < 4 | < 2 | < 3 | < 2 | < 3 | < 1 | < 2 | < 8 | < 3 |
| | 04/25/16 - 05/31/16 | < 2 | < 2 | < 4 | < 2 | < 3 | < 2 | < 3 | < 2 | < 2 | < 15 | < 5 |
| | 05/31/16 - 06/27/16 | < 6 | < 6 | < 15 | < 6 | < 11 | < 7 | < 11 | < 5 | < 6 | < 34 | < 10 |
| | 06/27/16 - 07/25/16 | < 2 | < 2 | < 6 | < 2 | < 4 | < 3 | < 4 | < 2 | < 2 | < 18 | < 6 |
| | 07/25/16 - 08/29/16 | < 5 | < 7 | < 8 | < 6 | < 14 | < 6 | < 11 | < 6 | < 7 | < 39 | < 10 |
| | 08/29/16 - 09/27/16 | < 6 | < 7 | < 16 | < 5 | < 15 | < 6 | < 13 | < 6 | < 6 | < 35 | < 10 |
| | 09/27/16 - 10/24/16 | < 3 | < 4 | < 8 | < 3 | < 7 | < 4 | < 7 | < 3 | < 4 | < 21 | < 7 |
| | 10/24/16 - 11/28/16 | < 7 | < 7 | < 18 | < 8 | < 16 | < 8 | < 12 | < 7 | < 8 | < 40 | < 10 |
| | 11/28/16 - 12/27/16 | < 5 | < 4 | < 11 | < 6 | < 10 | < 5 | < 10 | < 4 | < 5 | < 23 | < 7 |
| | *MEAN* | - | - | - | - | - | - | - | - | - | - | - |
| 4L | 12/30/15 - 01/28/16 | < 5 | < 5 | < 10 | < 7 | < 14 | < 5 | < 11 | < 6 | < 7 | < 30 | < 10 |
| | 01/28/16 - 02/25/16 | < 4 | < 4 | < 9 | < 4 | < 8 | < 5 | < 9 | < 4 | < 5 | < 20 | < 6 |
| | 02/25/16 - 03/31/16 | < 5 | < 4 | < 9 | < 5 | < 11 | < 5 | < 9 | < 5 | < 5 | < 26 | < 7 |
| | 03/31/16 - 04/28/16 | < 6 | < 6 | < 14 | < 7 | < 12 | < 6 | < 10 | < 6 | < 6 | < 25 | < 12 |
| | 04/28/16 - 06/02/16 | < 3 | < 3 | < 7 | < 3 | < 6 | < 3 | < 6 | < 3 | < 3 | < 23 | < 7 |
| | 06/02/16 - 06/30/16 | < 7 | < 7 | < 10 | < 8 | < 15 | < 9 | < 9 | < 7 | < 7 | < 40 | < 14 |
| | 06/30/16 - 07/28/16 | < 2 | < 2 | < 4 | < 2 | < 3 | < 2 | < 3 | < 2 | < 2 | < 11 | < 4 |
| | 07/28/16 - 09/01/16 | < 6 | < 7 | < 13 | < 6 | < 14 | < 8 | < 12 | < 9 | < 7 | < 36 | < 9 |
| | 09/01/16 - 09/29/16 | < 5 | < 5 | < 9 | < 7 | < 10 | < 6 | < 7 | < 5 | < 5 | < 24 | < 9 |
| | 09/29/16 - 10/27/16 | < 6 | < 7 | < 13 | < 8 | < 10 | < 8 | < 10 | < 7 | < 7 | < 30 | < 12 |
| | 10/27/16 - 12/01/16 | < 7 | < 6 | < 14 | < 6 | < 14 | < 7 | < 14 | < 7 | < 8 | < 35 | < 11 |
| | 12/01/16 - 12/29/16 | < 5 | < 5 | < 12 | < 4 | < 10 | < 5 | < 10 | < 5 | < 5 | < 24 | < 10 |
| | *MEAN* | - | - | - | - | - | - | - | - | - | - | - |
| 6I | 12/30/15 - 01/28/16 | < 10 | < 8 | < 20 | < 7 | < 19 | < 8 | < 14 | < 7 | < 9 | < 47 | < 12 |
| | 01/28/16 - 02/25/16 | < 6 | < 6 | < 12 | < 7 | < 12 | < 6 | < 10 | < 6 | < 4 | < 30 | < 8 |
| | 02/25/16 - 03/31/16 | < 5 | < 7 | < 13 | < 4 | < 14 | < 6 | < 10 | < 5 | < 8 | < 28 | < 7 |
| | 03/31/16 - 04/28/16 | < 7 | < 5 | < 14 | < 6 | < 11 | < 6 | < 13 | < 6 | < 6 | < 29 | < 9 |
| | 04/28/16 - 06/02/16 | < 2 | < 2 | < 6 | < 2 | < 5 | < 3 | < 4 | < 2 | < 2 | < 20 | < 5 |
| | 06/02/16 - 06/30/16 | < 6 | < 7 | < 15 | < 6 | < 16 | < 8 | < 14 | < 8 | < 8 | < 41 | < 11 |
| | 06/30/16 - 07/28/16 | < 2 | < 2 | < 5 | < 2 | < 5 | < 2 | < 4 | < 2 | < 2 | < 14 | < 5 |
| | 07/28/16 - 09/01/16 | < 8 | < 8 | < 16 | < 7 | < 15 | < 9 | < 11 | < 6 | < 7 | < 36 | < 13 |
| | 09/01/16 - 09/29/16 | < 6 | < 6 | < 16 | < 6 | < 14 | < 6 | < 12 | < 6 | < 7 | < 32 | < 7 |
| | 09/29/16 - 10/27/16 | < 8 | < 7 | < 14 | < 7 | < 13 | < 9 | < 15 | < 7 | < 8 | < 33 | < 7 |
| | 10/27/16 - 12/01/16 | < 9 | < 9 | < 22 | < 8 | < 19 | < 9 | < 18 | < 9 | < 11 | < 39 | < 10 |
| | 12/01/16 - 12/29/16 | < 4 | < 4 | < 11 | < 5 | < 8 | < 5 | < 7 | < 4 | < 5 | < 17 | < 6 |
| | *MEAN* | - | - | - | - | - | - | - | - | - | - | - |

**Table C-III.1** **CONCENTRATIONS OF GAMMA EMITTERS IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

| SITE | COLLECTION PERIOD | K-40 | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 06/15/16 | 3949 ± 702 | < 45 | < 43 | < 102 | < 41 | < 78 | < 47 | < 49 |
| *PREDATOR* | 10/11/16 | 3335 ± 864 | < 55 | < 61 | < 86 | < 26 | < 64 | < 52 | < 54 |
| | *MEAN ± 2 STD DEV* | 3642 ± 868 | - | - | - | - | - | - | - |
| 4 | 06/15/16 | 3086 ± 612 | < 39 | < 34 | < 85 | < 29 | < 82 | < 34 | < 33 |
| *BOTTOM FEEDER* | 10/11/16 | 3378 ± 678 | < 39 | < 29 | < 111 | < 36 | < 95 | < 41 | < 35 |
| | *MEAN ± 2 STD DEV* | 3232 ± 413 | - | - | - | - | - | - | - |
| 6 | 06/10/16 | 2885 ± 785 | < 57 | < 48 | < 111 | < 49 | < 112 | < 59 | < 45 |
| *PREDATOR* | 10/12/16 | 3897 ± 983 | < 63 | < 73 | < 148 | < 51 | < 153 | < 66 | < 82 |
| | *MEAN ± 2 STD DEV* | 3391 ± 1431 | - | - | - | - | - | - | - |
| 6 | 06/10/16 | 2586 ± 1133 | < 84 | < 91 | < 151 | < 87 | < 184 | < 61 | < 89 |
| *BOTTOM FEEDER* | 10/12/16 | 3201 ± 770 | < 54 | < 54 | < 109 | < 52 | < 133 | < 84 | < 70 |
| | *MEAN ± 2 STD DEV* | 2894 ± 870 | - | - | - | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

## Table C-IV.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PC/KG DRY ± 2 SIGMA

| SITE | COLLECTION PERIOD | K-40 | Mn-54 | Co-58 | Co-60 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| 4J | 06/29/16 | 10500 ± 1039 | < 46 | < 46 | < 49 | < 39 | < 48 |
| | 11/18/16 | 16200 ± 1812 | < 63 | < 75 | < 79 | < 58 | < 96 |
| | *MEAN ± 2 STD DEV* | 13350 ± 8061 | - | - | - | - | - |
| 4T | 06/29/16 | 25700 ± 3301 | < 157 | < 158 | < 165 | < 134 | < 149 |
| | 11/18/16 | 18520 ± 2131 | < 87 | < 97 | < 72 | < 87 | < 122 |
| | *MEAN ± 2 STD DEV* | 22110 ± 10154 | - | - | - | - | - |
| 6F | 06/29/16 | 17760 ± 1690 | < 71 | < 73 | < 77 | < 64 | 167 ± 90 |
| | 11/18/16 | 9115 ± 1553 | < 83 | < 74 | < 70 | < 79 | < 95 |
| | *MEAN ± 2 STD DEV* | 13438 ± 12226 | - | - | - | - | 167 ± 0 |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**Table C-V.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF E-3 PCI/CUBIC METER ± 2 SIGMA

| COLLECTION | GROUP I | | | GROUP II | GROUP III |
|---|---|---|---|---|---|
| PERIOD | 1B | 1C | 1Z | 3A | 5H2 |
| 12/28/15 - 01/04/16 | | | | | 11 ± 4 |
| 12/30/15 - 01/07/16 | 18 ± 4 | 14 ± 5 | 18 ± 3 | 17 ± 3 | |
| 01/04/16 - 01/11/16 | | | | | 12 ± 5 |
| 01/07/16 - 01/14/16 | 17 ± 4 | 18 ± 5 | 15 ± 3 | 16 ± 3 | |
| 01/11/16 - 01/19/16 | | | | | 16 ± 4 |
| 01/14/16 - 01/21/16 | 16 ± 4 | 21 ± 5 | 20 ± 4 | 17 ± 3 | |
| 01/19/16 - 01/26/16 | | | | | 9 ± 4 |
| 01/21/16 - 01/28/16 | 15 ± 4 | 11 ± 5 | 12 ± 3 | 12 ± 3 | |
| 01/26/16 - 02/01/16 | | | | | 16 ± 6 |
| 01/28/16 - 02/04/16 | 11 ± 4 | 19 ± 6 | 13 ± 4 | 11 ± 3 | |
| 02/01/16 - 02/08/16 | | | | | 17 ± 5 |
| 02/04/16 - 02/11/16 | 9 ± 4 | 16 ± 5 | 12 ± 3 | 11 ± 3 | |
| 02/08/16 - 02/14/16 | | | | | < 8 |
| 02/11/16 - 02/18/16 | 11 ± 4 | 12 ± 4 | 9 ± 3 | 8 ± 3 | |
| 02/14/16 - 02/22/16 | | | | | 12 ± 4 |
| 02/18/16 - 02/25/16 | 13 ± 4 | 14 ± 4 | 10 ± 3 | 10 ± 3 | |
| 02/22/16 - 02/29/16 | | | | | 14 ± 5 |
| 02/25/16 - 03/03/16 | 12 ± 4 | 13 ± 5 | 10 ± 3 | 13 ± 3 | |
| 02/29/16 - 03/07/16 | | | | | 12 ± 5 |
| 03/03/16 - 03/10/16 | 15 ± 4 | 15 ± 5 | 15 ± 3 | 16 ± 3 | |
| 03/07/16 - 03/14/16 | | | | | 14 ± 5 |
| 03/10/16 - 03/17/16 | 10 ± 4 | 11 ± 4 | 12 ± 3 | 11 ± 3 | |
| 03/14/16 - 03/21/16 | | | | | 11 ± 5 |
| 03/17/16 - 03/24/16 | 11 ± 4 | 13 ± 5 | 13 ± 3 | 12 ± 3 | |
| 03/21/16 - 03/28/16 | | | | | 14 ± 5 |
| 03/24/16 - 03/31/16 | 12 ± 5 | 10 ± 5 | 11 ± 4 | 11 ± 3 | |
| 03/28/16 - 04/04/16 | | | | | 18 ± 5 |
| 03/31/16 - 04/07/16 | 15 ± 5 | 14 ± 5 | 14 ± 3 | 13 ± 3 | |
| 04/04/16 - 04/11/16 | | | | | 16 ± 5 |
| 04/07/16 - 04/14/16 | 10 ± 4 | 11 ± 5 | 10 ± 3 | 7 ± 3 | |
| 04/11/16 - 04/18/16 | | | | | 17 ± 5 |
| 04/14/16 - 04/21/16 | 18 ± 5 | 16 ± 5 | 15 ± 4 | 14 ± 3 | |
| 04/18/16 - 04/25/16 | | | | | 14 ± 5 |
| 04/21/16 - 04/28/16 | 15 ± 5 | 17 ± 5 | 15 ± 4 | 17 ± 3 | |
| 04/25/16 - 05/03/16 | | | | | < 5 |
| 04/28/16 - 05/05/16 | 8 ± 4 | 7 ± 4 | 8 ± 3 | 6 ± 3 | |
| 05/03/16 - 05/09/16 | | | | | < 7 |
| 05/05/16 - 05/13/16 | < 5 | 10 ± 4 | 8 ± 3 | 9 ± 3 | |
| 05/09/16 - 05/16/16 | | | | | 10 ± 5 |
| 05/13/16 - 05/19/16 | 14 ± 5 | 10 ± 5 | 8 ± 3 | 10 ± 3 | |
| 05/16/16 - 05/23/16 | | | | | 13 ± 5 |
| 05/19/16 - 05/26/16 | 16 ± 5 | 17 ± 5 | 15 ± 4 | 16 ± 3 | |
| 05/23/16 - 05/31/16 | | | | | 20 ± 5 |
| 05/26/16 - 06/02/16 | 18 ± 5 | 23 ± 5 | 17 ± 3 | 19 ± 3 | |
| 05/31/16 - 06/06/16 | | | | | 13 ± 6 |
| 06/02/16 - 06/09/16 | 8 ± 4 | 10 ± 5 | 10 ± 3 | 10 ± 3 | |
| 06/06/16 - 06/13/16 | | | | | 10 ± 5 |
| 06/09/16 - 06/16/16 | 13 ± 5 | 12 ± 5 | 13 ± 3 | 14 ± 3 | |
| 06/13/16 - 06/20/16 | | | | | 18 ± 5 |
| 06/16/16 - 06/23/16 | 15 ± 5 | 17 ± 5 | 17 ± 4 | 16 ± 3 | |
| 06/20/16 - 06/28/16 | | | | | 19 ± 5 |
| 06/23/16 - 06/30/16 | 13 ± 5 | 18 ± 5 | 13 ± 3 | 16 ± 3 | |
| 06/28/16 - 07/05/16 | | | | | 7 ± 5 |
| 06/30/16 - 07/07/16 | 15 ± 5 | 17 ± 5 | 15 ± 3 | 15 ± 3 | |

**Table C-V.1** **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF E-3 PCI/CUBIC METER ± 2 SIGMA

| COLLECTION | GROUP I | | | GROUP II | GROUP III |
|---|---|---|---|---|---|
| PERIOD | 1B | 1C | 1Z | 3A | 5H2 |
| 07/05/16 - 07/11/16 | | | | | 14 ± 6 |
| 07/07/16 - 07/14/16 | 15 ± 5 | 19 ± 5 | 11 ± 3 | 15 ± 3 | |
| 07/11/16 - 07/19/16 | | | | | 16 ± 5 |
| 07/14/16 - 07/21/16 | 17 ± 5 | 21 ± 5 | 14 ± 3 | 16 ± 3 | |
| 07/19/16 - 07/25/16 | | | | | 18 ± 6 |
| 07/21/16 - 07/28/16 | 22 ± 6 | *(1)* | 18 ± 4 | 18 ± 3 | |
| 07/25/16 - 08/01/16 | | | | | 16 ± 5 |
| 07/28/16 - 08/04/16 | 11 ± 5 | 16 ± 5 | 15 ± 4 | 14 ± 3 | |
| 08/01/16 - 08/08/16 | | | | | 13 ± 5 |
| 08/04/16 - 08/11/16 | 11 ± 5 | 16 ± 5 | 16 ± 4 | 14 ± 3 | |
| 08/08/16 - 08/15/16 | | | | | 17 ± 5 |
| 08/11/16 - 08/18/16 | 8 ± 5 | 8 ± 5 | 9 ± 3 | 8 ± 3 | |
| 08/15/16 - 08/22/16 | | | | | 15 ± 5 |
| 08/18/16 - 08/25/16 | 13 ± 5 | 15 ± 5 | 16 ± 4 | 13 ± 3 | |
| 08/22/16 - 08/29/16 | | | | | 18 ± 5 |
| 08/25/16 - 09/01/16 | 22 ± 5 | 24 ± 5 | 22 ± 4 | 19 ± 3 | |
| 08/29/16 - 09/06/16 | | | | | 13 ± 4 |
| 09/01/16 - 09/08/16 | 21 ± 5 | 23 ± 5 | 20 ± 4 | 23 ± 4 | |
| 09/06/16 - 09/13/16 | | | | | 17 ± 5 |
| 09/08/16 - 09/15/16 | 16 ± 5 | 20 ± 5 | 17 ± 4 | 17 ± 3 | |
| 09/13/16 - 09/19/16 | | | | | 22 ± 6 |
| 09/15/16 - 09/22/16 | 13 ± 5 | 18 ± 5 | 14 ± 3 | 14 ± 3 | |
| 09/19/16 - 09/26/16 | | | | | 27 ± 6 |
| 09/22/16 - 09/29/16 | 18 ± 5 | 17 ± 5 | 21 ± 4 | 16 ± 3 | |
| 09/26/16 - 10/03/16 | | | | | 10 ± 5 |
| 09/29/16 - 10/06/16 | 8 ± 4 | 8 ± 4 | 10 ± 3 | 8 ± 3 | |
| 10/03/16 - 10/11/16 | | | | | 24 ± 5 |
| 10/06/16 - 10/13/16 | 11 ± 5 | 16 ± 5 | 12 ± 3 | 14 ± 3 | |
| 10/11/16 - 10/17/16 | | | | | 12 ± 6 |
| 10/13/16 - 10/20/16 | 19 ± 5 | 15 ± 5 | 20 ± 4 | 16 ± 3 | |
| 10/17/16 - 10/24/16 | | | | | 20 ± 5 |
| 10/20/16 - 10/27/16 | 13 ± 5 | 13 ± 5 | 13 ± 3 | 13 ± 3 | |
| 10/24/16 - 10/31/16 | | | | | 14 ± 5 |
| 10/27/16 - 11/03/16 | 17 ± 6 | 18 ± 5 | 17 ± 4 | 14 ± 3 | |
| 10/31/16 - 11/07/16 | | | | | 15 ± 5 |
| 11/03/16 - 11/10/16 | 13 ± 5 | 20 ± 6 | 13 ± 4 | 18 ± 4 | |
| 11/07/16 - 11/14/16 | | | | | 19 ± 5 |
| 11/10/16 - 11/17/16 | 28 ± 6 | 24 ± 5 | 26 ± 4 | 20 ± 4 | |
| 11/14/16 - 11/21/16 | | | | | 28 ± 6 |
| 11/17/16 - 11/23/16 | 22 ± 6 | 20 ± 6 | 17 ± 4 | 22 ± 4 | |
| 11/21/16 - 11/28/16 | | | | | 19 ± 5 |
| 11/23/16 - 12/01/16 | 16 ± 5 | 18 ± 4 | 16 ± 3 | 18 ± 3 | |
| 11/28/16 - 12/05/16 | | | | | 16 ± 5 |
| 12/01/16 - 12/08/16 | 21 ± 5 | 21 ± 5 | 17 ± 4 | 17 ± 3 | |
| 12/05/16 - 12/12/16 | | | | | 10 ± 5 |
| 12/08/16 - 12/15/16 | 16 ± 5 | 22 ± 5 | 17 ± 4 | 20 ± 4 | |
| 12/12/16 - 12/19/16 | | | | | 21 ± 6 |
| 12/15/16 - 12/22/16 | 19 ± 4 | 24 ± 5 | 21 ± 3 | 16 ± 3 | |
| 12/19/16 - 12/27/16 | | | | | 20 ± 5 |
| 12/22/16 - 12/29/16 | 17 ± 3 | 16 ± 5 | 17 ± 3 | 17 ± 3 | |
| 12/27/16 - 01/03/17 | | | | | 14 ± 5 |
| *MEAN ± 2 STD DEV* | 15 ± 8 | 16 ± 9 | 14 ± 8 | 14 ± 8 | 16 ± 9 |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*
*(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION*

## Table C-V.2 MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF E-3 PCI/CUBIC METER ± 2 SIGMA

| GROUP I - ON-SITE LOCATIONS | | | | GROUP II - INTERMEDIATE DISTANCE LOCATIONS | | | | GROUP III - CONTROL LOCATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COLLECTION PERIOD | MIN | MAX | MEAN ± 2SD | COLLECTION PERIOD | MIN | MAX | MEAN ± 2SD | COLLECTION PERIOD | MIN | MAX | MEAN ± 2SD |
| 12/30/15 - 02/04/16 | 11 | 21 | 16 ± 7 | 12/30/15 - 02/04/16 | 11 | 17 | 15 ± 6 | 12/28/15 - 02/01/16 | 9 | 16 | 13 ± 6 |
| 02/04/16 - 03/03/16 | 9 | 16 | 12 ± 4 | 02/04/16 - 03/03/16 | 8 | 13 | 10 ± 5 | 02/01/16 - 02/29/16 | 12 | 17 | 14 ± 4 |
| 03/03/16 - 03/31/16 | 10 | 15 | 12 ± 4 | 03/03/16 - 03/31/16 | 11 | 16 | 12 ± 5 | 02/29/16 - 03/28/16 | 11 | 14 | 13 ± 3 |
| 03/31/16 - 04/28/16 | 10 | 18 | 14 ± 5 | 03/31/16 - 04/28/16 | 7 | 17 | 12 ± 8 | 03/28/16 - 05/03/16 | 14 | 18 | 16 ± 3 |
| 04/28/16 - 06/02/16 | 7 | 23 | 13 ± 10 | 04/28/16 - 06/02/16 | 6 | 19 | 12 ± 11 | 05/03/16 - 05/31/16 | 10 | 20 | 14 ± 10 |
| 06/02/16 - 06/30/16 | 8 | 18 | 13 ± 6 | 06/02/16 - 06/30/16 | 10 | 16 | 14 ± 6 | 05/31/16 - 06/28/16 | 10 | 19 | 15 ± 8 |
| 06/30/16 - 08/04/16 | 11 | 22 | 16 ± 6 | 06/30/16 - 08/04/16 | 14 | 18 | 16 ± 3 | 06/28/16 - 08/01/16 | 7 | 18 | 14 ± 9 |
| 08/04/16 - 09/01/16 | 8 | 24 | 15 ± 11 | 08/04/16 - 09/01/16 | 8 | 19 | 13 ± 10 | 08/01/16 - 08/29/16 | 13 | 18 | 16 ± 5 |
| 09/01/16 - 09/29/16 | 13 | 23 | 18 ± 6 | 09/01/16 - 09/29/16 | 14 | 23 | 18 ± 8 | 08/29/16 - 10/03/16 | 10 | 27 | 18 ± 14 |
| 09/29/16 - 11/03/16 | 8 | 20 | 14 ± 8 | 09/29/16 - 11/03/16 | 8 | 16 | 13 ± 6 | 10/03/16 - 10/31/16 | 12 | 24 | 17 ± 11 |
| 11/03/16 - 12/01/16 | 13 | 28 | 19 ± 10 | 11/03/16 - 12/01/16 | 18 | 22 | 20 ± 4 | 10/31/16 - 12/05/16 | 15 | 28 | 19 ± 11 |
| 12/01/16 - 12/29/16 | 16 | 24 | 19 ± 5 | 12/01/16 - 12/29/16 | 16 | 20 | 17 ± 4 | 12/05/16 - 01/03/17 | 10 | 21 | 16 ± 11 |
| 12/30/15 - 12/29/16 | 7 | 28 | 15 ± 5 | 12/30/15 - 12/29/16 | 6 | 23 | 14 ± 5 | 12/28/15 - 01/03/17 | 7 | 28 | 15 ± 4 |

**Table C-V.3** **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF E-3 PCI/CUBIC METER ± 2 SIGMA

| SITE | COLLECTION PERIOD | Be-7 | Mn-54 | Co-58 | Co-60 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| 1B | 12/30/15 - 03/31/16 | 74 ± 29 | < 2 | < 3 | < 3 | < 2 | < 2 |
| | 03/31/16 - 06/30/16 | 99 ± 25 | < 3 | < 4 | < 3 | < 2 | < 2 |
| | 06/30/16 - 09/29/16 | 100 ± 28 | < 4 | < 3 | < 4 | < 4 | < 4 |
| | 09/29/16 - 12/29/16 | 58 ± 18 | < 2 | < 3 | < 3 | < 3 | < 2 |
| | *MEAN ± 2 STD DEV* | 83 ± 41 | - | - | - | - | - |
| 1C | 12/30/15 - 03/31/16 | 66 ± 44 | < 4 | < 7 | < 2 | < 4 | < 3 |
| | 03/31/16 - 06/30/16 | 90 ± 24 | < 3 | < 4 | < 3 | < 3 | < 3 |
| | 06/30/16 - 09/29/16 | 67 ± 18 | < 3 | < 3 | < 3 | < 2 | < 2 |
| | 09/29/16 - 12/29/16 | 75 ± 26 | < 4 | < 3 | < 3 | < 4 | < 3 |
| | *MEAN ± 2 STD DEV* | 74 ± 23 | - | - | - | - | - |
| 1Z | 12/30/15 - 03/31/16 | 54 ± 21 | < 2 | < 2 | < 1 | < 2 | < 2 |
| | 03/31/16 - 06/30/16 | 78 ± 18 | < 2 | < 2 | < 2 | < 2 | < 1 |
| | 06/30/16 - 09/29/16 | 66 ± 16 | < 1 | < 2 | < 2 | < 2 | < 2 |
| | 09/29/16 - 12/29/16 | 71 ± 15 | < 2 | < 1 | < 2 | < 2 | < 1 |
| | *MEAN ± 2 STD DEV* | 67 ± 20 | - | - | - | - | - |
| 3A | 12/30/15 - 03/31/16 | 42 ± 25 | < 3 | < 4 | < 2 | < 3 | < 3 |
| | 03/31/16 - 06/30/16 | 77 ± 25 | < 2 | < 3 | < 2 | < 2 | < 2 |
| | 06/30/16 - 09/29/16 | 76 ± 14 | < 2 | < 2 | < 2 | < 2 | < 2 |
| | 09/29/16 - 12/29/16 | 46 ± 10 | < 1 | < 1 | < 1 | < 2 | < 1 |
| | *MEAN ± 2 STD DEV* | 60 ± 38 | - | - | - | - | - |
| 5H2 | 12/28/15 - 03/28/16 | 58 ± 41 | < 3 | < 5 | < 4 | < 4 | < 4 |
| | 03/28/16 - 06/28/16 | 82 ± 27 | < 2 | < 3 | < 2 | < 3 | < 2 |
| | 06/28/16 - 10/03/16 | 66 ± 20 | < 2 | < 2 | < 2 | < 3 | < 3 |
| | 10/03/16 - 01/03/17 | 69 ± 16 | < 2 | < 2 | < 3 | < 2 | < 3 |
| | *MEAN ± 2 STD DEV* | 69 ± 20 | - | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

## Table C-VI.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF E-3 PCI/CUBIC METER ± 2 SIGMA

| COLLECTION | GROUP I | | | GROUP II | GROUP III |
|---|---|---|---|---|---|
| PERIOD | 1B | 1C | 1Z | 3A | 5H2 |
| 12/28/15 - 01/04/16 | | | | | < 17 |
| 12/30/15 - 01/07/16 | < 52 | < 64 | < 20 | < 39 | |
| 01/04/16 - 01/11/16 | | | | | < 27 |
| 01/07/16 - 01/14/16 | < 16 | < 19 | < 12 | < 12 | |
| 01/11/16 - 01/19/16 | | | | | < 7 |
| 01/14/16 - 01/21/16 | < 48 | < 56 | < 36 | < 35 | |
| 01/19/16 - 01/26/16 | | | | | < 28 |
| 01/21/16 - 01/28/16 | < 43 | < 52 | < 33 | < 13 | |
| 01/26/16 - 02/01/16 | | | | | < 25 |
| 01/28/16 - 02/04/16 | < 40 | < 48 | < 30 | < 30 | |
| 02/01/16 - 02/08/16 | | | | | < 17 |
| 02/04/16 - 02/11/16 | < 44 | < 52 | < 32 | < 32 | |
| 02/08/16 - 02/14/16 | | | | | < 18 |
| 02/11/16 - 02/18/16 | < 32 | < 37 | < 23 | < 23 | |
| 02/14/16 - 02/22/16 | | | | | < 27 |
| 02/18/16 - 02/25/16 | < 29 | < 34 | < 9 | < 21 | |
| 02/22/16 - 02/29/16 | | | | | < 33 |
| 02/25/16 - 03/03/16 | < 46 | < 51 | < 32 | < 32 | |
| 02/29/16 - 03/07/16 | | | | | < 16 |
| 03/03/16 - 03/10/16 | < 32 | < 37 | < 22 | < 22 | |
| 03/07/16 - 03/14/16 | | | | | < 21 |
| 03/10/16 - 03/17/16 | < 36 | < 34 | < 9 | < 9 | |
| 03/14/16 - 03/21/16 | | | | | < 22 |
| 03/17/16 - 03/24/16 | < 53 | < 61 | < 16 | < 37 | |
| 03/21/16 - 03/28/16 | | | | | < 13 |
| 03/24/16 - 03/31/16 | < 40 | < 46 | < 28 | < 28 | |
| 03/28/16 - 04/04/16 | | | | | < 30 |
| 03/31/16 - 04/07/16 | < 36 | < 39 | < 25 | < 24 | |
| 04/04/16 - 04/11/16 | | | | | < 24 |
| 04/07/16 - 04/14/16 | < 60 | < 67 | < 41 | < 41 | |
| 04/11/16 - 04/18/16 | | | | | < 39 |
| 04/14/16 - 04/21/16 | < 58 | < 66 | < 41 | < 39 | |
| 04/18/16 - 04/25/16 | | | | | < 16 |
| 04/21/16 - 04/28/16 | < 49 | < 54 | < 33 | < 32 | |
| 04/25/16 - 05/03/16 | | | | | < 14 |
| 04/28/16 - 05/05/16 | < 25 | < 28 | < 17 | < 17 | |
| 05/03/16 - 05/09/16 | | | | | < 21 |
| 05/05/16 - 05/13/16 | < 34 | < 36 | < 23 | < 21 | |
| 05/09/16 - 05/16/16 | | | | | < 18 |
| 05/13/16 - 05/19/16 | < 62 | < 65 | < 40 | < 39 | |
| 05/16/16 - 05/23/16 | | | | | < 21 |
| 05/19/16 - 05/26/16 | < 66 | < 70 | < 43 | < 40 | |
| 05/23/16 - 05/31/16 | | | | | < 22 |
| 05/26/16 - 06/02/16 | < 40 | < 42 | < 27 | < 24 | |
| 05/31/16 - 06/06/16 | | | | | < 15 |
| 06/02/16 - 06/09/16 | < 30 | < 32 | < 20 | < 18 | |
| 06/06/16 - 06/13/16 | | | | | < 60 |
| 06/09/16 - 06/16/16 | < 58 | < 57 | < 37 | < 13 | |
| 06/13/16 - 06/20/16 | | | | | < 17 |
| 06/16/16 - 06/23/16 | < 65 | < 68 | < 43 | < 38 | |
| 06/20/16 - 06/28/16 | | | | | < 19 |
| 06/23/16 - 06/30/16 | < 64 | < 67 | < 43 | < 38 | |
| 06/28/16 - 07/05/16 | | | | | < 38 |
| 06/30/16 - 07/07/16 | < 61 | < 63 | < 40 | < 35 | |

