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L-23-122

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

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440
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, 2022 through December 31, 2022. 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,

A handwritten signature in black ink, appearing to read "Rod L. Penfield".

Rod Penfield

Enclosures:

A PNPP 2022 Annual Radiological Environmental Operating Report

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III

Enclosure A

L-23-122

PNPP 2022 Annual Radiological Environmental Operating Report



Annual Radiological Environmental Operating Report 2022

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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

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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

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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, 2022. 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.

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Direct radiation measurements showed no significant changes from previous years. The indicator locations averaged 15.8 mrem/quarter and control locations averaged 15.2 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].

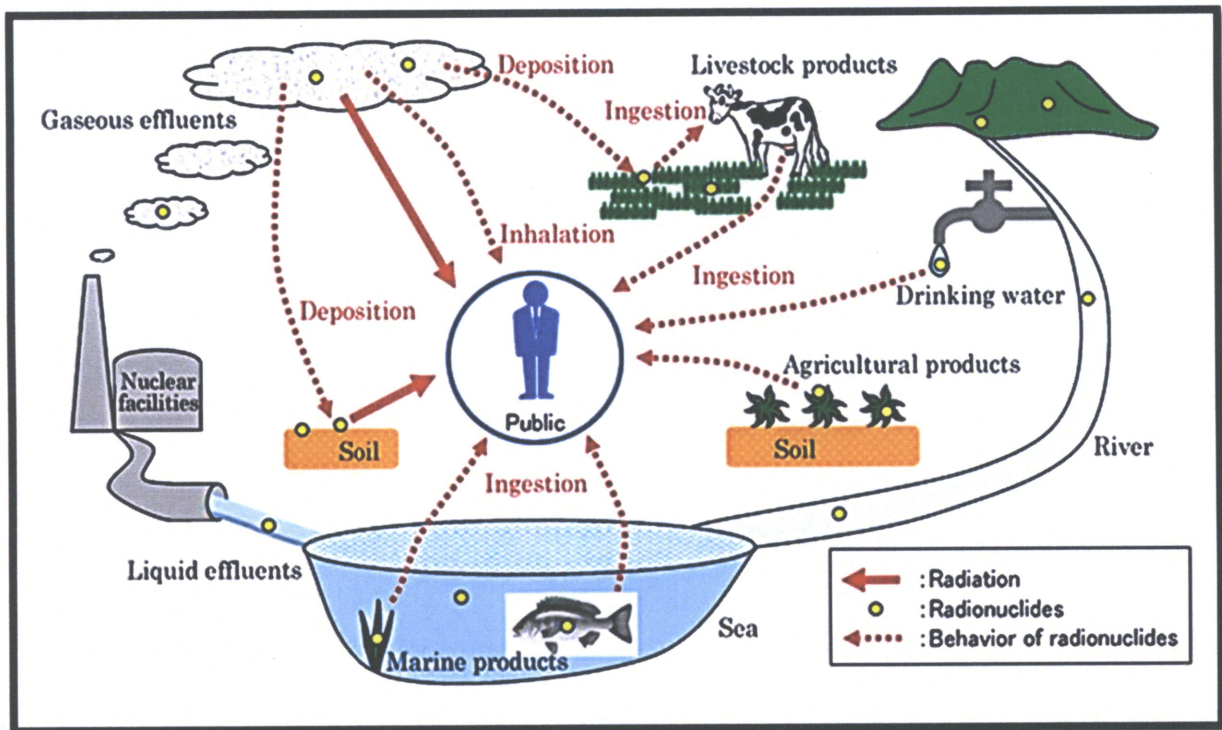


Figure 1: Potential exposure pathways to members of the public from plant operations [1].

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.

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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

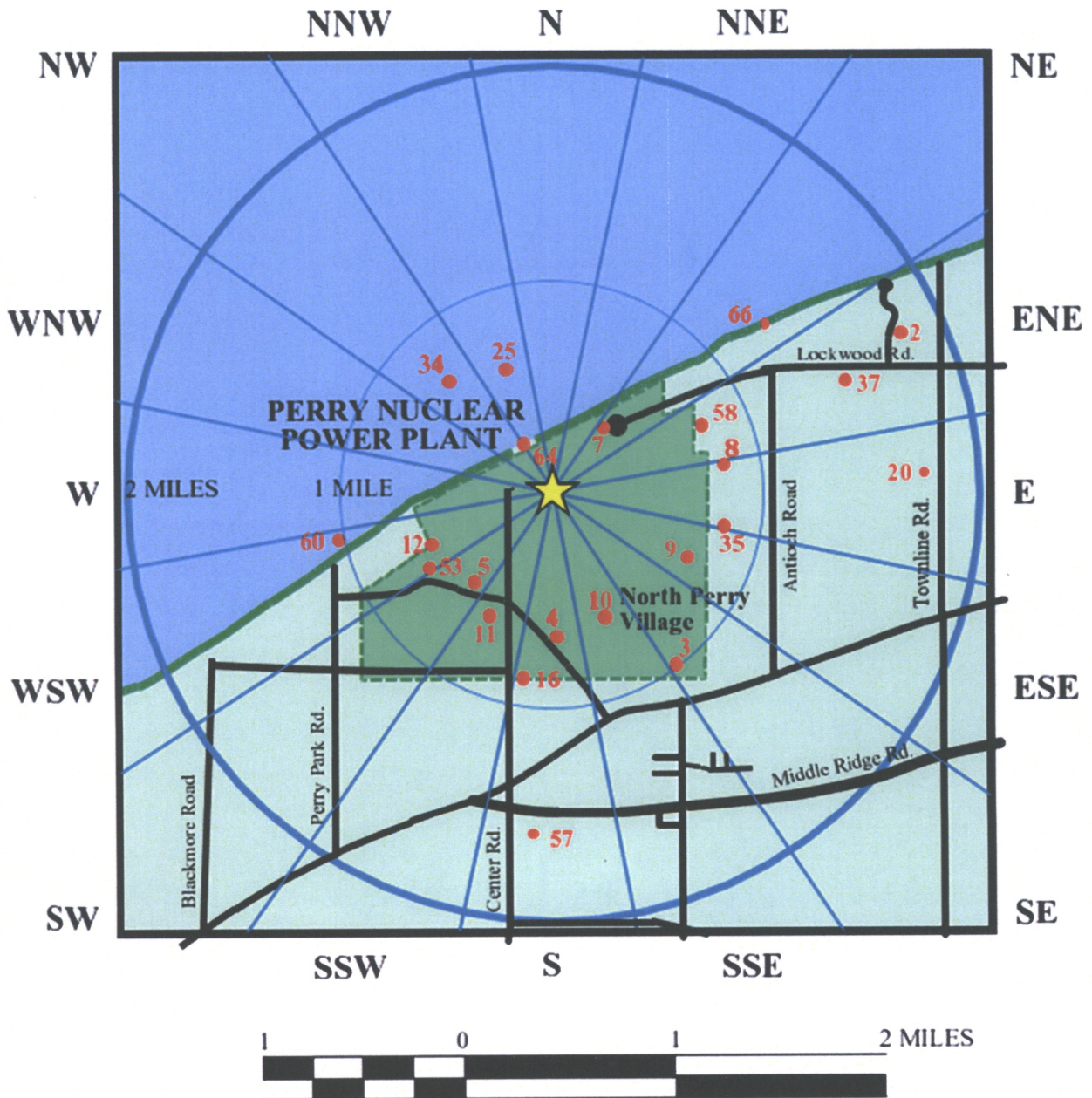


Figure 2: REMP Sample Locations within Two Miles of the Plant Site.

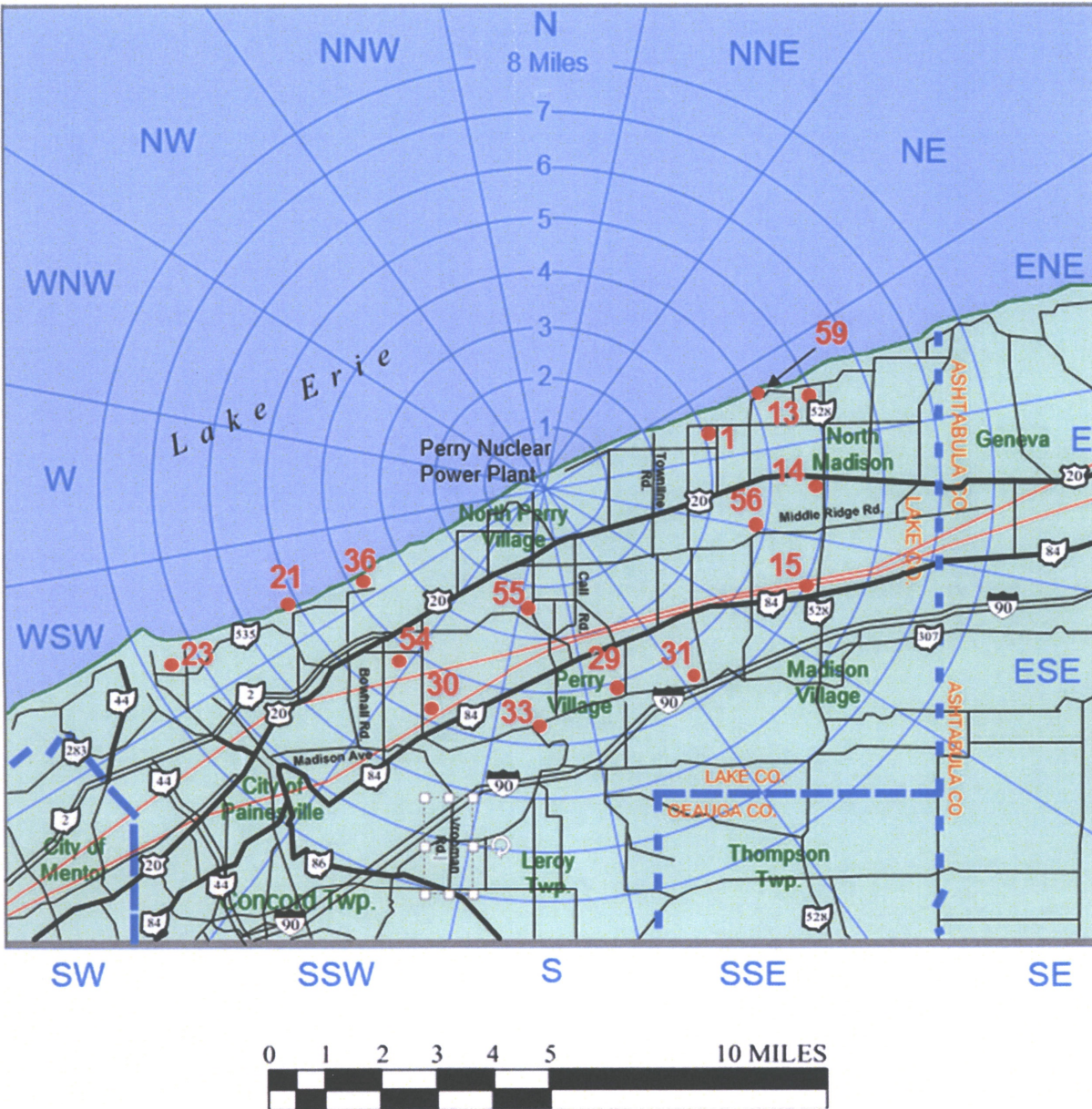


Figure 3: REMP Sampling Locations between Two and Eight Miles from the Plant Site

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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.

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, 2022 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.

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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.

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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.

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 364 air particulate and 364 air radioiodine samples were collected and analyzed.

Gross beta activity was detected in 363 of the 364 air samples. The average gross beta activity for indicator locations was 0.024 pCi/m³ and the controls was 0.025 pCi/m³. 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 2022 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.

