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

SUBJECT:
Perry Nuclear Power Plant
Docket No. 5000-440
Annual Radiological Environmental Operating Report

Enclosed is the Annual Radiological Environmental Operating Report for the Perry Nuclear Power Plant (PNPP) for the period of January 1, 2023 through December 31, 2023. This document partially satisfies the requirements of the PNPP Technical Specifications (TS), the PNPP Offsite Dose Calculation Manual (ODCM), and the Environmental Protection Plan contained in Appendix B of the PNPP Operating License.

There are no regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Eli Crosby, Manager of Radiation Protection and Chemistry at (440) 280-5032.

Sincerely,

Rod Penfield

Enclosures:
A PNPP 2023 Annual Radiological Environmental Operating Report

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III

Enclosure A

L-24-096

PNPP 2023 Annual Radiological Environmental Operating Report

Annual Radiological Environmental Operating Report 2023

Document Number: L-24-096

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LIST OF ACRONYMS AND DEFINITIONS

1. Airborne Activity Sampling: Continuous sampling of air through the collection of particulates and radionuclides on filter media. Periodic soil samples are collected for gamma isotopic analysis to provide information on deposition to the soil from airborne releases.
2. AIP: Air, Iodine and Particulate
3. ARERR: Annual Radioactive Effluent Release Report
4. AREOR: Annual Radioactive Environmental Operating Report
5. BLV: Broad Leaf Vegetation
6. BWR: Boiling Water Reactor
7. Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.
8. Control: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from Perry Nuclear Power Plant.
9. Curie (Ci): A measure of radioactivity; equal to 3.7E+10 disintegrations per second or 2.22E+12 disintegrations per minute.
10. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using Thermoluminescent dosimeters.
11. DW: Drinking Water
12. Grab Sample: A single discrete sample drawn at one point in time.
13. Indicator: A sampling location that is likely to be affected by plant effluents due to its proximity and/or direction from the plant.
14. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation and animal products such as eggs and meat when additional information about particular radionuclides is needed.
15. Lower Limit of Detection (LLD): The smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with a 5% probability of a false conclusion that a blank observation represents "real" signal.
16. MDA: Minimum Detectable Activity
17. Mean: The average, i.e., the sum of results divided by the number of results.
18. NA: Not Applicable
19. NIST: National Institute of Standards and Technology.

20. NRC: Nuclear Regulatory Commission
21. ODCM: Offsite Dose Calculation Manual
22. pCi: is equal to one trillionth of a curie or 2.22 disintegrations per second.
23. pCi/L: picocuries / Liter
24. PNPP: Perry Nuclear Power Plant
25. PWR: Pressurized Water Reactor
26. REMP: Radiological Environmental Monitoring Program
27. SW: Surface Water
28. TLD: Thermoluminescent Dosimeter
29. TS: Technical Specification

1.0 EXECUTIVE SUMMARY

The Annual Radiological Environmental Operating Report (AREOR) details the results of Radiological Environmental Monitoring Program (REMP) conducted at the Perry Nuclear Power Plant (PNPP) from January 01 through December 31, 2023. This report meets all requirements in PNPP Offsite Dose Calculation Manual (ODCM). Report topics include radiological environmental monitoring and the land use census. The results of the environmental and effluent programs indicate that the operations of the PNPP did not result in any adverse environmental impact.

1.1 Radiological Environmental Monitoring Program

The Radiological Environmental Monitoring Program (REMP) was established in 1981 to monitor the radiological conditions in the environment around PNPP. The operational REMP was initiated in 1986 and has continued through this reporting period. The REMP is conducted in accordance with the PNPP ODCM. This program includes collection and analysis of environmental samples and evaluation of results at indicator as well as control locations. Indicator samples are collected at locations determined to be most influenced by operation of the PNPP. Control samples are collected at locations beyond the measurable influence of the PNPP for data comparison.

1.2 Pre-Occupational REMP

The REMP was established at PNPP six years before the plant became operational. Between 1981 and 1986 environmental monitoring involved collection and analysis of environmental samples. This pre-operational program was designed to provide data on background radiation levels and radioactivity normally present in the area in order to establish a baseline for data comparison prior to operation of the plant. PNPP has continued to monitor the environment during plant operation by collecting and analyzing samples of air, milk, fish, vegetation, water, and sediment, as well as by measuring radiation directly.

The contribution of radionuclides to the environment resulting from PNPP operation is assessed by comparing results from the environmental monitoring program with pre-operational data, operational data from previous years, and control location data. The results for each sample type are compared to historical data to determine whether trends or changes in concentrations are observable.

1.3 Operational REMP

Results of air samples collected to monitor the radioactivity in the atmosphere indicated normal background radionuclide concentrations. Terrestrial monitoring vegetation analysis due to the unavailability of milk samples, the results of which indicated concentrations of radioactivity similar to those found in previous years. Analyses of vegetation samples detected only natural radioactivity similar to that observed in previous years and indicated no radioactivity attributable to operation of the PNPP.

Aquatic monitoring included the collection and analyses of water, fish, and shoreline sediments. The analytical results of these samples showed normal background radionuclide concentrations.

Direct radiation measurements showed no significant changes from previous years. The indicator locations averaged 14.4 mrem/quarter and control locations averaged 14.2 mrem/quarter. Radiation dose near PNPP was similar to the radiation dose measured at locations greater than ten miles away from PNPP.

Results from indicator samples collected during this reporting period were compared to control sample results and pre-operational data. Based on the results, it can be concluded that the operation of the PNPP resulted in no significant increase in the radionuclide concentrations observed in the surrounding environment. The results of the REMP indicate adequate control of radioactivity released from PNPP. These results also demonstrate that PNPP complies with federal regulations.

2.0 INTRODUCTION

The REMP was established at PNPP for several reasons. First, it verifies the adequacy of plant design and operation to control radioactive materials and limit effluent releases. Second, it assesses the radiological impact, if any, that the plant has had on the surrounding environment. Third, it ensures compliance with regulatory guidelines. The REMP is conducted in accordance with Appendix B of the PNPP Operating License, Technical Specifications, the ODCM, Nuclear Regulatory Commission (NRC) Regulatory Guide 4.1, NUREG 1302 [3], and the 1979 NRC Branch Technical Position [9].

A variety of samples are collected as part of the PNPP REMP. The selection of sample types, locations, and collection frequency are based on many variables. Potential pathways for the transfer of radionuclides through the environment to humans, sample availability, local meteorology, population characteristics, land use, and NRC requirements are all factors and diagramed in Figure 1.

To ensure that the REMP data is significant and valuable, detailed sampling methods and procedures are followed to ensure that samples are collected in the same manner and from the same locations each time. All samples are packaged on site and then shipped to an independent vendor laboratory for analysis. The vendor laboratory analyzes the samples and reports results to the PNPP Chemistry Unit staff, the Lake County General Health District, and the State of Ohio Department of Health. Additionally, the Lake County General Health District obtains monthly “split” samples of milk (when available), water, and vegetation to perform an independent verification of PNPP’s REMP.

The Radiological Environmental Monitoring Program (REMP) provides data on measurable levels of radiation and radioactive materials in the environment. This program also evaluates the relationship between quantities of radioactive materials released from the plant and resultant doses to individuals from principal pathways of exposure. In this capacity, REMP provides a check on the effluent release program and dispersion modeling to ensure that concentrations in the environment radioactive effluents conform to the “As Low as Is Reasonably Achievable” (ALARA) design objectives of 10 CFR 50, Appendix I. REMP is designed to conform to the NRC Regulatory Guide 4.1, NUREG 1302 [3], and the 1979 NRC Branch Technical Position [9].

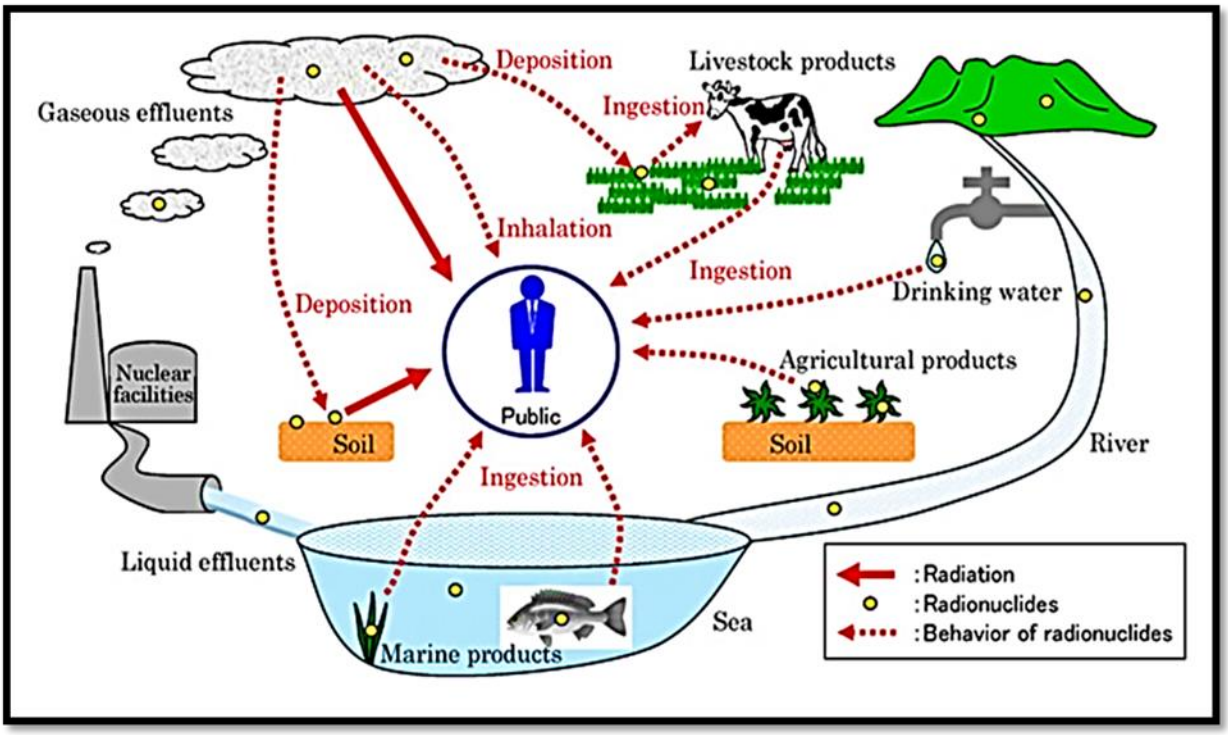

Figure 1: Potential exposure pathways to members of the public from plant operations [1].

Quality assurance aspects of the sampling program and TLD data collection are conducted in accordance with Regulatory Guide 4.15 [7] and Regulatory Guide 4.13 [11]. REMP also adheres to the requirements of the State of Ohio, PNPP Technical Specifications, and the Offsite Dose Calculation Manual (ODCM). These documents dictate the environmental sampling, sample analysis protocols, data reporting, and quality assurance requirements for the environmental monitoring program.

The Annual Radioactive Environmental Operating Report provides summaries of the environmental data from exposure pathways, interpretations of the data, and analyses of trends of the results. Routinely monitored pathways include ingestion, inhalation, and direct radiation. Routes of exposure are based on site specific information such as meteorology, receptor locations, and water usage around the plant.

3.0 SAMPLE LOCATIONS

REMP samples are collected at numerous locations, both on site and up to 16.2 miles away from the plant. Sampling locations are divided into two general categories: indicator and control. Indicator locations are relatively close to the plant and monitor for any environmental impact due to plant operations. Control locations are those that are unaffected by plant operation; they are a greater distance from the plant and in the least prevalent wind directions.

Data obtained from the indicator locations are compared with data from the control locations. This comparison allows naturally occurring background radiation to be considered when evaluating any radiological impact PNPP may have had on the environment. Table 1, Figure 2, Figure 3, and Figure 4 identify the PNPP REMP sampling locations. Many REMP samples are collected in addition to those required by the PNPP ODCM. The ODCM requirements for each sample type are discussed in more detail later in the report.

Table 1: REMP Sampling Locations

Location #	Description	Miles	Direction	Media (1)
1	Chapel Road	3.4	ENE	TLD, AIP
2	Kanda Garden	1.9	ENE	Broadleaf Vegetation
3	Meteorological Tower	1.0	SE	TLD, AIP
4	Site Boundary	0.7	S	TLD, AIP
5	Quincy Substation	0.6	SW	TLD, AIP
6	Concord Service Center	11.0	SSW	TLD, AIP
7	Site Boundary	0.6	NE	TLD, AIP
8	Site Boundary	0.8	E	TLD
9	Site Boundary	0.7	ESE	TLD
10	Site Boundary	0.8	SSE	TLD
11	Parmly Rd. at Center Rd.	0.6	SSW	TLD
12	Site Boundary	0.6	WSW	TLD
13	Madison-on-the-Lake	4.7	ENE	TLD
14	Hubbard Rd.	4.9	E	TLD
15	Eagle St. Substation	5.1	ESE	TLD
16	Eubank Garden	0.9	S	Broadleaf Vegetation
20	Rainbow Farms	1.9	E	Broadleaf Vegetation
21	Hardy Rd. – Painesville Township Park	5.1	WSW	TLD
23	High St. Substation	7.9	WSW	TLD
24	St. Clair Ave. at Mentor Substation	15.1	SW	TLD
25	Offshore - PNPP discharge	0.6	NNW	Fish
29	River Rd.at Turney Rd.	4.3	SSE	TLD
30	Lane Rd.	4.8	SSW	TLD
31	Wood Rd. at River Rd.	4.8	SE	TLD
32	Offshore – Mentor-on-the-Lake	15.8	WSW	Fish
33	River Rd. at Blair Rd.	4.5	S	TLD
34	PNPP Intake	0.2	NW	Surface Water
35	Site Boundary	0.6	E	TLD, AIP
36	Lake County Water Plant	3.9	WSW	TLD, Drinking Water
37	Gerlica Farm	1.5	ENE	Broadleaf Vegetation
39	Painesville Purification Plant	8.3	W	Drinking Water
53	3715 Parmly Rd.	0.5	WSW	TLD
54	Hale Rd. School	4.6	SW	TLD
55	Center Rd. behind soccer field	2.5	S	TLD
56	Madison High School	4.0	ESE	TLD
57	Perry High School	1.7	S	TLD
58	Antioch Rd.	0.8	ENE	TLD
59	Lake Shoreline at Green Rd.	4.0	ENE	Surface Water
60	Lake Shoreline at Perry Park	1.0	WSW	Surface Water
64	Northwest Drain Mouth	0.4	WNW	Sediment
66	Lake Shore, Metropolitan Park	1.4	NE	Sediment
70	H&H Farm Stand	16.2	SSW	Broadleaf Vegetation

4.0 MAPS OF COLLECTION SITES

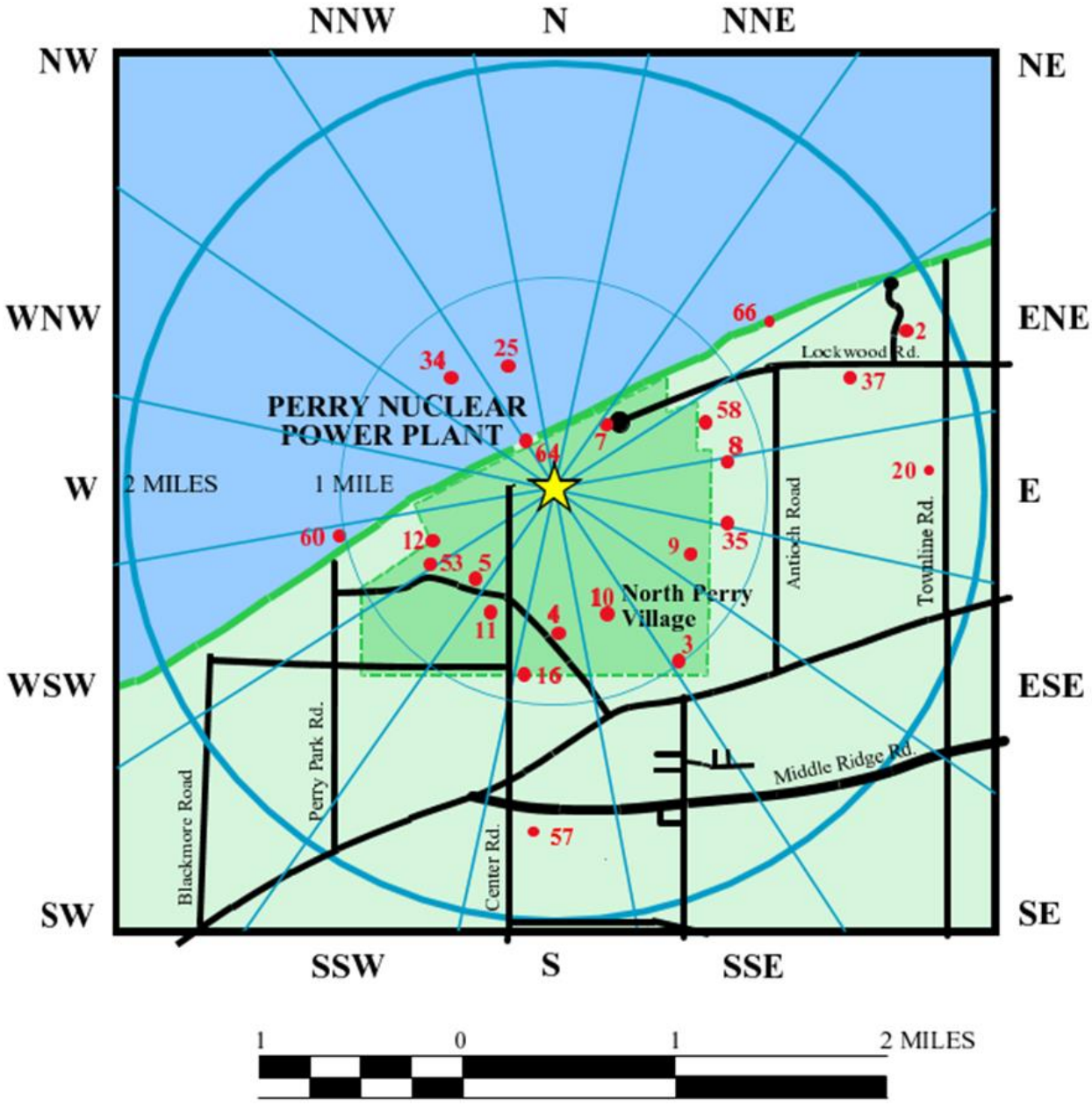

Figure 2: REMP Sample Locations within Two Miles of the Plant Site.

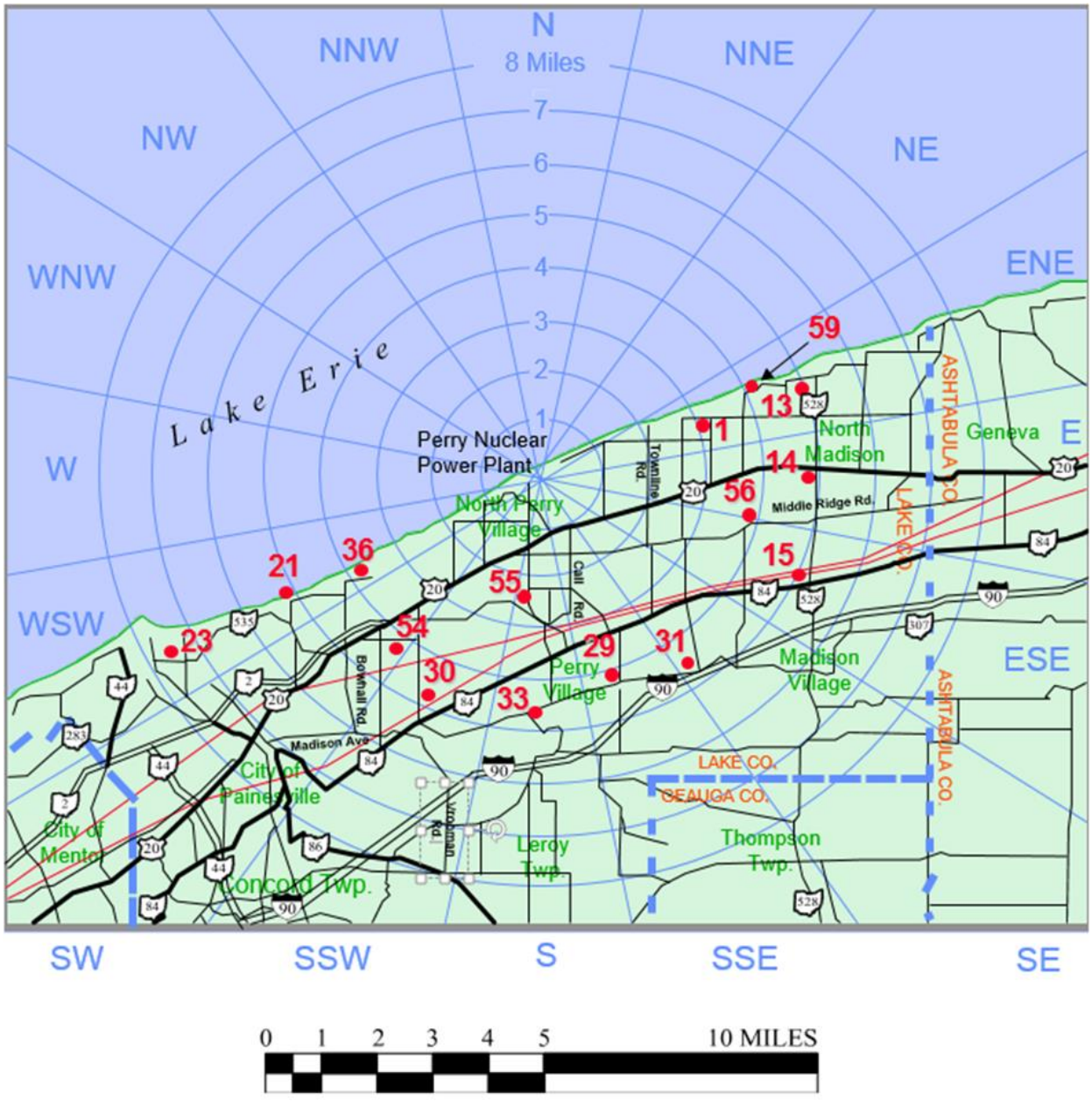

Figure 3: REMP Sampling Locations between Two and Eight Miles from the Plant Site

Figure 4: REMP Sampling Locations Greater Than Eight Miles from the Plant Site.

5.0 SAMPLING ANALYSIS

When environmental samples are analyzed for radioactivity, several types of measurements are performed to provide information about the types of radiation and radionuclides present. The major analyses that are performed are discussed below.

Gross beta activity measures the total amount of beta-emitting radioactivity present in a sample and acts as a tool to identify samples that may require further analysis. Beta radiation may be released by many different radionuclides. Since beta-decay results in a continuous energy spectrum rather than the discrete energy levels, or "peaks", associated with gamma radiation, identification of specific beta-emitting nuclides is more difficult. Therefore, gross beta activity only indicates whether the sample contains normal or abnormal amounts of beta emitting radioactivity; it does not specifically identify the radionuclides present.