**Table C-VI.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF E-3 PCI/CUBIC METER ± 2 SIGMA

| COLLECTION | GROUP I | | | GROUP II | GROUP III |
|---|---|---|---|---|---|
| PERIOD | 1B | 1C | 1Z | 3A | 5H2 |
| 07/05/16 - 07/11/16 | | | | | < 35 |
| 07/07/16 - 07/14/16 | < 65 | < 67 | < 44 | < 16 | |
| 07/11/16 - 07/19/16 | | | | | < 27 |
| 07/14/16 - 07/21/16 | < 60 | < 61 | < 40 | < 34 | |
| 07/19/16 - 07/25/16 | | | | | < 25 |
| 07/21/16 - 07/28/16 | < 68 | *(1)* | < 46 | < 18 | |
| 07/25/16 - 08/01/16 | | | | | < 25 |
| 07/28/16 - 08/04/16 | < 50 | < 52 | < 33 | < 29 | |
| 08/01/16 - 08/08/16 | | | | | < 31 |
| 08/04/16 - 08/11/16 | < 45 | < 45 | < 30 | < 26 | |
| 08/08/16 - 08/15/16 | | | | | < 41 |
| 08/11/16 - 08/18/16 | < 41 | < 40 | < 27 | < 30 | |
| 08/15/16 - 08/22/16 | | | | | < 54 |
| 08/18/16 - 08/25/16 | < 40 | < 41 | < 27 | < 25 | |
| 08/22/16 - 08/29/16 | | | | | < 49 |
| 08/25/16 - 09/01/16 | < 48 | < 49 | < 31 | < 29 | |
| 08/29/16 - 09/06/16 | | | | | < 13 |
| 09/01/16 - 09/08/16 | < 51 | < 51 | < 34 | < 30 | |
| 09/06/16 - 09/13/16 | | | | | < 35 |
| 09/08/16 - 09/15/16 | < 36 | < 37 | < 24 | < 8 | |
| 09/13/16 - 09/19/16 | | | | | < 15 |
| 09/15/16 - 09/22/16 | < 47 | < 48 | < 32 | < 28 | |
| 09/19/16 - 09/26/16 | | | | | < 11 |
| 09/22/16 - 09/29/16 | < 48 | < 50 | < 32 | < 12 | |
| 09/26/16 - 10/03/16 | | | | | < 14 |
| 09/29/16 - 10/06/16 | < 36 | < 38 | < 25 | < 22 | |
| 10/03/16 - 10/11/16 | | | | | < 25 |
| 10/06/16 - 10/13/16 | < 42 | < 43 | < 29 | < 10 | |
| 10/11/16 - 10/17/16 | | | | | < 21 |
| 10/13/16 - 10/20/16 | < 36 | < 36 | < 24 | < 21 | |
| 10/17/16 - 10/24/16 | | | | | < 10 |
| 10/20/16 - 10/27/16 | < 67 | < 67 | < 23 | < 21 | |
| 10/24/16 - 10/31/16 | | | | | < 24 |
| 10/27/16 - 11/03/16 | < 52 | < 50 | < 34 | < 12 | |
| 10/31/16 - 11/07/16 | | | | | < 32 |
| 11/03/16 - 11/10/16 | < 55 | < 55 | < 37 | < 32 | |
| 11/07/16 - 11/14/16 | | | | | < 22 |
| 11/10/16 - 11/17/16 | < 41 | < 40 | < 28 | < 9 | |
| 11/14/16 - 11/21/16 | | | | | < 18 |
| 11/17/16 - 11/23/16 | < 66 | < 63 | < 44 | < 38 | |
| 11/21/16 - 11/28/16 | | | | | < 40 |
| 11/23/16 - 12/01/16 | < 57 | < 53 | < 36 | < 31 | |
| 11/28/16 - 12/05/16 | | | | | < 15 |
| 12/01/16 - 12/08/16 | < 47 | < 48 | < 15 | < 15 | |
| 12/05/16 - 12/12/16 | | | | | < 18 |
| 12/08/16 - 12/15/16 | < 55 | < 50 | < 35 | < 16 | |
| 12/12/16 - 12/19/16 | | | | | < 32 |
| 12/15/16 - 12/22/16 | < 27 | < 45 | < 25 | < 26 | |
| 12/19/16 - 12/27/16 | | | | | < 12 |
| 12/22/16 - 12/29/16 | < 22 | < 40 | < 21 | < 8 | |
| 12/27/16 - 01/03/17 | | | | | < 10 |
| *MEAN* | - | - | - | - | - |

*(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION*

**Table C-VII.1**

## CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION | CONTROL FARMS | | | INDICATOR FARMS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERIOD | C | E | V | D | J | L | P | R | S | U | W | X |
| 01/04/16 | | | | | < 0.5 | | | < 0.6 | < 0.6 | < 0.5 | | < 0.4 |
| 02/01/16 | < 0.8 | < 0.9 | < 1.0 | < 0.9 | < 1.0 | < 1.0 | < 0.8 | < 0.9 | < 0.9 | < 0.9 | < 0.9 | < 0.8 |
| 03/03/16 | | | < 0.6 | | < 0.6 | | | < 0.6 | < 0.5 | < 0.5 | | < 0.5 |
| 04/01/16 | | | < 0.7 | | < 0.4 | | | < 0.5 | < 0.4 | < 0.4 | | < 0.4 |
| 04/15/16 | | | < 0.8 | | < 0.5 | | | < 0.4 | < 0.5 | < 0.6 | | < 0.3 |
| 05/02/16 | < 0.6 | < 0.5 | < 0.6 | < 0.4 | < 0.5 | < 0.5 | < 0.6 | < 0.7 | < 0.5 | < 0.8 | < 0.5 | < 0.7 |
| 05/16/16 | | | < 0.9 | | < 0.6 | | | < 0.4 | < 0.6 | < 0.5 | | < 0.6 |
| 05/30/16 | | | < 0.8 | | < 0.8 | | | < 0.8 | < 0.8 | < 0.8 | | < 0.8 |
| 06/13/16 | | | < 0.7 | | < 0.6 | | | < 0.7 | < 0.9 | < 0.8 | | < 0.9 |
| 06/27/16 | | | < 0.8 | | < 0.6 | | | < 0.6 | < 0.8 | < 0.5 | | < 0.7 |
| 07/11/16 | | | < 0.4 | | < 0.3 | | | < 0.3 | < 0.3 | < 0.3 | | < 0.3 |
| 07/26/16 | | | < 0.7 | | < 0.6 | | | < 0.6 | < 0.4 | < 0.5 | | < 0.5 |
| 08/08/16 | < 0.6 | < 0.8 | < 0.7 | < 0.9 | < 0.6 | < 0.7 | < 0.7 | < 0.8 | < 0.7 | < 0.7 | < 0.8 | < 0.7 |
| 08/22/16 | | | < 0.8 | | < 0.9 | | | < 0.8 | < 0.7 | < 0.7 | | < 0.7 |
| 09/05/16 | | | < 0.6 | | < 0.7 | | | < 0.6 | < 0.7 | < 0.7 | | < 0.5 |
| 09/19/16 | | | < 0.8 | | < 0.7 | | | < 0.8 | < 0.6 | < 0.6 | | < 0.6 |
| 10/03/16 | | | < 0.5 | | < 0.7 | | | < 0.8 | < 0.8 | < 1.0 | | < 0.7 |
| 10/17/16 | | | < 0.7 | | < 0.6 | | | < 0.6 | < 0.6 | < 0.8 | | < 0.6 |
| 10/31/16 | | | < 0.7 | | < 0.8 | | | < 0.5 | < 0.5 | < 0.9 | | < 0.6 |
| 11/14/16 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.7 | < 0.7 | < 0.8 | < 0.7 | < 0.6 | < 0.9 | < 0.7 | < 0.8 |
| 11/28/16 | | | < 0.5 | | < 0.4 | | | < 0.4 | < 0.3 | < 0.4 | | < 0.3 |
| 12/08/16 | | | < 0.9 | | < 0.9 | | | < 0.8 | < 0.8 | < 0.8 | | < 0.6 |
| *MEAN* | - | - | - | - | - | - | - | - | - | - | - | - |

## Table C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | K-40 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|
| C | 02/01/16 | 1257 ± 131 | < 6 | < 7 | < 25 | < 6 |
| | 05/02/16 | 1330 ± 144 | < 5 | < 6 | < 31 | < 9 |
| | 08/08/16 | 1301 ± 186 | < 6 | < 9 | < 28 | < 8 |
| | 11/14/16 | 1278 ± 171 | < 8 | < 9 | < 30 | < 8 |
| *MEAN ± 2 STD DEV* | | 1292 ± 63 | - | - | - | - |
| E | 02/01/16 | 1209 ± 236 | < 10 | < 10 | < 32 | < 14 |
| | 05/02/16 | 1411 ± 199 | < 7 | < 11 | < 47 | < 10 |
| | 08/08/16 | 1210 ± 169 | < 6 | < 7 | < 25 | < 8 |
| | 11/14/16 | 1287 ± 209 | < 6 | < 7 | < 28 | < 6 |
| *MEAN ± 2 STD DEV* | | 1279 ± 190 | - | - | - | - |
| V | 01/30/16 | 1416 ± 195 | < 9 | < 10 | < 47 | < 12 |
| | 03/03/16 | 1270 ± 185 | < 7 | < 8 | < 48 | < 12 |
| | 04/01/16 | 1401 ± 140 | < 5 | < 6 | < 23 | < 5 |
| | 04/15/16 | 1276 ± 254 | < 10 | < 13 | < 46 | < 11 |
| | 04/30/16 | 1312 ± 204 | < 8 | < 9 | < 35 | < 12 |
| | 05/14/16 | 1422 ± 197 | < 7 | < 9 | < 37 | < 9 |
| | 05/28/16 | 1392 ± 99 | < 4 | < 5 | < 25 | < 6 |
| | 06/11/16 | 1474 ± 209 | < 8 | < 10 | < 41 | < 8 |
| | 06/25/16 | 1200 ± 151 | < 5 | < 7 | < 32 | < 10 |
| | 07/09/16 | 1438 ± 152 | < 6 | < 7 | < 28 | < 9 |
| | 07/23/16 | 1278 ± 210 | < 8 | < 10 | < 33 | < 14 |
| | 08/06/16 | 1328 ± 194 | < 8 | < 9 | < 36 | < 5 |
| | 08/20/16 | 1069 ± 187 | < 7 | < 9 | < 38 | < 9 |
| | 09/03/16 | 1307 ± 172 | < 7 | < 8 | < 36 | < 13 |
| | 09/16/16 | 1444 ± 196 | < 8 | < 9 | < 41 | < 15 |
| | 10/01/16 | 1085 ± 183 | < 6 | < 8 | < 35 | < 8 |
| | 10/17/16 | 1397 ± 200 | < 9 | < 10 | < 37 | < 11 |
| | 10/31/16 | 1145 ± 165 | < 10 | < 10 | < 51 | < 14 |
| | 11/12/16 | 1185 ± 195 | < 8 | < 9 | < 35 | < 10 |
| | 11/26/16 | 1142 ± 169 | < 8 | < 9 | < 35 | < 13 |
| | 12/08/16 | 1074 ± 174 | < 8 | < 8 | < 35 | < 14 |
| *MEAN ± 2 STD DEV* | | 1288 ± 264 | - | - | - | - |
| D | 02/01/16 | 1397 ± 232 | < 8 | < 8 | < 33 | < 8 |
| | 05/03/16 | 1379 ± 231 | < 9 | < 6 | < 19 | < 13 |
| | 08/09/16 | 1502 ± 178 | < 8 | < 8 | < 32 | < 9 |
| | 11/15/16 | 1349 ± 223 | < 7 | < 9 | < 30 | < 9 |
| *MEAN ± 2 STD DEV* | | 1407 ± 133 | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**Table C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | | K-40 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|
| J | 01/04/16 | | 1036 ± 167 | < 9 | < 10 | < 33 | < 12 |
| | 02/01/16 | | 1365 ± 191 | < 7 | < 7 | < 31 | < 14 |
| | 03/07/16 | | 1704 ± 271 | < 8 | < 9 | < 34 | < 10 |
| | 04/04/16 | | 1461 ± 182 | < 8 | < 8 | < 37 | < 10 |
| | 04/18/16 | | 1278 ± 307 | < 8 | < 13 | < 52 | < 15 |
| | 05/02/16 | | 1171 ± 165 | < 7 | < 9 | < 30 | < 12 |
| | 05/16/16 | | 1301 ± 191 | < 7 | < 7 | < 27 | < 9 |
| | 05/30/16 | | 1323 ± 100 | < 4 | < 4 | < 25 | < 8 |
| | 06/13/16 | | 1277 ± 184 | < 5 | < 8 | < 39 | < 9 |
| | 06/27/16 | | 1206 ± 145 | < 7 | < 7 | < 38 | < 13 |
| | 07/11/16 | | 1161 ± 252 | < 11 | < 14 | < 45 | < 10 |
| | 07/25/16 | | 1204 ± 220 | < 9 | < 11 | < 36 | < 5 |
| | 08/08/16 | | 1252 ± 254 | < 6 | < 13 | < 35 | < 14 |
| | 08/22/16 | | 1466 ± 166 | < 6 | < 9 | < 27 | < 5 |
| | 09/05/16 | | 1489 ± 190 | < 7 | < 8 | < 30 | < 11 |
| | 09/19/16 | | 2782 ± 247 | < 8 | < 9 | < 31 | < 10 |
| | 09/19/16 | *Reanalysis** | 3040 ± 239 | | | | |
| | 10/03/16 | | 1261 ± 149 | < 8 | < 7 | < 30 | < 9 |
| | 10/17/16 | | 1239 ± 202 | < 8 | < 8 | < 41 | < 9 |
| | 10/31/16 | | 1261 ± 175 | < 7 | < 8 | < 40 | < 15 |
| | 11/14/16 | | 1458 ± 180 | < 6 | < 8 | < 25 | < 6 |
| | 11/28/16 | | 1199 ± 147 | < 8 | < 7 | < 27 | < 9 |
| | 12/12/16 | | 1292 ± 140 | < 7 | < 7 | < 24 | < 7 |
| *MEAN ± 2 STD DEV* | | | 1445 ± 969 | - | - | - | - |
| L | 02/01/16 | | 1219 ± 238 | < 10 | < 14 | < 43 | < 11 |
| | 05/02/16 | | 1387 ± 229 | < 9 | < 11 | < 48 | < 11 |
| | 08/08/16 | | 1329 ± 167 | < 7 | < 8 | < 31 | < 7 |
| | 11/14/16 | | 1421 ± 190 | < 8 | < 7 | < 26 | < 10 |
| *MEAN ± 2 STD DEV* | | | 1339 ± 177 | - | - | - | - |
| P | 02/01/16 | | 1217 ± 212 | < 10 | < 8 | < 33 | < 7 |
| | 05/02/16 | | 1265 ± 221 | < 8 | < 11 | < 37 | < 7 |
| | 08/08/16 | | 1068 ± 175 | < 8 | < 9 | < 31 | < 9 |
| | 11/14/16 | | 1192 ± 202 | < 9 | < 9 | < 30 | < 9 |
| *MEAN ± 2 STD DEV* | | | 1186 ± 168 | - | - | - | - |

**Sample reanalyzed by lab to confirm orignal result which was higher than historical values*

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

## Table C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | K-40 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|
| R | 01/04/16 | 1397 ± 198 | < 8 | < 9 | < 32 | < 9 |
| | 02/01/16 | 1186 ± 213 | < 13 | < 11 | < 48 | < 12 |
| | 03/07/16 | 1086 ± 206 | < 6 | < 10 | < 27 | < 14 |
| | 04/04/16 | 1191 ± 197 | < 10 | < 8 | < 31 | < 13 |
| | 04/18/16 | 1293 ± 276 | < 11 | < 14 | < 45 | < 10 |
| | 05/02/16 | 1489 ± 241 | < 10 | < 10 | < 45 | < 11 |
| | 05/16/16 | 1288 ± 194 | < 8 | < 11 | < 31 | < 13 |
| | 05/30/16 | 1270 ± 132 | < 4 | < 6 | < 36 | < 10 |
| | 06/13/16 | 1390 ± 192 | < 8 | < 9 | < 42 | < 14 |
| | 06/27/16 | 1313 ± 208 | < 8 | < 8 | < 40 | < 14 |
| | 07/11/16 | 1375 ± 241 | < 11 | < 9 | < 36 | < 8 |
| | 07/25/16 | 1389 ± 190 | < 8 | < 8 | < 30 | < 6 |
| | 08/08/16 | 1332 ± 187 | < 8 | < 8 | < 30 | < 11 |
| | 08/22/16 | 1310 ± 146 | < 5 | < 6 | < 22 | < 7 |
| | 09/05/16 | 1680 ± 210 | < 7 | < 8 | < 32 | < 11 |
| | 09/19/16 | 1171 ± 171 | < 5 | < 6 | < 22 | < 8 |
| | 10/03/16 | 1303 ± 196 | < 6 | < 8 | < 34 | < 9 |
| | 10/17/16 | 1003 ± 214 | < 10 | < 11 | < 38 | < 8 |
| | 10/31/16 | 1348 ± 196 | < 8 | < 8 | < 47 | < 9 |
| | 11/14/16 | 1400 ± 189 | < 8 | < 7 | < 27 | < 9 |
| | 11/28/16 | 1127 ± 155 | < 6 | < 7 | < 28 | < 8 |
| | 12/12/16 | 1333 ± 162 | < 5 | < 7 | < 26 | < 5 |
| *MEAN ± 2 STD DEV* | | 1303 ± 287 | - | - | - | - |
| S | 01/04/16 | 1458 ± 155 | < 6 | < 7 | < 28 | < 8 |
| | 02/01/16 | 1426 ± 227 | < 9 | < 9 | < 35 | < 13 |
| | 03/08/16 | 1301 ± 237 | < 11 | < 13 | < 51 | < 11 |
| | 04/04/16 | 1314 ± 176 | < 6 | < 8 | < 32 | < 12 |
| | 04/18/16 | 1251 ± 236 | < 13 | < 13 | < 45 | < 13 |
| | 05/02/16 | 1255 ± 202 | < 9 | < 11 | < 34 | < 14 |
| | 05/16/16 | 1456 ± 170 | < 8 | < 8 | < 32 | < 7 |
| | 05/30/16 | 1254 ± 115 | < 5 | < 5 | < 32 | < 9 |
| | 06/13/16 | 1323 ± 177 | < 7 | < 7 | < 34 | < 9 |
| | 06/27/16 | 1348 ± 197 | < 7 | < 9 | < 39 | < 13 |
| | 07/11/16 | 1278 ± 200 | < 9 | < 9 | < 32 | < 9 |
| | 07/25/16 | 1337 ± 185 | < 7 | < 9 | < 34 | < 9 |
| | 08/08/16 | 1399 ± 237 | < 9 | < 12 | < 46 | < 8 |
| | 08/22/16 | 1467 ± 200 | < 8 | < 8 | < 34 | < 8 |
| | 09/05/16 | 1376 ± 224 | < 8 | < 10 | < 33 | < 10 |
| | 09/19/16 | 1269 ± 165 | < 6 | < 7 | < 24 | < 7 |
| | 10/03/16 | 1310 ± 213 | < 8 | < 7 | < 28 | < 10 |
| | 10/17/16 | 1433 ± 196 | < 9 | < 9 | < 32 | < 10 |
| | 10/31/16 | 1343 ± 174 | < 7 | < 9 | < 41 | < 15 |
| | 11/14/16 | 1368 ± 220 | < 9 | < 11 | < 41 | < 9 |
| | 11/28/16 | 1252 ± 209 | < 6 | < 9 | < 34 | < 8 |
| | 12/12/16 | 1120 ± 161 | < 7 | < 6 | < 27 | < 8 |
| *MEAN ± 2 STD DEV* | | 1334 ± 172 | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**Table C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | K-40 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|
| U | 01/04/16 | 1077 ± 192 | < 8 | < 8 | < 26 | < 9 |
| | 02/01/16 | 1183 ± 202 | < 7 | < 9 | < 37 | < 10 |
| | 03/07/16 | 1114 ± 165 | < 6 | < 7 | < 28 | < 7 |
| | 04/04/16 | 997 ± 166 | < 7 | < 10 | < 36 | < 13 |
| | 04/18/16 | 941 ± 215 | < 8 | < 8 | < 28 | < 10 |
| | 05/02/16 | 1263 ± 298 | < 10 | < 13 | < 55 | < 13 |
| | 05/16/16 | 1107 ± 191 | < 7 | < 8 | < 37 | < 11 |
| | 05/30/16 | 1304 ± 124 | < 5 | < 5 | < 30 | < 9 |
| | 06/13/16 | 1302 ± 163 | < 7 | < 9 | < 34 | < 12 |
| | 06/27/16 | 1297 ± 215 | < 8 | < 8 | < 46 | < 7 |
| | 07/11/16 | 1328 ± 246 | < 6 | < 11 | < 39 | < 14 |
| | 07/26/16 | 1269 ± 215 | < 9 | < 9 | < 34 | < 8 |
| | 08/08/16 | 1126 ± 235 | < 9 | < 8 | < 43 | < 12 |
| | 08/22/16 | 1237 ± 137 | < 5 | < 7 | < 20 | < 5 |
| | 09/05/16 | 1225 ± 140 | < 6 | < 7 | < 29 | < 8 |
| | 09/19/16 | 1076 ± 184 | < 8 | < 11 | < 37 | < 12 |
| | 10/03/16 | 1110 ± 162 | < 6 | < 7 | < 24 | < 8 |
| | 10/17/16 | 1202 ± 164 | < 7 | < 8 | < 22 | < 6 |
| | 10/31/16 | 1209 ± 147 | < 7 | < 8 | < 43 | < 14 |
| | 11/14/16 | 1546 ± 232 | < 7 | < 8 | < 33 | < 10 |
| | 11/28/16 | 1237 ± 213 | < 8 | < 11 | < 38 | < 14 |
| | 12/12/16 | 1206 ± 147 | < 5 | < 7 | < 18 | < 7 |
| *MEAN ± 2 STD DEV* | | 1198 ± 257 | - | - | - | - |
| W | 02/02/16 | 1193 ± 128 | < 4 | < 5 | < 17 | < 5 |
| | 05/03/16 | 1489 ± 198 | < 7 | < 8 | < 36 | < 9 |
| | 08/09/16 | 1433 ± 214 | < 8 | < 9 | < 25 | < 9 |
| | 11/15/16 | 1468 ± 177 | < 10 | < 11 | < 37 | < 11 |
| *MEAN ± 2 STD DEV* | | 1396 ± 274 | - | - | - | - |
| X | 01/04/16 | 1236 ± 152 | < 8 | < 8 | < 31 | < 8 |
| | 02/01/16 | 1241 ± 222 | < 9 | < 10 | < 45 | < 14 |
| | 03/07/16 | 1466 ± 212 | < 9 | < 9 | < 36 | < 7 |
| | 04/04/16 | 1325 ± 174 | < 8 | < 10 | < 29 | < 9 |
| | 04/18/16 | 1471 ± 275 | < 11 | < 12 | < 44 | < 13 |
| | 05/02/16 | 1438 ± 229 | < 7 | < 8 | < 29 | < 8 |
| | 05/16/16 | 1398 ± 177 | < 8 | < 8 | < 31 | < 6 |
| | 05/30/16 | 1221 ± 105 | < 5 | < 4 | < 28 | < 9 |
| | 06/13/16 | 1197 ± 193 | < 7 | < 9 | < 43 | < 14 |
| | 06/27/16 | 1272 ± 222 | < 10 | < 11 | < 41 | < 14 |
| | 07/11/16 | 1287 ± 197 | < 8 | < 8 | < 23 | < 9 |
| | 07/25/16 | 1131 ± 195 | < 8 | < 9 | < 36 | < 9 |
| | 08/08/16 | 1439 ± 230 | < 8 | < 8 | < 34 | < 10 |
| | 08/22/16 | 1465 ± 203 | < 6 | < 7 | < 39 | < 12 |
| | 09/05/16 | 1312 ± 172 | < 6 | < 7 | < 25 | < 11 |
| | 09/19/16 | 1399 ± 176 | < 5 | < 7 | < 27 | < 8 |
| | 10/03/16 | 1219 ± 188 | < 8 | < 10 | < 34 | < 9 |
| | 10/17/16 | 1330 ± 150 | < 11 | < 9 | < 34 | < 8 |
| | 10/31/16 | 1370 ± 132 | < 7 | < 7 | < 35 | < 10 |
| | 11/14/16 | 1325 ± 188 | < 9 | < 12 | < 32 | < 9 |
| | 11/28/16 | 1300 ± 206 | < 9 | < 9 | < 42 | < 14 |
| | 12/12/16 | 1204 ± 163 | < 6 | < 8 | < 25 | < 9 |
| *MEAN ± 2 STD DEV* | | 1320 ± 200 | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**Table C-VIII.1**

## CONCENTRATIONS OF GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

| SITE | COLLECTION PERIOD | VEGETATION TYPE | Be-7 | K-40 | Mn-54 | Co-58 | Co-60 | I-131 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1B | 06/20/16 | *Beira Kale Leaves* | 401 ± 336 | 3085 ± 484 | < 29 | < 31 | < 28 | < 60 | < 29 | < 32 |
| | 06/20/16 | *Cabbage Leaves* | < 342 | 1093 ± 648 | < 43 | < 45 | < 47 | < 59 | < 40 | < 48 |
| | 06/20/16 | *Collard Leaves* | < 278 | 2632 ± 457 | < 29 | < 29 | < 19 | < 40 | < 22 | < 30 |
| | 07/20/16 | *Beira Kale Leaves* | < 370 | 1545 ± 499 | < 36 | < 33 | < 36 | < 40 | < 34 | < 44 |
| | 07/20/16 | *Cabbage Leaves* | < 324 | 1461 ± 504 | < 30 | < 27 | < 28 | < 46 | < 34 | < 41 |
| | 07/20/16 | *Collard Greens Leaves* | < 408 | 1829 ± 664 | < 34 | < 35 | < 34 | < 45 | < 38 | < 45 |
| | 08/24/16 | *Beira Kale Leaves* | < 303 | 1141 ± 450 | < 37 | < 37 | < 37 | < 59 | < 32 | < 39 |
| | 08/24/16 | *Collard Leaves* | < 358 | 1304 ± 491 | < 36 | < 34 | < 26 | < 56 | < 33 | < 41 |
| | 08/24/16 | *Head Cabbage Leaves* | < 288 | 1470 ± 397 | < 28 | < 25 | < 29 | < 47 | < 26 | < 27 |
| | 09/20/16 | *Cabbage Leaves* | < 372 | 1607 ± 512 | < 34 | < 37 | < 38 | < 48 | < 40 | < 37 |
| | 09/20/16 | *Collard Leaves* | < 338 | 797 ± 523 | < 39 | < 38 | < 43 | < 48 | < 38 | < 50 |
| | 09/20/16 | *Kale Leaves* | < 196 | 940 ± 398 | < 26 | < 24 | < 23 | < 30 | < 27 | < 25 |
| | | *MEAN ± 2 STD DEV* | 401 ± 0 | 1575 ± 1347 | - | - | - | - | - | - |
| 1C | 06/20/16 | *Cabbage Leaves* | 344 ± 278 | 2974 ± 715 | < 24 | < 29 | < 41 | < 59 | < 29 | < 34 |
| | 06/20/16 | *Collard Leaves* | < 322 | 4031 ± 697 | < 34 | < 35 | < 42 | < 59 | < 33 | < 35 |
| | 06/20/16 | *Field Corn Leaves* | 588 ± 240 | 1477 ± 394 | < 20 | < 26 | < 18 | < 47 | < 23 | < 23 |
| | 07/20/16 | *Cabbage Leaves* | < 257 | 1227 ± 428 | < 29 | < 26 | < 26 | < 28 | < 27 | < 32 |
| | 07/20/16 | *Collard Greens Leaves* | < 462 | 709 ± 624 | < 43 | < 51 | < 65 | < 58 | < 51 | < 50 |
| | 07/20/16 | *Field Corn Leaves* | 1278 ± 380 | 1001 ± 478 | < 39 | < 31 | < 48 | < 43 | < 30 | < 36 |
| | 08/24/16 | *Beria Kale Leaves* | < 319 | 2167 ± 499 | < 28 | < 29 | < 27 | < 55 | < 33 | < 30 |
| | 08/24/16 | *Field Corn Leaves* | 2175 ± 406 | 1335 ± 444 | < 31 | < 29 | < 27 | < 51 | < 25 | < 23 |
| | 08/24/16 | *Head Cabbage Leaves* | < 195 | 1319 ± 288 | < 19 | < 17 | < 12 | < 34 | < 16 | < 21 |
| | 09/20/16 | *Cabbage Leaves* | < 254 | 1760 ± 381 | < 21 | < 24 | < 20 | < 33 | < 29 | < 29 |
| | 09/20/16 *(1)* | *Field Corn Leaves* | 2315 ± 508 | 2141 ± 650 | < 40 | < 42 | < 39 | < 54 | < 39 | < 46 |
| | | *MEAN ± 2 STD DEV* | 1340 ± 1791 | 1831 ± 1929 | - | - | - | - | - | - |
| 2Q | 06/20/16 | *Broccoli Leaves* | 414 ± 296 | 3271 ± 608 | < 30 | < 25 | < 31 | < 58 | < 29 | < 33 |
| | 06/20/16 | *Cauliflower Leaves* | 300 ± 197 | 3365 ± 498 | < 23 | < 25 | < 25 | < 44 | < 25 | < 24 |
| | 06/20/16 | *Kale Leaves* | < 245 | 5493 ± 575 | < 24 | < 21 | < 22 | < 42 | < 20 | < 23 |
| | 07/20/16 | *Broccoli Leaves* | < 318 | 2494 ± 522 | < 30 | < 26 | < 29 | < 35 | < 27 | < 35 |
| | 07/20/16 | *Cabbage Leaves* | < 283 | 3651 ± 618 | < 29 | < 24 | < 39 | < 30 | < 21 | < 28 |
| | 07/20/16 | *Cauliflower Leaves* | 412 ± 219 | 4430 ± 684 | < 29 | < 26 | < 25 | < 28 | < 23 | < 32 |
| | 08/24/16 | *Broccoli Leaves* | < 228 | 3077 ± 460 | < 22 | < 22 | < 24 | < 38 | < 18 | < 26 |
| | 08/24/16 | *Cabbage Leaves* | < 197 | 4110 ± 501 | < 22 | < 20 | < 23 | < 40 | < 20 | < 22 |
| | 08/24/16 | *Kale Leaves* | < 270 | 5710 ± 587 | < 25 | < 27 | < 25 | < 53 | < 34 | < 29 |
| | 09/20/16 | *Broccoli Leaves* | < 239 | 1757 ± 429 | < 26 | < 28 | < 26 | < 37 | < 24 | < 32 |
| | 09/20/16 | *Cabbage Leaves* | < 267 | 2083 ± 511 | < 24 | < 20 | < 31 | < 33 | < 25 | < 27 |
| | 09/20/16 | *Kale Leaves* | < 320 | 4351 ± 702 | < 37 | < 42 | < 32 | < 48 | < 37 | < 36 |
| | | *MEAN ± 2 STD DEV* | 375 ± 131 | 3649 ± 2478 | - | - | - | - | - | - |

*(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION*

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**Table C-VIII.1** 

## CONCENTRATIONS OF GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

| SITE | COLLECTION PERIOD | VEGETATION TYPE | Be-7 | K-40 | Mn-54 | Co-58 | Co-60 | I-131 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|---|---|---|
| 3Q | 06/20/16 | *Collard Leaves* | < 231 | 6166 ± 460 | < 21 | < 23 | < 22 | < 45 | < 22 | < 23 |
| | 06/20/16 | *Kale Leaves (2)* | < 278 | 6106 ± 680 | < 28 | < 29 | < 25 | < 52 | < 29 | < 26 |
| | 06/20/16 | *Swiss Chard Leaves* | < 398 | 4149 ± 755 | < 34 | < 28 | < 33 | < 49 | < 31 | < 32 |
| | 07/20/16 | *Collard Greens Leaves (2)* | < 367 | 5648 ± 916 | < 50 | < 39 | < 42 | < 53 | < 40 | < 48 |
| | 07/20/16 | *Kale Leaves* | < 384 | 4625 ± 835 | < 39 | < 47 | < 39 | < 40 | < 36 | < 39 |
| | 07/20/16 | *Swiss Chard Leaves* | 335 ± 281 | 5936 ± 874 | < 34 | < 34 | < 18 | < 32 | < 24 | < 38 |
| | 08/24/16 | *Collard Leaves* | 549 ± 289 | 5099 ± 733 | < 28 | < 29 | < 31 | < 59 | < 32 | < 30 |
| | 08/24/16 | *Kale Leaves* | 445 ± 303 | 6230 ± 849 | < 35 | < 27 | < 38 | < 59 | < 30 | < 35 |
| | 08/24/16 | *Swiss Chard Leaves (2)* | < 319 | 4816 ± 642 | < 29 | < 28 | < 30 | < 58 | < 32 | < 34 |
| | 09/20/16 | *Kale Leaves* | < 239 | 5004 ± 495 | < 25 | < 26 | < 22 | < 34 | < 32 | < 28 |
| | 09/20/16 | *Sweet Corn Leaves* | 1830 ± 498 | 4262 ± 783 | < 45 | < 42 | < 55 | < 57 | < 40 | < 44 |
| | 09/20/16 | *Swiss Chard Leaves (2)* | < 420 | 6278 ± 887 | < 45 | < 39 | < 33 | < 44 | < 39 | < 41 |
| | | *MEAN ± 2 STD DEV* | 790 ± 1398 | 5360 ± 1587 | - | - | - | - | - | - |
| 55 | 06/20/16 | *Broccoli Leaves* | < 304 | 5738 ± 615 | < 31 | < 26 | < 22 | < 50 | < 25 | < 24 |
| | 06/20/16 | *Cabbage Leaves* | < 253 | 5058 ± 659 | < 26 | < 23 | < 27 | < 50 | < 28 | < 27 |
| | 06/20/16 | *Collard Leaves* | < 311 | 5707 ± 721 | < 31 | < 21 | < 30 | < 50 | < 25 | < 28 |
| | 07/20/16 | *Cabbage Leaves* | < 311 | 3843 ± 739 | < 26 | < 25 | < 39 | < 35 | < 29 | < 42 |
| | 07/20/16 | *Head Lettuce Leaves* | < 213 | 1750 ± 473 | < 30 | < 28 | < 32 | < 34 | < 29 | < 34 |
| | 07/20/16 | *Sweet Corn Leaves* | 1358 ± 487 | 5300 ± 1024 | < 44 | < 48 | < 26 | < 46 | < 44 | < 50 |
| | 08/24/16 | *Red Beet Leaves* | < 359 | 10350 ± 883 | < 30 | < 36 | < 29 | < 59 | < 32 | < 33 |
| | 08/24/16 | *Sweet Corn Leaves* | 2043 ± 330 | 5078 ± 620 | < 30 | < 26 | < 27 | < 48 | < 23 | < 26 |
| | 08/24/16 | *Sweet Potato Leaves* | 900 ± 266 | 7951 ± 592 | < 25 | < 26 | < 28 | < 47 | < 28 | < 24 |
| | 09/20/16 | *Cabbage Leaves* | < 265 | 3706 ± 671 | < 32 | < 26 | < 29 | < 41 | < 27 | < 34 |
| | 09/20/16 | *Lettuce Leaves* | < 259 | 4406 ± 730 | < 26 | < 26 | < 31 | < 39 | < 29 | < 35 |
| | 09/20/16 | *Red Beet Leaves* | 417 ± 244 | 6293 ± 852 | < 30 | < 41 | < 32 | < 38 | < 34 | < 35 |
| | | *MEAN ± 2 STD DEV* | 1179 ± 1385 | 5432 ± 4342 | - | - | - | - | - | - |