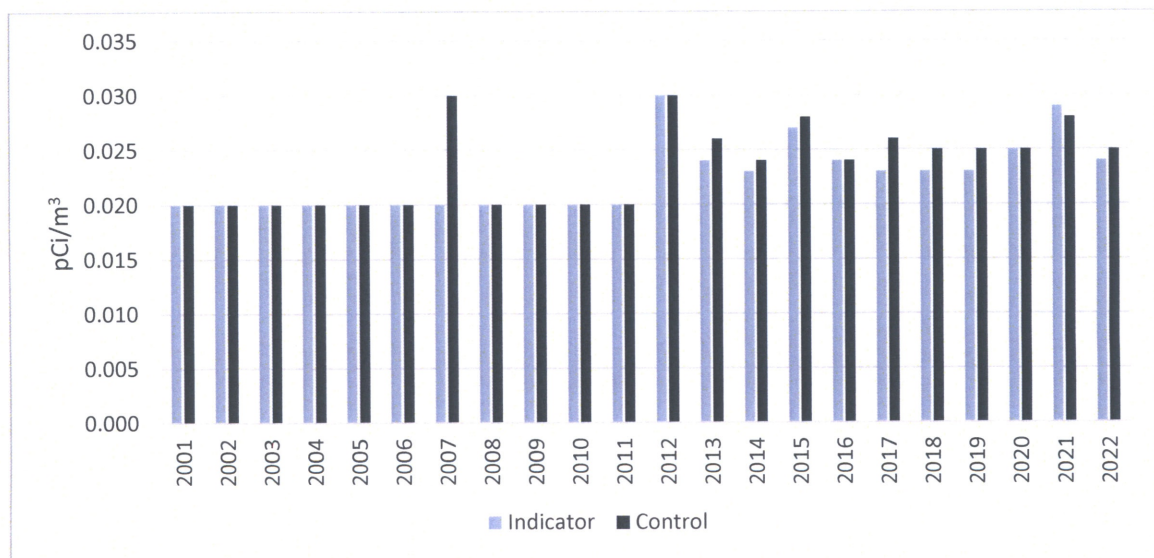


Figure 5: Air Particulate and Radioiodine Comparison of Current Year and Historic Data

Air particulate and radioiodine results from this monitoring period, 2022, 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 and Radioiodine Comparison of Current Year and Historic Data

Pre-Operational (pCi/m ³)	2022 Sample Result Average (pCi/m ³)
0.023	0.024

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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.

Seventy-five (75) 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.

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.

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Gross beta activity was detected in 31 of the 60 samples collected. The indicator annual average gross beta activity was 1.4 pCi/L and the control average gross beta activity was 1.2 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 10 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 230.5 pCi/L.

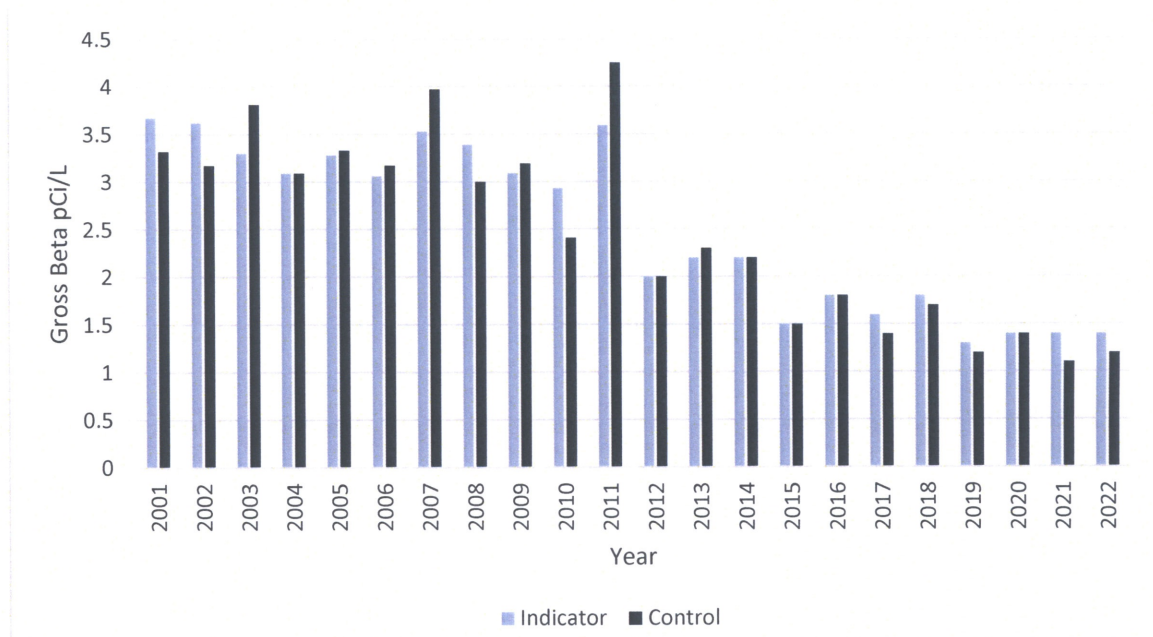


Figure 6: Annual Average Gross Beta Activity in Water

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 in May, June, and October of 2022 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.

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Sixteen (16) fish samples were collected and analyzed: 10 indicator and 6 control samples. The species were smallmouth bass, yellow perch, walleye, white perch, freshwater drum, channel catfish, redhorse sucker, and gizzard shad. 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 59.6 mrem versus 59.2 mrem for the control locations. The average quarterly dose for the indicator locations was 15.9 mrem versus 15.2 mrem for the control locations. Refer to Figure 7 for the average quarterly TLD dose rates for both indicator and control locations.

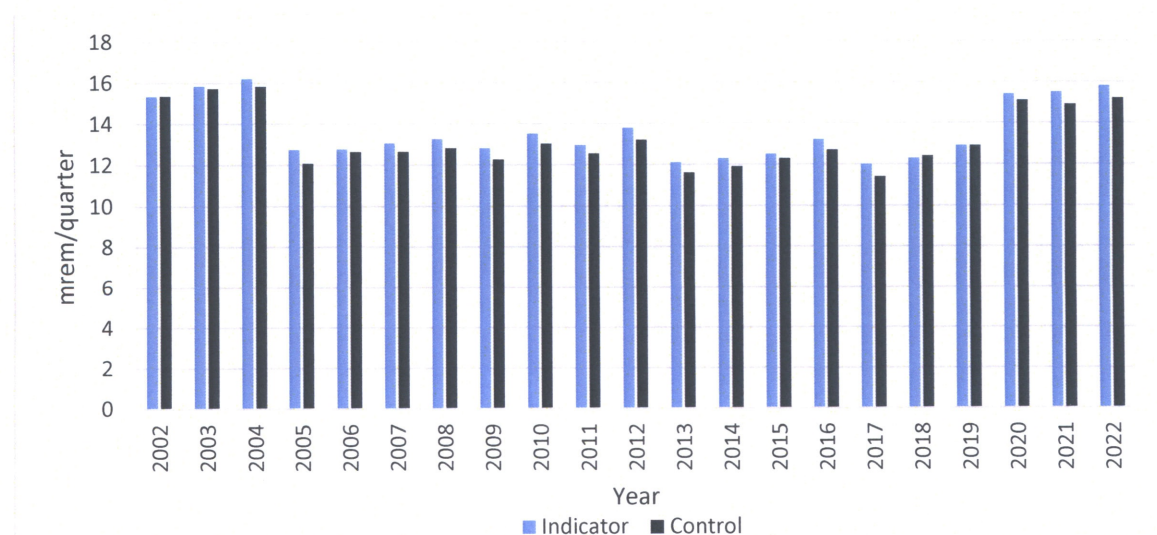


Figure 7: Average Quarterly TLD Dose

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. There is no detectable radiological effect on the surrounding environment due to operation of the Perry Nuclear Power Plant.

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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.

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The Land Use Census was conducted in September 2022. 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 2021 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.

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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

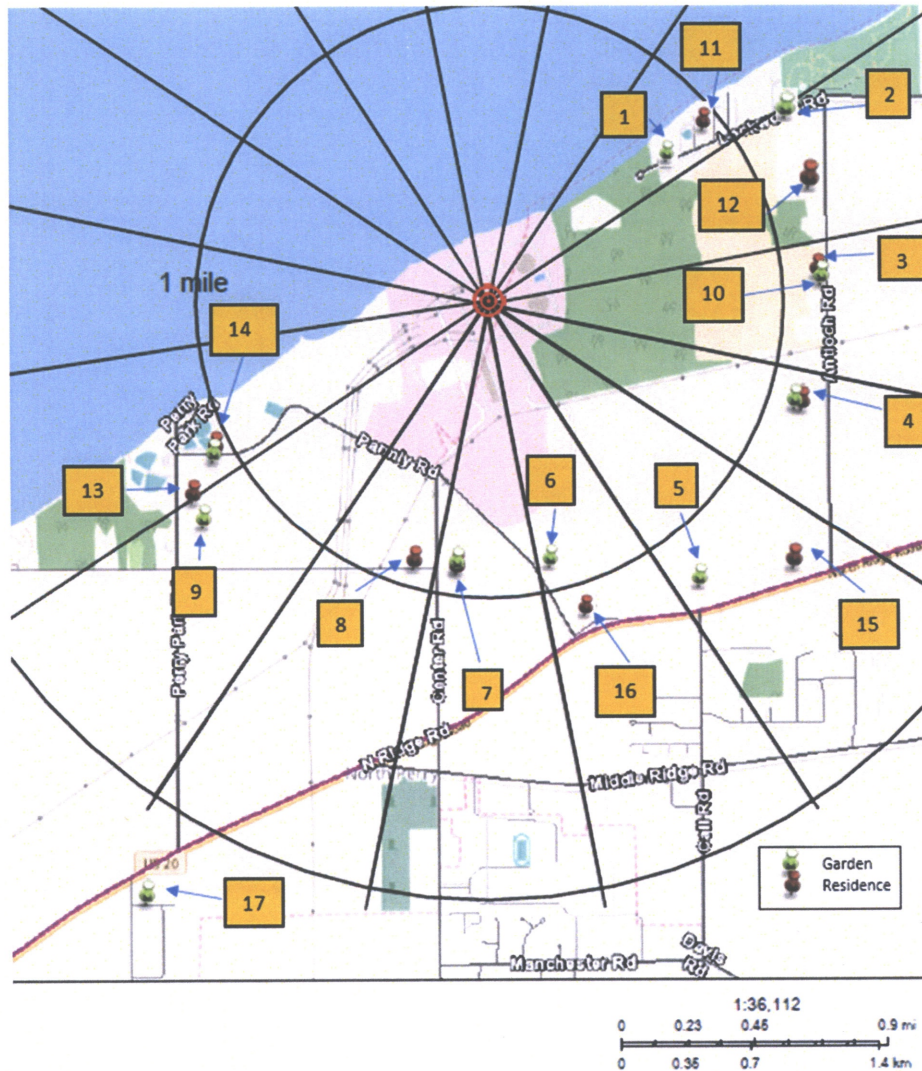


Figure 8: Land Use Census Map

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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

There were no ODCM non-compliances for 2022.

14.1 Introduction

Sampling and analysis are performed for media types addressed in the Offsite Dose Calculation Manual. 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 2022, 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 have altered 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).

14.2 Sampling Challenges and Deviations

There was no sample unavailability in 2022. No sampling deviations occurred in 2022.

14.3 Corrections to Previous Reports

There was one correction identified for the 2021 AREOR regarding a missed broadleaf vegetation sample.

August 2021 broadleaf vegetation sampling was obtained outside the ODCM-allowed grace period. On September 2, 2021, the vendor contacted the PNPP REMP Specialist to note they had not yet received the August vegetation samples for analysis.

¹ Mean and range are based on detectable measurements only.

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When the specialist investigated with the shipping company, it was found that the shipping company had disposed of the original sample because the box had become wet. The shipping company had no record of contacting PNPP to notify the site that the package had been disposed of.

The Specialist resampled vegetation on September 2, 2021 and shipped the samples to the vendor analysis lab. The resample date fell outside of the ODCM-required 31-day sampling frequency. This late sample should have been identified as a missed sample in the 2021 AREOR report. The analysis results from the replacement samples were analyzed by the vendor lab and were included in the 2021 AREOR report.

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¹ Mean and range are based on detectable measurements only.

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Attachment 1: Inter-Laboratory Cross Check Comparison Program Results



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, 2021 through September, 2022

¹ Mean and range are based on detectable measurements only.

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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.

¹ Mean and range are based on detectable measurements only.

