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PEACH BOTTOM ATOMIC POWER STATION

UNITS 2 and 3

Annual Radiological
Environmental Operating Report

Report No. 77
January 1 through December 31, 2019

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I. Executive Summary

The 2019 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 2019 through 31 December 2019. Throughout that time period, 1,287 analyses were performed on 997 samples. In assessing all the data gathered for this report and comparing the 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 Iodine-131 (I-131), tritium (H-3) and gamma-emitting nuclides. All nuclides were below minimum detectable activity.
- Drinking water samples were analyzed for concentrations of gross beta, I-131, H-3, and gamma-emitting nuclides. All nuclides were below minimum detectable activity. In some samples gross beta activity was detected above the lower limit of detection (LLD) of 4 pCi/L, but not above the investigation level (15 pCi/L) and therefore, likely due to background radiation.
- Fish and sediment samples were analyzed for concentrations of gamma-emitting nuclides. All nuclides were below minimum detectable activity.

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 power production 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 the investigation level (1.60E-01 pCi/m^3) and there were no notable differences between control and indicator locations.

Ambient Radiation:

- Ambient gamma radiation levels were measured quarterly. There was no detectable ambient gamma radiation levels to the members of the public at off site locations, indicating no impact from plant operations. The ISFSI location, 1R, had measurable 3Q Facility Dose, 6.4 millirem per standard quarter (mrem/std. qtr), which resulted in an annual facility dose of 15.5 millirem per year (mrem/yr), which is less than the required 25 mrem/yr limit. The nearest resident to the ISFSI

saw no detectable ambient gamma radiation levels, therefore ISFSI operations did not have an impact to members of the public.

In 2019, the doses from both liquid and gaseous effluents were conservatively calculated for the Maximum Exposed Member of the Public due to PBAPS Operation. 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	2.52E-01	All	1.10E+03	SSE	1.26E+00	2.00E+01	mrad
Noble Gas	Beta - Air Dose	1.71E-01	All	1.10E+03	SSE	4.28E-01	4.00E+01	mrad
Noble Gas	Total Body (gamma)	2.43E-01	All	1.10E+03	SSE	2.43E+00	1.00E+01	mrem
Noble Gas	Skin (Beta)	3.16E-01	All	1.10E+03	SSE	1.05E+00	3.00E+01	mrem
Gaseous Iodine, Particulate, Carbon-14 & Tritium	Bone	1.42E-01	Child	1.50E+03	SW	4.73E-01	3.00E+01	mrem
Gaseous Iodine, Particulate, & Tritium	Thyroid	8.79E-03	Infant	1.50E+03	SW	2.93E-02	3.00E+01	mrem
Liquid	Total Body (gamma)	2.59E-04	Child	Site Boundary		4.32E-03	6.00E+00	mrem
Liquid	GI-LLI	5.10E-04	Child			2.55E-03	2.00E+01	mrem
Direct Radiation	Total Body	0.00E+00	All	1.19E+03	SSE	0.00E+00	2.50E+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	2.43E-01	All	1.19E+03	SSE	9.73E-01	2.50E+01	mrem
Total Dose	Thyroid	8.79E-03	All	1.19E+03	SSE	1.17E-02	7.50E+01	mrem
Total Dose	Bone	1.43E-01	All	1.19E+03	SSE	5.70E-01	2.50E+01	mrem
Total Dose	Total Body	2.43E-01	All	1.19E+03	SSE	8.11E+00	3.00E+00	mrem
Total Dose	Bone	1.43E-01	All	1.19E+03	SSE	4.75E+00	3.00E+00	mrem
Total Dose	Thyroid	2.61E-01	All	1.19+03	SSE	4.74E-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 4,016 MWth while Unit 1 is a decommissioned 115 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 are contained in the PBAPS ODCM and the ODCM Specifications (ODCMS). This AREOR covers those analyses performed by Teledyne Brown Engineering (TBE), Landauer, Exelon Industrial Services (EIS) and GEL Laboratories on samples collected during the period 01 January 2019 through 31 December 2019.

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.

As the REMP is established to measure the impact of power plant operations (release of radionuclides) on man and the environment; it is important to understand radiation/radioactivity, the units used to measure them, and natural sources of radiation in the environment. A brief explanation is provided to differentiate between radiation from nuclear power production and other sources, be they man-made or natural. The doses produced from the other sources of radiation can be compared to the data presented in this report.

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 Cesium-137 (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 (mrem); 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 5, 6, 7 in Table 1 below). Radioactivity is measured in curies. A curie is that amount of radioactive material needed to produce 3.70E+10 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 [4]

NATURAL		MAN-MADE	
Source	Radiation Dose (mrem/yr)	Source	Radiation Dose (mrem/yr)
Internal, inhalation [5]	228	Medical [6]	300
External, space	33	Consumer [7]	13
Internal, ingestion	29	Industrial[8]	0.3
External, terrestrial	21	Occupational	0.5
		Weapons Fallout	<1
		Nuclear Power Plants	<1
Approximate Total	311	Approximate Total	314

Cosmic radiation from the sun and outer space penetrates the earth's atmosphere and continuously bombards us with rays and charged particles. Some of this cosmic radiation interacts with gases and particles in the atmosphere, making them radioactive in turn. 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 a dose of 33 mrem per year.

Additionally, natural radioactivity is in our body, in the food we eat (about 29 mrem/yr), in the ground we walk on (about 21 mrem/yr), and in the air we breathe (about 228 mrem/yr). One percent of all potassium in nature is the radioactive Potassium-40 (K-40). 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 soil and in 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 (mrem/yr).

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 and nuclear power plants (less than 1 mrem/yr). Typically, the average person in the United States receives about 314 mrem/yr from man-made sources.

Some of the natural radioactive nuclides discussed above were identified in PBAPS REMP samples. The typical power production radionuclides, described in the next sections, were not identified and thus it can be concluded that PBAPS did not impact man and the environs during the 2019 operating period.

III. Program Description

A. Sample Collection

Exelon Industrial Services (EIS) collected samples for the REMP for PBAPS Exelon Nuclear. This section describes the collection methods used by EIS to obtain environmental samples for the PBAPS REMP in 2019. 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 EIS are listed in Table B-2, Appendix B.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, 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 3 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. A new ISCO sampler was installed at location 4L on Friday, 10/25/19.

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 were 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 quillback) and Predator (smallmouth and largemouth bass), as these are the types of fish commonly collected by the public from the river around PBAPS. 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.

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 with the highest dose potential, within three miles of PBAPS 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, when the cows were on

pasture, and monthly from December through March, when the cows were primarily on feed. Six additional locations (C, D, E, P, W and Y; C and E are the controls) were sampled quarterly. Two-gallon samples were collected directly from the bulk tank at each location, preserved with sodium bisulfite, and shipped promptly to the laboratory.

The ODCM requires food products to be collected from the area of highest dose impact and a control location, if milk sampling is unavailable in those locations. Milk sampling occurs in most every sector, but one, and a garden was established there for sampling. Food product samples, comprised of annual broad green leaf vegetation, were collected monthly at four locations (1C, 2Q, 3Q and 55; 55 is the control) from 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 plastic bags and shipped promptly to the laboratory, but sample size varied on garden production.

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, including three site boundary locations with greatest dose impact, one location within a local community with the 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 to pull air through a glass fiber filter and charcoal cartridge. 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 is measured using dosimeters, which are exposed to ambient radiation in the field and exchanged quarterly. The ODCM requires at least 40 routine monitoring stations with two or more dosimeters at each location for continuous monitoring. The REMP contains 48 dosimeter monitoring locations.

Optically-Stimulated Luminescent Dosimeters (OSLD) replaced the Thermo-Luminescent Dosimeter (TLD) starting in 2012. However, PBAPS continued using TLD in addition to OSLD to compare the two technologies, although only the OSLD data is reported. TLD field deployment will be discontinued starting in 2020.

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

Site boundary monitoring consists 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).

Intermediate distance monitoring consists 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 plant exhaust vents (where practical).

Each dosimetry location in the environment has 2 OSLD and 2 TLD dosimeters which were enclosed in plastic as a moisture barrier. Dosimeter housing are mesh plastic tubes, aligned horizontally and oriented such that dosimeter windows face the plant. Dosimeters themselves were placed vertically in the tubes so that no dosimeter was covered by another dosimeter and all dosimeters properly faced the plant.

B. Sample Analysis

This section describes the analytical methods used by TBE, EIS and GEL Labs 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 environmental and direct radiation data collected prior to PBAPS becoming operational was used as a baseline with which the 2019 operational

data were compared. 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. Lower Limit of Detection and Minimum Detectable Concentration

   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) that would be detected 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. All analyses are designed to achieve the required detection limits for environmental samples, as described in the PBAPS ODCM.

   The minimum detectable concentration or activity (MDC or MDA) is defined as 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. In previous years, when net activity was reported, a lower baseline is seen in trending when compared to 2019 results.

   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, 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, 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.

Positive activity values (greater than MDC) were recorded and the mean and two standard deviation of the results were calculated. The standard deviation represents the variability of measured results for different samples of the same media rather than a single analysis uncertainty.

D. Program Exceptions

For 2019, the PBAPS REMP had a sample collection recovery rate of > 99%. The exceptions to this program are listed below:

Table 2 LIST OF SAMPLE ANOMALIES

Sample Type	Location Code	Collection Date	Reason
Food Products	All Locations	May, 2019	Gardens planted 04/29/19 insufficient volume for May collection
Dosimetry	40	3Q2019	Two Mirion dosimeters lost
Dosimetry	1R	3Q2019	Facility-related dose was identified at 1R, no other locations (including nearest resident 2B) identified facility related dose. New ISFSI pad under construction as original pad was filled with TN-68 casks in 2019

Table 3 LIST OF MISSING SAMPLES AND EQUIPMENT ISSUES

Sample Type	Location Code	Collection Date	Reason
Water	1MM	01/01-2/13	Water compositor was OOS due to fault in the line supplying power to berm. Compensatory grab samples were obtained, and all analyses performed but ODCMS 4.8.E.1.1 was not met and thus included in AREOR
Water	4L	01/01-05/16	Water compositor was OOS due to maintenance work at Conowingo Dam. Compensatory grab samples were obtained, and all analyses performed but ODCMS 4.8.E.1.1 was not met and thus included in AREOR
Milk	L	02/12	Farmer sold cows; replaced location in 2nd quarter (Farm Y)
AP/AI*	1A	02/28-03/07	Air sample pump GFCI tripped without sufficient run time for the sample to collect enough volume for valid sample results
Milk	U	04/16	Farm no longer producing commercial milk therefore missed this collection period although Farm later continued to provide samples for REMP
Food Products	55	09/19	Only 2 species available for collection; 3rd species not collected due to plant deterioration, late in the growing season
Water	4L	10/25	Composite sampler developed a significant leak, but did not cause any missed sampling. Was replaced on 10/25/19 with a new ISCO sampler

**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

In 2019, Milk Farm L sold all of their cows and withdrew from participating in PBAPS REMP. This farm was replaced by a neighboring farm, called Milk Farm Y. This is shown in Figure B-2.

In 2019, PBAPS adopted the Exelon corporate procedure CY-AA-170-1001 "Environmental Dosimetry Performance Specifications, Testing, and Data Analysis," which provides the new methodology for determining facility related, direct radiation dose in the general environment outside the nuclear facility which is suitable for demonstrating compliance with the Environmental Protection Agency (EPA) 40 CFR 190, "Environmental Radiation Projection Standards for Nuclear Power Operations".[12] It incorporates the concepts of ANSI/HPS N13.37, "Environmental Dosimetry"[10] as suggested in Regulatory Guide 4.13, "Environmental Dosimetry – Performance, Specifications, Testing and Data Analysis".[11] The new methodology will be presented in the Ambient Radiation (Section D) portion of Section V. Results and Discussion.

A new ISCO 3710 water compositor was installed at location 4L on 10/25/2019, due to degradation of the old BVS water compositor. The sampler requires semi-annual calibration and is set to pull the required composite samples every two minutes allowing for the full weekly sample to be collected. The new sampler is shown in Figure 1.

Figure 1 New ISCO 3710 water compositor at Station 4L

V. Results and Discussion

Appendix A contains a summary of all 2019 PBAPS REMP results which meets the requirement of Table 3 of NUREG 1302 'Branch Technical Position Paper'[9]. Table A-1 lists results by each sample media and analyses performed. The total number of analyses performed, required LLD, the number of positive results for each indicator and control location are also listed. From the positive results identified (greater than the MDA) the mean value, range and station locations with highest annual mean are listed. Commonly-identified nuclides are gross beta, K-40, and Be-7. A graphical representation is provided in Figure A-1.

A. Aquatic Environment

1. Surface Water

A summary of the 2019 analysis results for surface water samples from stations 1LL and 1MM are listed below:

Tritium

Quarterly samples were analyzed for tritium activity. No tritium activity was detected and the required LLD was met. (Table C-I.1, Appendix C)

Iodine

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

2. Drinking Water

The results from the drinking water samples collected in 2019 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 activity was detected in 16 of 36 samples. The values ranged from 1.9 to 6.0 pCi/L with a mean value of 3.0 ± 2.0 pCi/L. The mean detected gross beta activity was less than the required LLD (4 pCi/L) which indicates the sensitivity of the measurement technique. The detectable gross beta activity was well below the procedural investigation level (15 pCi/L). Concentrations detected were generally below those detected in previous years.

Tritium

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

Iodine

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

Gamma Spectrometry

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

3. Fish

Results from fish samples collected at locations 4 and 6 in 2019 are described below:

Gamma Spectrometry

The edible portions of the collected fish samples were analyzed semiannually for gamma-emitting nuclides (Table C-III.1, Appendix C). Naturally-occurring K-40 was found at all stations and ranged from 2,917 to 4,729 pCi/kg (wet), with a mean value of 3,684 ± 1,383 pCi/kg (wet), consistent with levels detected in previous years. No fission or activation products, due to plant operations were found in 2019 and all required LLDs were met. Figure C-2, Appendix C, displays the various gamma radionuclide MDC results for locations 4 and 6, based on the type of fish collected. All MDC results are less than the nuclide-specific LLDs. The last 15-year average Cs-137 MDC is also shown to trend 2019 results with historical results. There have been no detectable levels of Cs-137 in fish since 1983.

4. Sediment

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

Gamma Spectrometry

Sediment samples were analyzed for gamma-emitting nuclides (Table C-IV.1, Appendix C). K-40 was found in all locations and ranged from 10,120 to 19,080 pCi/kg (dry) with a mean value of 15,500 ± 6,642 pCi/kg (dry). No fission or activation products were found and all LLDs were met. The Cs-137 MDC results are displayed in Figure C-3, Appendix C, along with the 20-year average results.

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 are discussed in Section H. The results from samples collected in 2019 are described below:

Gross Beta

Weekly samples were analyzed for concentrations of beta- emitters (Tables C-V.1, Appendix C). Detectable gross beta activity was observed at all locations. The results from Group I ranged from 6E-3 to 43E-3 pCi/m^3, with a mean of 16E-3 ± 12E-3 pCi/m^3. The results from Group II ranged from 5E-3 to 38E-3 pCi/m^3 with a mean of 14E-3 ± 12E-3 pCi/m^3. The results from the Group III ranged from 8E-3 to 29E-3 pCi/m^3 with a mean of 15E-3 ± 9E-3 pCi/m^3.

The mean value from all locations 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 2019 air particulate data with historical data indicates a decreasing trend in gross beta activity since initial operation of the plant (Figure C-4, Appendix C).

Gamma Spectrometry

Quarterly samples were analyzed for gamma-emitting nuclides (Table C-V.2, Appendix C). Naturally-occurring Be-7 activity, from cosmic rays, was detected in all 20 samples. The values ranged from 48E-3 to 129E-3 pCi/m^3, with a mean value of 81E-3 ± 38E-3pCi/m^3. All power production nuclides were less than the MDC and all required LLDs were met.

2. Airborne Iodine

Weekly samples were also analyzed for low-level I-131. All results were less than the MDC for I-131 and the required LLD was met.
(Table C-VI.1, Appendix C)

C. Terrestrial

1. Milk

During 2019, 154 milk samples were collected and analyzed from the following locations: D, J, R, P, S, U, W, X, Y (indicators) and C, E, V (controls). 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. Figure C-5 displays the 2019 milk I-131 results for both indicator and control locations. All results are less than the LLD (1 pCi/L) and much less than the reporting level (3 pCi/L).

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 879 to 1,558 pCi/l, with a mean value of 1249 ± 270 pCi/L. All other nuclides were less than the MDC and all required LLDs were met.

2019 Cs-134 and Cs-137 MDC results are plotted in Figure C-5 with the required LLDs and Reporting Levels. All results are much less than the LLDs and reporting levels. The last 15-year average MDC of Cs-137 in milk is also plotted in Figure C-5, Appendix C. There is no statistical difference between the 2019 MDC Cs-137 results and the 15-year historical MDC.

2. Food Products

Throughout 2019, 49 samples of various green leafy vegetation (kale, cabbage, collard greens, broccoli, 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 29 of 49 samples and ranged from 184 to 2,148 pCi/kg (wet), with a mean of 784 ± 903 pCi/kg (wet). Also, naturally-occurring K-40 activity was found in all samples and ranged from 2,011 to 8,816 pCi/kg (wet), with a mean of 4,615 ± 3,088 pCi/kg (wet). All power production 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 and C-IX.2 and Figure C-6, Appendix C.

Six years of OSLD data (2012-2018) were re-evaluated with the new methodology presented in Exelon corporate procedure CY-AA-170-1001, in order to determine a background dose and baseline for each location in the REMP. Detectable Facility Dose, is any normalized net dose above the sum of the normalized mean background dose and minimum differential dose ($B_{Q/A}$ + $MDD_{Q/A}$) and is reported both quarterly and annually for each location. Therefore, mean gross dose of 'indicator' and 'control' locations will no longer be reported. Only Quarterly and Annual Normalized Net Dose for each location is reported in Table C-IX.1 and C-IX.2.

The net dose is calculated by subtracting a control transit dosimeter and extraneous dose rather than a control or background location dose. The net dose is normalized to a standard 91-day quarter rather than previously reported monthly doses. Figure C-6 displays the B_A + MDD_A for each location as a dash mark, and the annual normalized net dose is shown as a column graph. Any column above the dash mark, would indicate positive facility related dose.

All locations except for 1R showed no normalized net quarterly dose above the B_A + MDD_A, therefore, there is no detectable ambient gamma radiation to the members of the public due to PBAPS operations. 1R results will be discussed in

the next section (ISFSI). Location 1M had poor statistically matching results between the two dosimeters and thus is not reported for the 4th quarter. The annual normalized net dose is adjusted for only 3 of 4 for quarters being reported for that location.

E. Independent Spent Fuel Storage Installation (ISFSI)

ISFSI was initiated in June 2000. Three new casks were added to the ISFSI pad in 2019, filling the original ISFSI pad design requiring construction of a second pad, which completed in 2019. 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 which could be impacted by ISFSI. Location 1R showed positive facility-related dose (<25 mrem/yr) yet did not impact the nearest resident location (2B) as that location had no detectable facility-related dose. 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.

A six year data set (2012-2018) was used to determine the background dose at each location. There was only detectable facility-related dose at location 1R in the 3Q (6.4 mrem/std. qtr), leading to detectable annual facility-related dose (15.5 mrem/yr). This is the first time PB is reporting facility-related dose due to ISFSI, which is expected due to the increasing trends seen at 1R over the years. In 2019, the ISFSI pad was filled with its last TN-68 cask. Construction began in 2019 on a second ISFSI pad which will be loaded with Holtec casks starting in 2020. Facility-related dose is expected to increase due to the second ISFSI pad, but still remain below the 40CFR190 and 10CFR72.104 limits,

F. Land Use Census

A Land Use Survey, conducted during the fall of 2019, was performed by Exelon Industrial Services (EIS), 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 survey. The distance and direction of all locations were positioned using Global Positioning System (GPS) technology. The results of this survey are summarized below.

There was no change in nearest residents compared to the 2018 report. There were gardens identified in all sectors except the NNW sector. Eight (8) new gardens were located this year in NW, WNW, WSW, SSW, ENE and S sectors. The garden in sector NW was identified as the closest garden for that sector. Animals used for meat consumption were identified in 14 of the 16 sectors. Six (6)

new sites were identified this year in NNE, ENE, NE, WNW, and W sectors, with the nearest meat animal updating in the NE sector. Dairy sites were identified in 12 of 16 sectors. One (1) new dairy site was identified this year in the ENE sector. There were no changes in nearest milk-producing animal in any sector.

Location of the Nearest Residence, Garden, Milk, Meat, Animal within a Five-Mile Radius of PBASP Reactor Building Exhaust Vents

Sector		Residence Feet	Garden Feet	Milk Farm Feet	Meat Animal Feet
1	N	12,362	14,003	14,183	14,183
2	NNE	11,112	11,041	10,843	10,843
3	NE	10,080	10,004	10,492	10,008
4	ENE	10,495	11,554	10,925*	10,925
5	E	10,066	14,540	14,471	13,712
6	ESE	16,085	20,374	20,154	16,085
7	SE	10,772	10,772	19,134*	19,134
8	SSE	3,912	3,912	-	-
9	S	5,545	5,545	-	9,247
10	SSW	6,072	6,418	11,602	7,187
11	SW	4,755	4,865	4,860*	4,860
12	WSW	4,036	7,487	-	13,366
13	W	5,327	5,327	5,136*	5,136
14	WNW	2,928	4,192	22,124	3,926
15	NW	2,948	7,718	9,545	7,582
16	NNW	5,124	-	-	-

*Farm included in the REMP

G. Errata Data

There was no errata data for 2019.

H. Secondary Laboratory Analysis

Appendix D of this report presents the results of data analyses performed by the QC laboratory, EIS and GEL. Duplicate samples were obtained from several locations and analyzed by both the primary and QC laboratories. GEL was only used for H-3 analyses of water samples because EIS could not perform those analyses. Comparisons of the results for all media were within expected ranges. (Figure D-2)

I. Summary of Results – Quality Control (QC) Laboratory Analysis

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 F.

For the Teledyne Brown Engineering (TBE) laboratory, 119 out of 129

analyses performed met the specified acceptance criteria. Ten analyses (Water - Cs-134, Sr-89, Sr-90, Am-241 (2), Gross Alpha; Soil - Sr-90, Ni-63, Cr-51; Vegetation - Sr-90) did not meet the specified acceptance criteria and are documented in Appendix F. TBE has addressed each issue through the TBE Corrective Action Program.

For the EIS laboratory, 114 of 114 analyses met the specified acceptance criteria in 2019.

For the GEL laboratory, 413 of 425 analyses met the specified acceptance criteria. Tritium (water matrix) was the only nuclide analyzed for Peach Bottom REMP and all analyses met the specified acceptance criteria. Nuclides analyzed for Peach Bottom RGPP included H-3, Sr-89/90, Gross Alpha, Gross Beta, Gamma, and Alpha Spec (water matrix). Two nuclides, Sr-89 (2) and Gross-Alpha, did not meet the specified acceptance criteria and is documented in Appendix F. All failures were addressed through GEL's Corrective Action Program.