*(2) Split sample with DEP*

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

## Table C-IX.1 QUARTERLY OSLD RESULTS FOR PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF MILLIREM/STD. MONTH ± STANDARD DEVIATIONS

| STATION CODE | MEAN ± 2 S.D. | JAN - MAR | APR - JUN | JUL - SEP | OCT - DEC |
|---|---|---|---|---|---|
| 2 | 10.1 ± 0.3 | 10.0 | 10.1 | 9.9 | 10.2 |
| 5 | 9.8 ± 0.9 | 9.6 | 10.2 | 9.3 | 10.2 |
| 14 | 10.1 ± 0.5 | 10.4 | 10.2 | 10.1 | 9.8 |
| 15 | 10.0 ± 1.9 | 11.0 | 10.1 | 8.7 | 10.2 |
| 16 | 10.2 ± 0.5 | 9.8 | 10.3 | 10.3 | 10.2 |
| 17 | 11.7 ± 0.6 | 11.4 | 12.1 | 11.6 | 11.6 |
| 18 | 10.5 ± 0.3 | 10.7 | 10.5 | 10.4 | 10.5 |
| 19 | 9.7 ± 0.6 | 9.7 | 10.0 | 9.3 | 9.7 |
| 1A | 10.3 ± 0.4 | 10.6 | 10.4 | 10.1 | 10.2 |
| 1B | 9.3 ± 0.6 | 9.4 | 8.9 | 9.2 | 9.6 |
| 1C | 10.6 ± 0.6 | 10.7 | 10.8 | 10.6 | 10.1 |
| 1D | 10.5 ± 0.3 | 10.3 | 10.4 | 10.4 | 10.7 |
| 1E | 10.0 ± 0.5 | 9.9 | 10.0 | 9.8 | 10.4 |
| 1F | 11.5 ± 0.7 | 11.4 | 11.9 | 11.1 | 11.4 |
| 1G | 7.5 ± 0.9 | 7.5 | 7.7 | 6.8 | 7.8 |
| 1H | 10.5 ± 0.3 | 10.2 | 10.5 | 10.6 | 10.5 |
| 1I | 9.6 ± 0.6 | 9.3 | 9.8 | 9.3 | 9.8 |
| 1J | 11.7 ± 0.4 | 11.5 | 11.6 | 11.6 | 12.0 |
| 1K | 11.5 ± 0.7 | 11.1 | 11.6 | 11.3 | 11.9 |
| 1L | 9.0 ± 1.1 | 9.8 | 8.9 | 8.7 | 8.7 |
| 1M | 7.1 ± 0.9 | 7.7 | 6.9 | 6.6 | 7.1 |
| 1P | 7.7 ± 0.8 | 8.0 | 7.6 | 7.2 | 8.1 |
| 1Q | 8.6 ± 0.5 | 8.8 | 8.6 | 8.3 | 8.8 |
| 1R | 13.4 ± 0.7 | 12.9 | 13.3 | 13.6 | 13.6 |
| 1T | 10.7 ± 0.9 | 10.0 | 11.0 | 10.6 | 11.0 |
| 22 | 10.6 ± 0.8 | 10.4 | 10.9 | 10.1 | 11.0 |
| 23 | 10.7 ± 1.4 | 9.7 | 11.2 | 10.7 | 11.1 |
| 24 | 8.8 ± 0.8 | 9.0 | 8.3 | 8.6 | 9.2 |
| 26 | 11.6 ± 0.3 | 11.6 | 11.8 | 11.4 | 11.7 |
| 27 | 10.5 ± 0.6 | 10.2 | 10.7 | 10.3 | 10.8 |
| 2B | 9.7 ± 0.3 | 9.8 | 9.7 | 9.5 | 9.9 |
| 32 | 10.7 ± 0.8 | 10.4 | 11.2 | 10.4 | 10.7 |
| 3A | 8.1 ± 0.3 | 8.2 | 8.1 | 7.9 | 8.3 |
| 40 | 12.0 ± 0.9 | 11.3 | 12.1 | 12.4 | 12.0 |
| 42 | 9.5 ± 1.3 | 9.7 | 9.4 | 8.6 | 10.2 |
| 43 | 11.3 ± 0.9 | 10.8 | 11.8 | 11.5 | 11.0 |
| 44 | 10.3 ± 0.9 | 9.9 | 10.9 | 10.1 | 10.2 |
| 45 | 10.9 ± 0.5 | 10.9 | 11.0 | 10.5 | 11.1 |
| 46 | 9.7 ± 0.8 | 9.6 | 9.7 | 9.2 | 10.2 |
| 47 | 11.0 ± 0.6 | 10.8 | 10.8 | 11.1 | 11.4 |
| 48 | 10.5 ± 0.3 | 10.5 | 10.7 | 10.3 | 10.6 |
| 49 | 10.5 ± 0.7 | 10.0 | 10.5 | 10.5 | 10.9 |
| 4K | 7.4 ± 1.0 | 7.8 | 7.3 | 6.7 | 7.6 |
| 50 | 11.9 ± 1.5 | 11.5 | 13.0 | 11.3 | 11.9 |
| 51 | 10.3 ± 0.4 | 10.2 | 10.5 | 10.0 | 10.3 |
| 6B | 9.1 ± 1.0 | 9.2 | 9.0 | 8.5 | 9.7 |
| 1NN | 10.8 ± 0.8 | 10.7 | 10.4 | 10.7 | 11.3 |
| 31A | 9.2 ± 0.7 | 8.9 | 9.6 | 8.9 | 9.2 |

**Table C-IX.2 MEAN QUARTERLY OSLD RESULTS FOR THE SITE BOUNDARY, INTERMEDIATE, AND CONTROL LOCATIONS FOR PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF MILLI-ROENTGEN/MONTH STANDARD DEVIATIONS OF THE STATION DATA

| COLLECTION PERIOD | SITE BOUNDARY ± 2 S.D. | INTERMEDIATE ± 2 S.D. | CONTROL ± 2 S.D. |
|---|---|---|---|
| JAN-MAR | 10.0 ± 2.6 | 10.1 ± 1.9 | 9.8 ± 1.4 |
| APR-JUN | 10.1 ± 3.2 | 10.5 ± 2.5 | 9.8 ± 2.0 |
| JUL-SEP | 9.9 ± 3.5 | 9.9 ± 2.5 | 9.7 ± 1.7 |
| OCT-DEC | 10.2 ± 3.1 | 10.4 ± 2.0 | 9.9 ± 1.1 |

**Table C-IX.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF MILLI-ROENTGEN/STD. MONTH

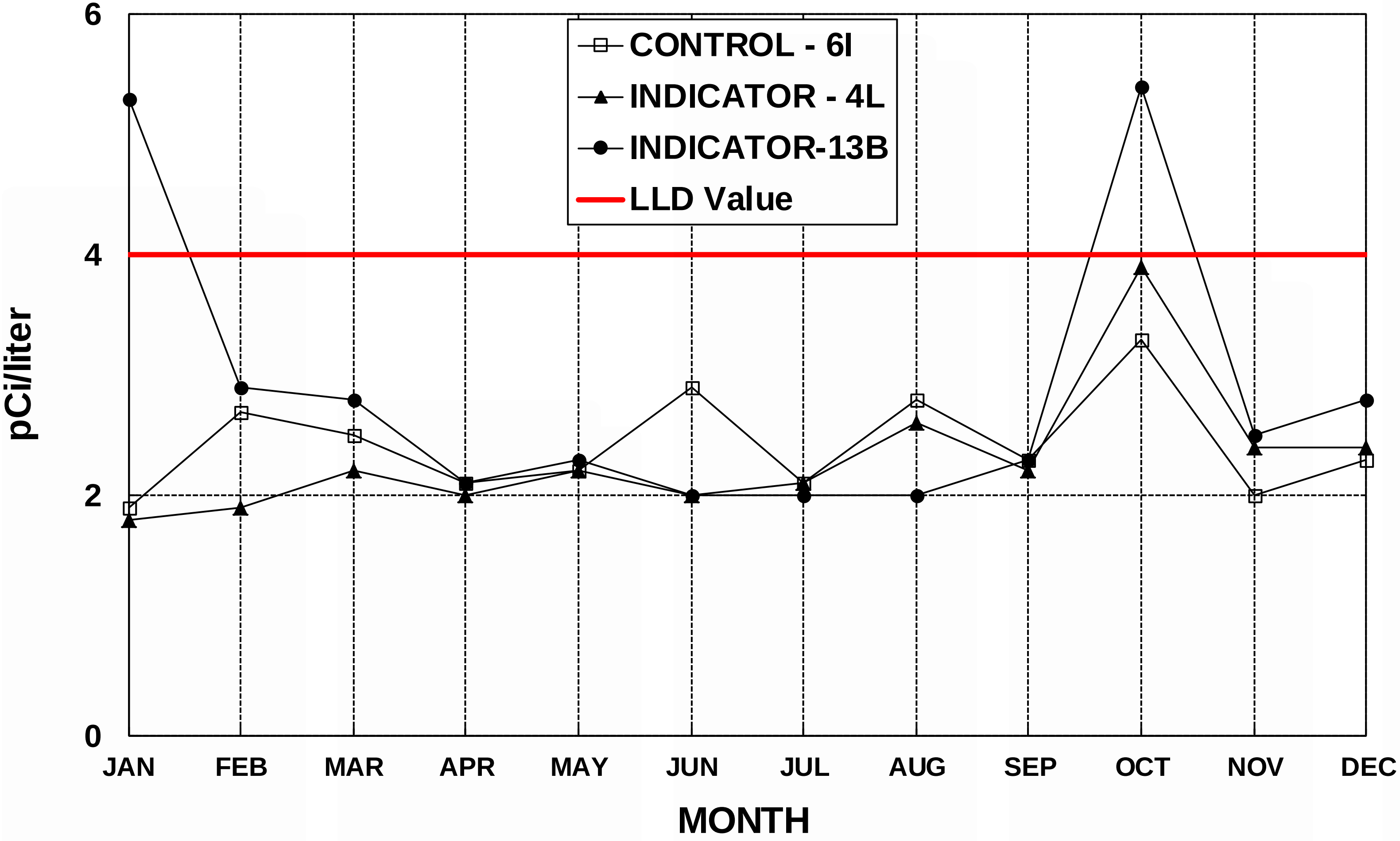
| LOCATION | SAMPLES ANALYZED | PERIOD MINIMUM | PERIOD MAXIMUM | PERIOD MEAN ± 2 S.D. |
|---|---|---|---|---|
| SITE BOUNDARY | 84 | 6.6 | 13.6 | 10.1 ± 3.1 |
| INTERMEDIATE | 92 | 6.7 | 13.0 | 10.2 ± 2.3 |
| CONTROL | 16 | 8.3 | 10.7 | 9.8 ± 1.4 |

SITE BOUNDARY STATIONS - 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H, 1I, 1J, 1K, 1L, 1M, 1NN, 1P, 1Q, 1R, 1T, 2, 2B, 40

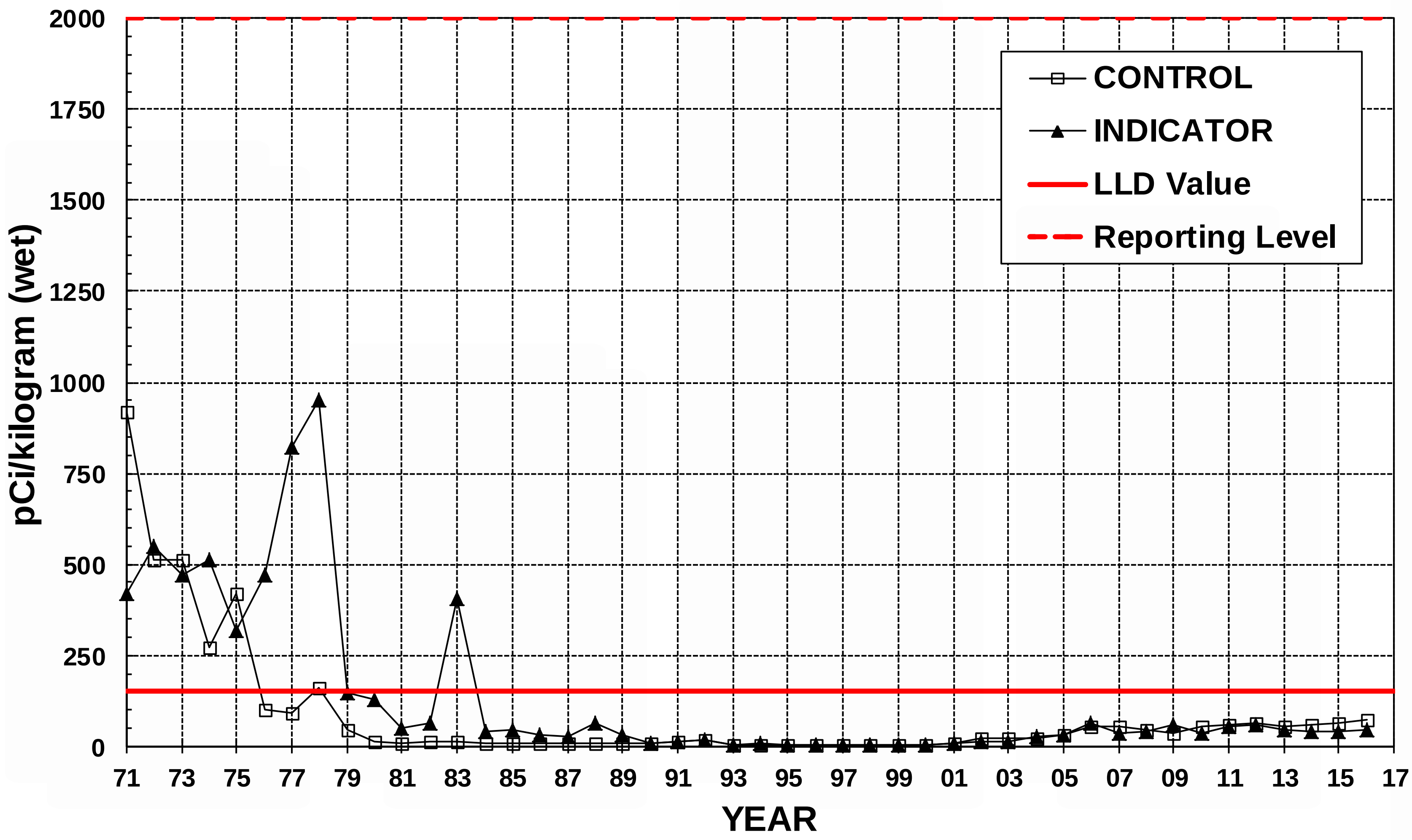
INTERMEDIATE STATIONS - 14, 15, 17, 22, 23, 26, 27, 31A, 32, 3A, 42, 43, 44, 45, 46, 47 48, 49, 4K, 5, 50, 51, 6B

CONTROL STATIONS - 16, 18, 19, 24

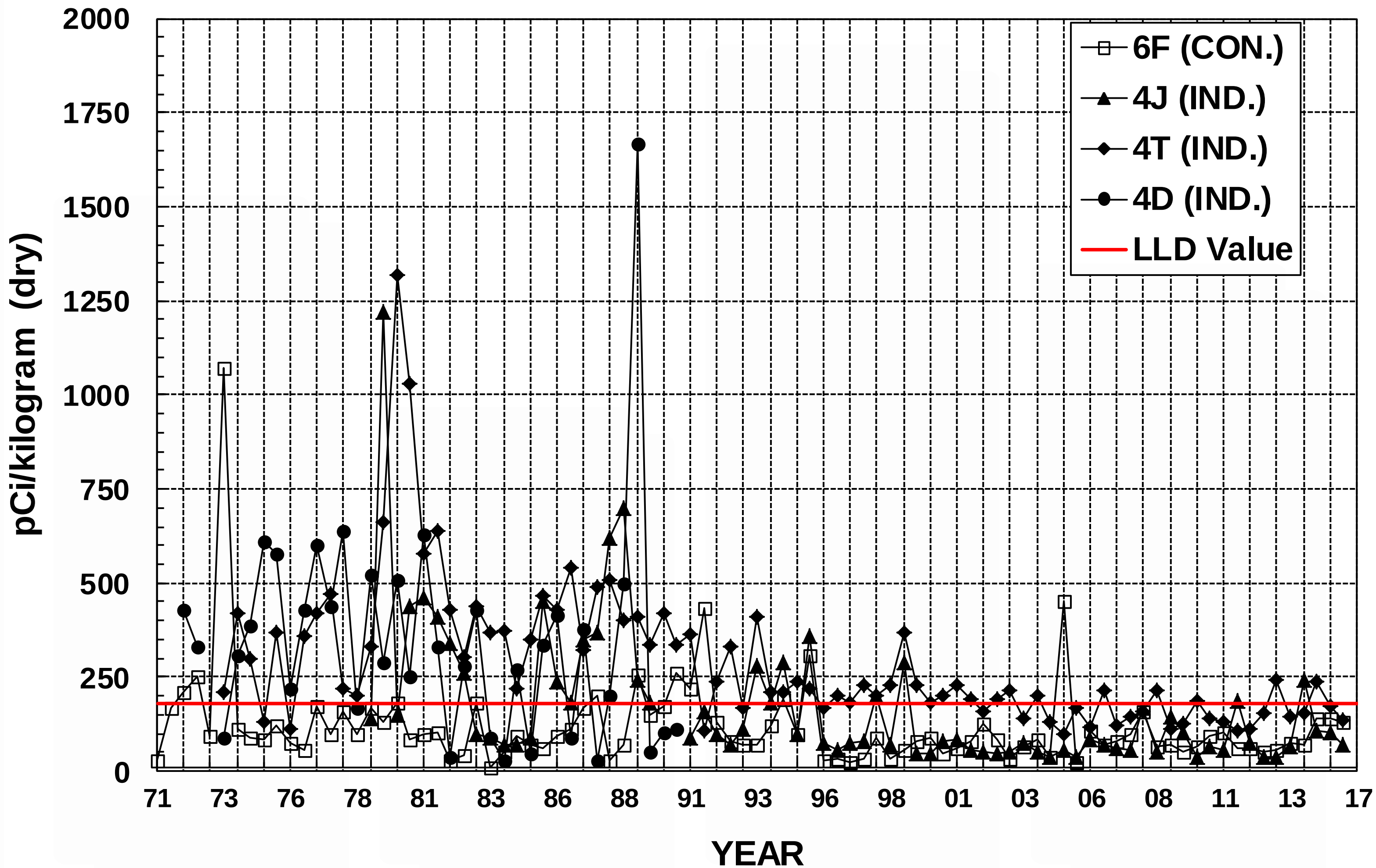
## FIGURE C-1
## MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 2016



## FIGURE C-2
## MEAN ANNUAL CS-137 CONCENTRATIONS IN FISH SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 1971 – 2016

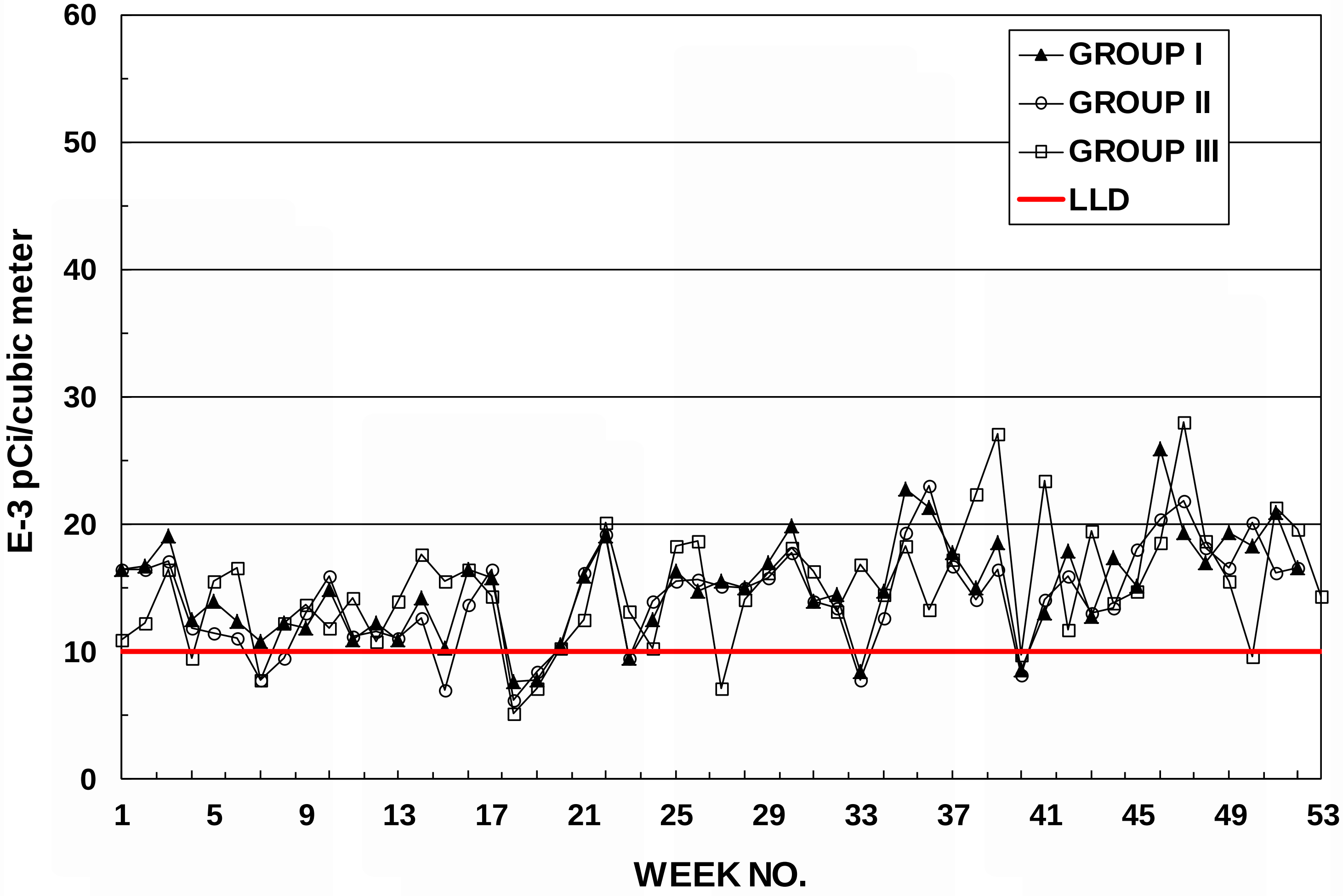


# FIGURE C-3
## MEAN SEMI-ANNUAL CS-137 CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 1971 – 2016



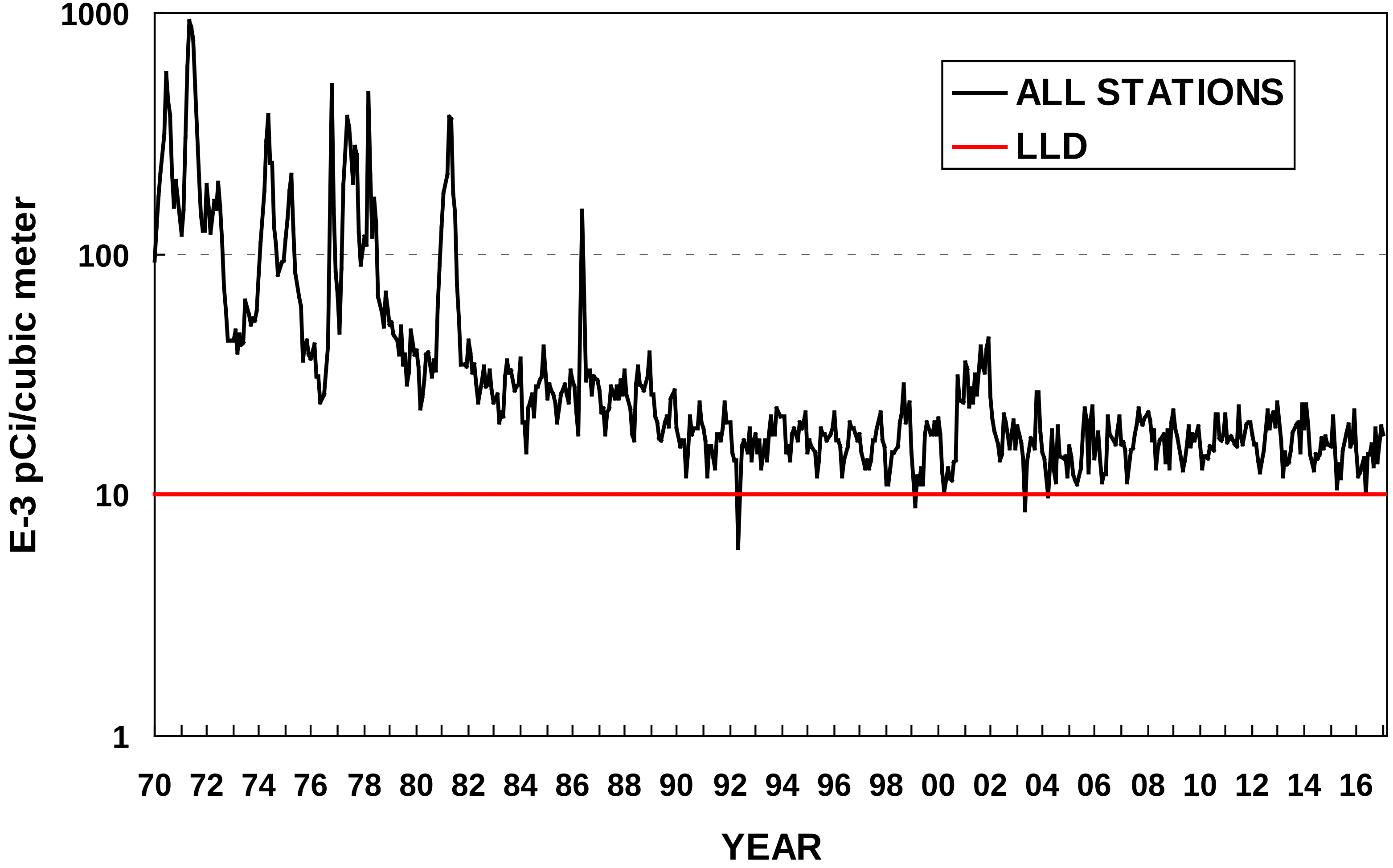

No sample collected from Station 4J in 1990 and
Station 4D discontinued beginning 1991

## FIGURE C-4
## MEAN WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 2016



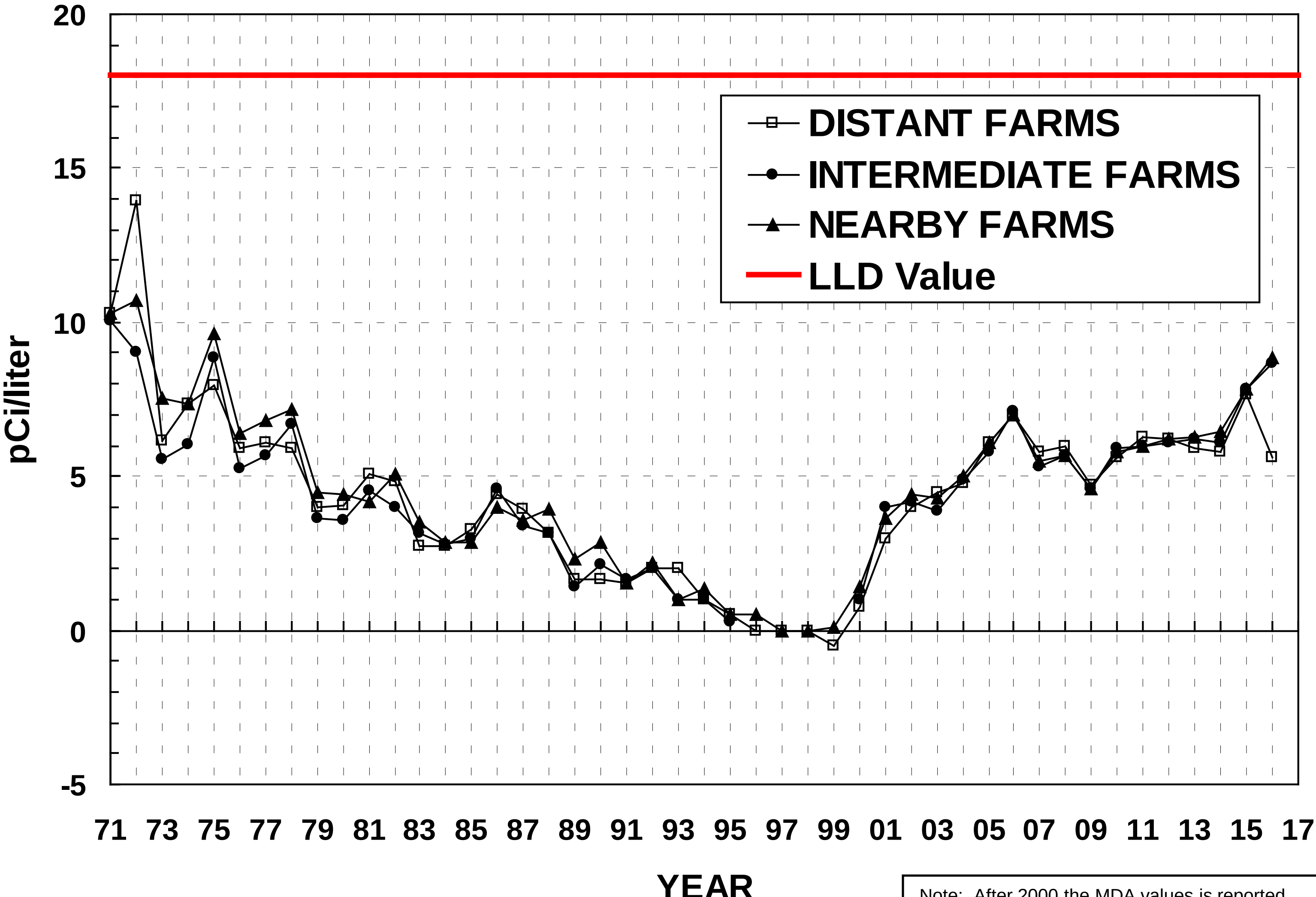

No Required Reporting Level for Gross Beta Activities.

## FIGURE C-5
## MEAN MONTHLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 1970 – 2016




No Required Reporting Level for Gross Beta Activities.