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

¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

RAD study						
Lab Code	Date	Analysis	Concentration (pCi/L)			Acceptance
			Laboratory Result	ERA Result	Control Limits	
RAD-128 Study						
ERDW-95	1/10/2022	Ba-133	67.4 ± 4.3	63.0	52.4 - 69.4	Pass
ERDW-95	1/10/2022	Cs-134	82.6 ± 4.1	84.9	69.6 - 93.4	Pass
ERDW-95	1/10/2022	Cs-137	35.4 ± 4.6	29.3	25.2 - 35.3	Fail ^b
ERDW-95	1/10/2022	Co-60	104 ± 4	102	91.8 - 114	Pass
ERDW-95	1/10/2022	Zn-65	356 ± 13	312	281 - 384	Pass
ERDW-97	1/10/2022	Gr. Alpha	30.9 ± 2.2	32.5	16.6 - 42.1	Pass
ERDW-97	1/10/2022	Gr. Beta	62.9 ± 2.3	68.3	47.4 - 75.1	Pass
ERDW-99	1/10/2022	Ra-226	8.40 ± 0.72	9.53	7.14 - 11.1	Pass
ERDW-99	1/10/2022	Ra-228	7.25 ± 2.32	8.71	5.59 - 11.0	Pass
ERDW-99	1/10/2022	Uranium	70.9 ± 2.3	69.0	56.4 - 75.9	Pass
ERDW-95	1/10/2022	H-3	23,600 ± 700	22,200	19,500 - 24,400	Pass
RAD-130 Study						
ERDW-2087	8/25/2022	Ba-133	37.2 ± 3.9	38.2	30.9 - 42.8	Pass
ERDW-2087	8/25/2022	Cs-134	81.8 ± 3.9	88.6	72.7 - 97.5	Pass
ERDW-2087	8/25/2022	Cs-137	174 ± 6	170	153 - 189	Pass
ERDW-2087	8/25/2022	Co-60	76.9 ± 4.0	72.4	65.2 - 82.1	Pass
ERDW-2087	8/25/2022	Zn-65	349 ± 3	326	293 - 380	Pass
ERDW-2087	8/25/2022	Gr. Alpha	52.8 ± 2.4	60.2	31.5 - 74.8	Pass
ERDW-2087	8/25/2022	Gr. Beta	18.7 ± 1.0	17.7	10.1 - 25.9	Pass
ERDW-2091	8/25/2022	Ra-226	9.23 ± 0.57	13.1	9.77 - 15.1	Fail ^c
ERDW-2091	8/25/2022	Ra-228	8.72 ± 1.49	8.40	5.38 - 10.6	Pass
ERDW-2095	8/25/2022	H-3	23,900 ± 481	22,100	19,400 - 24,300	Pass
ERDW-2089	8/25/2022	I-131	30.8 ± 1.0	27.1	23.0 - 32.5	Pass
090622D Study						
ERDW-2091	9/6/2022	Ra-226	21.5 ± 1.1	19.3	14.3 - 22.0	Pass ^c

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

^b The cesium-137 result did not meet ERA acceptance criteria. It is believed that detector drift could have contributed to the original Cs-137 result landing outside the upper acceptance limit.

^c The radium-226 result did not meet ERA acceptance criteria. A Quick response PT sample was ordered. The results were within the acceptance criteria. The reason for the earlier failing result is not known.

Company: Energy Harbor

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TABLE A-2. Thermoluminescent Dosimetry, (TLD, CaSO₄: Dy Cards).^a

Lab Code	Irradiation Date	Description	mrem		Performance ^c Quotient (P)	
			Delivered Dose	Reported ^b Dose		
<u>Environmental, Inc.</u>		Group 1				
2021-1	11/8/2021	Spike 1	167.0	171.4	0.03	
2021-1	11/8/2021	Spike 2	167.0	159.4	-0.05	
2021-1	11/8/2021	Spike 3	167.0	160.8	-0.04	
2021-1	11/8/2021	Spike 4	167.0	164.5	-0.01	
2021-1	11/8/2021	Spike 5	167.0	156.7	-0.06	
2021-1	11/8/2021	Spike 6	167.0	152.3	-0.09	
2021-1	11/8/2021	Spike 7	167.0	158.7	-0.05	
2021-1	11/8/2021	Spike 8	167.0	161.6	-0.03	
2021-1	11/8/2021	Spike 9	167.0	152.4	-0.09	
2021-1	11/8/2021	Spike 10	167.0	155.7	-0.07	
2021-1	11/8/2021	Spike 11	167.0	158.8	-0.05	
2021-1	11/8/2021	Spike 12	167.0	163.1	-0.02	
2021-1	11/8/2021	Spike 13	167.0	162.2	-0.03	
2021-1	11/8/2021	Spike 14	167.0	158.8	-0.05	
2021-1	11/8/2021	Spike 15	167.0	173.5	0.04	
2021-1	11/8/2021	Spike 16	167.0	158.7	-0.05	
2021-1	11/8/2021	Spike 17	167.0	162.9	-0.02	
2021-1	11/8/2021	Spike 18	167.0	159.3	-0.05	
2021-1	11/8/2021	Spike 19	167.0	158.2	-0.05	
2021-1	11/8/2021	Spike 20	167.0	161.7	-0.03	
Mean (Spike 1-20)				160.5	-0.04	Pass ^d
Standard Deviation (Spike 1-20)				5.2	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 $((\text{reported dose} - \text{conventionally true value}) / \text{conventionally true value})$ 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, CaSO₄: Dy Cards).^a

Lab Code	Irradiation Date	Description	mrem		Performance ^c Quotient (P)	
			Delivered Dose	Reported ^b Dose		
<u>Environmental, Inc.</u>		Group 2				
2021-2	11/8/2021	Spike 21	102.0	98.3	-0.04	
2021-2	11/8/2021	Spike 22	102.0	88.4	-0.13	
2021-2	11/8/2021	Spike 23	102.0	96.7	-0.05	
2021-2	11/8/2021	Spike 24	102.0	101.4	-0.01	
2021-2	11/8/2021	Spike 25	102.0	98.5	-0.03	
2021-2	11/8/2021	Spike 26	102.0	96.3	-0.06	
2021-2	11/8/2021	Spike 27	102.0	95.8	-0.06	
2021-2	11/8/2021	Spike 28	102.0	94.3	-0.08	
2021-2	11/8/2021	Spike 29	102.0	93.5	-0.08	
2021-2	11/8/2021	Spike 30	102.0	95.7	-0.06	
2021-2	11/8/2021	Spike 31	102.0	101.7	0.00	
2021-2	11/8/2021	Spike 32	102.0	98.5	-0.03	
2021-2	11/8/2021	Spike 33	102.0	96.7	-0.05	
2021-2	11/8/2021	Spike 34	102.0	87.2	-0.15	
2021-2	11/8/2021	Spike 35	102.0	89.7	-0.12	
2021-2	11/8/2021	Spike 36	102.0	88.5	-0.13	
2021-2	11/8/2021	Spike 37	102.0	85.4	-0.16	
2021-2	11/8/2021	Spike 38	102.0	90.0	-0.12	
2021-2	11/8/2021	Spike 39	102.0	90.9	-0.11	
2021-2	11/8/2021	Spike 40	102.0	92.6	-0.09	
Mean (Spike 21-40)				94.0	-0.08	Pass ^d
Standard Deviation (Spike 21-40)				4.7	0.05	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.

¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code ^b	Date	Analysis	Concentration ^a				Acceptance	Ratio Lab/Known
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d			
SPDW-3157	10/1/2021	H-3	2,111 ± 158	2,110	1,688 - 2,532	Pass	1.00	
SPDW-3393	10/15/2021	H-3	2,184 ± 161	2,110	1,688 - 2,532	Pass	1.04	
SPDW-3604	10/28/2021	H-3	2,104 ± 158	2,110	1,688 - 2,532	Pass	1.00	
SPDW-30283	11/4/2021	Ra-226	11.7 ± 0.3	12.3	8.6 - 16.0	Pass	0.95	
SPDW-3769	11/10/2021	H-3	2,026 ± 156	2,110	1,688 - 2,532	Pass	0.96	
SPDW-3860	11/18/2021	H-3	2,161 ± 161	2,110	1,688 - 2,532	Pass	1.02	
SPDW-30290	11/22/2021	Ra-226	12.0 ± 0.3	12.3	8.6 - 16.0	Pass	0.97	
SPDW-3958	12/3/2021	H-3	2,126 ± 160	2,110	1,688 - 2,532	Pass	1.01	
SPW-3971	12/7/2021	Sr-90	19.0 ± 1.2	17.1	13.7 - 20.5	Pass	1.11	
SPDW-30287	12/9/2021	Ra-228	12.3 ± 1.7	15.3	10.7 - 19.9	Pass	0.80	
SPDW-30295	12/16/2021	H-3	2,265 ± 163	2,110	1,688 - 2,532	Pass	1.07	
SPDW-30301	12/30/2021	H-3	2,055 ± 163	2,110	1,688 - 2,532	Pass	0.97	
SPDW-30307	12/13/2021	Ra-226	11.7 ± 0.4	12.3	8.6 - 16.0	Pass	0.95	
SPDW-30305	1/5/2022	Gr. Alpha	3.9 ± 0.8	6.3	3.1 - 9.4	Pass	0.62	
SPDW-30305	1/5/2022	Gr. Beta	65.5 ± 1.6	75.9	60.7 - 91.1	Pass	0.86	
SPDW-40000	1/7/2022	H-3	2,220 ± 162	2,110	1,688 - 2,532	Pass	1.05	
SPDW-40013	1/6/2022	Ra-226	12.7 ± 0.3	12.3	8.6 - 16.0	Pass	1.03	
SPDW-40014	7/12/2021	H-3	11,681 ± 345	10,400	8,320 - 12,480	Pass	1.12	
SPDW-40015	7/12/2021	H-3	11,318 ± 340	10,400	8,320 - 12,480	Pass	1.09	
SPDW-40022	2/3/2022	Ra-228	14.5 ± 3.9	15.3	10.7 - 19.9	Pass	0.95	
SPDW-40024	2/4/2022	H-3	10,502 ± 321	10,400	8,320 - 12,480	Pass	1.01	
SPDW-40025	1/11/2021	H-3	2,278 ± 176	2,110	1,688 - 2,532	Pass	1.08	
SPDW-40026	1/11/2021	H-3	2,291 ± 176	2,110	1,688 - 2,532	Pass	1.09	
SPDW-40028	2/11/2022	H-3	10,594 ± 322	10,400	8,320 - 12,480	Pass	1.02	
SPDW-40037	2/25/2022	H-3	10,724 ± 322	10,400	8,320 - 12,480	Pass	1.03	
SPDW-40045	3/3/2022	Sr-90	19.2 ± 1.1	17.1	13.7 - 20.5	Pass	1.12	
SPDW-40052	3/10/2022	H-3	10,851 ± 328	10,400	8,320 - 12,480	Pass	1.04	
SPDW-40064	3/18/2022	H-3	10,795 ± 332	10,400	8,320 - 12,480	Pass	1.04	
SPDW-40073	3/22/2022	Ra-228	15.1 ± 2.4	13.4	9.4 - 17.4	Pass	1.13	
SPDW-40075	1/28/2022	Ra-226	12.2 ± 0.3	12.3	8.6 - 16.0	Pass	0.99	
SPDW-40078	3/14/2022	U-234	28.0 ± 2.0	23.0	16.1 - 29.9	Pass	1.22	
SPDW-40078	3/14/2022	U-238	29.9 ± 2.1	23.2	16.2 - 30.2	Pass	1.29	
SPW-598	3/24/2022	Fe-55	10,505 ± 1,100	10006	8005 - 12007	Pass	1.05	
SPDW-40087	3/24/2022	Ra-226	14.4 ± 0.4	12.3	8.6 - 16.0	Pass	1.17	
LCS-032222	1/10/2022	Ba-133	65.4 ± 6.5	63.0	50 - 76	Pass	1.04	
LCS-032222	1/10/2022	Cs-134	87.7 ± 6.0	84.9	68 - 102	Pass	1.03	
LCS-032222	1/10/2022	Cs-137	34.2 ± 6.6	29.3	23 - 35	Pass	1.17	
LCS-032222	1/10/2022	Co-60	106 ± 6	102	82 - 122	Pass	1.04	
LCS-032222	1/10/2022	Zn-65	341 ± 18	312	250 - 374	Pass	1.09	