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

4. Information from NCRP Reports 160 and 94

5. Primarily from airborne radon and its radioactive progeny

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

7. 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)

8. Industrial, security, medical, educational, and research

9. Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors, Generic Letter 89-01, Supplement No. 1 (NUREG-1302), April 1991

10. American National Standards Institute/Health Physics Society, (ANSI/HPS) N13.37-2014, "Environmental Dosimetry – Criteria for System Design and Implementation"

11. U.S. Nuclear Regulatory Commission, Regulatory Guide 4.13, Revision 2, "Environmental Dosimetry - Performance, Specifications, Testing, and Data Analysis", June, 2019

12. Code of Federal Regulations 40 CFR 190, "Environmental Radiation Protection Standards for Nuclear Power Operations', 1977

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

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FIGURE A-1
TOTAL REMP ANALYSES FOR 2019 AND SPECIFIC NUCLIDE ANALYSES WITH ACTIVITY GREATER THAN MDA

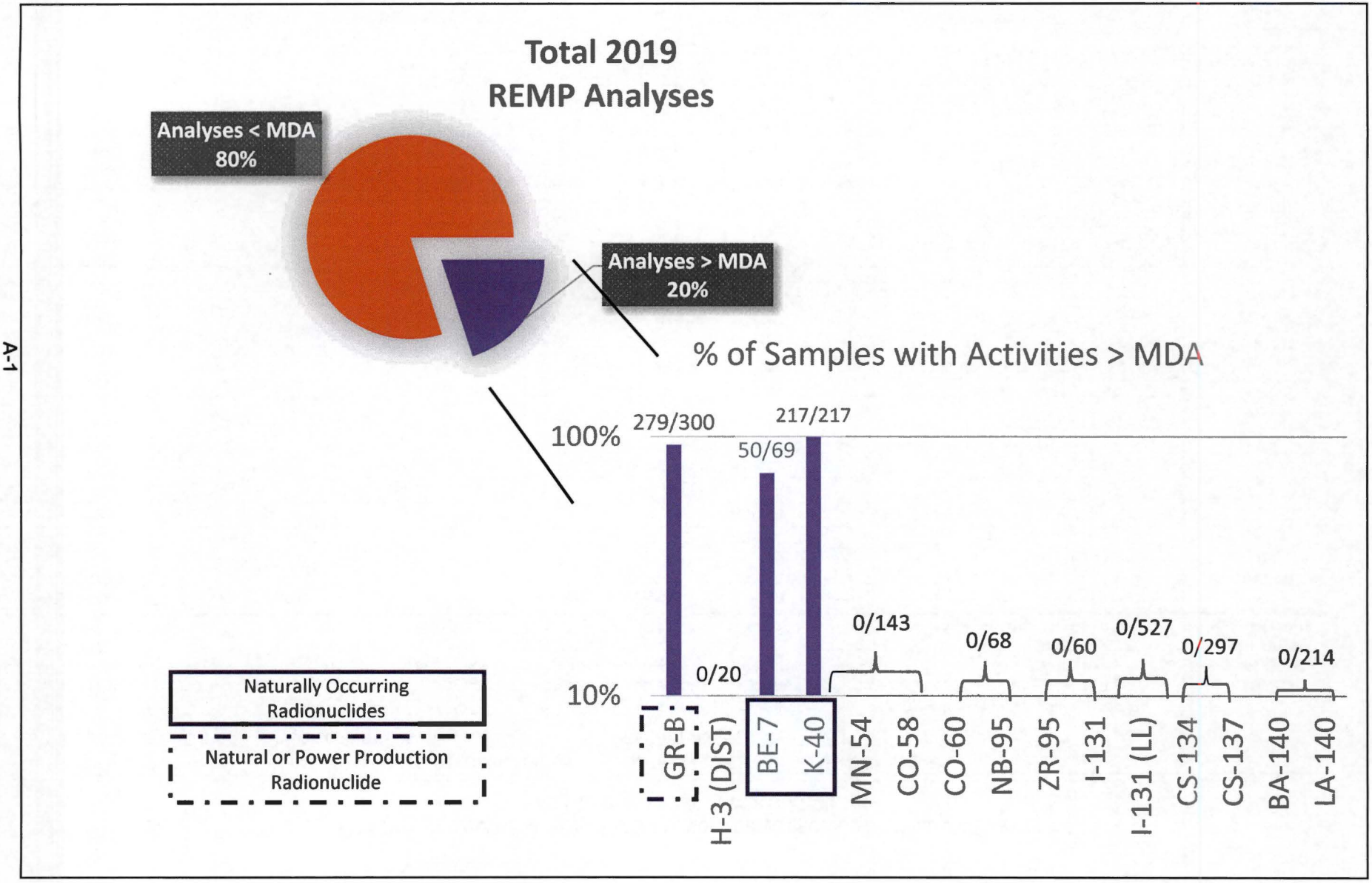

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR PEACH BOTTOM ATOMIC POWER STATION, 2019

NAME OF FACILITY:	**PEACH BOTTOM ATOMIC POWER STATION**	**DOCKET NUMBER:**	**50-277 & 50-278**
LOCATION OF FACILITY:	**YORK COUNTY , PA**	**REPORTING PERIOD:**	**2019**

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*	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 (11/24) *2.0 - 4.3*	3.2 (5/12) *1.9 - 6.0*	3.2 (5/12) *1.9 - 6.0*	6I CONTROL HOLTWOOD DAM HYDROELECTRIC STATION 30500 FEET NW	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 PEACH BOTTOM ATOMIC POWER STATION, 2019

NAME OF FACILITY:	PEACH BOTTOM ATOMIC POWER STATION	DOCKET NUMBER:	50-277 & 50-278
LOCATION OF FACILITY:	YORK COUNTY , PA	REPORTING PERIOD:	2019

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	3848 (2/2) 2967 - 4729	3609 (2/2) 2917 - 4300	3848 (2/2) 2967- 4729	4 INDICATOR CONOWINGO POND 600-10000 FEET SE	0
	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	3549 (2/2) 3069 - 4029	3732 (2/2) 3363 - 4101	3732 (2/2) 3363 - 4101	6 CONTROL HOLTWOOD POND 50000 - 70000 FEET NW	0
	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	14775 (4/4) 10120 - 19080	16950 (2/2) 16910 - 16990	18050 (2/2) 17020 - 19080	4T INDICATOR CONOWINGO POND NEAR CONOWINGO DAM 41800 FEET SE	0
	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	<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 PEACH BOTTOM ATOMIC POWER STATION, 2019

NAME OF FACILITY:	**PEACH BOTTOM ATOMIC POWER STATION**			**DOCKET NUMBER:**	**50-277 & 50-278**			
LOCATION OF FACILITY:	**YORK COUNTY , PA**			**REPORTING PERIOD:**	**2019**			
				INDICATOR	**CONTROL**	**LOCATION WITH HIGHEST ANNUAL MEAN (M)**		
MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	**LOCATIONS** MEAN (M) (F) *RANGE*	**LOCATION** MEAN (M) (F) *RANGE*	MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATE *(E-3 PCI/CU.METER)*	**GR-B**	264	10	16 (211/212) *5 - 43*	15 (52/52) *8 - 29*	18 (53/53) *8 - 42*	1B INDICATOR WEATHER STATION #2 2500 FEET NW	0
	GAMMA	20						
	BE-7		NA	79 (16/16) *48 - 129*	89 (4/4) *78 - 121*	96 (4/4) *72 - 129*	1B INDICATOR WEATHER STATION #2 2500 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**	264						
	I-131		70	<LLD	<LLD	-		0
MILK *(PCI/LITER)*	**I-131 (LOW LVL)**	154	1	<LLD	<LLD	-		0
	GAMMA	154						
	K-40		NA	1243 (124/124) *879 - 1525*	1275 (30/30) *1096 - 1558*	1373 (4/4) *1293 - 1537*	C CONTROL 5000 FEET NW	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 PEACH BOTTOM ATOMIC POWER STATION, 2019

NAME OF FACILITY:	PEACH BOTTOM ATOMIC POWER STATION			DOCKET NUMBER:	50-277 & 50-278			
LOCATION OF FACILITY:	YORK COUNTY , PA			REPORTING PERIOD:	2019			
				INDICATOR	CONTROL	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	LOCATIONS MEAN (M) (F) *RANGE*	LOCATION MEAN (M) (F) *RANGE*	MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
VEGETATION	GAMMA	49						
(PCI/KG WET)	*BE-7*		NA	881 (21/37) *272 - 2148*	529 (8/12) *184 - 1088*	938 (6/12) *315 - 1683*	1C INDICATOR PEACH BOTTOM SOUTH SUB STATION 4700 FEET SSE	0
	K-40		NA	4171 (37/37) *2011 - 7105*	5985 (12/12) *3484 - 8816*	5985 (12/12) *3484 - 8816*	55 CONTROL NE SECTOR 51900 FEET NE	0
	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	6.4 (1/176) *ND* - 6.4*	ND* ND*	N/A*		0
(MILLI-ROENTGEN/STD.MO.)								

**ND = Nondetectable; N/A = Mean no longer reported for direct radiation*

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

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APPENDIX B

SAMPLE DESIGNATION AND LOCATIONS

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TABLE B-1 Radiological Environmental Monitoring Program – Sampling Locations, Distance and Direction from Reactor Buildings, Peach Bottom Atomic Power Station, 2019

Location	Location Description	Distance & Direction From Site
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)	50,400 feet NW
D		18,500 feet NE
E	(Control)	46,100 feet N
L[1]		11,200 feet NE
P		11,000 feet ENE
W		89,200 feet S
Y		10,500 feet NE
H. Food Products		
1C		4,700 feet SSE
2Q		9,200 feet SW
3Q		9,500 feet W
55	(Control)	51,900 feet NE

[1]*Farm L was removed from the REMP 1Q2019 and replaced by Farm Y*

TABLE B-1 Radiological Environmental Monitoring Program – Sampling Locations, Distance and Direction from Reactor Buildings, Peach Bottom Atomic Power Station, 2019

Location	Location Description	Distance & Direction From Site
J. Environmental Dosimetry - OSLD		
Site Boundary		
1A	Weather Station #1	1,500 feet SE
1B	Weather Station #2	2,500 feet NW
1C	Peach Bottom South Substation	4,700 feet SSE
1D	140 o Sector	3,500 feet SSE
1E	Peach Bottom 350o Sector Hill	3,000 feet NNW
1F	Peach Bottom 200o Sector Hill	2,900 feet SSW
1G	Peach Bottom North Substation	3,100 feet WNW
1H	Peach Bottom 270o Sector Hill	3,200 feet W
1I	Peach Bottom South Substation	2,900 feet S
1J	Peach Bottom 180o Sector Hill	4,000 feet S
1K	Peach Bottom Site Area	4,700 feet SW
1L	Peach Bottom Unit 3 Intake	1,100 feet NE
1M	Discharge	5,400 feet SE
1NN	Peach Bottom Site	2,700 feet WSW
1P	Tower B & C Fence	2,200 feet ESE
1Q	Tower D & E Fence	3,300 feet SE
1R	Transmission Line Hill/ISFSI Pad	2,800 feet SSE
2	Peach Bottom 130o Sector Hill	4,700 feet SE
2B*	Burk Property	3,900 feet SSE
40	Peach Bottom Site Area	8,000 feet SW
Intermediate Distance		
1T*	Lay Road/LLRWSF	3,100 feet WNW
3A	Delta, PA Substation	19,300 feet SW
4K	Conowingo Dam Power House Roof	45,900 feet SE
5	Wakefield, PA	24,400 feet E
6B	Holtwood Dam Power House Roof	30,400 feet NW
14	Peters Creek	10,300 feet E
15	Silver Spring Rd	19,300 feet N
17	Riverview Rd	21,500 feet ESE
22	Eagle Road	12,500 feet NNE
23	Peach Bottom 150° Sector Hill	5,500 feet SSE
26	Slab Road	21,800 feet NW
27	N. Cooper Road	14,400 feet S
31A	Eckman Rd	24,100 feet SE
32	Slate Hill Rd	14,400 feet ENE
42	Muddy Run Environ. Laboratory	21,600 feet NNW
43	Drumore Township School	26,200 feet NNE
44	Goshen Mill Rd	26,700 feet NE
45	PB-Keeney Line	18,500 feet ENE
46	Broad Creek	23,800 feet SSE
47	Broad Creek Scout Camp	22,700 feet S
48	Macton Substation	26,500 feet SSW
49	PB-Conastone Line	21,500 feet WSW
50	TRANSCO Pumping Station	26,400 feet W
51	Fin Substation	21,000 feet WNW
Control		
16	Nottingham, PA Substation (Control)	67,100 feet E
18	Fawn Grove, PA (Control)	52,200 feet W
19	Red Lion, PA (Control)	124,000 feet WNW
24	Harrisville, MD Substation (Control)	58,200 feet ESE

**Nearest Residents*

TABLE B-2 Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Peach Bottom Atomic Power Station, 2019

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis ST-C-095-835-2 Circulating Water Intake and Discharge Composite Sampling	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Surface Water	Tritium	Quarterly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis ST-C-095-835-2 Circulating Water Intake and Discharge Composite Sampling	500 ml	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation GEL, EPA906.0 Mod, for Tritium analysis by Liquid Scintillation
Surface Water	I-131	Monthly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis ST-C-095-835-2 Circulating Water Intake and Discharge Composite Sampling	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis	2 gallon	TBE, TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices CY-ES-206, Operation of the Tennelec S5E Proportional Counter
Drinking Water	I-131	Monthly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Drinking Water	Tritium	Quarterly composite from a continuous water compositor	CY-ES-240 Surface, Drinking, and Effluent Water Sample Collection for Radiological Analysis	500 ml	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation GEL, EPA906.0 Mod, for Tritium Analysis by Liquid Scintillation
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	NAI-ER3 Collection of fish samples for radiological analysis (PBAPS)	1000 grams (wet)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System

TABLE B-2 Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Peach Bottom Atomic Power Station, 2019

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Sediment	Gamma Spectroscopy	Semi-annual grab samples	NAI-ER3 Collection of sediment samples for radiological analysis (PBAPS)	500 grams (dry)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205, Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	CY-ES-237 Air Iodine and Air Particulate Sample Collection for Radiological Analysis	1 filter (~ 280 cubic meters weekly)	TBE, TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices EIS, CY-ES-206, Operation of the Tennelec S5E Proportional Counter
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2023 Compositing of samples CY-ES-204 Sample Preparation for Gamma and Beta Counting	13 filters (~ 3600 cubic meters)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	CY-ES-237 Air Iodine and Air Particulate Sample Collection for Radiological Analysis	1 filter (~ 280 cubic meters weekly)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	CY-ES-238 Milk Sample Collection for Radiological Analysis	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture; Monthly all other times	CY-ES-238 Milk Sample Collection for Radiological Analysis	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Food Products	Gamma Spectroscopy	Monthly when available	CY-ES-241 Vegetation Sample Collection for Radiological Analysis	1000 grams	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements.	CY-ES-239, Collection/Exchange of Field Dosimeters for Radiological Analysis	2 dosimeters	Landauer Incorporated

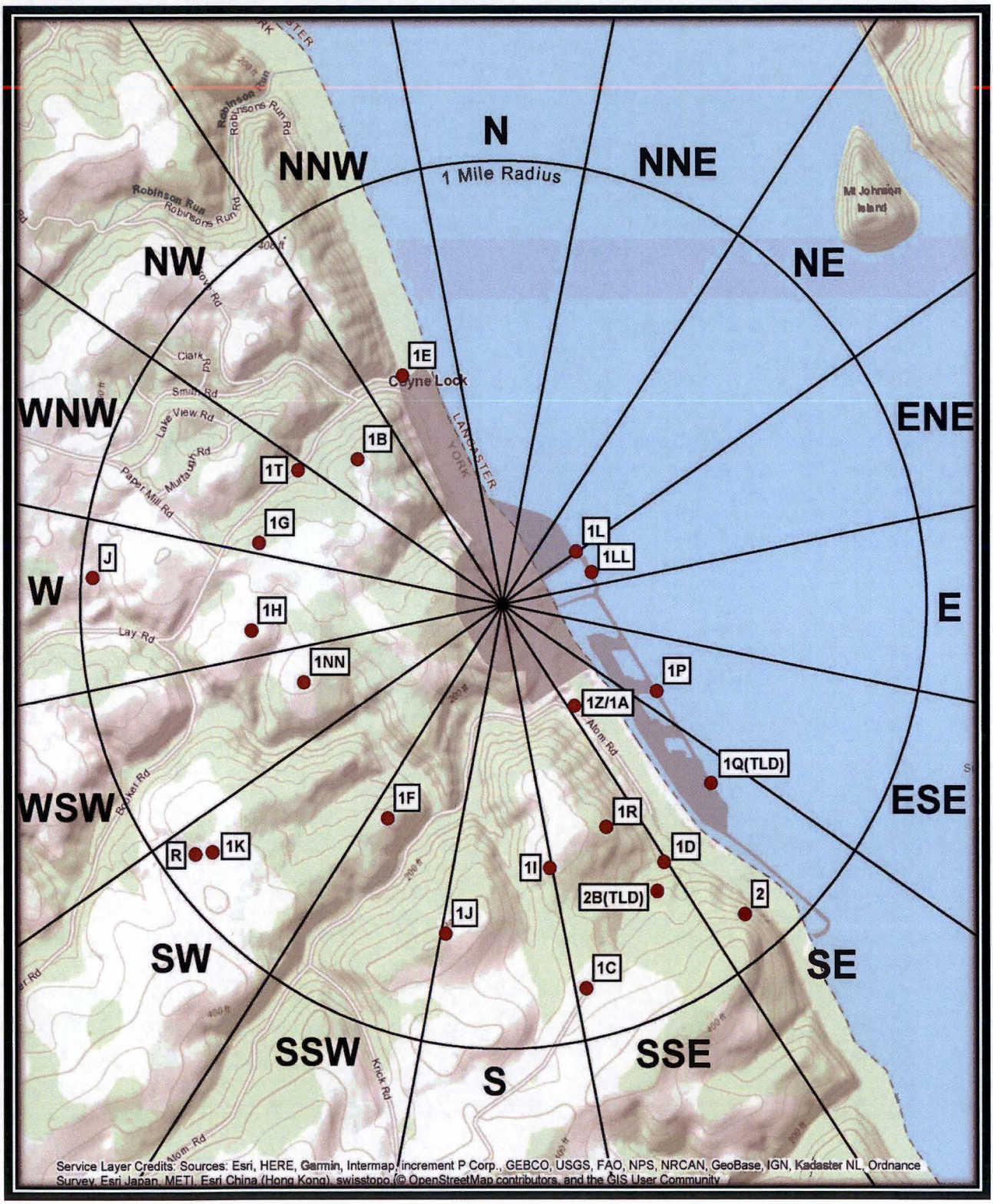

Figure B-1
Environmental Sampling Locations Within One Mile
of Peach Bottom Atomic Power Station, 2019

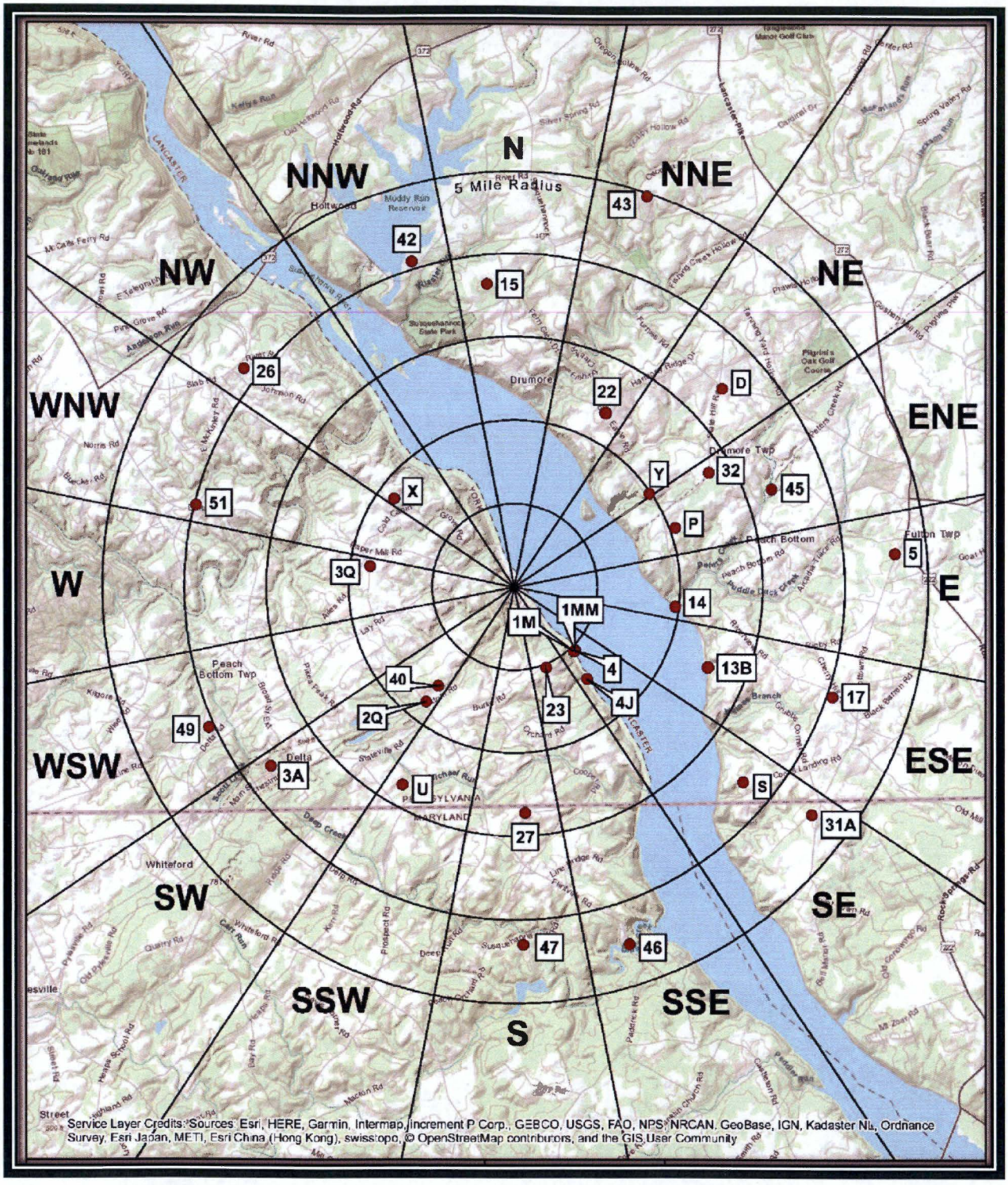

Figure B-2
Environmental Sampling Locations Between One and Approximately Five Miles of Peach Bottom Atomic Power Station, 2019