Gamma spectral analysis provides more specific information than does the analysis for gross beta activity. Gamma spectral analysis identifies each radionuclide and the amount of radioactivity present in the sample that is emitting gamma radiation. Each radionuclide has a very specific "fingerprint" that allows for accurate identification and quantification.

Iodine activity analysis measures the amount of radioactive iodine present in a sample. Some media (*e.g.*, air sample charcoal cartridges) are analyzed directly by gamma spectral analysis. With other media (*e.g.*, milk when available), the radioiodines are extracted by chemical separation before being analyzed by gamma spectral analysis.

Tritium activity analysis measures the amount of the radionuclide tritium (H-3) present in a sample. Tritium is an isotope of hydrogen that emits low-energy beta particles. Tritium occurs naturally from interactions with atmospheric cosmic rays and is also man-made from the nuclear fission process.

Gamma doses received by Thermoluminescent Dosimeters (TLD) while in the field are determined by a special laboratory procedure. Thermoluminescence is a process by which ionizing radiation interacts with the sensitive phosphor material in the TLD. Energy is trapped in the TLD material and can be stored for months or years. This capability provides a method to measure the dose received over long periods of time. The amount of energy that was stored in the TLD as a result of interaction with radiation is released by a controlled heating process and measured in a calibrated reading system. As the TLD is heated, the phosphor releases the stored energy as light. The amount of light is directly proportional to the amount of radiation to which the TLD was exposed.

The required REMP detection limits for samples are determined by sample media and the radionuclide that is being analyzed. The NRC has established LLDs for REMP sample analysis. These LLDs are listed in the PNPP ODCM. The vendor laboratory for REMP sample analysis has complied with these LLDs.

Table 2 provides a list of the analyses performed on environmental samples collected for the PNPP REMP, with the exception of terrestrial monitoring of milk samples. No milk-producing animals are located within the required distance per the ODCM, reference Section 7.1 Milk.

5.1 Sampling Program

The contribution of radionuclides to the environment resulting from PNPP operation is assessed by comparing results from the environmental monitoring program with pre-operational data (*i.e.*, data from before 1986), operational data from previous years, and control location data. The results for each sample type are discussed below and compared to historical data to determine if there are any observable trends. All results are expressed as concentrations. Refer to Appendix B, 2023 REMP Data Summary Reports for a detailed listing of these results. The NRC requires special reporting whenever sample analysis results exceed set limits. No values exceeded those limits.

Table 2: REMP Sample Analyses

Type	Sample	Frequency	Analysis
Atmospheric Monitoring	Airborne Particulates	Weekly	Gross Beta Activity
		Quarterly	Gamma Spectral Analysis
	Airborne Radioiodine	Weekly	Iodine-131
Terrestrial Monitoring	Milk	Monthly Semi-Monthly when animals are on pasture	Gamma Spectral Analysis & Iodine-131
	Broadleaf Vegetation	Monthly during growing season	Gamma Spectral Analysis & Iodine-131
Aquatic Monitoring	Drinking Water	Monthly	Gross Beta Activity & Gamma Spectral Analysis
		Quarterly	Tritium Activity
	Surface Water	Monthly	Gamma Spectral Analysis
		Quarterly	Tritium Activity
	Fish	Annually if seasonal. Semi-Annually if not seasonal.	Gamma Spectral Analysis
	Sediment	Semi-annually	Gamma Spectral Analysis
Direct Radiation Monitoring	TLD	Quarterly & Annually	Gamma Dose

5.2 Sampling Changes

There were no changes to the REMP program during this reporting period.

6.0 ATMOSPHERIC MONITORING

Air sampling is conducted to detect any increase in the concentration of airborne radionuclides. The PNPP REMP maintains an additional two air sampling locations above the five locations (four indicators and one control) required by the ODCM. Six of these locations are within four miles of the plant site; the seventh is used as a control location and is eleven miles from PNPP.

Air sampling pumps draw continuous samples at a rate of approximately two cubic feet per minute. The air is drawn through glass fiber filters to collect particulate material and a charcoal cartridge to adsorb iodine. The samples are collected on a weekly basis, 52 weeks a year, from each of the seven air sampling stations. Due to how the 2023 calendar year fell, 53 weeks of data were collected and included in this report.

Air samples are analyzed weekly for gross beta activity and radioiodine activity. The air samples are also analyzed by gamma spectral analysis quarterly. A total of 370 air particulate and 370 air radioiodine samples were collected and analyzed.

Gross beta activity was detected in 370 of the 370 air samples. The average gross beta activity for all indicator locations was 0.025 pCi/m^3 and the controls was 0.026 pCi/m^3. Historically, the concentration of gross beta in air has been essentially identical at indicator and control locations. Figure 5 reflects the average gross beta activity for 2023 and previous years.

With the exception of naturally occurring beryllium-7, no radionuclides above the LLD values were identified in the quarterly gamma spectral analysis. All radioiodine samples were less than the lower limit of detection for iodine-131.

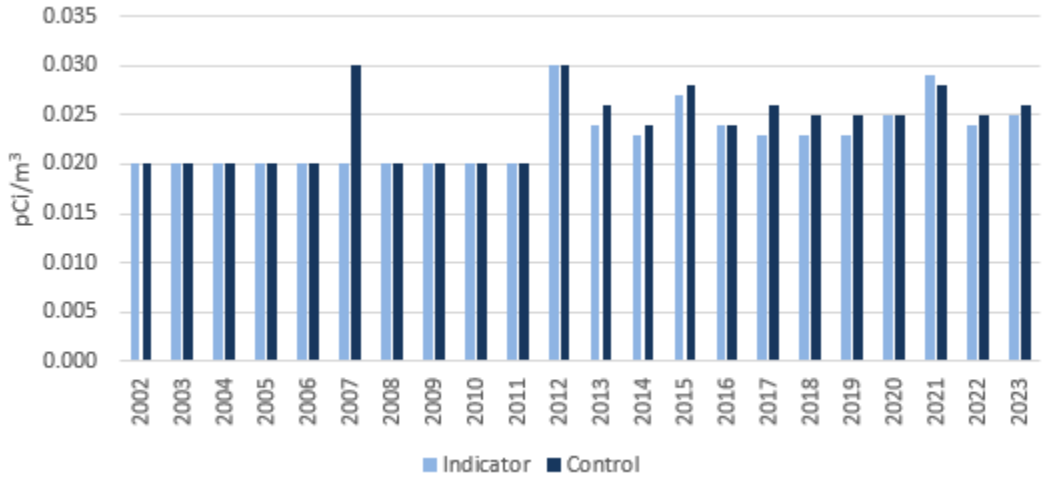

Figure 5: Air Particulate Gross Beta Comparison of Current Year and Historic Data

Air particulate and gross beta results from this monitoring period, 2023, were similar compared to preoperational data as shown in Figure 5 and Table 3 There were no significant changes in baseline.

Table 3: Air Particulate Gross Beta Comparison of Current Year and Historic Data

Pre-Operational (pCi/m^3)	2023 Sample Result Average (pCi/m^3)
0.023	0.025

7.0 TERRESTRIAL MONITORING

Collecting and analyzing samples of milk (when available) and broadleaf vegetation provides data to assess the build-up of radionuclides that may be ingested by humans. The historical data from soil and vegetation samples provides information on atmospheric radionuclide deposition.

7.1 Milk

Since the milk sampling locations do not meet the requirements of the ODCM (no milk-producing animals are located within the required distance), broadleaf vegetation sampling (discussed below) is performed by PNPP. Milk was collected from the available locations to augment vegetation sampling until Spring 2018.

7.2 Broadleaf Vegetation

Because there is not a milking animal within 5 km of the plant, PNPP sampled broadleaf vegetation as required by the ODCM. These samples are collected monthly during the growing season from four gardens in the vicinity of PNPP and one control location 16.2 miles SSW from PNPP.

Sixty three (63) samples were collected and analyzed by gamma spectral analysis. Four vegetation types were grown and collected: collard greens, turnip greens, kale, and Swiss chard. Beryllium-7 and potassium-40, both naturally occurring radionuclides, were found in the samples. No other radionuclides were detected.

The decrease in the number samples from previous years is because three garden participants were unable to produce swiss chard for the 2023 growing season. This was corelated to excessive rain during the spring. A second planting was attempted in mid-July to attempt obtaining end of season vegetation; however, this planting was unsuccessful.

8.0 AQUATIC MONITORING

Radionuclides may be present in Lake Erie from many sources other than the PNPP. These sources include atmospheric deposition, run-off, soil erosion, and releases of radioactivity in liquid effluents from hospitals, universities, or other industrial facilities. These sources provide two forms of potential radiation exposure: external and internal.

External exposure can occur from contact with water or shoreline sediments, while internal exposure can occur from either direct ingestion of radionuclides or the transfer of radionuclides through the aquatic food chain. Direct exposure can occur through ingestion by drinking the water, while the transfer via the aquatic food chain occurs from the eventual consumption of aquatic organisms, such as fish. PNPP samples water, shoreline sediments, and fish to monitor these pathways.

8.1 Water

Water is sampled from five locations along Lake Erie in the vicinity of the PNPP as required by the PNPP ODCM when available and as weather permits. Sixty (60) monthly composite samples were collected and analyzed for gross beta activity and gamma spectral analysis. Monthly composite samples are analyzed for gamma emitters. Aliquots from the monthly composites are combined to form quarterly composites which is then analyzed for tritium.

Gross beta activity was detected in 44 of the 60 samples collected. The indicator annual average gross beta activity was 1.5 pCi/L and the control average gross beta activity was 1.1 pCi/L. Refer to Figure 6 for the annual average gross beta activity for both indicator and control locations. No gamma activity was detected in any of the 60 samples collected. The 20 quarterly composite samples had 6 samples where tritium activity was detected. Any positive result less than 500 pCi/L is considered as background activity and not due to plant operations. The highest tritium activity was 221.3 pCi/L.

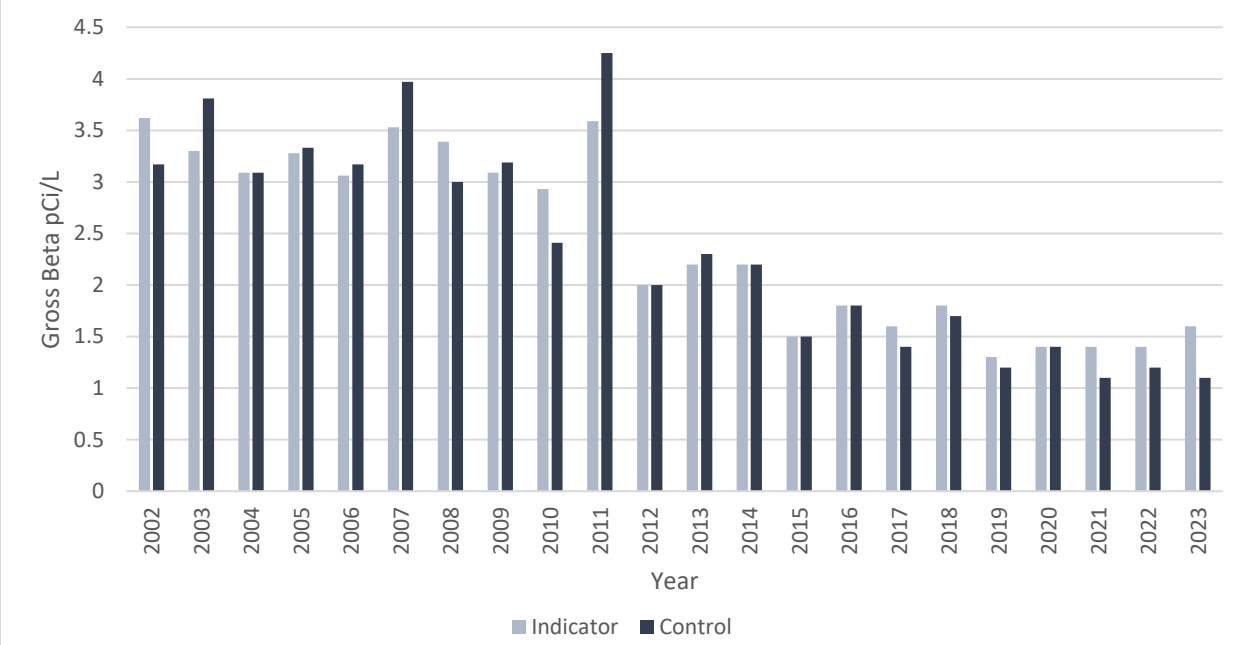

Figure 6: Annual Average Gross Beta Activity in Water

8.2 Sediment

Sampling shoreline sediments provides an indication of the accumulation of particulate radionuclides which may lead to an external radiation source to fishermen and swimmers from shoreline exposure. Sediment was sampled from two locations.

A total of four sediment samples were collected and were analyzed by gamma spectroscopy. The only radionuclide detected was naturally occurring potassium-40.

8.3 Fish

Fish are analyzed primarily to quantify the radionuclide intake by humans and secondarily to serve as indicators of radioactivity in the aquatic ecosystem. Fish are collected from two locations annually during the fishing season as required by the ODCM. Important sport or commercial species are targeted, and only the fillets are sent to the laboratory for analysis.

Eighteen (18) fish samples were collected and analyzed: 9 indicator and 9 control samples. The species were smallmouth bass, walleye, white sucker, red horse sucker, gizzard shad, yellow perch, freshwater drum, golden red horse, channel catfish, and white perch. Only naturally occurring potassium-40 was detected in these samples.

9.0 DIRECT RADIATION MONITORING

Environmental radiation is measured directly at 27 locations around the PNPP site and at two control locations using thermoluminescent dosimeters (TLDs). The locations are positioned in two rings around the plant as well as at the site boundary. The inner ring is within a one-mile radius of the plant site; the outer ring is four to five miles from the plant. The control locations are over ten miles from the plant in the two least prevalent wind directions. Each location has three TLDs, two of which are changed quarterly, and one that is changed annually.

A total of 261 TLDs were collected and analyzed. This includes 232 collected on a quarterly basis and 29 collected annually. Annual TLDs are not required per the ODCM and are used for supplemental data only.

The annual average dose for all indicator locations was 59.2 mrem versus 57.3 mrem for the control locations. The average quarterly dose for the indicator locations was 14.4 mrem versus 14.2 mrem for the control locations. Refer to Figure 7 for the average quarterly TLD dose rates for both indicator and control locations.

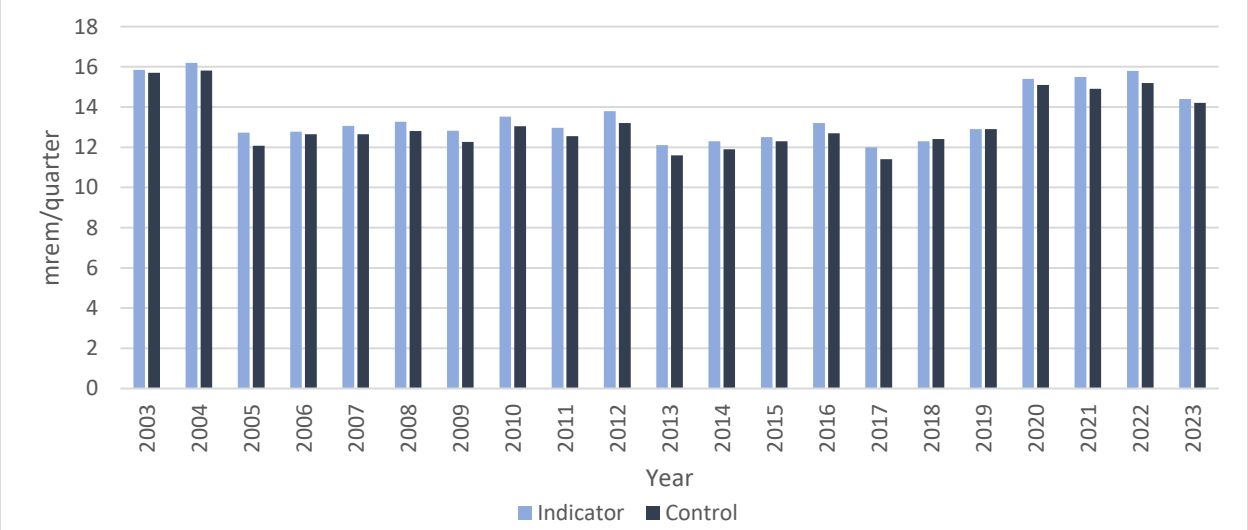

Figure 7: Average Quarterly TLD Dose

10.0 CONCLUSION

There are no discernable trends or increase in radiological parameters when comparing current monitoring results to pre-operational studies. Non-routine analyses were not required during this reporting period. While you can note a slight increase in data of control vs indicator locations, there is no significant impact on the surrounding environment due to the operation of the Perry Nuclear Power Plant.

11.0 INTER-LABORATORY CROSS-CHECK COMPARISON PROGRAM

The purpose of the Inter-laboratory Cross-Check Comparison Program is to provide an independent check on the vendor laboratory's analytical procedures. Samples with a known concentration of specific radionuclides are provided to the vendor laboratory. The vendor laboratory measures and reports the concentration of specified radionuclides. The known values are then compared to the vendor results. Results consistently outside established acceptance criteria indicate a need to check instruments or procedures. Regulatory Guide 4.15 [7] specifically requires that contractor laboratories that performed environmental measurement participate in the EPA's Environmental Radioactivity Laboratory Inter Comparison Studies Program, or an equivalent program.

The EPA's program is no longer funded or offered. The reason that the EPA program was referenced in the regulatory guide is that the EPA standards were traceable to National Bureau of Standards (now known as National Institute of Standards and Technology). In response, the vendor lab incorporated a program offered by Environmental Resource Associates (ERA), which covered the same analyses in the same matrix at the same frequency as the EPA program. ERA has received NIST accreditation as an equivalent program. In addition to comparison cross checks performed with ERA, the vendor laboratory routinely monitors the quality of their analyses by analyzing "spiked" samples (samples with a specific quantity of radioactive material present in them) and participating in the Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

See Attachment 1 for the vendor Inter-Laboratory Cross-Check Comparison Program Results.

12.0 LAND USE CENSUS EXPOSURE PATHWAY

To estimate radiation dose attributable to operation of the PNPP, the potential pathways through which public exposure can occur must be known. To identify these pathways, an Annual Land Use Census is performed as part of the REMP. During the census, PNPP personnel travel public roads within a five-mile radius of the plant to locate key radiological exposure pathways. These key pathways include the nearest resident and nearest garden in each of the ten meteorological land sectors that surround the plant. The information obtained from the census is entered into a computer program used to assess hypothetical dose to members of the public. The predominant land use within the census area continues to be rural and/or agricultural.

12.1 Introduction

Each year a Land Use Census is conducted to identify the locations of the nearest available milking animal, garden (of greater than 500 square feet), and residence in each of the meteorological sectors that is over land. Information gathered during the Land Use Census is used for off-site dose assessment and to update sampling locations for the REMP. The census is conducted by traveling all roads within a five-mile radius of the plant site and recording and mapping the locations of the nearest resident, available milk animal, and vegetable garden.

The Land Use Census was conducted in August 2023. The census identified the garden, and residence locations identified in Table 4 and Table 5 that are depicted in Figure 8. Note that the W, WNW, NW, NNW, N, and NNE sectors extend over Lake Erie and are not included in the survey. No location with an available milking animal was identified.

12.2 Discussion and Results

In general, the predominant land use within the census area continues to be rural/ agricultural. In recent years, however, it has been noted that tracts of land once used for farming are now being developed as mini-industrial parks and residential housing. This is reflected in the loss of available milking animals within a five-kilometer radius of PNPP to support the REMP.

There were no changes to the REMP sampling locations compared to the 2022 Land Use Census. Refer to Figure 2, Figure 3, and Figure 4, for the REMP sampling locations.

Table 4 identifies the nearest residences, by sector, to the PNPP. There were no changes from the 2022 Land Use Census. Refer to Figure 8 for map locator numbers.

Table 4: Nearest Residence - By Sector

Sector	Location Address	Miles from PNPP	Map Locator Number
NE	2348 W. Hemlock	0.9	11
ENE	2452 Antioch	1.1	12
E	2634 Antioch	1.1	10
ESE	2836 Antioch	1.1	4
SE	4671 North Ridge	1.3	15
SSE	4225 Red Mill Valley	1.1	16
S	3121 Center Rd.	0.9	7
SSW	3850 Clark	0.9	8
SW	3021 Perry Park	1.3	13
WSW	3460 Parmly	1.0	14

Table 5 lists the nearest gardens by sector to the PNPP consisting of at least 500 square feet. Refer to Figure 8 for map locator numbers.

Table 5: Nearest Garden - By Sector

Sector	Location Address	Miles from PNPP	Map Locator Number
NE	4384 Lockwood	0.7	1
ENE	4602 Lockwood	1.1	2
E	2626 Antioch	1	3
ESE	2836 Antioch	1.1	4
SE	4495 North Ridge	1.3	5
SSE	3119 Parmly	0.9	6
S	3121 Center	0.9	7
SSW	3300 Ohio St.	2.3	17
SW	2997 Perry Park	1.2	9
WSW	3460 Parmly	1	14

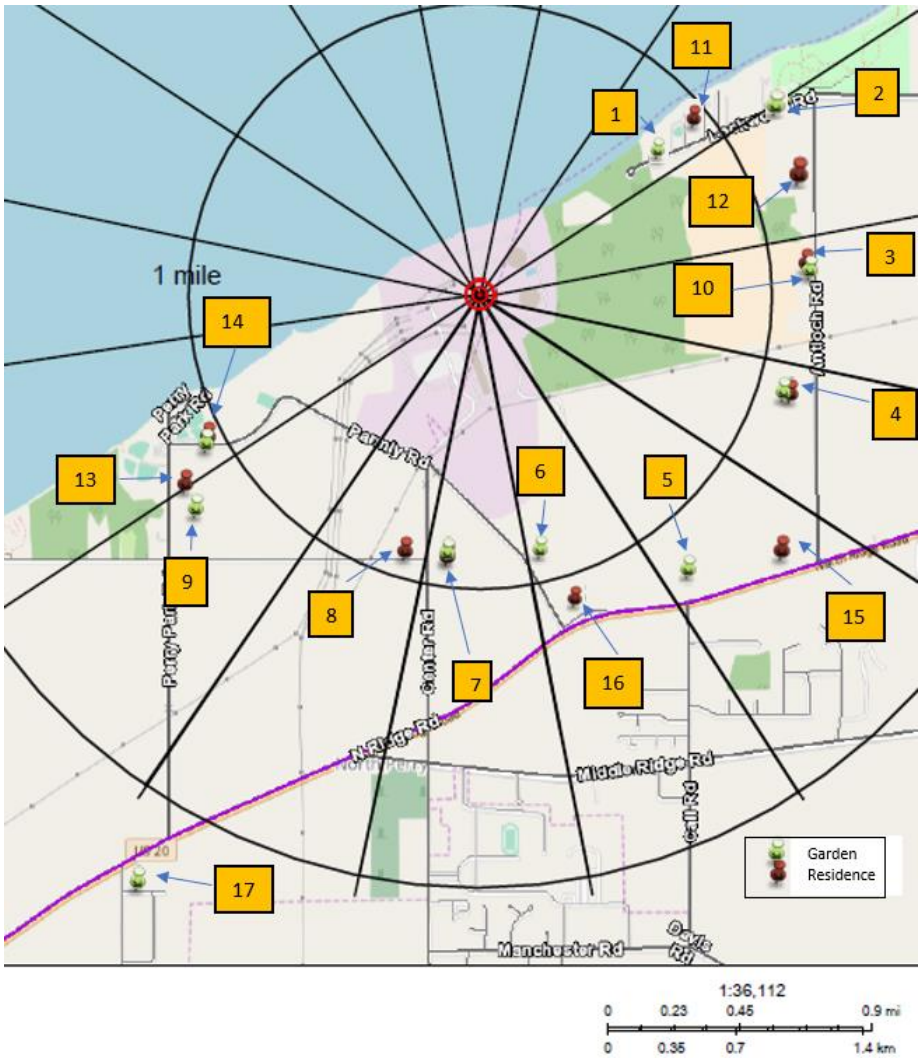

Figure 8: Land Use Census Map

13.0 ANNUAL ENVIRONMENTAL OPERATING REPORT

The NRC issued Amendment No. 178 to Facility Operating License No. NPF-58 on October 19, 2017. This amendment revises the PNPP "Environmental Protection Plan (Non-radiological)" (EPP) to clarify and enhance wording to remove duplicative or outdated program information, and to relieve the burden of submitting unnecessary or duplicative information to the NRC.