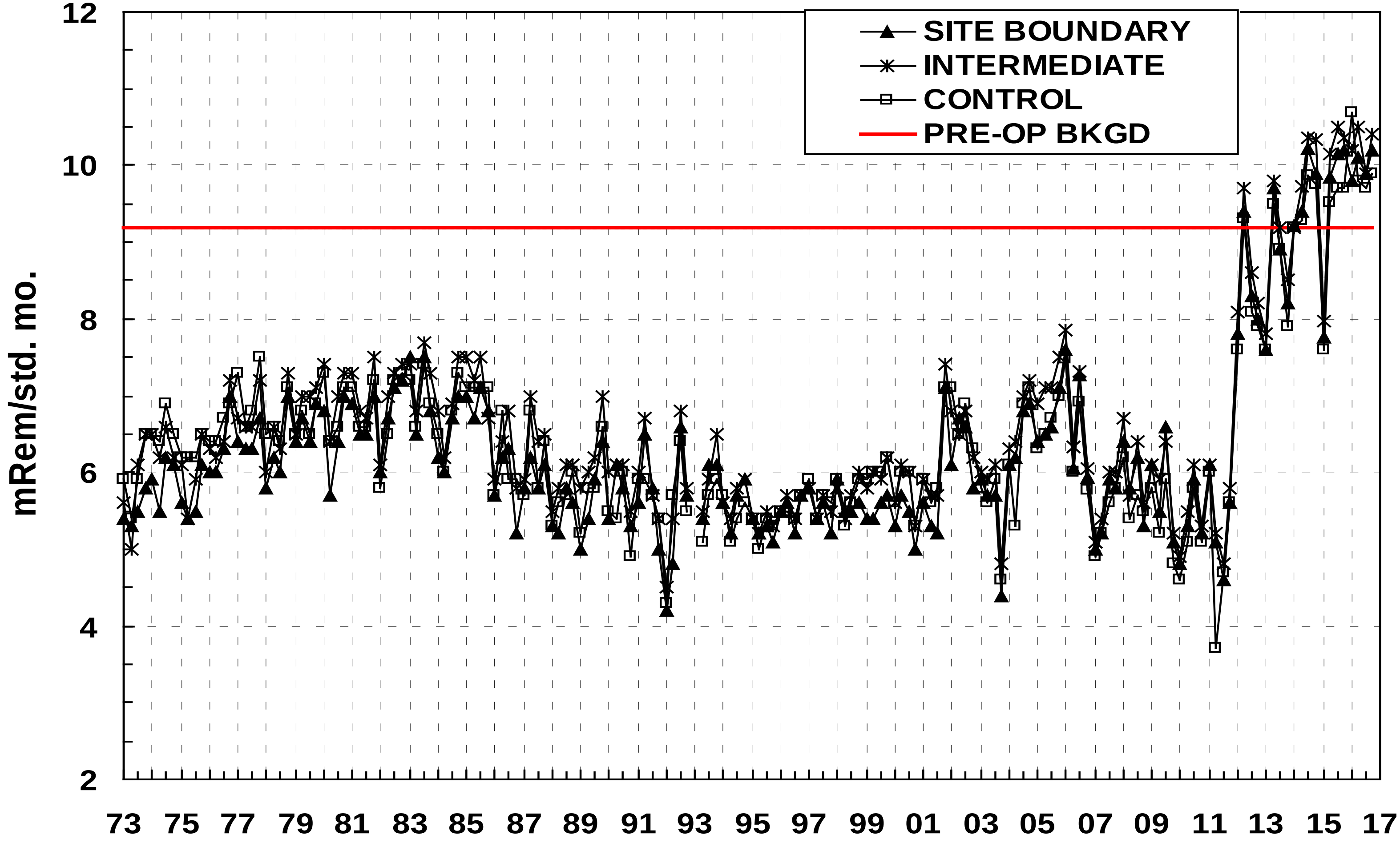
## FIGURE C-6
## MEAN ANNUAL CS-137 CONCENTRATIONS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 1971 - 2016




**Intermediate Farms Discontinued from 1995 - 1999**
**Cs-137 milk Reporting Level = 70 pCi/liter**

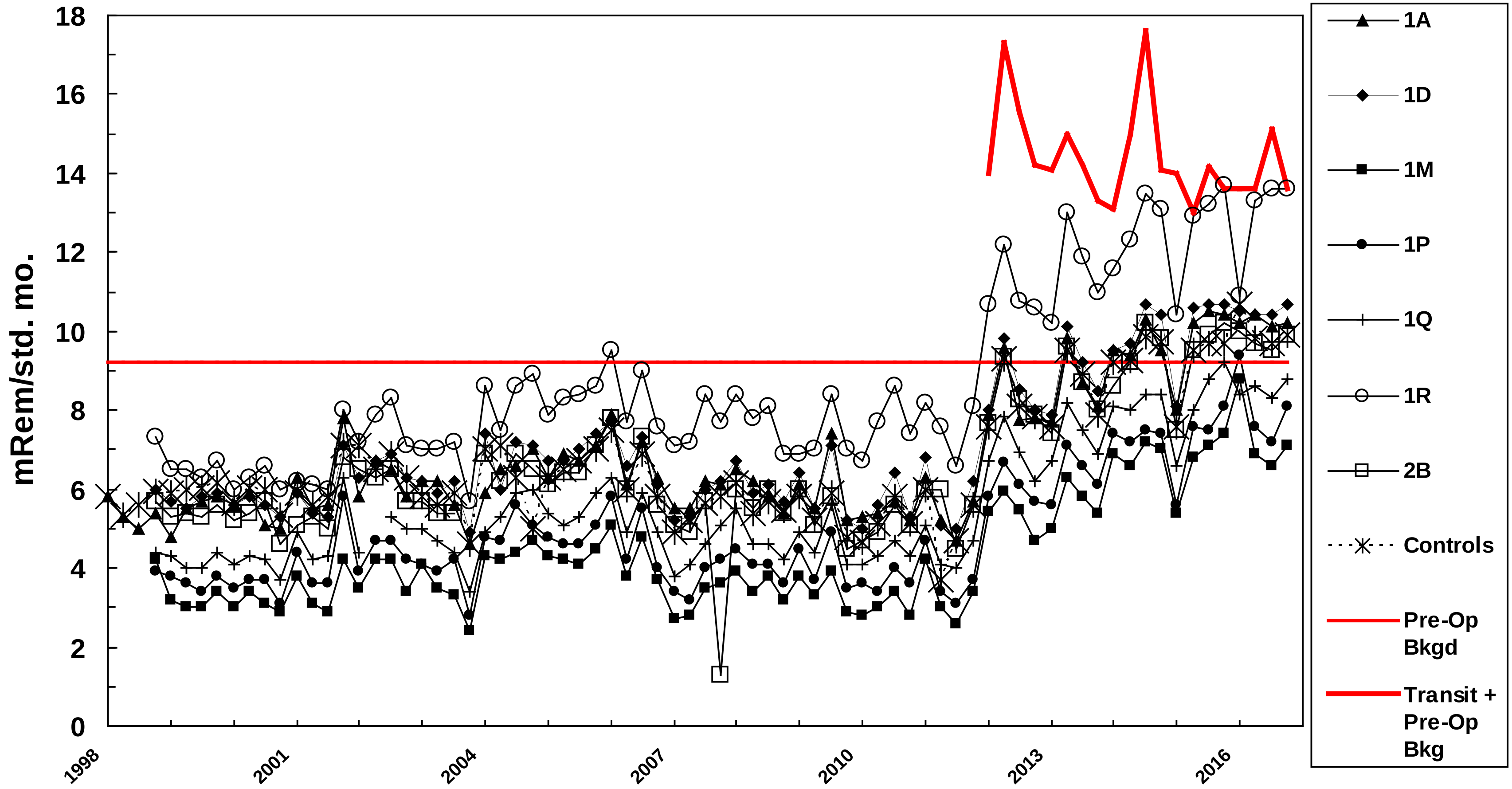
Note: After 2000 the MDA values is reported, while previously the measured activity was reported, even if less than MDA.

## FIGURE C- 7
## MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS IN THE VICINITY OF PBAPS, 1973 – 2016




OSLD technology use began January 2012, TLD technology ended December 2011. For only OSLD data, Gross mRem per standard month is reported.

# FIGURE C-8
# QUARTERLY AMBIENT GAMMA RADIATION LEVELS NEAR THE INDEPENDENT SPENT FUEL STORAGE INSTALLATION LOCATED AT PBAPS, 1998 – 2016




OSLD technology use began January 2012, TLD technology ended December 2011. For only OSLD data, Gross mRem per standard month is reported. TLD data was reported as Net Value.

ISFSI activated June, 2000

# APPENDIX D

# DATA TABLES AND FIGURES
# QC LABORATORY

**TABLE D-I.1 CONCENTRATIONS OF GROSS BETA INSOLUBLE IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 4L |
|---|---|
| JAN | < 1.9 |
| FEB | < 1.9 |
| MAR | < 1.9 |
| APR | < 1.8 |
| MAY | < 1.8 |
| JUN | < 1.6 |
| JUL | < 1.7 |
| AUG | < 1.9 |
| SEP | < 1.7 |
| OCT | < 1.1 |
| NOV | < 1.7 |
| DEC | < 1.8 |
| *MEAN* | - |

**TABLE D-I.2 CONCENTRATIONS OF GROSS BETA SOLUBLE IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 4L |
|---|---|
| JAN | < 1.8 |
| FEB | < 0.9 |
| MAR | 1.9 ± 0.9 |
| APR | < 1.7 |
| MAY | 1.9 ± 0.9 |
| JUN | 2.8 ± 0.9 |
| JUL | 2.2 ± 1.0 |
| AUG | 2.7 ± 0.9 |
| SEP | 2.1 ± 1.0 |
| OCT | 1.7 ± 0.4 |
| NOV | 2.2 ± 1.0 |
| DEC | 2.1 ± 1.0 |
| *MEAN ± 2 STD DEV* | 2.2 ± 0.7 |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**TABLE D-I.3 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 4L |
|---|---|
| JAN-MAR | < 145 |
| APR-JUN | < 150 |
| JUL-SEP | < 157 |
| OCT-DEC | < 153 |
| *MEAN* | - |

**TABLE D-I.4 CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| COLLECTION PERIOD | 4L |
|---|---|
| JAN | < 0.4 |
| FEB | < 0.3 |
| MAR | < 0.2 |
| APR | < 0.2 |
| MAY | < 0.3 |
| JUN | < 0.3 |
| JUL | < 0.4 |
| AUG | < 0.1 |
| SEP | < 0.2 |
| OCT | < 0.2 |
| NOV | < 0.3 |
| DEC | < 0.3 |
| *MEAN* | - |

TABLE D-I.5 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | Mn-54 | Fe-59 | Co-58 | Co-60 | Zn-65 | Zr-95 | Nb-95 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4L | JAN | < 2 | < 4 | < 1 | < 2 | < 4 | < 5 | < 2 | < 3 | < 3 | < 15 | < 4 |
| | FEB | < 2 | < 4 | < 2 | < 2 | < 4 | < 4 | < 3 | < 3 | < 3 | < 13 | < 3 |
| | MAR | < 2 | < 5 | < 2 | < 2 | < 5 | < 2 | < 3 | < 2 | < 3 | < 17 | < 2 |
| | APR | < 3 | < 7 | < 3 | < 2 | < 4 | < 6 | < 3 | < 4 | < 3 | < 15 | < 3 |
| | MAY | < 2 | < 4 | < 2 | < 2 | < 5 | < 5 | < 4 | < 2 | < 2 | < 17 | < 4 |
| | JUN | < 2 | < 4 | < 3 | < 2 | < 3 | < 3 | < 4 | < 2 | < 3 | < 13 | < 2 |
| | JUL | < 2 | < 4 | < 2 | < 2 | < 3 | < 4 | < 3 | < 1 | < 2 | < 19 | < 8 |
| | AUG | < 2 | < 5 | < 3 | < 3 | < 4 | < 4 | < 3 | < 2 | < 2 | < 32 | < 4 |
| | SEP | < 3 | < 4 | < 2 | < 2 | < 4 | < 6 | < 4 | < 3 | < 3 | < 18 | < 2 |
| | OCT | < 2 | < 2 | < 2 | < 3 | < 4 | < 5 | < 4 | < 3 | < 4 | < 29 | < 5 |
| | NOV | < 2 | < 4 | < 2 | < 1 | < 3 | < 5 | < 3 | < 2 | < 2 | < 23 | < 6 |
| | DEC | < 3 | < 3 | < 2 | < 3 | < 5 | < 5 | < 2 | < 2 | < 4 | < 12 | < 2 |
| | *MEAN* | - | - | - | - | - | - | - | - | - | - | - |

**TABLE D-II.1 CONCENTRATIONS OF GROSS BETA INSOLUBLE IN AIR PARTICULATE AND 1-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

| COLLECTION PERIOD | 1A GROSS BETA | 1A I-131 |
|---|---|---|
| 1 | 28 ± 3 | < 10 |
| 2 | 29 ± 4 | < 11 |
| 3 | 32 ± 4 | < 10 |
| 4 | 27 ± 4 | < 13 |
| 5 | 20 ± 4 | < 11 |
| 6 | 19 ± 2 | < 13 |
| 7 | 12 ± 3 | < 14 |
| 8 | 17 ± 3 | < 12 |
| 9 | 21 ± 3 | < 17 |
| 10 | 23 ± 3 | < 9 |
| 11 | 15 ± 3 | < 10 |
| 12 | 20 ± 3 | < 13 |
| 13 | 20 ± 3 | < 9 |
| 14 | 19 ± 3 | < 7 |
| 15 | 16 ± 3 | < 12 |
| 16 | 28 ± 3 | < 11 |
| 17 | 23 ± 3 | < 14 |
| 18 | 10 ± 3 | < 9 |
| 19 | 11 ± 3 | < 9 |
| 20 | 17 ± 3 | < 9 |
| 21 | 23 ± 3 | < 12 |
| 22 | 26 ± 3 | < 13 |
| 23 | 14 ± 3 | < 13 |
| 24 | 23 ± 3 | < 11 |
| 25 | 20 ± 3 | < 12 |
| 26 | 23 ± 3 | < 11 |
| 27 | 25 ± 3 | < 12 |
| 28 | 21 ± 4 | < 7 |
| 29 | 27 ± 4 | < 12 |
| 30 | 28 ± 4 | < 7 |
| 31 | 26 ± 3 | < 13 |
| 32 | 22 ± 4 | < 10 |
| 33 | 14 ± 3 | < 9 |
| 34 | 26 ± 4 | < 10 |
| 35 | 32 ± 4 | < 12 |
| 36 | 26 ± 4 | < 11 |
| 37 | 31 ± 3 | < 10 |
| 38 | 22 ± 3 | < 7 |
| 39 | 27 ± 3 | < 10 |
| 40 | 16 ± 3 | < 8 |
| 41 | 19 ± 3 | < 12 |
| 42 | 32 ± 4 | < 14 |
| 43 | 17 ± 4 | < 11 |
| 44 | 27 ± 3 | < 13 |
| 45 | 26 ± 3 | < 12 |
| 46 | 37 ± 4 | < 7 |
| 47 | 32 ± 4 | < 19 |
| 48 | 29 ± 3 | < 15 |
| 49 | 24 ± 4 | < 14 |
| 50 | 32 ± 4 | < 7 |
| 51 | 28 ± 3 | < 7 |
| 52 | 34 ± 3 | < 9 |
| *MEAN* | 23 ± 13 | - |

**TABLE D-II.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

| SITE | COLLECTION PERIOD | Be-7 | Mn-54 | Co-58 | Co-60 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| 1A | 12/30/15 - 03/31/16 | 69 ± 11 | < 0.3 | < 0.4 | < 0.4 | < 0.4 | < 0.5 |
| | 03/31/16 - 06/30/16 | 85 ± 11 | < 0.5 | < 0.3 | < 0.3 | < 0.4 | < 0.3 |
| | 06/30/16 - 09/29/16 | 81 ± 13 | < 0.6 | < 0.7 | < 0.4 | < 0.6 | < 0.4 |
| | 09/29/16 - 12/29/16 | 64 ± 11 | < 0.3 | < 0.6 | < 0.2 | < 0.5 | < 0.3 |
| | *MEAN ± 2 STD DEV* | 75 ± 20 | - | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

**TABLE D-III.1 CONCENTRATIONS OF I-131 BY CHEMICAL SEPARATION AND GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION PERIOD | I-131 | K-40 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|
| J | 02/01/16 | < 0.2 | 1348 ± 85 | < 3 | < 3 | < 19 | < 3 |
| | 05/02/16 | < 0.4 | 1367 ± 110 | < 2 | < 4 | < 9 | < 2 |
| | 08/08/16 | < 0.3 | 1479 ± 96 | < 3 | < 3 | < 58 | < 9 |
| | 11/14/16 | < 0.5 | 1379 ± 97 | < 3 | < 3 | < 44 | < 5 |
| | *MEAN ± 2 STD DEV* | - | 1393 ± 117 | - | - | - | - |
| S | 02/01/16 | < 0.2 | 1341 ± 84 | < 2 | < 2 | < 19 | < 6 |
| | 05/02/16 | < 0.5 | 1342 ± 115 | < 4 | < 2 | < 15 | < 4 |
| | 08/08/16 | < 0.3 | 1327 ± 101 | < 3 | < 3 | < 53 | < 6 |
| | 11/14/16 | < 0.3 | 1414 ± 99 | < 2 | < 3 | < 30 | < 4 |
| | *MEAN ± 2 STD DEV* | - | 1356 ± 79 | - | - | - | - |
| V | 01/30/16 | < 0.2 | 1326 ± 85 | < 3 | < 2 | < 21 | < 4 |
| | 04/30/16 | < 0.3 | 1320 ± 95 | < 2 | < 3 | < 15 | < 1 |
| | 08/06/16 | < 0.4 | 1356 ± 92 | < 2 | < 2 | < 42 | < 10 |
| | 11/12/16 | < 0.5 | 1268 ± 96 | < 3 | < 3 | < 47 | < 12 |
| | *MEAN ± 2 STD DEV* | - | 1318 ± 73 | - | - | - | - |

*THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES*

## TABLE D-IV.1 SUMMARY OF COLLECTION DATES FOR SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2016

**DRINKING WATER (GROSS BETA & GAMMA SPECTROSCOPY)**

| COLLECTION PERIOD | 4L |
|---|---|
| JAN | 12/30/15 - 01/28/16 |
| FEB | 01/28/16 - 02/25/16 |
| MAR | 02/25/16 - 03/31/16 |
| APR | 03/31/16 - 04/28/16 |
| MAY | 04/28/16 - 06/02/16 |
| JUN | 06/02/16 - 06/30/16 |
| JUL | 06/30/16 - 07/28/16 |
| AUG | 07/28/16 - 09/01/16 |
| SEP | 09/01/16 - 09/29/16 |
| OCT | 09/29/16 - 10/27/16 |
| NOV | 10/27/16 - 12/01/16 |
| DEC | 12/01/16 - 12/29/16 |

**DRINKING WATER (TRITIUM)**

| COLLECTION PERIOD | 4L |
|---|---|
| JAN-MAR | 12/30/15 - 03/31/16 |
| APR-JUN | 03/31/16 - 06/30/16 |
| JUL-SEP | 06/30/16 - 09/29/16 |
| OCT-DEC | 09/29/16 - 12/29/16 |

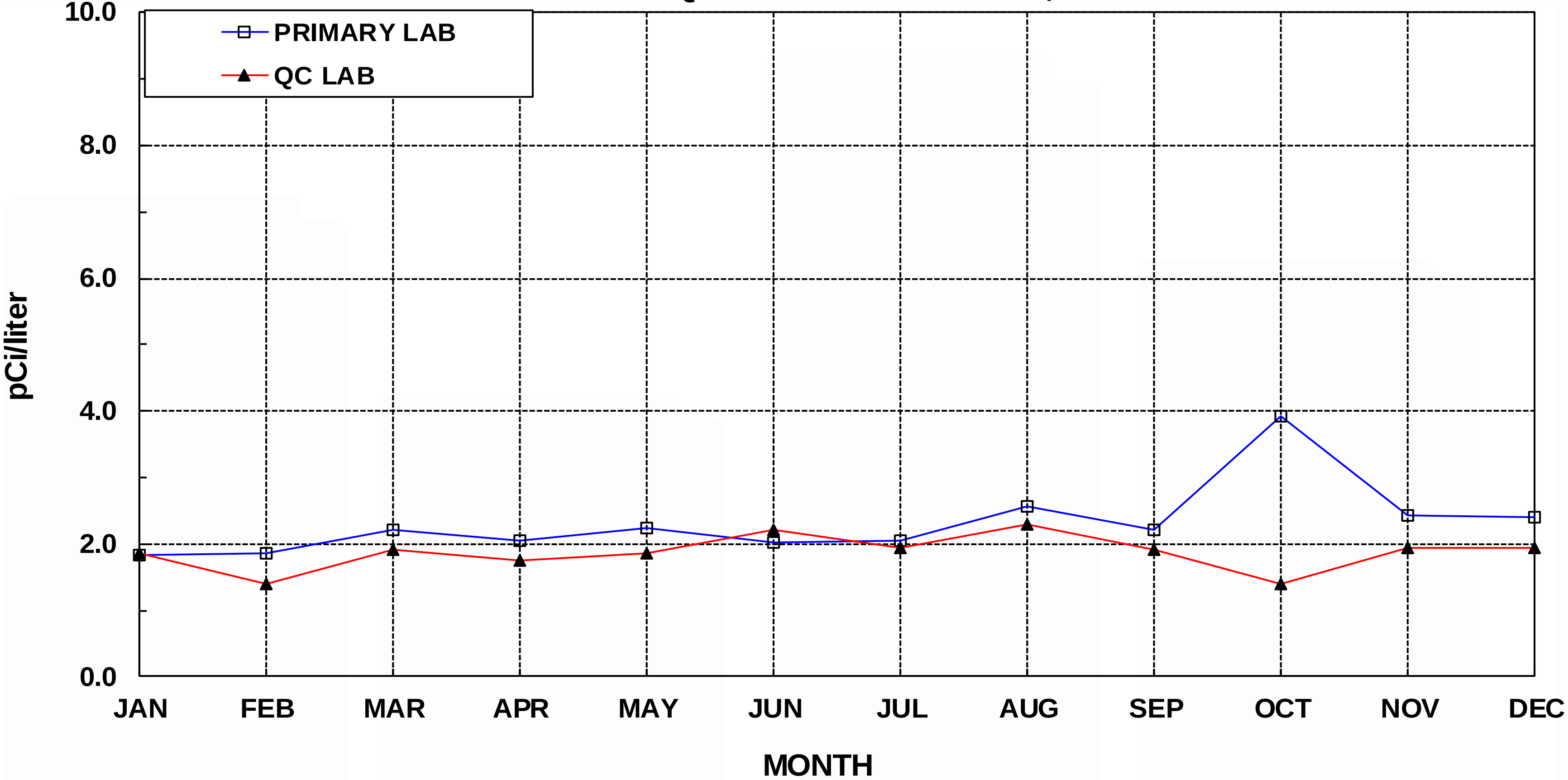
**AIR PARTICULATE (GAMMA SPECTROSCOPY)**

| COLLECTION PERIOD | 1A |
|---|---|
| JAN-MAR | 12/30/15 - 03/31/16 |
| APR-JUN | 03/31/16 - 06/30/16 |
| JUL-SEP | 06/30/16 - 09/29/16 |
| OCT-DEC | 09/29/16 - 12/29/16 |

**AIR PARTICULATE (GROSS BETA) AND AIR IODINE (I-131)**

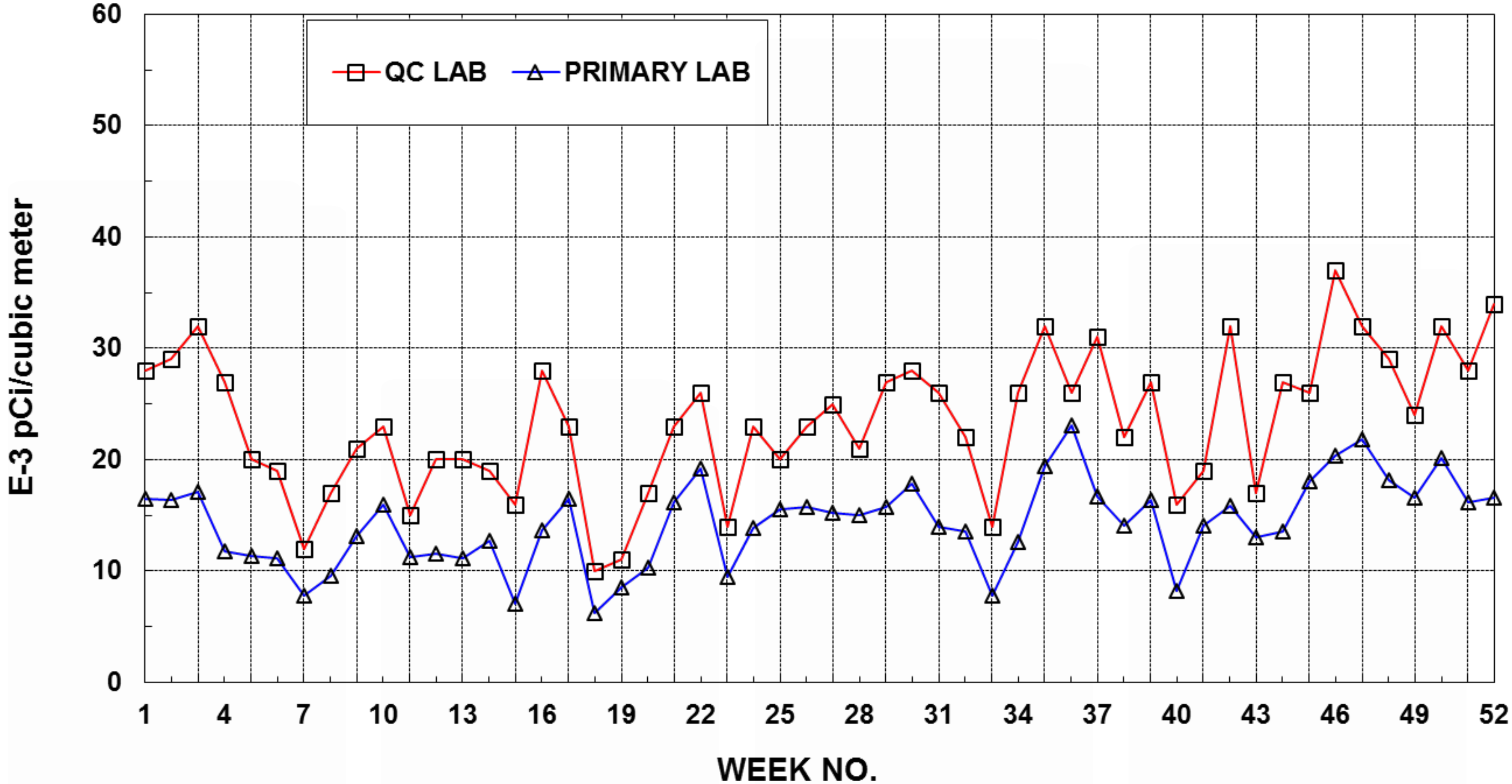
| COLLECTION PERIOD | 1A | COLLECTION PERIOD | 1A |
|---|---|---|---|
| 1 | 12/30/15 - 01/07/16 | 27 | 06/30/16 - 07/07/16 |
| 2 | 01/07/16 - 01/14/16 | 28 | 07/07/16 - 07/14/16 |
| 3 | 01/14/16 - 01/21/16 | 29 | 07/14/16 - 07/21/16 |
| 4 | 01/21/16 - 01/28/16 | 30 | 07/21/16 - 07/28/16 |
| 5 | 01/28/16 - 02/04/16 | 31 | 07/28/16 - 08/04/16 |
| 6 | 02/04/16 - 02/11/16 | 32 | 08/04/16 - 08/11/16 |
| 7 | 02/11/16 - 02/18/16 | 33 | 08/11/16 - 08/18/16 |
| 8 | 02/18/16 - 02/25/16 | 34 | 08/18/16 - 08/25/16 |
| 9 | 02/25/16 - 03/03/16 | 35 | 08/25/16 - 09/01/16 |
| 10 | 03/03/16 - 03/10/16 | 36 | 09/01/16 - 09/08/16 |
| 11 | 03/10/16 - 03/17/16 | 37 | 09/08/16 - 09/15/16 |
| 12 | 03/17/16 - 03/24/16 | 38 | 09/15/16 - 09/22/16 |
| 13 | 03/24/16 - 03/31/16 | 39 | 09/22/16 - 09/29/16 |
| 14 | 03/31/16 - 04/07/16 | 40 | 09/29/16 - 10/06/16 |
| 15 | 04/07/16 - 04/14/16 | 41 | 10/06/16 - 10/13/16 |
| 16 | 04/14/16 - 04/21/16 | 42 | 10/13/16 - 10/20/16 |
| 17 | 04/21/16 - 04/28/16 | 43 | 10/20/16 - 10/27/16 |
| 18 | 04/28/16 - 05/05/16 | 44 | 10/27/16 - 11/03/16 |
| 19 | 05/05/16 - 05/13/16 | 45 | 11/03/16 - 11/10/16 |
| 20 | 05/13/16 - 05/19/16 | 46 | 11/10/16 - 11/17/16 |
| 21 | 05/19/16 - 05/26/16 | 47 | 11/17/16 - 11/23/16 |
| 22 | 05/26/16 - 06/02/16 | 48 | 11/23/16 - 12/01/16 |
| 23 | 06/02/16 - 06/09/16 | 49 | 12/01/16 - 12/08/16 |
| 24 | 06/09/16 - 06/16/16 | 50 | 12/08/16 - 12/15/16 |
| 25 | 06/16/16 - 06/23/16 | 51 | 12/15/16 - 12/22/16 |
| 26 | 06/23/16 - 06/30/16 | 52 | 12/22/16 - 12/29/16 |

# FIGURE D-1
# COMPARISON OF MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES SPLIT BETWEEN THE PRIMARY AND QC LABORATORIES, 2016




*ENVIRONMENTAL INC. SOLUBLE AND INSOLUBLE FRACTIONS WERE COMBINED FOR TOTAL GROSS BETA COMPARISON.*

# FIGURE D-2
# COMPARISON OF WEEKLY GROSS BETA CONCENTRATIONS FROM CO-LOCATED AIR PARTICULATE LOCATIONS SPLIT BETWEEN THE PRIMARY AND QC LABORATORIES, 2016



# APPENDIX E

# INTER-LABORATORY COMPARISON PROGRAM ACCEPTANCE CRITERIA AND RESULTS

Intentionally left blank

A. Pre-set Acceptance Criteria

1. Analytics Evaluation Criteria

Analytics' evaluation report provides a ratio of laboratory results and Analytics' known value. Since flag values are not assigned by Analytics, TBE-ES evaluates the reported ratios based on internal QC requirements, which are based on the DOE MAPEP criteria.

2. ERA Evaluation Criteria

The Environmental Resource Associates' evaluation report provides an acceptance range for control and warning limits with associated flag values. The Environmental Resource Associates' acceptance limits are established per the United States Environmental Protection Agency (USEPA), National Environmental Laboratory Accreditation Conference (NELAC), state-specific performance testing program requirements or ERA's standard operating procedure for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

3. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values.

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

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

B. Teledyne Brown Engineering PE Results and Discussion

1. Teledyne Brown Engineering's MAPEP March 2016 air particulate cross check sample is now being provided to TBE by Analytics. MAPEP's

policy is to evaluate as failed non-reported nuclides that were reported in the previous study. NCR 16-14

a. Since the Sr-90 was reported in the previous MAPEP study but not in this study MAPEP evaluated the Sr-90 for Soil as failed. NCR 16-14

b. The MAPEP March 2016 Sr-90 in vegetation was evaluated as failing a false positive test. In reviewing the data that was reported vs the data in LIMS, it was found that the error was incorrectly reported as 0.023 rather than the correct value of 0.230. If the value had been reported with the activity and correct uncertainty of 0.301 ± 0.230, MAPEP would have evaluated the result as acceptable. NCR 16-14

2. Teledyne Brown Engineering's Analytics' March 2016 milk Sr-90 result of 15 ± .125 pCi/L was higher than the known value of 11.4 pCi/L with a ratio of 1.32. The upper ratio of 1.30 (acceptable with warning) was exceeded. After an extensive review of the data it is believed the technician did not rinse the filtering apparatus properly and some cross contamination from one of the internal laboratory spike samples may have been transferred to the analytics sample. We feel the issue is specific to the March 2016 Analytics sample. NCR 16-26

3. Teledyne Brown Engineering's ERA November 2016 sample for H-3 in water was evaluated as failing. A result of 918 pCi/L was reported incorrectly due to a data entry issue. If the correct value of 9180 had been reported, ERA would have evaluated the result as acceptable. NCR 16-34

4. Teledyne Brown Engineering's Analytics' December 2016 milk Sr-90 sample result of 14.7 ± .26 pCi/L was higher than the known value of 10 pCi/L with a ratio of 1.47. The upper ratio of 1.30 (acceptable with warning) was exceeded. The technician entered the wrong aliquot into the LIMS system. To achieve a lower error term TBE uses a larger aliquot of 1.2L (Normally we use .6L for client samples). If the technician had entered an aliquot of 1.2L into the LIMS system, the result would have been 12.2 pCi/L, which would have been considered acceptable. NCR 16-35

C. EIML PE Results and Discussion

1. The Environmental Inc., Midwest Laboratory's ERA April 2016 water Ba-133 result of 65.2 pCi/L was higher than the known value of 58.8 pCi/L, exceeding the upper control limit of 64.9 pCi/L. The reanalysis result of 57.8 pCi/L fell within acceptance criteria.

2. The Environmental Inc., Midwest Laboratory's MAPEP February 2016 water Co-57 result of 1.38 Bq/L sample was higher than the known value of 0.00 Bq/L sample. This sample is considered a false positive.

3. The Environmental Inc., Midwest Laboratory's MAPEP August 2016 soil Ni-63 result of 648 Bq/kg was lower than the known value of 990 Bq/kg, exceeding the lower control limit of 693 Bq/kg. Reanalysis with a smaller aliquot resulted in acceptable results. An investigation is in process to identify better techniques for analyzing samples with complex matrices.

4. The Environmental Inc., Midwest Laboratory's MAPEP August 2016 soil U-233/234 result of 46.8 Bq/kg was lower than the known value of 122 Bq/kg, exceeding the lower control limit of 85 Bq/kg. MAPEP states that samples contain two fractions of Uranium; one that is soluble in concentrated $HNO_3$ and HCl acid and one that is "fundamentally insoluble in these acids". They also state that HF treatment cannot assure complete dissolution. Results are consistent with measuring the soluble form.