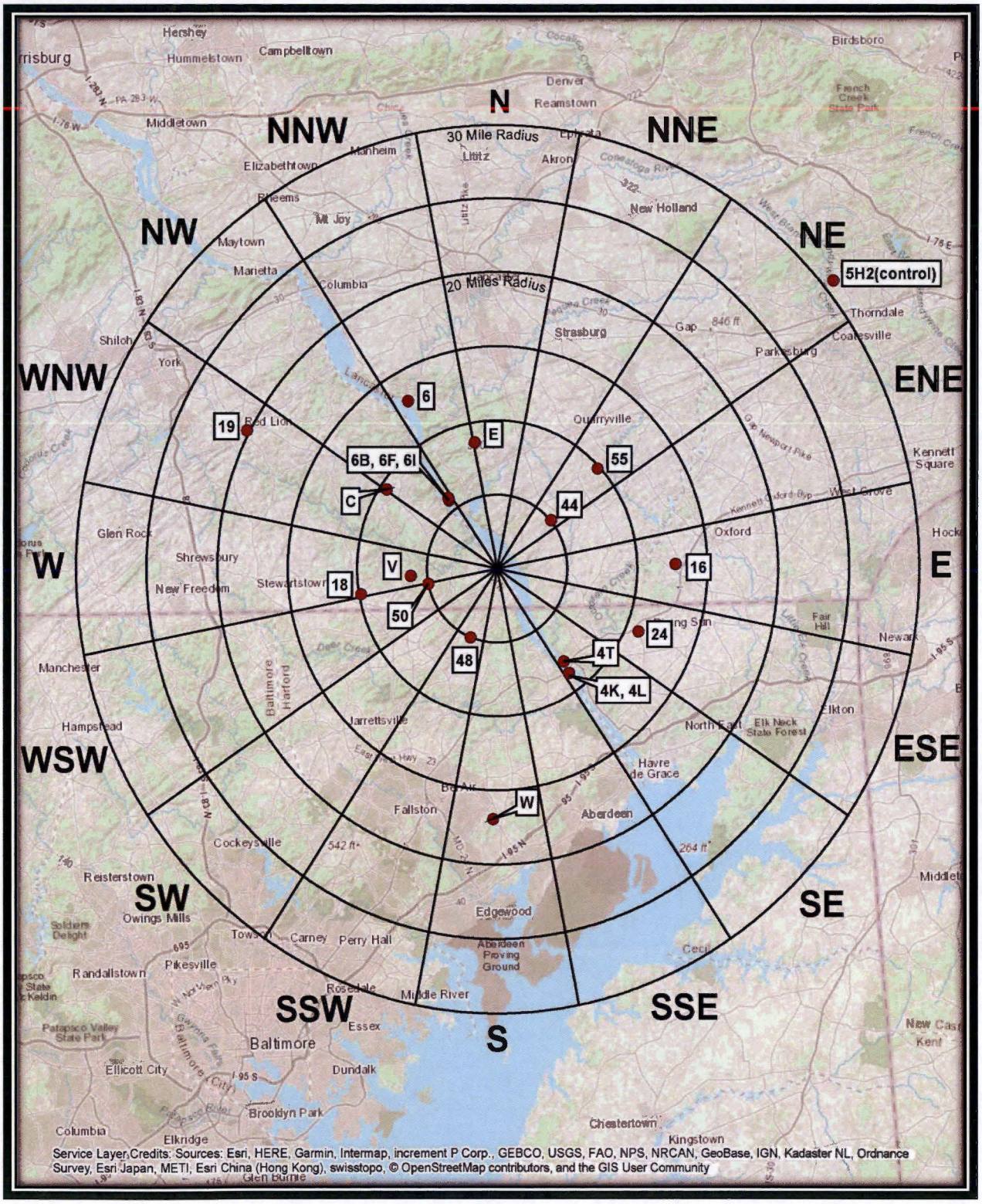

Figure B-3
Environmental Sampling Locations Greater Than
Five Miles from Peach Bottom Atomic Power Station, 2019

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APPENDIX C

DATA TABLES AND FIGURES
PRIMARY LABORATORY

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Table C-I.1 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

COLLECTION PERIOD	1LL	1MM
01/02/19 - 03/27/19	< 194	< 193
03/27/19 - 06/26/19	< 198	< 181
06/26/19 - 10/02/19	< 196	< 198
10/02/19 - 01/01/20	< 183	< 187
MEAN	-	-

Table C-I.2 **CONCENTRATIONS OF LOW LEVEL I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

COLLECTION PERIOD	1LL	1MM
01/02/19 - 01/30/19	< 0.6	< 0.6
01/30/19 - 02/27/19	< 0.4	< 0.8
02/27/19 - 03/27/19	< 0.7	< 0.8
03/27/19 - 05/01/19	< 0.6	< 0.4
05/01/19 - 05/29/19	< 0.8	< 0.9
05/29/19 - 06/26/19	< 0.7	< 0.9
06/26/19 - 07/31/19	< 0.8	< 0.9
07/31/19 - 08/28/19	< 0.8	< 0.9
08/28/19 - 10/02/19	< 0.7	< 0.8
10/02/19 - 10/30/19	< 1.0	< 0.9
10/30/19 - 12/04/19	< 0.9	< 0.8
12/04/19 - 01/01/20	< 0.5	< 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, 2019**

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	01/02/19 - 01/30/19	< 5	< 5	< 11	< 6	< 13	< 6	< 8	< 5	< 5	< 23	< 7
	01/30/19 - 02/27/19	< 8	< 8	< 17	< 6	< 15	< 10	< 11	< 9	< 8	< 32	< 14
	02/27/19 - 03/27/19	< 6	< 5	< 12	< 7	< 11	< 6	< 11	< 6	< 6	< 24	< 7
	03/27/19 - 05/01/19	< 5	< 6	< 11	< 6	< 11	< 7	< 11	< 7	< 5	< 26	< 10
	05/01/19 - 05/29/19	< 6	< 5	< 12	< 5	< 10	< 6	< 11	< 6	< 6	< 27	< 8
	05/29/19 - 06/26/19	< 7	< 6	< 9	< 7	< 11	< 6	< 9	< 6	< 5	< 26	< 10
	06/26/19 - 07/31/19	< 3	< 4	< 8	< 4	< 8	< 4	< 8	< 4	< 4	< 17	< 7
	07/31/19 - 08/28/19	< 5	< 9	< 15	< 6	< 15	< 8	< 13	< 10	< 8	< 46	< 14
	08/28/19 - 10/02/19	< 7	< 8	< 13	< 8	< 14	< 7	< 12	< 6	< 7	< 36	< 14
	10/02/19 - 10/30/19	< 7	< 7	< 15	< 7	< 16	< 10	< 9	< 8	< 7	< 35	< 10
	10/30/19 - 12/04/19	< 6	< 6	< 14	< 6	< 14	< 6	< 10	< 7	< 6	< 32	< 10
	12/04/19 - 01/01/20	< 7	< 7	< 15	< 7	< 14	< 7	< 12	< 8	< 8	< 32	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-
1MM	01/02/19 - 01/30/19	< 6	< 6	< 10	< 9	< 11	< 4	< 8	< 6	< 6	< 23	< 8
	01/30/19 - 02/27/19	< 8	< 7	< 15	< 8	< 17	< 8	< 14	< 9	< 8	< 36	< 12
	02/27/19 - 03/27/19	< 7	< 9	< 16	< 8	< 18	< 9	< 15	< 9	< 8	< 42	< 12
	03/27/19 - 05/01/19	< 4	< 6	< 8	< 5	< 9	< 4	< 9	< 4	< 4	< 22	< 8
	05/01/19 - 05/29/19	< 5	< 5	< 11	< 5	< 11	< 6	< 8	< 5	< 6	< 24	< 7
	05/29/19 - 06/26/19	< 7	< 6	< 14	< 7	< 14	< 6	< 9	< 6	< 7	< 22	< 7
	06/26/19 - 07/31/19	< 7	< 5	< 16	< 6	< 15	< 7	< 12	< 8	< 5	< 30	< 14
	07/31/19 - 08/28/19	< 6	< 7	< 12	< 7	< 13	< 7	< 12	< 8	< 8	< 32	< 12
	08/28/19 - 10/02/19	< 6	< 6	< 15	< 7	< 13	< 8	< 13	< 8	< 7	< 32	< 14
	10/02/19 - 10/30/19	< 6	< 7	< 13	< 7	< 12	< 8	< 11	< 8	< 7	< 26	< 11
	10/30/19 - 12/04/19	< 8	< 7	< 13	< 8	< 14	< 7	< 14	< 7	< 7	< 34	< 14
	12/04/19 - 01/01/20	< 7	< 5	< 11	< 5	< 10	< 6	< 6	< 7	< 4	< 28	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-II.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	13B	4L	6I
12/31/19 - 01/30/19	< 2.1	< 2.0	< 2.0
01/30/19 - 02/28/19	< 1.8	2.0 ± 1.3	< 1.8
02/28/19 - 03/27/19	< 2.1	< 2.1	< 2.1
03/27/19 - 05/01/19	2.0 ± 1.4	2.6 ± 1.4	< 1.9
05/01/19 - 05/29/19	< 2.1	< 2.0	< 2.0
05/29/19 - 06/27/19	< 1.9	< 1.9	1.9 ± 1.3
06/27/19 - 08/01/19	< 2.1	2.8 ± 1.5	2.6 ± 1.5
08/01/19 - 08/29/19	2.9 ± 1.6	2.7 ± 1.5	< 2.2
08/29/19 - 10/03/19	< 2.3	2.7 ± 1.6	< 2.3
10/03/19 - 10/30/19	3.4 ± 1.5	2.7 ± 1.4	3.0 ± 1.4
10/30/19 - 12/04/19	< 1.7	3.6 ± 1.3	2.5 ± 1.4
12/04/19 - 01/02/20	< 1.9	4.3 ± 1.5	6.0 ± 1.6
MEAN ± 2 STD DEV	2.8 ± 1.5	2.9 ± 1.4	3.2 ± 3.2

Table C-II.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	13B	4L	6I
12/31/19 - 03/27/19	< 192	< 198	< 189
03/27/19 - 06/27/19	< 180	< 184	< 179
06/27/19 - 10/03/19	< 196	< 198	< 196
10/03/19 - 01/02/20	< 185	< 186	< 185
MEAN	-	-	-

Table C-II.3 CONCENTRATIONS OF LOW LEVEL I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	13B	4L	6I
12/31/19 - 01/30/19	< 0.8	< 0.7	< 0.6
01/30/19 - 02/28/19	< 0.8	< 0.6	< 0.9
02/28/19 - 03/27/19	< 0.8	< 0.7	< 0.5
03/27/19 - 05/01/19	< 0.9	< 0.4	< 0.5
05/01/19 - 05/29/19	< 0.8	< 0.7	< 0.8
05/29/19 - 06/27/19	< 0.8	< 0.8	< 0.8
06/27/19 - 08/01/19	< 1.0	< 0.5	< 0.8
08/01/19 - 08/29/19	< 0.9	< 0.8	< 0.8
08/29/19 - 10/03/19	< 0.7	< 0.8	< 0.9
10/03/19 - 10/30/19	< 0.7	< 0.8	< 0.8
10/30/19 - 12/04/19	< 0.7	< 0.9	< 0.8
12/04/19 - 01/02/20	< 0.6	< 0.4	< 0.8
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, 2019

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	12/31/18 - 01/28/19	< 5	< 6	< 13	< 5	< 13	< 5	< 9	< 5	< 5	< 28	< 6
	01/28/19 - 02/25/19	< 5	< 5	< 11	< 5	< 9	< 7	< 10	< 5	< 7	< 31	< 9
	02/25/19 - 03/25/19	< 6	< 6	< 15	< 7	< 13	< 8	< 14	< 6	< 7	< 36	< 10
	03/25/19 - 04/29/19	< 4	< 5	< 13	< 5	< 10	< 5	< 8	< 5	< 5	< 27	< 10
	04/29/19 - 05/28/19	< 5	< 6	< 12	< 4	< 11	< 5	< 10	< 5	< 5	< 25	< 8
	05/28/19 - 06/25/19	< 6	< 5	< 11	< 5	< 10	< 6	< 9	< 5	< 5	< 26	< 7
	06/25/19 - 07/29/19	< 7	< 7	< 12	< 8	< 16	< 6	< 11	< 7	< 7	< 24	< 10
	07/29/19 - 08/26/19	< 8	< 8	< 14	< 7	< 11	< 6	< 11	< 8	< 6	< 33	< 13
	08/26/19 - 09/30/19	< 6	< 6	< 13	< 6	< 11	< 6	< 12	< 6	< 7	< 26	< 10
	09/30/19 - 10/28/19	< 3	< 4	< 8	< 4	< 8	< 4	< 7	< 4	< 3	< 19	< 6
	10/28/19 - 12/02/19	< 6	< 7	< 16	< 7	< 14	< 6	< 12	< 6	< 7	< 29	< 7
	12/02/19 - 12/30/19	< 5	< 5	< 13	< 6	< 12	< 5	< 9	< 6	< 6	< 26	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-
4L	01/03/19 - 01/30/19	< 6	< 6	< 12	< 7	< 13	< 5	< 11	< 7	< 7	< 31	< 9
	01/30/19 - 02/28/19	< 6	< 6	< 15	< 4	< 16	< 5	< 12	< 7	< 6	< 32	< 9
	02/28/19 - 03/27/19	< 7	< 7	< 12	< 5	< 15	< 5	< 8	< 8	< 5	< 26	< 7
	03/27/19 - 05/01/19	< 5	< 5	< 11	< 6	< 14	< 5	< 9	< 6	< 5	< 20	< 8
	05/01/19 - 05/29/19	< 3	< 5	< 7	< 5	< 8	< 5	< 8	< 4	< 4	< 23	< 6
	05/29/19 - 06/27/19	< 7	< 7	< 14	< 5	< 12	< 8	< 11	< 7	< 7	< 34	< 15
	06/27/19 - 08/01/19	< 10	< 8	< 15	< 12	< 18	< 10	< 15	< 10	< 9	< 40	< 7
	08/01/19 - 08/29/19	< 5	< 5	< 9	< 6	< 8	< 5	< 11	< 6	< 6	< 23	< 10
	08/29/19 - 10/02/19	< 6	< 7	< 11	< 6	< 11	< 6	< 8	< 6	< 7	< 31	< 12
	10/02/19 - 10/30/19	< 8	< 7	< 12	< 6	< 13	< 7	< 12	< 8	< 7	< 30	< 10
	10/30/19 - 12/04/19	< 6	< 6	< 13	< 5	< 12	< 6	< 10	< 5	< 5	< 25	< 10
	12/04/19 - 01/02/20	< 5	< 6	< 11	< 6	< 11	< 5	< 9	< 6	< 6	< 26	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-
6I	01/03/19 - 01/30/19	< 7	< 6	< 11	< 7	< 13	< 7	< 11	< 7	< 5	< 25	< 8
	01/30/19 - 02/28/19	< 6	< 5	< 10	< 8	< 15	< 7	< 9	< 6	< 6	< 25	< 11
	02/28/19 - 03/27/19	< 6	< 8	< 14	< 8	< 7	< 8	< 11	< 6	< 6	< 32	< 7
	03/27/19 - 05/02/19	< 5	< 5	< 12	< 5	< 10	< 5	< 9	< 5	< 4	< 22	< 7
	05/02/19 - 05/30/19	< 5	< 5	< 9	< 7	< 10	< 5	< 10	< 7	< 5	< 21	< 6
	05/30/19 - 06/27/19	< 6	< 7	< 15	< 7	< 14	< 7	< 10	< 6	< 7	< 29	< 13
	06/27/19 - 08/01/19	< 3	< 4	< 9	< 4	< 9	< 5	< 8	< 5	< 5	< 20	< 7
	08/01/19 - 08/29/19	< 6	< 7	< 13	< 7	< 15	< 7	< 11	< 7	< 7	< 28	< 10
	08/29/19 - 10/03/19	< 8	< 8	< 15	< 8	< 16	< 9	< 13	< 8	< 9	< 37	< 13
	10/03/19 - 10/31/19	< 8	< 7	< 14	< 8	< 17	< 6	< 10	< 7	< 6	< 28	< 10
	10/31/19 - 12/04/19	< 6	< 7	< 17	< 8	< 17	< 7	< 12	< 7	< 7	< 28	< 10
	12/04/19 - 01/02/20	< 6	< 4	< 10	< 6	< 11	< 6	< 11	< 6	< 6	< 23	< 8
	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, 2019**

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	06/05/19	3069 ± 811	< 59	< 52	< 102	< 57	< 124	< 45	< 59
PREDATOR	09/23/19	4029 ± 1048	< 76	< 73	< 137	< 70	< 151	< 86	< 81
	MEAN ± 2 STD DEV	3549 ± 1358	-	-	-	-	-	-	-
4	06/05/19	4729 ± 1009	< 50	< 57	< 99	< 35	< 96	< 35	< 44
BOTTOM FEEDER	09/23/19	2967 ± 809	< 38	< 57	< 87	< 66	< 128	< 65	< 40
	MEAN ± 2 STD DEV	3848 ± 2492	-	-	-	-	-	-	-
6	06/14/19	3363 ± 857	< 41	< 37	< 66	< 61	< 102	< 54	< 41
PREDATOR	09/30/19	4101 ± 822	< 45	< 44	< 88	< 48	< 104	< 40	< 48
	MEAN ± 2 STD DEV	3732 ± 1044	-	-	-	-	-	-	-
6	06/14/19	2917 ± 878	< 40	< 45	< 129	< 54	< 119	< 51	< 49
BOTTOM FEEDER	09/30/19	4300 ± 1225	< 75	< 69	< 191	< 93	< 166	< 82	< 67
	MEAN ± 2 STD DEV	3609 ± 1956	-	-	-	-	-	-	-

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, 2019

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Mn-54	Co-58	Co-60	Cs-134	Cs-137
4J	06/17/19	12880 ± 921	< 44	< 38	< 42	< 53	< 49
	12/06/19	10120 ± 1677	< 80	< 84	< 72	< 88	< 85
	MEAN ± 2 STD DEV	11500 ± 3903	-	-	-	-	-
4T	06/17/19	17020 ± 1995	< 110	< 92	< 98	< 140	< 135
	12/06/19	19080 ± 1925	< 104	< 81	< 90	< 113	< 112
	MEAN ± 2 STD DEV	18050 ± 2913	-	-	-	-	-
6F	06/17/19	16990 ± 1995	< 79	< 79	< 85	< 115	< 115
	12/06/19	16910 ± 2046	< 96	< 89	< 92	< 125	< 113
	MEAN ± 2 STD DEV	16950 ± 113	-	-	-	-	-

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, 2019

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

COLLECTION	GROUP I			GROUP II	GROUP III
PERIOD	1B	1C	1Z	3A	5H2
12/27/18 - 01/03/19	18 ± 4	16 ± 4	12 ± 4	11 ± 4	
01/02/19 - 01/07/19					13 ± 6
01/03/19 - 01/10/19	19 ± 4	9 ± 3	10 ± 3	10 ± 4	
01/07/19 - 01/14/19					15 ± 4
01/10/19 - 01/17/19	16 ± 4	14 ± 4	12 ± 4	9 ± 3	
01/14/19 - 01/22/19					13 ± 4
01/17/19 - 01/24/19	14 ± 4	11 ± 4	9 ± 4	8 ± 3	
01/22/19 - 01/28/19					19 ± 5
01/24/19 - 01/30/19	25 ± 5	18 ± 5	16 ± 5	17 ± 5	
01/28/19 - 02/04/19					19 ± 5
01/30/19 - 02/07/19	23 ± 4	21 ± 4	13 ± 4	21 ± 4	
02/04/19 - 02/11/19					10 ± 4
02/07/19 - 02/14/19	17 ± 4	13 ± 4	12 ± 3	14 ± 4	
02/11/19 - 02/18/19					15 ± 5
02/14/19 - 02/22/19	27 ± 4	15 ± 4	17 ± 4	16 ± 4	
02/18/19 - 02/26/19					23 ± 5
02/22/19 - 02/28/19	21 ± 5	19 ± 5	18 ± 5	17 ± 5	
02/26/19 - 03/04/19					21 ± 5
02/28/19 - 03/07/19	20 ± 5	13 ± 4	12 ± 4	11 ± 4	
03/04/19 - 03/11/19					16 ± 4
03/07/19 - 03/14/19	22 ± 5	20 ± 4	18 ± 4	17 ± 4	
03/11/19 - 03/18/19					20 ± 4
03/14/19 - 03/21/19	19 ± 4	13 ± 4	16 ± 4	10 ± 4	
03/18/19 - 03/25/19					10 ± 4
03/21/19 - 03/27/19	12 ± 5	8 ± 4	6 ± 4	7 ± 4	
03/25/19 - 04/02/19					12 ± 4
03/27/19 - 04/04/19	22 ± 4	14 ± 3	11 ± 3	11 ± 3	
04/02/19 - 04/08/19					16 ± 5
04/04/19 - 04/10/19	15 ± 5	11 ± 5	16 ± 5	12 ± 5	
04/08/19 - 04/15/19					9 ± 4
04/10/19 - 04/17/19	9 ± 5	9 ± 4	8 ± 3	< 4	
04/15/19 - 04/22/19					11 ± 4
04/17/19 - 04/25/19	11 ± 4	10 ± 3	8 ± 3	7 ± 3	
04/22/19 - 04/29/19					10 ± 4
04/25/19 - 05/01/19	12 ± 4	8 ± 4	10 ± 4	10 ± 4	
04/29/19 - 05/07/19					8 ± 4
05/01/19 - 05/09/19	11 ± 3	10 ± 3	6 ± 3	5 ± 3	
05/07/19 - 05/13/19					13 ± 5
05/09/19 - 05/16/19	12 ± 4	6 ± 3	9 ± 4	9 ± 4	
05/13/19 - 05/20/19					13 ± 4
05/16/19 - 05/23/19	15 ± 4	14 ± 5	17 ± 5	17 ± 6	
05/20/19 - 05/28/19					10 ± 3
05/23/19 - 05/29/19	11 ± 4	11 ± 4	14 ± 4	10 ± 4	
05/28/19 - 06/03/19					12 ± 4
05/29/19 - 06/06/19	19 ± 4	12 ± 4	16 ± 4	11 ± 3	
06/03/19 - 06/11/19					10 ± 3
06/06/19 - 06/13/19	18 ± 4	12 ± 4	15 ± 4	12 ± 4	
06/11/19 - 06/17/19					8 ± 4
06/13/19 - 06/20/19	16 ± 4	11 ± 4	14 ± 4	8 ± 4	
06/17/19 - 06/24/19					8 ± 4
06/20/19 - 06/27/19	17 ± 4	15 ± 4	17 ± 4	12 ± 4	
06/24/19 - 07/02/19					13 ± 3
06/27/19 - 07/03/19	12 ± 5	15 ± 5	14 ± 5	13 ± 5	

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, 2019

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

COLLECTION	GROUP I			GROUP II	GROUP III
PERIOD	1B	1C	1Z	3A	5H2
07/02/19 - 07/08/19					13 ± 4
07/03/19 - 07/11/19	17 ± 4	15 ± 4	18 ± 4	10 ± 3	
07/08/19 - 07/15/19					16 ± 4
07/11/19 - 07/17/19	20 ± 5	16 ± 5	19 ± 5	12 ± 4	
07/15/19 - 07/22/19					12 ± 4
07/17/19 - 07/25/19	15 ± 4	13 ± 3	14 ± 3	12 ± 3	
07/22/19 - 07/30/19					13 ± 4
07/25/19 - 08/01/19	23 ± 4	13 ± 3	20 ± 4	17 ± 4	
07/30/19 - 08/05/19					23 ± 5
08/01/19 - 08/07/19	25 ± 5	23 ± 5	22 ± 5	21 ± 5	
08/05/19 - 08/12/19					23 ± 5
08/07/19 - 08/15/19	21 ± 4	18 ± 4	16 ± 4	14 ± 4	
08/12/19 - 08/19/19					21 ± 5
08/15/19 - 08/22/19	27 ± 5	24 ± 4	23 ± 5	21 ± 5	
08/19/19 - 08/26/19					15 ± 4
08/22/19 - 08/29/19	10 ± 4	11 ± 4	8 ± 4	6 ± 4	
08/26/19 - 09/03/19					12 ± 3
08/29/19 - 09/05/19	17 ± 4	19 ± 4	13 ± 4	12 ± 4	
09/03/19 - 09/10/19					18 ± 4
09/05/19 - 09/12/19	20 ± 5	18 ± 5	17 ± 5	16 ± 5	
09/10/19 - 09/16/19					18 ± 5
09/12/19 - 09/19/19	14 ± 4	18 ± 4	16 ± 4	11 ± 4	
09/16/19 - 09/23/19					20 ± 4
09/19/19 - 09/26/19	26 ± 5	31 ± 5	25 ± 4	20 ± 4	
09/23/19 - 09/30/19					14 ± 4
09/26/19 - 10/02/19	26 ± 5	28 ± 6	24 ± 5	18 ± 5	
09/30/19 - 10/07/19					10 ± 4
10/02/19 - 10/10/19	11 ± 3	13 ± 4	13 ± 4	11 ± 4	
10/07/19 - 10/14/19					17 ± 4
10/10/19 - 10/17/19	28 ± 5	24 ± 5	21 ± 4	18 ± 4	
10/14/19 - 10/21/19					14 ± 4
10/17/19 - 10/24/19	10 ± 4	10 ± 4	8 ± 4	11 ± 4	
10/21/19 - 10/28/19					14 ± 4
10/24/19 - 10/30/19	8 ± 5	13 ± 5	18 ± 5	12 ± 4	
10/28/19 - 11/05/19					9 ± 3
10/30/19 - 11/07/19	16 ± 4	15 ± 4	18 ± 4	13 ± 3	
11/05/19 - 11/11/19					14 ± 4
11/07/19 - 11/14/19	15 ± 4	18 ± 4	15 ± 4	16 ± 4	
11/11/19 - 11/18/19					24 ± 5
11/14/19 - 11/21/19	20 ± 5	22 ± 4	14 ± 4	19 ± 4	
11/18/19 - 11/25/19					16 ± 4
11/21/19 - 11/27/19	21 ± 5	17 ± 4	10 ± 4	24 ± 5	
11/25/19 - 12/03/19					13 ± 4
11/27/19 - 12/04/19	12 ± 4	10 ± 3	8 ± 3	11 ± 4	
12/03/19 - 12/09/19					17 ± 4
12/04/19 - 12/12/19	19 ± 4	15 ± 3	17 ± 4	18 ± 4	
12/09/19 - 12/16/19					15 ± 4
12/12/19 - 12/19/19	16 ± 4	17 ± 4	13 ± 4	22 ± 5	
12/16/19 - 12/23/19					20 ± 4
12/19/19 - 12/26/19	42 ± 6	43 ± 6	28 ± 5	38 ± 6	
12/23/19 - 12/30/19					29 ± 5
12/26/19 - 01/02/20	21 ± 5	23 ± 5	16 ± 4	23 ± 5	
MEAN ± 2 STD DEV	18 ± 12	16 ± 13	15 ± 10	14 ± 12	15 ± 9