^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.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code ^b	Date	Analysis	Concentration ^a				Acceptance	Ratio Lab/Known
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d			
SPDW-40083	4/1/2022	H-3	10,785 ± 329	10,400	8,320 - 12,480	Pass	1.04	
LCS-W-4/6/2022	1/10/2022	Ba-133	60.4 ± 7.6	63.0	50.4 - 75.6	Pass	0.96	
LCS-W-4/6/2022	1/10/2022	Cs-134	91.4 ± 6.8	84.9	67.9 - 102	Pass	1.08	
LCS-W-4/6/2022	1/10/2022	Cs-137	31.7 ± 8.5	29.3	23.4 - 35.2	Pass	1.08	
LCS-W-4/6/2022	1/10/2022	Co-60	111 ± 7	102	81.6 - 122	Pass	1.08	
LCS-W-4/6/2022	1/10/2022	Zn-65	330 ± 28	312	250 - 374	Pass	1.06	
LCS-SO-04/08/22	8/1/2020	Cs-134	17,126 ± 176	19,189	15351 - 23027	Pass	0.89	
LCS-SO-04/08/22	8/1/2020	Co-57	29,070 ± 356	29,730	23784 - 35676	Pass	0.98	
LCS-SO-04/08/22	8/1/2020	Co-60	27,057 ± 166	27,027	21622 - 32432	Pass	1.00	
LCS-SO-04/08/22	8/1/2020	Mn-54	17,886 ± 455	16,486	13189 - 19783	Pass	1.08	
LCS-SO-04/08/22	8/1/2020	K-40	18,799 ± 685	16,810	13448 - 20172	Pass	1.12	
LCS-SO-04/08/22	8/1/2020	Zn-65	14,460 ± 754	12,703	10162 - 15244	Pass	1.14	
SPDW-40085	4/4/2022	Sr-90	17.3 ± 1.1	17.1	13.7 - 20.5	Pass	1.01	
SPDW-40089	4/8/2022	H-3	10,677 ± 326	10,400	8,320 - 12,480	Pass	1.03	
SPDW-40130	4/8/2022	Ra-226	11.4 ± 0.3	12.3	8.6 - 16.0	Pass	0.93	
SPDW-40098	4/11/2022	Gr. Alpha	6.7 ± 1.1	6.3	3.1 - 9.4	Pass	1.07	
SPDW-40098	4/11/2022	Gr. Beta	71.7 ± 1.7	75.9	60.7 - 91.1	Pass	0.94	
SPDW-40102	4/14/2022	H-3	10,369 ± 323	10,400	8,320 - 12,480	Pass	1.00	
SPDW-40132	5/3/2022	H-3	10,834 ± 329	10,400	8,320 - 12,480	Pass	1.04	
SPDW-40142	5/5/2022	Ra-226	11.6 ± 0.4	12.3	8.6 - 16.0	Pass	0.94	
SPDW-40139	5/18/2022	H-3	10,465 ± 322	10,400	8,320 - 12,480	Pass	1.01	
SPDW-40147	5/9/2022	Gr. Alpha	22.1 ± 1.2	32.5	16.3 - 48.8	Pass	0.68	
SPDW-40147	5/9/2022	Gr. Beta	63.1 ± 1.6	62.9	50.3 - 75.5	Pass	1.00	
SPDW-40157	5/25/2022	Ra-226	10.1 ± 0.3	12.3	8.6 - 16.0	Pass	0.82	
SPW-1856	6/14/2022	Sr-90	17.4 ± 2.9	17.1	13.7 - 20.5	Pass	1.02	
SPDW-40164	6/21/2022	Ra-228	14.2 ± 1.8	13.4	9.4 - 17.4	Pass	1.06	
SPDW-40177	6/30/2022	Ra-226	12.1 ± 0.3	12.3	8.6 - 16.0	Pass	0.98	
SPW-1881	6/27/2022	Tc-99	97.1 ± 1.7	107.8	75.5 - 140.1	Pass	0.90	
SPDW-40253	7/12/2022	Ra-226	11.6 ± 0.3	12.3	8.6 - 16.0	Pass	0.94	
SPW-40179	7/15/2022	H-3	10,467 ± 324	10,400	8,320 - 12,480	Pass	1.01	
SPDW-40200	7/26/2022	Gr. Alpha	21.1 ± 1.3	32.5	16.3 - 48.8	Pass	0.65	
SPDW-40200	7/26/2022	Gr. Beta	61.0 ± 1.6	62.9	50.3 - 75.5	Pass	0.97	
SPDW-40220	7/29/2022	H-3	10,553 ± 326	10,400	8,320 - 12,480	Pass	1.01	
SPDW-40212	8/9/2022	Ra-228	14.5 ± 2.3	13.4	9.4 - 17.4	Pass	1.08	
SPDW-40220	8/16/2022	H-3	10,613 ± 326	10,400	8,320 - 12,480	Pass	1.02	
SPDW-40239	8/22/2022	Gr. Alpha	37.1 ± 2.0	60.2	31.5 - 74.8	Pass	0.62	
SPDW-40239	8/22/2022	Gr. Beta	16.6 ± 0.9	17.7	10.1 - 25.9	Pass	0.94	
SPDW-40255	8/12/2022	Ra-226	9.1 ± 0.3	12.3	8.6 - 16.0	Pass	0.74	

^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.

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¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-3. Intralaboratory "Spiked" Samples

Lab Code ^b	Date	Analysis	Concentration ^a			Acceptance	Ratio Lab/Known
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d		
SPDW-40265	9/2/2022	H-3	10,555 ± 325	10,400	8,320 - 12,480	Pass	1.01
SPDW-40267	9/6/2022	Ra-228	14.0 ± 1.4	13.4	9.4 - 17.4	Pass	1.04
SPDW-40283	9/9/2022	H-3	10,059 ± 318	10,400	8,320 - 12,480	Pass	0.97
SPDW-40300	8/31/2022	Ra-226	11.2 ± 0.3	12.3	8.6 - 16.0	Pass	0.91
SPMI-2918	9/19/2022	Sr-90	17.9 ± 1.0	17.1	13.7 - 20.5	Pass	1.05
SPDW-40321	9/20/2022	Ra-226	13.2 ± 0.5	12.3	8.6 - 16.0	Pass	1.07
SPDW-40305	9/21/2022	Ra-228	12.5 ± 1.8	13.4	9.4 - 17.4	Pass	0.93

^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.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-4. Intralaboratory "Blank" Samples

Lab Code ^b	Sample Type	Date	Analysis ^c	Concentration ^a		Acceptance Criteria (4.66 σ)
				Laboratory results (4.66 σ)		
				LLD	Activity ^d	
SPDW-3156	Water	10/1/2021	H-3	161	-11 ± 75	200
SPDW-3289	Water	10/12/2021	Gr. Alpha	0.40	0.21 ± 0.30	2
SPDW-3289	Water	10/12/2021	Gr. Beta	0.72	0.31 ± 0.52	4
SPDW-3392	Water	10/15/2021	H-3	158	58 ± 79	200
SPDW-3603	Water	10/28/2021	H-3	163	26 ± 77	200
SPDW-30282	Water	11/4/2021	Ra-226	0.04	0.04 ± 0.03	2
SPDW-3768	Water	11/10/2021	H-3	162	31 ± 77	200
SPDW-3859	Water	11/18/2021	H-3	162	45 ± 78	200
SPDW-30289	Water	11/22/2021	Ra-226	0.03	0.19 ± 0.03	2
SPDW-3957	Water	12/3/2021	H-3	161	118 ± 84	200
SPW-3970	Water	12/7/2021	Sr-89	0.54	-0.12 ± 0.43	5
SPW-3970	Water	12/7/2021	Sr-90	0.54	0.08 ± 0.26	1
SPDW-30286	Water	12/9/2021	Ra-228	0.91	-0.26 ± 0.39	2
SPDW-30288	Water	12/10/2021	I-131	0.22	0.00 ± 0.12	1
SPDW-30306	Water	12/13/2021	Ra-226	0.05	-0.05 ± 0.04	2
SPDW-30294	Water	12/16/2021	H-3	162	-33 ± 73	200
SPDW-30300	Water	12/30/2021	H-3	166	68 ± 91	200
SPDW-30304	Water	1/5/2022	Gr. Alpha	0.47	0.07 ± 0.33	2
SPDW-30304	Water	1/5/2022	Gr. Beta	0.77	0.33 ± 0.55	4
SPDW-40001	Water	1/7/2022	H-3	156	3 ± 75	200
SPDW-40012	Water	1/6/2022	Ra-226	0.06	-0.08 ± 0.05	2
SPDW-40016	Water	7/12/2021	H-3	165	-41 ± 85	200
SPDW-40017	Water	7/21/2021	H-3	165	0 ± 87	200
SPDW-40021	Water	2/3/2022	Ra-228	1.15	0.20 ± 0.56	2
SPDW-40023	Water	2/4/2022	H-3	162	78 ± 81	200
SPDW-40027	Water	2/11/2022	H-3	168	26 ± 85	200
SPDW-40036	Water	2/25/2022	H-3	160	55 ± 78	200
SPDW-40044	Water	3/3/2022	Sr-89	0.62	0.20 ± 0.44	5
SPDW-40044	Water	3/3/2022	Sr-90	0.60	-0.18 ± 0.26	1
SPDW-40046	Water	3/3/2022	I-131	0.12	0.04 ± 0.08	1
SPDW-40051	Water	3/10/2022	H-3	161	17 ± 78	200
SPDW-40063	Water	3/18/2022	H-3	177	60 ± 96	200
SPDW-40072	Water	3/22/2022	Ra-228	1.20	0.29 ± 0.56	2
SPDW-40074	Water	1/28/2022	Ra-226	0.06	0.08 ± 0.14	2
SPDW-40077	Water	3/14/2022	U-234	0.19	0.17 ± 0.20	1
SPDW-40077	Water	3/14/2022	U-238	0.19	-0.04 ± 0.14	1
SPW-597	Water	3/31/2022	Fe-55	1159	92 ± 708	2000
SPDW-40081	Water	3/30/2022	Ra-228	1.66	0.19 ± 0.79	2
SPDW-40082	Water	4/1/2022	H-3	170	60 ± 85	200
SPDW-40084	Water	4/4/2022	Sr-89	0.51	0.28 ± 0.41	5

^a Liquid sample results are reported in pCi/Liter, air filters (pCi/m³), 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.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-4. Intralaboratory "Blank" Samples

Lab Code ^b	Sample Type	Date	Analysis ^c	Concentration ^a		
				Laboratory results (4.66σ)		Acceptance Criteria (4.66 σ)
				LLD	Activity ^d	
SPDW-40084	Water	4/4/2022	Sr-90	0.55	0.01 ± 0.25	1
SPDW-40088	Water	4/8/2022	H-3	166.00	66.00 ± 83.00	200
SPDW-40129	Water	4/8/2022	Ra-226	0.01	0.11 ± 0.02	2
SPDW-40098	Water	4/11/2022	Gr. Alpha	0.42	0.06 ± 0.30	2
SPDW-40098	Water	4/11/2022	Gr. Beta	0.75	-0.73 ± 0.50	4
SPDW-40101	Water	4/14/2022	H-3	164	37 ± 84	200
SPDW-40120	Water	4/22/2022	H-3	109	74 ± 84	200
SPDW-40131	Water	5/3/2022	H-3	165	75 ± 86	200
SPDW-40141	Water	5/5/2022	Ra-226	0.08	0.01 ± 0.07	2
SPU-1297	Urine	5/12/2022	H-3	1325	674 ± 733	200
SPDW-40138	Water	5/18/2022	H-3	163	69 ± 80	200
SPDW-40156	Water	5/25/2022	Ra-226	0.04	0.09 ± 0.03	2
SPW-1855	Water	6/14/2022	Sr-89	0.63	0.02 ± 0.49	5
SPW-1855	Water	6/14/2022	Sr-90	0.57	0.00 ± 0.26	1
SPDW-40172	Water	6/14/2022	Ra-226	0.03	0.06 ± 0.03	2
SPDW-40163	Water	6/21/2022	Ra-228	0.84	0.30 ± 0.43	2
SPW-1876	Water	6/27/2022	C-14	9.99	-9.14 ± 5.92	200
SPW-1878	Water	6/27/2022	Fe-55	522	-200 ± 306	2000
SPW-1880	Water	6/27/2022	Tc-99	11.4	-6.0 ± 6.8	200
SPW-1891	Water	6/28/2022	Ni-63	75.9	0.0 ± 46.1	200
SPDW-40176	Water	6/30/2022	Ra-226	0.04	0.06 ± 0.04	2
SPDW-40252	Water	7/12/2022	Ra-226	0.04	-0.06 ± 0.10	2
SPDW-40178	Water	7/15/2022	H-3	167	58 ± 83	200
SPW-2220	Water	7/21/2022	C-14	3.52	-3.15 ± 2.09	200
SPDW-40199	Water	7/26/2022	Gr. Alpha	0.80	0.47 ± 0.58	2
SPDW-40199	Water	7/26/2022	Gr. Beta	0.77	0.98 ± 0.57	4
SPDW-40207	Water	7/29/2022	H-3	161	-21 ± 84	200
SPDW-40211	Water	8/9/2022	Ra-228	1.23	0.20 ± 0.59	2
SPDW-40219	Water	8/16/2022	H-3	161	68 ± 80	200
SPDW-40238	Water	8/22/2022	Gr. Alpha	0.47	0.05 ± 0.34	2
SPDW-40238	Water	8/22/2022	Gr. Beta	0.75	0.34 ± 0.54	4
SPDW-40263	Water	9/2/2022	I-131	0.17	-0.05 ± 0.09	1
SPDW-40264	Water	9/2/2022	H-3	162	82 ± 81	200
SPDW-40264	Water	9/6/2022	Ra-228	1.11	-0.22 ± 0.49	2
SPDW-40282	Water	9/9/2022	H-3	163	71 ± 83	200
SPDW-40291	Water	9/16/2022	I-131	0.11	-0.01 ± 0.08	1
SPMI-2917	Milk	9/19/2022	Sr-89	0.58	0.03 ± 0.47	5
SPMI-2917	Milk	9/19/2022	Sr-90	0.51	0.30 ± 0.27	1
SPDW-40304	Water	9/21/2022	Ra-228	0.87	0.09 ± 0.41	2
SPDW-40311	Water	9/30/2022	I-131	0.15	0.00 ± 0.08	1

^a Liquid sample results are reported in pCi/Liter, air filters (pCi/m³), 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.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-5. Intralaboratory "Duplicate" Samples