5. The Environmental Inc., Midwest Laboratory's MAPEP August 2016 soil U-238 result of 46.6 Bq/kg was lower than the known value of 121 Bq/kg, exceeding the lower control limit of 85 Bq/kg. MAPEP states that samples contain two fractions of Uranium; one that is soluble in concentrated $HNO_3$ and HCl acid and one that is "fundamentally insoluble in these acids". They also state that HF treatment cannot assure complete dissolution. Results are consistent with measuring the soluble form.

TABLE E-1

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES, 2016**


| Month/Year | Identification Number | Matrix | Nuclide | Units | Reported Value (a) | Known Value (b) | Ratio (c) TBE/Analytics | Evaluation (d) |
|---|---|---|---|---|---|---|---|---|
| March 2016 | E11476 | Milk | Sr-89 | pCi/L | 97 | 86.7 | 1.12 | A |
| | | | Sr-90 | pCi/L | 15 | 11.4 | 1.32 | N(2) |
| | E11477 | Milk | I-131 | pCi/L | 85.9 | 82.2 | 1.05 | A |
| | | | Ce-141 | pCi/L | 106 | 98.4 | 1.08 | A |
| | | | Cr-51 | pCi/L | 255 | 243 | 1.05 | A |
| | | | Cs-134 | pCi/L | 134 | 130 | 1.03 | A |
| | | | Cs-137 | pCi/L | 174 | 161 | 1.08 | A |
| | | | Co-58 | pCi/L | 123 | 117 | 1.05 | A |
| | | | Mn-54 | pCi/L | 141 | 117 | 1.21 | W |
| | | | Fe-59 | pCi/L | 152 | 131 | 1.16 | A |
| | | | Zn-65 | pCi/L | 193 | 179 | 1.08 | A |
| | | | Co-60 | pCi/L | 259 | 244 | 1.06 | A |
| | E11479 | AP | Ce-141 | pCi | 69 | 81.1 | 0.85 | A |
| | | | Cr-51 | pCi | 242 | 201 | 1.20 | W |
| | | | Cs-134 | pCi | 98.1 | 107.0 | 0.92 | A |
| | | | Cs-137 | pCi | 136 | 133 | 1.02 | A |
| | | | Co-58 | pCi | 91.9 | 97 | 0.95 | A |
| | | | Mn-54 | pCi | 98.6 | 96.2 | 1.02 | A |
| | | | Fe-59 | pCi | 98.8 | 108 | 0.91 | A |
| | | | Zn-65 | pCi | 131 | 147 | 0.89 | A |
| | | | Co-60 | pCi | 209 | 201 | 1.04 | A |
| | E11478 | Charcoal | I-131 | pCi | 85.3 | 88.3 | 0.97 | A |
| | E11480 | Water | Fe-55 | pCi/L | 1800 | 1666 | 1.08 | A |
| June 2016 | E11537 | Milk | Sr-89 | pCi/L | 94.4 | 94.4 | 1.00 | A |
| | | | Sr-90 | pCi/L | 13.4 | 15.4 | 0.87 | A |
| | E11538 | Milk | I-131 | pCi/L | 96.8 | 94.5 | 1.02 | A |
| | | | Ce-141 | pCi/L | 129 | 139 | 0.93 | A |
| | | | Cr-51 | pCi/L | 240 | 276 | 0.87 | A |
| | | | Cs-134 | pCi/L | 157 | 174 | 0.90 | A |
| | | | Cs-137 | pCi/L | 117 | 120 | 0.98 | A |
| | | | Co-58 | pCi/L | 131 | 142 | 0.92 | A |
| | | | Mn-54 | pCi/L | 128 | 125 | 1.02 | A |
| | | | Fe-59 | pCi/L | 132 | 122 | 1.08 | A |
| | | | Zn-65 | pCi/L | 235 | 235 | 1.00 | A |
| | | | Co-60 | pCi/L | 169 | 173 | 0.98 | A |
| June 2016 | E11539 | Charcoal | I-131 | pCi | 86.1 | 89.4 | 0.96 | A |
| | E11540 | AP | Ce-141 | pCi | 105 | 99.8 | 1.05 | A |
| | | | Cr-51 | pCi | 216 | 198.0 | 1.09 | A |
| | | | Cs-134 | pCi | 113 | 125 | 0.90 | A |
| | | | Cs-137 | pCi | 94.5 | 86.6 | 1.09 | A |
| | | | Co-58 | pCi | 101 | 102 | 0.99 | A |
| | | | Mn-54 | pCi | 88.8 | 90.2 | 0.98 | A |
| | | | Fe-59 | pCi | 82 | 87.5 | 0.94 | A |
| | | | Zn-65 | pCi | 174 | 169 | 1.03 | A |
| | | | Co-60 | pCi | 143 | 124 | 1.15 | A |
| | E11541 | Water | Fe-55 | pCi/L | 164 | 186 | 0.88 | A |

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES, 2016**



| Month/Year | Identification Number | Matrix | Nuclide | Units | Reported Value (a) | Known Value (b) | Ratio (c) TBE/Analytics | Evaluation (d) |
|---|---|---|---|---|---|---|---|---|
| September 2016 | E11609 | Milk | Sr-89 | pCi/L | 90 | 90.9 | 0.99 | A |
| | | | Sr-90 | pCi/L | 13.3 | 13.7 | 0.97 | A |
| | E11610 | Milk | I-131 | pCi/L | 80.4 | 71.9 | 1.12 | A |
| | | | Ce-141 | pCi/L | 81.3 | 93 | 0.87 | A |
| | | | Cr-51 | pCi/L | 198 | 236 | 0.84 | A |
| | | | Cs-134 | pCi/L | 122 | 136 | 0.90 | A |
| | | | Cs-137 | pCi/L | 119 | 119 | 1.00 | A |
| | | | Co-58 | pCi/L | 92.2 | 97.4 | 0.95 | A |
| | | | Mn-54 | pCi/L | 156 | 152 | 1.03 | A |
| | | | Fe-59 | pCi/L | 97.5 | 90.6 | 1.08 | A |
| | | | Zn-65 | pCi/L | 189 | 179 | 1.06 | A |
| | | | Co-60 | pCi/L | 131 | 135 | 0.97 | A |
| | E11611 | Charcoal | I-131 | pCi | 52.4 | 59.9 | 0.87 | A |
| | E11612 | AP | Ce-141 | pCi | 67.5 | 63.6 | 1.06 | A |
| | | | Cr-51 | pCi | 192 | 161.0 | 1.19 | A |
| | | | Cs-134 | pCi | 91.4 | 92.6 | 0.99 | A |
| | | | Cs-137 | pCi | 93.9 | 80.8 | 1.16 | A |
| | | | Co-58 | pCi | 66 | 66.4 | 0.99 | A |
| | | | Mn-54 | pCi | 104 | 104 | 1.00 | A |
| | | | Fe-59 | pCi | 60.5 | 61.8 | 0.98 | A |
| | | | Zn-65 | pCi | 140 | 122 | 1.15 | A |
| | | | Co-60 | pCi | 119 | 91.9 | 1.29 | W |
| | E11613 | Water | Fe-55 | pCi/L | 1990 | 1670 | 1.19 | A |
| | E11614 | Soil | Ce-141 | pCi/g | 0.153 | 0.175 | 0.87 | A |
| | | | Cr-51 | pCi/g | 0.482 | 0.441 | 1.09 | A |
| | | | Cs-134 | pCi/g | 0.270 | 0.254 | 1.06 | A |
| | | | Cs-137 | pCi/g | 0.313 | 0.299 | 1.05 | A |
| | | | Co-58 | pCi/g | 0.177 | 0.182 | 0.97 | A |
| | | | Mn-54 | pCi/g | 0.340 | 0.285 | 1.19 | A |
| | | | Fe-59 | pCi/g | 0.206 | 0.17 | 1.21 | W |
| | | | Zn-65 | pCi/g | 0.388 | 0.335 | 1.16 | A |
| | | | Co-60 | pCi/g | 0.284 | 0.252 | 1.13 | A |
| December 2016 | E11699 | Milk | Sr-89 | pCi/L | 95 | 74.2 | 1.28 | W |
| | | | Sr-90 | pCi/L | 14.7 | 10 | 1.47 | N(3) |
| | E11700 | Milk | I-131 | pCi/L | 97.5 | 97.4 | 1.00 | A |
| | | | Ce-141 | pCi/L | 136 | 143 | 0.95 | A |
| | | | Cr-51 | pCi/L | 247 | 280 | 0.88 | A |
| | | | Cs-134 | pCi/L | 164 | 178 | 0.92 | A |
| | | | Cs-137 | pCi/L | 120 | 126 | 0.95 | A |
| | | | Co-58 | pCi/L | 139 | 146 | 0.95 | A |
| | | | Mn-54 | pCi/L | 126 | 129 | 0.98 | A |
| | | | Fe-59 | pCi/L | 114 | 125 | 0.91 | A |
| | | | Zn-65 | pCi/L | 237 | 244 | 0.97 | A |
| | | | Co-60 | pCi/L | 168 | 178 | 0.94 | A |
| | E11701 | Charcoal | I-131 | pCi | 95.6 | 98 | 0.98 | A |

**TABLE E-1** **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES, 2016**



| Month/Year | Identification Number | Matrix | Nuclide | Units | Reported Value (a) | Known Value (b) | Ratio (c) TBE/Analytics | Evaluation (d) |
|---|---|---|---|---|---|---|---|---|
| December 2016 | E11702 | AP | Ce-141 | pCi | 91.7 | 97.7 | 0.94 | A |
| | | | Cr-51 | pCi | 210 | 192.0 | 1.09 | A |
| | | | Cs-134 | pCi | 122 | 122 | 1.00 | A |
| | | | Cs-137 | pCi | 93.9 | 86.4 | 1.09 | A |
| | | | Co-58 | pCi | 92 | 100 | 0.92 | A |
| | | | Mn-54 | pCi | 93.7 | 88.5 | 1.06 | A |
| | | | Fe-59 | pCi | 84.9 | 84.5 | 1.00 | A |
| | | | Zn-65 | pCi | 176 | 167 | 1.05 | A |
| | | | Co-60 | pCi | 151 | 122 | 1.24 | W |
| | E11702 | AP | Sr-89 | pCi | 79.1 | 92 | 0.86 | A |
| | | | Sr-90 | pCi | 10 | 12.5 | 0.80 | A |
| | E11703 | Water | Fe-55 | pCi/L | 2180 | 1800 | 1.21 | W |

*(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.*

*(2) NCR 16-26 was initiated*

*(3) NCR 16-35 was initiated*

**TABLE E-2** **DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES, 2016**



| Month/Year | Identification Number | Media | Nuclide | Units | Reported Value (a) | Known Value (b) | Acceptance Range | Evaluation (c) |
|---|---|---|---|---|---|---|---|---|
| March 2016 | 16-MaW34 | Water | Am-241 | Bq/L | 0.008 | | (1) | A |
| | | | Ni-63 | Bq/L | 12.4 | 12.3 | 8.6-16.0 | A |
| | | | Pu-238 | Bq/L | 1.4900 | 1.2440 | 0.871-1.617 | A |
| | | | Pu-239/240 | Bq/L | 0.729 | 0.641 | 0.449-0.833 | A |
| | 16-MaS34 | Soil | Ni-63 | Bq/kg | 1140 | 1250.0 | 875-1625 | A |
| | | | Sr-90 | Bq/kg | 8.15 | | (1) | A |
| | 16-RdF34 | AP | U-234/233 | Bq/sample | 0.1620 | 0.1650 | 0.116-0.215 | A |
| | | | U-238 | Bq/sample | 0.163 | 0.172 | 0.120-0.224 | A |
| | 16-GrF34 | AP | Gr-A | Bq/sample | 0.608 | 1.20 | 0.36-2.04 | A |
| | | | Gr-B | Bq/sample | 0.8060 | 0.79 | 0.40-1.19 | A |
| | 16-RdV34 | Vegetation | Cs-134 | Bq/sample | 10.10 | 10.62 | 7.43-13.81 | A |
| | | | Cs-137 | Bq/sample | 6.0 | 5.62 | 3.93-7.31 | A |
| | | | Co-57 | Bq/sample | 13.3000 | 11.8 | 8.3-15.3 | A |
| | | | Co-60 | Bq/sample | 0.013 | | (1) | A |
| | | | Mn-54 | Bq/sample | 0.0150 | | (1) | A |
| | | | Sr-90 | Bq/sample | 0.301 | | (1) | N(4) |
| | | | Zn-65 | Bq/sample | 10.500 | 9.6 | 6.7-12.5 | A |
| September 2016 | 16-MaW35 | Water | Am-241 | Bq/L | 0.626 | 0.814 | .570-1058 | W |
| | | | Ni-63 | Bq/L | 12.4 | 17.2 | 12.0-22.4 | A |
| | | | Pu-238 | Bq/L | 1.23 | 1.13 | 0.79-1.47 | W |
| | | | Pu-239/240 | Bq/L | 0.0318 | 0.013 | (1) | A |
| | 16-MaS35 | Soil | Ni-63 | Bq/kg | 724 | 990 | 693-1287 | A |
| | | | Sr-90 | Bq/kg | 747 | 894 | 626-1162 | A |
| | 16-RdF35 | AP | U-234/233 | Bq/sample | 0.160 | 0.15 | 0.105-0.195 | A |
| | | | U-238 | Bq/sample | 0.157 | 0.156 | 0.109-0.203 | A |
| | 16-RdV35 | Vegetation | Cs-134 | Bq/sample | -0.103 | | (1) | A |
| | | | Cs-137 | Bq/sample | 5.64 | 5.54 | 3.88-7.20 | A |
| | | | Co-57 | Bq/sample | 7.38 | 6.81 | 4.77-8.85 | A |
| | | | Co-60 | Bq/sample | 4.81 | 4.86 | 3.40-6.32 | A |
| | | | Mn-54 | Bq/sample | 7.4 | 7.27 | 5.09-9.45 | A |
| | | | Sr-90 | Bq/sample | 0.774 | 0.80 | 0.56-1.04 | A |
| | | | Zn-65 | Bq/sample | 5.46 | 5.4 | 3.78-7.02 | 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.*

*(4)NCR 16-14 was initiated*

**TABLE E-3** **ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES, 2016**



| Month/Year | Identification Number | Media | Nuclide | Units | Reported Value (a) | Known Value (b) | Acceptance Limits | Evaluation (c) |
|---|---|---|---|---|---|---|---|---|
| May 2016 | RAD-105 | Water | Sr-89 | pCi/L | 48.9 | 48.2 | 37.8 - 55.6 | A |
| | | | Sr-90 | pCi/L | 25.0 | 28.5 | 20.7 - 33.1 | A |
| | | | Ba-133 | pCi/L | 53.1 | 58.8 | 48.7 - 64.9 | A |
| | | | Cs-134 | pCi/L | 40.9 | 43.3 | 34.6 - 47.6 | A |
| | | | Cs-137 | pCi/L | 84.8 | 78.4 | 70.6 - 88.9 | A |
| | | | Co-60 | pCi/L | 108 | 102 | 91.8 - 114 | A |
| | | | Zn-65 | pCi/L | 226 | 214 | 193 - 251 | A |
| | | | Gr-A | pCi/L | 38.9 | 62.7 | 32.9 - 77.8 | A |
| | | | Gr-B | pCi/L | 41.9 | 39.2 | 26.0 - 46.7 | A |
| | | | I-131 | pCi/L | 24.1 | 26.6 | 22.1 - 31.3 | A |
| | | | U-Nat | pCi/L | 4.68 | 4.64 | 3.39 - 5.68 | A |
| | | | H-3 | pCi/L | 7720 | 7840 | 6790 - 8620 | A |
| November 2016 | RAD-107 | Water | Sr-89 | pCi/L | 43.0 | 43.3 | 33.4-50.5 | A |
| | | | Sr-90 | pCi/L | 30.0 | 33.6 | 24.6-38.8 | A |
| | | | Ba-133 | pCi/L | 47.8 | 54.9 | 45.4-60.7 | A |
| | | | Cs-134 | pCi/L | 72.9 | 81.8 | 67.0-90.0 | A |
| | | | Cs-137 | pCi/L | 189 | 210 | 189-233 | A |
| | | | Co-60 | pCi/L | 58.4 | 64.5 | 58.0-73.4 | A |
| | | | Zn-65 | pCi/L | 243 | 245 | 220-287 | A |
| | | | Gr-A | pCi/L | 37.2 | 68.4 | 35.9-84.5 | A |
| | | | Gr-B | pCi/L | 35.1 | 33.9 | 22.1-41.6 | A |
| | | | I-131 | pCi/L | 23.5 | 26.3 | 21.9-31.0 | A |
| | | | U-Nat | pCi/L | 49.2 | 51.2 | 41.6-56.9 | A |
| | | | H-3 | pCi/L | 918 | 9820 | 8540-10800 | N(5) |
| | MRAD-25 | AP | Gr-A | pCi/Filter | 56.8 | 71.2 | 23.9-111 | A |

*(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. N=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.*

(5) NCR 16-34 was initiated

**TABLE E-4** **ERA STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM[a]**

**MRAD Study, ENVIRONMENTAL, INC., 2016**

| | | | Concentration [a] | | | |
|---|---|---|---|---|---|---|
| Lab Code [b] | Date | Analysis | Laboratory Result | ERA Result | Control Limits | Acceptance |
| ERAP-1101 | 3/14/2016 | Am-241 | 37.3 | 45.9 | 28.3 - 62.1 | Pass |
| ERAP-1101 | 3/14/2016 | Co-60 | 637 | 623 | 482 - 778 | Pass |
| ERAP-1101 | 3/14/2016 | Cs-134 | 251 | 304 | 193 - 377 | Pass |
| ERAP-1101 | 3/14/2016 | Cs-137 | 1,273 | 1,150 | 864 - 1,510 | Pass |
| ERAP-1101 | 3/14/2016 | Fe-55 | < 162 | 126 | 39.1 - 246 | Pass |
| ERAP-1101 | 3/14/2016 | Mn-54 | < 2.64 | < 50.0 | 0.00 - 50.0 | Pass |
| ERAP-1101 | 3/14/2016 | Pu-238 | 68.0 | 70.5 | 48.3 - 92.7 | Pass |
| ERAP-1101 | 3/14/2016 | Pu-239/240 | 54.1 | 54.8 | 39.70 - 71.60 | Pass |
| ERAP-1101 | 3/14/2016 | Sr-90 | 139 | 150 | 73.3 - 225.0 | Pass |
| ERAP-1101 | 3/14/2016 | U-233/234 | 59.3 | 64.8 | 40.2 - 97.7 | Pass |
| ERAP-1101 | 3/14/2016 | U-238 | 55.5 | 64.2 | 41.5 - 88.8 | Pass |
| ERAP-1101 | 3/14/2016 | Zn-65 | 428 | 356 | 255 - 492 | Pass |
| | | | | | | |
| ERAP-1101 | 3/14/2016 | Gr. Alpha | 98.0 | 70.1 | 23.5 - 109 | Pass |
| ERAP-1101 | 3/14/2016 | Gr. Beta | 78.6 | 54.4 | 34.4 - 79.3 | Pass |
| | | | | | | |
| ERSO-1105 | 3/14/2016 | Am-241 | 1,030 | 1,360 | 796 - 1,770 | Pass |
| ERSO-1105 | 3/14/2016 | Ac-228 | 1,540 | 1,240 | 795 - 1,720 | Pass |
| ERSO-1105 | 3/14/2016 | Bi-212 | 1,550 | 1,240 | 330 - 1,820 | Pass |
| ERSO-1105 | 3/14/2016 | Bi-214 | 3,100 | 3,530 | 2,130 - 5,080 | Pass |
| ERSO-1105 | 3/14/2016 | Co-60 | 5,600 | 5,490 | 3,710 - 7,560 | Pass |
| ERSO-1105 | 3/14/2016 | Cs-134 | 3,030 | 3,450 | 2,260 - 4,140 | Pass |
| ERSO-1105 | 3/14/2016 | Cs-137 | 4,440 | 4,310 | 3,300 - 5,550 | Pass |
| ERSO-1105 | 3/14/2016 | K-40 | 10,300 | 10,600 | 7,740 - 14,200 | Pass |
| ERSO-1105 | 3/14/2016 | Mn-54 | < 50.8 | < 1000 | 0.0 - 1,000 | Pass |
| ERSO-1105 | 3/14/2016 | Pb-212 | 1,140 | 1,240 | 812 - 1,730 | Pass |
| ERSO-1105 | 3/14/2016 | Pb-214 | 3,190 | 3,710 | 2,170 - 5,530 | Pass |
| ERSO-1105 | 3/14/2016 | Pu-238 | 680 | 658 | 396 - 908 | Pass |
| ERSO-1105 | 3/14/2016 | Pu-239/240 | 460 | 496 | 324 - 0,685 | Pass |
| ERSO-1105 | 3/14/2016 | Sr-90 | 7,740 | 8,560 | 3,260 - 13,500 | Pass |
| ERSO-1105 | 3/14/2016 | Th-234 | 3,630 | 3,430 | 1,080 - 6,450 | Pass |
| ERSO-1105 | 3/14/2016 | U-233/234 | 3,090 | 3,460 | 2,110 - 4,430 | Pass |
| ERSO-1105 | 3/14/2016 | U-238 | 3,280 | 3,430 | 2,120 - 4,350 | Pass |
| ERSO-1105 | 3/14/2016 | Zn-65 | 2,940 | 2,450 | 1,950 - 3,260 | Pass |
| | | | | | | |
| ERW-1115 | 3/14/2016 | Gr. Alpha | 105.0 | 117.0 | 41.5 - 181.0 | Pass |
| ERW-1115 | 3/14/2016 | Gr. Beta | 76.2 | 75.5 | 43.2 - 112.0 | Pass |
| | | | | | | |
| ERW-1117 | 3/14/2016 | H-3 | 8,870 | 8,650 | 5,800 - 12,300 | Pass |
| | | | | | | |
| ERVE-1108 | 3/14/2016 | Am-241 | 1,930 | 2,120 | 1,300 - 2,820 | Pass |
| ERVE-1108 | 3/14/2016 | Cm-244 | 1,294 | 1,560 | 764 - 2,430 | Pass |
| ERVE-1108 | 3/14/2016 | Co-60 | 1,164 | 1,100 | 759 - 1,540 | Pass |
| ERVE-1108 | 3/14/2016 | Cs-134 | 1,056 | 1,070 | 687 - 1,390 | Pass |
| ERVE-1108 | 3/14/2016 | Cs-137 | 930 | 838 | 608 - 1,170 | Pass |
| ERVE-1108 | 3/14/2016 | K-40 | 32,200 | 31,000 | 22,400 - 43,500 | Pass |
| ERVE-1108 | 3/14/2016 | Mn-54 | < 24.5 | < 300 | 0.00 - 300 | Pass |
| ERVE-1108 | 3/14/2016 | Zn-65 | 3,320 | 2,820 | 2,030 - 3,960 | Pass |

**TABLE E-4** **ERA STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM[a]**

**MRAD Study, ENVIRONMENTAL, INC., 2016**

| | | | Concentration [a] | | | |
|---|---|---|---|---|---|---|
| Lab Code [b] | Date | Analysis | Laboratory Result | ERA Result | Control Limits | Acceptance |
| ERVE-1108 | 3/14/2016 | Pu-238 | 3,410 | 2,810 | 1,680 - 3,850 | Pass |
| ERVE-1108 | 3/14/2016 | Pu-239/240 | 4,120 | 3,640 | 2,230 - 5,010 | Pass |
| ERVE-1108 | 3/14/2016 | Sr-90 | 8,120 | 8,710 | 4,960 - 11,500 | Pass |
| ERVE-1108 | 3/14/2016 | U-233/234 | 4,350 | 4,160 | 2,740 - 5,340 | Pass |
| ERVE-1108 | 3/14/2016 | U-238 | 4,220 | 4,120 | 2,750 - 5,230 | Pass |
| ERW-1111 | 3/14/2016 | Am-241 | 113 | 121 | 81.5 - 162 | Pass |
| ERW-1111 | 3/14/2016 | Co-60 | 1,120 | 1,050 | 912 - 1,230 | Pass |
| ERW-1111 | 3/14/2016 | Cs-134 | 806 | 842 | 618 - 968 | Pass |
| ERW-1111 | 3/14/2016 | Cs-137 | 1,190 | 1,100 | 934 - 1,320 | Pass |
| ERW-1111 | 3/14/2016 | Mn-54 | < 5.89 | < 100 | 0.00 - 100 | Pass |
| ERW-1111 | 3/14/2016 | Pu-238 | 159 | 138 | 102 - 172 | Pass |
| ERW-1111 | 3/14/2016 | Pu-239/240 | 113 | 98.7 | 76.6 - 124 | Pass |
| ERW-1111 | 3/14/2016 | U-233/234 | 46.9 | 52.7 | 39.6 - 68.0 | Pass |
| ERW-1111 | 3/14/2016 | U-238 | 50.4 | 52.3 | 39.9 - 64.2 | Pass |
| ERW-1111 | 3/14/2016 | Zn-65 | 1,160 | 1,010 | 842 - 1,270 | Pass |
| ERW-1111 | 3/14/2016 | Fe-55 | 1,600 | 1,650 | 984 - 2,240 | Pass |
| ERW-1111 | 3/14/2016 | Sr-90 | 430 | 434 | 283 - 574 | Pass |

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

**TABLE E-5** **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)**

**ENVIRONMENTAL, INC., 2016**

| | | | Concentration [a] | | | |
|---|---|---|---|---|---|---|
| Lab Code [b] | Reference Date | Analysis | Laboratory result | Known Activity | Control Limits [c] | Acceptance |
| MASO-1053 | 2/1/2016 | Ni-63 | 1,206 ± 20 | 1250 | 875 - 1625 | Pass |
| MASO-1053 | 2/1/2016 | Sr-90 | 0.65 ± 1.27 | 0.00 | NA [c] | Pass |
| MASO-1053 | 2/1/2016 | Tc-99 | 0.1 ± 5.5 | 0.0 | NA [c] | Pass |
| MASO-1053 | 2/1/2016 | Cs-134 | 908 ± 26 | 1030 | 721 - 1339 | Pass |
| MASO-1053 | 2/1/2016 | Cs-137 | 0.10 ± 6.20 | 0.00 | NA [c] | Pass |
| MASO-1053 | 2/1/2016 | Co-57 | 1058 ± 26 | 992 | 694 - 1290 | Pass |
| MASO-1053 | 2/1/2016 | Co-60 | 1229 ± 28 | 1190 | 833 - 1547 | Pass |
| MASO-1053 | 2/1/2016 | Mn-54 | 1235 ± 43 | 1160 | 812 - 1508 | Pass |
| MASO-1053 | 2/1/2016 | Zn-65 | 753 ± 64 | 692 | 484 - 900 | Pass |
| MASO-1053 | 2/1/2016 | K-40 | 753 ± 140 | 607 | 425 - 789 | Pass |
| MASO-1053 | 2/1/2016 | Am-241 | 79 ± 6 | 103 | 72 - 134 | Pass |
| MASO-1053 | 2/1/2016 | Pu-238 | 73.9 ± 9.2 | 63.6 | 44.5 - 82.7 | Pass |
| MASO-1053 | 2/1/2016 | Pu-239/240 | 0.76 ± 1.34 | 0.21 | NA [d] | Pass |
| MASO-1053 | 2/1/2016 | U-234/233 | 45.0 ± 5.1 | 45.9 | 32.1 - 59.7 | Pass |
| MASO-1053 | 2/1/2016 | U-238 | 129 ± 9 | 146 | 102 - 190 | Pass |
| | | | | | | |
| MAW-989 | 2/1/2016 | Am-241 | 0.018 ± 0.015 | 0.00 | NA [c] | Pass |
| MAW-989 | 2/1/2016 | H-3 | 0.2 ± 2.8 | 0.0 | NA [c] | Pass |
| MAW-989 | 2/1/2016 | Ni-63 | 12.8 ± 2.7 | 12.3 | 8.6 - 16.0 | Pass |
| MAW-989 | 2/1/2016 | Sr-90 | 8.70 ± 1.20 | 8.74 | 6.12 - 11.36 | Pass |
| MAW-989 | 2/1/2016 | Tc-99 | -1.1 ± 0.6 | 0.0 | NA [c] | Pass |
| MAW-989 | 2/1/2016 | Cs-134 | 15.5 ± 0.3 | 16.1 | 11.3 ± 20.9 | Pass |
| MAW-989 | 2/1/2016 | Cs-137 | 23.7 ± 0.5 | 21.2 | 14.8 - 27.6 | Pass |
| MAW-989[e] | 2/1/2016 | Co-57 | 1.38 ± 0.12 | 0.00 | NA [c] | Fail |
| MAW-989 | 2/1/2016 | Co-60 | 12.5 ± 0.3 | 11.8 | 8.3 - 15.3 | Pass |
| MAW-989 | 2/1/2016 | Mn-54 | 12.2 ± 0.4 | 11.1 | 7.8 - 14.4 | Pass |
| MAW-989 | 2/1/2016 | Zn-65 | 15.7 ± 0.7 | 13.6 | 9.5 - 17.7 | Pass |
| MAW-989 | 2/1/2016 | K-40 | 288 ± 5 | 251 | 176 - 326 | Pass |
| MAW-989 | 2/1/2016 | Fe-55 | 17.3 ± 7.0 | 16.2 | 11.3 - 21.1 | Pass |
| MAW-989 | 2/1/2016 | Ra-226 | 0.710 ± 0.070 | 0.718 | 0.503 - 0.933 | Pass |
| MAW-989 | 2/1/2016 | Pu-238 | 1.280 ± 0.110 | 1.244 | 0.871 ± 1.617 | Pass |
| MAW-989 | 2/1/2016 | Pu-239/240 | 0.640 ± 0.080 | 0.641 | 0.449 - 0.833 | Pass |
| MAW-989 | 2/1/2016 | U-234/233 | 1.39 ± 0.12 | 1.48 | 1.04 - 1.92 | Pass |
| MAW-989 | 2/1/2016 | U-238 | 1.43 ± 0.12 | 1.53 | 1.07 - 1.99 | Pass |
| | | | | | | |
| MAW-893 | 2/1/2016 | Gross Alpha | 0.600 ± 0.050 | 0.673 | 0.202 - 1.144 | Pass |
| MAW-893 | 2/1/2016 | Gross Beta | 2.10 ± 0.06 | 2.15 | 1.08 - 3.23 | Pass |
| | | | | | | |
| MAW-896 | 2/1/2016 | I-129 | 3.67 ± 0.20 | 3.85 | 2.70 - 5.01 | Pass |
| | | | | | | |
| MAAP-1056 | 2/1/2016 | Gross Alpha | 0.39 ± 0.05 | 1.20 | 0.36 - 2.04 | Pass |
| MAAP-1056 | 2/1/2016 | Gross Beta | 1.03 ± 0.07 | 0.79 | 0.40 - 1.19 | Pass |
| | | | | | | |
| MAAP-1057 | 2/1/2016 | Sr-90 | 1.34 ± 0.15 | 1.38 | 0.97 ± 1.79 | Pass |
| MAAP-1057 | 2/1/2016 | Cs-134 | -0.01 ± 0.03 | 0.00 | NA [c] | Pass |
| MAAP-1057 | 2/1/2016 | Cs-137 | 2.57 ± 0.10 | 2.30 | 1.61 - 2.99 | Pass |