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

Table C-V.2 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

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	12/27/18 - 03/27/19	91 ± 21	< 2	< 2	< 3	< 2	< 2
	03/27/19 - 06/27/19	129 ± 30	< 3	< 4	< 4	< 4	< 4
	06/27/19 - 10/02/19	91 ± 20	< 2	< 3	< 2	< 3	< 2
	10/02/19 - 01/02/20	72 ± 16	< 2	< 2	< 2	< 2	< 2
	MEAN ± 2 STD DEV	96 ± 47	-	-	-	-	-
1C	12/27/18 - 03/27/19	71 ± 16	< 3	< 2	< 3	< 2	< 2
	03/27/19 - 06/27/19	95 ± 23	< 2	< 2	< 3	< 2	< 2
	06/27/19 - 10/02/19	90 ± 17	< 2	< 1	< 2	< 2	< 2
	10/02/19 - 01/02/20	72 ± 16	< 2	< 2	< 2	< 2	< 2
	MEAN ± 2 STD DEV	82 ± 25	-	-	-	-	-
1Z	12/27/18 - 03/27/19	90 ± 20	< 2	< 1	< 3	< 2	< 2
	03/27/19 - 06/27/19	64 ± 19	< 2	< 2	< 2	< 2	< 2
	06/27/19 - 10/02/19	66 ± 16	< 2	< 2	< 1	< 2	< 1
	10/02/19 - 01/02/20	48 ± 14	< 2	< 2	< 2	< 2	< 2
	MEAN ± 2 STD DEV	67 ± 35	-	-	-	-	-
3A	12/27/18 - 03/27/19	57 ± 14	< 2	< 2	< 1	< 2	< 2
	03/27/19 - 06/27/19	84 ± 26	< 3	< 4	< 4	< 4	< 3
	06/27/19 - 10/02/19	64 ± 18	< 2	< 2	< 2	< 2	< 2
	10/02/19 - 01/02/20	77 ± 21	< 3	< 4	< 5	< 4	< 4
	MEAN ± 2 STD DEV	70 ± 24	-	-	-	-	-
5H2	01/02/19 - 04/02/19	121 ± 27	< 4	< 2	< 3	< 3	< 3
	04/02/19 - 07/02/19	80 ± 20	< 2	< 2	< 2	< 2	< 2
	07/02/19 - 09/30/19	78 ± 21	< 2	< 3	< 2	< 2	< 2
	09/30/19 - 12/30/19	79 ± 18	< 2	< 2	< 3	< 2	< 2
	MEAN ± 2 STD DEV	89 ± 42	-	-	-	-	-

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, 2019

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

COLLECTION PERIOD	GROUP I			GROUP II	GROUP III
	1B	1C	1Z	3A	5H2
12/27/18 - 01/03/19	< 48	< 20	< 48	< 48	
01/02/19 - 01/07/19					< 28
01/03/19 - 01/10/19	< 55	< 55	< 55	< 55	
01/07/19 - 01/14/19					< 16
01/10/19 - 01/17/19	< 41	< 41	< 41	< 41	
01/14/19 - 01/22/19					< 25
01/17/19 - 01/24/19	< 41	< 40	< 41	< 40	
01/22/19 - 01/28/19					< 29
01/24/19 - 01/30/19	< 42	< 42	< 47	< 42	
01/28/19 - 02/04/19					< 22
01/30/19 - 02/07/19	< 34	< 34	< 34	< 34	
02/04/19 - 02/11/19					< 19
02/07/19 - 02/14/19	< 39	< 39	< 39	< 39	
02/11/19 - 02/18/19					< 23
02/14/19 - 02/22/19	< 28	< 28	< 28	< 28	
02/18/19 - 02/26/19					< 20
02/22/19 - 02/28/19	< 51	< 51	< 51	< 50	
02/26/19 - 03/04/19					< 24
02/28/19 - 03/07/19	< 28	< 24	< 27	< 24	
03/04/19 - 03/11/19					< 22
03/07/19 - 03/14/19	< 54	< 54	< 54	< 54	
03/11/19 - 03/18/19					< 28
03/14/19 - 03/21/19	< 42	< 42	< 42	< 42	
03/18/19 - 03/25/19					< 19
03/21/19 - 03/27/19	< 31	< 30	< 27	< 30	
03/25/19 - 04/02/19					< 9
03/27/19 - 04/04/19	< 43	< 37	< 37	< 41	
04/02/19 - 04/08/19					< 23
04/04/19 - 04/10/19	< 55	< 57	< 51	< 57	
04/08/19 - 04/15/19					< 31
04/10/19 - 04/17/19	< 46	< 32	< 32	< 32	
04/15/19 - 04/22/19					< 28
04/17/19 - 04/25/19	< 39	< 39	< 39	< 39	
04/22/19 - 04/29/19					< 20
04/25/19 - 05/01/19	< 32	< 39	< 39	< 39	
04/29/19 - 05/07/19					< 13
05/01/19 - 05/09/19	< 20	< 17	< 17	< 17	
05/07/19 - 05/13/19					< 21
05/09/19 - 05/16/19	< 31	< 28	< 33	< 31	
05/13/19 - 05/20/19					< 9
05/16/19 - 05/23/19	< 18	< 21	< 20	< 24	
05/20/19 - 05/28/19					< 24
05/23/19 - 05/29/19	< 50	< 45	< 18	< 50	
05/28/19 - 06/03/19					< 17
05/29/19 - 06/06/19	< 33	< 33	< 30	< 29	
06/03/19 - 06/11/19					< 30
06/06/19 - 06/13/19	< 45	< 47	< 47	< 47	
06/11/19 - 06/17/19					< 28
06/13/19 - 06/20/19	< 48	< 44	< 44	< 44	
06/17/19 - 06/24/19					< 18
06/20/19 - 06/27/19	< 49	< 48	< 18	< 60	
06/24/19 - 07/02/19					< 11
06/27/19 - 07/03/19	< 11	< 21	< 21	< 21	

Table C-VI.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

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

COLLECTION	GROUP I			GROUP II	GROUP III
PERIOD	1B	1C	1Z	3A	5H2
07/02/19 - 07/08/19					< 19
07/03/19 - 07/11/19	< 29	< 30	< 30	< 30	
07/08/19 - 07/15/19					< 16
07/11/19 - 07/17/19	< 48	< 52	< 52	< 52	
07/15/19 - 07/22/19					< 18
07/17/19 - 07/25/19	< 22	< 17	< 22	< 23	
07/22/19 - 07/30/19					< 13
07/25/19 - 08/01/19	< 48	< 43	< 47	< 52	
07/30/19 - 08/05/19					< 21
08/01/19 - 08/07/19	< 17	< 17	< 17	< 19	
08/05/19 - 08/12/19					< 14
08/07/19 - 08/15/19	< 39	< 16	< 38	< 38	
08/12/19 - 08/19/19					< 14
08/15/19 - 08/22/19	< 33	< 27	< 30	< 30	
08/19/19 - 08/26/19					< 11
08/22/19 - 08/29/19	< 33	< 33	< 28	< 33	
08/26/19 - 09/03/19					< 8
08/29/19 - 09/05/19	< 38	< 38	< 38	< 16	
09/03/19 - 09/10/19					< 14
09/05/19 - 09/12/19	< 16	< 16	< 16	< 16	
09/10/19 - 09/16/19					< 22
09/12/19 - 09/19/19	< 23	< 23	< 23	< 23	
09/16/19 - 09/23/19					< 10
09/19/19 - 09/26/19	< 32	< 32	< 32	< 32	
09/23/19 - 09/30/19					< 20
09/26/19 - 10/02/19	< 17	< 41	< 41	< 41	
09/30/19 - 10/07/19					< 23
10/02/19 - 10/10/19	< 39	< 43	< 43	< 48	
10/07/19 - 10/14/19					< 21
10/10/19 - 10/17/19	< 23	< 20	< 20	< 20	
10/14/19 - 10/21/19					< 6
10/17/19 - 10/24/19	< 28	< 25	< 25	< 25	
10/21/19 - 10/28/19					< 13
10/24/19 - 10/30/19	< 40	< 30	< 36	< 35	
10/28/19 - 11/05/19					< 8
10/30/19 - 11/07/19	< 27	< 24	< 25	< 10	
11/05/19 - 11/11/19					< 23
11/07/19 - 11/14/19	< 30	< 27	< 27	< 27	
11/11/19 - 11/18/19					< 47
11/14/19 - 11/21/19	< 22	< 18	< 20	< 20	
11/18/19 - 11/25/19					< 19
11/21/19 - 11/27/19	< 29	< 27	< 30	< 30	
11/25/19 - 12/03/19					< 18
11/27/19 - 12/04/19	< 44	< 40	< 44	< 50	
12/03/19 - 12/09/19					< 14
12/04/19 - 12/12/19	< 29	< 29	< 35	< 35	
12/09/19 - 12/16/19					< 14
12/12/19 - 12/19/19	< 24	< 19	< 25	< 24	
12/16/19 - 12/23/19					< 39
12/19/19 - 12/26/19	< 28	< 26	< 28	< 29	
12/23/19 - 12/30/19					< 21
12/26/19 - 01/02/20	< 31	< 31	< 31	< 17	
MEAN	-	-	-	-	-

Table C-VII.1

CONCENTRATIONS OF LOW LEVEL I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION	CONTROL FARMS			INDICATOR FARMS								
PERIOD	C	E	V	D	J	P	R	S	U	W	X	Y
01/08/19			< 0.8		< 0.8		< 0.7	< 0.7	< 0.6		< 0.9	
02/13/19	< 0.9	< 0.6	< 0.5	< 0.4	< 0.7	< 0.4	< 0.5	< 0.5	< 0.4	< 0.8	< 0.5	*(2)*
03/11/19			< 0.7		< 0.9		< 0.6	< 0.8	< 0.8		< 0.7	
04/01/19			< 0.7		< 0.7		< 0.8	< 0.7	< 0.8		< 0.8	
04/16/19			< 0.6		< 0.7		< 0.7	< 0.9	*(1)*		< 0.9	
04/30/19			< 0.8		< 0.7		< 0.5	< 0.7	< 0.7		< 0.9	
05/15/19	< 0.4	< 0.4	< 0.7	< 0.5	< 0.8	< 0.5	< 0.5	< 0.8	< 0.6	< 0.7	< 0.5	< 0.8
05/30/19			< 0.9		< 0.8		< 0.6	< 0.6	< 0.8		< 0.7	
06/12/19			< 0.7		< 0.7		< 0.8	< 0.7	< 0.8		< 0.8	
06/26/19			< 0.6		< 0.8		< 0.7	< 0.9	< 0.8		< 0.8	
07/09/19			< 0.7		< 0.6		< 0.6	< 0.7	< 0.7		< 0.6	
07/23/19			< 0.8		< 0.7		< 0.7	< 0.8	< 1.0		< 0.8	
08/07/19	< 0.7	< 0.6	< 0.7	< 0.8	< 0.6	< 0.7	< 0.8	< 0.6	< 0.8	< 0.8	< 0.8	< 0.7
08/20/19			< 0.5		< 0.7		< 0.6	< 0.6	< 0.4		< 0.7	
09/05/19			< 0.9		< 0.9		< 0.7	< 0.9	< 0.7		< 0.7	
09/17/19			< 0.7		< 0.6		< 0.7	< 0.8	< 0.9		< 0.9	
10/01/19			< 0.9		< 0.8		< 0.8	< 0.9	< 0.8		< 0.8	
10/16/19			< 0.9		< 0.9		< 0.9	< 0.8	< 0.9		< 0.9	
10/29/19			< 0.9		< 0.9		< 0.8	< 0.7	< 0.9		< 0.8	
11/13/19	< 0.8	< 0.7	< 0.8	< 1.0	< 0.9	< 0.9	< 0.8	< 0.8	< 0.9	< 0.9	< 1.0	< 0.9
11/26/19			< 0.8		< 0.8		< 0.8	< 0.9	< 0.8		< 0.7	
12/10/19			< 0.8		< 0.9		< 0.7	< 0.7	< 0.8		< 0.7	
MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) Missed sample due to farm no longer producing milk commercially
(2) Replaced Farm L in 1Q2019, 1st sample obtained in 2Q2019

Table C-VII.2 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
C	02/13/19	1293 ± 155	< 10	< 8	< 37	< 11
	05/15/19	1537 ± 202	< 9	< 8	< 35	< 13
	08/07/19	1310 ± 131	< 7	< 6	< 31	< 8
	11/13/19	1352 ± 207	< 8	< 9	< 32	< 9
	MEAN ± 2 STD DEV	1373 ± 224	-	-	-	-
E	02/12/19	1287 ± 156	< 10	< 10	< 50	< 11
	05/15/19	1364 ± 168	< 7	< 6	< 27	< 10
	08/07/19	1558 ± 150	< 6	< 6	< 27	< 10
	11/13/19	1240 ± 123	< 4	< 5	< 19	< 6
	MEAN ± 2 STD DEV	1362 ± 280	-	-	-	-
V	01/07/19	1344 ± 150	< 8	< 6	< 35	< 10
	02/13/19	1193 ± 186	< 8	< 8	< 23	< 7
	03/11/19	1135 ± 207	< 9	< 9	< 29	< 10
	04/01/19	1334 ± 149	< 10	< 9	< 31	< 9
	04/16/19	1308 ± 128	< 6	< 5	< 29	< 7
	04/30/19	1289 ± 206	< 11	< 10	< 33	< 8
	05/14/19	1096 ± 168	< 9	< 6	< 29	< 8
	05/29/19	1192 ± 160	< 8	< 7	< 29	< 12
	06/12/19	1307 ± 159	< 5	< 6	< 25	< 8
	06/25/19	1172 ± 159	< 7	< 7	< 26	< 5
	07/08/19	1163 ± 161	< 7	< 6	< 23	< 10
	07/23/19	1323 ± 153	< 7	< 7	< 24	< 8
	08/06/19	1220 ± 187	< 8	< 7	< 34	< 14
	08/20/19	1154 ± 150	< 11	< 10	< 45	< 15
	09/03/19	1106 ± 201	< 8	< 7	< 35	< 9
	09/17/19	1274 ± 184	< 7	< 10	< 41	< 10
	09/30/19	1194 ± 183	< 8	< 8	< 39	< 10
	10/15/19	1237 ± 159	< 7	< 7	< 28	< 10
	10/29/19	1234 ± 191	< 9	< 10	< 28	< 8
	11/12/19	1421 ± 166	< 8	< 6	< 18	< 7
	11/25/19	1273 ± 169	< 8	< 8	< 41	< 14
	12/10/19	1330 ± 111	< 5	< 4	< 17	< 4
	MEAN ± 2 STD DEV	1241 ± 172	-	-	-	-
D	02/12/19	1213 ± 153	< 10	< 11	< 52	< 12
	05/14/19	1345 ± 154	< 8	< 7	< 28	< 11
	08/06/19	1419 ± 177	< 9	< 7	< 34	< 8
	11/12/19	1038 ± 190	< 8	< 9	< 26	< 8
	MEAN ± 2 STD DEV	1254 ± 334	-	-	-	-

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, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
J	01/08/19	986 ± 211	< 9	< 8	< 40	< 8
	02/13/19	1219 ± 150	< 7	< 4	< 22	< 7
	03/11/19	1245 ± 151	< 11	< 11	< 38	< 9
	04/01/19	1063 ± 166	< 8	< 7	< 25	< 9
	04/16/19	1414 ± 143	< 7	< 6	< 25	< 9
	04/30/19	1388 ± 120	< 8	< 7	< 26	< 7
	05/14/19	1317 ± 191	< 7	< 9	< 35	< 8
	05/30/19	1259 ± 166	< 6	< 6	< 30	< 9
	06/12/19	1311 ± 165	< 6	< 7	< 30	< 12
	06/25/19	1232 ± 121	< 7	< 5	< 26	< 9
	07/09/19	1414 ± 197	< 8	< 9	< 28	< 9
	07/23/19	1350 ± 176	< 8	< 7	< 27	< 10
	08/06/19	1383 ± 193	< 11	< 8	< 45	< 12
	08/20/19	1400 ± 199	< 9	< 8	< 44	< 10
	09/04/19	1132 ± 145	< 10	< 9	< 37	< 9
	09/17/19	1186 ± 195	< 7	< 8	< 23	< 7
	09/30/19	1505 ± 197	< 10	< 8	< 43	< 14
	10/16/19	1097 ± 166	< 8	< 9	< 25	< 7
	10/29/19	879 ± 172	< 8	< 8	< 29	< 7
	11/12/19	1313 ± 163	< 8	< 8	< 25	< 8
	11/26/19	1215 ± 177	< 10	< 7	< 37	< 12
	12/10/19	1194 ± 165	< 8	< 8	< 37	< 13
	MEAN ± 2 STD DEV	1250 ± 306	-	-	-	-
P	02/12/19	1048 ± 141	< 12	< 10	< 52	< 12
	05/14/19	1350 ± 160	< 7	< 6	< 33	< 10
	08/06/19	1296 ± 158	< 8	< 6	< 35	< 9
	11/12/19	1322 ± 175	< 8	< 6	< 24	< 10
	MEAN ± 2 STD DEV	1254 ± 278	-	-	-	-
R	01/08/19	1268 ± 152	< 11	< 11	< 48	< 14
	02/13/19	1307 ± 131	< 5	< 5	< 24	< 7
	03/11/19	1362 ± 150	< 6	< 6	< 21	< 5
	04/01/19	1494 ± 192	< 10	< 7	< 28	< 11
	04/16/19	1370 ± 119	< 8	< 8	< 34	< 9
	04/30/19	1296 ± 166	< 11	< 10	< 40	< 9
	05/14/19	1450 ± 183	< 7	< 6	< 29	< 8
	05/30/19	1238 ± 170	< 8	< 8	< 21	< 8
	06/12/19	1274 ± 191	< 6	< 8	< 36	< 7
	06/25/19	1388 ± 143	< 5	< 5	< 25	< 9
	07/09/19	1204 ± 174	< 8	< 7	< 28	< 7
	07/23/19	1099 ± 168	< 7	< 8	< 30	< 9
	08/06/19	1299 ± 159	< 10	< 10	< 39	< 12
	08/20/19	1525 ± 180	< 8	< 7	< 29	< 8
	09/04/19	1150 ± 198	< 7	< 6	< 33	< 9
	09/17/19	1476 ± 191	< 8	< 6	< 23	< 8
	09/30/19	1334 ± 174	< 9	< 9	< 36	< 13
	10/16/19	993 ± 179	< 8	< 7	< 25	< 6
	10/29/19	1271 ± 185	< 9	< 9	< 30	< 8
	11/12/19	1122 ± 149	< 7	< 7	< 21	< 7
	11/26/19	1348 ± 190	< 8	< 8	< 40	< 13
	12/10/19	1090 ± 153	< 6	< 7	< 34	< 10
	MEAN ± 2 STD DEV	1289 ± 279	-	-	-	-

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, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD		K-40	Cs-134	Cs-137	Ba-140	La-140
S	01/08/19		1437 ± 197	< 9	< 5	< 35	< 9
	02/12/19		1191 ± 147	< 6	< 7	< 31	< 10
	03/11/19		1311 ± 129	< 6	< 5	< 19	< 5
	04/01/19		1263 ± 155	< 10	< 10	< 36	< 10
	04/16/19		1348 ± 143	< 7	< 6	< 27	< 7
	04/30/19		1511 ± 212	< 9	< 9	< 33	< 6
	05/15/19		1410 ± 148	< 6	< 6	< 26	< 7
	05/30/19		1451 ± 187	< 8	< 8	< 31	< 7
	06/12/19		1279 ± 174	< 8	< 7	< 34	< 11
	06/25/19		1340 ± 176	< 8	< 9	< 34	< 9
	07/09/19		1468 ± 178	< 8	< 7	< 27	< 9
	07/23/19		1113 ± 142	< 9	< 9	< 36	< 8
	08/06/19		1194 ± 189	< 9	< 8	< 40	< 11
	08/20/19		1231 ± 147	< 8	< 7	< 35	< 8
	09/05/19		1264 ± 160	< 11	< 9	< 42	< 11
	09/17/19		1331 ± 187	< 8	< 5	< 22	< 10
	09/30/19		1398 ± 193	< 7	< 7	< 31	< 8
	10/16/19		1167 ± 160	< 8	< 8	< 31	< 9
	10/29/19		1327 ± 184	< 9	< 7	< 27	< 4
	11/12/19		1265 ± 145	< 7	< 6	< 22	< 8
	11/26/19		1492 ± 180	< 8	< 9	< 44	< 13
	12/10/19		1263 ± 118	< 4	< 5	< 17	< 6
MEAN ± 2 STD DEV			1321 ± 221	-	-	-	-
U	01/08/19		1176 ± 155	< 7	< 7	< 31	< 9
	02/13/19		1039 ± 171	< 6	< 8	< 32	< 13
	03/11/19		1233 ± 183	< 7	< 8	< 29	< 9
	04/01/19		1011 ± 163	< 6	< 8	< 25	< 8
	04/16/19	*(1)*					
	04/30/19		1284 ± 151	< 10	< 10	< 34	< 7
	05/14/19		1349 ± 190	< 8	< 8	< 30	< 9
	05/30/19		1317 ± 176	< 8	< 8	< 32	< 9
	06/12/19		1247 ± 190	< 9	< 8	< 36	< 6
	06/26/19		1241 ± 147	< 7	< 7	< 29	< 9
	07/09/19		1147 ± 137	< 8	< 7	< 25	< 7
	07/23/19		1162 ± 184	< 6	< 8	< 23	< 6
	08/07/19		1075 ± 160	< 8	< 6	< 29	< 11
	08/20/19		1416 ± 169	< 7	< 7	< 36	< 9
	09/04/19		1105 ± 153	< 6	< 6	< 24	< 13
	09/17/19		933 ± 177	< 9	< 9	< 35	< 11
	10/01/19		1168 ± 168	< 8	< 7	< 30	< 12
	10/15/19		1195 ± 198	< 8	< 8	< 52	< 12
	10/29/19		1215 ± 175	< 9	< 9	< 26	< 8
	11/12/19		1366 ± 132	< 6	< 6	< 21	< 6
	11/26/19		969 ± 125	< 7	< 7	< 37	< 12
	12/10/19		1085 ± 103	< 5	< 5	< 22	< 6
MEAN ± 2 STD DEV			1178 ± 261	-	-	-	-