As a result of the above Amendment issued in October 2017, redundant program information is no longer required to be compiled and included in this report. This includes the sections: Clam/Mussel Monitoring, Herbicide Applications, and Special Reports which included National Pollutant Discharge Elimination System Permit exceedances, and the EPP from previous years.

14.0 ODCM NON-COMPLIANCES

Sampling and analysis are performed for media types addressed in the Offsite Dose Calculation Manual. ODCM non-compliances occur when a sample required by the ODCM is not obtained and/or analyzed.

Sampling and analysis challenges may be experienced due to a multitude of reasons including environmental factors, loss of TLDs, contamination of samples, etc. To aid classification of sampling and analysis challenges experienced in 2023, the following three terms are used to describe the issues: Sample Anomalies (SA), Sample Deviation (SD), and Unavailable Samples (US).

Media that experienced downtime (*i.e.*, air samplers or water samplers) during a surveillance period are classified a "Sample Deviation".

"Sample Anomalies" are defined as errors that were introduced to a sample once it arrived in the laboratory or errors that prevent the sample from being analyzed as it normally would or may alter the outcome of the analysis (*i.e.*, cross contamination, human error).

"Sample Unavailability" is defined as sample collection evolution with no available sample (*i.e.*, food crop, TLD).

14.1 Non-Compliances

There was one ODCM non-compliance for 2023. During the week of 3/2/2023 no iodine and particulate sample was obtained at the P-1 location (Chapel Road). This occurred due to an accident on 2/21/2023 when a vehicle collided with air sample station #1. The offsite air sample station was damaged when the vehicle struck it and a nearby power pole. This traffic accident was caused by non-site personnel.

Due to the nature of the accident the power had been cut off to the air sample station for an extended period of time. Air sampler station #1 was reassembled and restored with a complete pump rebuild, keypad, and turbine replacement. Temporary power was routed to the sample station from a nearby business the following week until the completion of restoration of power to a new power pole. This full evolution took around seven weeks: First Energy installed a new power pole and meter, the Lake County Building

Department inspected the electricians' work and provided approval of compliance, then power was reconnected to the sample station and restoration of service was achieved.

This was captured in the stations Corrective Action Program.

14.2 Sampling Challenges

There was sample unavailability at 3 garden locations for vegetation, specifically swiss chard, for the duration of the growing season. This was attributed to the excessive rains during the spring and a failed second planting of swiss chard in July at these locations.

Sample Deviation did occur due to the previous listed ODCM non-compliance. In the following 6 weeks after 2/21/23 accident that removed power to air sample station #1 (Chapel Road) reduced air sample run times occurred due to business temporary power availability not being continuous. This is noted in sample volume collected for this station.

This was captured in the stations Corrective Action Program.

15.0 CORRECTIONS TO PREVIOUS REPORTS

There were no corrections identified for previous reports.

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Attachment 1: Inter-Laboratory Cross Check Comparison Program Results

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APPENDIX A

INTERLABORATORY AND INTRALABORATORY
COMPARISON PROGRAM RESULTS

NOTE: Appendix A is updated four times a year. The complete appendix is included in March, June, September and December monthly progress reports only.

October, 2022 through September, 2023

Appendix A

Interlaboratory/ Intralaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the RAD PT Study Proficiency Testing Program administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via irradiation and evaluation by the University of Wisconsin-Madison Radiation Calibration Laboratory at the University of Wisconsin Medical Radiation Research Center.

Table A-3 lists results of the analyses on intralaboratory "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on intralaboratory "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists analytical results from the intralaboratory "duplicate" program for the past twelve months. Acceptance is based on each result being within 25% of the mean of the two results or the two sigma uncertainties of each result overlap.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the MRAD PT Study Proficiency Testing Program administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory acceptance criteria for various analyses.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR INTRALABORATORY "SPIKED" SAMPLES

Analysis	Ratio of lab result to known value.
Gamma Emitters	0.8 to 1.2
Strontium-89, Strontium-90	0.8 to 1.2
Potassium-40	0.8 to 1.2
Gross alpha	0.5 to 1.5
Gross beta	0.8 to 1.2
Tritium	0.8 to 1.2
Radium-226, Radium-228	0.7 to 1.3
Plutonium	0.8 to 1.2
Iodine-129, Iodine-131	0.8 to 1.2
Nickel-63, Technetium-99, Uranium-238	0.7 to 1.3
Iron-55	0.8 to 1.2
Other Analyses	0.8 to 1.2

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

RAD study

Lab Code	Date	Analysis	Concentration (pCi/L) Laboratory Result	ERA Value	Acceptance Limits	Acceptance
RAD-132 Study						
ERDW-162	2/23/2023	Ba-133	33.0 ± 3.5	30.5	24.2 - 34.6	Pass
ERDW-162	2/23/2023	Cs-134	30.7 ± 3.0	28.2	21.9 - 31.1	Pass
ERDW-162	2/23/2023	Cs-137	191 ± 7	190	171 - 211	Pass
ERDW-162	2/23/2023	Co-60	110 ± 4	110	99.0 - 123	Pass
ERDW-162	2/23/2023	Zn-65	109 ± 8	105	94.5 - 125	Pass
ERDW-162	2/23/2023	Gr. Alpha	25.3 ± 0.2	30.0	15.3 - 39.2	Pass
ERDW-162	2/23/2023	G. Beta	15.0 ± 0.1	16.5	9.25 - 24.8	Pass
ERDW-162	2/23/2023	Ra-226	7.58 ± 0.52	8.26	6.21 - 9.71	Pass
ERDW-162	2/23/2023	Ra-228	7.44 ± 1.53	7.17	4.51 - 9.20	Pass
ERDW-162	2/23/2023	H-3	22,600 ± 467	21,600	18,900 - 23,800	Pass
RAD-134 Study						
ERDW-1956	7/10/2023	Ba-133	64.1 ± 4.7	66.5	55.4 - 73.2	Pass
ERDW-1956	7/10/2023	Cs-134	97.0 ± 4.8	90.8	74.5 - 99.9	Pass
ERDW-1956	7/10/2023	Cs-137	179 ± 8	163	147 - 181	Pass
ERDW-1956	7/10/2023	Co-60	26.6 ± 2.9	20.7	17.5 - 25.6	Fail [b]
ERDW-1956	7/10/2023	Zn-65	318 ± 12	290	261 - 339	Pass
ERDW-50167	7/10/2023	Gr. Alpha	34.3 ± 1.9	47.9	24.9 - 60.3	Pass
ERDW-50167	7/10/2023	G. Beta	27.4 ± 1.2	28.6	18.2 - 36.4	Pass
ERDW-50171	7/10/2023	Ra-226	19.3 ± 0.9	17.4	12.9 - 19.9	Pass
ERDW-50171	7/10/2023	Ra-228	7.11 ± 1.59	7.16	4.50 - 9.18	Pass
ERDW-50173	7/10/2023	H-3	10,500 ± 326	9,860	8,570 - 10,800	Pass
ERDW-50169	7/10/2023	I-131	23.9 ± 1.2	24.4	20.2 - 28.9	Pass

[a] Results obtained by Microbac Laboratories Inc. - Northbrook as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resource Associates (ERA).

[b] The Cobalt-60 result did not meet ERA acceptance criteria. The sample was reanalyzed and passed for all analytes. (Co-60 reanalysis result was 21.2 ± 3.0 pCi/L). No cause for the earlier failure could be determined.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).[a]

			mrem			
Lab Code	Irradiation Date	Description	Delivered Dose	Reported[b] Dose	Performance[c] Quotient (P)	
Environmental, Inc.		Group 1				
2022-23-1	2/7/2023	Spike 1	134.0	134.5	0.00	
2022-23-1	2/7/2023	Spike 2	134.0	131.1	-0.02	
2022-23-1	2/7/2023	Spike 3	134.0	134.0	0.00	
2022-23-1	2/7/2023	Spike 4	134.0	130.7	-0.02	
2022-23-1	2/7/2023	Spike 5	134.0	131.5	-0.02	
2022-23-1	2/7/2023	Spike 6	134.0	139.3	0.04	
2022-23-1	2/7/2023	Spike 7	134.0	134.8	0.01	
2022-23-1	2/7/2023	Spike 8	134.0	130.7	-0.02	
2022-23-1	2/7/2023	Spike 9	134.0	133.1	-0.01	
2022-23-1	2/7/2023	Spike 10	134.0	129.9	-0.03	
2022-23-1	2/7/2023	Spike 11	134.0	125.6	-0.06	
2022-23-1	2/7/2023	Spike 12	134.0	139.5	0.04	
2022-23-1	2/7/2023	Spike 13	134.0	135.2	0.01	
2022-23-1	2/7/2023	Spike 14	134.0	135.8	0.01	
2022-23-1	2/7/2023	Spike 15	134.0	133.6	0.00	
2022-23-1	2/7/2023	Spike 16	134.0	132.7	-0.01	
2022-23-1	2/7/2023	Spike 17	134.0	125.1	-0.07	
2022-23-1	2/7/2023	Spike 18	134.0	131.9	-0.02	
2022-23-1	2/7/2023	Spike 19	134.0	125.3	-0.06	
2022-23-1	2/7/2023	Spike 20	134.0	128.2	-0.04	
Mean (Spike 1-20)				132.1	-0.01	Pass[d]
Standard Deviation (Spike 1-20)				4.1	0.03	Pass[d]

a TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

b Reported dose was converted from exposure (R) to Air Kerma (cGy) using a conversion of 0.876. Conversion from air kerma to ambient dose equivalent for Cs-137 at the reference dose point $H^*(10)K_a = 1.20$. mrem/cGy = 1000.

c Performance Quotient (P) is calculated as ((reported dose - conventionally true value) + conventionally true value) where the conventionally true value is the delivered dose.

d Acceptance is achieved when neither the absolute value of the mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).[a]

			mrem		
Lab Code	Irradiation Date	Description	Delivered Dose	Reported[b] Dose	Performance[c] Quotient (P)
Environmental, Inc.		Group 2			
2022-23-2	2/7/2023	Spike 21	70.0	71.7	0.02
2022-23-2	2/7/2023	Spike 22	70.0	72.1	0.03
2022-23-2	2/7/2023	Spike 23	70.0	66.2	-0.05
2022-23-2	2/7/2023	Spike 24	70.0	70.6	0.01
2022-23-2	2/7/2023	Spike 25	70.0	71.0	0.01
2022-23-2	2/7/2023	Spike 26	70.0	71.3	0.02
2022-23-2	2/7/2023	Spike 27	70.0	68.4	-0.02
2022-23-2	2/7/2023	Spike 28	70.0	70.2	0.00
2022-23-2	2/7/2023	Spike 29	70.0	72.1	0.03
2022-23-2	2/7/2023	Spike 30	70.0	71.2	0.02
2022-23-2	2/7/2023	Spike 31	70.0	67.5	-0.04
2022-23-2	2/7/2023	Spike 32	70.0	68.8	-0.02
2022-23-2	2/7/2023	Spike 33	70.0	72.2	0.03
2022-23-2	2/7/2023	Spike 34	70.0	69.6	-0.01
2022-23-2	2/7/2023	Spike 35	70.0	69.7	0.00
2022-23-2	2/7/2023	Spike 36	70.0	68.0	-0.03
2022-23-2	2/7/2023	Spike 37	70.0	72.2	0.03
2022-23-2	2/7/2023	Spike 38	70.0	70.6	0.01
2022-23-2	2/7/2023	Spike 39	70.0	70.4	0.01
2022-23-2	2/7/2023	Spike 40	70.0	66.5	-0.05
Mean (Spike 21-40)				70.0	0.00 Pass[d]
Standard Deviation (Spike 21-40)				1.9	0.03 Pass[d]

a TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

b Reported dose was converted from exposure (R) to Air Kerma (cGy) using a conversion of 0.876. Conversion from air kerma to ambient dose equivalent for Cs-137 at the reference dose point $H^*(10)K_a = 1.20$. mrem/cGy = 1000.

c Performance Quotient (P) is calculated as ((reported dose - conventionally true value) ÷ conventionally true value) where the conventionally true value is the delivered dose.

d Acceptance is achieved when neither the absolute value of the mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code[b]	Date	Concentration[a] Analysis	Laboratory results 2s, n=1[c]	Known Activity	Control Limits[d]	Acceptance	Ratio Lab/Known
SPDW-40361	10/12/2022	Ra-226	10.0 ± 0.3	12.3	8.6 - 16.0	Pass	0.81
SPDW-40344	11/3/2022	Ra-228	13.2 ± 1.8	13.4	9.4 - 17.4	Pass	0.99
SPDW-40346	11/8/2022	Gr. Alpha	42.0 ± 2.2	60.2	30.1 - 90.3	Pass	0.70
SPDW-40346	11/8/2022	Gr. Beta	16.6 ± 1.0	17.7	14.2 - 21.2	Pass	0.94
SPDW-40352	11/17/2022	Sr-90	18.8 ± 1.2	17.1	13.7 - 20.5	Pass	1.10
SPDW-40355	11/18/2022	H-3	10,143 ± 316	10,400	8,320 - 12,480	Pass	0.98
SPDW-40364	11/30/2022	Gr. Alpha	38.4 ± 1.5	49.1	24.6 - 73.7	Pass	0.78
SPDW-40364	11/30/2022	Gr. Beta	30.9 ± 1.2	31.5	25.2 - 37.8	Pass	0.98
LCS-W-110822	2/1/2022	Cs-137	222 ± 10	206	165 - 247	Pass	1.08
LCS-W-110822	2/1/2022	Co-57	1,060 ± 117	973	778 - 1,168	Pass	1.09
LCS-W-110822	2/1/2022	Co-60	250 ± 8	251	201 - 301	Pass	1.00
LCS-W-110822	2/1/2022	Mn-54	537 ± 18	511	409 - 613	Pass	1.05
LCS-W-110822	2/1/2022	Zn-65	673 ± 35	708	566 - 850	Pass	0.95
SPDW-40372	11/21/2022	Ra-226	11.3 ± 0.3	12.3	8.6 - 16.0	Pass	0.92
SPU-3883	12/1/2022	H-3	21,694 ± 1,387	23,900	19,120 - 28,680	Pass	0.91
SPW-3950	12/1/2022	Ni-63	1,937 ± 28	2,135	1,708 - 2,562	Pass	0.91
SPDW-40366	12/2/2022	H-3	22,466 ± 464	23,900	19,120 - 28,680	Pass	0.94
SPW-3969	12/2/2022	Ni-63	2,123 ± 29	2,135	1,708 - 2,562	Pass	0.99
SPW-3881	12/5/2022	Tc-99	85.0 ± 1.6	108	75 - 140	Pass	0.79
SPDW-40374	12/12/2022	H-3	22,554 ± 463	23,900	19,120 - 28,680	Pass	0.94
SPDW-40382	12/12/2022	Ra-226	12.7 ± 0.4	12.3	8.6 - 16.0	Pass	1.03
SPDW-40380	12/22/2022	H-3	22,200 ± 462	23,900	19,120 - 28,680	Pass	0.93
SPDW-26	1/5/2023	Ra-228	11.8 ± 1.9	13.4	9.4 - 17.4	Pass	0.88
SPDW-50002	1/11/2023	H-3	21,747 ± 452	22,100	17,680 - 26,520	Pass	0.98
SPDW-50004	1/20/2023	H-3	21,861 ± 458	22,100	17,680 - 26,520	Pass	0.99
SPDW-50006	1/5/2023	Ra-226	11.3 ± 0.3	12.3	8.6 - 16.0	Pass	0.92
SPDW-50034	1/27/2023	Ra-226	12.6 ± 0.4	12.3	8.6 - 16.0	Pass	1.02
LCS-SO-012723	8/1/2020	Cs-134	17.1 ± 0.2	19.2	15.4 - 23.0	Pass	0.89
LCS-SO-012723	8/1/2020	Zn-65	13.8 ± 1.7	14.1	11.3 - 16.9	Pass	0.98
LCS-SO-012723	8/1/2020	Co-60	26.4 ± 0.2	27.0	21.6 - 32.4	Pass	0.98
LCS-SO-012723	8/1/2020	Co-57	30.7 ± 0.1	30.9	24.7 - 37.1	Pass	0.99
LCS-SO-012723	8/1/2020	Mn-54	17.7 ± 0.8	16.5	13.2 - 19.8	Pass	1.07
LCS-SO-012723	8/1/2020	K-40	18.4 ± 0.7	16.8	13.4 - 20.2	Pass	1.10
SPDW-50010	1/31/2023	Ra-228	9.7 ± 1.3	13.4	9.4 - 17.4	Pass	0.72
SPDW-50008	2/3/2023	H-3	21,961 ± 459	22,100	17,680 - 26,520	Pass	0.99
SPDW-50016	2/10/2023	H-3	22,137 ± 462	22,100	17,680 - 26,520	Pass	1.00
SPDW-50012	2/24/2023	Sr-90	18.6 ± 1.2	17.1	13.7 - 20.5	Pass	1.09
SPDW-50032	2/16/2023	Ra-228	13.1 ± 1.9	13.4	9.4 - 17.4	Pass	0.98
SPDW-50018	2/16/2023	Gr. Alpha	19.1 ± 1.3	23.5	11.8 - 28.2	Pass	0.81
SPDW-50018	2/16/2023	Gr. Beta	133 ± 2	141	112 - 169	Pass	0.94
SPDW-50021	2/17/2023	H-3	21,843 ± 459	22,100	17,680 - 26,520	Pass	0.99
SPDW-50047	2/24/2023	Ra-226	12.8 ± 0.4	12.3	8.6 - 16.0	Pass	1.04

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).
[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).
[c] Results are based on single determinations.
[d] Acceptance criteria are listed in Attachment A of this report.

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code[b]	Date	Concentration[a] Analysis	Laboratory results 2s, n=1[c]	Known Activity	Control Limits[d]	Acceptance	Ratio Lab/Known
SPDW-50049	3/17/2023	H-3	22,120 ± 465	22,100	17,680 - 26,520	Pass	1.00
SPDW-50056	3/24/2023	H-3	21,911 ± 463	22,100	17,680 - 26,520	Pass	0.99
SPDW-50060	3/16/2023	Ra-226	12.9 ± 0.4	12.3	8.6 - 16.0	Pass	1.05
SPDW-50097	4/13/2023	Ra-226	11.7 ± 0.5	12.3	8.6 - 16.0	Pass	0.95
SPDW-50068	4/14/2023	H-3	22,656 ± 482	22,100	17,680 - 26,520	Pass	1.03
SPDW-50081	4/25/2023	H-3	21,594 ± 461	22,100	17,680 - 26,520	Pass	0.98
SPDW-50131	5/3/2023	Ra-226	11.4 ± 0.3	12.3	8.6 - 16.0	Pass	0.93
SPDW-50104	5/12/2023	H-3	21,513 462	22,100	17,680 - 26,520	Pass	0.97
SPDW-50117	5/26/2023	H-3	22,069 468	22,100	17,680 - 26,520	Pass	1.00
SPDW-50182	6/8/2023	Ra-226	10.4 ± 0.3	12.3	8.6 - 16.0	Pass	0.85
SPDW-50137	6/12/2023	H-3	21,898 ± 456	22,100	17,680 - 26,520	Pass	0.99
SPDW-50138	6/12/2023	H-3	21,898 ± 456	22,100	17,680 - 26,520	Pass	0.99
SPDW-50153	6/26/2023	H-3	21,672 ± 456	22,100	17,680 - 26,520	Pass	0.98
SPDW-50153	6/26/2023	H-3	21,672 ± 456	22,100	17,680 - 26,520	Pass	0.98
SPDW-50259	7/19/2023	Ra-226	10.5 ± 0.3	12.3	8.6 - 16.0	Pass	0.85
SPDW-50219	8/15/2023	Sr-90	17.5 ± 1.1	17.1	13.7 - 20.5	Pass	1.02
SPDW-50291	8/28/2023	Ra-226	11 ± 0	12.3	8.6 - 16.0	Pass	0.89
SPDW-50249	8/22/2023	Gr. Alpha	16.7 ± 1.4	23.5	11.8 - 28.2	Pass	0.71
SPDW-50249	8/22/2023	Gr. Beta	128 ± 2	141	112 - 169	Pass	0.91
SPDW-50252	8/18/2023	H-3	21,628 ± 459	22,100	17,680 - 26,520	Pass	0.98
SPDW-50257	8/25/2023	H-3	22,152 ± 469	22,100	17,680 - 26,520	Pass	1.00
LCS-09/12/23	8/1/2020	Cs-134	17,533 ± 346	19,170	15,336 - 23,004	Pass	0.91
LCS-09/12/23	8/1/2020	Co-60	27,480 ± 347	26,055	20,844 - 31,266	Pass	1.05
LCS-09/12/23	8/1/2020	K-40	20,183 1268	18,468	14,774 - 22,162	Pass	1.09
SPDW-50270	9/6/2023	H-3	22,287 ± 469	22,100	17,680 - 26,520	Pass	1.01
SPDW-50283	9/25/2023	H-3	21,062 ± 444	22,100	17,680 - 26,520	Pass	0.95

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).
[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).
[c] Results are based on single determinations.
[d] Acceptance criteria are listed in Attachment A of this report.