Lab Code ^b	Date	Analysis	Concentration ^a		Averaged Result	Acceptance
			First Result	Second Result		
DW-30256,30257	10/8/2021	Gr. Alpha	2.35 ± 0.79	2.71 ± 0.92	2.53 ± 0.61	Pass
S-3279,3280	10/11/2021	K-40	10.08 ± 0.58	9.18 ± 0.53	9.63 ± 0.39	Pass
DW-30262,30263	10/14/2021	Ra-226	1.49 ± 0.30	1.51 ± 0.17	1.50 ± 0.17	Pass
DW-30262,30263	10/14/2021	Ra-228	1.16 ± 0.79	2.08 ± 0.82	1.62 ± 0.57	Pass
AP-102521A,B	10/25/2021	Gr. Beta	0.026 ± 0.005	0.030 ± 0.010	0.028 ± 0.010	Pass
XWW-3707,3708	10/27/2021	H-3	206 ± 87	268 ± 90	237 ± 63	Pass
AP-110121A,B	11/1/2021	Gr. Beta	0.017 ± 0.004	0.016 ± 0.00	0.016 ± 0.003	Pass
DW-30277,30278	11/5/2021	Gr. Alpha	10.11 ± 1.19	9.72 ± 1.11	9.92 ± 0.81	Pass
DW-30277,30278	11/5/2021	Gr. Beta	5.53 ± 0.72	4.22 ± 0.69	4.88 ± 0.50	Pass
DW-30277,30278	11/5/2021	Ra-226	6.27 ± 0.32	6.34 ± 0.37	6.31 ± 0.25	Pass
DW-30277,30278	11/5/2021	Ra-228	3.10 ± 0.86	3.76 ± 0.90	3.43 ± 0.62	Pass
AP-111521A,B	11/15/2021	Gr. Beta	0.022 ± 0.004	0.026 ± 0.005	0.024 ± 0.003	Pass
AP-112221A,B	11/22/2021	Gr. Beta	0.023 ± 0.004	0.025 ± 0.005	0.024 ± 0.003	Pass
AP-112921A,B	11/29/2021	Gr. Beta	0.038 ± 0.005	0.035 ± 0.005	0.037 ± 0.004	Pass
DW-30297,8	12/15/2021	Ra-226	1.71 ± 0.15	1.21 ± 0.13	1.46 ± 0.10	Pass
DW-30297,8	12/15/2021	Ra-228	2.44 ± 0.98	1.96 ± 0.97	2.20 ± 0.69	Pass
S-4182,4183	12/19/2021	Pb-214	1.19 ± 0.06	1.07 ± 0.08	1.13 ± 0.05	Pass
S-4182,4183	12/19/2021	Ac-228	1.08 ± 0.11	1.15 ± 0.14	1.12 ± 0.09	Pass
S-4182,4183	12/19/2021	K-40	1.75 ± 0.74	1.80 ± 0.84	1.78 ± 0.56	Pass
AP-122721A,B	12/27/2021	Gr. Beta	0.063 ± 0.006	0.060 ± 0.006	0.062 ± 0.004	Pass
AP-4350,4351	12/28/2021	Be-7	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01	Pass
AP-4845,4846	12/31/2021	Be-7	0.07 ± 0.01	0.06 ± 0.02	0.06 ± 0.01	Pass
CF-20,21	1/3/2022	Gr. Beta	7.07 ± 0.26	7.05 ± 0.26	7.06 ± 0.18	Pass
CF-20,21	1/3/2022	K-40	9.06 ± 0.28	7.54 ± 0.70	8.30 ± 0.38	Pass
U-135,136	1/20/2022	Beta (-K40)	5.74 ± 1.63	3.53 ± 1.40	4.64 ± 1.07	Pass
DW-40019,40020	1/25/2022	Gr. Alpha	5.01 ± 1.34	6.01 ± 1.40	5.51 ± 0.97	Pass
DW-40019,40020	1/25/2022	Ra-226	1.19 ± 0.15	0.98 ± 0.17	1.09 ± 0.11	Pass
DW-40019,40020	1/25/2022	Ra-228	4.84 ± 0.98	5.38 ± 1.05	5.11 ± 0.72	Pass
W-159,160	1/27/2022	Gr. Alpha	3.04 ± 3.19	3.85 ± 2.04	3.45 ± 1.89	Pass
W-159,160	1/27/2022	Gr. Beta	14.38 ± 2.67	13.08 ± 1.45	13.73 ± 1.52	Pass
W-159,160	1/27/2022	Ra-226	0.94 ± 0.19	1.11 ± 0.30	1.03 ± 0.18	Pass
W-159,160	1/27/2022	Ra-228	3.14 ± 0.96	3.39 ± 0.96	3.27 ± 0.68	Pass
W-888,889	2/14/2022	Ni-63	119 ± 47	95 ± 48	107 ± 34	Pass
S-391,392	2/17/2022	K-40	11.2 ± 0.8	9.8 ± 0.7	10.5 ± 0.5	Pass
DW-40040,40041	2/25/2022	Ra-226	2.78 ± 0.21	2.01 ± 0.22	2.40 ± 0.15	Pass
DW-40040,40041	2/25/2022	Ra-228	3.15 ± 0.95	3.29 ± 0.94	3.22 ± 0.67	Pass
AP-022821A,B	2/28/2022	Gr. Beta	0.038 ± 0.005	0.039 ± 0.005	0.039 ± 0.003	Pass
S-435,436	3/2/2022	Pb-214	1.42 ± 0.11	1.29 ± 0.15	1.36 ± 0.09	Pass
S-435,436	3/2/2022	Ac-228	0.94 ± 0.20	1.06 ± 0.15	1.00 ± 0.13	Pass
AP-030721A,B	3/7/2022	Gr. Beta	0.038 ± 0.005	0.038 ± 0.005	0.038 ± 0.004	Pass

¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-5. Intralaboratory "Duplicate" Samples

Lab Code ^b	Date	Analysis	Concentration ^a		Averaged Result	Acceptance
			First Result	Second Result		
S-477,478	3/8/2022	K-40	6.58 ± 0.23	6.73 ± 0.24	6.66 ± 0.17	Pass
SWT-657,658	3/9/2022	Gr. Beta	1.00 ± 0.54	1.20 ± 0.57	1.10 ± 0.39	Pass
DW-40059,40060	3/11/2022	Ra-226	0.40 ± 0.10	0.53 ± 0.11	0.47 ± 0.07	Pass
DW-40059,40060	3/11/2022	Ra-228	0.40 ± 0.60	0.72 ± 0.60	0.56 ± 0.42	Pass
AP-0315221A,B	3/15/2022	Gr. Beta	0.025 ± 0.003	0.027 ± 0.003	0.026 ± 0.002	Pass
AP-1161,1162	3/29/2022	Be-7	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01	Pass
DW-700,701	4/4/2022	Gr. Alpha	1.70 ± 1.83	2.82 ± 1.78	2.26 ± 1.28	Pass
DW-700,701	4/4/2022	Gr. Beta	3.33 ± 1.26	4.29 ± 1.30	3.81 ± 0.91	Pass
DW-700,701	4/4/2022	Ra-226	0.50 ± 0.16	0.65 ± 0.14	0.58 ± 0.11	Pass
DW-700,701	4/4/2022	Ra-228	5.04 ± 1.00	4.79 ± 0.99	4.915 ± 0.70	Pass
SG-706,707	4/4/2022	Gr. Alpha	25.67 ± 3.56	21.65 ± 3.22	23.66 ± 2.40	Pass
SG-706,707	4/4/2022	Gr. Beta	23.23 ± 1.74	24.50 ± 1.83	23.87 ± 1.26	Pass
SG-706,707	4/4/2022	Ra-226	2.47 ± 0.10	2.62 ± 0.09	2.55 ± 0.07	Pass
SG-706,707	4/4/2022	Ra-228	4.63 ± 0.22	4.40 ± 0.20	4.52 ± 0.15	Pass
DW-40091,40092	4/5/2022	Gr. Alpha	0.43 ± 0.78	0.57 ± 0.82	0.50 ± 0.57	Pass
DW-40091,40092	4/6/2022	Ra-226	0.21 ± 0.10	0.24 ± 0.08	0.23 ± 0.06	Pass
U-951,952	4/13/2022	Gr. Beta	2.72 ± 1.55	4.11 ± 1.45	3.41 ± 1.06	Pass
U-951,952	4/13/2022	H-3	861 ± 723	1,015 ± 732	938 ± 514	Pass
W-1014,1015	4/21/2022	Ra-228	1.76 ± 0.93	1.51 ± 0.92	1.64 ± 0.65	Pass
W-1014,1015	4/21/2022	Ra-226	1.23 ± 0.27	1.36 ± 0.29	1.30 ± 0.20	Pass
DW-40117,40118	4/26/2022	Ra-226	0.33 ± 0.22	0.29 ± 0.09	0.31 ± 0.12	Pass
SW-1034,1035	4/26/2022	H-3	15,159 ± 386	16,022 ± 396	15,591 ± 277	Pass
DW-40124,40125	4/28/2022	Gr. Alpha	0.7 ± 0.56	0.6 ± 0.68	0.65 ± 0.44	Pass
SO-1266,1267	5/9/2022	K-40	17.74 ± 0.79	15.95 ± 1.03	16.85 ± 0.65	Pass
SO-1266,1267	5/9/2022	Pb-214	0.42 ± 0.05	0.30 ± 0.06	0.36 ± 0.04	Pass
SO-1266,1267	5/9/2022	Ac-228	0.58 ± 0.09	0.61 ± 0.02	0.60 ± 0.05	Pass
AP-51721,51722	5/17/2022	Gr. Beta	0.023 ± 0.003	0.022 ± 0.003	0.022 ± 0.002	Pass
SG-1368,1369	5/18/2022	Pb-214	4.31 ± 0.27	5.78 ± 0.31	5.05 ± 0.21	Pass
SG-1368,1369	5/18/2022	Ac-228	6.08 ± 0.56	6.59 ± 0.50	6.34 ± 0.38	Pass
SG-1368,1369	5/18/2022	Gr. Alpha	37.80 ± 1.70	40.60 ± 1.70	39.20 ± 1.20	Pass
SG-1368,1369	5/18/2022	Gr. Beta	34.80 ± 0.80	31.20 ± 0.80	33.00 ± 0.57	Pass
DW-40143,40144	5/19/2022	Ra-226	1.17 ± 0.25	1.56 ± 0.16	1.365 ± 0.15	Pass
DW-40143,40144	5/19/2022	Ra-228	1.29 ± 0.72	2.14 ± 0.85	1.715 ± 0.56	Pass
AP-53121,53122	5/31/2022	Gr. Beta	0.016 ± 0.003	0.014 ± 0.003	0.015 ± 0.002	Pass
PM-1646,1647	6/1/2022	K-40	14.23 ± 0.82	13.93 ± 0.40	14.083 ± 0.46	Pass
S-1731,1732	6/6/2022	K-40	16.50 ± 0.80	15.80 ± 1.90	16.15 ± 1.03	Pass
DW-40152,40153	6/7/2022	Gr. Alpha	4.00 ± 0.74	3.50 ± 0.70	3.75 ± 0.51	Pass
AP-60721,60722	6/7/2022	Gr. Beta	0.014 ± 0.003	0.013 ± 0.003	0.013 ± 0.002	Pass
S-1773,1774	6/13/2022	Be-7	1.29 ± 0.28	1.56 ± 0.15	1.43 ± 0.16	Pass
S-1773,1774	6/13/2022	K-40	13.80 ± 0.70	13.30 ± 0.70	13.55 ± 0.49	Pass

¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-5. Intralaboratory "Duplicate" Samples