(1) Missed sample due to farm no longer producing milk commercially

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, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD		K-40	Cs-134	Cs-137	Ba-140	La-140
W	02/12/19		1246 ± 120	< 8	< 9	< 42	< 10
	05/14/19		1387 ± 190	< 7	< 7	< 30	< 6
	08/06/19		1239 ± 148	< 8	< 5	< 24	< 7
	11/12/19		1266 ± 189	< 8	< 8	< 23	< 9
	MEAN ± 2 STD DEV		1285 ± 139	-	-	-	-
X	~~01/08/19~~		~~990 ± 138~~	~~< 7~~	~~< 7~~	~~< 34~~	~~< 7~~
	02/12/19		1031 ± 175	< 9	< 7	< 36	< 10
	03/11/19		1304 ± 171	< 8	< 7	< 30	< 9
	04/01/19		1286 ± 140	< 6	< 5	< 19	< 5
	04/16/19		1059 ± 102	< 7	< 7	< 31	< 8
	04/30/19		1085 ± 161	< 9	< 11	< 36	< 10
	05/14/19		1187 ± 175	< 8	< 7	< 35	< 8
	05/30/19		1089 ± 172	< 8	< 7	< 21	< 11
	06/12/19		919 ± 155	< 8	< 7	< 30	< 9
	06/25/19		1159 ± 162	< 8	< 6	< 29	< 10
	07/09/19		1226 ± 167	< 9	< 6	< 26	< 10
	07/23/19		1208 ± 164	< 8	< 8	< 24	< 8
	08/06/19		1254 ± 172	< 9	< 9	< 38	< 13
	08/20/19		1074 ± 169	< 9	< 8	< 36	< 11
	09/04/19		1079 ± 145	< 10	< 9	< 43	< 12
	09/17/19		998 ± 158	< 8	< 7	< 32	< 11
	09/30/19		1173 ± 180	< 7	< 6	< 25	< 12
	10/16/19		1311 ± 168	< 8	< 7	< 29	< 9
	10/29/19		1157 ± 169	< 7	< 7	< 26	< 10
	11/12/19		1208 ± 146	< 7	< 6	< 20	< 8
	11/26/19		1335 ± 158	< 8	< 8	< 42	< 14
	12/10/19		1284 ± 145	< 7	< 6	< 27	< 9
	MEAN ± 2 STD DEV		1155 ± 234	-	-	-	-
Y	02/13/19	(2)					
	05/15/19		1414 ± 160	< 7	< 6	< 31	< 6
	08/06/19		1207 ± 154	< 7	< 7	< 30	< 10
	11/12/19		1269 ± 181	< 10	< 6	< 30	< 7
	MEAN ± 2 STD DEV		1297 ± 212	-	-	-	-

(2) Replaced Farm L in 1Q2019, 1st sample obtained in 2Q2019

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, 2019**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD		Be-7	K-40	Mn-54	Co-58	Co-60	I-131	Cs-134	Cs-137
1C	06/26/19	*Kale*	< 209	4833 ± 752	< 20	< 27	< 23	< 45	< 33	< 29
	06/26/19	*Cabbage*	< 335	3327 ± 602	< 27	< 30	< 32	< 45	< 37	< 36
	06/26/19	*Collards*	< 406	2814 ± 619	< 42	< 40	< 29	< 58	< 38	< 43
	07/24/19	*Swiss Chard*	1683 ± 236	4698 ± 412	< 20	< 17	< 18	< 23	< 22	< 22
	07/24/19	*Cabbage*	1066 ± 159	2983 ± 369	< 17	< 15	< 17	< 17	< 18	< 21
	07/24/19	*Kale*	1154 ± 303	2011 ± 391	< 25	< 24	< 23	< 27	< 27	< 25
	08/21/19	*Kale*	315 ± 86	3440 ± 291	< 14	< 13	< 15	< 16	< 13	< 14
	08/21/19	*Collards*	799 ± 158	3077 ± 288	< 13	< 13	< 15	< 17	< 16	< 15
	08/21/19	*Swiss Chard*	611 ± 125	3436 ± 273	< 14	< 13	< 14	< 16	< 15	< 14
	09/18/19	*Kale*	< 350	3554 ± 806	< 40	< 34	< 36	< 33	< 34	< 32
	09/18/19	*Swiss Chard*	< 379	3526 ± 763	< 45	< 35	< 36	< 43	< 48	< 46
	09/18/19	*Collards*	< 372	4121 ± 782	< 39	< 29	< 30	< 39	< 43	< 48
		MEAN ± 2 STD DEV	938 ± 952	3485 ± 1569	-	-	-	-	-	-
2Q	06/26/19	*Cabbage*	< 237	3048 ± 441	< 21	< 23	< 16	< 32	< 22	< 21
	06/26/19	*Broccoli Leaves*	< 252	3197 ± 469	< 17	< 16	< 17	< 28	< 15	< 13
	06/26/19	*Cauliflower Leaves*	272 ± 141	2616 ± 386	< 18	< 18	< 15	< 29	< 19	< 20
	07/24/19	*Broccoli Leaves*	410 ± 240	2754 ± 600	< 17	< 21	< 21	< 30	< 28	< 25
	07/24/19	*Cabbage*	857 ± 271	2789 ± 534	< 25	< 18	< 29	< 27	< 27	< 25
	07/24/19	*Kale*	642 ± 293	5471 ± 733	< 30	< 28	< 33	< 33	< 35	< 33
	08/21/19	*Corn Leaves*	2148 ± 175	4715 ± 274	< 15	< 14	< 16	< 18	< 17	< 16
	08/21/19	*Zucchini*	1476 ± 404	4454 ± 797	< 54	< 43	< 51	< 55	< 49	< 51
	08/21/19	*Squash*	< 413	4686 ± 527	< 40	< 38	< 42	< 43	< 47	< 37
	09/18/19	*Collards*	< 291	3691 ± 589	< 28	< 30	< 36	< 34	< 33	< 33
	09/18/19	*Squash Leaves*	< 272	3606 ± 545	< 15	< 23	< 18	< 23	< 21	< 21
	09/18/19	*Pumpkin Leaves*	623 ± 236	4050 ± 765	< 29	< 26	< 40	< 32	< 33	< 26
	09/24/19	*Sweet Potato*	< 104	3005 ± 388	< 14	< 17	< 13	< 27	< 17	< 15
		MEAN ± 2 STD DEV	918 ± 1333	3699 ± 1817	-	-	-	-	-	-

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, 2019**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD		Be-7	K-40	Mn-54	Co-58	Co-60	I-131	Cs-134	Cs-137
3Q	06/26/19	*Collards*	< 192	4649 ± 572	< 16	< 17	< 17	< 30	< 26	< 19
	06/26/19	*Cabbage*	< 320	6394 ± 711	< 38	< 27	< 33	< 46	< 34	< 33
	06/26/19	*Broccoli Leaves*	< 199	4228 ± 460	< 19	< 19	< 16	< 28	< 21	< 21
	07/24/19	*Cabbage*	1021 ± 237	4692 ± 596	< 28	< 24	< 27	< 31	< 28	< 28
	07/24/19	*Cauliflower Leaves*	1183 ± 272	2827 ± 486	< 27	< 19	< 24	< 22	< 24	< 24
	07/24/19	*Collards*	609 ± 177	4981 ± 527	< 19	< 17	< 25	< 21	< 21	< 21
	08/21/19	*Kale*	585 ± 144	7105 ± 369	< 15	< 14	< 16	< 17	< 15	< 15
	08/21/19	*Collards*	666 ± 136	6247 ± 359	< 19	< 19	< 22	< 20	< 20	< 19
	08/21/19	*Corn Leaves*	815 ± 136	5440 ± 357	< 14	< 14	< 14	< 18	< 15	< 15
	09/18/19	*Corn Leaves*	1184 ± 446	5410 ± 862	< 38	< 41	< 46	< 49	< 50	< 43
	09/18/19	*Collards*	379 ± 177	6271 ± 881	< 30	< 24	< 38	< 31	< 38	< 29
	09/18/19	*Kale*	< 336	6180 ± 878	< 38	< 29	< 50	< 45	< 47	< 41
		MEAN ± 2 STD DEV	805 ± 596	5369 ± 2351	-	-	-	-	-	-
55	06/26/19	*Swiss Chard*	184 ± 162	8816 ± 718	< 21	< 22	< 19	< 31	< 26	< 17
	06/26/19	*Collards*	< 196	5937 ± 594	< 19	< 20	< 21	< 31	< 20	< 18
	06/26/19	*Cabbage*	< 196	4342 ± 560	< 21	< 18	< 21	< 26	< 21	< 18
	07/24/19	*Cabbage*	494 ± 267	4166 ± 696	< 30	< 30	< 34	< 27	< 27	< 31
	07/24/19	*Collards*	406 ± 284	5881 ± 578	< 25	< 22	< 23	< 24	< 24	< 20
	07/24/19	*Swiss Chard*	447 ± 365	5879 ± 628	< 28	< 27	< 26	< 36	< 34	< 29
	08/21/19	*Cabbage*	627 ± 356	5153 ± 784	< 34	< 33	< 44	< 51	< 43	< 39
	08/21/19	*Collards*	611 ± 268	6122 ± 775	< 28	< 29	< 27	< 34	< 32	< 29
	08/21/19	*Swiss Chard*	373 ± 250	6904 ± 825	< 38	< 34	< 32	< 40	< 40	< 40
	09/18/19	*Swiss Chard*	< 328	7826 ± 837	< 34	< 39	< 34	< 35	< 33	< 36
	09/18/19	*Corn Leaves*	1088 ± 311	7311 ± 998	< 27	< 25	< 49	< 27	< 36	< 35
	09/26/19	*Sweet Potato*	< 203	3484 ± 476	< 22	< 24	< 19	< 37	< 23	< 22
		MEAN ± 2 STD DEV	529 ± 532	5985 ± 3134	-	-	-	-	-	-

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

Table C-IX.1 QUARTERLY DLR RESULTS FOR PEACH BOTTOM ATOMIC POWER STATION, 2019

Monitoring Location	Location Quarterly Baseline, B_Q (mrem)	B_Q + MDD_Q[1] (mrem)	2019 Normalized Net Dose, M_{QX} (mrem/std. qtr.)				Quarterly Facility Dose, F_Q (mrem)			
			1	2	3	4	1	2	3	4
P-TLD-14	22.9	28.6	23.7	23.1	27.6	24.6	ND	ND	ND	ND
P-TLD-15	23.5	29.2	25.8	25.1	26.8	25.8	ND	ND	ND	ND
P-TLD-16	23.3	29.0	21.6	23.3	28.1	24.1	ND	ND	ND	ND
P-TLD-17	27	32.7	28.0	28.0	29.8	28.6	ND	ND	ND	ND
P-TLD-18	23.8	29.5	24.7	24.5	25.0	23.6	ND	ND	ND	ND
P-TLD-19	21	26.7	19.4	20.5	19.1	19.9	ND	ND	ND	ND
P-TLD-1A	23.6	29.3	24.6	25.5	27.5	21.7	ND	ND	ND	ND
P-TLD-1B	20	25.7	20.4	21.9	21.8	21.3	ND	ND	ND	ND
P-TLD-1C	24	29.7	23.2	25.9	24.4	24.4	ND	ND	ND	ND
P-TLD-1D	23.6	29.3	19.9	22.5	25.7	22.8	ND	ND	ND	ND
P-TLD-1E	22.6	28.3	23.7	23.7	25.6	22.8	ND	ND	ND	ND
P-TLD-1F	26.9	32.6	25.2	26.9	31.1	26.2	ND	ND	ND	ND
P-TLD-1G	16	21.7	14.7	15.2	16.0	14.6	ND	ND	ND	ND
P-TLD-1H	23.5	29.2	23.0	24.0	25.5	23.5	ND	ND	ND	ND
P-TLD-1I	21.3	27.0	21.4	21.5	23.7	21.8	ND	ND	ND	ND
P-TLD-1J	27	32.7	26.9	28.0	29.7	30.1	ND	ND	ND	ND
P-TLD-1K	26.2	31.9	26.3	25.8	31.2	27.8	ND	ND	ND	ND
P-TLD-1L	19.3	25.0	20.8	19.9	20.3	19.0	ND	ND	ND	ND
P-TLD-1M	13.9	19.6	15.0	13.7	16.0	*(2)*	ND	ND	ND	ND
P-TLD-1NN	25.5	31.2	24.7	26.1	26.1	26.8	ND	ND	ND	ND
P-TLD-1P	15.9	21.6	17.1	17.2	18.2	17.1	ND	ND	ND	ND
P-TLD-1Q	18.6	24.3	19.4	18.9	20.0	20.6	ND	ND	ND	ND
P-TLD-1R(*)	32.4	38.1	35.6	35.1	38.8	35.5	ND	ND	6.4[3]	ND
P-TLD-1T	24.7	30.4	24.3	23.1	26.2	25.0	ND	ND	ND	ND
P-TLD-2	23	28.7	22.5	22.3	25.6	23.8	ND	ND	ND	ND
P-TLD-22	24.1	29.8	23.9	24.3	29.4	23.9	ND	ND	ND	ND
P-TLD-23	24.8	30.5	23.1	25.3	28.1	25.8	ND	ND	ND	ND
P-TLD-24	18.3	24.0	16.3	17.3	17.8	17.0	ND	ND	ND	ND
P-TLD-26	26.4	32.1	21.5	24.5	25.0	24.1	ND	ND	ND	ND
P-TLD-27	24.4	30.1	24.6	25.2	28.4	26.7	ND	ND	ND	ND
P-TLD-2B(**)	21.9	27.6	21.3	22.8	24.4	24.8	ND	ND	ND	ND
P-TLD-31A	19.8	25.5	18.4	20.3	22.1	20.8	ND	ND	ND	ND
P-TLD-32	25.2	30.9	24.9	27.6	28.3	26.4	ND	ND	ND	ND
P-TLD-3A	17.2	22.9	17.4	17.8	20.4	17.8	ND	ND	ND	ND
P-TLD-40	27.8	33.5	26.2	29.3	28.9	27.5	ND	ND	ND	ND
P-TLD-42	21	26.7	21.7	22.2	20.4	20.1	ND	ND	ND	ND
P-TLD-43	26.3	32.0	27.2	27.5	28.8	28.2	ND	ND	ND	ND
P-TLD-44	22.7	28.4	23.1	24.0	24.6	23.3	ND	ND	ND	ND
P-TLD-45	24.5	30.2	23.4	21.7	27.3	26.2	ND	ND	ND	ND
P-TLD-46	21.2	26.9	18.9	20.2	22.0	19.8	ND	ND	ND	ND
P-TLD-47	25.8	31.5	25.7	26.2	28.8	27.1	ND	ND	ND	ND
P-TLD-48	24.2	29.9	24.3	24.1	27.3	24.1	ND	ND	ND	ND
P-TLD-49	23.9	29.6	23.4	24.7	25.6	24.2	ND	ND	ND	ND
P-TLD-4K	14.9	20.6	15.2	16.3	16.8	16.2	ND	ND	ND	ND
P-TLD-5	21.8	27.5	21.8	22.9	23.3	22.5	ND	ND	ND	ND
P-TLD-50	28.1	33.8	26.2	28.5	29.3	27.6	ND	ND	ND	ND
P-TLD-51	23.5	29.2	23.3	24	26.4	24.1	ND	ND	ND	ND
P-TLD-6B	19.7	25.4	19.2	19.3	21.6	20.4	ND	ND	ND	ND

[1] **Minimum Differential Dose (MDD_Q)**: The smallest amount of facility-related dose above the background dose (quarterly)

[2] Quarterly dose not reported due to the Coefficient of Variation for 4Q element readings being >0.1 and all readings being within 3 standard deviations of the mean

[3] Repoted Facility Dose recorded at 1R in 3Q2019

(*) 1R is the dosimeter closest to the ISFSI (**) 2B is the closest resident to the plant and ISFSI

Table C-IX.2 ANNUAL DLR RESULTS FOR PEACH BOTTOM ATOMIC POWER STATION, 2019

Monitoring Location	Annual Baseline, B_A (mrem)	$B_A + MDD_A$[1] (mrem)	Normalized Annual Dose, M_A (mrem/yr)	Annual Facility Dose, F_A
P-TLD-14	91.7	105.2	99.0	ND
P-TLD-15	94.2	107.7	103.5	ND
P-TLD-16	93.1	106.6	97.1	ND
P-TLD-17	108	121.5	114.4	ND
P-TLD-18	95.2	108.7	97.8	ND
P-TLD-19	83.9	97.4	78.9	ND
P-TLD-1A	94.3	107.8	99.3	ND
P-TLD-1B	80.1	93.6	85.4	ND
P-TLD-1C	96	109.5	97.9	ND
P-TLD-1D	94.3	107.8	90.9	ND
P-TLD-1E	90.5	104.0	95.8	ND
P-TLD-1F	107.7	121.2	109.4	ND
P-TLD-1G	63.9	77.4	60.5	ND
P-TLD-1H	94.1	107.6	96.0	ND
P-TLD-1I	85.2	98.7	88.4	ND
P-TLD-1J	108.1	121.6	114.7	ND
P-TLD-1K	104.6	118.1	111.1	ND
P-TLD-1L	77.2	90.7	80.0	ND
P-TLD-1M	55.5	69.0	59.6[2]	ND
P-TLD-1NN	101.9	115.4	103.7	ND
P-TLD-1P	63.8	77.3	69.6	ND
P-TLD-1Q	74.3	87.8	78.9	ND
P-TLD-1R(*)	129.5	143.0	145.0	15.5[3]
P-TLD-1T	105.9	119.4	98.6	ND
P-TLD-2	91.8	105.3	94.2	ND
P-TLD-22	96.3	109.8	101.5	ND
P-TLD-23	99.3	112.8	102.3	ND
P-TLD-24	72.9	86.4	68.4	ND
P-TLD-26	105.6	119.1	95.1	ND
P-TLD-27	97.8	111.3	104.9	ND
P-TLD-2B(**)	87.6	101.1	93.3	ND
P-TLD-31A	79.3	92.8	81.6	ND
P-TLD-32	100.8	114.3	107.2	ND
P-TLD-3A	68.7	82.2	73.4	ND
P-TLD-40	111.1	124.6	111.9	ND
P-TLD-42	84.1	97.6	84.4	ND
P-TLD-43	105.2	118.7	111.7	ND
P-TLD-44	90.6	104.1	95.0	ND
P-TLD-45	98.1	111.6	98.6	ND
P-TLD-46	84.7	98.2	80.9	ND
P-TLD-47	103.2	116.7	107.8	ND
P-TLD-48	96.7	110.2	99.8	ND
P-TLD-49	95.5	109.0	97.9	ND
P-TLD-4K	59.6	73.1	64.5	ND
P-TLD-5	87.4	100.9	90.5	ND
P-TLD-50	112.4	125.9	111.6	ND
P-TLD-51	94	107.5	97.8	ND
P-TLD-6B	78.9	92.4	80.5	ND

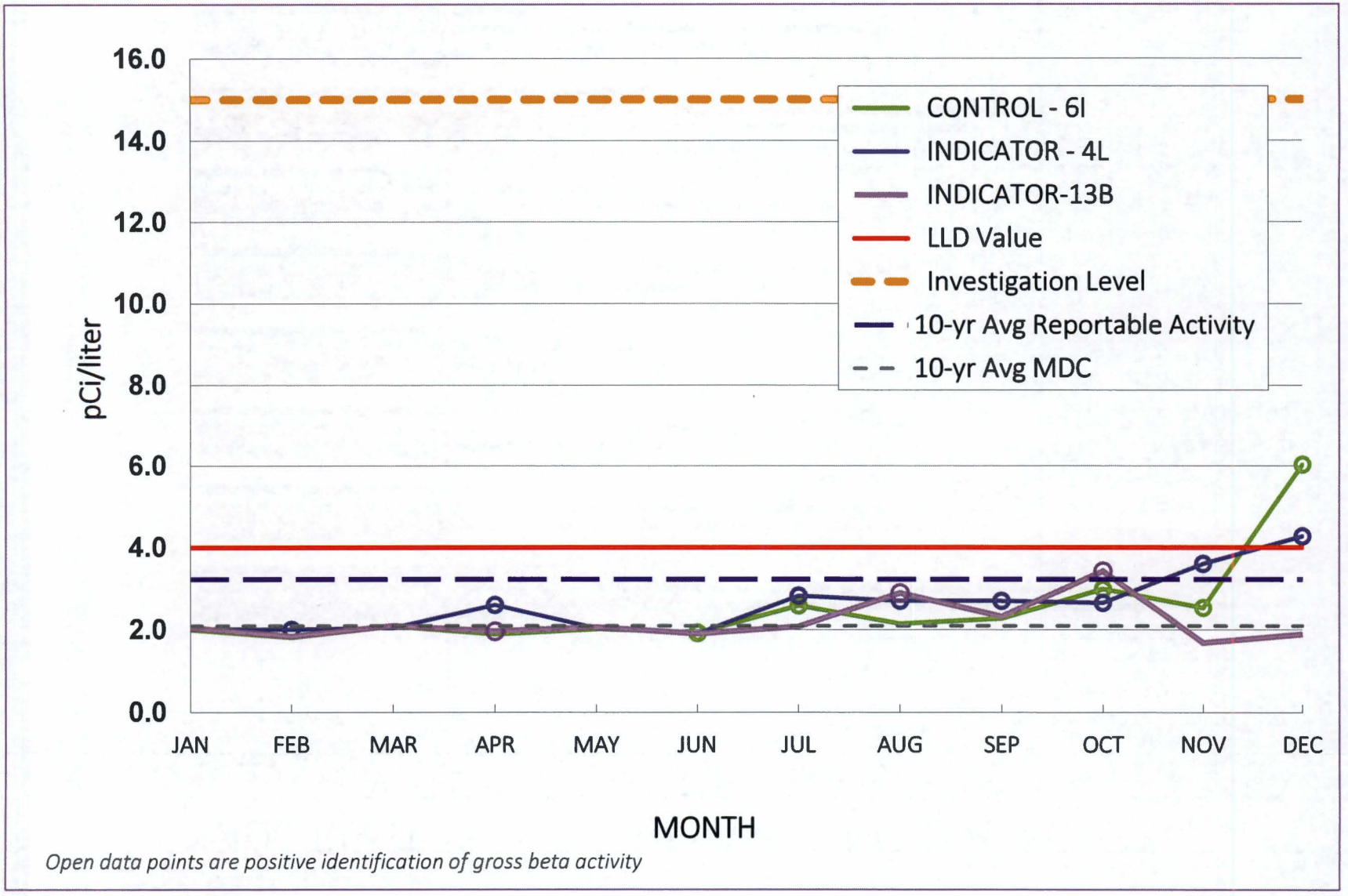
[1] **Minimum Differential Dose (MDD_A):** The smallest amount of facility-related dose above the background dose (annually)

[2] Normalized Annual Dose is corrected to adjust for only 3 quarters of dose being reported

[3] Facility Related Dose reported for 1R, ISFSI, location which is on PB property, no impact to the public

(*) 1R is the dosimeter closest to the ISFSI (**) 2B is the closest resident to the plant and ISFSI