**TABLE E-5** DOE's Mixed Analyte Performance Evaluation Program (MAPEP)

**ENVIRONMENTAL, INC., 2016**

| | | | Concentration [a] | | | |
|---|---|---|---|---|---|---|
| Lab Code [b] | Reference Date | Analysis | Laboratory result | Known Activity | Control Limits [c] | Acceptance |
| MAAP-1057 | 2/1/2016 | Co-57 | 3.01 ± 0.06 | 2.94 | 2.06 - 3.82 | Pass |
| MAAP-1057 | 2/1/2016 | Co-60 | 4.28 ± 0.10 | 4.02 | 2.81 - 5.23 | Pass |
| MAAP-1057 | 2/1/2016 | Mn-54 | 4.90 ± 0.13 | 4.53 | 3.17 - 5.89 | Pass |
| MAAP-1057 | 2/1/2016 | Zn-65 | 4.09 ± 0.18 | 3.57 | 2.50 - 4.64 | Pass |
| MAAP-1057 | 2/1/2016 | Am-241 | 0.059 ± 0.015 | 0.0805 | 0.0564 - 0.1047 | Pass |
| MAAP-1057 | 2/1/2016 | Pu-238 | 0.066 ± 0.020 | 0.0637 | 0.0446 - 0.0828 | Pass |
| MAAP-1057 | 2/1/2016 | Pu-239/240 | 0.074 ± 0.020 | 0.099 | NA [d] | Pass |
| MAAP-1057 | 2/1/2016 | U-234/233 | 0.151 ± 0.026 | 0.165 | 0.116 - 0.215 | Pass |
| MAAP-1057 | 2/1/2016 | U-238 | 0.160 ± 0.026 | 0.172 | 0.120 - 0.224 | Pass |
| | | | | | | |
| MAVE-1050 | 2/1/2016 | Cs-134 | 9.83 ± 0.19 | 10.62 | 7.43 - 13.81 | Pass |
| MAVE-1050 | 2/1/2016 | Cs-137 | 6.06 ± 0.19 | 5.62 | 3.93 - 7.31 | Pass |
| MAVE-1050 | 2/1/2016 | Co-57 | 13.8 ± 0.2 | 11.8 | 8.3 - 15.3 | Pass |
| MAVE-1050 | 2/1/2016 | Co-60 | 0.022 ± 0.040 | 0.00 | NA [c] | Pass |
| MAVE-1050 | 2/1/2016 | Mn-54 | 0.009 ± 0.044 | 0.000 | NA [c] | Pass |
| MAVE-1050 | 2/1/2016 | Zn-65 | 10.67 ± 0.39 | 9.60 | 6.70 - 12.50 | Pass |
| | | | | | | |
| MASO-4780 [f] | 8/1/2016 | Ni-63 | 648 ± 14 | 990 | 693 - 1287 | Fail |
| MASO-4780 [g] | 8/1/2016 | Ni-63 | 902 ± 46 | 990 | 693 - 1287 | Pass |
| MASO-4780 | 8/1/2016 | Sr-90 | 757 ± 16 | 894 | 626 - 1162 | Pass |
| MASO-4780 | 8/1/2016 | Tc-99 | 559 ± 12 | 556 | 389 - 723 | Pass |
| MASO-4780 | 8/1/2016 | Cs-134 | 0.93 ± 2.92 | 0.00 | NA [c] | Pass |
| MASO-4780 | 8/1/2016 | Cs-137 | 1061 ± 12 | 1067 | 747 - 1387 | Pass |
| MASO-4780 | 8/1/2016 | Co-57 | 1178 ± 8 | 1190 | 833 - 1547 | Pass |
| MASO-4780 | 8/1/2016 | Co-60 | 841 ± 9 | 851 | 596 - 1106 | Pass |
| MASO-4780 | 8/1/2016 | Mn-54 | 0.69 ± 2.53 | 0.00 | NA [c] | Pass |
| MASO-4780 | 8/1/2016 | Zn-65 | 724 ± 19 | 695 | 487 - 904 | Pass |
| MASO-4780 | 8/1/2016 | K-40 | 566 ± 52 | 588 | 412 - 764 | Pass |
| MASO-4780 | 8/1/2016 | Am-241 | 0.494 ± 0.698 | 0.000 | NA [c] | Pass |
| | | | | | | |
| MASO-4780 | 8/1/2016 | Pu-238 | 69.7 ± 7.4 | 70.4 | 49.3 - 91.5 | Pass |
| MASO-4780 | 8/1/2016 | Pu-239/240 | 53.9 ± 6.3 | 53.8 | 37.7 - 69.9 | Pass |
| MASO-4780 [h] | 8/1/2016 | U-233/234 | 46.8 ± 3.9 | 122 | 85 - 159 | Fail |
| MASO-4780 [h] | 8/1/2016 | U-238 | 46.6 ± 3.9 | 121 | 85 - 157 | Fail |
| | | | | | | |
| MAW-4776 | 8/1/2016 | I-129 | 4.40 ± 0.20 | 4.54 | 3.18 - 5.90 | Pass |
| | | | | | | |
| MAVE-4782 | 8/1/2016 | Cs-134 | -0.01 ± 0.05 | 0.00 | NA [c] | Pass |
| MAVE-4782 | 8/1/2016 | Cs-137 | 6.18 ± 0.20 | 5.54 | 3.88 - 7.20 | Pass |
| MAVE-4782 | 8/1/2016 | Co-57 | 8.13 ± 0.16 | 6.81 | 4.77 - 8.85 | Pass |
| MAVE-4782 | 8/1/2016 | Co-60 | 5.30 ± 0.15 | 4.86 | 3.40 - 6.32 | Pass |
| MAVE-4782 | 8/1/2016 | Mn-54 | 8.08 ± 0.24 | 7.27 | 5.09 - 9.45 | Pass |
| MAVE-4782 | 8/1/2016 | Zn-65 | 6.24 ± 0.36 | 5.40 | 3.78 - 7.02 | Pass |
| | | | | | | |
| MAAP-4784 | 8/1/2016 | Sr-90 | 1.18 ± 0.10 | 1.03 | 0.72 - 1.34 | Pass |
| MAAP-4784 | 8/1/2016 | Cs-134 | 1.58 ± 0.08 | 2.04 | 1.43 - 2.65 | Pass |

**TABLE E-5** **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)**

**ENVIRONMENTAL, INC., 2016**

| | | | Concentration [a] | | | |
|---|---|---|---|---|---|---|
| Lab Code [b] | Reference Date | Analysis | Laboratory result | Known Activity | Control Limits [c] | Acceptance |
| MAAP-4784 | 8/1/2016 | Cs-137 | 1.85 ± 0.09 | 1.78 | 1.25 - 2.31 | Pass |
| MAAP-4784 | 8/1/2016 | Co-57 | 2.39 ± 0.52 | 2.48 | 1.74 - 3.22 | Pass |
| MAAP-4784 | 8/1/2016 | Co-60 | 3.22 ± 0.08 | 3.26 | 2.28 - 4.24 | Pass |
| MAAP-4784 | 8/1/2016 | Mn-54 | 2.82 ± 0.12 | 2.75 | 1.93 - 3.58 | Pass |
| MAAP-4784 | 8/1/2016 | Zn-65 | -0.015 ± 0.062 | 0.00 | NA [c] | Pass |
| MAAP-4784 | 8/1/2016 | Am-241 | -0.001 ± 0.006 | 0.00 | NA [c] | Pass |
| MAAP-4784 | 8/1/2016 | Pu-238 | 0.075 ± 0.022 | 0.069 | 0.049 - 0.090 | Pass |
| MAAP-4784 | 8/1/2016 | Pu-239/240 | 0.048 ± 0.015 | 0.054 | 0.038 - 0.070 | Pass |
| MAAP-4784 | 8/1/2016 | U-234/233 | 0.151 ± 0.036 | 0.150 | 0.105 - 0.195 | Pass |
| MAAP-4784 | 8/1/2016 | U-238 | 0.147 ± 0.034 | 0.156 | 0.109 - 0.203 | Pass |
| MAW-4778 | 8/1/2016 | H-3 | 365 ± 11 | 334 | 234 - 434 | Pass |
| MAW-4778 | 8/1/2016 | Fe-55 | 23.6 ± 16.3 | 21.5 | 15.1 ± 28.0 | Pass |
| MAW-4778 | 8/1/2016 | Ni-63 | 17.0 ± 2.8 | 17.2 | 12.0 ± 22.4 | Pass |
| MAW-4778 | 8/1/2016 | Sr-90 | 0.17 ± 0.28 | 0.00 | NA [c] | Pass |
| MAW-4778 | 8/1/2016 | Tc-99 | 9.50 ± 0.41 | 11.60 | 8.10 - 15.10 | Pass |
| MAW-4778 | 8/1/2016 | Cs-134 | 22.6 ± 0.4 | 23.9 | 16.7 - 31.1 | Pass |
| MAW-4778 | 8/1/2016 | Cs-137 | 0.018 ± 0.117 | 0.00 | NA [c] | Pass |
| MAW-4778 | 8/1/2016 | Co-57 | 27.6 ± 0.2 | 27.3 | 19.1 ± 35.5 | Pass |
| MAW-4778 | 8/1/2016 | Co-60 | 0.018 ± 0.090 | 0.00 | NA [c] | Pass |
| MAW-4778 | 8/1/2016 | Mn-54 | 16.2 ± 0.4 | 14.8 | 10.4 - 19.2 | Pass |
| MAW-4778 | 8/1/2016 | Zn-65 | 19.3 ± 0.7 | 17.4 | 12.2 - 22.6 | Pass |
| MAW-4778 | 8/1/2016 | K-40 | 286 ± 6 | 252 | 176 - 328 | Pass |
| MAW-4778 | 8/1/2016 | Ra-226 | 1.48 ± 0.09 | 1.33 | 0.93 - 1.73 | Pass |
| MAW-4778 | 8/1/2016 | Pu-238 | 1.09 ± 0.13 | 1.13 | 0.79 - 1.47 | Pass |
| MAW-4778 | 8/1/2016 | Pu-239/240 | 0.003 ± 0.011 | 0.016 | NA [d] | Pass |
| MAW-4778 | 8/1/2016 | U-234/233 | 1.80 ± 0.13 | 1.86 | 1.30 - 2.42 | Pass |
| MAW-4778 | 8/1/2016 | U-238 | 1.77 ± 0.13 | 1.92 | 1.34 - 2.50 | Pass |
| MAW-4778 | 8/1/2016 | Am-241 | 0.678 ± 0.086 | 0.814 | 0.570 ± 1.058 | Pass |

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: MAW (water), MAAP (air filter), MASO (soil), MAVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

[e] The laboratory properly identified the Sn-75 interfering peak in the vicinity of Co-57 and stated so in the comment field. MAPEP requires results to be reported as an activity with an uncertainty. Since the calculated uncertainty was less than the activity MAPEP interpreted the submitted result as a "false positive" resulting in a failure.

[f] Original analysis for Ni-63 failed.

[g] Reanalysis with a smaller aliquot resulted in acceptable results. An investigation is in process to identify better techniques for analyzing samples with complex matrices.

[h] MAPEP states that samples contain two fractions of Uranium; one that is soluble in concentrated $HNO^3$ and HCl acid and one that is "fundamentally insoluble in these acids". They also state that HF treatment can not assure complete dissolution. Results are consistent with measuring the soluble form.

**TABLE E-6 Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a]**

**RAD Study, ENVIRONMENTAL, INC., 2016**

| Lab Code | Date | Analysis | Laboratory Result | ERA Result | Control Limits | Acceptance |
|---|---|---|---|---|---|---|
| | | Concentration (pCi/L) | | | | |
| ERW-1392 | 4/4/2016 | Sr-89 | 43.5 ± 4.3 | 48.2 | 37.8 - 55.6 | Pass |
| ERW-1392 | 4/4/2016 | Sr-90 | 27.5 ± 1.9 | 28.5 | 20.7 - 33.1 | Pass |
| ERW-1394 [b] | 4/4/2016 | Ba-133 | 65.2 ± 3.8 | 58.8 | 48.7 - 64.9 | Fail |
| ERW-1394 [c] | 4/4/2016 | Ba-133 | 57.8 ± 5.3 | 58.8 | 48.7 - 64.9 | Pass |
| ERW-1394 | 4/4/2016 | Cs-134 | 43.7 ± 3.0 | 43.3 | 34.6 - 47.6 | Pass |
| ERW-1394 | 4/4/2016 | Cs-137 | 86.1 ± 5.3 | 78.4 | 70.6 - 88.9 | Pass |
| ERW-1394 | 4/4/2016 | Co-60 | 108 ± 44 | 102 | 91.8 - 114 | Pass |
| ERW-1394 | 4/4/2016 | Zn-65 | 240 ± 13 | 214 | 193 - 251 | Pass |
| ERW-1397 | 4/4/2016 | Gr. Alpha | 52.0 ± 2.2 | 62.7 | 32.9 - 77.8 | Pass |
| ERW-1397 | 4/4/2016 | Gr. Beta | 33.9 ± 1.2 | 39.2 | 26.0 - 46.7 | Pass |
| ERW-1400 | 4/4/2016 | I-131 | 24.7 ± 0.6 | 26.6 | 22.1 - 31.3 | Pass |
| ERW-1402 | 4/4/2016 | Ra-226 | 15.6 ± 0.5 | 15.2 | 11.3 - 17.4 | Pass |
| ERW-1402 | 4/4/2016 | Ra-228 | 5.28 ± 0.76 | 5.19 | 3.12 - 6.93 | Pass |
| ERW-1403 | 4/4/2016 | Uranium | 4.02 ± 0.42 | 4.64 | 3.39 - 5.68 | Pass |
| ERW-1405 | 4/4/2016 | H-3 | 8,150 ± 270 | 7,840 | 6,790 - 8,620 | Pass |
| SPW-2845 | 7/7/2015 | Ba-133 | 60.3 ± 5.7 | 64.7 | 53.9 - 71.2 | Pass |
| SPW-2845 | 7/7/2015 | Cs-134 | 48.8 ± 9.3 | 50.1 | 40.3 - 55.1 | Pass |
| SPW-2845 | 7/7/2015 | Cs-137 | 101 ± 8 | 89.8 | 80.8 - 101 | Pass |
| SPW-2845 | 7/7/2015 | Co-60 | 65.1 ± 5.8 | 59.9 | 53.9 - 68.4 | Pass |
| SPW-2845 | 7/7/2015 | Zn-65 | 288 ± 29 | 265 | 238 - 310 | Pass |
| ERW-3485 | 7/11/2016 | Sr-89 | 43.3 ± 6.5 | 53.3 | 42.3 - 60.9 | Pass |
| ERW-3485 | 7/11/2016 | Sr-90 | 39.0 ± 2.8 | 39.2 | 28.8 - 45.1 | Pass |
| ERW-3487 | 7/11/2016 | Ba-133 | 83.3 ± 4.9 | 82.9 | 69.7 - 91.2 | Pass |
| ERW-3487 | 7/11/2016 | Cs-134 | 62.5 ± 4.4 | 65.3 | 53.1 - 71.8 | Pass |
| ERW-3487 | 7/11/2016 | Cs-137 | 98.1 ± 5.6 | 95.2 | 85.7 - 107 | Pass |
| ERW-3487 | 7/11/2016 | Co-60 | 122 ± 5 | 117 | 105 - 131 | Pass |
| ERW-3487 | 7/11/2016 | Zn-65 | 124 ± 9 | 113 | 102 - 134 | Pass |
| ERW-3490 | 7/11/2016 | Gr. Alpha | 46.6 ± 2.2 | 48.1 | 25.0 - 60.5 | Pass |
| ERW-3490 | 7/11/2016 | Gr. Beta | 26.8 ± 1.1 | 28.6 | 18.2 - 36.4 | Pass |
| ERW-3492 | 7/11/2016 | I-131 | 23.7 ± 1.0 | 24.9 | 20.7 - 29.5 | Pass |
| ERW-3493 | 7/11/2016 | Ra-226 | 12.9 ± 0.4 | 12.3 | 9.2 - 14.2 | Pass |
| ERW-3493 | 7/11/2016 | Ra-228 | 5.8 ± 0.8 | 5.8 | 3.5 - 7.6 | Pass |
| ERW-3493 | 7/11/2016 | Uranium | 32.8 ± 0.8 | 25.2 | 28.4 - 39.3 | Pass |
| ERW-3495 | 7/11/2016 | H-3 | 12,400 ± 334 | 12,400 | 10,800 - 13,600 | Pass |

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

[b] No reason determined for failure of Ba-133 result.

[c] The result of reanalysis (Compare to original result, footnoted "b" above).

# APPENDIX F

# ERRATA DATA

There is no errata data for 2016.

# APPENDIX G

# ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

Docket No: 50-277
50-278

# PEACH BOTTOM ATOMIC POWER STATION
# UNITS 2 and 3

Annual Radiological Groundwater
Protection Program Report (ARGPPR)

January 1 through December 31, 2016

**Prepared By**
Teledyne Brown Engineering
Environmental Services

Exelon Generation.

Peach Bottom Atomic Power Station
Delta, PA 17314

**May 2017**

## Table of Contents

Appendices

## I. Summary and Conclusions

This report on the Radiological Groundwater Protection Program (RGPP) conducted for the Peach Bottom Atomic Power Station (PBAPS) by Exelon Nuclear covers the period 01 January 2016 through 31 December 2016. This evaluation involved numerous station personnel and contractor support personnel. At PBAPS, there are 31 permanent groundwater monitoring wells. Installation of the wells began in 2006. Of these monitoring locations, none were assigned to the station's Radiological Environmental Monitoring Program (REMP). This is the tenth in a series of annual reports on the status of the RGPP conducted at PBAPS. This report covers groundwater, surface water, seep water, and precipitation water samples collected from the environment on station property in 2016. During that time period, 1,411 analyses were performed on more than 336 samples from 41 locations. These 41 locations include 27 groundwater monitoring wells, 3 surface water sample points, 3 groundwater seeps and 2 yard drain sumps (groundwater) and 6 precipitation water sampling points. Phase 1 of the monitoring was part of a comprehensive study initiated by Exelon to determine whether groundwater or surface water in the vicinity of PBAPS had been adversely impacted by any releases of radionuclides. Phase 1 was conducted by Conestoga Rovers and Associates (CRA) and the conclusions were made available to state and federal regulators as well as the public. Phase 2 of the RGPP was conducted by Exelon corporate and station personnel to initiate follow up of Phase 1 and begin long-term monitoring at groundwater and surface water locations selected during Phase 1. All analytical results from Phase 2 monitoring are reported herein.

Samples supporting the RGPP were analyzed for Tritium, Strontium-89 (Sr-89), Strontium-90 (Sr-90), gross alpha, gross beta, and gamma-emitting radionuclides associated with licensed plant operations and isotopes known as 'hard to detects'.

In assessing all the data gathered for this report, it was concluded that the operation of PBAPS had no adverse radiological impact on the environment and there are currently no known active releases into the groundwater at PBAPS.

Tritium was not detected at any location in concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission [NRC] Reporting Limit) of 20,000 pCi/L.

Tritium was not detected at concentrations greater than the minimum detectable concentration (MDC) in any surface water, seep water or precipitation water sample locations. Based on the sample data tritium is not migrating off the station property at detectable concentrations.

## II. Introduction

PBAPS is located along the Susquehanna River between Holtwood and Conowingo Dams in Peach Bottom Township, York County, Pennsylvania. The initial loading of fuel into Unit 1, a 40 MWe (net) high temperature gas-cooled reactor, began on 5 February 1966, and initial criticality was achieved on 3 March 1966. Shutdown of Peach Bottom Unit 1 for decommissioning was on 31 October 1974. For the purposes of the monitoring program, the beginning of the operational period for Unit 1 was considered to be 5 February 1966. A summary of the Unit 1 preoperational monitoring program was presented in a previous report [1]. PBAPS Units 2 and 3 are boiling water reactors, each with a power output of approximately 1366 MWe. The first fuel was loaded into Peach Bottom Unit 2 on 9 August 1973. Criticality was achieved on 16 September 1973 and full power was reached on 16 June 1974. The first fuel was loaded into Peach Bottom Unit 3 on 5 July 1974. Criticality was achieved on 7 August 1974 and full power was first reached on 21 December 1974. Preoperational summary reports [2][3] for Units 2 and 3 have been previously issued and summarize the results of all analyses performed on samples collected from 5 February 1966 through 8 August 1973.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2016.

### A. Objective of the RGPP

The objectives of the RGPP are as follows:

1. Ensure that the site characterization of geology and hydrology provides an understanding of predominant groundwater gradients based upon current site conditions.

2. Identify site risk based on plant design and work practices.

3. Establish an on-site groundwater monitoring program to ensure timely detection of inadvertent radiological releases to ground water.

4. Establish a remediation protocol to prevent migration of licensed material off-site and to minimize decommissioning impacts.

5. Ensure that records of leaks, spills, remediation efforts are retained and retrievable to meet the requirements of 10 CFR 50.75(g).

6. Conduct initial and periodic briefings of their site specific Groundwater Protection Initiative (GPI) program with the designated State/Local officials.

7. Make informal communication as soon as practicable to appropriate

State/Local officials, with follow-up notifications to the NRC, as appropriate, regarding significant on-site leaks/spills into groundwater and on-site or off-site water sample results exceeding the criteria in the REMP as described in the OCDM.

8. Submit a written 30-day report to the NRC for any water sample result for on-site groundwater that is or may be used as a source of drinking water that exceeds any of the criteria in the licensee’s existing REMP/ODCM for 30-day reporting of off-site water sample results.

9. Document all on-site groundwater sample results and a description of any significant on-site leaks/spills into groundwater for each calendar year in the Annual Radiological Environmental Operating Report (AREOR) for REMP or the Annual Radioactive Effluent Release Report (ARERR).

10. Perform a self-assessment of the GPI program.

11. Conduct a review of the GPI program, including at a minimum the licensee's self-assessments, under the auspices of the Nuclear Energy Institute (NEI).

B. Implementation of the Objectives

The objectives identified have been implemented at PBAPS via Corporate and Site specific procedures. These procedures include:

1. EN-AA-407, Response to Inadvertent Releases of Licensed Materials to Groundwater, Surface Water, Soil or Engineered Structures

2. EN-AA-408, Radiological Groundwater Protection Program

3. EN-AA-408-4000, Radiological Groundwater Protection Program Implementation

4. EN-PB-408-4160, RGPP Reference Material for Peach Bottom Atomic Power Station

C. Program Description

1. Sample Collection

Sample locations can be found in Table A–1 and Figures A–1 and A–2, Appendix A.

Groundwater, Surface Water and Precipitation Water

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures. Sample locations, sample collection frequencies and analytical frequencies are controlled in accordance with approved station procedures. Contractor and/or station personnel are trained in the collection, preservation management and shipment of samples, as well as in documentation of sampling events. Analytical laboratories are subject to internal quality assurance programs, industry cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all analytical data deliverables as data are received.

Analytical data results are reviewed by both station personnel and an independent hydrogeologist for adverse trends or changes to hydrogeologic conditions.

D. Characteristics of Tritium (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." The chemical properties of tritium are essentially those of ordinary hydrogen.

Tritiated water behaves the same as ordinary water in both the environment and the body. Tritium can be taken into the body by drinking water, breathing air, eating food or absorption through skin. Once tritium enters the body it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion essentially all tritium is cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. Tritium is also produced during nuclear weapons explosions, as a by-product in reactors producing electricity and in special production reactors, where the isotopes Lithium-7 (Li-7) and/or Boron-10 (B-10) are activated to produce tritium. Like normal water, tritiated water is colorless and odorless. Tritiated water behaves chemically and physically like non-tritiated water in the subsurface and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium has a half-life of approximately 12.3 years. It decays spontaneously to Helium-3 (He-3). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium emits a low energy beta particle and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

## III. Program Description

### A. Sample Analysis

This section describes the general analytical methodologies used by TBE and Environmental Inc. Midwest Laboratories (EIML) to analyze the environmental samples for radioactivity for the PBAPS RGPP in 2016.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of gamma emitters in groundwater and surface water.

2. Concentrations of strontium in groundwater.

3. Concentrations of tritium in groundwater, surface water and precipitation water.

4. Concentrations of 'hard-to-detect' isotopes, Americium-241 (Am-241), Cerium-242/243/244 (Cm-242, Cm-243, Cm-244), Plutonium-238/239/240 (Pu-238, Pu-239, Pu-240), Uranium-233/234/235/238 (U-233, U-234, U-235, U-238), Iron-55 (Fe-55), and Nickel-64 (Ni-63) in groundwater. These analyses are required based on tritium results.

### B. Data Interpretation

The radiological data collected prior to PBAPS becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, PBAPS was considered operational at initial criticality. Several factors were important in the interpretation of the data:

1. <u>Lower Limit of Detection</u>

   The lower limit of detection (LLD) is a minimum sensitivity value that must be achieved routinely by the analytical parameter.

2. <u>Laboratory Measurements Uncertainty</u>

The estimated uncertainty in measurement of tritium in environmental samples is frequently on the order of 50% of the measurement value.

Statistically, the exact value of a measurement is expressed as a range with a stated level of confidence. The convention is to report results with a 95% level of confidence. The uncertainty comes from factors such as calibration standards, sample volume or weight measurements, and sampling uncertainty. Exelon reports the uncertainty of a measurement created by statistical process (counting error) as well as all sources of error (Total Propagated Uncertainty or TPU). Each result has two values calculated. Exelon reports the TPU by following the result with plus or minus ± the estimated sample standard deviation as TPU that is obtained by propagating all sources of analytical uncertainty in measurements.

Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the AREOR.

Gamma spectroscopy results for each type of sample were grouped as follows:

> For groundwater and surface water 12 nuclides, Manganese-54 (Mn-54), Colbalt-58/50 (Co-58, Co-60), Iron-59 (Fe-59), Zinc-65 (Zn-65), Niobium-95 (Nb-95), Zirconium-95 (Zr-95), Iodine-131 (I-131), Cerium-134/137 (Cs-134, Cs-137), Barium-140 (Ba-140) and Lanthanum-140 (La-140) are measured.

C. Background Analysis

A pre-operational REMP was conducted to establish background radioactivity levels prior to operation of the Station. The environmental media sampled and analyzed during the pre-operational REMP were atmospheric radiation, fall-out, domestic water, surface water, marine life and foodstuffs. The results of the monitoring were detailed in the report entitled PBAPS, Environs Radiation Monitoring Program, Preoperational Summary Report Units 2 and 3, September 1970- August 1973, January 1974 and PBAPS, Environs Radiation Monitoring Program, Preoperational Summary Report Units 2 and 3, June 1977. The pre-operational REMP contained analytical results from samples collected from the surface water, discharge, well and rain water.

1. Background Concentrations of Tritium

The purpose of the following discussion is to summarize background measurements of tritium in various media performed by others. Additional detail may be found by consulting references (CRA 2006)[1].

a. Tritium Production

Tritium is created in the environment from naturally occurring processes both cosmic and subterranean, as well as from anthropogenic (i.e., man-made) sources. In the upper atmosphere, "Cosmogenic" tritium is produced from the bombardment of stable nuclides and combines with oxygen to form tritiated water, which will then enter the hydrologic cycle. Below ground, "lithogenic" tritium is produced by the bombardment of natural Li present in crystalline rocks by neutrons produced by the radioactive decay of naturally abundant U and Th. Lithogenic production of tritium is usually negligible compared to other sources due to the limited abundance of Li in rock. The lithogenic tritium is introduced directly to groundwater.

A major anthropogenic source of tritium and Sr-90 comes from the former atmospheric testing of thermonuclear weapons. Levels of tritium in precipitation increased significantly during the 1950s and early 1960s and later with additional testing, resulting in the release of significant amounts of tritium to the atmosphere. The Canadian heavy water nuclear power reactors, other commercial power reactors, nuclear research and weapons production continue to influence tritium concentrations in the environment.

b. Precipitation Data

Precipitation samples are routinely collected at stations around the world for the analysis of tritium and other radionuclides. Two publicly available databases that provide tritium concentrations in precipitation are Global Network of Isotopes in Precipitation (GNIP) and USEPA's RadNet database. GNIP provides tritium precipitation concentration data for samples collected worldwide from 1960 to 2006. RadNet provides tritium precipitation concentration data for samples collected at stations throughout the U.S. from 1960 up to and including 2006. Based on GNIP data for sample stations located in the U.S. Midwest, tritium concentrations peaked around 1963. This peak, which approached 10,000 pCi/L for some stations, coincided with the atmospheric testing of thermonuclear weapons. Tritium concentrations in surface water showed a sharp decline up until 1975 followed by a gradual decline since that time. Tritium concentrations have typically been below 100 pCi/L since around 1980. Tritium concentrations in wells may still be above the 200 pCi/L detection limit from the external causes described above. Water from previous years and decades is naturally captured in groundwater, so some well water sources today are affected by the surface water from the 1960s that was elevated in tritium.

c. Surface Water Data

Surface water level measurements were collected at the surface water monitoring locations during the groundwater level measurement event. The purpose of the surface water monitoring was to provide surface water elevation data to evaluate the groundwater/surface water interaction at the Station.

The USEPA RadNet surface water data typically has a reported 'Combined Standard Uncertainty' of 35 to 50 pCi/L. According to USEPA, this corresponds to a ± 70 to 100 pCi/L 95% confidence bound on each given measurement. Therefore, the typical background data provided may be subject to measurement uncertainty of approximately ± 70 to 100 pCi/L.

The radio-analytical laboratory is counting tritium results to an Exelon specified LLD of 200 pCi/L. Typically, the lowest positive measurement will be reported within a range of 40 – 240 pCi/L or 140 ± 100 pCi/L. Clearly, these sample results cannot be distinguished as different from background at this concentration.

## IV. Results and Discussion

### A. Groundwater Results

Groundwater

Samples were collected from on-site wells throughout the year in accordance with the station radiological groundwater protection program.

Analytical results and anomalies are discussed below.

Tritium

Samples from 41 locations were analyzed for tritium activity (Tables B-I.1, B-II.1 and B-III.1, Appendix B). Tritium values ranged from the detection limit to 11,000 pCi/L. Tritium was not detected in wells at or near the owner-controlled boundary. The location most representative of potential offsite user of drinking water is less than the MDC (Table B-I.1, Appendix B).

Low levels of tritium were detected at concentrations greater than the minimum detectable concentration (MDC) in 11 of 27 groundwater monitoring wells and 1 yard drain sump location. The tritium concentrations ranged from 181 pCi/L to 11,000 pCi/L (Table B–I.1, Appendix B).

No tritium was detected in any surface water samples (Table B–II.1, Appendix B). No tritium was detected in any precipitation water samples (Table B–III.1, Appendix B).

Sr

Sr-89 and Sr-90 were not detected in any of the samples (Table B-I.1, Appendix B).

Gross Alpha and Gross Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater samples during 2016.

Gross Alpha (dissolved) was detected in 6 of 24 groundwater locations analyzed. The concentrations ranged from 1.5 to 14.6 pCi/L.

Gross Alpha (suspended) was detected in 9 of 24 groundwater locations analyzed. The concentrations ranged from 1.3 to 13.9 pCi/L.

Gross Beta (dissolved) was detected in 24 of 24 groundwater locations analyzed. The concentrations ranged from 1.2 to 50.7 pCi/L.

Gross Beta (suspended) was detected in 6 of 24 groundwater locations analyzed. The concentrations ranged from 1.6 to 12.1 pCi/L.

The activity detected is consistent with historical levels. The activity detected is naturally occurring and the levels are considered to be background (Table B-I.1, Appendix B).

Hard-To-Detect

Hard-To-Detect analyses were performed on a select group of groundwater and surface water locations to establish baseline levels. The analyses for groundwater included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238.

U-234 was detected in 7 of 24 groundwater monitoring locations analyzed. The concentrations ranged from 0.22 to 15.07 pCi/L.

U-235 was detected in 1 of 24 groundwater monitoring locations analyzed. The concentrations was 0.45 pCi/L.

U-238 was detected in 7 of 24 groundwater monitoring locations analyzed. The concentrations ranged from 0.21 to 13.71 pCi/L. No plant-produced radionuclides were detected.

The activity detected is naturally occurring and the levels are considered to be background (Table B–I.3, Appendix B).

Gamma Emitters

No power-production gamma emitters were detected in any of the samples (Table B–I.2, Appendix B).

B. Surface Water Results

Surface Water

Samples were collected from surface water locations throughout the year in accordance with the station radiological groundwater protection program. Analytical results are discussed below.

Tritium

Samples from three locations were analyzed for tritium activity. Tritium was not detected in any samples (Table B–II.1, Appendix B).

Gamma Emitters

No power-production gamma emitters were detected in any of the samples. No other gamma emitting nuclides were detected (Table B–II.2, Appendix B).

C. Precipitation Water Results

Precipitation Water

Samples were collected at six locations (1A, 1B, 1S, 1SSE, 1Z, and 4M) in accordance with the station radiological groundwater protection program. The following analysis was performed:

Tritium

Samples from six locations were analyzed for tritium activity. Tritium activity was not detected in any samples (Table B-III.1, Appendix B).

D. Drinking Water Well Survey

A drinking water well survey was conducted during the summer 2006 by CRA (CRA 2006)(1) around PBAPS. The water well inventory was updated in 2012(4). The updated water well database search indicated a new water well off Station property within a one mile radius of the Station. The well is described as a “test” well and its use is listed as “unused”. In summary, there were no significant changes in off Station groundwater use from 2006-2012.

E. Summary of Results – Inter-Laboratory Comparison Program

Inter-Laboratory Comparison Program results for TBE and Environmental Inc. (Midwest Labs) are presented in the AREOR.

F. Leaks, Spills and Releases

There were no inadvertent leaks, spills or releases of water containing licensed material to the environment in 2016.

G. Trends

A tritium plume has been identified northeast of the Unit 3 Turbine Building. The plume extends eastward toward well MW-PB-4. The plume is bounded on the north by wells MW-PB-12 and MW-PB-22. The plume is bounded on the south by wells MW-PB-20 and MW-PB-21.

The tritium plume is a result of licensed material entering the groundwater through degraded floor seams and penetration seals in the Unit 3 Turbine Building. The activity currently detected in the Unit 3 Turbine Building monitoring wells, MW-PB-24, 25, 26 and 27, is the result of legacy licensed material under the turbine building being transported eastward by natural hydrogeologic groundwater flow.

Tritium activity in the Unit 3 Turbine Building monitoring wells are trended. Any adverse trend is captured in the Station's Corrective Action Program.

H. Investigations

MW-PB-4

In 2006, monitoring wells MW-PB-1 through MW-PB-14 were installed. Tritium activity was detected in MW-PB-4, located north of the Unit 3 Circulating Water Pump Structure and MW-PB-12, north of the Administration Building. Groundwater flow on site is from west to east. Monitoring wells were installed to the west, southwest and northwest of monitoring wells MW-PB-4 and MW-PB-12. The wells with the highest tritium activity are the wells installed directly east of and adjacent to the Unit 3 Turbine Building, wells MW-PB-24, 25, 26 and 27.

Investigation of potential sources identified that the likely source of groundwater contamination was due to degraded floor seams in the Unit 3 Turbine Building Moisture Separator area 116' elevation. Leaks internal to the building entered the groundwater through the degraded floor seams. The floor seams were repaired in August 2010. The floor in the Unit 3 Turbine Building Moisture Separator area 116' elevation was sealed and recoated in October 2011.