Lab Code ^b	Date	Analysis	Concentration ^a		Averaged Result	Acceptance
			First Result	Second Result		
AP-61321,61322	6/13/2022	Gr. Beta	0.023 ± 0.004	0.023 ± 0.004	0.023 ± 0.003	Pass
AP-62021,62022	6/20/2022	Gr. Beta	0.031 ± 0.005	0.031 ± 0.005	0.031 ± 0.003	Pass
AP-62721,62722	6/27/2022	Gr. Beta	0.027 ± 0.005	0.027 ± 0.005	0.027 ± 0.003	Pass
DW-40169,40170	6/29/2022	Ra-228	1.06 ± 0.70	0.17 ± 0.54	0.62 ± 0.44	Pass
DW-40169,40170	6/29/2022	Ra-226	0.22 ± 0.12	0.03 ± 0.12	0.13 ± 0.08	Pass
W-2014,2015	7/4/2022	Ra-226	0.73 ± 0.24	0.72 ± 0.27	0.73 ± 0.18	Pass
S-2035,2036	7/7/2022	Pb-214	1.00 ± 0.09	1.65 ± 0.11	1.33 ± 0.07	Pass
S-2035,2036	7/7/2022	Ac-228	1.16 ± 0.20	1.09 ± 0.18	1.13 ± 0.13	Pass
S-2152,2153	7/13/2022	Pb-214	0.58 ± 0.07	0.65 ± 0.05	0.62 ± 0.04	Pass
S-2152,2153	7/13/2022	Ac-228	0.62 ± 0.11	0.61 ± 0.08	0.62 ± 0.07	Pass
S-2152,2153	7/18/2022	K-40	10.9 ± 0.8	12.5 ± 0.8	11.7 ± 0.6	Pass
DW-40192,40193	7/19/2022	Ra-226	0.80 ± 0.10	0.70 ± 0.10	0.75 ± 0.07	Pass
DW-40192,40193	7/19/2022	Ra-228	0.03 ± 0.60	1.20 ± 0.68	0.62 ± 0.45	Pass
DW-40205,40206	7/27/2022	Ra-226	0.32 ± 0.15	0.28 ± 0.10	0.30 ± 0.09	Pass
DW-40205,40206	7/27/2022	Ra-228	0.34 ± 0.59	0.65 ± 0.62	0.50 ± 0.43	Pass
G-2343,2344	8/1/2022	Be-7	3.00 ± 0.31	3.04 ± 0.26	3.02 ± 0.20	Pass
G-2343,2344	8/1/2022	K-40	5.82 ± 0.53	6.03 ± 0.39	5.93 ± 0.33	Pass
W-2406,2407	8/1/2022	Gr. Alpha	4.27 ± 3.20	4.60 ± 2.95	4.44 ± 2.18	Pass
W-2406,2407	8/1/2022	Gr. Beta	11.1 ± 2.6	10.5 ± 2.4	10.8 ± 1.8	Pass
W-2406,2407	8/1/2022	Ra-226	1.83 ± 0.28	2.31 ± 0.35	2.07 ± 0.22	Pass
W-2406,2407	8/1/2022	Ra-228	2.87 ± 0.95	2.43 ± 0.93	2.65 ± 0.66	Pass
DW-40213	8/3/2022	Gr. Alpha	0.60 ± 0.60	-0.30 ± 0.70	0.15 ± 0.46	Pass
DW-40213	8/3/2022	Gr. Beta	0.72 ± 0.59	0.85 ± 0.54	0.79 ± 0.40	Pass
DW-40225	8/10/2022	Ra-226	0.53 ± 0.13	0.41 ± 0.10	0.47 ± 0.08	Pass
DW-40225	8/10/2022	Ra-228	1.20 ± 0.71	1.00 ± 0.71	1.10 ± 0.50	Pass
S-2553	8/18/2022	K-40	1.74 ± 0.27	1.33 ± 0.22	1.54 ± 0.17	Pass
WW-2774	8/19/2022	H-3	138 ± 86	171 ± 88	155 ± 62	Pass
S-2797	8/22/2022	K-40	19.0 ± 0.2	18.7 ± 0.2	18.9 ± 0.1	Pass
DW-40241	8/23/2022	Ra-226	3.10 ± 0.19	3.54 ± 0.19	3.32 ± 0.13	Pass
DW-40241	8/23/2022	Ra-228	6.05 ± 0.98	6.61 ± 1.02	6.33 ± 0.71	Pass
W-2681	8/24/2022	H-3	1054 ± 126	962 ± 122	1008 ± 88	Pass
DW-40259	8/30/2022	Ra-228	0.49 ± 0.11	0.11 ± 0.10	0.30 ± 0.07	Pass
DW-40259	8/30/2022	Ra-226	0.49 ± 0.11	0.11 ± 0.09	0.30 ± 0.07	Pass
DW-40259	8/30/2022	Ra-228	0.00 ± 0.57	0.47 ± 61.00	0.24 ± 30.50	Pass
AP-830227	8/30/2022	Gr. Beta	0.027 ± 0.004	0.026 ± 0.004	0.027 ± 0.003	Pass
AP-808227	8/30/2022	Gr. Beta	0.016 ± 0.004	0.018 ± 0.004	0.017 ± 0.003	Pass
VE-2702	8/30/2022	K-40	2.58 ± 0.12	2.62 ± 0.27	2.60 ± 0.15	Pass
VE-2702	8/30/2022	Be-7	0.21 ± 0.05	0.30 ± 0.13	0.26 ± 0.07	Pass
VE-2702	8/30/2022	Sr-90	0.002 ± 0.001	0.002 ± 0.001	0.002 ± 0.001	Pass

¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-5. Intralaboratory "Duplicate" Samples

Lab Code ^b	Date	Analysis	Concentration ^a		Averaged Result	Acceptance
			First Result	Second Result		
SG-2844	9/9/2022	Gr. Alpha	25.7 ± 4.0	18.7 ± 3.5	22.2 ± 2.7	Pass
SG-2844	9/9/2022	Gr. Beta	21.3 ± 2.0	22.2 ± 2.0	21.8 ± 1.4	Pass
SG-2844	9/9/2022	Pb-214	4.35 ± 0.12	4.43 ± 0.10	4.39 ± 0.08	Pass
SG-2844	9/9/2022	Ac-228	5.37 ± 0.22	5.39 ± 0.17	5.38 ± 0.14	Pass
DW-40279	9/9/2022	Ra-226	3.92 ± 0.23	4.18 ± 0.25	4.05 ± 0.17	Pass
DW-40279,40280	9/9/2022	Ra-228	7.05 ± 1.09	6.58 ± 1.06	6.82 ± 0.76	Pass
SG-2841,2842	9/9/2022	Pb-214	0.90 ± 0.50	1.16 ± 0.12	1.03 ± 0.26	Pass
SG-2841,2842	9/9/2022	Ac-228	0.91 ± 0.10	0.88 ± 0.17	0.90 ± 0.10	Pass
DW-40295,40296	9/13/2022	Gr. Alpha	0.79 ± 0.97	0.64 ± 0.97	0.72 ± 0.69	Pass
DW-40295,40296	9/14/2022	Ra-226	2.75 ± 0.32	2.89 ± 0.24	2.82 ± 0.20	Pass
DW-40295,40296	9/14/2022	Ra-228	2.88 ± 0.78	2.95 ± 0.76	2.92 ± 0.54	Pass
SG-2862,2863	9/14/2022	Pb-214	11.80 ± 0.20	11.20 ± 0.20	11.50 ± 0.14	Pass
SG-2862,2863	9/14/2022	Ac-228	6.95 ± 0.24	7.18 ± 0.19	7.07 ± 0.15	Pass
SG-3119,3120	9/24/2022	Pb-214	3.10 ± 0.21	3.10 ± 0.22	3.10 ± 0.15	Pass
SG-3119,3120	9/24/2022	Ac-228	2.16 ± 0.38	2.30 ± 0.33	2.23 ± 0.25	Pass
SG-3075,3076	9/28/2022	Gr. Alpha	174 ± 10	158 ± 10	166 ± 7	Pass
SG-3075,3076	9/28/2022	Pb-214	23.6 ± 0.9	24.4 ± 0.4	24.0 ± 0.5	Pass
SG-3075,3076	9/28/2022	Ac-228	38.2 ± 1.9	35.8 ± 0.8	37.0 ± 1.0	Pass
DW-40318,40319	9/29/2022	Gr. Alpha	1.02 ± 0.94	1.79 ± 1.68	1.41 ± 0.96	Pass
DW-40318,40319	9/29/2022	Gr. Alpha	1.02 ± 0.94	1.79 ± 1.68	1.41 ± 0.96	Pass
DW-40318,40319	9/29/2022	Gr. Alpha	1.02 ± 0.94	1.79 ± 1.68	1.41 ± 0.96	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).

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

Lab Code ^b	Reference Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MAAP-3007	8/1/2021	Gross Alpha	0.45 ± 0.04	0.960	0.288 - 1.632	Pass
MAAP-3007	8/1/2021	Gross Beta	0.71 ± 0.04	0.553	0.277 - 0.830	Pass
MADW-2688	8/1/2021	Gross Alpha	0.19 ± 0.03	0.232	0.070 - 0.394	Pass
MADW-2688	8/1/2021	Gross Beta	2.60 ± 0.06	2.807	1.404 - 4.211	Pass
MASO-3004	8/1/2021	Cs-134	1035 ± 10	1170	819 - 1521	Pass
MASO-3004	8/1/2021	Cs-137	628 ± 11	572	400 - 744	Pass
MASO-3004	8/1/2021	Co-57	-0.11 ± 1.26	0	NA ^c	Pass
MASO-3004	8/1/2021	Co-60	720 ± 7	722	714 - 1326	Pass
MASO-3004	8/1/2021	Mn-54	456 ± 11	410	287 - 533	Pass
MASO-3004	8/1/2021	Zn-65	1002 ± 22	907	635 - 1179	Pass
MASO-3004	8/1/2021	K-40	663 ± 50	607	425 - 789	Pass
MADW-3003	8/1/2021	Ra-226	0.32 ± 0.06	0.226	0.158 - 0.294	Fail ^d
MADW-3003	8/1/2021	Sr-90	3.63 ± 0.16	3.9	2.70 - 5.02	Pass
MADW-3003	8/1/2021	U-234	0.02 - 0.01	0.02	NA ^e	Pass
MADW-3003	8/1/2021	U-238	0.02 - 0.01	0.01	NA ^e	Pass
MAAP-506	2/1/2022	Gross Alpha	1.10 ± 0.14	1.20	0.36 - 2.04	Pass
MAAP-506	2/1/2022	Gross Beta	0.83 ± 0.06	0.681	0.341 - 1.022	Pass
MADW-408	2/1/2022	Gross Alpha	0.34 ± 0.04	0.574	0.172 ± 0.976	Pass
MADW-408	2/1/2022	Gross Beta	6.61 ± 0.09	7.25	3.63 - 10.88	Pass
MASO-504	2/1/2022	Cs-134	738 ± 8	890	623 - 1157	Pass
MASO-504	2/1/2022	Cs-137	399 ± 9	365	256 - 475	Pass
MASO-504	2/1/2022	Co-57	1479 ± 375	1400	980 - 1820	Pass
MASO-504	2/1/2022	Co-60	433 ± 6	443	310 - 576	Pass
MASO-504	2/1/2022	Mn-54	1258 ± 606	1140	798 - 1482	Pass
MASO-504	2/1/2022	Zn-65	-2.11 ± 4.44	0	NA ^c	Pass
MASO-504	2/1/2022	K-40	641 ± 40	596	417 - 775	Pass
MADW-500	2/1/2022	Cs-134	-0.06 ± 0.11	0	NA ^c	Pass
MADW-500	2/1/2022	Cs-137	8.09 ± 0.33	7.64	5.35 - 9.93	Pass
MADW-500	2/1/2022	Co-57	37.04 ± 0.55	36.0	25.20 - 46.80	Pass
MADW-500	2/1/2022	Co-60	8.91 ± 0.27	9.3	6.5 - 12.1	Pass
MADW-500	2/1/2022	Mn-54	20.4 ± 0.6	18.9	13.2 - 24.6	Pass
MADW-500	2/1/2022	Zn-65	28.65 ± 0.94	26.2	18.3 - 34.1	Pass
MADW-500	2/1/2022	K-40	4.80 ± 2.57	0	NA ^c	Pass

¹ Mean and range are based on detectable measurements only.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

Lab Code ^b	Reference Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MADW-500	2/1/2022	H-3	309 ± 10	300	210 - 390	Pass
MADW-500	2/1/2022	Ra-226	0.83 ± 0.10	0.8	0.6 - 1.0	Pass
MADW-500	2/1/2022	U-234	0.13 ± 0.01	1.5	1.1 - 2.0	Fail ^e
MADW-500	2/1/2022	U-238	0.12 ± 0.01	1.54	1.08 - 2.00	Fail ^e
MAAP-502	2/1/2022	Cs-134	0.83 ± 0.05	0.93	0.65 - 1.21	Pass
MAAP-502	2/1/2022	Cs-137	0.87 ± 0.07	0.726	0.51 - 0.94	Pass
MAAP-502	2/1/2022	Co-57	0.87 ± 0.05	0	NA ^c	Fail ^f
MAAP-502	2/1/2022	Co-60	0.83 ± 0.07	0.72	0.50 - 0.94	Pass
MAAP-502	2/1/2022	Mn-54	0.02 ± 0.02	0	NA ^c	Pass
MAAP-502	2/1/2022	Sr-90	0.72 ± 0.10	0.54	0.38 - 0.70	Fail ^g
MAVE-507	2/1/2022	Cs-134	7.53 ± 0.17	7.61	5.33 - 9.89	Pass
MAVE-507	2/1/2022	Cs-137	1.60 ± 0.12	1.52	1.06 - 1.98	Pass
MAVE-507	2/1/2022	Co-57	6.21 ± 0.17	5.09	3.56 - 6.62	Pass
MAVE-507	2/1/2022	Co-60	0.01 ± 0.03	0	NA ^c	Pass
MAVE-507	2/1/2022	Mn-54	2.940 ± 0.140	3	1.81 - 3.37	Pass
MAVE-507	2/1/2022	Zn-65	1.69 ± 0.17	1.47	1.03 - 1.91	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 control limits.