TABLE A-4. Intralaboratory "Blank" Samples

Lab Code[b]	Sample Type	Date	Analysis[c]	Concentration[a] Laboratory results (4.66σ) LLD	Activity[d]	Acceptance Criteria (4.66 σ)
SPDW-40345	Water	11/8/2022	Gr. Alpha	0.53	-0.17 ± 0.36	2
SPDW-40345	Water	11/8/2022	Gr. Beta	0.78	-0.05 ± 0.54	4
SPDW-40350	Water	11/11/2022	H-3	166	96 ± 84	200
SPDW-40352	Water	11/17/2022	Sr-89	0.66	-0.01 ± 0.53	5
SPDW-40352	Water	11/17/2022	Sr-90	0.61	0.11 ± 0.29	1
SPDW-40354	Water	11/18/2022	H-3	155	21 ± 76	200
SPDW-40354	Water	11/18/2022	I-131	0.18	-0.11 ± 0.09	1
SPW-3880	Water	12/1/2022	Tc-99	5.58	2.99 ± 3.44	200
SPU-3882	Urine	12/1/2022	H-3	1157	599 ± 642	2000
SPW-3949	Water	12/2/2022	Ni-63	16.3	9.0 ± 10.0	200
SPW-3968	Water	12/2/2022	Ni-63	15.9	0.0 ± 9.6	200
SPDW-40370	Water	12/7/2022	I-131	0.10	-0.04 ± 0.06	1
SPDW-40381	Water	12/12/2022	Ra-226	0.06	-0.04 ± 0.05	2
SPDW-40379	Water	12/22/2022	H-3	162	107 ± 84	200
SPW-25	Water	1/5/2023	Ra-228	0.98	0.74 ± 0.54	2
SPDW-50000	Water	1/6/2023	I-131	0.36	-0.10 ± 0.16	1
SPDW-50001	Water	1/11/2023	H-3	157	13 ± 74	200
SPDW-50003	Water	1/20/2023	H-3	161	98 ± 85	200
SPDW-50005	Water	1/5/2023	Ra-226	0.02	0.00 ± 0.03	2
SPDW-50033	Water	1/27/2023	Ra-226	0.03	-0.01 ± 0.03	2
SPDW-50009	Water	1/31/2023	Ra-228	1.40	0.69 ± 0.75	2
SPDW-50007	Water	2/3/2023	H-3	160	17 ± 80	200
SPDW-50015	Water	2/10/2023	H-3	159	91 ± 84	200
SPDW-50011	Water	2/9/2023	Sr-89	0.62	0.24 ± 0.49	5
SPDW-50011	Water	2/9/2023	Sr-90	0.66	-0.02 ± 0.30	1
SPDW-50018	Water	2/16/2023	Gr. Alpha	0.62	0.01 ± 0.44	2
SPDW-50018	Water	2/16/2023	Gr. Beta	0.78	-0.10 ± 0.54	4
SPDW-50020	Water	2/17/2023	H-3	154	122 ± 80	200
SPDW-50031	Water	2/16/2023	Ra-228	0.82	0.42 ± 0.43	2
SPDW-50046	Water	2/24/2023	Ra-226	0.03	0.05 ± 0.04	2
SPDW-50044	Water	3/13/2023	I-131	0.15	-0.06 ± 0.08	1
SPDW-50048	Water	3/17/2023	H-3	163	80 ± 80	200
SPDW-50055	Water	3/24/2023	H-3	169	63 ± 82	200
SPDW-50059	Water	3/16/2023	Ra-226	0.04	-0.02 ± 0.03	2
SPDW-50063	Water	3/28/2023	Ra-226	0.06	-0.01 ± 0.05	2
SPDW-50067	Water	4/14/2023	H-3	173	92 ± 87	200
SPDW-50069	Water	4/17/2023	I-131	0.11	-0.05 ± 0.08	1
SPDW-50102	Water	5/15/2023	I-131	0.15	-0.01 ± 0.08	1
SPDW-50103	Water	5/12/2023	H-3	161	67 ± 80	200
SPDW-50116	Water	5/26/2023	H-3	161	122 ± 87	200

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[d] Activity reported is a net activity result.

TABLE A-4. Intralaboratory "Blank" Samples

Lab Code[b]	Sample Type	Date	Analysis[c]	Concentration[a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[d]	Criteria (4.66 σ)
SPDW-50137	Water	6/12/2023	H-3	157	125 ± 80	200
SPDW-50154	Water	6/26/2023	H-3	157	105 ± 80	200
SPDW-50181	Water	6/8/2023	Ra-226	0.04	-0.07 ± 0.03	2
SPDW-50218	Water	8/15/2023	Sr-89	0.66	-0.07 ± 0.48	5
SPDW-50218	Water	8/15/2023	Sr-90	0.55	0.02 ± 0.26	1
SPDW-50248	Water	8/22/2024	Gr. Alpha	0.57	-0.03 ± 0.40	2
SPDW-50248	Water	8/22/2024	Gr. Beta	0.70	0.28 ± 0.50	4
SPDW-50256	Water	8/25/2023	H-3	161	75 ± 84	200
SPDW-50258	Water	7/19/2023	Ra-226	0.06	-0.25 ± 0.04	2
SPDW-50270	Water	9/6/2023	H-3	160	90 ± 81	200
SPDW-50282	Water	9/25/2023	H-3	163	53 ± 79	200
SPDW-50290	Water	8/28/2023	Ra-226	0.05	0.00 ± 0.04	2

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).
[b] Laboratory codes : W & SPW (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).
[c] I-131(G); iodine-131 as analyzed by gamma spectroscopy.
[d] Activity reported is a net activity result.

TABLE A-5. Intralaboratory "Duplicate" Samples

			Concentration[a]			
Lab Code[b]	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-100321A/B	10/3/2022	Gr. Beta	0.015 ± 0.003	0.011 ± 0.003	0.013 ± 0.002	Pass
SO-3140,3141	10/3/2022	Be-7	0.353 ± 0.180	0.304 ± 0.163	0.328 ± 0.121	Pass
SO-3140,3141	10/3/2022	K-40	11.2 ± 0.6	11.0 ± 0.6	11.1 ± 0.4	Pass
SO-3140,3141	10/3/2022	Cs-137	0.055 ± 0.016	0.069 ± 0.020	0.062 ± 0.013	Pass
SO-3140,3141	10/3/2022	Tl-208	0.132 ± 0.022	0.114 ± 0.024	0.123 ± 0.016	Pass
SO-3140,3141	10/3/2022	Bi-214	0.315 ± 0.041	0.390 ± 0.041	0.353 ± 0.029	Pass
SO-3140,3141	10/3/2022	Pb-212	0.344 ± 0.029	0.357 ± 0.029	0.351 ± 0.020	Pass
SO-3140,3141	10/3/2022	Pb-214	0.362 ± 0.043	0.446 ± 0.047	0.404 ± 0.032	Pass
SO-3140,3141	10/3/2022	Ra-226	0.602 ± 0.250	0.768 ± 0.248	0.685 ± 0.176	Pass
SO-3140,3141	10/3/2022	Ac-228	0.442 ± 0.101	0.405 ± 0.083	0.423 ± 0.066	Pass
SO-3140,3141	10/3/2022	Gr. Alpha	4.07 ± 1.77	4.43 ± 2.17	4.25 ± 1.40	Pass
SO-3140,3141	10/3/2022	Gr. Beta	15.6 ± 1.6	17.0 ± 1.5	16.3 ± 1.1	Pass
AP-101021A/B	10/10/2022	Gr. Beta	0.037 ± 0.005	0.040 ± 0.005	0.039 ± 0.004	Pass
S-3501,3502	10/18/2022	K-40	16.3 ± 1.2	16.3 ± 1.3	16.3 ± 0.9	Pass
AP-101821A/B	10/18/2022	Gr. Beta	0.026 ± 0.003	0.027 ± 0.003	0.026 ± 0.002	Pass
DW-40328,40329	10/25/2022	Ra-226	2.13 ± 0.18	2.17 ± 0.28	2.15 ± 0.17	Pass
AP-102621A/B	10/26/2022	Gr. Beta	0.051 ± 0.005	0.047 ± 0.005	0.049 ± 0.003	Pass
SG-3557,3558	11/1/2022	Gr. Alpha	24.5 ± 4.0	25.0 ± 4.0	24.8 ± 2.8	Pass
SG-3557,3558	11/1/2022	Gr. Beta	26.7 ± 2.2	29.3 ± 2.3	28.0 ± 1.6	Pass
SG-3557,3558	11/1/2022	Pb-214	9.23 ± 0.15	9.23 ± 0.32	9.23 ± 0.18	Pass
SG-3557,3558	11/1/2022	Ac-228	7.35 ± 0.31	8.26 ± 0.63	7.81 ± 0.35	Pass
AP-110221A/B	11/2/2022	Gr. Beta	0.020 ± 0.003	0.020 ± 0.003	0.020 ± 0.002	Pass
DW-40341,40342	11/7/2022	Ra-226	1.18 ± 0.15	0.89 ± 0.14	1.04 ± 0.10	Pass
DW-40341,40342	11/7/2022	Ra-228	1.98 ± 0.95	3.32 ± 1.12	2.65 ± 0.73	Pass
AP-110921A/B	11/9/2022	Gr. Beta	0.025 ± 0.003	0.025 ± 0.003	0.025 ± 0.002	Pass
AP-111621A/B	11/16/2022	Gr. Beta	0.013 ± 0.002	0.015 ± 0.002	0.014 ± 0.002	Pass
AP-112321A/B	11/23/2022	Gr. Beta	0.034 ± 0.004	0.031 ± 0.004	0.032 ± 0.003	Pass
AP-113021A/B	11/30/2022	Gr. Beta	0.056 ± 0.005	0.058 ± 0.005	0.057 ± 0.003	Pass
SG-4016,4017	12/5/2022	Gr. Alpha	24.5 ± 4.0	25.0 ± 4.0	24.7 ± 2.9	Pass
SG-4016,4017	12/5/2022	Gr. Beta	26.7 ± 2.2	29.3 ± 2.3	28.0 ± 1.6	Pass
SG-4016,4017	12/5/2022	Pb-214	8.64 ± 0.30	9.28 ± 0.30	8.96 ± 0.21	Pass
SG-4016,4017	12/5/2022	Ac-228	10.8 ± 0.8	10.0 ± 0.8	10.4 ± 0.6	Pass
AP-120721A/B	12/7/2022	Gr. Beta	0.034 ± 0.003	0.030 ± 0.003	0.032 ± 0.002	Pass
DW-40375,40376	12/14/2022	Ra-228	5.05 ± 0.96	7.15 ± 1.09	6.10 ± 0.73	Pass
DW-40375,40376	12/14/2022	Ra-226	3.33 ± 0.27	4.28 ± 0.29	3.81 ± 0.20	Pass
AP-121621A/B	12/16/2022	Gr. Beta	0.039 ± 0.004	0.033 ± 0.004	0.036 ± 0.003	Pass
AP-122721A/B	12/27/2022	Gr. Beta	0.018 ± 0.002	0.016 ± 0.002	0.017 ± 0.001	Pass
W-21,22	12/27/2022	Ra-226	0.99 ± 0.29	1.52 ± 0.34	1.26 ± 0.22	Pass
AP-122821A/B	12/28/2022	Gr. Beta	0.042 ± 0.003	0.039 ± 0.003	0.041 ± 0.002	Pass

TABLE A-5. Intralaboratory "Duplicate" Samples

			Concentration[a]			
Lab Code[b]	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
WW-65,66	1/10/2023	Gr. Beta	15.4 ± 2.0	17.2 ± 2.1	16.3 ± 1.5	Pass
WW-107,108	1/18/2023	H-3	153 ± 88	132 ± 87	143 ± 62	Pass
SG-187,188	1/30/2023	Gr. Alpha	28.1 ± 3.9	22.0 ± 3.5	25.1 ± 2.6	Pass
SG-187,188	1/30/2023	Gr. Beta	22.3 ± 1.8	22.2 ± 1.8	22.3 ± 1.3	Pass
SG-187,188	1/30/2023	Pb-214	4.08 ± 0.16	3.38 ± 0.09	3.73 ± 0.09	Pass
SG-187,188	1/30/2023	Ac-228	3.88 ± 0.28	3.98 ± 0.14	3.93 ± 0.16	Pass
SWU-201,202	1/31/2023	H-3	171 ± 89	234 ± 92	203 ± 64	Pass
SW-243,244	2/7/2023	H-3	358 ± 98	262 ± 93	310 ± 68	Pass
PW-266,267	2/6/2023	Ra-226	0.61 ± 0.18	0.37 ± 0.20	0.49 ± 0.13	Pass
DW-50028.50029	2/27/2023	Ra-226	0.68 ± 0.13	0.76 ± 0.13	0.72 ± 0.09	Pass
DW-50028.50029	2/27/2023	Ra-228	2.26 ± 0.65	1.20 ± 0.65	1.73 ± 0.46	Pass
DW-50052,50053	2/27/2023	Ra-228	0.48 ± 0.57	1.19 ± 0.65	0.84 ± 0.43	Pass
DW-50035,50036	2/28/2023	Gr. Alpha	3.68 ± 1.42	4.00 ± 1.29	3.84 ± 0.96	Pass
DW-50035,50036	2/28/2023	Gr. Beta	2.50 ± 0.64	1.99 ± 0.64	2.25 ± 0.45	Pass
LW-518,519	3/8/2023	Gr. Beta	1.71 ± 0.64	1.38 ± 0.64	1.55 ± 0.45	Pass
SG-571,572	3/8/2023	Pb-214	7.80 ± 0.46	8.20 ± 0.35	8.00 ± 0.29	Pass
SG-571,572	3/8/2023	Ac-228	11.9 ± 0.8	11.4 ± 0.6	11.7 ± 0.5	Pass
SG-571.572	3/8/2023	Gr. Alpha	86.5 ± 10.6	89.6 ± 11.0	88.1 ± 7.6	Pass
DW-50052,50053	3/17/2023	Gr. Alpha	9.16 ± 1.02	14.7 ± 1.2	11.9 ± 0.8	Pass
DW-50052,50053	3/17/2023	Gr. Beta	6.03 ± 0.71	7.58 ± 0.75	6.81 ± 0.52	Pass
CF-700,701	3/22/2023	K-40	2.91 ± 0.32	3.30 ± 0.36	3.11 ± 0.24	Pass
SW-679,680	3/27/2023	H-3	14,480 ± 389	14,487 ± 389	14,484 ± 275	Pass
SG-974,975	4/4/2023	Gr. Alpha	12.0 ± 2.1	12.1 ± 2.1	12.1 ± 1.5	Pass
DW-50074,50075	4/21/2023	Ra-226	1.63 ± 0.22	1.56 ± 0.28	1.60 ± 0.18	Pass
DW-50074,50075	4/21/2023	Ra-228	3.41 ± 0.98	2.14 ± 0.80	2.78 ± 0.63	Pass
U-1038,1039	4/20/2023	Gr. Beta	6.14 ± 1.71	6.46 ± 2.19	6.30 ± 1.39	Pass
WW-1101,1102	4/25/2023	H-3	358 ± 96	334 ± 95	346 ± 68	Pass
DW-50092,50093	5/1/2023	Ra-226	1.00 ± 0.22	1.46 ± 0.19	1.23 ± 0.15	Pass
DW-50092,50093	5/1/2023	Ra-228	1.11 ± 0.73	1.57 ± 0.82	1.34 ± 0.55	Pass
WW-1122,1123	5/2/2023	H-3	307 ± 93	229 ± 89	268 ± 64	Pass
WW-1269,1270	5/17/2023	H-3	366 ± 100	214 ± 92	290 ± 68	Pass
DW-50110,50111	5/29/2023	Ra-226	6.27 ± 0.40	4.77 ± 0.26	5.52 ± 0.24	Pass
DW-50110,50111	5/29/2023	Ra-228	2.81 ± 0.97	3.53 ± 0.98	3.17 ± 0.69	Pass
SW-1356,1357	5/30/2023	H-3	380 ± 94	257 ± 88	319 ± 64	Pass
WW-1398,1399	5/24/2023	H-3	571 ± 103	613 ± 105	592 ± 74	Pass
SG-1377,1378	5/30/2023	Pb-214	1.07 ± 0.14	1.19 ± 0.15	1.13 ± 0.10	Pass
SG-1377,1378	5/30/2023	Ac-228	1.23 ± 0.28	1.11 ± 0.23	1.17 ± 0.18	Pass

TABLE A-5. Intralaboratory "Duplicate" Samples

			Concentration[a]			
Lab Code[b]	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
DW-50124,50125	6/5/2023	Ra-226	0.25 ± 0.08	0.24 ± 0.09	0.25 ± 0.06	Pass
DW-50126,50127	6/5/2023	Gr. Alpha	2.50 ± 1.17	3.87 ± 1.39	3.19 ± 0.91	Pass
WW-1441,1442	6/6/2023	Gr. Beta	2.55 ± 0.64	1.91 ± 0.67	2.23 ± 0.46	Pass
SW-1483,1484	6/8/2023	H-3	281 ± 90	281 ± 90	281 ± 64	Pass
CF-1546,1547	6/12/2023	K-40	7.77 ± 0.34	7.48 ± 0.48	7.63 ± 0.29	Pass
S-1567,1568	6/14/2023	K-40	9.75 ± 0.71	9.80 ± 0.77	9.78 ± 0.52	Pass
WW-1630,1631	6/6/2023	H-3	319 ± 93	236 ± 89	278 ± 64	Pass
F-1945,1946	6/26/2023	K-40	3.81 ± 0.34	3.22 ± 0.54	3.52 ± 0.32	Pass
DW-50157,50158	6/26/2023	Gr. Beta	0.93 ± 0.59	1.09 ± 0.06	1.01 ± 0.30	Pass
DW-50160,50161	7/5/2023	Ra-226	2.63 ± 0.32	2.77 ± 0.27	2.70 ± 0.21	Pass
DW-50160,50161	7/5/2023	Ra-228	2.46 ± 0.78	2.51 ± 0.81	2.49 ± 0.56	Pass
DW-50188,50189	7/21/2023	Ra-226	3.07 ± 0.30	2.63 ± 0.20	2.85 ± 0.18	Pass
DW-50188,50189	7/21/2023	Ra-228	5.28 ± 0.92	5.08 ± 0.90	5.18 ± 0.64	Pass
DW-50197,50198	7/24/2023	Gr. Alpha	5.82 ± 1.50	5.78 ± 1.30	5.80 ± 0.99	Pass
DW-50200,50201	7/24/2023	Ra-226	2.51 ± 0.24	4.07 ± 0.29	3.29 ± 0.19	Pass
DW-50200,50201	7/24/2023	Ra-228	7.04 ± 1.13	6.55 ± 1.09	6.80 ± 0.79	Pass
SG-2199,2200	7/25/2023	Pb-214	1.18 ± 0.22	1.03 ± 0.19	1.11 ± 0.15	Pass
SG-2199,2200	7/25/2023	Ac-228	1.74 ± 0.32	1.86 ± 0.42	1.80 ± 0.26	Pass
SG-2315,2316	8/3/2023	Gr. Alpha	59.5 ± 6.7	48.2 ± 6.1	53.9 ± 4.5	Pass
SG-2315,2316	8/3/2023	Gr. Beta	39.8 ± 2.9	34.4 ± 2.6	37.1 ± 1.9	Pass
DW-50200,50201	8/9/2023	Ra-228	1.88 ± 0.71	1.29 ± 0.70	1.59 ± 0.50	Pass
DW-50262,50263	8/24/2023	Ra-228	2.62 ± 0.87	1.46 ± 0.52	2.04 ± 0.51	Pass
DW-50262,50263	8/24/2023	Ra-228	2.62 ± 0.87	2.8 ± 0.67	2.71 ± 0.55	Pass
DW-50262,50263	8/24/2023	Ra-228	2.62 ± 0.87	1.73 ± 0.67	2.18 ± 0.55	Pass
DW-50268,50269	8/29/2023	Gr. Alpha	0.87 ± 0.69	0.97 ± 0.81	0.92 ± 0.53	Pass
SG-2660,2661	9/4/2023	Gr. Alpha	68.5 ± 7.1	51.0 ± 6.3	59.8 ± 4.7	Pass
SG-2660,2661	9/4/2023	Pb-214	13.7 ± 0.5	14.2 ± 0.5	14.0 ± 0.4	Pass
SG-2660,2661	9/4/2023	Ac-228	14.4 ± 0.8	14.3 ± 0.9	14.4 ± 0.6	Pass
W-2776,2777	9/18/2023	Gr. Alpha	1.86 ± 1.73	0.99 ± 1.64	1.43 ± 1.19	Pass
W-2776,2777	9/18/2023	Ra-226	0.43 ± 0.10	0.55 ± 0.27	0.49 ± 0.14	Pass
W-2776,2777	9/18/2023	Ra-228	1.71 ± 1.07	3.33 ± 1.12	2.52 ± 0.77	Pass
DW-50296,50297	9/27/2023	Ra-226	0.51 ± 0.09	0.54 ± 0.20	0.53 ± 0.11	Pass

Note: Duplicate analyses are performed on every twentieth sample received. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter or pCi/m3), food products, vegetation, soil and sediment (pCi/g).