MW-PB-29, 30 and 31

An extent-of-condition inspection of the Unit 2 Turbine Building Moisture Separator area 116' elevation floor was performed in October 2010. Minor degradation of the floor seams was identified and repaired. In May 2011, monitoring wells MW-PB-29 and 30 were installed directly east of and adjacent to the Unit 2 Turbine Building; MW-PB-31 was installed southeast of and adjacent to the Unit 2 Turbine Building. These wells were installed to determine if a condition existed east of the Unit 2 Turbine Building that is similar to the condition east of the Unit 3 Turbine Building.

Tritium activity in these wells ranged from less than the MDC to 696 pCi/L. Samples from these wells were also analyzed for gamma-emitting isotopes and hard-to-detect radionuclides. All results are less than the MDC for each isotope.

The Unit 2 Turbine Building Moisture Separator floor 116' elevation floor was sealed and recoated in October 2012. Groundwater intrusion into a ventilation pit on the east side of the area was identified. The groundwater was removed and degraded seams in the ventilation pit were successfully repaired.

MW-PB-24, 25, 26 and 27

Wells MW-PB-24, 25, 26 and 27 are considered the wells of primary interest. These wells were sampled on a frequency ranging from weekly to quarterly. Below are 3 tables. The first lists the highest tritium activity of the wells of primary interest and the date of the sampling. The second table lists the highest tritium activity of the wells during 2016. The third table lists the activity of the wells from the last sampling of 2016. The tritium activity is in pCi/L.

| Well # | Tritium Activity | Date |
|---|---|---|
| MW-PB-24 | 33,500 | 3/15/2010 |
| MW-PB-25 | 161,000 | 3/8/2010 |
| MW-PB-26 | 196,000 | 3/8/2010 |
| MW-PB-27 | 71,800 | 2/22/2010 |

| Well # | Tritium Activity | Date |
|---|---|---|
| MW-PB-24 | 3,270 | 8/23/2016 |
| MW-PB-25 | 11,00 | 4/5/2016 |
| MW-PB-26 | 401 | 4/26/2016 |
| MW-PB-27 | 1,830 | 4/26/2016 |

| Well # | Tritium Activity | Date |
|---|---|---|
| MW-PB-24 | 246 | 11/30/2016 |
| MW-PB-25 | 5,150 | 11/30/2016 |
| MW-PB-26 | 345 | 11/30/2016 |
| MW-PB-27 | 892 | 11/30/2016 |

Potential sources of tritium in the groundwater are investigated via procedural processes and documented in the corrective action program. The most likely pathway for tritium to enter the groundwater has been determined to be leaks internal to the Unit 3 Turbine Building Moisture Separator 116', migrating through degraded floor seams or other unidentified openings in the floor.

I. Actions Taken

1. Unit 3 Turbine Building Moisture Separator area 116’ – A primary system leak past HV-3-01A-32044B was repaired, preventing water from accumulating (retired PIMS Work Order C0259275).
   Unit 2 Turbine Building Moisture Separator area 116' - Blank floor drain covers were replaced with slotted floor drain covers (Issue Report 2733795).
   Unit 2 Turbine Building Moisture Separation area 116' - Degradation around a floor drain was repaired (Issue Report 2733799).

2. Installation of Monitoring Wells

   No groundwater monitoring wells were installed in 2016.

3. Actions to Recover/Reverse Plumes

   There were no actions to recover the plume.

J. Deviations

The data tables show that duplicate samples were obtained at several wells during 2016. These duplicate samples were obtained and analyzed for quality control purposes.

For the U/2 Yard Drain sample taken 04/19/16, TBE's lab was unable to reach the client-required detection limits due to its age at the time of analysis for the following nuclides: Co-58, Fe-59, Zn-65, Nb-95, Zr-95, I-131, Ba-140, and La-140. The sample was received on 05/03/16 and gamma was not originally requested on the paperwork received with the sample. The analysis was done promptly upon discovery of the omission and the sample was counted for 891 minutes to achieve the lowest possible MDC.

Due to regional drought conditions, seep SP-PB-3, located west of the Low Level RadWaste Storage Facility was dry during the 4$^{th}$ quarter of 2016. No sample was obtained or analyzed.

## V. References


1. Conestoga Rovers and Associates, Fleetwide Assessment, Peach Bottom Atomic Power Station, Delta, PA, Fleetwide Assessment, Rev. 1, September 1, 2006.

2. Peach Bottom Atomic Power Station, Environs Radiation Monitoring Program, Preoperational Summary Report units 2 and 3, June 1977.

3. Peach Bottom Atomic Power Station, Environs Radiation Monitoring Program, Preoperational Summary Report units 2 and 3, September 1970-August 1973, January 1974.

4. Conestoga Rovers and Associates, Hydrogeologic Investigation Report, Peach Bottom Atomic Power Station, November 2012.

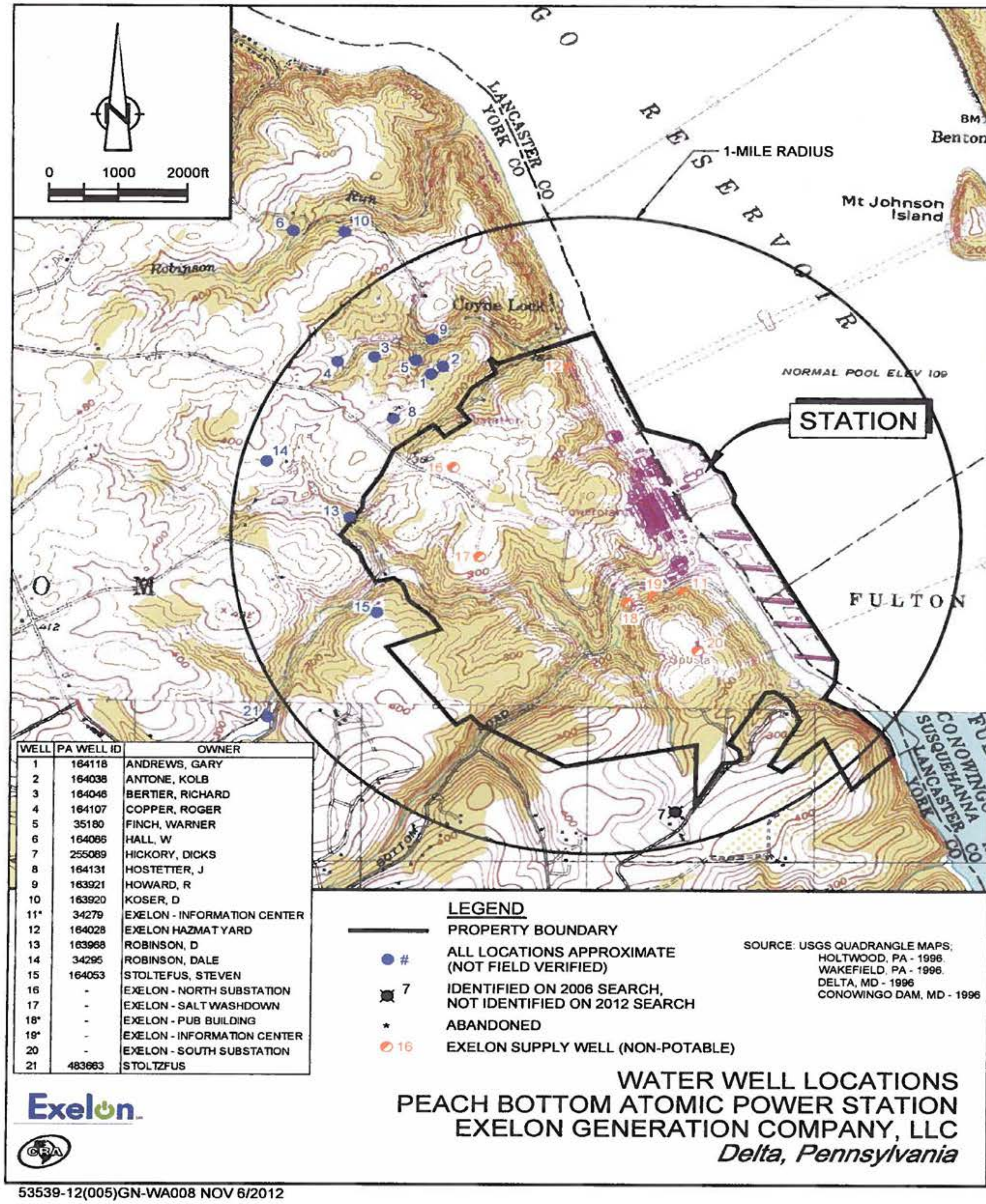
5. AMO Environmental Decisions, 2016 RGPP Summary Monitoring Reports, April 2016, August 2016, October 2016 and February 2017.

# APPENDIX A

# SAMPLING LOCATIONS, DISTANCE AND DIRECTION

TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Distance and Direction, Peach Bottom Atomic Power Station, 2016

| Site | Site Type | Sector | Distance (ft.) |
|---|---|---|---|
| MW-PB-1 | Groundwater Well | SW | 1,166.6 |
| MW-PB-2 | Groundwater Well | WNW | 309.0 |
| MW-PB-3 | Groundwater Well | SSE | 709.7 |
| MW-PB-4 | Groundwater Well | ENE | 350.2 |
| MW-PB-5 | Groundwater Well | NNW | 1,146.1 |
| MW-PB-6 | Groundwater Well | NE | 1,072.4 |
| MW-PB-7 | Groundwater Well | SE | 813.9 |
| MW-PB-8 | Groundwater Well | SE | 1,167.0 |
| MW-PB-9 | Groundwater Well | SE | 2,816.9 |
| MW-PB-10 | Groundwater Well | SSE | 1,125.1 |
| MW-PB-11 | Groundwater Well | SE | 438.4 |
| MW-PB-12 | Groundwater Well | NNE | 317.2 |
| MW-PB-13 | Groundwater Well | NW | 329.4 |
| MW-PB-14 | Groundwater Well | S | 1,231.2 |
| MW-PB-15 | Groundwater Well | SE | 1,087.9 |
| MW-PB-16 | Groundwater Well | SE | 1,101.6 |
| MW-PB-17 | Groundwater Well | SE | 1,005.4 |
| MW-PB-18 | Groundwater Well | SE | 1,010.0 |
| MW-PB-19 | Groundwater Well | NW | 226.8 |
| MW-PB-20 | Groundwater Well | E | 260.5 |
| MW-PB-21 | Groundwater Well | E | 363.3 |
| MW-PB-22 | Groundwater Well | NE | 315.4 |
| MW-PB-24 | Groundwater Well | N | 185.9 |
| MW-PB-25 | Groundwater Well | N | 159.7 |
| MW-PB-26 | Groundwater Well | NNE | 121.1 |
| MW-PB-27 | Groundwater Well | NNE | 139.1 |
| MW-PB-28 | Groundwater Well | NW | 249.6 |
| MW-PB-29 | Groundwater Well | SE | 325.0 |
| MW-PB-30 | Groundwater Well | SE | 379.2 |
| MW-PB-31 | Groundwater Well | SE | 450.1 |
| SW-PB-1 | Surface Water | NNW | 2,850.5 |
| SW-PB-5 | Surface Water | SE | 675.1 |
| SW-PB-6 | Surface Water | SE | 1,305.9 |
| SP-PB-1 | Groundwater Seep | S | 514.2 |
| SP-PB-2 | Groundwater Seep | WNW | 311.6 |
| SP-PB-3 | Groundwater Seep | NNW | 1,281.1 |
| U/2 YARD DRAIN SUMP | Groundwater | SSE | 498.7 |
| U/3 YARD DRAIN SUMP | Groundwater | WSW | 175.8 |
| 1A | Precipitation Water | ESE | 1,271 |
| 1B | Precipitation Water | NW | 2,587 |
| 1S | Precipitation Water | S | 1,315 |
| 1SSE | Precipitation Water | SSE | 1,312 |
| 1Z | Precipitation Water | SE | 1,763 |
| 4M | Precipitation Water | SE | 45,989 |




| WELL | PA WELL ID | OWNER |
|---|---|---|
| 1 | 164118 | ANDREWS, GARY |
| 2 | 164038 | ANTONE, KOLB |
| 3 | 164046 | BERTIER, RICHARD |
| 4 | 164107 | COPPER, ROGER |
| 5 | 35180 | FINCH, WARNER |
| 6 | 164086 | HALL, W |
| 7 | 255089 | HICKORY, DICKS |
| 8 | 164131 | HOSTETTER, J |
| 9 | 163921 | HOWARD, R |
| 10 | 163920 | KOSER, D |
| 11* | 34279 | EXELON - INFORMATION CENTER |
| 12 | 164028 | EXELON HAZMAT YARD |
| 13 | 163968 | ROBINSON, D |
| 14 | 34295 | ROBINSON, DALE |
| 15 | 164053 | STOLTEFUS, STEVEN |
| 16 | - | EXELON - NORTH SUBSTATION |
| 17 | - | EXELON - SALT WASHDOWN |
| 18* | - | EXELON - PUB BUILDING |
| 19* | - | EXELON - INFORMATION CENTER |
| 20 | - | EXELON - SOUTH SUBSTATION |
| 21 | 483663 | STOLTZFUS |

Figure A-1
Well Water Locations, Peach Bottom Atomic Power Station, 2016

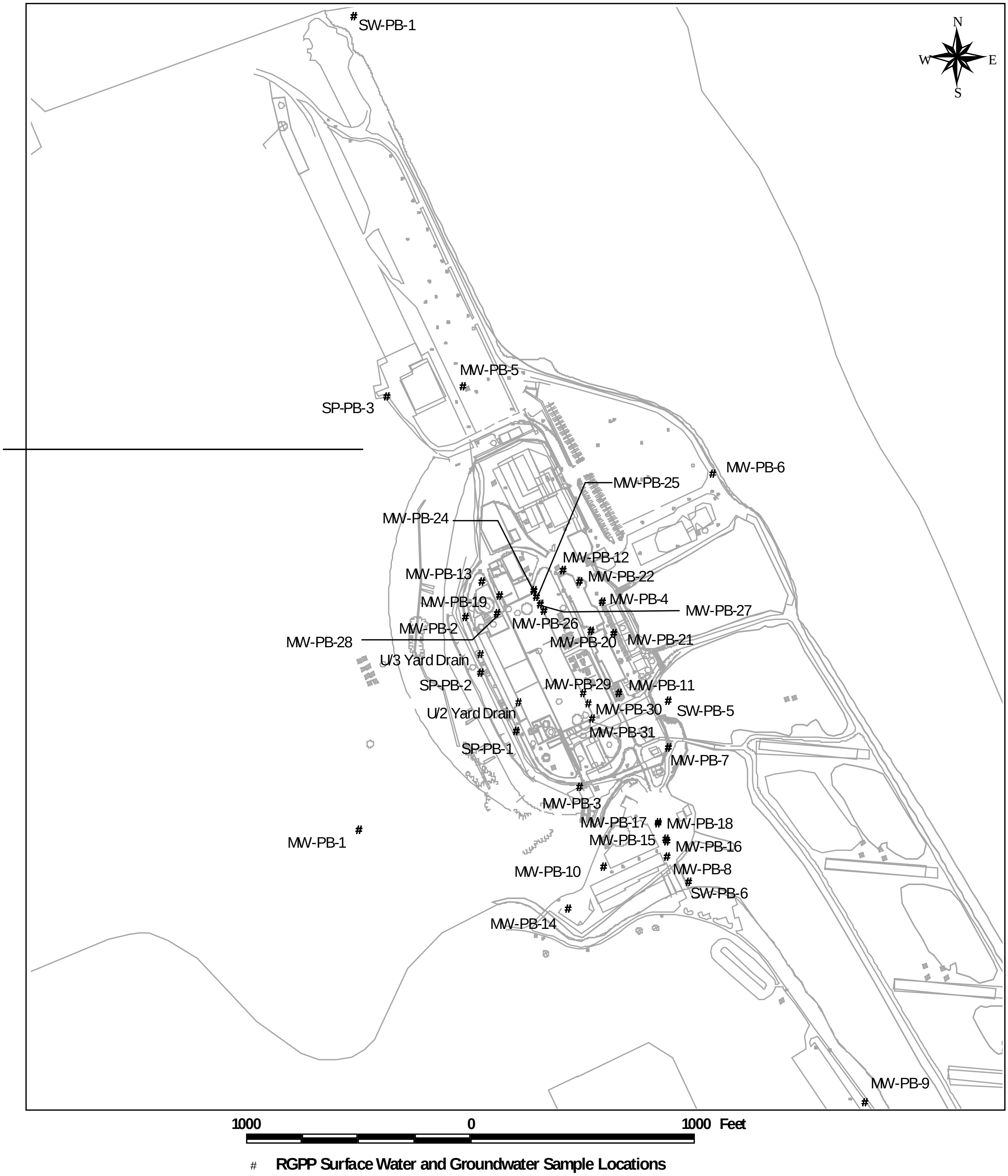



Figure A-2
RGPP Monitoring Locations, Peach Bottom Atomic Power Station, 2016

# APPENDIX B

# DATA TABLES

**TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER AND SEEP SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | | H-3 | Sr-89 | Sr-90 | Gr-A (Dis) | Gr-A (Sus) | Gr-B (Dis) | Gr-B (Sus) |
|---|---|---|---|---|---|---|---|---|---|
| MW-PB-1 | 04/26/16 | TBE | < 193 | | | | | | |
| MW-PB-1 | 04/26/16 | TBE | < 181 | | | | | | |
| MW-PB-1 | 04/26/16 | EIML | < 147 | | | | | | |
| MW-PB-2 | 02/02/16 | | < 194 | | | | | | |
| MW-PB-2 | 04/25/16 | | < 194 | < 5.3 | < 0.5 | 2.1 ± 0.7 | < 1.3 | 5.3 ± 0.8 | < 2.3 |
| MW-PB-2 | 07/26/16 | | < 171 | | | | | | |
| MW-PB-2 | 10/11/16 | | < 181 | | | | | | |
| MW-PB-3 | 02/02/16 | | < 195 | | | | | | |
| MW-PB-3 | 04/25/16 | | < 191 | < 8.5 | < 0.5 | < 0.6 | 2.2 ± 0.9 | 1.3 ± 1 | 1.6 ± 1.1 |
| MW-PB-3 | 07/26/16 | | < 171 | | | | | | |
| MW-PB-3 | 10/11/16 | | < 181 | | | | | | |
| MW-PB-4 | 02/02/16 | | 241 ± 131 | | | | | | |
| MW-PB-4 | 02/02/16 | | < 200 | | | | | | |
| MW-PB-4 | 04/26/16 | | < 192 | < 6.0 | < 0.6 | < 3.7 *(1)* | < 0.8 | 9.1 ± 1.7 | < 1.6 |
| MW-PB-4 | 07/27/16 | | 211 ± 114 | | | | | | |
| MW-PB-4 | 10/11/16 | TBE | < 181 | | | | | | |
| MW-PB-4 | 10/11/16 | TBE | < 183 | | | | | | |
| MW-PB-4 | 10/11/16 | EIML | 243 ± 88 | | | | | | |
| MW-PB-5 | 04/25/16 | | < 194 | | | | | | |
| MW-PB-6 | 04/25/16 | | < 194 | | | | | | |
| MW-PB-7 | 02/03/16 | | < 194 | | | | | | |
| MW-PB-7 | 04/25/16 | TBE | < 177 | < 4.4 | < 0.4 | < 2.2 | < 0.8 | 10.0 ± 1.7 | < 1.6 |
| MW-PB-7 | 04/25/16 | TBE | < 191 | < 7.9 | < 0.6 | < 2.3 | < 0.8 | 10.9 ± 1.7 | < 1.6 |
| MW-PB-7 | 04/25/16 | EIML | < 147 | < 0.9 | < 0.5 | 1.5 ± 1.1 *(2)* | | 5.1 ± 0.8 *(2)* | |
| MW-PB-7 | 07/25/16 | | < 166 | | | | | | |
| MW-PB-7 | 10/12/16 | | < 184 | | | | | | |
| MW-PB-8 | 02/03/16 | | < 179 | | | | | | |
| MW-PB-8 | 04/26/16 | | < 195 | < 9.4 | < 0.4 | < 2.3 | 1.9 ± 0.9 | 23.5 ± 2.1 | < 1.6 |
| MW-PB-8 | 07/25/16 | | < 168 | | | | | | |
| MW-PB-8 | 10/12/16 | | < 181 | | | | | | |
| MW-PB-10 | 02/03/16 | | < 193 | | | | | | |
| MW-PB-10 | 04/25/16 | | < 192 | < 4.4 | < 0.5 | < 6.6 *(1)* | 6.4 ± 2.2 | 9.9 ± 4.2 | 7.8 ± 2.8 |
| MW-PB-10 | 07/25/16 | | < 165 | | | | | | |
| MW-PB-10 | 10/12/16 | | < 180 | | | | | | |
| MW-PB-11 | 02/02/16 | | < 196 | | | | | | |
| MW-PB-11 | 04/25/16 | | < 192 | < 6.6 | < 0.4 | < 4.4 *(1)* | 13.9 ± 3.2 | 6.7 ± 3.2 | 12.1 ± 5.4 |
| MW-PB-11 | 07/27/16 | | < 171 | | | | | | |
| MW-PB-11 | 10/11/16 | | < 182 | | | | | | |
| MW-PB-12 | 02/02/16 | | < 194 | | | | | | |
| MW-PB-12 | 04/27/16 | | < 191 | < 5.2 | < 0.5 | < 1.0 | < 0.8 | 1.2 ± 0.7 | < 1.6 |
| MW-PB-12 | 07/27/16 | TBE | 250 ± 112 | | | | | | |
| MW-PB-12 | 07/27/16 | *TBE- Orig* | 220 ± 113 | | | | | | |
| MW-PB-12 | 07/27/16 | *TBE - R1* | 181 ± 108 | | | | | | |
| MW-PB-12 | 07/27/16 | EIML | < 150 | | | | | | |
| MW-PB-12 | 11/30/16 | | 245 ± 128 | | | | | | |
| MW-PB-13 | 02/02/16 | | 248 ± 128 | | | | | | |
| MW-PB-13 | 04/25/16 | | < 192 | < 5.1 | < 0.7 | 14.6 ± 6.4 | < 4.0 | 27.3 ± 7.8 | < 3.6 |
| MW-PB-13 | 07/26/16 | | < 169 | | | | | | |
| MW-PB-13 | 10/11/16 | | < 185 | | | | | | |
| MW-PB-14 | 04/26/16 | | < 195 | | | | | | |
| MW-PB-15 | 02/03/16 | | < 181 | | | | | | |
| MW-PB-15 | 04/25/16 | | < 193 | < 4.0 | < 0.5 | < 1.5 | < 0.9 | 8.8 ± 1.2 | < 1.6 |
| MW-PB-15 | 07/25/16 | | < 167 | | | | | | |
| MW-PB-15 | 10/12/16 | | < 184 | | | | | | |
| MW-PB-16 | 02/03/16 | | < 178 | | | | | | |

**TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER AND SEEP SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | | H-3 | Sr-89 | Sr-90 | Gr-A (Dis) | Gr-A (Sus) | Gr-B (Dis) | Gr-B (Sus) |
|---|---|---|---|---|---|---|---|---|---|
| MW-PB-16 | 04/25/16 | | < 194 | < 5.1 | < 0.6 | 3.5 ± 1.1 | 1.8 ± 0.9 | 8.3 ± 1.0 | < 1.6 |
| MW-PB-16 | 07/25/16 | *Original* | 180 ± 111 | | | | | | |
| MW-PB-16 | 07/25/16 | *Recount* | < 173 | | | | | | |
| MW-PB-16 | 10/12/16 | | < 183 | | | | | | |
| MW-PB-19 | 02/02/16 | | < 196 | | | | | | |
| MW-PB-19 | 04/25/16 | | < 189 | < 3.3 | < 0.4 | < 1.0 | 3.0 ± 1.2 | 2.9 ± 0.7 | 4.0 ± 1.3 |
| MW-PB-19 | 07/26/16 | | < 167 | | | | | | |
| MW-PB-19 | 08/27/16 | | < 178 | | | | | | |
| MW-PB-19 | 10/11/16 | TBE | < 179 | | | | | | |
| MW-PB-19 | 10/11/16 | TBE | < 182 | | | | | | |
| MW-PB-19 | 10/11/16 | EIML | < 181 | | | | | | |
| MW-PB-20 | 02/02/16 | | < 195 | | | | | | |
| MW-PB-20 | 04/25/16 | | < 194 | < 4.5 | < 0.7 | < 5.5 *(1)* | < 0.9 | 11.3 ± 2.0 | < 1.6 |
| MW-PB-20 | 07/27/16 | | < 162 | | | | | | |
| MW-PB-20 | 10/11/16 | | < 182 | | | | | | |
| MW-PB-21 | 02/02/16 | | < 198 | | | | | | |
| MW-PB-21 | 04/26/16 | | < 192 | < 9.7 | < 0.9 | < 4.7 *(1)* | < 0.9 | 50.7 ± 3.0 | < 1.6 |
| MW-PB-21 | 07/27/16 | | < 161 | | | | | | |
| MW-PB-21 | 10/11/16 | | < 181 | | | | | | |
| MW-PB-22 | 02/02/16 | | 507 ± 143 | | | | | | |
| MW-PB-22 | 04/26/16 | | 581 ± 136 | < 6.4 | < 0.6 | < 1.3 | < 0.9 | 3.5 ± 0.9 | < 1.6 |
| MW-PB-22 | 07/27/16 | TBE | 745 ± 136 | | | | | | |
| MW-PB-22 | 07/27/16 | TBE | 702 ± 133 | | | | | | |
| MW-PB-22 | 07/27/16 | EIML | 733 ± 106 | | | | | | |
| MW-PB-22 | 10/11/16 | | 429 ± 133 | | | | | | |
| MW-PB-24 | 02/02/16 | | < 200 | | | | | | |
| MW-PB-24 | 03/03/16 | | 232 ± 130 | | | | | | |
| MW-PB-24 | 03/29/16 | | 229 ± 109 | | | | | | |
| MW-PB-24 | 04/05/16 | | 186 ± 115 | | | | | | |
| MW-PB-24 | 04/12/16 | | 255 ± 125 | | | | | | |
| MW-PB-24 | 04/19/16 | | < 192 | | | | | | |
| MW-PB-24 | 04/26/16 | | 305 ± 114 | < 6.3 | < 0.4 | < 2.1 | < 1.1 | 5.3 ± 1.2 | < 1.7 |
| MW-PB-24 | 05/02/16 | | 250 ± 125 | | | | | | |
| MW-PB-24 | 05/11/16 | *Original* | 1010 ± 173 | | | | | | |
| MW-PB-24 | 05/11/16 | *Recount* | 833 ± 152 | | | | | | |
| MW-PB-24 | 05/11/16 | *Rerun* | 800 ± 149 | | | | | | |
| MW-PB-24 | 05/17/16 | | 567 ± 134 | | | | | | |
| MW-PB-24 | 05/25/16 | | 592 ± 141 | | | | | | |
| MW-PB-24 | 06/01/16 | | 1060 ± 175 | | | | | | |
| MW-PB-24 | 06/08/16 | | 1320 ± 197 | | | | | | |
| MW-PB-24 | 06/15/16 | | 1010 ± 173 | | | | | | |
| MW-PB-24 | 06/22/16 | | 275 ± 121 | | | | | | |
| MW-PB-24 | 06/29/16 | | 285 ± 131 | | | | | | |
| MW-PB-24 | 07/06/16 | *Original* | 1180 ± 188 | | | | | | |
| MW-PB-24 | 07/06/16 | *Rerun* | 1260 ± 198 | | | | | | |
| MW-PB-24 | 07/12/16 | | 1000 ± 173 | | | | | | |
| MW-PB-24 | 07/19/16 | | 344 ± 124 | | | | | | |
| MW-PB-24 | 07/27/16 | | 893 ± 163 | | | | | | |
| MW-PB-24 | 08/04/16 | *Original* | 1910 ± 245 | | | | | | |
| MW-PB-24 | 08/04/16 | *Rerun* | 1690 ± 229 | | | | | | |
| MW-PB-24 | 08/09/16 | | 1680 ± 229 | | | | | | |
| MW-PB-24 | 08/16/16 | | 1700 ± 234 | | | | | | |
| MW-PB-24 | 08/23/16 | *Original* | 3180 ± 373 | | | | | | |
| MW-PB-24 | 08/23/16 | *Recount* | 3040 ± 356 | | | | | | |
| MW-PB-24 | 08/23/16 | *Rerun* | 3270 ± 378 | | | | | | |

**TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER AND SEEP SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | | H-3 | Sr-89 | Sr-90 | Gr-A (Dis) | Gr-A (Sus) | Gr-B (Dis) | Gr-B (Sus) |
|---|---|---|---|---|---|---|---|---|---|
| MW-PB-24 | 08/27/16 | | 2190 ± 278 | | | | | | |
| MW-PB-24 | 09/07/16 | | 1230 ± 183 | | | | | | |
| MW-PB-24 | 09/13/16 | | 1180 ± 183 | | | | | | |
| MW-PB-24 | 09/20/16 | *Original* | 260 ± 118 | | | | | | |
| MW-PB-24 | 09/20/16 | *Recount* | 307 ± 114 | | | | | | |
| MW-PB-24 | 09/20/16 | *Rerun* | 283 ± 113 | | | | | | |
| MW-PB-24 | 09/27/16 | | 539 ± 129 | | | | | | |
| MW-PB-24 | 10/10/16 | | 362 ± 132 | | | | | | |
| MW-PB-24 | 11/14/16 | | 382 ± 139 | | | | | | |
| MW-PB-24 | 11/30/16 | | 246 ± 121 | | | | | | |
| MW-PB-25 | 02/02/16 | | 8890 ± 946 | | | | | | |
| MW-PB-25 | 03/03/16 | | 9130 ± 975 | | | | | | |
| MW-PB-25 | 03/29/16 | | 9410 ± 987 | | | | | | |
| MW-PB-25 | 04/05/16 | | 11000 ± 1150 | | | | | | |
| MW-PB-25 | 04/12/16 | | 10000 ± 1050 | | | | | | |
| MW-PB-25 | 04/19/16 | | 8970 ± 951 | | | | | | |
| MW-PB-25 | 04/26/16 | | 7560 ± 809 | < 3.7 | < 0.4 | < 1.1 | < 1.1 | 11.5 ± 1.0 | < 1.7 |
| MW-PB-25 | 05/02/16 | | 10900 ± 1150 | | | | | | |
| MW-PB-25 | 05/11/16 | | 10000 ± 1060 | | | | | | |
| MW-PB-25 | 05/17/16 | | 8030 ± 854 | | | | | | |
| MW-PB-25 | 05/25/16 | | 10400 ± 1100 | | | | | | |
| MW-PB-25 | 06/01/16 | | 7940 ± 847 | | | | | | |
| MW-PB-25 | 06/08/16 | | 7050 ± 757 | | | | | | |
| MW-PB-25 | 06/15/16 | | 6760 ± 734 | | | | | | |
| MW-PB-25 | 06/22/16 | | 7060 ± 758 | | | | | | |
| MW-PB-25 | 06/29/16 | | 8300 ± 889 | | | | | | |
| MW-PB-25 | 07/06/16 | | 7330 ± 789 | | | | | | |
| MW-PB-25 | 07/12/16 | | 8360 ± 889 | | | | | | |
| MW-PB-25 | 07/19/16 | | 5330 ± 587 | | | | | | |
| MW-PB-25 | 07/27/16 | | 7690 ± 827 | | | | | | |
| MW-PB-25 | 08/04/16 | *Original* | 3740 ± 426 | | | | | | |
| MW-PB-25 | 08/04/16 | *Rerun* | 3970 ± 451 | | | | | | |
| MW-PB-25 | 08/09/16 | | 7130 ± 765 | | | | | | |
| MW-PB-25 | 08/16/16 | | 7590 ± 815 | | | | | | |
| MW-PB-25 | 08/23/16 | *Original* | 7480 ± 799 | | | | | | |
| MW-PB-25 | 08/23/16 | *Recount* | 8090 ± 855 | | | | | | |
| MW-PB-25 | 08/23/16 | *Rerun* | 7310 ± 778 | | | | | | |
| MW-PB-25 | 08/27/16 | | 7610 ± 815 | | | | | | |
| MW-PB-25 | 09/07/16 | | 4420 ± 490 | | | | | | |
| MW-PB-25 | 09/13/16 | | 3870 ± 442 | | | | | | |
| MW-PB-25 | 09/20/16 | *Original* | 8880 ± 934 | | | | | | |
| MW-PB-25 | 09/20/16 | *Rerun* | 7700 ± 819 | | | | | | |
| MW-PB-25 | 09/27/16 | | 4240 ± 471 | | | | | | |
| MW-PB-25 | 10/10/16 | | 5930 ± 664 | | | | | | |
| MW-PB-25 | 11/14/16 | | 9010 ± 955 | | | | | | |
| MW-PB-25 | 11/30/16 | | 5150 ± 562 | | | | | | |
| MW-PB-26 | 02/02/16 | | 247 ± 134 | | | | | | |
| MW-PB-26 | 03/03/16 | | 299 ± 134 | | | | | | |
| MW-PB-26 | 03/29/16 | | 266 ± 112 | | | | | | |
| MW-PB-26 | 04/05/16 | | 262 ± 117 | | | | | | |
| MW-PB-26 | 04/12/16 | | 211 ± 124 | | | | | | |
| MW-PB-26 | 04/19/16 | | 295 ± 130 | | | | | | |
| MW-PB-26 | 04/26/16 | TBE | 367 ± 119 | < 7.5 | < 0.5 | 1.9 ± 1.0 | 1.3 ± 0.7 | 5.4 ± 0.9 | < 1.6 |
| MW-PB-26 | 04/26/16 | TBE | 401 ± 119 | < 6.8 | < 0.6 | 1.6 ± 0.8 | < 0.8 | 3.8 ± 0.9 | < 1.6 |
| MW-PB-26 | 04/26/16 | EIML | 328 ± 93 | < 1.0 | < 0.6 | 3.9 ± 0.9 *(2)* | | 2.6 ± 0.6 *(2)* | |