^d Radium result did not meet MAPEP acceptance criteria.

^e Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

^f Results for a different dataset were mistakenly input into the MAPEP system. If the correct dataset had been entered, the results, (U-234: 1.62 ± 0.04, U-238: 1.69 ± 0.04), would have been within the acceptance range.

^g MAPEP likely added Eu-152 as an interference to Co-57. Reanalyzing the spectra in duplicate with libraries to account for both Co-57 and Eu-152 yields Co-57 results of 0.03 ± 0.04 & 18 ± 0.18 Bq/sample. Which satisfies MAPEP criteria for passing a "false positive" test.

^h The analysis of this sample was repeated and the result, (Sr-90: 0.52 ± 0.09), was within the acceptance range.

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)^a.
MRAD-30 Study

Lab Code ^b	Date	Analysis	Concentration ^a		Control Limits ^d	Acceptance
			Laboratory Result	ERA Value ^c		
ERAP-640	3/21/2022	Cs-134	458	549	356 - 673	Pass
ERAP-640	3/21/2022	Cs-137	1430	1,320	1,080 - 1730	Pass
ERAP-640	3/21/2022	Co-60	913	885	752 - 1120	Pass
ERAP-640	3/21/2022	Mn-54	< 4.1	< 35.0	0.00 - 35.0	Pass
ERAP-640	3/21/2022	Zn-65	771	671	550 - 1030	Pass
ERAP-639	3/21/2022	Gross Alpha	93.5	94.2	49.2 - 155	Pass
ERAP-639	3/21/2022	Gross Beta	60.7	66.8	40.5 - 101.0	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.

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APPENDIX B

DATA REPORTING CONVENTIONS

B-1

¹ Mean and range are based on detectable measurements only.

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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;
 $s = 2\sigma$ 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 4.86σ 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, \dots, 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.

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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	0.064	0.065	1	0.073	0.075	0
			28/28	24/24	3.4	4/4	4/4	
			0.052 - 0.084	0.052 - 0.084	ENE	0.053 - 0.083	0.072 - 0.079	
Air pCi/m ³	Co-58 28	N/A	< LLD	< LLD	—	—	< LLD	0
			0/28	0/24	—	—	0/4	
			—	—	—	—	—	
Air pCi/m ³	Co-60 28	N/A	< LLD	< LLD	—	—	< LLD	0
			0/28	0/24	—	—	0/4	
			—	—	—	—	—	
Air pCi/m ³	Cs-134 28	0.005	< LLD	< LLD	—	—	< LLD	0
			0/28	0/24	—	—	0/4	
			—	—	—	—	—	
Air pCi/m ³	Cs-137 28	0.045	< LLD	< LLD	—	—	< LLD	0
			0/28	0/24	—	—	0/4	
			—	—	—	—	—	
Air pCi/m ³	Gross Beta 364	0.0075	0.024	0.024	1	0.026	0.025	0
			363/364	311/312	3.4	52/52	52/52	
			0.008 - 0.055	0.008 - 0.055	ENE	0.011 - 0.048	0.012 - 0.051	

¹ Mean and range are based on detectable measurements only.

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Plant: Perry Nuclear Power Plant

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-131 364	0.050	< LLD 0/364	< LLD 0/312	—	—	<LLD 0/52 —	0
Broadleaf Vegetation pCi/kg wet	Be-7 72	N/A	604.4 53/72 117 – 1778	600.5 56/59 117 – 1669	2 1.9 ENE	669.4 12/13 289 - 1275	621.2 13/13 214 – 1778	0
Broadleaf Vegetation pCi/kg wet	K-40 72	N/A	4836.1 72/72 2561 – 10965	4709.0 59/59 2561 – 9736	20 1.9 E	5131.6 16/16 3171 - 9736	5421.8 13/13 3216 – 10965	0
Broadleaf Vegetation pCi/kg wet	Co-58 72	N/A	< LLD 0/72	<LLD 0/59	—	—	< LLD 0/13 —	0
Broadleaf Vegetation pCi/kg wet	Co-60 72	N/A	< LLD 0/72	<LLD 0/59	—	—	< LLD 0/13 —	0
Broadleaf Vegetation pCi/kg wet	I-131 72	45	< LLD 0/72	<LLD 0/59	—	—	< LLD 0/13 —	0
Broadleaf Vegetation pCi/kg wet	Cs-134 72	45	< LLD 0/72	<LLD 0/59	—	—	< LLD 0/13 —	0

¹ Mean and range are based on detectable measurements only.

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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 72	60	< LLD 0/72 —	< LLD 0/59 —	—	—	< LLD 0/13 —	0
Fish pCi/kg wet	K-40 16	N/A	1395.8 16/16 756 – 3246	1213.1 10/10 756 – 2539	25 0.6 NNW	1213.1 10/10 756 – 2539	1700.3 6/6 1051 – 3246	0
Fish pCi/kg wet	Mn-54 16	94	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0
Fish pCi/kg wet	Fe-59 16	195	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0
Fish pCi/kg wet	Co-58 16	97	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0
Fish pCi/kg wet	Co-60 16	97	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0
Fish pCi/kg wet	Zn-65 16	195	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0

¹ Mean and range are based on detectable measurements only.

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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 16	97	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0
Fish pCi/kg wet	Cs-137 16	112	< LLD 0/16 —	< LLD 0/10 —	—	—	< LLD 0/6 —	0
Sediment pCi/kg wet	K-40 4	N/A	9239.3 4/4 8274 – 10008	9239.3 4/4 8274 – 10008	64 0.4 WNW	9488.5 2/2 8969 – 10008	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.

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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	16.1 116/116 9.2 – 25.0	16.2 108/108 11.0 – 25.0	36 3.9 WSW	20.3 4/4 19.0 – 21.6	15.2 8/8 13.3 – 17.3	0
TLD (Q) mR/91 days	Direct 116	1.0	15.8 116/116 12.0 – 23.1	15.9 108/108 12.0 – 23.1	33 4.5 S	19.9 4/4 18.2 – 22.2	15.2 8/8 13.8 – 16.4	0
TLD mR/365 days	Direct 29	1.0	59.5 29/29 48.8 – 74.7	59.6 27/27 48.8 – 74.7	29 4.3 SSE	74.7 1/1 74.7 – 74.7	59.2 2/2 56.5 – 61.9	0
Water pCi/L	Gross Beta 60	3	1.4 31/60 0.9 – 3.2	1.4 27/48 0.9 – 3.2	60 1.0 WSW	1.7 6/12 1.1 – 3.2	1.2 4/12 0.9 – 1.6	0
Water pCi/L	H-3 20	1500	186.4 10/20 165.6 – 230.5	190.0 8/16 165.6 – 230.5	59 4.0 ENE	201.7 2/4 201.0 – 202.3	114.7 2/4 167.0 – 177.1	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.

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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.

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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.

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Attachment 3: 2022 REMP Detailed Data Report



MONTHLY PROGRESS REPORT
to
ENERGY HARBOR

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

Reporting Period: January-December, 2022

Prepared and Submitted by
ENVIRONMENTAL, INC.,
MIDWEST LABORATORY

Project Number: 8033

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PERRY NUCLEAR POWER PLANT

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PERRY NUCLEAR POWER PLANT

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PERRY NUCLEAR POWER PLANT

1.0 INTRODUCTION

The following constitutes the current 2022 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 collection period.

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

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2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
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3.0 DATA TABLES

PNPP

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

	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
Date Placed	01-06-22	04-19-22	07-14-22	10-11-22
Date Removed	04-19-22	07-14-22	10-11-22	12-11-22
E-1	15.2 ± 0.7	15.1 ± 2.1	16.0 ± 0.9	17.3 ± 1.9
E-3	12.9 ± 0.8	11.0 ± 1.6	13.3 ± 0.7	13.8 ± 1.4
E-4	14.3 ± 0.7	14.9 ± 1.6	14.5 ± 0.8	17.6 ± 1.3
E-5	14.1 ± 0.7	13.6 ± 2.0	14.5 ± 1.1	14.9 ± 1.4
E-6	14.9 ± 0.9	16.1 ± 1.7	15.6 ± 1.1	17.3 ± 1.3
E-7	14.7 ± 0.9	13.8 ± 1.5	15.4 ± 1.0	15.2 ± 1.2
E-8	13.0 ± 0.7	25.0 ± 1.8	14.1 ± 0.9	17.5 ± 1.4
E-9	13.7 ± 0.6	13.3 ± 1.7	14.8 ± 0.9	15.0 ± 1.3
E-10	14.7 ± 0.9	15.0 ± 2.0	13.7 ± 0.9	16.5 ± 2.0
E-11	14.0 ± 0.9	14.9 ± 1.5	15.3 ± 1.0	16.1 ± 1.2
E-12	14.6 ± 0.9	13.0 ± 1.7	15.5 ± 0.9	14.5 ± 1.4
E-13	14.6 ± 1.2	14.0 ± 1.6	15.4 ± 1.5	15.1 ± 1.4
E-14	14.8 ± 0.8	15.1 ± 1.7	15.4 ± 1.0	16.6 ± 1.3
E-15	14.2 ± 0.8	13.0 ± 2.0	14.5 ± 0.9	14.5 ± 1.4
E-21	15.9 ± 0.8	15.4 ± 1.6	17.6 ± 0.7	16.4 ± 1.2
E-23	17.1 ± 0.7	16.6 ± 1.5	18.5 ± 0.8	17.4 ± 1.1
E-24	15.5 ± 0.9	13.9 ± 1.6	13.3 ± 1.0	14.9 ± 1.2
E-29	18.6 ± 1.1	19.1 ± 1.9	20.7 ± 1.1	19.6 ± 1.3
E-30	16.7 ± 0.8	18.2 ± 1.6	18.0 ± 1.0	19.2 ± 1.1
E-31	17.7 ± 0.9	19.1 ± 1.5	20.1 ± 0.9	22.9 ± 1.5
E-33	18.1 ± 1.4	19.4 ± 1.4	20.3 ± 1.1	22.2 ± 1.1
E-35	14.6 ± 0.7	13.3 ± 1.5	15.8 ± 0.8	15.7 ± 1.4
E-36	19.0 ± 1.4	19.1 ± 1.5	21.6 ± 1.3	21.4 ± 1.2
E-53	14.4 ± 0.5	15.5 ± 1.5	16.1 ± 0.7	19.0 ± 1.2
E-54	15.3 ± 0.9	15.9 ± 1.5	17.2 ± 0.9	18.6 ± 1.1
E-55	16.3 ± 1.3	14.5 ± 1.7	17.4 ± 1.2	17.7 ± 1.3
E-56	15.5 ± 0.9	15.7 ± 1.7	16.6 ± 1.0	18.8 ± 1.2
E-57	16.2 ± 0.9	16.8 ± 1.9	15.3 ± 0.9	20.9 ± 1.7
E-58	13.0 ± 0.9	11.7 ± 1.5	15.1 ± 1.0	17.0 ± 1.2
Mean ± s.d.	15.3 ± 1.6	15.6 ± 2.8	16.3 ± 2.2	17.4 ± 2.4
E-Control 1	9.8 ± 0.9	10.3 ± 1.6	10.0 ± 1.0	12.8 ± 1.7
E-Control 2	9.7 ± 0.8	9.3 ± 1.5	9.2 ± 1.2	12.5 ± 1.3

* Sample originally considered lost. Recovered and read on 1/13/23 per station request.