[b] AP (Air Particulate), AV (Aquatic Vegetation), BS (Bottom Sediment), CF (Cattle Feed), CH (Charcoal Canister), DW (Drinking Water), E (Egg), F (Fish), G (Grass), LW (Lake Water), MI (Milk), P (Precipitation), PM (Powdered Milk), S (Solid), SG (Sludge), SO (Soil), SS (Shoreline Sediment), SW (Surface Water), SWT (Surface Water Treated), SWU (Surface Water Untreated), U (Urine), VE (Vegetation), W (Water), WW (Well Water).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration[a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Acceptance Range [c]	Acceptance
MADW-2613	8/1/2022	Gross Alpha	1.39 ± 0.10	0.90	0.27 - 1.53	Pass
MADW-2613	8/1/2022	Gross Beta	1.69 ± 0.04	1.31	0.66 - 1.97	Pass
MASO-2737	8/1/2022	Cs-134	523 ± 5	627	439 - 815	Pass
MASO-2737	8/1/2022	Cs-137	1.18 ± 2.21	0	NA [c]	Pass
MASO-2737	8/1/2022	Co-57	715 ± 6	786	550 - 1022	Pass
MASO-2737	8/1/2022	Co-60	-0.04 ± 1.07	0	NA [c]	Pass
MASO-2737	8/1/2022	Mn-54	903 ± 11	841	589 - 1093	Pass
MASO-2737	8/1/2022	Zn-65	1227 ± 19	1140	798 - 1482	Pass
MASO-2737	8/1/2022	K-40	595 ± 37	537	376 - 698	Pass
MADW-2733	8/1/2022	Cs-134	13.6 ± 0.3	17.1	12.0 - 22.2	Pass
MADW-2733	8/1/2022	Cs-137	16.0 ± 0.4	16.8	11.8 - 21.8	Pass
MADW-2733	8/1/2022	Co-57	27.5 ± 0.4	30.0	21.0 - 39.0	Pass
MADW-2733	8/1/2022	Co-60	14.4 ± 0.3	17.0	11.9 - 22.1	Pass
MADW-2733	8/1/2022	Mn-54	-0.03 ± 0.10	0	NA [c]	Pass
MADW-2733	8/1/2022	Zn-65	11.5 ± 0.6	11.3	7.9 - 14.7	Pass
MADW-2733	8/1/2022	K-40	3.88 ± 1.51	0	NA [c]	Pass
MADW-2733	8/1/2022	Sr-90	6.79 ± 0.32	7.73	5.41 - 10.05	Pass
MAAP-2735	8/1/2022	Cs-134	-0.001 ± 0.029	0	NA [c]	Pass
MAAP-2735	8/1/2022	Cs-137	1.76 ± 0.11	1.53	1.07 - 1.99	Pass
MAAP-2735	8/1/2022	Co-57	3.50 ± 0.07	3.32	2.32 - 4.32	Pass
MAAP-2735	8/1/2022	Co-60	2.11 ± 0.08	1.99	1.39 - 2.59	Pass
MAAP-2735	8/1/2022	Mn-54	2.18 ± 0.13	1.88	1.32 - 2.44	Pass
MAAP-2735	8/1/2022	Zn-65	1.83 ± 0.22	1.58	1.11 - 2.05	Pass
MAVE-2740	8/1/2022	Cs-134	0.01 ± 0.06	0	NA [c]	Pass
MAVE-2740	8/1/2022	Cs-137	1.15 ± 0.12	1.083	0.758 - 1.408	Pass
MAVE-2740	8/1/2022	Co-57	-0.003 ± 0.035	0	NA [c]	Pass
MAVE-2740	8/1/2022	Co-60	4.71 ± 0.14	4.62	3.23 - 6.01	Pass
MAVE-2740	8/1/2022	Mn-54	2.67 ± 0.19	2.43	1.70 - 3.16	Pass
MAVE-2740	8/1/2022	Zn-65	7.73 ± 0.39	7.49	5.24 - 9.74	Pass
MAAP-544	2/1/2023	Gross Alpha	1.23 ± 0.10	0.97	0.29 - 1.65	Pass
MAAP-544	2/1/2023	Gross Beta	1.67 ± 0.06	1.49	0.75 - 2.24	Pass
MADW-543	2/1/2023	Gross Alpha	0.843 ± 0.074	1.19	0.36 - 2.02	Pass
MADW-543	2/1/2023	Gross Beta	0.578 ± 0.093	5.94	2.97 - 8.91	Fail [d]

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration[a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Acceptance Range [c]	Acceptance
MASO-540	2/1/2023	Cs-134	2.33 ± 2.77	0	NA [c]	Pass
MASO-540	2/1/2023	Cs-137	1.22 ± 2.41	0	NA [c]	Pass
MASO-540	2/1/2023	Co-57	585 ± 4	698	489 - 907	Pass
MASO-540	2/1/2023	Co-60	727 ± 8	795	557 - 1034	Pass
MASO-540	2/1/2023	Mn-54	1180 ± 10	1230	861 - 1599	Pass
MASO-540	2/1/2023	Zn-65	846 ± 11	990	693 - 1287	Pass
MASO-540	2/1/2023	K-40	526 ± 23	574	402 - 746	Pass
MADW-545	2/1/2023	Cs-134	9.17 ± 0.17	9.6	6.7 - 12.5	Pass
MADW-545	2/1/2023	Cs-137	9.38 ± 0.29	8.7	6.1 - 11.3	Pass
MADW-545	2/1/2023	Co-57	-0.01 ± 0.08	0.0	NA [c]	Pass
MADW-545	2/1/2023	Co-60	7.47 ± 0.18	7.24	5.07 - 9.41	Pass
MADW-545	2/1/2023	Mn-54	12.3 ± 0.3	11.3	7.9 - 14.7	Pass
MADW-545	2/1/2023	Zn-65	15.7 ± 0.5	15.3	10.7 - 19.9	Pass
MADW-545	2/1/2023	K-40	1.23 ± 1.52	0	NA [c]	Pass
MADW-545	2/1/2023	Sr-90	-0.0035 ± 0.0172	0	NA [c]	Pass
MAAP-538	2/1/2023	Cs-134	1.12 ± 0.04	1.52	1.06 - 1.98	Pass
MAAP-538	2/1/2023	Cs-137	0.56 ± 0.07	0.630	0.441 - 0.819	Pass
MAAP-538	2/1/2023	Co-57	0.62 ± 0.30	0.661	0.463 - 0.859	Pass
MAAP-538	2/1/2023	Co-60	0.89 ± 0.07	1.05	0.74 - 1.37	Pass
MAAP-538	2/1/2023	Mn-54	2.02 ± 0.09	2.14	1.50 - 2.78	Pass
MAAP-538	2/1/2023	Zn-65	2.13 ± 0.14	2.25	1.58 - 2.93	Pass
MAAP-538	2/1/2023	Sr-90	0.004 ± 0.061	0	NA [c]	Pass
MAVE-545	2/1/2023	Cs-134	7.45 ± 0.39	7.60	5.32 - 9.88	Pass
MAVE-545	2/1/2023	Cs-137	0.010 ± 0.084	0	NA [c]	Pass
MAVE-545	2/1/2023	Co-57	6.83 ± 0.17	6.93	4.85 - 9.01	Pass
MAVE-545	2/1/2023	Co-60	6.89 ± 0.17	6.51	4.56 - 8.46	Pass
MAVE-545	2/1/2023	Mn-54	9.08 ± 0.28	8.03	5.62 - 10.44	Pass
MAVE-545	2/1/2023	Zn-65	7.83 ± 0.39	7.43	5.20 - 9.66	Pass

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

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

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

[d] A decimal point was misplaced in a unit conversion. If the conversion was was done properly the result: 5.78 ± 0.93 Bq/L woud have been within MAPEP's acceptance range.

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a].

MRAD-38 Study

Lab Code [b]	Date	Analysis	Concentration [a] Laboratory Result	ERA Value [c]	Acceptance Limits [d]	Acceptance
ERAP-599	3/20/2023	Cs-134	139	153	99 - 188	Pass
ERAP-599	3/20/2023	Cs-137	970	892	733 - 1170	Pass
ERAP-599	3/20/2023	Co-60	474	467	397 - 593	Pass
ERAP-599	3/20/2023	Mn-54	< 3.3	< 35.0	0.00 - 35.0	Pass
ERAP-599	3/20/2023	Zn-65	1280	1110	910 - 1700	Pass
ERAP-599	3/20/2023	Sr-90	143	137	87 - 187	Pass
ERAP-598	3/20/2023	Gross Alpha	72.7	76.8	40.1 - 127	Pass
ERAP-598	3/20/2023	Gross Beta	35.0	32.8	19.9 - 49.6	Pass

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

[b] Laboratory code ERAP (air filter). Results are reported in units of (pCi/Filter).

[c] The ERA Assigned values for the air filter standards are equal to 100% of the parameter present in the standard as determined by the gravimetric and/or volumetric measurements made during standard preparation as applicable.

[d] The acceptance limits are established per the guidelines contained in the Department of Energy (DOE) report EML-564, Analysis of Environmental Measurements Laboratory (EML) Quality Assessment Program (QAP) Data Determination of Operational Criteria and Control Limits for Performance Evaluation Purposes or ERA's SOP for the generation of Performance Acceptance Limits.

Appendix B

Data Reporting Conventions

APPENDIX B. DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;
s = 2σ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: < L,
where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: < L, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, < L Reported result: $x \pm s$ if $x \geq L$; < L otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

Attachment 2: REMP Data Summary Reports

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
Air pCi/m^3	Be-7 28	N/A	0.054 28/28 0.038 - 0.068	0.056 24/24 0.038 – 0.068	3 1.0 SE	0.058 4/4 0.043 – 0.065	0.061 4/4 0.049 – 0.068	0
Air pCi/m^3	Co-58 28	N/A	< LLD 0/28 —	< LLD 0/24 —	—	—	< LLD 0/4 —	0
Air pCi/m^3	Co-60 28	N/A	< LLD 0/28 —	< LLD 0/24 —	—	—	< LLD 0/4 —	0
Air pCi/m^3	Cs-134 28	0.005	< LLD 0/28 —	< LLD 0/24 —	—	—	< LLD 0/4 —	0
Air pCi/m^3	Cs-137 28	0.045	< LLD 0/28 —	< LLD 0/24 —	—	—	< LLD 0/4 —	0
Air pCi/m^3	Gross Beta 370	0.0075	0.025 370/370 0.007 – 0.050	0.025 317/317 0.007 – 0.050	7 0.6 NE	0.026 53/53 0.009 – 0.048	0.026 53/53 0.011 – 0.049	0

[1] Mean and range are based on detectable measurements only.

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
Air pCi/m^3	I-131 370	0.050	< LLD 0/370 —	< LLD 0/317 —	—	—	<LLD 0/53 —	0
Broadleaf Vegetation pCi/kg wet	Be-7 63	N/A	544.6 39/63 158 – 1249	544.9 34/49 158 – 1249	2 1.9 ENE	719.1 9/12 292 - 1249	543.7 10/13 314 – 838	0
Broadleaf Vegetation pCi/kg wet	K-40 63	N/A	4746.6 63/63 2768 – 8101	4693.9 49/49 2768 – 7528	16 0.9 S	4855.0 12/12 4044 - 6275	4931.2 14/14 3333 - 8101	0
Broadleaf Vegetation pCi/kg wet	Co-58 63	N/A	< LLD 0/63 —	<LLD 0/49 —	—	—	< LLD 0/14 —	0
Broadleaf Vegetation pCi/kg wet	Co-60 63	N/A	< LLD 0/63 —	<LLD 0/49 —	—	—	< LLD 0/14 —	0
Broadleaf Vegetation pCi/kg wet	I-131 63	45	< LLD 0/63 —	<LLD 0/49 —	—	—	< LLD 0/14 —	0
Broadleaf Vegetation pCi/kg wet	Cs-134 63	45	< LLD 0/63 —	<LLD 0/49 —	—	—	< LLD 0/14 —	0

[1] Mean and range are based on detectable measurements only.

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
Broadleaf Vegetation pCi/kg wet	Cs-137 63	60	< LLD 0/63 —	<LLD 0/49 —	—	—	< LLD 0/14 —	0
Fish pCi/kg wet	K-40 18	N/A	1660.5 18/18 605 - 3797	1565.4 9/9 851 - 2184	25 0.6 NNW	1565.4 9/9 851 - 2184	1755.6 9/9 605 - 3797	0
Fish pCi/kg wet	Mn-54 18	94	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0
Fish pCi/kg wet	Fe-59 18	195	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0
Fish pCi/kg wet	Co-58 18	97	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0
Fish pCi/kg wet	Co-60 18	97	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0
Fish pCi/kg wet	Zn-65 18	195	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0

[1] Mean and range are based on detectable measurements only.

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
Fish pCi/kg wet	Cs-134 18	97	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0
Fish pCi/kg wet	Cs-137 18	112	< LLD 0/18 —	< LLD 0/9 —	—	—	< LLD 0/9 —	0
Sediment pCi/kg wet	K-40 4	N/A	7589.0 4/4 6850 - 8291	7589.0 4/4 6850 - 8291	66 1.4 NE	7607.5 2/2 6983 - 8232	N/A N/A N/A	0
Sediment pCi/kg wet	Co-58 4	50	< LLD 0/4 —	< LLD 0/4 —	—	—	N/A N/A N/A	0
Sediment pCi/kg wet	Co-60 4	40	< LLD 0/4 —	< LLD 0/4 —	—	—	N/A N/A N/A	0
Sediment pCi/kg wet	Cs-134 4	112	< LLD 0/4 —	< LLD 0/4 —	—	—	N/A N/A N/A	0
Sediment pCi/kg wet	Cs-137 4	135	< LLD 0/4 —	< LLD 0/4 —	—	—	N/A N/A N/A	0

[1] Mean and range are based on detectable measurements only.

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
TLD (E) mR/91 days	Direct 116	1.0	14.8 116/116 8.1 – 20.0	14.8 108/108 9.8 – 20.0	36 3.9 WSW	18.7 4/4 16.6 – 18.5	14.2 8/8 12.4 – 16.3	0
TLD (Q) mR/91 days	Direct 116	1.0	14.4 116/116 10.3 – 20.6	14.4 108/108 10.3 – 20.6	33 4.5 S	18.5 4/4 16.7 – 20.3	14.2 8/8 12.4 – 16.8	0
TLD mR/365 days	Direct 29	1.0	59.0 29/29 48.2 – 75.6	59.2 27/27 48.2 – 75.6	29 4.3 SSE	75.6 1/1 75.6 – 75.6	57.3 2/2 53.8 – 60.7	0
Water pCi/L	Gross Beta 60	3	1.4 44/60 0.9 – 3.3	1.5 37/48 0.9 – 3.3	34 0.2 NW	1.6 10/12 1.0 – 3.3	1.1 7/12 1.0 – 1.4	0
Water pCi/L	H-3 20	1500	195.9 6/20 166.0 – 221.3	195.9 6/16 166.0 – 221.3	59 4.0 ENE	221.3 1/4 221.3 – 221.3	<LLD 0/4 —	0
Water pCi/L	Mn-54 60	11	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Fe-59 60	22	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0

[1] Mean and range are based on detectable measurements only.

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
Water pCi/L	Co-58 60	11	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Co-60 60	11	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Zn-65 60	22	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Zr-95 60	22	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Nb-95 60	11	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Cs-134 60	11	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	Cs-137 60	13	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0

[1] Mean and range are based on detectable measurements only.

Pathway Sampled (Units)	Type, Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Locations Mean[1] Detected/Collected Range[1]	Indicator Mean[1] Detected/Collected Range[1]	Location with Highest Annual Mean		Control Mean[1] Detected/Collected Range	Number of Non-routine Reported Measurements
					Location # Distance Direction	Mean[1] Detected/Collected Range		
Water pCi/L	Ba-140 60	45	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0
Water pCi/L	La-140 60	11	< LLD 0/60 —	< LLD 0/48 —	—	—	< LLD 0/12 —	0

[1] Mean and range are based on detectable measurements only.

Attachment 3: 2022 REMP Detailed Data Report

MICROBAC®

MONTHLY PROGRESS REPORT
to
ENERGY HARBOR

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
FOR THE
PERRY NUCLEAR POWER PLANT

Reporting Period: January-December, 2023

Prepared and Submitted by
ENVIRONMENTAL, INC.,
MIDWEST LABORATORY

Project Number: 8033

Reviewed and Approved _____ Date 2/14/24

A. Banavali, PhD.
Laboratory Director

Distribution: S. Chapin
P. Hintz, Ohio Department of Health
B. Mechenbier, Lake County Health Department

PERRY NUCLEAR POWER PLANT

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PERRY NUCLEAR POWER PLANT

LIST OF TABLES

PERRY NUCLEAR POWER PLANT

1.0 INTRODUCTION

The following constitutes the current 2023 report for the Radiological Environmental Monitoring Program conducted at the Perry Nuclear Power Plant in Perry, Ohio. Results of completed analyses are presented in the attached tables.

The data obtained in the program were within ranges previously encountered and to be expected in the environmental media sampled.

All concentrations, except gross beta, are decay corrected to the time of collection. Airborne iodine is decay corrected to the midpoint of the colledion period.

All samples were collected within the scheduled period, unless noted otherwise in Table 2.0, Listing of Missed Samples.

PNPP

2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
AP/AI	PE-001	03-02-23	The sample housing destroyed by a car accident.

3.0 DATA TABLES

PNPP

Table 1. Direct Radiation (TLDs), Quarterly Exposure.
Units: mR/91 days

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Date Placed	12-14-22	03-17-23	07-12-23	10-04-23
Date Removed	03-17-23	07-12-23	10-04-23	12-26-23
E-1	15.0 ± 0.7	13.0 ± 1.0	13.5 ± 0.7	15.4 ± 1.0
E-3	12.4 ± 0.7	9.8 ± 0.8	11.7 ± 0.8	11.8 ± 0.9
E-4	13.0 ± 0.7	13.8 ± 0.8	12.1 ± 0.6	16.0 ± 0.8
E-5	14.6 ± 0.6	10.6 ± 0.7	14.0 ± 0.4	12.9 ± 0.7
E-6	16.1 ± 0.7	13.1 ± 0.8	15.0 ± 0.5	16.3 ± 0.9
E-7	15.2 ± 0.7	12.0 ± 0.8	15.0 ± 0.6	14.0 ± 0.9
E-8	13.7 ± 0.7	13.9 ± 0.9	13.0 ± 0.8	16.4 ± 0.8
E-9	13.6 ± 0.6	11.3 ± 0.8	13.4 ± 0.5	15.3 ± 0.8
E-10	12.6 ± 0.5	12.7 ± 1.1	12.1 ± 0.4	14.8 ± 1.1
E-11	13.4 ± 0.7	14.5 ± 0.8	12.7 ± 0.7	17.2 ± 0.8
E-12	15.3 ± 0.6	11.5 ± 0.9	16.0 ± 0.6	13.7 ± 0.9
E-13	14.4 ± 0.9	11.9 ± 0.9	14.4 ± 0.8	14.1 ± 0.9
E-14	14.0 ± 0.6	13.7 ± 0.8	13.8 ± 0.6	16.2 ± 0.8
E-15	13.6 ± 0.7	11.4 ± 1.0	13.4 ± 0.7	13.5 ± 1.0
E-21	15.3 ± 0.7	13.4 ± 0.7	15.4 ± 0.7	15.3 ± 0.8
E-23	18.2 ± 0.5	14.2 ± 0.7	18.2 ± 0.5	16.1 ± 0.8
E-24	13.0 ± 0.6	12.6 ± 0.8	12.4 ± 0.5	15.2 ± 0.8
E-29	19.3 ± 0.8	16.2 ± 0.9	19.7 ± 0.8	18.4 ± 0.7
E-30	17.8 ± 0.7	15.8 ± 0.8	17.6 ± 0.6	17.9 ± 0.8
E-31	18.7 ± 0.7	17.7 ± 0.7	18.5 ± 0.7	20.0 ± 0.8
E-33	17.6 ± 0.8	16.6 ± 0.8	16.9 ± 0.8	18.5 ± 0.8
E-35	13.9 ± 0.6	12.9 ± 0.9	14.1 ± 0.5	15.8 ± 1.0
E-36	18.8 ± 1.0	15.3 ± 0.8	17.7 ± 0.8	19.7 ± 0.9
E-53	14.0 ± 0.5	13.2 ± 0.8	13.7 ± 0.5	15.5 ± 0.8
E-54	15.3 ± 0.5	13.0 ± 0.8	15.3 ± 0.4	17.6 ± 0.8
E-55	15.5 ± 1.2	12.6 ± 0.8	15.9 ± 1.1	14.0 ± 0.8
E-56	16.1 ± 0.6	13.7 ± 0.9	15.8 ± 0.4	15.6 ± 0.8
E-57	14.4 ± 0.8	14.9 ± 1.0	14.0 ± 0.6	17.5 ± 1.2
E-58	14.9 ± 0.8	11.7 ± 0.7	15.3 ± 0.7	13.8 ± 0.8
Mean ± s.d.	15.2 ± 1.9	13.3 ± 1.8	14.8 ± 2.1	15.8 ± 2.0
E-Control 1	10.6 ± 0.5	8.5 ± 1.0	10.5 ± 0.5	9.1 ± 1.1
E-Control 2	8.5 ± 0.6	8.3 ± 0.8	8.1 ± 0.5	9.7 ± 0.9

PNPP

Table 1. Direct Radiation (TLDs), Quarterly Exposure.
Units: mR/91 days

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Date Placed	12-14-22	03-17-23	07-12-23	10-04-23
Date Removed	03-17-23	07-12-23	10-04-23	12-26-23
Q-1	13.1 ± 0.9	13.6 ± 1.0	12.9 ± 0.8	15.8 ± 1.4
Q-3	12.6 ± 0.7	11.2 ± 0.7	12.6 ± 0.7	14.9 ± 0.7
Q-4	13.9 ± 0.5	12.0 ± 0.6	13.7 ± 0.5	13.4 ± 0.6
Q-5	11.9 ± 0.7	11.1 ± 0.6	11.3 ± 0.7	12.7 ± 0.8
Q-6	15.1 ± 0.4	12.4 ± 0.5	14.6 ± 0.6	13.7 ± 0.6
Q-7	13.0 ± 0.5	12.0 ± 0.5	12.4 ± 0.5	13.5 ± 0.5
Q-8	13.9 ± 0.4	13.9 ± 0.5	15.0 ± 0.6	15.9 ± 0.6
Q-9	11.0 ± 0.6	10.5 ± 0.5	10.3 ± 0.8	12.4 ± 1.2
Q-10	13.6 ± 0.5	12.6 ± 0.5	13.0 ± 0.6	14.5 ± 0.5
Q-11	15.3 ± 0.5	13.3 ± 0.6	16.2 ± 0.6	15.2 ± 0.5
Q-12	14.9 ± 0.6	13.8 ± 0.5	14.1 ± 0.7	17.7 ± 0.6
Q-13	14.1 ± 0.5	13.0 ± 0.9	13.2 ± 0.6	14.9 ± 0.8
Q-14	14.7 ± 0.5	12.2 ± 0.5	14.1 ± 0.6	14.0 ± 0.5
Q-15	12.0 ± 0.5	12.2 ± 0.7	10.9 ± 0.6	14.5 ± 0.8
Q-21	16.8 ± 0.7	16.0 ± 0.8	16.0 ± 1.1	19.8 ± 1.1
Q-23	17.9 ± 1.1	14.1 ± 0.7	16.8 ± 0.8	16.1 ± 0.9
Q-24	14.3 ± 1.2	13.3 ± 0.6	13.6 ± 1.1	16.8 ± 0.7
Q-29	16.1 ± 0.6	17.9 ± 0.7	15.3 ± 0.7	20.6 ± 0.7
Q-30	17.1 ± 0.5	15.5 ± 0.6	16.5 ± 0.6	17.8 ± 0.7
Q-31	15.4 ± 0.7	17.3 ± 0.7	14.3 ± 0.5	19.2 ± 0.7
Q-33	18.7 ± 0.7	16.7 ± 0.7	20.3 ± 0.8	18.3 ± 0.7
Q-35	11.8 ± 0.5	13.3 ± 0.8	10.9 ± 0.5	15.0 ± 0.9
Q-36	15.4 ± 0.5	16.3 ± 0.5	14.7 ± 0.6	18.4 ± 0.6
Q-53	13.8 ± 0.5	13.7 ± 0.9	13.2 ± 0.5	17.5 ± 1.3
Q-54	15.6 ± 0.6	12.4 ± 0.6	14.7 ± 0.5	13.6 ± 0.6
Q-55	14.3 ± 0.6	13.9 ± 0.5	13.4 ± 0.8	17.9 ± 0.6
Q-56	13.6 ± 0.5	12.4 ± 0.6	12.8 ± 0.7	14.1 ± 0.6
Q-57	13.5 ± 0.8	15.0 ± 0.8	12.4 ± 0.8	17.0 ± 0.8
Q-58	13.8 ± 1.0	12.6 ± 0.5	13.4 ± 1.1	14.5 ± 0.5
Mean ± s.d.	14.4 ± 1.8	13.6 ± 1.9	13.9 ± 2.1	15.9 ± 2.2
Q-Control 1	9.5 ± 0.4	8.3 ± 0.9	9.3 ± 0.4	8.7 ± 1.1
Q-Control 2	8.8 ± 0.6	8.6 ± 0.5	9.9 ± 0.7	9.2 ± 0.5