**TABLE B-I.1** **CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER AND SEEP SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | | H-3 | Sr-89 | Sr-90 | Gr-A (Dis) | Gr-A (Sus) | Gr-B (Dis) | Gr-B (Sus) |
|---|---|---|---|---|---|---|---|---|---|
| MW-PB-26 | 05/02/16 | | 214 ± 124 | | | | | | |
| MW-PB-26 | 05/11/16 | | 296 ± 131 | | | | | | |
| MW-PB-26 | 05/17/16 | | 261 ± 120 | | | | | | |
| MW-PB-26 | 05/25/16 | | < 194 | | | | | | |
| MW-PB-26 | 06/01/16 | | < 179 | | | | | | |
| MW-PB-26 | 06/08/16 | | < 176 | | | | | | |
| MW-PB-26 | 06/15/16 | | 205 ± 118 | | | | | | |
| MW-PB-26 | 06/22/16 | | < 175 | | | | | | |
| MW-PB-26 | 06/29/16 | | < 190 | | | | | | |
| MW-PB-26 | 07/06/16 | *Original* | 221 ± 125 | | | | | | |
| MW-PB-26 | 07/06/16 | *Rerun* | 369 ± 133 | | | | | | |
| MW-PB-26 | 07/12/16 | | 253 ± 126 | | | | | | |
| MW-PB-26 | 07/19/16 | | < 177 | | | | | | |
| MW-PB-26 | 07/27/16 | | < 176 | | | | | | |
| MW-PB-26 | 08/04/16 | | < 172 | | | | | | |
| MW-PB-26 | 08/09/16 | | < 167 | | | | | | |
| MW-PB-26 | 08/16/16 | | < 179 | | | | | | |
| MW-PB-26 | 08/23/16 | | 187 ± 118 | | | | | | |
| MW-PB-26 | 09/07/16 | | 273 ± 118 | | | | | | |
| MW-PB-26 | 09/13/16 | | 189 ± 111 | | | | | | |
| MW-PB-26 | 09/20/16 | | 191 ± 114 | | | | | | |
| MW-PB-26 | 09/27/16 | | < 167 | | | | | | |
| MW-PB-26 | 10/10/16 | | 208 ± 132 | | | | | | |
| MW-PB-26 | 11/14/16 | | 227 ± 133 | | | | | | |
| MW-PB-26 | 11/30/16 | | 345 ± 129 | | | | | | |
| MW-PB-27 | 02/02/16 | | 836 ± 162 | | | | | | |
| MW-PB-27 | 02/02/16 | | 792 ± 159 | | | | | | |
| MW-PB-27 | 03/03/16 | | 1280 ± 202 | | | | | | |
| MW-PB-27 | 03/29/16 | | 1100 ± 170 | | | | | | |
| MW-PB-27 | 04/05/16 | | 959 ± 167 | | | | | | |
| MW-PB-27 | 04/12/16 | | 1050 ± 174 | | | | | | |
| MW-PB-27 | 04/19/16 | | 1460 ± 218 | | | | | | |
| MW-PB-27 | 04/26/16 | | 1830 ± 245 | < 5.5 | < 0.8 | 2.6 ± 1.0 | < 0.4 | 5.1 ± 0.9 | < 1.6 |
| MW-PB-27 | 05/02/16 | | 1250 ± 205 | | | | | | |
| MW-PB-27 | 05/11/16 | | 1230 ± 193 | | | | | | |
| MW-PB-27 | 05/17/16 | | 1380 ± 202 | | | | | | |
| MW-PB-27 | 05/25/16 | | 1260 ± 201 | | | | | | |
| MW-PB-27 | 06/01/16 | | 1350 ± 200 | | | | | | |
| MW-PB-27 | 06/08/16 | | 1520 ± 215 | | | | | | |
| MW-PB-27 | 06/15/16 | | 1250 ± 195 | | | | | | |
| MW-PB-27 | 06/22/16 | | 1380 ± 200 | | | | | | |
| MW-PB-27 | 06/29/16 | | 1180 ± 192 | | | | | | |
| MW-PB-27 | 07/06/16 | | 1210 ± 190 | | | | | | |
| MW-PB-27 | 07/12/16 | | 1060 ± 176 | | | | | | |
| MW-PB-27 | 07/19/16 | | 1080 ± 177 | | | | | | |
| MW-PB-27 | 07/27/16 | | 980 ± 170 | | | | | | |
| MW-PB-27 | 08/04/16 | | 903 ± 153 | | | | | | |
| MW-PB-27 | 08/09/16 | | 935 ± 159 | | | | | | |
| MW-PB-27 | 08/16/16 | | 1060 ± 176 | | | | | | |
| MW-PB-27 | 08/23/16 | | 922 ± 159 | | | | | | |
| MW-PB-27 | 09/07/16 | | 829 ± 382 | | | | | | |
| MW-PB-27 | 09/13/16 | | 743 ± 142 | | | | | | |
| MW-PB-27 | 09/20/16 | | 1120 ± 176 | | | | | | |
| MW-PB-27 | 09/27/16 | | 621 ± 134 | | | | | | |
| MW-PB-27 | 10/10/16 | | 1270 ± 212 | | | | | | |

**TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER AND SEEP SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | | H-3 | Sr-89 | Sr-90 | Gr-A (Dis) | Gr-A (Sus) | Gr-B (Dis) | Gr-B (Sus) |
|---|---|---|---|---|---|---|---|---|---|
| MW-PB-27 | 11/14/16 | | 712 ± 153 | | | | | | |
| MW-PB-27 | 11/30/16 | | 892 ± 192 | | | | | | |
| MW-PB-28 | 02/02/16 | | < 192 | | | | | | |
| MW-PB-28 | 04/25/16 | | < 176 | < 7.5 | < 0.5 | < 1.0 | 2.8 ± 1.1 | 4.7 ± 0.8 | 3.6 ± 1.4 |
| MW-PB-28 | 07/26/16 | | < 168 | | | | | | |
| MW-PB-28 | 08/27/16 | | < 179 | | | | | | |
| MW-PB-28 | 10/11/16 | | < 184 | | | | | | |
| MW-PB-29 | 02/02/16 | | 203 ± 126 | | | | | | |
| MW-PB-29 | 04/27/16 | | 373 ± 125 | < 3.3 | < 0.4 | < 0.8 | < 0.4 | 2.6 ± 0.6 | < 1.6 |
| MW-PB-29 | 07/27/16 | | 337 ± 115 | | | | | | |
| MW-PB-29 | 10/11/16 | | 294 ± 133 | | | | | | |
| MW-PB-29 | 11/30/16 | | 445 ± 136 | | | | | | |
| MW-PB-30 | 02/02/16 | | < 191 | | | | | | |
| MW-PB-30 | 04/27/16 | | 696 ± 143 | < 6.3 | < 0.6 | < 0.7 | 2.0 ± 0.9 | 2.8 ± 0.7 | 2.1 ± 1.2 |
| MW-PB-30 | 07/27/16 | | 220 ± 111 | | | | | | |
| MW-PB-30 | 10/11/16 | | 196 ± 119 | | | | | | |
| MW-PB-30 | 11/30/16 | | 264 ± 130 | | | | | | |
| MW-PB-31 | 02/02/16 | | < 194 | | | | | | |
| MW-PB-31 | 02/02/16 | | 187 ± 120 | | | | | | |
| MW-PB-31 | 04/27/16 | | < 177 | < 6.6 | < 0.7 | < 1.1 | < 0.8 | 2.1 ± 0.9 | < 1.6 |
| MW-PB-31 | 07/26/16 | | 213 ± 111 | | | | | | |
| MW-PB-31 | 10/11/16 | | < 181 | | | | | | |
| MW-PB-31 | 11/30/16 | | 212 ± 127 | | | | | | |
| SP-PB-1 | 02/02/16 | | < 179 | | | | | | |
| SP-PB-1 | 04/25/16 | | < 178 | | | | | | |
| SP-PB-1 | 07/25/16 | | < 165 | | | | | | |
| SP-PB-1 | 10/11/16 | | < 180 | | | | | | |
| SP-PB-2 | 02/02/16 | | < 196 | | | | | | |
| SP-PB-2 | 04/25/16 | | < 178 | | | | | | |
| SP-PB-2 | 07/26/16 | | < 164 | | | | | | |
| SP-PB-2 | 10/11/16 | | < 180 | | | | | | |
| SP-PB-3 | 02/02/16 | | < 180 | | | | | | |
| SP-PB-3 | 04/26/16 | | < 178 | | | | | | |
| SP-PB-3 | 07/25/16 | | < 164 | | | | | | |
| U/2 YARD DRAIN | 01/22/16 | *Rerun 1* | < 199 | | | | | | |
| U/2 YARD DRAIN | 01/22/16 | *Rerun 2* | < 196 | | | | | | |
| U/2 YARD DRAIN | 04/19/16 | | < 180 | | | | | | |
| U/2 YARD DRAIN | 07/11/16 | | < 176 | | | | | | |
| U/2 YARD DRAIN | 12/19/16 | | < 183 | | | | | | |
| U/3 YARD DRAIN | 02/02/16 | *Rerun 1* | 618 ± 148 | | | | | | |
| U/3 YARD DRAIN | 02/02/16 | *Rerun 2* | 605 ± 148 | | | | | | |
| U/3 YARD DRAIN | 03/11/16 | | 217 ± 129 | | | | | | |
| U/3 YARD DRAIN | 03/11/16 | *Recount* | 220 ± 131 | | | | | | |
| U/3 YARD DRAIN | 04/26/16 | | < 178 | < 5.8 | < 0.6 | < 1.1 | < 0.8 | 2.5 ± 0.9 | < 1.6 |
| U/3 YARD DRAIN | 07/27/16 | | < 164 | | | | | | |
| U/3 YARD DRAIN | 12/19/16 | | < 182 | | | | | | |

*(1) See program exceptions section for explanation*

*(2) Total Gross Alpha/Total Gross Beta reported*

**TABLE B-I.2** **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER AND SEEP WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Nb-95 | Zr-95 | I-131 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-PB-1 | 04/26/16 TBE | < 6 | < 5 | < 12 | < 8 | < 9 | < 5 | < 8 | < 14 | < 7 | < 6 | < 35 | < 10 |
| MW-PB-1 | 04/26/16 TBE | < 4 | < 4 | < 8 | < 4 | < 7 | < 4 | < 7 | < 9 | < 4 | < 4 | < 23 | < 8 |
| MW-PB-1 | 04/26/16 EIML | < 3 | < 2 | < 4 | < 2 | < 4 | < 2 | < 3 | < 6 | < 3 | < 2 | < 16 | < 4 |
| MW-PB-2 | 04/25/16 | < 6 | < 6 | < 12 | < 6 | < 9 | < 7 | < 11 | < 11 | < 7 | < 6 | < 31 | < 11 |
| MW-PB-3 | 04/25/16 | < 5 | < 5 | < 12 | < 5 | < 10 | < 5 | < 8 | < 11 | < 5 | < 5 | < 27 | < 8 |
| MW-PB-4 | 04/26/16 | < 7 | < 8 | < 13 | < 9 | < 17 | < 9 | < 14 | < 13 | < 7 | < 8 | < 34 | < 11 |
| MW-PB-5 | 04/25/16 | < 5 | < 5 | < 10 | < 6 | < 11 | < 5 | < 10 | < 12 | < 5 | < 5 | < 30 | < 11 |
| MW-PB-6 | 04/25/16 | < 5 | < 7 | < 13 | < 6 | < 12 | < 7 | < 12 | < 14 | < 6 | < 7 | < 31 | < 12 |
| MW-PB-7 | 04/25/16 TBE | < 3 | < 3 | < 7 | < 4 | < 6 | < 4 | < 6 | < 9 | < 3 | < 3 | < 19 | < 7 |
| MW-PB-7 | 04/25/16 TBE | < 5 | < 5 | < 10 | < 6 | < 11 | < 6 | < 9 | < 12 | < 4 | < 5 | < 27 | < 11 |
| MW-PB-7 | 04/25/16 EIML | < 3 | < 2 | < 5 | < 2 | < 4 | < 3 | < 2 | < 7 | < 2 | < 3 | < 17 | < 2 |
| MW-PB-8 | 02/03/16 | < 5 | < 6 | < 10 | < 7 | < 14 | < 6 | < 15 | < 12 | < 6 | < 4 | < 33 | < 15 |
| MW-PB-8 | 04/26/16 | < 5 | < 6 | < 12 | < 6 | < 12 | < 7 | < 9 | < 12 | < 6 | < 6 | < 40 | < 11 |
| MW-PB-8 | 07/25/16 | < 4 | < 3 | < 10 | < 4 | < 7 | < 4 | < 8 | < 13 | < 3 | < 4 | < 27 | < 8 |
| MW-PB-8 | 10/12/16 | < 9 | < 9 | < 16 | < 7 | < 18 | < 11 | < 16 | < 13 | < 9 | < 9 | < 36 | < 14 |
| MW-PB-10 | 02/03/16 | < 5 | < 6 | < 12 | < 6 | < 13 | < 7 | < 11 | < 15 | < 6 | < 6 | < 38 | < 11 |
| MW-PB-10 | 04/25/16 | < 5 | < 6 | < 11 | < 6 | < 7 | < 7 | < 10 | < 15 | < 7 | < 5 | < 42 | < 15 |
| MW-PB-10 | 07/25/16 | < 4 | < 4 | < 11 | < 4 | < 8 | < 5 | < 8 | < 15 | < 4 | < 4 | < 31 | < 11 |
| MW-PB-10 | 10/12/16 | < 6 | < 5 | < 10 | < 5 | < 13 | < 8 | < 11 | < 11 | < 8 | < 6 | < 27 | < 7 |
| MW-PB-11 | 04/25/16 | < 5 | < 5 | < 9 | < 7 | < 11 | < 6 | < 11 | < 13 | < 6 | < 7 | < 32 | < 9 |
| MW-PB-12 | 04/27/16 | < 8 | < 8 | < 15 | < 8 | < 12 | < 9 | < 11 | < 13 | < 8 | < 7 | < 32 | < 8 |
| MW-PB-13 | 04/25/16 | < 6 | < 7 | < 13 | < 6 | < 13 | < 7 | < 12 | < 14 | < 6 | < 7 | < 35 | < 13 |
| MW-PB-14 | 04/26/16 | < 7 | < 5 | < 15 | < 7 | < 12 | < 7 | < 14 | < 14 | < 6 | < 8 | < 36 | < 13 |
| MW-PB-15 | 02/03/16 | < 6 | < 6 | < 13 | < 8 | < 12 | < 8 | < 10 | < 15 | < 6 | < 6 | < 38 | < 13 |
| MW-PB-15 | 04/25/16 | < 5 | < 5 | < 10 | < 5 | < 12 | < 6 | < 8 | < 13 | < 5 | < 6 | < 32 | < 10 |
| MW-PB-15 | 07/25/16 | < 3 | < 4 | < 7 | < 3 | < 6 | < 4 | < 6 | < 11 | < 3 | < 3 | < 24 | < 8 |
| MW-PB-15 | 10/12/16 | < 6 | < 8 | < 13 | < 9 | < 15 | < 11 | < 15 | < 15 | < 7 | < 7 | < 42 | < 13 |
| MW-PB-16 | 02/03/16 | < 4 | < 3 | < 8 | < 3 | < 6 | < 4 | < 8 | < 14 | < 4 | < 4 | < 28 | < 11 |
| MW-PB-16 | 04/25/16 | < 6 | < 6 | < 12 | < 6 | < 11 | < 7 | < 11 | < 12 | < 6 | < 6 | < 29 | < 11 |
| MW-PB-16 | 07/25/16 | < 3 | < 4 | < 9 | < 3 | < 7 | < 4 | < 7 | < 12 | < 3 | < 4 | < 27 | < 10 |
| MW-PB-16 | 10/12/16 | < 6 | < 6 | < 13 | < 7 | < 16 | < 9 | < 11 | < 10 | < 6 | < 7 | < 33 | < 12 |
| MW-PB-19 | 04/25/16 | < 5 | < 5 | < 11 | < 3 | < 11 | < 5 | < 9 | < 13 | < 5 | < 6 | < 35 | < 8 |
| MW-PB-20 | 04/25/16 | < 4 | < 6 | < 13 | < 10 | < 12 | < 5 | < 8 | < 13 | < 5 | < 6 | < 35 | < 6 |
| MW-PB-21 | 04/26/16 | < 6 | < 7 | < 11 | < 7 | < 11 | < 6 | < 13 | < 13 | < 6 | < 6 | < 35 | < 10 |
| MW-PB-22 | 04/26/16 | < 5 | < 5 | < 11 | < 6 | < 11 | < 6 | < 9 | < 12 | < 5 | < 6 | < 31 | < 8 |
| MW-PB-24 | 04/26/16 | < 8 | < 6 | < 12 | < 5 | < 9 | < 7 | < 14 | < 14 | < 6 | < 7 | < 41 | < 12 |
| MW-PB-24 | 10/10/16 | < 5 | < 6 | < 11 | < 5 | < 10 | < 6 | < 9 | < 10 | < 5 | < 5 | < 28 | < 8 |
| MW-PB-25 | 04/26/16 | < 6 | < 6 | < 11 | < 8 | < 10 | < 6 | < 10 | < 12 | < 5 | < 6 | < 30 | < 14 |
| MW-PB-25 | 10/10/16 | < 8 | < 6 | < 16 | < 7 | < 16 | < 6 | < 15 | < 14 | < 6 | < 9 | < 35 | < 8 |

**TABLE B-I.2** **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER AND SEEP WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Nb-95 | Zr-95 | I-131 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-PB-26 | 04/26/16 TBE | < 5 | < 5 | < 10 | < 6 | < 9 | < 5 | < 10 | < 12 | < 5 | < 5 | < 24 | < 9 |
| MW-PB-26 | 04/26/16 TBE | < 3 | < 3 | < 8 | < 4 | < 7 | < 4 | < 6 | < 9 | < 4 | < 4 | < 21 | < 6 |
| MW-PB-26 | 04/26/16 EIML | < 2 | < 2 | < 4 | < 3 | < 4 | < 3 | < 5 | < 4 | < 3 | < 2 | < 12 | < 4 |
| MW-PB-26 | 10/10/16 | < 5 | < 6 | < 10 | < 5 | < 11 | < 5 | < 8 | < 10 | < 5 | < 6 | < 24 | < 7 |
| MW-PB-27 | 04/26/16 | < 4 | < 4 | < 10 | < 5 | < 10 | < 7 | < 8 | < 12 | < 5 | < 5 | < 30 | < 8 |
| MW-PB-27 | 10/10/16 | < 6 | < 7 | < 15 | < 7 | < 12 | < 10 | < 11 | < 13 | < 7 | < 7 | < 38 | < 11 |
| MW-PB-28 | 04/25/16 | < 5 | < 5 | < 10 | < 5 | < 11 | < 5 | < 7 | < 12 | < 5 | < 5 | < 26 | < 9 |
| MW-PB-29 | 04/27/16 | < 7 | < 7 | < 19 | < 6 | < 17 | < 8 | < 14 | < 14 | < 7 | < 8 | < 36 | < 10 |
| MW-PB-30 | 04/27/16 | < 6 | < 6 | < 12 | < 7 | < 12 | < 7 | < 10 | < 13 | < 6 | < 6 | < 35 | < 12 |
| MW-PB-31 | 04/27/16 | < 4 | < 5 | < 11 | < 5 | < 10 | < 6 | < 9 | < 11 | < 4 | < 5 | < 27 | < 9 |
| SP-PB-1 | 04/25/16 | < 3 | < 4 | < 8 | < 3 | < 6 | < 4 | < 7 | < 11 | < 3 | < 4 | < 27 | < 5 |
| SP-PB-2 | 04/25/16 | < 4 | < 5 | < 10 | < 4 | < 10 | < 5 | < 9 | < 12 | < 5 | < 6 | < 29 | < 9 |
| SP-PB-3 | 04/26/16 | < 4 | < 5 | < 9 | < 5 | < 11 | < 5 | < 9 | < 12 | < 4 | < 5 | < 27 | < 8 |
| U/2 YARD DRAIN | 04/19/16 | < 12 | * | * | < 7 | * | * | * | * | < 8 | < 7 | * | * |
| U/3 YARD DRAIN | 04/26/16 | < 3 | < 3 | < 7 | < 3 | < 5 | < 4 | < 6 | < 8 | < 3 | < 3 | < 18 | < 6 |

** Unable to reach client-required detection limit due to age of sample at time of analysis*

**TABLE B-I.3**

## CONCENTRATIONS OF HARD-TO-DETECTS IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | | COLLECTION DATE | Am-241 | Cm-242 | Cm-243/244 | Pu-238 | Pu-239/240 | U-234 | U-235 | U-238 | Fe-55 | Ni-63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-PB-2 | | 04/25/16 | < 0.19 | < 0.04 | < 0.13 | < 0.03 | < 0.06 | 2.99 ± 0.54 | < 0.03 | 2.11 ± 0.44 | | |
| MW-PB-3 | | 04/25/16 | < 0.16 | < 0.08 | < 0.04 | < 0.04 | < 0.16 | 1.09 ± 0.27 | < 0.07 | 0.70 ± 0.21 | | |
| MW-PB-4 | | 04/26/16 | < 0.02 | < 0.02 | < 0.02 | < 0.04 | < 0.13 | < 0.04 | < 0.03 | < 0.08 | < 115 | < 4.1 |
| MW-PB-7 | TBE | 04/25/16 | *(1)* < 0.32 | < 0.10 | < 0.10 | < 0.04 | < 0.18 | < 0.05 | < 0.12 | < 0.03 | | |
| MW-PB-7 | TBE | 04/25/16 | < 0.16 | < 0.03 | < 0.15 | < 0.07 | < 0.07 | < 0.06 | < 0.07 | < 0.15 | | |
| MW-PB-7 | EIML | 04/25/16 | < 0.05 | | < 0.05 | < 0.10 | < 0.25 | < 0.09 | | < 0.05 | | |
| MW-PB-8 | | 04/26/16 | < 0.14 | < 0.05 | < 0.12 | < 0.05 | < 0.07 | < 0.06 | < 0.08 | < 0.06 | | |
| MW-PB-10 | | 04/25/16 | < 0.05 | < 0.04 | < 0.04 | < 0.06 | < 0.03 | < 0.02 | < 0.03 | < 0.07 | | |
| MW-PB-11 | | 04/25/16 | < 0.09 | < 0.17 | < 0.09 | < 0.11 | < 0.15 | < 0.08 | < 0.06 | < 0.09 | | |
| MW-PB-12 | | 04/27/16 | *(1)* < 0.29 | < 0.29 | < 0.29 | < 0.08 | < 0.18 | < 0.06 | < 0.15 | < 0.18 | < 154 | < 4.1 |
| MW-PB-13 | | 04/25/16 | *(1)* < 0.21 | < 0.06 | < 0.06 | < 0.09 | < 0.13 | 15.07 ± 2.60 | 0.45 ± 0.19 | 13.71 ± 2.38 | | |
| MW-PB-15 | | 04/25/16 | < 0.20 | < 0.08 | < 0.19 | < 0.17 | < 0.14 | < 0.13 | < 0.05 | < 0.12 | | |
| MW-PB-16 | | 04/25/16 | < 0.10 | < 0.03 | < 0.15 | < 0.12 | < 0.10 | < 0.10 | < 0.03 | < 0.14 | | |
| MW-PB-19 | | 04/25/16 | *(1)* < 0.21 | < 0.21 | < 0.21 | < 0.05 | < 0.13 | 0.22 ± 0.13 | < 0.08 | 0.21 ± 0.14 | | |
| MW-PB-20 | | 04/25/16 | < 0.10 | < 0.02 | < 0.02 | < 0.14 | < 0.06 | < 0.06 | < 0.12 | < 0.10 | < 134 | < 4.0 |
| MW-PB-21 | | 04/26/16 | < 0.03 | < 0.07 | < 0.03 | < 0.03 | < 0.10 | < 0.14 | < 0.20 | < 0.16 | < 138 | < 4.1 |
| MW-PB-22 | | 04/26/16 | < 0.04 | < 0.04 | < 0.04 | < 0.03 | < 0.09 | < 0.17 | < 0.19 | < 0.16 | < 161 | < 4.2 |
| MW-PB-24 | | 04/26/16 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.09 | < 0.10 | < 0.09 | < 0.13 | < 141 | < 4.1 |
| MW-PB-25 | | 04/26/16 | < 0.12 | < 0.02 | < 0.09 | < 0.03 | < 0.11 | 1.54 ± 0.39 | < 0.04 | 0.50 ± 0.21 | < 100 | < 4.1 |
| MW-PB-26 | TBE | 04/26/16 | < 0.09 | < 0.04 | < 0.07 | < 0.02 | < 0.06 | 4.22 ± 0.62 | < 0.03 | 1.71 ± 0.37 | < 169 | < 4.1 |
| MW-PB-26 | TBE | 04/26/16 | < 0.05 | < 0.02 | < 0.02 | < 0.03 | < 0.05 | 4.82 ± 0.67 | < 0.11 | 2.20 ± 0.42 | < 127 | < 4.2 |
| MW-PB-26 | EIML | 04/26/16 | < 0.10 | | < 0.07 | < 0.24 | < 0.58 | 4.53 ± 0.45 | | 2.08 ± 0.30 | | |
| MW-PB-27 | | 04/26/16 | < 0.11 | < 0.06 | < 0.06 | < 0.03 | < 0.08 | 5.00 ± 1.06 | < 0.07 | 3.35 ± 0.82 | < 144 | < 4.2 |
| MW-PB-28 | | 04/25/16 | < 0.11 | < 0.07 | < 0.11 | < 0.02 | < 0.06 | < 0.08 | < 0.14 | < 0.12 | | |
| MW-PB-29 | | 04/27/16 | *(1)* < 0.22 | < 0.22 | < 0.22 | < 0.05 | < 0.02 | < 0.12 | < 0.12 | < 0.12 | | |
| MW-PB-30 | | 04/27/16 | < 0.03 | < 0.07 | < 0.05 | < 0.05 | < 0.08 | < 0.08 | < 0.12 | < 0.08 | | |
| MW-PB-31 | | 04/27/16 | < 0.06 | < 0.02 | < 0.09 | < 0.04 | < 0.08 | < 0.02 | < 0.09 | < 0.02 | | |
| U/3 YARD DRAIN | | 04/26/16 | < 0.07 | < 0.06 | < 0.07 | < 0.05 | < 0.09 | < 0.13 | < 0.12 | < 0.09 | | |

*(1) See program exceptions section for explanation*

**TABLE B-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | | COLLECTION DATE | H-3 |
|---|---|---|---|
| SW-PB-1 | | 02/01/16 | < 191 |
| SW-PB-1 | | 02/02/16 | < 191 |
| SW-PB-1 | | 04/26/16 | < 176 |
| SW-PB-1 | | 07/27/16 | < 162 |
| SW-PB-1 | | 10/11/16 | < 184 |
| SW-PB-1 | | 10/11/16 | < 181 |
| SW-PB-5 | | 02/01/16 | < 193 |
| SW-PB-5 | | 04/26/16 | < 180 |
| SW-PB-5 | | 07/27/16 | < 161 |
| SW-PB-5 | | 10/11/16 | < 183 |
| SW-PB-6 | | 02/01/16 | < 193 |
| SW-PB-6 | TBE | 04/26/16 | < 180 |
| SW-PB-6 | TBE | 04/26/16 | < 179 |
| SW-PB-6 | EIML | 04/26/16 | < 147 |
| SW-PB-6 | | 07/27/16 | < 162 |
| SW-PB-6 | | 07/27/16 | < 165 |
| SW-PB-6 | | 10/11/16 | < 181 |

**TABLE B-II.2** **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | | Mn-54 | Co-58 | Fe-59 | Co-60 | Zn-65 | Nb-95 | Zr-95 | I-131 | Cs-134 | Cs-137 | Ba-140 | La-140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SW-PB-1 | 04/26/16 | | < 3 | < 3 | < 5 | < 2 | < 5 | < 3 | < 5 | < 8 | < 3 | < 3 | < 18 | < 4 |
| SW-PB-5 | 04/26/16 | | < 3 | < 3 | < 7 | < 4 | < 6 | < 3 | < 6 | < 7 | < 3 | < 3 | < 17 | < 5 |
| SW-PB-6 | 04/26/16 | TBE | < 4 | < 3 | < 9 | < 4 | < 8 | < 4 | < 7 | < 9 | < 3 | < 4 | < 24 | < 8 |
| SW-PB-6 | 04/26/16 | TBE | < 3 | < 4 | < 9 | < 4 | < 7 | < 4 | < 6 | < 8 | < 3 | < 4 | < 21 | < 5 |
| SW-PB-6 | 04/26/16 | EIML | < 2 | < 3 | < 3 | < 2 | < 6 | < 2 | < 3 | < 7 | < 3 | < 3 | < 17 | < 4 |

## TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

| SITE | COLLECTION DATE | H-3 |
|---|---|---|
| 1A | 01/28/16 | < 182 |
| 1A | 02/25/16 | < 172 |
| 1A | 03/31/16 | < 187 |
| 1A | 04/28/16 | < 182 |
| 1A | 06/02/16 | < 163 |
| 1A | 06/30/16 | < 175 |
| 1A | 07/28/16 | < 168 |
| 1A | 09/01/16 | < 173 |
| 1A | 09/29/16 | < 181 |
| 1A | 10/27/16 | < 189 |
| 1A | 12/01/16 | < 191 |
| 1A | 12/29/16 | < 193 |
| 1B | 01/28/16 | < 184 |
| 1B | 02/25/16 | < 172 |
| 1B | 03/31/16 | < 177 |
| 1B | 04/28/16 | < 182 |
| 1B | 06/02/16 | < 162 |
| 1B | 06/30/16 | < 181 |
| 1B | 07/28/16 | < 164 |
| 1B | 09/01/16 | < 172 |
| 1B | 09/29/16 | < 178 |
| 1B | 10/27/16 | < 189 |
| 1B | 12/01/16 | < 191 |
| 1B | 12/29/16 | < 193 |
| 1S | 01/28/16 | < 175 |
| 1S | 02/25/16 | < 176 |
| 1S | 03/31/16 | < 179 |
| 1S | 04/28/16 | < 184 |
| 1S | 06/02/16 | < 190 |
| 1S | 06/30/16 | < 182 |
| 1S | 07/28/16 | < 166 |
| 1S | 09/01/16 | < 176 |
| 1S | 09/29/16 | < 183 |
| 1S | 10/27/16 | < 189 |
| 1S | 12/01/16 | < 195 |
| 1S | 12/29/16 | < 193 |
| 1SSE | 01/28/16 | < 183 |
| 1SSE | 02/25/16 | < 178 |
| 1SSE | 03/31/16 | < 182 |
| 1SSE | 04/28/16 | < 183 |
| 1SSE | 06/02/16 | < 164 |
| 1SSE | 06/30/16 | < 181 |
| 1SSE | 07/28/16 | < 168 |
| 1SSE | 09/01/16 | < 175 |
| 1SSE | 09/29/16 | < 181 |
| 1SSE | 10/27/16 | < 190 |
| 1SSE | 12/01/16 | < 195 |
| 1SSE | 12/29/16 | < 196 |
| 1Z | 01/28/16 | < 183 |
| 1Z | 02/25/16 | < 176 |
| 1Z | 03/31/16 | < 181 |

**TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, PEACH BOTTOM ATOMIC POWER STATION, 2016**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

| SITE | COLLECTION DATE | H-3 |
|---|---|---|
| 1Z | 04/28/16 | < 179 |
| 1Z | 06/02/16 | < 164 |
| 1Z | 06/30/16 | < 178 |
| 1Z | 07/28/16 | < 168 |
| 1Z | 09/01/16 | < 174 |
| 1Z | 09/29/16 | < 182 |
| 1Z | 10/27/16 | < 191 |
| 1Z | 12/01/16 | < 197 |
| 1Z | 12/29/16 | < 195 |
| 4M | 01/28/16 | < 186 |
| 4M | 02/25/16 | < 176 |
| 4M | 03/31/16 | < 180 |
| 4M | 04/28/16 | < 183 |
| 4M | 06/02/16 | < 164 |
| 4M | 06/30/16 | < 180 |
| 4M | 07/28/16 | < 167 |
| 4M | 09/01/16 | < 173 |
| 4M | 09/29/16 | < 183 |
| 4M | 10/27/16 | < 182 |
| 4M | 12/01/16 | < 189 |
| 4M | 12/29/16 | 195 |