FIGURE C-1
MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 2019



Open data points are positive identification of gross beta activity

FIGURE C-2
MDC RESULTS FOR FISH SAMPLING COLLECTED IN THE VICINITY OF PBAPS, 2019

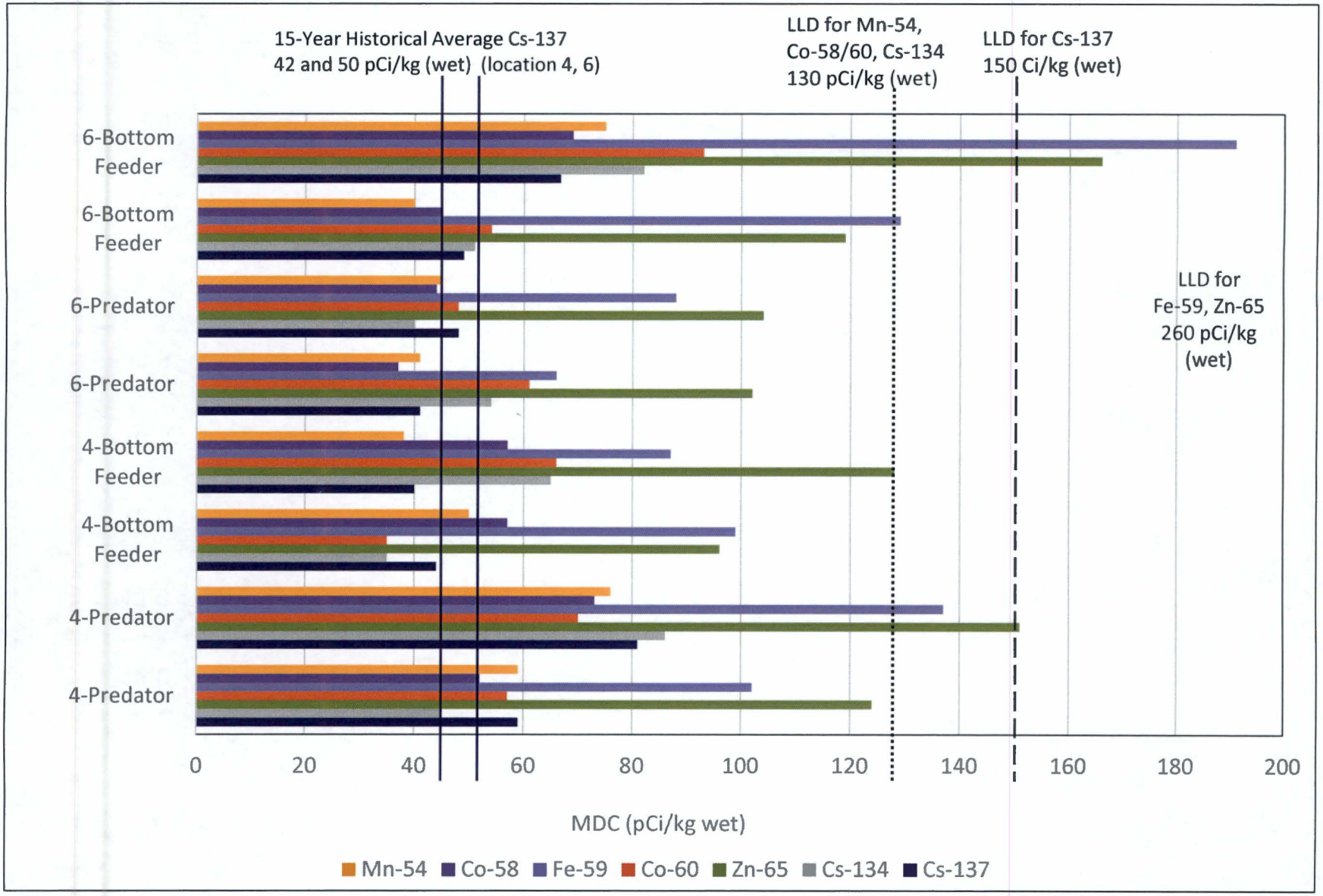


FIGURE C-3
SEMI-ANNUAL CS-137 CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 2019

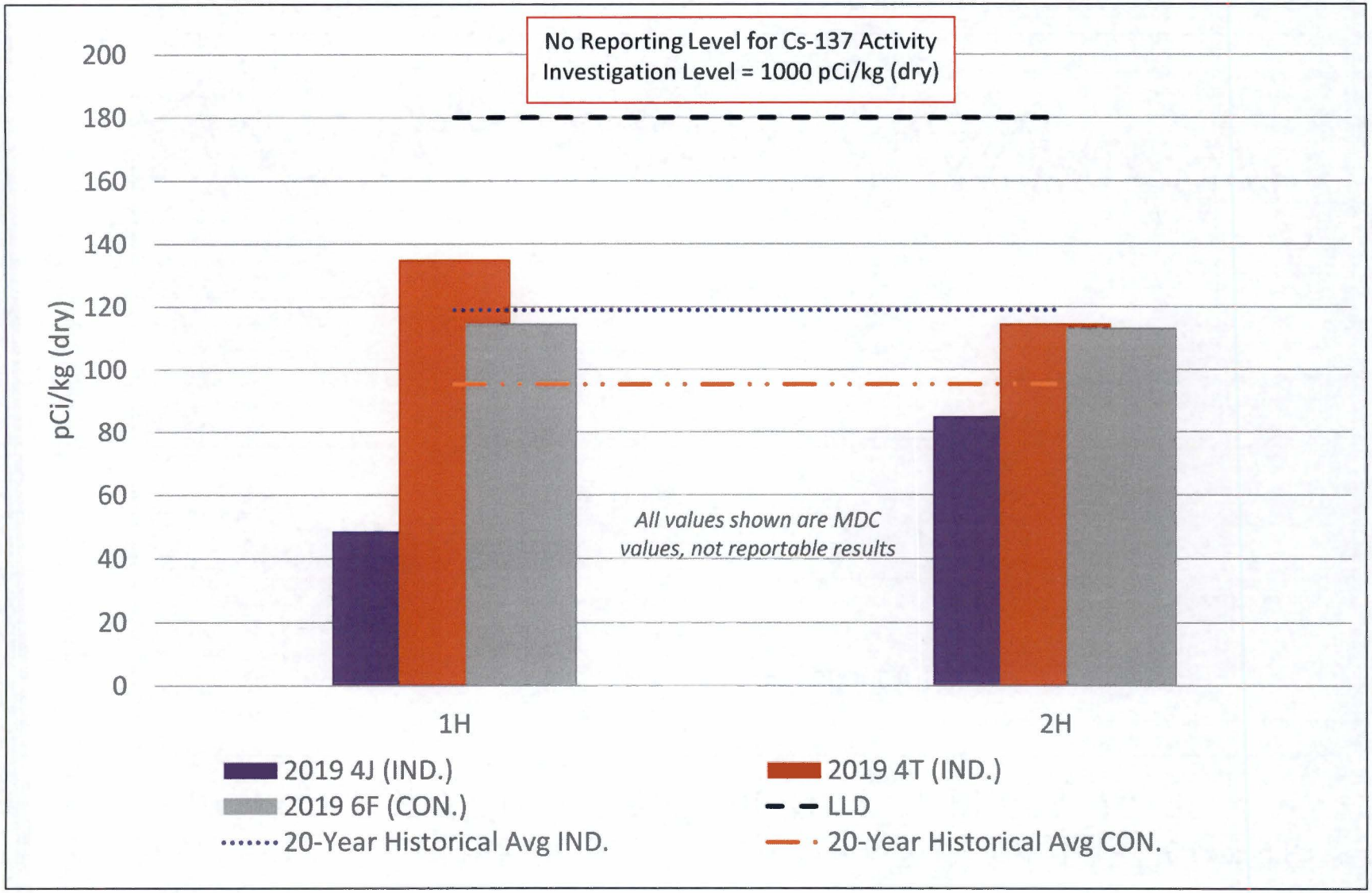
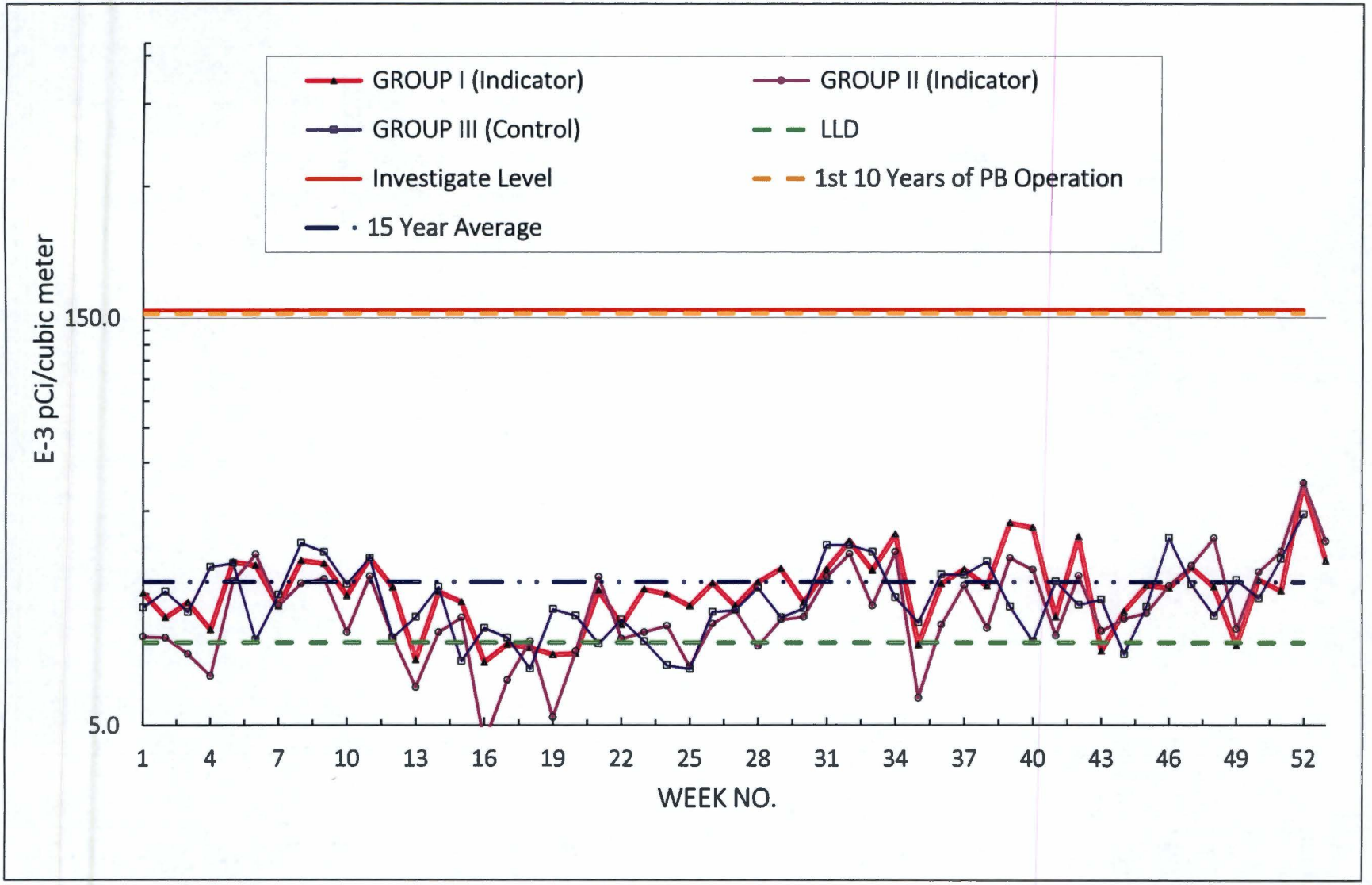


FIGURE C-4
MEAN WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 2019



No Required Reporting Level for Gross Beta Activities

FIGURE C-5
AVERAGE MONTHLY MDC FOR REMP MILK SAMPLES COLLECTED IN THE VICINITY OF PBAPS, 2019

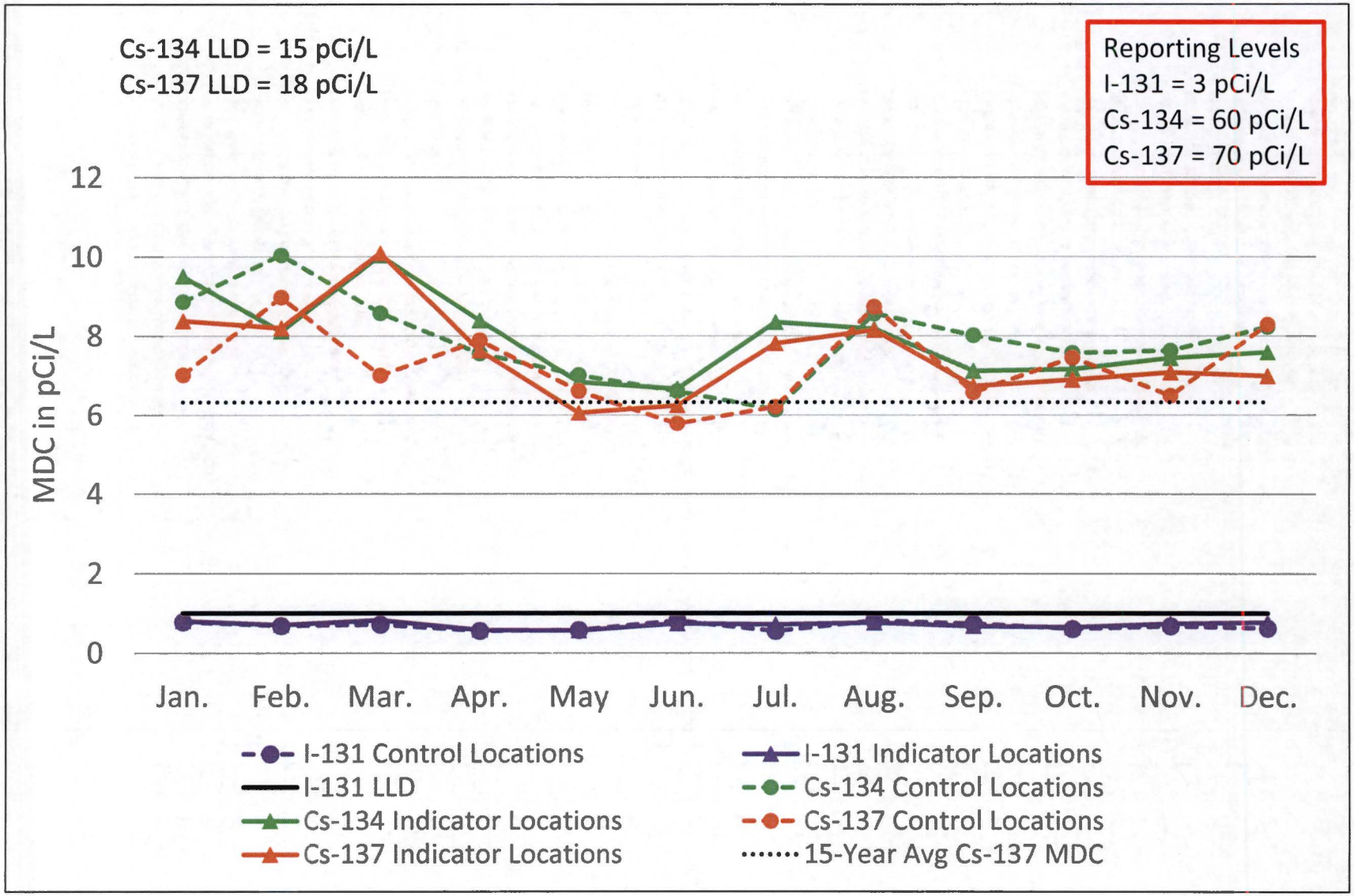
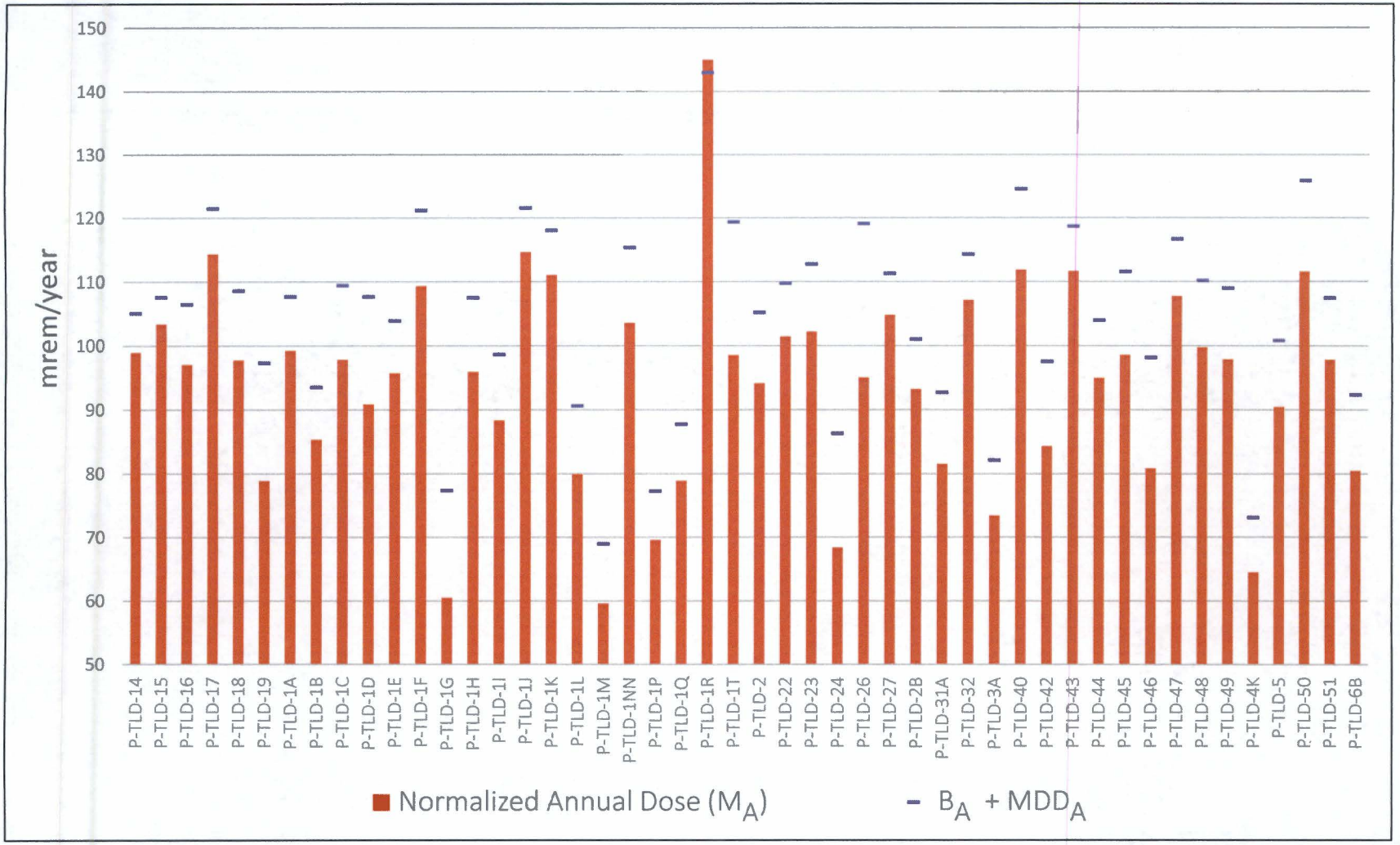


FIGURE C-6
ANNUAL NORMALIZED GAMMA RADIATION RESULTS FROM DOSIMETERS COLLECTED IN THE VICINITY OF PBAPS, 2019



All M_A data less than B_A + MDD_A Annual Facility Dose (F_A) is reported as Non-Detectable (ND)
1R had reportable F_A of 15.5 mrem/year, located on PBAPS property, no impact to public

APPENDIX D

DATA TABLES AND FIGURES
QC LABORATORIES

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TABLE D-I.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	4L *	Lab
01/03/19 - 01/30/19	1.4 ± 0.6	EIS
01/30/19 - 02/28/19	1.9 ± 0.6	EIS
02/28/19 - 03/27/19	2.3 ± 0.7	EIS
03/27/19 - 05/01/19	2.6 ± 0.7	EIS
05/01/19 - 05/29/19	1.5 ± 0.6	EIS
05/29/19 - 06/27/19	1.5 ± 0.6	EIS
06/27/19 - 08/01/19	1.0 ± 0.6	EIS
08/01/19 - 08/29/19	2.5 ± 0.7	EIS
08/29/19 - 10/02/19	2.6 ± 0.7	EIS
10/02/19 - 10/30/19	2.4 ± 0.7	EIS
10/30/19 - 12/04/19	2.2 ± 0.7	EIS
12/04/19 - 01/02/20	2.7 ± 0.7	EIS
MEAN ± 2 STD DEV	2.0 ± 1.1	

TABLE D-I.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	4L	Lab
01/03/19 - 03/27/19	< 119	GEL
03/27/19 - 06/27/19	< 122	GEL
06/27/19 - 10/02/19	< 143	GEL
10/02/19 - 01/03/19	< 147	GEL
MEAN	-	

TABLE D-I.3 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	4L	Lab
01/03/19 - 01/30/19	< 0.7	EIS
01/30/19 - 02/28/19	< 0.6	EIS
02/28/19 - 03/27/19	< 0.8	EIS
03/27/19 - 05/01/19	< 0.7	EIS
05/01/19 - 05/29/19	< 0.6	EIS
05/29/19 - 06/27/19	< 0.7	EIS
06/27/19 - 08/01/19	< 0.8	EIS
08/01/19 - 08/29/19	< 0.7	EIS
08/29/19 - 10/02/19	< 0.6	EIS
10/02/19 - 10/30/19	< 0.8	EIS
10/30/19 - 12/04/19	< 1.0	EIS
12/04/19 - 01/02/20	< 0.6	EIS
MEAN	-	

*All detectable results were less than the required LLD

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

TABLE D-I.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019**

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	Lab
4L	01/03/19 - 01/30/19	< 4	< 8	< 3	< 4	< 7	< 7	< 4	< 4	< 4	< 20	< 6	EIS
	01/30/19 - 02/28/19	< 4	< 7	< 4	< 4	< 8	< 6	< 4	< 4	< 4	< 18	< 7	EIS
	02/28/19 - 03/27/19	< 4	< 9	< 4	< 5	< 10	< 9	< 5	< 5	< 4	< 19	< 8	EIS
	03/27/19 - 05/01/19	< 4	< 9	< 4	< 4	< 8	< 7	< 4	< 4	< 4	< 28	< 11	EIS
	05/01/19 - 05/29/19	< 3	< 7	< 3	< 3	< 7	< 6	< 4	< 3	< 3	< 23	< 8	EIS
	05/29/19 - 06/27/19	< 3	< 7	< 3	< 3	< 6	< 6	< 4	< 3	< 3	< 20	< 8	EIS
	06/27/19 - 08/01/19	< 5	< 11	< 5	< 6	< 10	< 8	< 6	< 4	< 4	< 32	< 13	EIS
	08/01/19 - 08/29/19	< 5	< 10	< 5	< 5	< 10	< 8	< 5	< 4	< 4	< 18	< 8	EIS
	08/29/19 - 10/02/19	< 3	< 6	< 3	< 4	< 6	< 6	< 6	< 3	< 3	< 14	< 4	EIS
	10/02/19 - 10/30/19	< 4	< 8	< 3	< 4	< 9	< 6	< 4	< 4	< 4	< 19	< 7	EIS
	10/30/19 - 12/04/19	< 4	< 8	< 4	< 4	< 7	< 6	< 4	< 4	< 4	< 19	< 7	EIS
	12/04/19 - 01/02/20	< 4	< 7	< 3	< 4	< 7	< 6	< 4	< 4	< 4	< 15	< 6	EIS
	MEAN	-	-	-	-	-	-	-	-	-	-	-	

TABLE D-II.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE AND I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