PNPP

Table 1. Direct Radiation (TLDs), Annual Exposure.
Units: mR/365 days

	2023
Date Placed	12-14-22
Date Removed	12-26-23
A-1	50.5 ± 2.9
A-3	49.8 ± 2.0
A-4	49.5 ± 2.6
A-5	49.1 ± 1.5
A-6	60.7 ± 1.4
A-7	51.9 ± 1.6
A-8	61.2 ± 1.2
A-9	48.2 ± 3.0
A-10	56.0 ± 2.0
A-11	56.6 ± 1.1
A-12	61.9 ± 1.9
A-13	60.7 ± 4.2
A-14	53.8 ± 2.5
A-15	49.9 ± 2.2
A-21	66.7 ± 4.1
A-23	64.6 ± 2.4
A-24	53.8 ± 2.7
A-29	73.7 ± 2.0
A-30	67.1 ± 1.5
A-31	70.6 ± 2.3
A-33	75.6 ± 2.3
A-35	55.3 ± 1.7
A-36	61.3 ± 2.5
A-53	55.8 ± 3.8
A-54	59.8 ± 3.4
A-55	67.2 ± 1.3
A-56	52.6 ± 2.4
A-57	66.5 ± 1.7
A-58	61.9 ± 1.6
Mean ± s.d.	59.0 ± 7.7
A-Control 1	32.4 ± 1.8
A-Control 2	32.2 ± 1.3

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: P-1
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	608	0.031 ± 0.003	< 0.010	07-04-23	525	0.022 ± 0.003	< 0.012
01-11-23	623	0.027 ± 0.003	< 0.007	07-12-23	723	0.020 ± 0.002	< 0.009
01-18-23	607	0.025 ± 0.003	< 0.006	07-19-23	610	0.020 ± 0.003	< 0.012
01-25-23	612	0.020 ± 0.003	< 0.008	07-26-23	569	0.024 ± 0.003	< 0.012
02-01-23	619	0.024 ± 0.003	< 0.008	08-02-23	608	0.015 ± 0.003	< 0.011
02-08-23	600	0.032 ± 0.003	< 0.007	08-09-23	584	0.025 ± 0.003	< 0.015
02-15-23	554	0.030 ± 0.003	< 0.008	08-16-23	546	0.019 ± 0.003	< 0.014
02-21-23	500	0.033 ± 0.003	< 0.006 [b]	08-23-23	563	0.021 ± 0.003	< 0.017
03-02-23		NS[a]		08-30-23	544	0.017 ± 0.003	< 0.013
03-09-23	569	0.023 ± 0.003	< 0.005	09-07-23	631	0.030 ± 0.003	< 0.008
03-15-23	515	0.015 ± 0.003	< 0.011	09-13-23	449	0.015 ± 0.003	< 0.019
03-22-23	152	0.014 ± 0.009	< 0.029 [c]	09-20-23	610	0.017 ± 0.003	< 0.011
03-28-23	182	0.022 ± 0.007	< 0.017 [c]	09-27-23	537	0.025 ± 0.003	< 0.008
1Q 2023	Mean ± s.d.	0.025 ± 0.006	< 0.029	3Q 2023	Mean ± s.d.	0.021 ± 0.004	< 0.019
04-04-23	192	0.007 ± 0.007	< 0.023 [c]	10-04-23	531	0.029 ± 0.003	< 0.011
04-12-23	221	0.013 ± 0.006	< 0.019 [c]	10-11-23	540	0.025 ± 0.003	< 0.011
04-19-23	648	0.020 ± 0.003	< 0.008	10-18-23	525	0.015 ± 0.003	< 0.013
04-26-23	643	0.011 ± 0.002	< 0.006	10-25-23	534	0.025 ± 0.003	< 0.010
05-03-23	634	0.008 ± 0.002	< 0.010	11-01-23	529	0.022 ± 0.003	< 0.011
05-10-23	637	0.011 ± 0.002	< 0.007	11-08-23	530	0.039 ± 0.004	< 0.005
05-17-23	645	0.018 ± 0.003	< 0.007	11-15-23	532	0.019 ± 0.003	< 0.010
05-24-23	647	0.019 ± 0.003	< 0.007	11-22-23	523	0.028 ± 0.003	< 0.007
05-30-23	538	0.013 ± 0.002	< 0.007	11-29-23	520	0.024 ± 0.003	< 0.008
06-06-23	633	0.019 ± 0.003	< 0.005	12-06-23	519	0.033 ± 0.004	< 0.011
06-14-23	740	0.018 ± 0.002	< 0.006	12-13-23	503	0.030 ± 0.003	< 0.009
06-21-23	626	0.018 ± 0.002	< 0.009	12-20-23	521	0.030 ± 0.003	< 0.008
06-28-23	612	0.012 ± 0.002	< 0.013	12-27-23	529	0.040 ± 0.004	< 0.011
				01-03-24	485	0.021 ± 0.003	< 0.015
2Q 2023	Mean ± s.d.	0.014 ± 0.004	< 0.023	4Q 2023	Mean ± s.d.	0.027 ± 0.007	< 0.015
				Cumulative Average		0.022	

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.
[b] Six days run time due to a car accident.
[c] Reduced run time due to temporary power availability during equipment repairs to power structure following previous listed car accident.

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-3
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	561	0.035 ± 0.003	< 0.011	07-04-23	450	0.024 ± 0.004	< 0.014
01-11-23	573	0.025 ± 0.003	< 0.007	07-12-23	616	0.023 ± 0.003	< 0.010
01-18-23	583	0.028 ± 0.003	< 0.006	07-19-23	531	0.024 ± 0.003	< 0.014
01-25-23	554	0.027 ± 0.003	< 0.009	07-26-23	536	0.023 ± 0.003	< 0.013
02-01-23	551	0.027 ± 0.003	< 0.008	08-02-23	557	0.020 ± 0.003	< 0.013
02-08-23	559	0.035 ± 0.003	< 0.008	08-09-23	567	0.027 ± 0.003	< 0.015
02-15-23	538	0.028 ± 0.003	< 0.009	08-16-23	561	0.023 ± 0.003	< 0.014
02-22-23	576	0.037 ± 0.003	< 0.005	08-23-23	580	0.020 ± 0.003	< 0.017
03-02-23	619	0.021 ± 0.003	< 0.007	08-30-23	569	0.017 ± 0.003	< 0.012
03-09-23	529	0.026 ± 0.003	< 0.006	09-07-23	666	0.031 ± 0.003	< 0.006
03-15-23	482	0.016 ± 0.003	< 0.012	09-13-23	498	0.014 ± 0.003	< 0.017
03-22-23	541	0.030 ± 0.003	< 0.008	09-20-23	567	0.019 ± 0.003	< 0.012
03-29-23	545	0.031 ± 0.003	< 0.005	09-27-23	555	0.027 ± 0.003	< 0.007
1Q 2023	Mean ± s.d.	0.028 ± 0.006	< 0.012	3Q 2023	Mean ± s.d.	0.022 ± 0.005	< 0.017
04-05-23	546	0.028 ± 0.003	< 0.007	10-04-23	567	0.030 ± 0.003	< 0.010
04-12-23	543	0.032 ± 0.003	< 0.007	10-11-23	551	0.031 ± 0.003	< 0.011
04-19-23	540	0.024 ± 0.003	< 0.009	10-18-23	546	0.019 ± 0.003	< 0.013
04-26-23	557	0.015 ± 0.003	< 0.007	10-25-23	562	0.029 ± 0.003	< 0.009
05-03-23	539	0.008 ± 0.003	< 0.012	11-01-23	553	0.026 ± 0.003	< 0.010
05-10-23	533	0.015 ± 0.003	< 0.008	11-08-23	545	0.048 ± 0.004	< 0.005
05-17-23	562	0.020 ± 0.003	< 0.007	11-15-23	557	0.027 ± 0.003	< 0.009
05-24-23	546	0.020 ± 0.003	< 0.009	11-22-23	543	0.032 ± 0.003	< 0.007
05-30-23	519	0.017 ± 0.003	< 0.007	11-29-23	551	0.029 ± 0.003	< 0.007
06-07-23	561	0.021 ± 0.003	< 0.006	12-06-23	549	0.034 ± 0.003	< 0.010
06-14-23	526	0.018 ± 0.003	< 0.008	12-13-23	546	0.034 ± 0.003	< 0.008
06-21-23	532	0.024 ± 0.003	< 0.010	12-20-23	550	0.035 ± 0.003	< 0.008
06-28-23	540	0.015 ± 0.003	< 0.015	12-27-23	560	0.050 ± 0.004	< 0.011
				01-03-24	527	0.022 ± 0.003	< 0.014
2Q 2023	Mean ± s.d.	0.020 ± 0.006	< 0.015	4Q 2023	Mean ± s.d.	0.032 ± 0.009	< 0.014
				Cumulative Average		0.026	

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-4
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	651	0.034 ± 0.003	< 0.010	07-04-23	461	0.028 ± 0.004	< 0.014
01-11-23	663	0.024 ± 0.003	< 0.006	07-12-23	619	0.023 ± 0.003	< 0.010
01-18-23	677	0.027 ± 0.003	< 0.005	07-19-23	542	0.022 ± 0.003	< 0.013
01-25-23	651	0.021 ± 0.003	< 0.008	07-26-23	499	0.024 ± 0.003	< 0.016
02-01-23	661	0.025 ± 0.003	< 0.007	08-02-23	516	0.020 ± 0.003	< 0.014
02-08-23	636	0.033 ± 0.003	< 0.007	08-09-23	578	0.026 ± 0.003	< 0.015
02-15-23	529	0.022 ± 0.003	< 0.009	08-16-23	563	0.020 ± 0.003	< 0.014
02-22-23	547	0.033 ± 0.003	< 0.005	08-23-23	580	0.021 ± 0.003	< 0.017
03-02-23	622	0.021 ± 0.003	< 0.007	08-30-23	566	0.014 ± 0.003	< 0.012
03-09-23	526	0.028 ± 0.003	< 0.006	09-07-23	681	0.027 ± 0.003	< 0.007
03-15-23	456	0.017 ± 0.003	< 0.013	09-13-23	485	0.015 ± 0.003	< 0.017
03-22-23	546	0.027 ± 0.003	< 0.008	09-20-23	613	0.020 ± 0.003	< 0.011
03-29-23	534	0.030 ± 0.003	< 0.006	09-27-23	567	0.022 ± 0.003	< 0.007
1Q 2023	Mean ± s.d.	0.026 ± 0.005	< 0.013	3Q 2023	Mean ± s.d.	0.022 ± 0.004	< 0.017
04-05-23	550	0.026 ± 0.003	< 0.007	10-04-23	573	0.032 ± 0.003	< 0.010
04-12-23	544	0.028 ± 0.003	< 0.007	10-11-23	583	0.028 ± 0.003	< 0.010
04-19-23	539	0.022 ± 0.003	< 0.009	10-18-23	551	0.016 ± 0.003	< 0.012
04-26-23	544	0.015 ± 0.003	< 0.007	10-25-23	571	0.027 ± 0.003	< 0.009
05-03-23	523	0.008 ± 0.003	< 0.012	11-01-23	576	0.024 ± 0.003	< 0.010
05-10-23	538	0.014 ± 0.003	< 0.008	11-08-23	581	0.039 ± 0.003	< 0.004
05-17-23	566	0.021 ± 0.003	< 0.007	11-15-23	586	0.023 ± 0.003	< 0.009
05-24-23	549	0.021 ± 0.003	< 0.009	11-22-23	578	0.028 ± 0.003	< 0.006
05-30-23	452	0.015 ± 0.003	< 0.009	11-29-23	588	0.022 ± 0.003	< 0.007
06-06-23	553	0.021 ± 0.003	< 0.006	12-06-23	587	0.030 ± 0.003	< 0.009
06-14-23	620	0.017 ± 0.003	< 0.007	12-13-23	589	0.031 ± 0.003	< 0.008
06-21-23	534	0.022 ± 0.003	< 0.010	12-20-23	590	0.031 ± 0.003	< 0.007
06-28-23	542	0.015 ± 0.003	< 0.015	12-27-23	599	0.037 ± 0.003	< 0.010
				01-03-24	569	0.019 ± 0.003	< 0.013
2Q 2023	Mean ± s.d.	0.019 ± 0.005	< 0.015	4Q 2023	Mean ± s.d.	0.028 ± 0.006	< 0.013
				Cumulative Average		0.024	

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-5

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	445	0.037 ± 0.004	< 0.014	07-04-23	454	0.026 ± 0.004	< 0.014
01-11-23	449	0.025 ± 0.004	< 0.009	07-12-23	605	0.022 ± 0.003	< 0.010
01-18-23	594	0.026 ± 0.003	< 0.006	07-19-23	543	0.024 ± 0.003	< 0.014
01-25-23	590	0.019 ± 0.003	< 0.009	07-26-23	544	0.024 ± 0.003	< 0.013
02-01-23	576	0.025 ± 0.003	< 0.008	08-02-23	480	0.020 ± 0.003	< 0.014
02-08-23	602	0.033 ± 0.003	< 0.007	08-09-23	632	0.025 ± 0.003	< 0.013
02-15-23	539	0.026 ± 0.003	< 0.009	08-16-23	608	0.020 ± 0.003	< 0.013
02-22-23	544	0.033 ± 0.003	< 0.005	08-23-23	610	0.022 ± 0.003	< 0.016
03-02-23	622	0.019 ± 0.003	< 0.007	08-30-23	630	0.014 ± 0.002	< 0.011
03-09-23	534	0.026 ± 0.003	< 0.006	09-07-23	706	0.028 ± 0.003	< 0.007
03-15-23	461	0.015 ± 0.003	< 0.013	09-13-23	486	0.014 ± 0.003	< 0.017
03-22-23	545	0.031 ± 0.003	< 0.008	09-20-23	655	0.020 ± 0.002	< 0.010
03-29-23	537	0.030 ± 0.003	< 0.006	09-27-23	603	0.024 ± 0.003	< 0.007
1Q 2023	Mean ± s.d.	0.027 ± 0.006	< 0.014	3Q 2023	Mean ± s.d.	0.022 ± 0.004	< 0.017
04-05-23	556	0.027 ± 0.003	< 0.007	10-04-23	617	0.026 ± 0.003	< 0.009
04-12-23	550	0.030 ± 0.003	< 0.007	10-11-23	577	0.024 ± 0.003	< 0.011
04-19-23	539	0.021 ± 0.003	< 0.009	10-18-23	587	0.014 ± 0.003	< 0.012
04-26-23	549	0.017 ± 0.003	< 0.007	10-25-23	593	0.026 ± 0.003	< 0.009
05-03-23	523	0.008 ± 0.003	< 0.012	11-01-23	588	0.026 ± 0.003	< 0.010
05-10-23	554	0.013 ± 0.003	< 0.008	11-08-23	592	0.041 ± 0.003	< 0.004
05-17-23	538	0.024 ± 0.003	< 0.008	11-15-23	615	0.024 ± 0.003	< 0.008
05-24-23	544	0.022 ± 0.003	< 0.009	11-22-23	578	0.030 ± 0.003	< 0.006
05-30-23	471	0.016 ± 0.003	< 0.008	11-29-23	585	0.028 ± 0.003	< 0.007
06-06-23	543	0.030 ± 0.003	< 0.006	12-06-23	587	0.035 ± 0.003	< 0.009
06-14-23	616	0.019 ± 0.003	< 0.007	12-13-23	585	0.039 ± 0.003	< 0.008
06-21-23	524	0.023 ± 0.003	< 0.010	12-20-23	586	0.033 ± 0.003	< 0.007
06-28-23	520	0.016 ± 0.003	< 0.016	12-27-23	604	0.044 ± 0.003	< 0.010
				01-03-24	562	0.019 ± 0.003	< 0.013
2Q 2023	Mean ± s.d.	0.020 ± 0.007	< 0.016	4Q 2023	Mean ± s.d.	0.029 ± 0.008	< 0.013
				Cumulative Average		0.025	

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-6
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	521	0.038 ± 0.004	< 0.012	07-05-23	461	0.026 ± 0.004	< 0.014
01-11-23	494	0.030 ± 0.004	< 0.008	07-12-23	538	0.022 ± 0.003	< 0.012
01-18-23	503	0.034 ± 0.004	< 0.007	07-19-23	527	0.026 ± 0.003	< 0.012
01-25-23	467	0.025 ± 0.004	< 0.011	07-26-23	539	0.024 ± 0.003	< 0.013
02-01-23	471	0.035 ± 0.004	< 0.010	08-02-23	539	0.020 ± 0.003	< 0.014
02-08-23	524	0.037 ± 0.004	< 0.008	08-09-23	524	0.026 ± 0.003	< 0.016
02-15-23	487	0.020 ± 0.003	< 0.010	08-16-23	515	0.023 ± 0.003	< 0.015
02-22-23	499	0.036 ± 0.004	< 0.005	08-23-23	528	0.023 ± 0.003	< 0.018
03-02-23	561	0.018 ± 0.003	< 0.008	08-30-23	516	0.016 ± 0.003	< 0.013
03-09-23	491	0.023 ± 0.003	< 0.006	09-07-23	574	0.032 ± 0.003	< 0.009
03-15-23	399	0.012 ± 0.004	< 0.015	09-13-23	419	0.017 ± 0.003	< 0.020
03-22-23	478	0.026 ± 0.004	< 0.009	09-20-23	495	0.022 ± 0.003	< 0.014
03-29-23	480	0.029 ± 0.004	< 0.006	09-27-23	477	0.027 ± 0.003	< 0.009
1Q 2023	Mean ± s.d.	0.028 ± 0.008	< 0.015	3Q 2023	Mean ± s.d.	0.023 ± 0.004	< 0.020
04-05-23	474	0.029 ± 0.004	< 0.009	10-04-23	476	0.030 ± 0.004	< 0.012
04-12-23	446	0.035 ± 0.004	< 0.009	10-11-23	462	0.026 ± 0.004	< 0.013
04-19-23	462	0.021 ± 0.003	< 0.011	10-18-23	429	0.017 ± 0.004	< 0.016
04-26-23	466	0.015 ± 0.003	< 0.008	10-25-23	454	0.033 ± 0.004	< 0.012
05-03-23	422	0.011 ± 0.003	< 0.015	11-01-23	451	0.024 ± 0.004	< 0.013
05-10-23	461	0.015 ± 0.003	< 0.010	11-08-23	447	0.047 ± 0.004	< 0.006
05-17-23	472	0.020 ± 0.003	< 0.009	11-15-23	451	0.023 ± 0.003	< 0.011
05-24-23	481	0.019 ± 0.003	< 0.010	11-22-23	450	0.032 ± 0.004	< 0.008
05-30-23	421	0.017 ± 0.003	< 0.009	11-29-23	468	0.028 ± 0.004	< 0.009
06-06-23	476	0.028 ± 0.004	< 0.007	12-06-23	479	0.034 ± 0.004	< 0.011
06-14-23	527	0.015 ± 0.003	< 0.008	12-13-23	474	0.033 ± 0.004	< 0.010
06-21-23	453	0.023 ± 0.003	< 0.012	12-20-23	473	0.034 ± 0.004	< 0.009
06-28-23	460	0.016 ± 0.003	< 0.018	12-27-23	582	0.049 ± 0.004	< 0.010
				01-03-24	579	0.021 ± 0.003	< 0.013
2Q 2023	Mean ± s.d.	0.020 ± 0.007	< 0.018	4Q 2023	Mean ± s.d.	0.031 ± 0.009	< 0.016
				Cumulative Average		0.026	

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-7
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	658	0.029 ± 0.003	< 0.010	07-04-23	390	0.034 ± 0.004	< 0.017
01-11-23	674	0.023 ± 0.003	< 0.006	07-12-23	505	0.027 ± 0.003	< 0.012
01-18-23	673	0.020 ± 0.003	< 0.005	07-19-23	416	0.034 ± 0.004	< 0.007
01-25-23	653	0.018 ± 0.003	< 0.008	07-26-23	408	0.035 ± 0.004	< 0.017
02-01-23	653	0.024 ± 0.003	< 0.007	08-02-23	578	0.026 ± 0.003	< 0.013
02-08-23	616	0.030 ± 0.003	< 0.007	08-09-23	552	0.025 ± 0.003	< 0.015
02-15-23	546	0.026 ± 0.003	< 0.009	08-16-23	532	0.017 ± 0.003	< 0.015
02-22-23	555	0.029 ± 0.003	< 0.005	08-23-23	542	0.022 ± 0.003	< 0.018
03-02-23	625	0.021 ± 0.003	< 0.007	08-30-23	535	0.016 ± 0.003	< 0.013
03-09-23	527	0.027 ± 0.003	< 0.006	09-07-23	622	0.026 ± 0.003	< 0.008
03-15-23	453	0.019 ± 0.004	< 0.013	09-13-23	437	0.017 ± 0.003	< 0.019
03-22-23	533	0.029 ± 0.003	< 0.008	09-20-23	553	0.018 ± 0.003	< 0.012
03-29-23	522	0.028 ± 0.003	< 0.006	09-27-23	529	0.021 ± 0.003	< 0.008
1Q 2023	Mean ± s.d.	0.025 ± 0.004	< 0.013	3Q 2023	Mean ± s.d.	0.024 ± 0.007	< 0.019
04-05-23	533	0.030 ± 0.003	< 0.008	10-04-23	526	0.035 ± 0.003	< 0.011
04-12-23	502	0.037 ± 0.004	< 0.008	10-11-23	532	0.026 ± 0.003	< 0.012
04-19-23	480	0.024 ± 0.003	< 0.010	10-18-23	510	0.015 ± 0.003	< 0.013
04-26-23	543	0.016 ± 0.003	< 0.007	10-25-23	521	0.030 ± 0.003	< 0.010
05-03-23	489	0.009 ± 0.003	< 0.013	11-01-23	507	0.024 ± 0.003	< 0.012
05-10-23	519	0.019 ± 0.003	< 0.009	11-08-23	489	0.048 ± 0.004	< 0.005
05-17-23	517	0.025 ± 0.003	< 0.008	11-15-23	496	0.021 ± 0.003	< 0.010
05-24-23	485	0.026 ± 0.003	< 0.010	11-22-23	489	0.033 ± 0.004	< 0.007
05-30-23	406	0.023 ± 0.004	< 0.010	11-29-23	492	0.027 ± 0.004	< 0.008
06-06-23	477	0.031 ± 0.004	< 0.007	12-06-23	491	0.036 ± 0.004	< 0.011
06-14-23	531	0.022 ± 0.003	< 0.008	12-13-23	469	0.035 ± 0.004	< 0.010
06-21-23	469	0.028 ± 0.003	< 0.012	12-20-23	472	0.036 ± 0.004	< 0.009
06-28-23	453	0.019 ± 0.003	< 0.018	12-27-23	499	0.048 ± 0.004	< 0.012
				01-03-24	514	0.024 ± 0.003	< 0.015
2Q 2023	Mean ± s.d.	0.024 ± 0.007	< 0.018	4Q 2023	Mean ± s.d.	0.031 ± 0.009	< 0.015
				Cumulative Average		0.026	

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: P-35
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.0075	0.050			0.0075	0.050
01-04-23	569	0.034 ± 0.003	< 0.013	07-04-23	469	0.028 ± 0.004	< 0.018
01-11-23	590	0.025 ± 0.003	< 0.014	07-12-23	618	0.026 ± 0.003	< 0.014
01-18-23	590	0.028 ± 0.003	< 0.005	07-19-23	537	0.026 ± 0.003	< 0.012
01-25-23	574	0.020 ± 0.003	< 0.007	07-26-23	539	0.028 ± 0.003	< 0.013
02-01-23	581	0.023 ± 0.003	< 0.005	08-02-23	534	0.017 ± 0.003	< 0.013
02-08-23	592	0.032 ± 0.003	< 0.008	08-09-23	586	0.026 ± 0.003	< 0.009
02-15-23	539	0.027 ± 0.003	< 0.009	08-16-23	572	0.023 ± 0.003	< 0.011
02-22-23	555	0.034 ± 0.003	< 0.006	08-23-23	589	0.023 ± 0.003	< 0.009
03-02-23	626	0.018 ± 0.003	< 0.006	08-30-23	570	0.014 ± 0.003	< 0.012
03-09-23	535	0.023 ± 0.003	< 0.003	09-07-23	673	0.028 ± 0.003	< 0.007
03-15-23	463	0.016 ± 0.003	< 0.011	09-13-23	487	0.015 ± 0.003	< 0.005
03-22-23	547	0.028 ± 0.003	< 0.010	09-20-23	603	0.020 ± 0.003	< 0.006
03-29-23	540	0.033 ± 0.003	< 0.006	09-27-23	580	0.026 ± 0.003	< 0.006
1Q 2023	Mean ± s.d.	0.026 ± 0.006	< 0.014	3Q 2023	Mean ± s.d.	0.023 ± 0.005	< 0.018
04-05-23	556	0.027 ± 0.003	< 0.009	10-04-23	572	0.030 ± 0.003	< 0.006
04-12-23	553	0.036 ± 0.003	< 0.010	10-11-23	593	0.023 ± 0.003	< 0.006
04-19-23	549	0.025 ± 0.003	< 0.010	10-18-23	565	0.015 ± 0.003	< 0.006
04-26-23	548	0.015 ± 0.003	< 0.005	10-25-23	583	0.029 ± 0.003	< 0.004
05-03-23	544	0.009 ± 0.003	< 0.010	11-01-23	578	0.021 ± 0.003	< 0.005
05-10-23	544	0.018 ± 0.003	< 0.009	11-08-23	570	0.049 ± 0.004	< 0.006
05-17-23	556	0.024 ± 0.003	< 0.009	11-15-23	581	0.020 ± 0.003	< 0.007
05-24-23	545	0.022 ± 0.003	< 0.010	11-22-23	573	0.031 ± 0.003	< 0.008
05-30-23	463	0.018 ± 0.003	< 0.017	11-29-23	579	0.025 ± 0.003	< 0.006
06-06-23	550	0.025 ± 0.003	< 0.012	12-06-23	589	0.034 ± 0.003	< 0.006
06-14-23	622	0.022 ± 0.003	< 0.013	12-13-23	563	0.035 ± 0.003	< 0.004
06-21-23	547	0.024 ± 0.003	< 0.011	12-20-23	597	0.032 ± 0.003	< 0.005
06-28-23	538	0.018 ± 0.003	< 0.016	12-27-23	591	0.043 ± 0.003	< 0.006
				01-03-24	559	0.021 ± 0.003	< 0.006
2Q 2023	Mean ± s.d.	0.022 ± 0.007	< 0.017	4Q 2023	Mean ± s.d.	0.029 ± 0.009	< 0.008
				Cumulative Average		0.025	

PNPP

Table 3. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite
Units: pCi/m^3

Location	PE-1				
Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Lab Code	PEAP - 866	PEAP - 2130	PEAP - 3094	PEAP - 4128	
Vol. (m^3)	6141	7416	7499	7321	
Be-7	0.051 ± 0.009	0.054 ± 0.010	0.052 ± 0.007	0.038 ± 0.007	-
Co-58	< 0.0006	< 0.0005	< 0.0003	< 0.0004	-
Co-60	< 0.0005	< 0.0005	< 0.0010	< 0.0002	-
Cs-134	< 0.0005	< 0.0005	< 0.0004	< 0.0006	0.005
Cs-137	< 0.0006	< 0.0004	< 0.0007	< 0.0004	0.045
Location	PE-3				
Lab Code	PEAP - 867	PEAP - 2131	PEAP - 3096	PEAP - 4129	
Vol. (m^3)	7211	7044	7253	7707	
Be-7	0.065 ± 0.009	0.063 ± 0.011	0.062 ± 0.009	0.043 ± 0.007	-
Co-58	< 0.0003	< 0.0005	< 0.0004	< 0.0003	-
Co-60	< 0.0005	< 0.0004	< 0.0002	< 0.0002	-
Cs-134	< 0.0004	< 0.0005	< 0.0004	< 0.0005	0.005
Cs-137	< 0.0005	< 0.0002	< 0.0004	< 0.0003	0.045
Location	PE-4				
Lab Code	PEAP - 868	PEAP - 2132	PEAP - 3097	PEAP - 4130	
Vol. (m^3)	7699	7054	7270	8121	
Be-7	0.062 ± 0.009	0.058 ± 0.010	0.060 ± 0.008	0.045 ± 0.007	-
Co-58	< 0.0004	< 0.0005	< 0.0005	< 0.0003	-
Co-60	< 0.0008	< 0.0002	< 0.0010	< 0.0004	-
Cs-134	< 0.0004	< 0.0006	< 0.0005	< 0.0004	0.005
Cs-137	< 0.0006	< 0.0004	< 0.0007	< 0.0004	0.045
Location	PE-5				
Lab Code	PEAP - 869	PEAP - 2133	PEAP - 3098	PEAP - 4131	
Vol. (m^3)	7038	7027	7556	8256	
Be-7	0.063 ± 0.011	0.058 ± 0.010	0.053 ± 0.009	0.046 ± 0.007	-
Co-58	< 0.0005	< 0.0004	< 0.0004	< 0.0003	-
Co-60	< 0.0005	< 0.0002	< 0.0003	< 0.0006	-
Cs-134	< 0.0003	< 0.0004	< 0.0005	< 0.0004	0.005
Cs-137	< 0.0005	< 0.0004	< 0.0003	< 0.0002	0.045

PNPP

Table 3. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite
Units: pCi/m^3

Location	PE-6				
Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Lab Code	PEAP - 871	PEAP - 2134	PEAP - 3099	PEAP - 4132	
Vol. (m^3)	6375	6021	6652	6675	
Be-7	0.063 ± 0.000	0.068 ± 0.014	0.063 ± 0.009	0.049 ± 0.008	-
Co-58	< 0.0004	< 0.0007	< 0.0003	< 0.0004	-
Co-60	< 0.0006	< 0.0007	< 0.0011	< 0.0005	-
Cs-134	< 0.0005	< 0.0005	< 0.0004	< 0.0005	0.005
Cs-137	< 0.0003	< 0.0004	< 0.0007	< 0.0003	0.045
Location	PE-7				
Lab Code	PEAP - 872	PEAP - 2135	PEAP - 3100	PEAP - 4133	
Vol. (m^3)	7688	6404	6599	7007	
Be-7	0.054 ± 0.009	0.066 ± 0.011	0.068 ± 0.009	0.040 ± 0.008	-
Co-58	< 0.0007	< 0.0006	< 0.0005	< 0.0007	-
Co-60	< 0.0010	< 0.0004	< 0.0002	< 0.0005	-
Cs-134	< 0.0005	< 0.0006	< 0.0005	< 0.0006	0.005
Cs-137	< 0.0007	< 0.0004	< 0.0004	< 0.0004	0.045
Location	PE-35				
Lab Code	PEAP - 873	PEAP - 2136	PEAP - 3101	PEAP - 4134	
Vol. (m^3)	7301	7115	7357	8093	
Be-7	0.063 ± 0.011	0.064 ± 0.011	0.061 ± 0.008	0.043 ± 0.012	-
Co-58	< 0.0005	< 0.0006	< 0.0003	< 0.0006	-
Co-60	< 0.0004	< 0.0002	< 0.0010	< 0.0005	-
Cs-134	< 0.0005	< 0.0005	< 0.0005	< 0.0006	0.005
Cs-137	< 0.0003	< 0.0003	< 0.0007	< 0.0005	0.045

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes. PNPP

Location: P-34 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 157	PELW- 371	PELW- 963	PELW- 1206	
Start Date	12-27-22	01-23-23	02-21-23	03-21-23	Req. LLD
End Date	01-23-23	02-21-23	03-21-23	04-25-23	
Gross beta	1.1 ± 0.6	1.3 ± 0.6	3.3 ± 0.7	< 0.9	3.0
Mn-54	< 1.8	< 3.9	< 1.1	< 1.5	11
Fe-59	< 4.8	< 5.3	< 5.3	< 8.1	22
Co-58	< 2.3	< 3.8	< 1.7	< 2.6	11
Co-60	< 1.9	< 3.8	< 1.2	< 2.0	11
Zn-65	< 3.9	< 3.5	< 3.4	< 4.2	22
Zr-95	< 4.1	< 8.0	< 4.1	< 4.3	22
Nb-95	< 1.8	< 4.1	< 3.1	< 4.2	11
Cs-134	< 1.9	< 5.1	< 1.6	< 2.3	11
Cs-137	< 2.5	< 5.0	< 1.8	< 2.8	13
Ba-140	< 9.4	< 12.0	< 39.2	< 41.6	45
La-140	< 2.5	< 5.2	< 7.9	< 9.7	11

Lab Code	PELW- 1317	PELW- 1889	PELW- 2526	PELW- 2602	
Start Date	04-25-23	05-22-23	06-28-23	07-25-23	Req. LLD
End Date	05-22-23	06-28-23	07-25-23	08-29-23	
Gross beta	< 0.8	1.0 ± 0.5	1.0 ± 0.5	1.2 ± 0.5	3.0
Mn-54	< 3.1	< 1.4	< 1.5	< 2.5	11
Fe-59	< 3.4	< 3.7	< 5.5	< 4.5	22
Co-58	< 1.9	< 1.7	< 1.7	< 2.0	11
Co-60	< 2.3	< 2.6	< 3.5	< 7.5	11
Zn-65	< 6.3	< 2.7	< 3.8	< 3.4	22
Zr-95	< 3.6	< 3.8	< 4.4	< 3.3	22
Nb-95	< 2.5	< 2.0	< 2.2	< 5.1	11
Cs-134	< 2.9	< 1.4	< 1.8	< 3.3	11
Cs-137	< 2.7	< 2.5	< 3.2	< 7.2	13
Ba-140	< 16.7	< 37.8	< 41.3	< 24.2	45
La-140	< 3.5	< 9.9	< 8.1	< 3.8	11

Lab Code	PELW- 2928	PELW- 3281	PELW- 3781	PELW- 3961	
Start Date	08-29-23	09-26-23	10-24-23	11-28-23	Req. LLD
End Date	09-26-23	10-24-23	11-28-23	12-19-23	
Gross beta	1.3 ± 0.6	3.8 ± 0.7	2.5 ± 0.7 [a]	1.0 ± 0.5	3.0
Mn-54	< 2.4	< 2.1	< 3.3	< 2.9	11
Fe-59	< 2.7	< 4.3	< 5.0	< 4.7	22
Co-58	< 3.4	< 1.7	< 1.8	< 2.6	11
Co-60	< 6.6	< 3.5	< 4.1	< 2.6	11
Zn-65	< 3.4	< 4.9	< 2.5	< 6.3	22
Zr-95	< 4.4	< 5.6	< 4.9	< 6.4	22
Nb-95	< 4.1	< 2.9	< 2.3	< 6.5	11
Cs-134	< 4.0	< 3.5	< 2.9	< 3.1	11
Cs-137	< 6.3	< 3.0	< 3.2	< 4.9	13
Ba-140	< 14.2	< 11.2	< 18.2	< 29.1	45
La-140	< 3.1	< 3.7	< 5.5	< 8.7	11

[a] Recount = 1.8 ± 0.3 pCi/L.

PNPP

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-36 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 158	PELW- 373	PELW- 964	PELW- 1208	
Start Date	12-27-22	01-23-23	02-21-23	03-21-23	Req. LLD
End Date	01-23-23	02-21-23	03-21-23	04-25-23	
Gross beta	1.8 ± 0.6	< 0.9	< 0.9	1.7 ± 0.6	3.0
Mn-54	< 1.7	< 3.1	< 1.9	< 2.2	11
Fe-59	< 3.8	< 6.0	< 6.1	< 6.3	22
Co-58	< 2.1	< 2.0	< 1.9	< 2.6	11
Co-60	< 1.5	< 3.4	< 1.6	< 5.4	11
Zn-65	< 4.0	< 3.9	< 6.6	< 5.6	22
Zr-95	< 2.9	< 6.3	< 5.6	< 4.2	22
Nb-95	< 2.0	< 4.0	< 4.7	< 3.9	11
Cs-134	< 2.3	< 3.4	< 2.5	< 2.4	11
Cs-137	< 2.7	< 3.3	< 2.6	< 4.5	13
Ba-140	< 9.0	< 10.3	< 31.1	< 43.2	45
La-140	< 1.2	< 3.3	< 6.8	< 6.8	11

Lab Code	PELW- 1318	PELW- 1890	PELW- 2527	PELW- 2603	
Start Date	04-25-23	05-22-23	06-28-23	07-25-23	Req. LLD
End Date	05-22-23	06-28-23	07-25-23	08-29-23	
Gross beta	< 0.9	< 0.8	< 0.8	1.0 ± 0.8	3.0
Mn-54	< 3.1	< 2.5	< 2.0	< 2.9	11
Fe-59	< 3.2	< 7.5	< 5.2	< 5.8	22
Co-58	< 3.2	< 3.4	< 1.4	< 3.8	11
Co-60	< 2.5	< 2.4	< 4.0	< 8.0	11
Zn-65	< 5.5	< 3.6	< 3.9	< 8.2	22
Zr-95	< 4.1	< 6.6	< 4.4	< 7.7	22
Nb-95	< 1.9	< 5.1	< 4.5	< 3.5	11
Cs-134	< 2.9	< 2.7	< 2.3	< 4.8	11
Cs-137	< 3.4	< 2.9	< 3.3	< 6.7	13
Ba-140	< 19.3	< 34.7	< 41.5	< 16.1	45
La-140	< 5.4	< 10.5	< 5.4	< 3.9	11

Lab Code	PELW- 2929	PELW- 3282	PELW- 3782	PELW- 3962	
Start Date	08-29-23	09-26-23	10-24-23	11-28-23	Req. LLD
End Date	09-26-23	10-24-23	11-28-23	12-19-23	
Gross beta	1.1 ± 0.5	3.4 ± 0.7 [a]	2.4 ± 0.6	1.5 ± 0.6	3.0
Mn-54	< 1.8	< 2.8	< 2.5	< 2.0	11
Fe-59	< 4.1	< 3.2	< 5.3	< 7.0	22
Co-58	< 3.8	< 1.7	< 3.2	< 2.0	11
Co-60	< 5.8	< 8.4	< 6.2	< 5.7	11
Zn-65	< 4.7	< 4.9	< 3.3	< 4.8	22
Zr-95	< 4.7	< 6.7	< 7.9	< 4.4	22
Nb-95	< 3.2	< 2.9	< 2.8	< 3.4	11
Cs-134	< 3.5	< 5.1	< 3.8	< 3.4	11
Cs-137	< 5.9	< 7.6	< 5.8	< 5.8	13
Ba-140	< 12.3	< 9.2	< 27.7	< 35.7	45
La-140	< 3.0	< 2.7	< 2.6	< 3.8	11

[a] Recount 1.0 ± 0.3 pCi/L.

PNPP

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-39 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 159	PELW- 374	PELW- 965	PELW- 1209	
Start Date	12-27-22	01-23-23	02-21-23	03-31-23	Req. LLD
End Date	01-23-23	02-21-23	03-21-23	04-25-23	
Gross beta	1.2 ± 0.5	1.0 ± 0.5	< 0.9	1.1 ± 0.5	3.0
Mn-54	< 1.5	< 0.8	< 2.1	< 1.9	11
Fe-59	< 3.0	< 2.7	< 2.7	< 5.3	22
Co-58	< 1.8	< 0.8	< 3.2	< 2.5	11
Co-60	< 1.5	< 1.2	< 5.8	< 2.1	11
Zn-65	< 2.8	< 1.8	< 4.9	< 2.3	22
Zr-95	< 2.9	< 1.2	< 6.7	< 2.7	22
Nb-95	< 1.7	< 1.2	< 4.8	< 3.6	11
Cs-134	< 1.5	< 1.0	< 3.2	< 1.9	11
Cs-137	< 1.2	< 1.2	< 4.2	< 2.2	13
Ba-140	< 4.7	< 4.1	< 43.4	< 26.2	45
La-140	< 1.7	< 0.9	< 7.8	< 5.5	11

Lab Code	PELW- 1319	PELW- 1891	PELW- 2528	PELW- 2604	
Start Date	04-25-23	05-22-23	06-28-23	07-25-23	Req. LLD
End Date	05-22-23	06-28-23	07-25-23	08-29-23	
Gross beta	1.4 ± 0.6	1.0 ± 0.5	< 0.9	< 0.9	3.0
Mn-54	< 2.0	< 0.8	< 2.2	< 6.5	11
Fe-59	< 5.4	< 4.1	< 5.0	< 8.3	22
Co-58	< 2.7	< 1.5	< 3.3	< 8.8	11
Co-60	< 6.5	< 2.7	< 4.4	< 5.6	11
Zn-65	< 1.9	< 2.2	< 3.7	< 5.5	22
Zr-95	< 6.1	< 2.7	< 5.1	< 9.1	22
Nb-95	< 2.5	< 2.5	< 4.7	< 7.1	11
Cs-134	< 3.2	< 1.4	< 2.4	< 6.6	11
Cs-137	< 5.5	< 2.3	< 3.8	< 5.1	13
Ba-140	< 20.2	< 36.0	< 42.2	< 29.3	45
La-140	< 2.8	< 6.6	< 8.0	< 5.6	11

Lab Code	PELW- 2930	PELW- 3283	PELW- 3783	PELW- 3963	
Start Date	08-29-23	09-26-23	10-24-23	11-28-23	Req. LLD
End Date	09-26-23	10-24-23	11-28-23	12-19-23	
Gross beta	1.0 ± 0.5	5.6 ± 0.9 [a, b]	< 0.8	< 0.4	3.0
Mn-54	< 3.9	< 0.9	< 2.1	< 2.7	11
Fe-59	< 2.3	< 1.8	< 3.2	< 7.0	22
Co-58	< 3.3	< 0.8	< 2.1	< 3.2	11
Co-60	< 7.2	< 1.3	< 6.6	< 2.8	11
Zn-65	< 3.4	< 1.5	< 8.4	< 7.2	22
Zr-95	< 5.9	< 1.5	< 4.5	< 7.4	22
Nb-95	< 3.5	< 1.2	< 3.1	< 3.2	11
Cs-134	< 4.5	< 0.9	< 4.5	< 3.3	11
Cs-137	< 8.0	< 1.1	< 6.4	< 3.6	13
Ba-140	< 17.0	< 5.0	< 23.0	< 22.2	45
La-140	< 2.4	< 1.3	< 2.5	< 7.3	11

[a] Reanalysis = 1.1 ± 0.5 pCi/L. [b] Backup sample analysis result = 1.5 ± 0.6 pCi/L.

PNPP

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.

Location: P-59 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 160	PELW- 375	PELW- 966	PELW- 1199	
Start Date	12-27-22	01-23-23	02-21-23	03-21-23	Req. LLD
End Date	01-23-23	02-21-23	03-21-23	04-25-23	
Gross beta	1.7 ± 0.6	1.8 ± 0.6	1.7 ± 0.6	1.5 ± 0.6	3.0
Mn-54	< 1.8	< 1.1	< 1.8	< 1.8	11
Fe-59	< 3.1	< 2.0	< 4.4	< 7.3	22
Co-58	< 2.7	< 1.3	< 2.4	< 2.2	11
Co-60	< 6.0	< 2.8	< 1.3	< 5.1	11
Zn-65	< 4.9	< 2.9	< 2.8	< 4.5	22
Zr-95	< 4.9	< 1.8	< 3.7	< 4.8	22
Nb-95	< 2.7	< 1.4	< 3.9	< 4.2	11
Cs-134	< 3.0	< 1.3	< 1.6	< 2.6	11
Cs-137	< 4.5	< 2.4	< 1.7	< 4.3	13
Ba-140	< 13.8	< 4.1	< 30.8	< 30.5	45
La-140	< 2.4	< 1.7	< 8.8	< 7.1	11

Lab Code	PELW- 1320	PELW- 1892	PELW- 2529	PELW- 2605	
Start Date	04-25-23	05-22-23	06-28-23	07-25-23	Req. LLD
End Date	05-22-23	06-28-23	07-25-23	08-29-23	
Gross beta	< 0.9	0.9 ± 0.5	0.9 ± 0.5	< 0.8	3.0
Mn-54	< 5.6	< 1.3	< 5.1	< 7.3	11
Fe-59	< 5.2	< 1.8	< 6.0	< 5.7	22
Co-58	< 3.0	< 1.3	< 2.8	< 4.3	11
Co-60	< 3.8	< 2.7	< 4.6	< 4.0	11
Zn-65	< 7.1	< 2.9	< 4.3	< 6.1	22
Zr-95	< 9.6	< 3.8	< 7.6	< 8.5	22
Nb-95	< 5.3	< 2.4	< 4.4	< 6.9	11
Cs-134	< 5.5	< 1.4	< 4.1	< 5.9	11
Cs-137	< 6.2	< 2.3	< 4.7	< 6.0	13
Ba-140	< 23.8	< 26.9	< 37.1	< 31.3	45
La-140	< 4.7	< 5.4	< 10.9	< 3.5	11

Lab Code	PELW- 2931	PELW- 3285	PELW- 3784	PELW- 3964	
Start Date	08-29-23	09-26-23	10-24-23	11-28-23	Req. LLD
End Date	09-26-23	10-24-23	11-28-23	12-19-23	
Gross beta	1.6 ± 0.6	2.0 ± 0.6 [a]	1.2 ± 0.6	1.1 ± 0.6	3.0
Mn-54	< 5.6	< 4.6	< 2.3	< 2.7	11
Fe-59	< 4.8	< 6.8	< 4.4	< 5.2	22
Co-58	< 7.8	< 4.3	< 4.2	< 2.1	11
Co-60	< 6.9	< 7.7	< 1.5	< 2.6	11
Zn-65	< 7.9	< 3.5	< 1.8	< 5.1	22
Zr-95	< 9.4	< 6.2	< 6.0	< 2.7	22
Nb-95	< 5.4	< 2.1	< 5.3	< 5.2	11
Cs-134	< 7.5	< 3.6	< 2.6	< 2.2	11
Cs-137	< 6.8	< 8.6	< 3.9	< 2.9	13
Ba-140	< 32.6	< 12.7	< 19.9	< 18.5	45
La-140	< 4.7	< 4.2	< 3.7	< 7.7	11

[a] Recount = 1.1 ± 0.3 pCi/L.