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

COLLECTION PERIOD	1A GROSS BETA	1A I-131
12/27/18 - 01/03/19	34 ± 3	< 16
01/03/19 - 01/10/19	31 ± 2	< 21
01/10/19 - 01/17/19	31 ± 2	< 15
01/17/19 - 01/24/19	26 ± 2	< 15
01/24/19 - 01/30/19	43 ± 3	< 18
01/30/19 - 02/07/19	41 ± 3	< 13
02/07/19 - 02/14/19	27 ± 2	< 10
02/14/19 - 02/22/19	32 ± 2	< 13
02/22/19 - 02/28/19	42 ± 3	< 13
02/28/19 - 03/07/19	*(1)*	*(1)*
03/07/19 - 03/14/19	50 ± 3	< 13
03/14/19 - 03/21/19	33 ± 3	< 16
03/21/19 - 03/28/19	20 ± 2	< 22
03/28/19 - 04/04/19	25 ± 2	< 14
04/04/19 - 04/10/19	31 ± 3	< 17
04/10/19 - 04/17/01	18 ± 2	< 18
04/17/01 - 04/25/19	18 ± 2	< 14
04/25/19 - 05/01/19	20 ± 2	< 12
05/01/19 - 05/09/19	21 ± 2	< 12
05/09/19 - 05/16/09	11 ± 2	< 17
05/16/09 - 05/23/19	32 ± 3	< 18
05/23/19 - 05/29/19	22 ± 2	< 13
05/29/19 - 06/06/19	22 ± 2	< 8
06/06/19 - 06/13/19	20 ± 2	< 14
06/13/19 - 06/20/19	27 ± 2	< 15
06/20/19 - 06/27/19	25 ± 2	< 13
06/27/19 - 07/03/19	27 ± 3	< 16
07/03/19 - 07/11/19	27 ± 2	< 12
07/11/19 - 07/17/19	29 ± 3	< 14
07/17/19 - 07/25/19	28 ± 2	< 9
07/25/19 - 08/01/19	44 ± 3	< 15
08/01/19 - 08/07/19	44 ± 3	< 24
08/07/19 - 08/15/19	38 ± 2	< 9
08/15/19 - 08/22/19	48 ± 3	< 16
08/22/19 - 08/29/19	20 ± 2	< 19
08/29/19 - 09/05/19	37 ± 3	< 15
09/05/19 - 09/12/19	38 ± 3	< 10
09/12/19 - 09/19/19	30 ± 2	< 11
09/19/19 - 09/26/19	40 ± 3	< 12
09/26/19 - 10/02/19	34 ± 3	< 25
10/02/19 - 10/10/19	20 ± 2	< 13
10/10/19 - 10/17/19	37 ± 3	< 13
10/17/19 - 10/24/19	22 ± 2	< 14
10/24/19 - 10/30/19	31 ± 3	< 11
10/30/19 - 11/07/19	27 ± 2	< 9
11/07/19 - 11/14/19	27 ± 2	< 10
11/14/19 - 11/21/19	25 ± 2	< 15
11/21/19 - 11/27/19	25 ± 3	< 13
11/27/19 - 12/04/19	11 ± 2	< 11
12/04/19 - 12/12/19	23 ± 2	< 18
12/12/19 - 12/19/19	21 ± 2	< 15
12/19/19 - 12/26/19	51 ± 3	< 9
12/26/19 - 01/02/20	33 ± 3	< 13
MEAN ± 2 STD DEV	30 ± 19	-

(1) Invalid Sample due to equipment failure

TABLE D-II.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

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	12/27/18 - 03/27/19	88 ± 13	< 1	< 1	< 1	< 1	< 1
	03/27/19 - 06/27/19	93 ± 12	< 1	< 1	< 1	< 1	< 1
	06/27/19 - 10/02/19	84 ± 11	< 1	< 1	< 1	< 1	< 1
	10/02/19 - 01/02/20	66 ± 11	< 1	< 1	< 1	< 1	< 1
	MEAN ± 2 STD DEV	83 ± 24	-	-	-	-	-

TABLE D-III.1 CONCENTRATIONS OF I-131 AND GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF PEACH BOTTOM ATOMIC POWER STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
J	02/13/19	< 0.8	1460 ± 119	< 5	< 5	< 35	< 13
	05/14/19	< 0.7	1250 ± 108	< 5	< 6	< 27	< 10
	08/06/19	< 0.8	1360 ± 112	< 5	< 6	< 27	< 9
	11/12/19	< 1.0	1380 ± 93	< 4	< 5	< 23	< 8
	MEAN ± 2 STD DEV	-	1363 ± 173	-	-	-	-
S	02/12/19	< 0.6	1410 ± 96	< 4	< 5	< 29	< 10
	05/15/19	< 0.9	1430 ± 116	< 5	< 6	< 26	< 8
	08/06/19	< 0.8	1440 ± 94	< 5	< 5	< 23	< 7
	11/12/19	< 0.8	1340 ± 92	< 4	< 5	< 22	< 7
	MEAN ± 2 STD DEV	-	1405 ± 90	-	-	-	-
V	02/13/19	< 0.7	1280 ± 93	< 4	< 4	< 26	< 10
	05/14/19	< 0.6	1250 ± 87	< 4	< 5	< 23	< 6
	08/06/19	< 0.6	1340 ± 84	< 4	< 4	< 19	< 6
	11/12/19	< 0.7	1550 ± 90	< 3	< 4	< 18	< 5
	MEAN ± 2 STD DEV	-	1355 ± 271	-	-	-	-

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

FIGURE D-1
COMPARISON OF MONTHLY TOTAL GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES FROM STATION 4L ANALYZED BY THE PRIMARY AND QC LABORATORIES, 2019

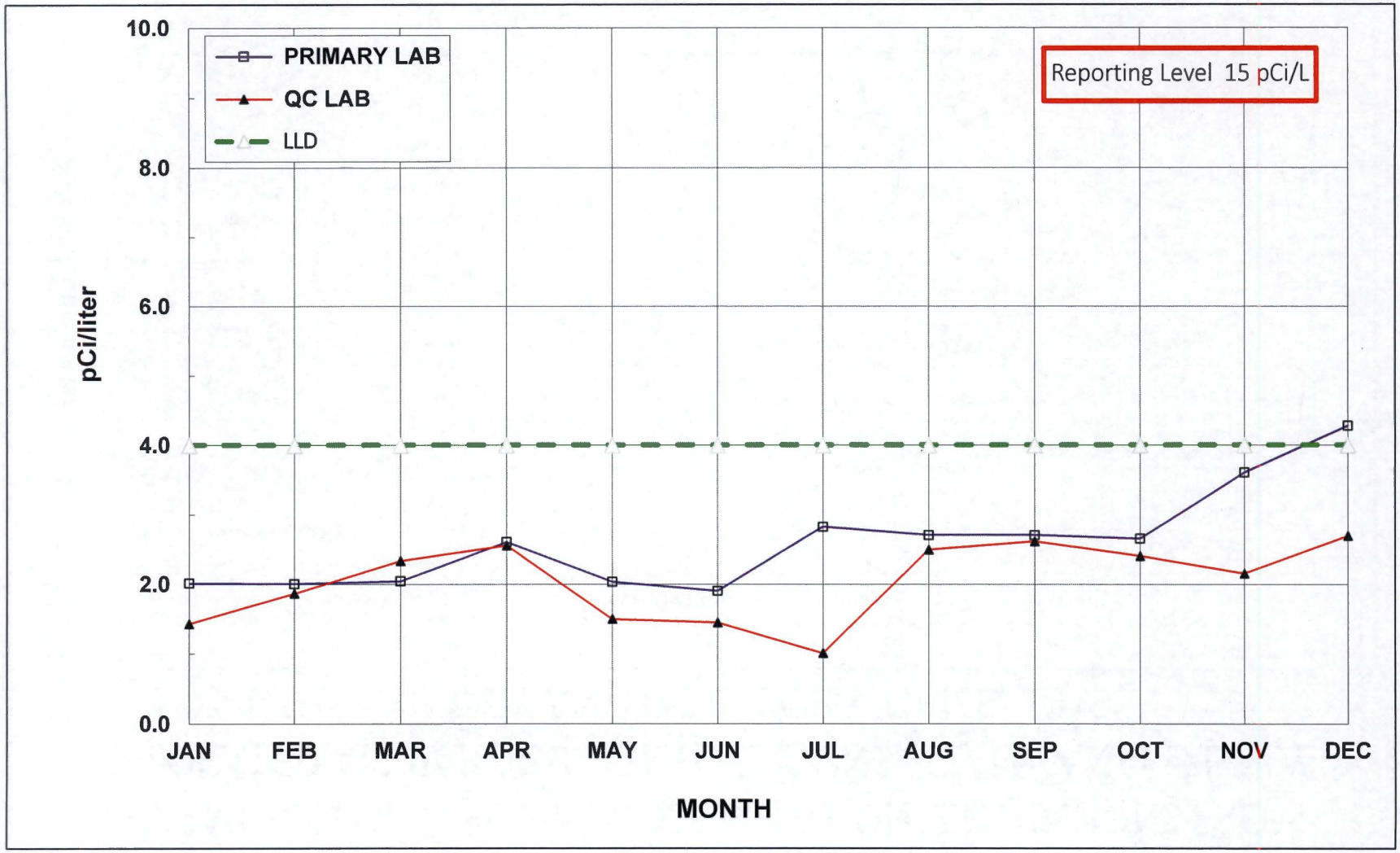
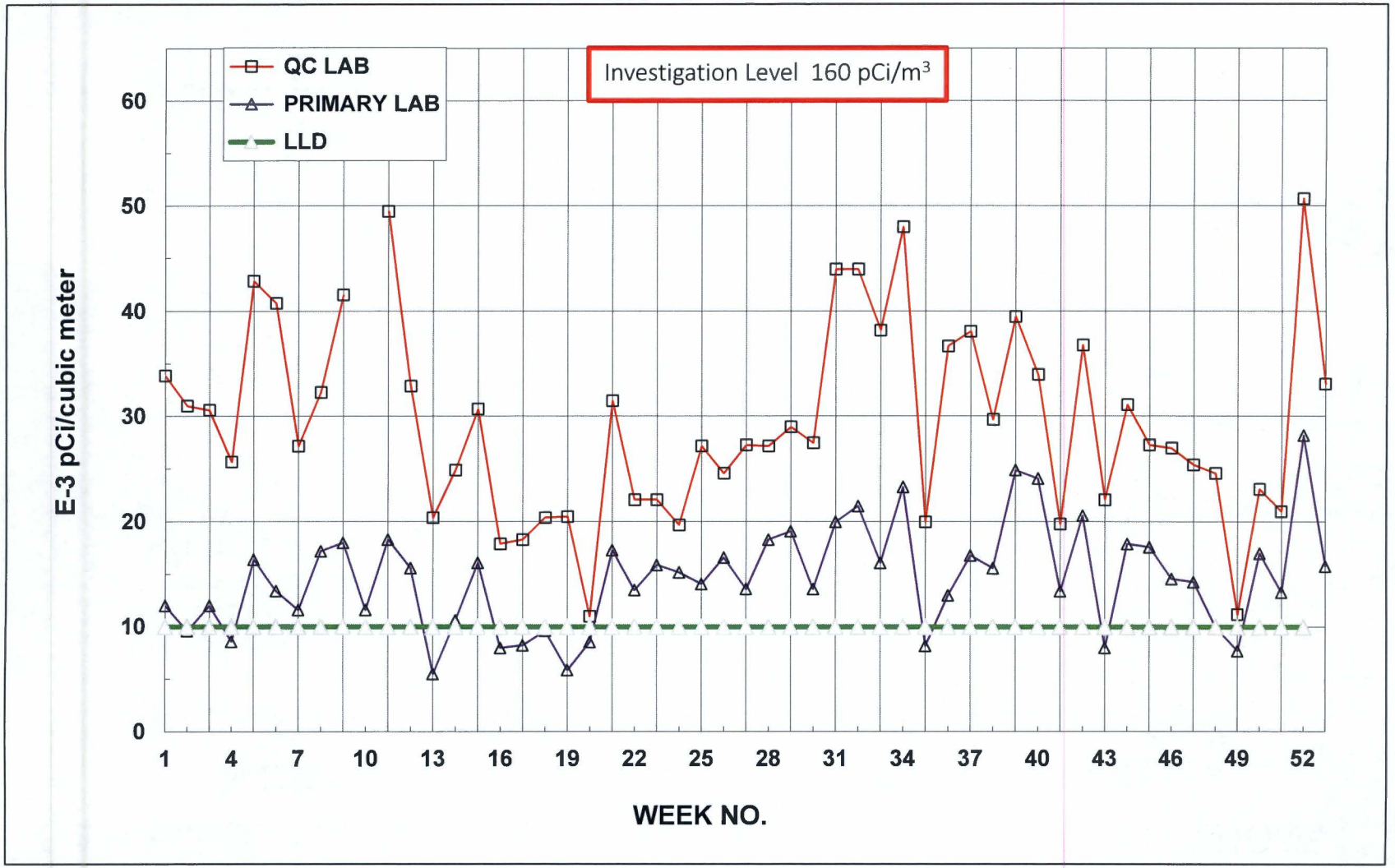


FIGURE D-2
COMPARISON OF WEEKLY GROSS BETA CONCENTRATIONS FROM CO-LOCATED AIR PARTICULATE LOCATIONS (1Z/1A) ANALYZED BY THE PRIMARY AND QC LABORATORIES, 2019



APPENDIX E

ERRATA DATA

There was no errata data for 2019.

APPENDIX F

INTER-LABORATORY COMPARISON PROGRAM ACCEPTANCE CRITERIA AND RESULTS

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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.

3. Laboratory-Specific Criteria

Each analytical laboratory has a documentation system in place to address performance evaluation (PE) sample failures in the form of corrective actions. The TBE Laboratory initiates a Non-Conformance Report (NCR), which details the failure, performs a root cause investigation, and proposes a corrective and/or preventative action. The GEL Laboratory's system is documented via a Corrective Action Request and Report (CARR).

B. TBE PE Results and Discussion

1. The ERA April 2019 water Cs-134 result was evaluated as Not Acceptable. The reported value was 15.2 pCi/L (error 2.82 pCi/L) and the known result was 12.1 pCi/L (acceptance range of 8.39 - 14.4 pCi/L). With the error, the reported result overlaps the acceptable range. This sample was run as the workgroup duplicate on a different detector with a result of 10.7 pCi/L (within acceptable range). (NCR 19-10)

2. The ERA April 2019 water Sr-89 result was evaluated as Not Acceptable. The reported value was 44.9 pCi/L and the known result was 33.3 pCi/L (acceptance range of 24.5 - 40.1 pCi/L). The sample was only counted for 15 minutes instead of 200 minutes. The sample was re-prepped in duplicate and counted for 200 minutes with results of 30.7 ± 5.37 pCi/L and 33.0 ± 8.71 pCi/L. This was the 1st "high" failure for Sr-89 in 5 years. (NCR 19-11)

3. The MAPEP February 2019 soil Sr-90 result was not submitted and therefore evaluated as Not Acceptable. The sample was run in duplicate, with results of -1.32 ± 4.09 Bq/kg (<6.87) and -1.030 ± 3.55 Bq/kg (<5.97). The known result was a false positive test (no significant activity). TBE did not submit a result because it appeared that the results may not be accurate. TBE analyzed a substitute soil Sr-90 sample from another vendor, with a result within the acceptable range. (NCR 19-12)

4. The MAPEP February 2019 water Am-241 result was evaluated as Not Acceptable. The reported value was 0.764 ± 0.00725 Bq/L with a known result of 0.582 Bq/L (acceptable range 0.407 - 0.757 Bq/L). TBE's result falls within the upper acceptable range with the error. It appeared that a non-radiological interference was added and lead to an increased mass and higher result. (NCR 19-13)

5. The MAPEP February 2019 vegetation Sr-90 result was evaluated as Not Acceptable. The reported result was -0.1060 ± 0.0328 Bq/kg and the known result was a false positive test (no significant activity). TBE's result was correct in that there was no activity. MAPEP's evaluation was a "statistical failure" at 3 standard deviations. (NCR 19-14)

6. The ERA October 2019 water Gross Alpha result was evaluated as Not Acceptable. TBE's reported result was 40.5 ± 10.3 pCi/L and the known result was 27.6 pCi/L (ratio of TBE to known result at 135%). With the associated error, the result falls within the acceptable range (14.0 - 36.3 pCi/L). The sample was run as the workgroup duplicate on a different detector with a result of 30.8 ± 9.17 pCi/L (within the acceptable range). This was the first failure for drinking water Gr-A since 2012. (NCR 19-23)

7. The ERA October 2019 water Sr-90 result was evaluated as Not Acceptable. TBE's reported result was 32.5 ± 2.12 pCi/L and the known result was 26.5

pCi/L (ratio of TBE to known result at 123%). With the associated error, the result falls within the acceptable range (19.2 - 30.9 pCi/L). The sample was run as the workgroup duplicate on a different detector with a result of 20.0 ± 1.91 pCi/L (within the acceptable range). Both TBE results are within internal QC limits. A substitute "quick response" sample was analyzed with an acceptable result of 18.6 pCi/L (known range of 13.2 - 22.1 pCi/L). (NCR 19-24)

8. The MAPEP August 2019 soil Ni-63 result of 436 ± 22.8 Bq/kg was evaluated as Not Acceptable. The known result was 629 Bq/kg (acceptable range 440 - 818 Bq/sample). With the associated error, the TBE result falls within the lower acceptance range. All associated QC was acceptable. No reason for failure could be found. This is the first failure for soil Ni-63 since 2012. (NCR 19-25).

9. The MAPEP August 2019 water Am-241 result was not reported and therefore evaluated as Not Acceptable. Initial review of the results showed a large peak where Am-241 should be (same as the February, 2019 sample results). It is believed that Th-228 was intentionally added as an interference. The sample was re-prepped and analyzed using a smaller sample aliquot. The unusual large peak (Th-228) was seen again and also this time a smaller peak (Am-241). The result was 436 ± 22.8 Bq/L (acceptable range 0.365 ± 0.679 Bq/L). Th-228 is not a typical nuclide requested by clients, so there is no analytical purpose to take samples through an additional separation step. TBE will pursue using another vendor for Am-241 water cross-checks that more closely reflects actual customer samples. (NCR 19-26)

10. The Analytics September 2019 soil Cr-51 sample was evaluated as Not Acceptable. TBE's reported result of 0.765 ± 0.135 pCi/g exceeded the upper acceptance range (140% of the known result of 0.547 pCi/g). The TBE result was within the acceptable range (0.63 - 0.90 pCi/g) with the associated error. The Cr-51 result is very close to TBE's normal detection limit. In order to get a reportable result, the sample must be counted for 15 hours (10x longer than client samples). There is no client or regulatory requirement for this nuclide and TBE will remove Cr-51 from the reported gamma nuclides going forward. (NCR 19-27)

C. EIS Laboratory PE Results and Discussion

All analyses met the specified acceptance criteria.

D. GEL Labs PE Results and Discussion

1. Two ERA 1st quarter 2019 water Sr-89 results were evaluated as Not Acceptable. The reported values were 78.5 pCi/L and 76.5 pCi/L. The known result was 66.9 pCi/L, with an acceptance range of 54.4 - 75.0 pCi/L. A review of the data as well as of the preparation processes did not reveal any errors or

possible contributors to the high bias. The Laboratory has concluded that this positive bias was an isolated occurrence and that the overall process is within control. In addition, the reported value is 117% of the reference value, which is within the lab's standard acceptance criteria of +/- 25% for Laboratory Control Samples. No permanent corrective or preventative actions or improvements made at the time. The laboratory will continue to monitor the recoveries to ensure that there are no continued issues in the process. (CARR190225-1192)

2. The ERA 2nd quarter 2019 vegetation Sr-90 result was evaluated as Not Acceptable. The reported value was 4670 pCi/kg and the known result was 3530 pCi/kg (acceptance range of 1990 - 4600 pCi/kg). The reanalysis was performed using the same processes as the original reported analysis. The reanalysis result met the acceptance range with 96% recovery. No permanent corrective or preventative actions or improvements made at the time. The laboratory will continue to monitor the recoveries to ensure that there are no continued issues in the process. (CARR190530-1211)

3. One of the two ERA 3rd quarter 2019 water Sr-89 results was evaluated as Not Acceptable. The reported value was 69.4 pCi/L and the known result was 58.7 (acceptance range of 47.1 - 66.5 pCi/L). A review of the data as well as of the preparation processes did not reveal any errors or possible contributors to the high bias. The Laboratory has concluded that this positive bias was an isolated occurrence and that the overall process is within control. In addition, the reported value is 118% of the reference value, which is within the lab's standard acceptance criteria of +/- 25% for Laboratory Control Samples. In addition, a duplicate sample was run using separation resin and that result was within the acceptance range. The results from the two methods compared with a relative percent difference (RPD) of 11.1%, which meets the lab's duplicate acceptance criteria. No permanent corrective or preventative actions or improvements made at the time. The laboratory will continue to monitor the recoveries to ensure that there are no continued issues in the process. (CARR190826-1250)

Table F.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services, 2019

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
March 2019	E12468A	Milk	Sr-89	pCi/L	87.1	96	0.91	A
			Sr-90	pCi/L	12.6	12.6	1.00	A
	E12469A	Milk	Ce-141	pCi/L	113	117	0.97	A
			Co-58	pCi/L	153	143	1.07	A
			Co-60	pCi/L	289	299	0.97	A
			Cr-51	pCi/L	233	293	0.80	A
			Cs-134	pCi/L	147	160	0.92	A
			Cs-137	pCi/L	193	196	0.98	A
			Fe-59	pCi/L	153	159	0.96	A
			I-131	pCi/L	91.5	89.5	1.02	A
			Mn-54	pCi/L	149	143	1.04	A
			Zn-65	pCi/L	209	220	0.95	A
	E12470	Charcoal	I-131	pCi	77.5	75.2	1.03	A
	E12471	AP	Ce-141	pCi	60.7	70.2	0.87	A
			Co-58	pCi	87.9	85.8	1.02	A
			Co-60	pCi	175	179	0.98	A
			Cr-51	pCi	165	176	0.94	A
			Cs-134	pCi	91.2	95.9	0.95	A
			Cs-137	pCi	120	118	1.02	A
			Fe-59	pCi	108	95.3	1.13	A
			Mn-54	pCi	94.2	85.7	1.10	A
			Zn-65	pCi	102	132	0.77	W
	E12472	Water	Fe-55	pCi/L	2230	1920	1.16	A
	E12473	Soil	Ce-141	pCi/g	0.189	0.183	1.03	A
			Co-58	pCi/g	0.209	0.224	0.93	A
			Co-60	pCi/g	0.481	0.466	1.03	A
			Cr-51	pCi/g	0.522	0.457	1.14	A
			Cs-134	pCi/g	0.218	0.250	0.87	A
			Cs-137	pCi/g	0.370	0.381	0.97	A
			Fe-59	pCi/g	0.263	0.248	1.06	A
			Mn-54	pCi/g	0.248	0.223	1.11	A
			Zn-65	pCi/g	0.371	0.344	1.08	A
	E12474	AP	Sr-89	pCi	88.3	95.2	0.93	A
			Sr-90	pCi	11.7	12.5	0.94	A
August 2019	E12562	Soil	Sr-90	pCi/g	4.710	6.710	0.70	W

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

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

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

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

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

Table F.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services, 2019

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
September 2019	E12475	Milk	Sr-89	pCi/L	70.0	93.9	0.75	W
			Sr-90	pCi/L	12.0	12.9	0.93	A
	E12476	Milk	Ce-141	pCi/L	150	167	0.90	A
			Co-58	pCi/L	170	175	0.97	A
			Co-60	pCi/L	211	211	1.00	A
			Cr-51	pCi/L	323	331	0.98	A
			Cs-134	pCi/L	180	207	0.87	A
			Cs-137	pCi/L	147	151	0.97	A
			Fe-59	pCi/L	156	148	1.05	A
			I-131	pCi/L	81.1	92.1	0.88	A
			Mn-54	pCi/L	160	154	1.04	A
			Zn-65	pCi/L	303	293	1.03	A
	E12477	Charcoal	I-131	pCi	95.9	95.1	1.01	A
	E12478	AP	Ce-141	pCi	129	138	0.93	A
			Co-58	pCi	128	145	0.88	A
			Co-60	pCi	181	174	1.04	A
			Cr-51	pCi	292	274	1.07	A
			Cs-134	pCi	166	171	0.97	A
			Cs-137	pCi	115	125	0.92	A
			Fe-59	pCi	119	123	0.97	A
			Mn-54	pCi	129	128	1.01	A
			Zn-65	pCi	230	242	0.95	A
	E12479	Water	Fe-55	pCi/L	1810	1850	0.98	A
	E12480	Soil	Ce-141	pCi/g	0.305	0.276	1.10	A
			Co-58	pCi/g	0.270	0.289	0.93	A
			Co-60	pCi/g	0.358	0.348	1.03	A
			Cr-51	pCi/g	0.765	0.547	1.40	N[1]
			Cs-134	pCi/g	0.327	0.343	0.95	A
			Cs-137	pCi/g	0.308	0.321	0.96	A
			Fe-59	pCi/g	0.257	0.245	1.05	A
			Mn-54	pCi/g	0.274	0.255	1.07	A
			Zn-65	pCi/g	0.536	0.485	1.11	A
	E12481	AP	Sr-89	pCi	95.9	91.9	1.04	A
			Sr-90	pCi	12.3	12.6	0.97	A
	E12563	Soil	Sr-90	pCi/g	0.392	0.360	1.09	A