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes. PNPP

Location: P-60 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 161	PELW- 376	PELW- 967	PELW- 1210	
Start Date	12-27-22	01-23-23	02-21-23	03-21-23	Req. LLD
End Date	01-23-23	02-21-23	03-21-23	04-25-23	
Gross beta	2.8 ± 0.7	1.0 ± 0.6	1.2 ± 0.6	1.4 ± 0.6	3.0
Mn-54	< 2.3	< 2.0	< 1.6	< 1.4	11
Fe-59	< 5.1	< 4.3	< 3.5	< 3.5	22
Co-58	< 2.3	< 1.7	< 1.8	< 1.5	11
Co-60	< 2.0	< 4.7	< 2.9	< 2.7	11
Zn-65	< 2.5	< 3.8	< 2.8	< 2.1	22
Zr-95	< 5.1	< 3.4	< 3.4	< 3.2	22
Nb-95	< 2.9	< 2.9	< 3.0	< 2.1	11
Cs-134	< 2.3	< 2.6	< 1.4	< 1.3	11
Cs-137	< 2.1	< 3.7	< 2.4	< 2.2	13
Ba-140	< 9.5	< 12.1	< 32.6	< 17.9	45
La-140	< 1.8	< 3.0	< 8.4	< 5.2	11

Lab Code	PELW- 1321	PELW- 1893	PELW- 2530	PELW- 2606	
Start Date	04-25-23	05-22-23	06-28-23	07-25-23	Req. LLD
End Date	05-22-23	06-28-23	07-25-23	08-29-23	
Gross beta	< 1.0	1.3 ± 0.6	1.1 ± 0.6	< 0.9	3.0
Mn-54	< 4.1	< 1.2	< 4.0	< 6.0	11
Fe-59	< 6.0	< 2.5	< 10.1	< 6.4	22
Co-58	< 2.2	< 1.6	< 3.7	< 5.0	11
Co-60	< 2.6	< 2.4	< 3.2	< 5.3	11
Zn-65	< 8.3	< 2.4	< 5.4	< 5.7	22
Zr-95	< 7.7	< 3.3	< 9.7	< 10.9	22
Nb-95	< 4.2	< 2.6	< 6.1	< 7.3	11
Cs-134	< 3.4	< 1.3	< 3.5	< 7.5	11
Cs-137	< 3.8	< 2.0	< 4.2	< 3.7	13
Ba-140	< 18.8	< 25.1	< 44.8	< 20.9	45
La-140	< 5.8	< 7.0	< 12.4 [a]	< 8.4	11

Lab Code	PELW- 2932	PELW- 3286	PELW- 3785	PELW- 3965	
Start Date	08-29-23	09-26-23	10-24-23	11-28-23	Req. LLD
End Date	09-26-23	10-24-23	11-28-23	12-19-23	
Gross beta	2.0 ± 0.6	2.7 ± 0.7 [b]	1.3 ± 0.6	1.2 ± 0.6	3.0
Mn-54	< 7.6	< 7.0	< 2.3	< 3.5	11
Fe-59	< 5.2	< 7.9	< 7.4	< 8.5	22
Co-58	< 6.3	< 3.7	< 1.7	< 2.3	11
Co-60	< 4.4	< 7.3	< 1.8	< 2.1	11
Zn-65	< 12.7	< 11.6	< 4.5	< 6.8	22
Zr-95	< 9.2	< 11.9	< 4.8	< 5.7	22
Nb-95	< 5.1	< 7.5	< 2.0	< 3.0	11
Cs-134	< 8.5	< 9.9	< 3.4	< 3.4	11
Cs-137	< 7.4	< 4.2	< 3.2	< 4.1	13
Ba-140	< 24.4	< 38.4	< 19.1	< 31.1	45
La-140	< 5.2	< 5.4	< 3.9	< 6.1	11

[a] Unable to reach LLD due to late sample arrival.

[b] Recount = 1.3 ± 0.3 pCi/L.

PNPP

Table 4. Lake Water, analysis for tritium.
Collection: Quarterly composites of monthly collections.
Units: pCi/L

Required limit of detection: 1500 pCi/L

Location	P-34			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 969	PELW- 1915	PELW- 2978	PELW- 4019
H-3	217 ± 88	166 ± 83	< 167	< 169
Location	**P-36**			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 970	PELW- 1916	PELW- 2979	PELW- 4020
H-3	192 ± 86	192 ± 85	< 167	< 169
Location	**P-39**			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 971	PELW- 1917	PELW- 2980	PELW- 4021
H-3	< 162	< 158	< 167	< 169
Location	**P-59**			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 972	PELW- 1918	PELW- 2981	PELW- 4022
H-3	221 ± 88	< 158	< 167	< 169
Location	**P-60**			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 973	PELW- 1919	PELW- 2982	PELW- 4023
H-3	< 162	187 ± 85	< 167	< 169

PNPP

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-2

Lab Code	PEVE- 1958	PEVE- 1959	PEVE- 1970	PEVE- 2382	
Date Collected	07-12-23	07-12-23	07-13-23	08-08-23	Req. LLD
Sample Type	Collard Greens	Kale	Turnip Greens	Turnip Greens	
Be-7	570 ± 263	854 ± 202	292 ± 124	731 ± 288	-
K-40	4248 ± 559	6187 ± 511	3612 ± 463	5102 ± 605	-
Co-58	< 17	< 14	< 15	< 20	-
Co-60	< 43	< 11	< 20	< 22	-
I-131	< 30	< 21	< 19	< 35	45
Cs-134	< 24	< 21	< 11	< 22	45
Cs-137	< 38	< 13	< 10	< 23	60

Lab Code	PEVE- 2383	PEVE- 2384	PEVE- 2690	PEVE- 2691	
Date Collected	08-08-23	08-08-23	09-12-23	09-12-23	Req. LLD
Sample Type	Collard Greens	Kale	Turnip Greens	Kale	
Be-7	486 ± 248	< 296	953 ± 257	< 242	-
K-40	3862 ± 488	4102 ± 839	5726 ± 614	4032 ± 522	-
Co-58	< 17	< 26	< 21	< 17	-
Co-60	< 13	< 32	< 38	< 39	-
I-131	< 35	< 40	< 36	< 39	45
Cs-134	< 20	< 27	< 20	< 22	45
Cs-137	< 22	< 37	< 35	< 36	60

Lab Code	PEVE- 2692	PEVE- 3102	PEVE- 3103	PEVE- 3104	
Date Collected	09-12-23	10-10-23	10-10-23	10-10-23	Req. LLD
Sample Type	Collard Greens	Turnip Greens	Kale	Collard Greens	
Be-7	< 355	1249 ± 259	665 ± 118	672 ± 262	-
K-40	3540 ± 932	6679 ± 587	6445 ± 344	4629 ± 598	-
Co-58	< 17	< 10	< 10	< 11	-
Co-60	< 16	< 35	< 8	< 33	-
I-131	< 35	< 33	< 14	< 43	45
Cs-134	< 35	< 20	< 12	< 22	45
Cs-137	< 29	< 33	< 8	< 31	60

PNPP

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-16

Lab Code	PEVE- 1960	PEVE- 1961	PEVE- 1962	PEVE- 2385	
Date Collected	07-12-23	07-12-23	07-12-23	08-08-23	Req. LLD
Sample Type	Kale	Collard Greens	Turnip Greens	Turnip Greens	
Be-7	< 208	421 ± 121	593 ± 289	634 ± 324	-
K-40	4913 ± 591	4044 ± 302	4743 ± 502	5137 ± 594	-
Co-58	< 14	< 7	< 18	< 8	-
Co-60	< 21	< 10	< 16	< 42	-
I-131	< 38	< 10	< 40	< 27	45
Cs-134	< 20	< 10	< 24	< 22	45
Cs-137	< 18	< 7	< 14	< 31	60

Lab Code	PEVE- 2386	PEVE- 2387	PEVE- 2693	PEVE- 2694	
Date Collected	08-08-23	08-08-23	09-12-23	09-12-23	Req. LLD
Sample Type	Collard Greens	Kale	Kale	Turnip Greens	
Be-7	< 203	< 208	< 231	362 ± 80	-
K-40	4326 ± 488	4241 ± 529	5072 ± 644	4592 ± 258	-
Co-58	< 12	< 19	< 14	< 6	-
Co-60	< 37	< 19	< 38	< 8	-
I-131	< 35	< 34	< 29	< 6	45
Cs-134	< 20	< 20	< 27	< 10	45
Cs-137	< 30	< 15	< 41	< 6	60

Lab Code	PEVE- 2695	PEVE- 3105	PEVE- 3106	PEVE- 3107	
Date Collected	09-12-23	10-10-23	10-10-23	10-10-23	Req. LLD
Sample Type	Collard Greens	Kale	Turnip Greens	Collard Greens	
Be-7	457 ± 217	489 ± 196	696 ± 94	443 ± 83	-
K-40	6275 ± 611	5011 ± 542	5381 ± 279	4525 ± 247	-
Co-58	< 11	< 12	< 6	< 6	-
Co-60	< 36	< 30	< 5	< 5	-
I-131	< 20	< 38	< 12	< 11	45
Cs-134	< 19	< 13	< 9	< 8	45
Cs-137	< 34	< 28	< 7	< 6	60

PNPP

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-20

Lab Code	PEVE- 2388	PEVE- 2390	PEVE- 2391	PEVE- 2696	
Date Collected	08-08-23	08-08-23	08-08-23	09-12-23	Req. LLD
Sample Type	Turnip Greens	Collard Greens	Kale	Collard Greens	
Be-7	351 ± 181	< 320	< 104	< 397	-
K-40	5564 ± 553	3887 ± 710	5496 ± 496	4649 ± 814	-
Co-58	< 14	< 26	< 13	< 31	-
Co-60	< 34	< 11	< 15	< 22	-
I-131	< 37	< 33	< 14	< 42	45
Cs-134	< 19	< 33	< 16	< 42	45
Cs-137	< 27	< 27	< 14	< 30	60

Lab Code	PEVE- 2697	PEVE- 2698	PEVE- 3108	PEVE- 3109	
Date Collected	09-12-23	09-12-23	10-10-23	10-10-23	Req. LLD
Sample Type	Kale	Turnip Greens	Collard Greens	Kale	
Be-7	< 253	408 ± 151	475 ± 112	227 ± 67	-
K-40	4816 ± 901	2768 ± 327	4951 ± 308	4834 ± 236	-
Co-58	< 29	< 6	< 7	< 5	-
Co-60	< 34	< 24	< 9	< 5	-
I-131	< 19	< 16	< 16	< 10	45
Cs-134	< 43	< 13	< 11	< 7	45
Cs-137	< 34	< 19	< 8	< 5	60

Lab Code	PEVE- 3110	
Date Collected	10-10-23	Req. LLD
Sample Type	Turnip Greens	
Be-7	201 ± 61	-
K-40	4617 ± 226	-
Co-58	< 5	-
Co-60	< 6	-
I-131	< 10	45
Cs-134	< 6	45
Cs-137	< 5	60

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Table 7. Food Products, analyses for gamma emitting isotopes.
Collection: Monthly
Location: P-37
Units: pCi/kg wet

Lab Code	PEVE- 1965	PEVE- 1966	PEVE- 1967	PEVE- 1968	
Date Collected	07-13-23	07-13-23	07-13-23	07-13-23	Req. LLD
Sample Type	Swiss Chard	Turnip Greens	Collard Greens	Kale	
Be-7	520 ± 199	894 ± 165	235 ± 134	331 ± 150	-
K-40	5607 ± 574	4180 ± 410	3721 ± 401	3810 ± 342	-
Co-58	< 13	< 8	< 8	< 8	-
Co-60	< 34	< 27	< 26	< 24	-
I-131	< 32	< 24	< 21	< 20	45
Cs-134	< 18	< 14	< 12	< 12	45
Cs-137	< 29	< 22	< 24	< 23	60

Lab Code	PEVE- 2392	PEVE- 2393	PEVE- 2394	PEVE- 2395	
Date Collected	08-08-23	08-08-23	08-08-23	08-08-23	Req. LLD
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	844 ± 341	< 313	< 186	585 ± 238	-
K-40	5306 ± 686	3126 ± 421	3695 ± 493	7528 ± 791	-
Co-58	< 14	< 14	< 8	< 33	-
Co-60	< 11	< 31	< 18	< 26	-
I-131	< 40	< 28	< 21	< 15	45
Cs-134	< 29	< 17	< 22	< 31	45
Cs-137	< 29	< 28	< 21	< 34	60

Lab Code	PEVE- 2699	PEVE- 2700	PEVE- 2701	PEVE- 2702	
Date Collected	09-12-23	09-12-23	09-12-23	09-12-23	Req. LLD
Sample Type	Collard Greens	Turnip Greens	Swiss Chard	Kale	
Be-7	< 154	461 ± 214	657 ± 382	< 149	-
K-40	2833 ± 487	3955 ± 495	5538 ± 942	3453 ± 579	-
Co-58	< 9	< 11	< 36	< 18	-
Co-60	< 35	< 29	< 18	< 15	-
I-131	< 22	< 16	< 30	< 37	45
Cs-134	< 22	< 15	< 35	< 27	45
Cs-137	< 28	< 28	< 37	< 24	60

Lab Code	PEVE- 3111	PEVE- 3112	PEVE- 3113	PEVE- 3114	
Date Collected	10-10-23	10-10-23	10-10-23	10-10-23	Req. LLD
Sample Type	Collard Greens	Turnip Greens	Swiss Chard	Kale	
Be-7	158 ± 94	870 ± 273	552 ± 329	189 ± 57	-
K-40	2999 ± 230	5334 ± 568	6560 ± 979	4351 ± 213	-
Co-58	< 9	< 20	< 30	< 5	-
Co-60	< 4	< 13	< 18	< 6	-
I-131	< 24	< 43	< 44	< 10	45
Cs-134	< 9	< 19	< 43	< 6	45
Cs-137	< 10	< 20	< 25	< 5	60

PNPP

Table 7. Food Products, analyses for gamma emitting isotopes.

Collection: Monthly — Units: pCi/kg wet

Location: P-70

Lab Code	PEVE- 1963	PEVE- 1964	PEVE- 2396	PEVE- 2397	
Date Collected	07-12-23	07-12-23	08-08-23	08-08-23	Req. LLD
Sample Type	Collard Greens	Kale	Turnip Greens	Collard Greens	
Be-7	< 174	< 149	534 ± 147	< 133	-
K-40	5598 ± 537	5625 ± 350	4894 ± 444	3398 ± 372	-
Co-58	< 11	< 11	< 18	< 13	-
Co-60	< 33	< 11	< 12	< 26	-
I-131	< 27	< 16	< 27	< 17	45
Cs-134	< 17	< 16	< 17	< 14	45
Cs-137	< 33	< 12	< 13	< 21	60

Lab Code	PEVE- 2398	PEVE- 2399	PEVE- 2704	PEVE- 2705	
Date Collected	08-08-23	08-08-23	09-12-23	09-12-23	Req. LLD
Sample Type	Kale	Swiss Chard	Turnip Greens	Collard Greens	
Be-7	314 ± 160	633 ± 327	362 ± 307	473 ± 223	-
K-40	3333 ± 392	6177 ± 656	3964 ± 727	3455 ± 550	-
Co-58	< 12	< 20	< 29	< 12	-
Co-60	< 27	< 41	< 16	< 41	-
I-131	< 28	< 41	< 44	< 18	45
Cs-134	< 12	< 21	< 36	< 23	45
Cs-137	< 21	< 36	< 30	< 39	60

Lab Code	PEVE- 2706	PEVE- 2707	PEVE- 3115	PEVE- 3117	
Date Collected	09-12-23	09-12-23	10-10-23	10-10-23	Req. LLD
Sample Type	Swiss Chard	Kale	Turnip Greens	Collard Greens	
Be-7	692 ± 337	< 308	838 ± 227	444 ± 178	-
K-40	6445 ± 927	3411 ± 782	5731 ± 529	3652 ± 383	-
Co-58	< 30	< 29	< 12	< 11	-
Co-60	< 38	< 20	< 33	< 21	-
I-131	< 31	< 43	< 33	< 29	45
Cs-134	< 35	< 21	< 20	< 13	45
Cs-137	< 29	< 35	< 24	< 19	60

Lab Code	PEVE- 3118	PEVE- 3119	
Date Collected	10-10-23	10-10-23	Req. LLD
Sample Type	Swiss Chard	Kale	
Be-7	822 ± 246	325 ± 180	-
K-40	8101 ± 720	5253 ± 646	-
Co-58	< 20	< 26	-
Co-60	< 33	< 15	-
I-131	< 27	< 40	45
Cs-134	< 21	< 25	45
Cs-137	< 30	< 17	60

PNPP

Table 9. Fish, analyses for gamma emitting isotopes.
Collection: Semiannually — Units: pCi/kg wet

Location	P-25				
Lab Code	PEF- 1881	PEF- 1882	PEF- 2864	PEF- 2865	
Date Collected	06-01-23	06-01-23	09-21-23	09-21-23	Req. LLD
Sample Type	Smallmouth Bass	Walleye	White Sucker	Red Horse Sucker	
K-40	1718 ± 300	2127 ± 316	1133 ± 352	2184 ± 380	-
Mn-54	< 16	< 11	< 16	< 14	94
Fe-59	< 101	< 98	< 38	< 51	195
Co-58	< 26	< 19	< 26	< 17	97
Co-60	< 16	< 18	< 15	< 15	97
Zn-65	< 32	< 33	< 42	< 34	195
Cs-134	< 18	< 14	< 20	< 18	97
Cs-137	< 13	< 9	< 18	< 18	112

Location	P-25				
Lab Code	PEF- 2866	PEF- 2867	PEF- 2868	PEF- 2869	
Date Collected	09-11-23	09-21-23	09-21-23	09-21-23	Req. LLD
Sample Type	Gizzard Shad	Walleye	Yellow Perch	Freshwater Drum	
K-40	1204 ± 325	1327 ± 338	851 ± 215	1611 ± 282	-
Mn-54	< 14	< 15	< 14	< 12	94
Fe-59	< 30	< 30	< 44	< 58	195
Co-58	< 19	< 28	< 9	< 11	97
Co-60	< 8	< 33	< 27	< 15	97
Zn-65	< 37	< 41	< 30	< 28	195
Cs-134	< 20	< 19	< 14	< 18	97
Cs-137	< 12	< 26	< 22	< 7	112

Location	P-25	
Lab Code	PEF- 2870	
Date Collected	09-21-23	Req. LLD
Sample Type	White Perch	
K-40	1934 ± 273	-
Mn-54	< 11	94
Fe-59	< 47	195
Co-58	< 12	97
Co-60	< 9	97
Zn-65	< 19	195
Cs-134	< 14	97
Cs-137	< 13	112

PNPP

Table 9. Fish, analyses for gamma emitting isotopes.
Collection: Semiannually Units: pCi/kg wet

Location	P-32				
Lab Code	PEF- 1884	PEF- 1885	PEF- 1186	PEF- 1887	
Date Collected	06-01-23	06-01-23	06-01-23	06-29-23	Req. LLD
Sample Type	Golden Red Horse	White Perch	Yellow Perch	Walleye	
K-40	2055 ± 358	2652 ± 426	2011 ± 240	3797 ± 417	-
Mn-54	< 16	< 24	< 12	< 12	94
Fe-59	< 102	< 192	< 84	< 57	195
Co-58	< 32	< 42	< 19	< 18	97
Co-60	< 14	< 26	< 10	< 14	97
Zn-65	< 42	< 52	< 19	< 27	195
Cs-134	< 22	< 34	< 16	< 19	97
Cs-137	< 13	< 23	< 9	< 15	112

Location	P-32				
Lab Code	PEF- 2871	PEF- 2872	PEF- 2873	PEF- 2874	
Date Collected	09-21-23	09-21-23	09-21-23	09-21-23	Req. LLD
Sample Type	Channel Catfish	Gizzard	Walleye	Freshwater Drum	
K-40	812 ± 260	1063 ± 333	1428 ± 344	1377 ± 365	-
Mn-54	< 18	< 21	< 12	< 21	94
Fe-59	< 44	< 24	< 27	< 56	195
Co-58	< 25	< 32	< 20	< 18	97
Co-60	< 10	< 34	< 11	< 5	97
Zn-65	< 29	< 36	< 34	< 29	195
Cs-134	< 16	< 22	< 16	< 21	97
Cs-137	< 14	< 28	< 17	< 20	112

Location	P-32	
Lab Code	PEF- 2875	
Date Collected	09-21-23	Req. LLD
Sample Type	White Perch	
K-40	605 ± 251	-
Mn-54	< 16	94
Fe-59	< 51	195
Co-58	< 13	97
Co-60	< 14	97
Zn-65	< 26	195
Cs-134	< 15	97
Cs-137	< 12	112

PNPP

Table 11. Sediments, analyses for gamma emitting isotopes.

Collection: Semiannually — Units: pCi/kg dry

Location	P-64		
Lab Code	PEBS- 1299	PEBS- 3156	
Date Collected	05-09-23	10-10-23	Req. LLD
K-40	6850 ± 424	8291 ± 439	-
Co-58	< 15.3	< 13.8	50
Co-60	< 8.0	< 12.0	40
Cs-134	< 13.4	< 10.9	112
Cs-137	< 10.2	< 14.9	135

Location	P-66		
Lab Code	PEBS- 1300	PEBS- 3157	
Date Collected	05-09-23	10-10-23	Req. LLD
K-40	6983 ± 431	8232 ± 395	-
Co-58	< 13.7	< 17.0	50
Co-60	< 14.1	< 9.6	40
Cs-134	< 13.5	< 10.9	112
Cs-137	< 9.6	< 13.1	135