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

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

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

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

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

*(1) See **NCR 19-27***

Table F.2 **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)**
Teledyne Brown Engineering Environmental Services, 2019

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2019	19-GrF40	AP	Gross Alpha	Bq/sample	0.184	0.528	0.158 - 0.898	A
			Gross Beta	Bq/sample	0.785	0.948	0.474 - 1.422	A
	19-MaS40	Soil	Ni-63	Bq/kg	420	519.0	363 - 675	A
			Sr-90	Bq/kg			*(1)*	NR(3)
	19-MaW40	Water	Am-241	Bq/L	0.764	0.582	0.407 - 0.757	N(4)
			Ni-63	Bq/L	4.72	5.8	4.1 - 7.5	A
			Pu-238	Bq/L	0.443	0.451	0.316 - 0.586	A
			Pu-239/240	Bq/L	-0.00161	0.0045	*(2)*	A
	19-RdF40	AP	U-234/233	Bq/sample	0.1138	0.106	0.074 - 0.138	A
			U-238	Bq/sample	0.107	0.110	0.077 - 0.143	A
	19-RdV40	Vegetation	Cs-134	Bq/sample	2.14	2.44	1.71 - 3.17	A
			Cs-137	Bq/sample	2.22	2.30	1.61 - 2.99	A
			Co-57	Bq/sample	2.16	2.07	1.45 - 2.69	A
			Co-60	Bq/sample	0.02382		*(1)*	A
			Mn-54	Bq/sample	-0.03607		*(1)*	A
			Sr-90	Bq/sample	-0.1060		*(1)*	N(5)
			Zn-65	Bq/sample	1.35	1.71	1.20 - 2.22	W
August 2019	19-GrF41	AP	Gross Alpha	Bq/sample	0.192	0.528	0.158 - 0.898	W
			Gross Beta	Bq/sample	0.722	0.937	0.469 - 1.406	A
	19-MaS41	Soil	Ni-63	Bq/kg	436	629	440 - 818	N(6)
			Sr-90	Bq/kg	444	572	400 - 744	W
	19-MaW41	Water	Am-241	Bq/L				NR(7)
			Ni-63	Bq/L	7.28	9.7	6.8 - 12.6	W
			Pu-238	Bq/L	0.0207	0.0063	*(2)*	A
			Pu-239/240	Bq/L	0.741	0.727	0.509 - 0.945	A
	19-RdF41	AP	U-234/233	Bq/sample	0.0966	0.093	0.065 - 0.121	A
			U-238	Bq/sample	0.0852	0.096	0.067-0.125	A
	19-RdV41	Vegetation	Cs-134	Bq/sample	0.0197		*(1)*	A
			Cs-137	Bq/sample	3.21	3.28	2.30 - 4.26	A
			Co-57	Bq/sample	4.62	4.57	3.20 - 5.94	A
			Co-60	Bq/sample	4.88	5.30	3.71 - 6.89	A
			Mn-54	Bq/sample	4.54	4.49	3.14 - 5.84	A
			Sr-90	Bq/sample	0.889	1.00	0.70 - 1.30	A
			Zn-65	Bq/sample	2.78	2.85	2.00 - 3.71	A

(a) 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

(b) DOE/MAPEP evaluation:
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) False positive test
(2) Sensitivity evaluation
*(3) See **NCR 19-12***
*(4) See **NCR 19-13***
*(5) See **NCR 19-14***
*(6) See **NCR 19-25***
*(7) See **NCR 19-26***

Table F.3 **ERA Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services, 2019

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
April 2019	Rad-117	Water	Ba-133	pCi/L	26.3	24.1	18.6 - 27.8	A
			Cs-134	pCi/L	15.2	12.1	8.39 - 14.4	N[1]
			Cs-137	pCi/L	33.6	33.1	28.8 - 39.4	A
			Co-60	pCi/L	11.9	11.5	8.67 - 15.5	A
			Zn-65	pCi/L	87.1	89.2	80.3 - 107	A
			GR-A	pCi/L	19	19.3	9.56 - 26.5	A
			GR-B	pCi/L	20.2	29.9	19.1 - 37.7	A
			U-Nat	pCi/L	55.5	55.9	45.6 - 61.5	A
			H-3	pCi/L	21500	21400	18700 - 23500	A
			Sr-89	pCi/L	44.9	33.3	24.5 - 40.1	N[2]
			Sr-90	pCi/L	24.5	26.3	19.0 - 30.7	A
			I-131	pCi/L	28.9	28.4	23.6 - 33.3	A
October 2019	Rad-119	Water	Ba-133	pCi/L	42.7	43.8	35.7 - 48.8	A
			Cs-134	pCi/L	53.5	55.9	45.2 - 61.5	A
			Cs-137	pCi/L	77.7	78.7	70.8 - 89.2	A
			Co-60	pCi/L	51.5	53.4	48.1 - 61.3	A
			Zn-65	pCi/L	36.6	34.0	28.5 - 43.1	A
			GR-A	pCi/L	40.5	27.6	14.0 - 36.3	N[3]
			GR-B	pCi/L	36.3	39.8	26.4 - 47.3	A
			U-Nat	pCi/L	27.66	28.0	22.6 - 31.1	A
			H-3	pCi/L	22800	23400	20500 - 25700	A
			Sr-89	pCi/L	47.1	45.5	35.4 - 52.7	A
			Sr-90	pCi/L	32.5	26.5	19.2 - 30.9	N[4]
			I-131	pCi/L	26.0	23.9	19.8 - 28.4	A
December 2019	QR 120419D	Water	Sr-90	pCi/L	20.1	18.6	13.2 - 22.1	A

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

(b) ERA evaluation:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 19-10***
*(2) See **NCR 19-11***
*(3) See **NCR 19-23***
*(4) See **NCR 19-24***

TABLE F.4 **Analytics Environmental Radioactivity Cross Check Program**
Exelon Industrial Services, 2019

Month/Year	Identification Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [a]	Ratio of Analytics to EIS Result	Evaluation [b]
March 2019	E 12379	Water	Gr-B	pCi/L	264	288	92	Pass
	E 12380	Charcoal	I-131	pCi	73.0	75.6	97	Pass
	E 12378A	Milk	I-131	pCi/L	92	89.5	103	Pass
			Ce-141	pCi/L	101	117	86	Pass
			Cr-51	pCi/L	227	293	77	Pass
			Cs-134	pCi/L	138	160	86	Pass
			Cs-137	pCi/L	184	196	94	Pass
			Co-58	pCi/L	128	143	90	Pass
			Mn-54	pCi/L	141	143	99	Pass
			Fe-59	pCi/L	149	159	94	Pass
			Zn-65	pCi/L	177	220	80	Pass
			Co-60	pCi/L	262	299	88	Pass
June 2019	E12383	AP	Ce-141	pCi/Filter	97.7	88	111	Pass
			Cr-51	pCi/Filter	222	223	100	Pass
			Cs-134	pCi/Filter	80.9	93	87	Pass
			Cs-137	pCi/Filter	119	111	107	Pass
			Co-58	pCi/Filter	77.7	74	105	Pass
			Mn-54	pCi/Filter	142	126	113	Pass
			Fe-59	pCi/Filter	121	93.5	129	Pass
			Zn-65	pCi/Filter	185	164	113	Pass
			Co-60	pCi/Filter	139	131	106	Pass
	E12382	Water	I-131	pCi/L	115	89.1	129	Pass
			Ce-141	pCi/L	142	145	98	Pass
			Cr-51	pCi/L	327	368	89	Pass
			Cs-134	pCi/L	139	153	91	Pass
			Cs-137	pCi/L	186	184	101	Pass
			Co-58	pCi/L	115	122	94	Pass
			Mn-54	pCi/L	214	207	103	Pass
			Fe-59	pCi/L	154	154	100	Pass
			Zn-65	pCi/L	257	270	95	Pass
			Co-60	pCi/L	216	216	100	Pass
	E12381	Water	Gr-B	pCi/L	199	199	100	Pass
September 2019	E12384	AP	Gr-B	pCi	270.7	221	122	Pass
December 2019	E12386	Water	Gr-B	pCi/L	260	269	97	Pass
	E12387	Cartridge Detector 2	I-131	pCi	79.0	88.2	90	Pass
	E12387	Cartridge Detector 3	I-131	pCi	79.1	88.2	90	Pass
	E12387	Cartridge Detector 4	I-131	pCi	79.2	88.2	90	Pass
December 2019	E12385	AP Detector 2	Ce-141	pCi/Filter	98.5	99.1	99	Pass
			Cr-51	pCi/Filter	246	288	85	Pass
			Cs-134	pCi/Filter	123	135.0	91	Pass
			Cs-137	pCi/Filter	128	121.0	106	Pass
			Co-58	pCi/Filter	117	107.0	109	Pass
			Mn-54	pCi/Filter	170	155.0	110	Pass
			Fe-59	pCi/Filter	124	104.0	119	Pass

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

(b) Analytics evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

TABLE F.4 **Analytics Environmental Radioactivity Cross Check Program**
Exelon Industrial Services, 2019

Month/Year	Identification Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [a]	Ratio of Analytics to EIS Result	Evaluation [b]
December 2019	E12385	AP	Zn-65	pCi/Filter	194	190	102	Pass
		Detector 2	Co-60	pCi/Filter	139	138	101	Pass
	E12385	AP	Ce-141	pCi/Filter	95.7	99.1	97	Pass
		Detector 3	Cr-51	pCi/Filter	257.1	288	89	Pass
			Cs-134	pCi/Filter	128	135.0	95	Pass
			Cs-137	pCi/Filter	128	121.0	105	Pass
			Co-58	pCi/Filter	111	107.0	104	Pass
			Mn-54	pCi/Filter	173	155.0	112	Pass
			Fe-59	pCi/Filter	121.7	104.0	117	Pass
			Zn-65	pCi/Filter	203	190	107	Pass
			Co-60	pCi/Filter	147.5	138	107	Pass
	E12385	AP	Ce-141	pCi/Filter	102	99.1	103	Pass
		Detector 4	Cr-51	pCi/Filter	299	288	104	Pass
			Cs-134	pCi/Filter	122	135.0	90	Pass
			Cs-137	pCi/Filter	122	121.0	101	Pass
			Co-58	pCi/Filter	102	107.0	95	Pass
			Mn-54	pCi/Filter	167	155.0	108	Pass
			Fe-59	pCi/Filter	132	104.0	127	Pass
			Zn-65	pCi/Filter	195	190	103	Pass
			Co-60	pCi/Filter	146	138	106	Pass
	E12388	Milk	I-131	pCi/L	100	94.5	106	Pass
		Detector 2	Ce-141	pCi/L	82.4	83.0	99	Pass
			Cr-51	pCi/L	271	241	112	Pass
			Cs-134	pCi/L	112	113	99	Pass
			Cs-137	pCi/L	123	102	121	Pass
			Co-58	pCi/L	84.9	89.9	94	Pass
			Mn-54	pCi/L	128	130	98	Pass
			Fe-59	pCi/L	95.5	87	110	Pass
			Zn-65	pCi/L	148	159	93	Pass
			Co-60	pCi/L	119	115	103	Pass
	E12388	Milk	I-131	pCi/L	99.3	94.5	105	Pass
		Detector 3	Ce-141	pCi/L	80.7	83.0	97	Pass
			Cr-51	pCi/L	227.9	241	95	Pass
			Cs-134	pCi/L	103.4	113	92	Pass
			Cs-137	pCi/L	109.2	102	107	Pass
			Co-58	pCi/L	101.9	89.9	113	Pass
			Mn-54	pCi/L	140.8	130	108	Pass
			Fe-59	pCi/L	102.1	87	117	Pass
			Zn-65	pCi/L	166.2	159	105	Pass
			Co-60	pCi/L	111	115	97	Pass
	E12388	Milk	I-131	pCi/L	104	94.5	110	Pass
		Detector 4	Ce-141	pCi/L	78.3	83.0	94	Pass
			Cr-51	pCi/L	235.4	241	98	Pass
			Cs-134	pCi/L	114	113	101	Pass
			Cs-137	pCi/L	105	102	103	Pass
			Co-58	pCi/L	92	89.9	102	Pass
			Mn-54	pCi/L	143	130	110	Pass
			Fe-59	pCi/L	104	87	119	Pass
			Zn-65	pCi/L	164	159	103	Pass
			Co-60	pCi/L	123	115	107	Pass

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

(b) Analytics evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

TABLE F.5 ERA Environmental Radioactivity Cross Check Program
Exelon Industrial Services, 2019

Month/Year	ID Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [a]	Acceptance Ratio of ERA to EIS Result	Evaluation [b]
April 2019	RAD-117	Water	Ba-133	pCi/L	23.0	24.1	95	Pass
			Cs-134	pCi/L	10.8	12.1	89	Pass
			Cs-137	pCi/L	34	33.1	104	Pass
			Co-60	pCi/L	11.3	11.5	98	Pass
			Zn-65	pCi/L	88.0	89.2	99	Pass
			I-131	pCi/L	25.3	28.4	89	Pass
			GR-B	pCi/L	28.8	29.9	96	Pass
			H-3	pCi/L	20,766	21,400	97	Pass
July 2019	RAD-118	Water	H-3	pCi/L	17,684	16,700	106	Pass
September 2019	MRAD-31	AP	Am-241	pCi/Filter	28.4	32	89	Pass
			Cs-134	pCi/Filter	60.7	59	103	Pass
			Cs-137	pCi/Filter	440	437	101	Pass
			Co-60	pCi/Filter	57.5	58.4	98	Pass
			Zn-65	pCi/Filter	381	364	105	Pass
October 2019	RAD-119	Water	Ba-133	pCi/L	37.2	43.8	85	Pass
			Cs-134	pCi/L	52.2	55.9	93	Pass
			Cs-137	pCi/L	80.3	78.7	102	Pass
			Co-60	pCi/L	54.8	53.4	103	Pass
			Zn-65	pCi/L	39.3	34	116	Pass
			I-131	pCi/L	25.4	23.9	106	Pass

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

(b) ERA evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

TABLE F.6 Analytics Environmental Radioactivity Cross Check Program GEL Laboratories (Relevant Nuclides), 2019

Quarter/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value [(a)]	Acceptance Limits	Evaluation [(b)]
1st/2019	E12367	Water	Cs-134	pCi/L	143	155	0.92	A
			Cs-137	pCi/L	209	191	1.10	A
			Co-58	pCi/L	143	139	1.03	A
			Co-60	pCi/L	318	290	1.10	A
			Fe-59	pCi/L	176	154	1.14	A
			Mn-54	pCi/L	155	139	1.12	A
			Zn-65	pCi/L	244	214	1.14	A
2nd/2019	E12361	Milk	Sr-89	pCi/L	101	82.9	1.22	A
			Sr-90	pCi/L	12.1	13.5	0.90	A
	E12363	Water	Cs-134	pCi/L	137	153	0.89	A
			Cs-137	pCi/L	190	184	1.03	A
			Co-58	pCi/L	122	122	1.00	A
			Co-60	pCi/L	222	216	1.03	A
			Fe-59	pCi/L	173	154	1.12	A
			Mn-54	pCi/L	227	270	1.10	A
			Zn-65	pCi/L	301	270	1.11	A
3rd/2019	E12369	Milk	Sr-89	pCi/L	87.1	93.9	0.93	A
			Sr-90	pCi/L	7.02	12.9	0.54	A
	E12371	Water	Cs-134	pCi/L	150	157	0.96	A
			Cs-137	pCi/L	122	114	1.07	A
			Co-58	pCi/L	136	133	1.03	A
			Co-60	pCi/L	168	160	1.04	A
			Fe-59	pCi/L	127	112	1.13	A
			Mn-54	pCi/L	134	117	1.15	A
			Zn-65	pCi/L	257	222	1.16	A
4th/2019	E12373	Milk	Sr-89	pCi/L	66.0	80.6	0.82	A
			Sr-90	pCi/L	11.1	11.0	1.00	A
	E12375	Water	Cs-134	pCi/L	106	114	0.93	A
			Cs-137	pCi/L	109	103	1.06	A
			Co-58	pCi/L	95.4	91.1	1.05	A
			Co-60	pCi/L	122	117	1.05	A
			Fe-59	pCi/L	93.2	88.2	1.06	A
			Mn-54	pCi/L	144	131	1.10	A
			Zn-65	pCi/L	191	161	1.19	A

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

(b) Analytics evaluation based on laboratory's internal acceptance criteria of 75% - 125%:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

TABLE F.7 DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
GEL Laboratories (Relevant Nuclides), 2019

Quarter/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
2nd/2019	19-GrW40	Water	Gr-A	Bq/L	0.819	0.840	0.25 - 1.43	A
			Gr-B	Bq/L	2.39	2.33	1.17 - 3.50	A
	19-MaS40	Soil	Sr-90	Bq/Kg	3.44			A
	19-MaW40	Water	H-3	Bq/L	389	421	295 - 547	A
			Sr-90	Bq/L	5.86	6.35	4.45 - 8.26	A
			Cs-134	Bq/L	5.32	5.99	4.19 - 7.79	A
			Cs-137	Bq/L	0		False Positive Test	A
			Co-60	Bq/L	6.7	6.7	4.7 - 8.7	A
			Fe-55	Bq/L	0.0173		False Positive Test	A
			Mn-54	Bq/L	8.8	8.4	5.9 - 10.9	A
			Zn-65	Bq/L	-0.0318		False Positive Test	A
	19-RdF40	AP	Sr-90	Bq/sample	0.616	0.662	0.463 - 0.861	A
	19-RdV40	Veg	Sr-90	Bq/sample	0.00951		False Positive Test	A
4th/2019	19-MaS41	Soil	S-90	Bq/Kg	609	572	400 - 744	A
	19-MaW41	Water	H-3	Bq/L	166	175	123 - 228	A
			Sr-90	Bq/L	9.34	10.6	7.4 - 13.8	A
			Cs-134	Bq/L	0.0266		False Positive Test	A
			Cs-137	Bq/L	19.7	18.4	12.9 - 23.9	A
			Co-60	Bq/L	9.01	8.8	6.2 - 11.4	A
			Fe-55	Bq/L	13.8	15.70	11.0 - 20.4	A
			Mn-54	Bq/L	22.6	20.6	14.4 - 26.8	A
			Zn-65	Bq/L	23.1	20.3	5.27 - 9.79	A
	19-RdF41	AP	Sr-90	Bq/sample	0.442	0.498	0.349 - 0.647	A
	19-RdV41	Veg	Sr-90	Bq/sample	0.847	1.00	0.70 - 1.30	A

(a) 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

(b) DOE/MAPEP evaluation:

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

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

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

TABLE F.8 **ERA Environmental Radioactivity Cross Check Program**
GEL Laboratories (Relevant Nuclides), 2019

Quarter/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
1st/2019	RAD-116	Water	Cs-134	pCi/L	48.2	49.1	39.5 - 54.0	A
			Cs-137	pCi/L	128	125	112 - 140	A
			Co-60	pCi/L	104	96.4	86.8 - 108	A
			Zn-65	pCi/L	88.1	77.4	69.5 - 93.2	A
			Gr-A	pCi/L	22.3	21.8	10.9 - 29.5	A
			Gr-A	pCi/L	23.5	21.8	10.9 - 29.5	A
			Gr-B	pCi/L	43.6	55.7	38.1 - 62.6	A
			H-3	pCi/L	2,160	2,110	1,740 - 2,340	A
			H-3	pCi/L	1,920	2,110	1,740 - 2,340	A
			Sr-89	pCi/L	78.5	66.9	54.4 - 75.0	N[1]
			Sr-89	pCi/L	76.5	66.9	54.4 - 75.0	N[1]
			Sr-90	pCi/L	40.1	41.0	30.2 - 47.1	A
			Sr-90	pCi/L	42.2	41.0	30.2 - 47.1	A
2nd/2019	MRAD-30	Soil	Sr-90	pCi/kg	1,220	1,350	420 - 2,100	A
		Veg	Sr-90	pCi/kg	4,670	3,530	1,900 - 4,600	N[2]
		AP	Sr-90	pCi	169	181	114 - 246	A
		Water	Sr-90	pCi/L	365	315	227 - 389	A
			Gr-A	pCi/L	79.8	68.5	25.0 - 94.5	A
			Gr-B	pCi/L	140	151	75.5 - 208	A
			H-3	pCi/L	22,200	23,700	17,900 - 28,800	A
			Cs-134	pCi/L	116	123	92.9 - 135	A
			Cs-137	pCi/L	126	125	107 - 142	A
			Co-60	pCi/L	1,200.0	1,100	949 - 1,260	A
			Fe-55	pCi/L	1,310	1,320	776 - 1,920	A
			Mn-54	pCi/L	<5.6	<100	<100	A
			Zn-65	pCi/L	1,990	1,780	1,580 - 2,250	A
	RAD-116	Water	Sr-89	pCi/L	35.9	33.3	24.5 - 40.2	A
			Sr-89	pCi/L	34.4	33.3	24.5 - 40.2	A
3rd/2019	RAD-118	Water	Cs-134	pCi/L	30.4	32.0	25.1 - 35.2	A
			Cs-137	pCi/L	23	21	17.6 - 26.7	A
			Co-60	pCi/L	102	95.1	85.6 - 107	A
			Zn-65	pCi/L	49.2	41.2	35.3 - 51.4	A
			Gr-A	pCi/L	88.7	70.6	37.1 - 87.1	N[3]
			Gr-A	pCi/L	80.7	70.6	37.1 - 87.1	A
			Gr-B	pCi/L	57.7	63.9	44.2 - 70.5	A
			H-3	pCi/L	14,700	16,700	14,600 - 18,400	A
			H-3	pCi/L	14,700	16,700	14,600 - 18,400	A
			H-3	pCi/L	15,000	16,700	14,600 - 18,400	A
			Sr-89	pCi/L	69.4	58.7	47.1 - 66.5	N[3]
			Sr-89	pCi/L	62.1	58.7	47.1 - 66.5	A
			Sr-90	pCi/L	34.3	38.5	28.3 - 44.3	A
			Sr-90	pCi/L	33.4	38.5	28.3 - 44.3	A
4th/2019	MRAD-31	Soil	Sr-90	pCi/kg	1,660	1,910	594 - 2,980	A
		Veg	Sr-90	pCi/kg	4,010	3,940	2,220 - 5,130	A
		AP	Sr-90	pCi	34.8	34.5	21.8 - 47.0	A
		Water	Sr-90	pCi/L	508	481	346 - 595	A
			Gr-A	pCi/L	147	124	45.3 - 17	A
			Gr-B	pCi/L	72.9	68.0	34.0 - 93.6	A
			H-3	pCi/L	20,900	22,300	16,800 - 27,100	A
			Cs-134	pCi/L	1,820	1,960	1,480 - 2,160	A
			Cs-137	pCi/L	1,820	1,840	1,580 - 2,090	A
			Co-60	pCi/L	1,970	1,870	1,610 - 2,150	A
			Fe-55	pCi/L	1,410	1,460	858 - 2,120	A
			Mn-54	pCi/L	<7.24	<100	<100	A
			Zn-65	pCi/L	1,490	1,370	1,220 - 1,730	A

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

(b) ERA evaluation: A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) **CARR190225-1192*** *(2) **CARR190530-1211*** *(3) **CARR190826-1250***