PNPP

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

	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
Date Placed	01-06-22	04-19-22	07-14-22	10-11-22
Date Removed	04-19-22	07-14-22	10-11-22	12-14-22
Q-1	14.9 ± 0.9	13.5 ± 1.9	15.3 ± 1.2	16.0 ± 1.7
Q-3	12.9 ± 0.6	13.4 ± 1.1	12.9 ± 0.9	13.8 ± 1.1
Q-4	15.6 ± 0.7	13.7 ± 1.1	16.1 ± 0.8	14.6 ± 1.0
Q-5	13.3 ± 0.7	12.5 ± 1.2	13.2 ± 0.8	13.6 ± 0.9
Q-6	15.1 ± 0.7	13.8 ± 1.0	16.4 ± 1.3	14.6 ± 0.8
Q-7	14.3 ± 0.4	13.9 ± 0.9	14.8 ± 0.5	14.0 ± 0.8
Q-8	14.8 ± 0.7	23.1 ± 0.9	15.0 ± 0.6	16.5 ± 0.8
Q-9	13.6 ± 0.6	12.0 ± 1.0	13.0 ± 0.6	13.1 ± 1.3
Q-10	14.2 ± 0.7	13.6 ± 1.0	15.1 ± 0.6	15.2 ± 0.8
Q-11	16.6 ± 0.6	14.6 ± 1.0	17.4 ± 0.7	15.5 ± 0.9
Q-12	15.0 ± 0.6	16.1 ± 0.9	16.0 ± 0.8	17.0 ± 0.9
Q-13	15.6 ± 0.7	15.2 ± 1.4	15.8 ± 0.6	16.1 ± 1.5
Q-14	15.3 ± 0.7	13.1 ± 1.0	16.4 ± 0.7	14.3 ± 0.8
Q-15	12.6 ± 0.5	14.0 ± 1.2	12.9 ± 0.7	15.2 ± 0.9
Q-21	17.6 ± 0.7	18.5 ± 1.5	18.7 ± 1.0	19.6 ± 1.3
Q-23	19.3 ± 1.4	16.2 ± 1.5	19.9 ± 1.5	16.6 ± 1.1
Q-24	15.1 ± 1.2	14.9 ± 1.1	15.1 ± 1.3	16.4 ± 1.2
Q-29	17.8 ± 1.0	20.5 ± 1.7	18.2 ± 1.0	21.4 ± 1.3
Q-30	16.5 ± 0.6	17.0 ± 1.1	17.7 ± 0.7	18.2 ± 1.0
Q-31	17.8 ± 0.8	18.7 ± 1.1	17.3 ± 0.9	20.0 ± 1.2
Q-33	19.8 ± 0.6	18.2 ± 1.1	22.2 ± 0.9	19.3 ± 1.0
Q-35	17.0 ± 0.7	13.5 ± 1.0	13.5 ± 0.6	16.1 ± 1.0
Q-36	21.3 ± 0.7	17.1 ± 0.9	18.0 ± 0.7	17.8 ± 0.8
Q-53	15.1 ± 0.7	15.3 ± 1.1	16.4 ± 0.6	17.5 ± 1.0
Q-54	15.0 ± 0.4	13.8 ± 0.9	15.6 ± 0.8	14.6 ± 0.8
Q-55	15.3 ± 0.9	15.8 ± 0.9	16.3 ± 1.1	16.9 ± 0.9
Q-56	14.7 ± 0.7	13.5 ± 1.1	15.3 ± 0.8	14.7 ± 0.9
Q-57	15.9 ± 0.9	15.9 ± 1.4	15.2 ± 0.9	17.1 ± 1.1
Q-58	13.3 ± 0.9	12.1 ± 0.9	14.9 ± 1.3	14.3 ± 0.9
Mean ± s.d.	15.7 ± 2.1	15.3 ± 2.6	16.0 ± 2.1	16.2 ± 2.1
Q-Control 1	9.5 ± 0.4	8.6 ± 0.8	9.7 ± 0.4	9.6 ± 1.6
Q-Control 2	9.6 ± 0.8	9.3 ± 0.9	10.0 ± 0.7	9.6 ± 0.8

* Sample originally considered lost. Recovered and read on 1/13/23 per station request

PNPP

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

	<u>2022</u>
Date Placed	01-06-22
Date Removed	12-14-22
A-1	56.4 ± 2.5
A-3	50.2 ± 1.8
A-4	55.1 ± 2.5
A-5	52.9 ± 1.8
A-6	61.9 ± 1.6
A-7	56.5 ± 1.8
A-8	54.6 ± 1.3
A-9	48.8 ± 1.2
A-10	53.0 ± 2.3
A-11	58.4 ± 1.3
A-12	56.6 ± 1.5
A-13	56.7 ± 1.5
A-14	58.1 ± 2.6
A-15	55.5 ± 2.1
A-21	63.2 ± 3.7
A-23	65.3 ± 1.8
A-24	56.5 ± 2.9
A-29	74.7 ± 2.3
A-30	65.2 ± 2.5
A-31	70.9 ± 4.3
A-33	74.4 ± 1.4
A-35	54.5 ± 1.4
A-36	69.4 ± 1.3
A-53	59.2 ± 1.7
A-54	59.0 ± 1.2
A-55	62.5 ± 1.6
A-56	61.4 ± 4.0
A-57	60.8 ± 1.2
A-58	54.7 ± 2.3
Mean ± s.d.	59.5 ± 6.6
A-Control 1	38.9 ± 1.3
A-Control 2	38.0 ± 1.9

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

PNPP

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

Location: P-1

Units: pCi/m³

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
01-05-22	549	0.027 ± 0.003	< 0.010	07-06-22	350	0.048 ± 0.005	< 0.022
01-12-22	527	0.036 ± 0.004	< 0.012	07-13-22	633	0.018 ± 0.003	< 0.009
01-19-22	532	0.044 ± 0.004	< 0.011	07-20-22	622	0.028 ± 0.003	< 0.011
01-26-22	531	0.025 ± 0.003	< 0.010	07-27-22	642	0.023 ± 0.003	< 0.007
02-02-22	536	0.037 ± 0.003	< 0.009	08-03-22	628	0.017 ± 0.003	< 0.007
02-09-22	529	0.042 ± 0.004	< 0.008	08-10-22	659	0.022 ± 0.003	< 0.009
02-16-22	527	0.024 ± 0.003	< 0.009	08-17-22	650	0.024 ± 0.003	< 0.007
02-23-22	537	0.028 ± 0.003	< 0.007	08-23-22	542	0.029 ± 0.003	< 0.006
03-02-22	502	0.033 ± 0.004	< 0.008	08-31-22	759	0.030 ± 0.003	< 0.009
03-09-22	479	0.025 ± 0.003	< 0.009	09-07-22	581	0.025 ± 0.003	< 0.005
03-16-22	425	0.029 ± 0.004	< 0.017	09-14-22	578	0.016 ± 0.003	< 0.009
03-23-22	459	0.023 ± 0.004	< 0.009	09-21-22	587	0.045 ± 0.003	< 0.006
03-30-22	430	0.015 ± 0.003	< 0.010	09-28-22	571	0.017 ± 0.003	< 0.010
1Q 2022 Mean ± s.d.		0.030 ± 0.008	< 0.017	3Q 2022 Mean ± s.d.		0.026 ± 0.010	< 0.022
04-06-22	497	0.019 ± 0.003	< 0.013	10-05-22	582	0.011 ± 0.003	< 0.007
04-13-22	513	0.018 ± 0.003	< 0.005	10-12-22	577	0.034 ± 0.003	< 0.009
04-20-22	546	0.017 ± 0.003	< 0.013	10-19-22	597	0.021 ± 0.003	< 0.008
04-27-22	529	0.020 ± 0.003	< 0.012	10-26-22	571	0.043 ± 0.004	< 0.007
05-04-22	547	0.022 ± 0.003	< 0.012	11-02-22	588	0.021 ± 0.003	< 0.006
05-11-22	553	0.024 ± 0.003	< 0.007	11-09-22	596	0.040 ± 0.003	< 0.005
05-18-22	533	0.017 ± 0.003	< 0.008	11-16-22	582	0.016 ± 0.003	< 0.004
05-25-22	543	0.016 ± 0.003	< 0.010	11-23-22	591	0.032 ± 0.003	< 0.008
06-01-22	547	0.022 ± 0.003	< 0.006	11-30-22	613	0.041 ± 0.003	< 0.005
06-08-22	560	0.018 ± 0.003	< 0.008	12-07-22	608	0.032 ± 0.003	< 0.006
06-15-22	541	0.020 ± 0.003	< 0.008	12-14-22	631	0.033 ± 0.003	< 0.007
06-22-22	557	0.028 ± 0.003	< 0.008	12-21-22	631	0.029 ± 0.003	< 0.014
06-29-22	432	0.018 ± 0.004	< 0.011	12-28-22	607	0.030 ± 0.003	< 0.008
2Q 2022 Mean ± s.d.		0.020 ± 0.003	< 0.013	4Q 2022 Mean ± s.d.		0.029 ± 0.010	< 0.014
Cumulative Average						0.027	

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

PNPP

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

Location: P-3

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	I-131	Date Collected	Volume (m ³)	Gross Beta	I-131		
Required LLD		<u>0.0075</u>	<u>0.050</u>			<u>0.0075</u>	<u>0.050</u>		
01-05-22	578	0.023 ± 0.003	< 0.009	07-06-22	649	0.023 ± 0.003	< 0.012		
01-12-22	579	0.034 ± 0.003	< 0.011	07-13-22	606	0.015 ± 0.003	< 0.009		
01-19-22	646	0.040 ± 0.003	< 0.009	07-20-22	639	0.021 ± 0.003	< 0.011		
01-26-22	512	0.021 ± 0.003	< 0.010	07-27-22	531	0.019 ± 0.003	< 0.009		
02-02-22	564	0.032 ± 0.003	< 0.008	08-03-22	516	0.012 ± 0.003	< 0.008		
02-09-22	586	0.032 ± 0.003	< 0.007	08-10-22	642	0.018 ± 0.003	< 0.009		
02-16-22	575	0.023 ± 0.003	< 0.008	08-17-22	598	0.019 ± 0.003	< 0.007		
02-23-22	583	0.026 ± 0.003	< 0.006	08-23-22	532	0.024 ± 0.003	< 0.006		
03-02-22	488	0.000 ± 0.003	< 0.008	08-31-22	702	0.023 ± 0.002	< 0.010		
03-09-22	576	0.024 ± 0.003	< 0.007	09-07-22	585	0.021 ± 0.003	< 0.005		
03-16-22	632	0.027 ± 0.003	< 0.012	09-14-22	580	0.018 ± 0.003	< 0.009		
03-23-22	628	0.020 ± 0.003	< 0.006	09-21-22	590	0.040 ± 0.003	< 0.006		
03-30-22	616	0.011 ± 0.002	< 0.007	09-28-22	572	0.015 ± 0.003	< 0.010		
1Q 2022		Mean ± s.d.	0.024 ± 0.010	< 0.012	3Q 2022		Mean ± s.d.	0.021 ± 0.007	< 0.012
04-06-22	609	0.014 ± 0.003	< 0.011	10-05-22	589	0.012 ± 0.003	< 0.007		
04-13-22	627	0.015 ± 0.002	< 0.004	10-12-22	556	0.028 ± 0.003	< 0.009		
04-20-22	606	0.013 ± 0.002	< 0.012	10-19-22	590	0.023 ± 0.003	< 0.008		
04-27-22	621	0.016 ± 0.003	< 0.010	10-26-22	577	0.043 ± 0.004	< 0.007		
05-04-22	621	0.020 ± 0.003	< 0.011	11-02-22	565	0.020 ± 0.003	< 0.006		
05-11-22	643	0.020 ± 0.003	< 0.006	11-09-22	588	0.034 ± 0.003	< 0.005		
05-18-22	616	0.013 ± 0.002	< 0.007	11-16-22	554	0.015 ± 0.003	< 0.005		
05-25-22	621	0.014 ± 0.003	< 0.009	11-23-22	580	0.033 ± 0.003	< 0.008		
06-01-22	608	0.017 ± 0.003	< 0.005	11-30-22	556	0.041 ± 0.003	< 0.006		
06-08-22	605	0.014 ± 0.003	< 0.007	12-07-22	561	0.030 ± 0.003	< 0.007		
06-15-22	619	0.017 ± 0.003	< 0.007	12-14-22	580	0.033 ± 0.003	< 0.007		
06-22-22	626	0.025 ± 0.003	< 0.007	12-21-22	553	0.026 ± 0.003	< 0.016		
06-29-22	607	0.012 ± 0.003	< 0.008	12-28-22	553	0.035 ± 0.003	< 0.009		
2Q 2022		Mean ± s.d.	0.016 ± 0.004	< 0.012	4Q 2022		Mean ± s.d.	0.029 ± 0.009	< 0.016
Cumulative Average						0.023			

PNPP

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
 Location: P-4
 Units: pCi/m³
 Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	I-131	Date Collected	Volume (m ³)	Gross Beta	I-131
<u>Required LLD</u>		<u>0.0075</u>	<u>0.050</u>			<u>0.0075</u>	<u>0.050</u>
01-05-22	594	0.018 ± 0.003	< 0.009	07-06-22	593	0.023 ± 0.003	< 0.013
01-12-22	592	0.026 ± 0.003	< 0.010	07-13-22	587	0.014 ± 0.003	< 0.010
01-19-22	572	0.030 ± 0.003	< 0.010	07-20-22	575	0.020 ± 0.003	< 0.012
01-26-22	559	0.016 ± 0.003	< 0.009	07-27-22	581	0.021 ± 0.003	< 0.008
02-02-22	533	0.025 ± 0.003	< 0.009	08-03-22	560	0.019 ± 0.003	< 0.008
02-09-22	523	0.025 ± 0.003	< 0.008	08-10-22	597	0.016 ± 0.003	< 0.010
02-16-22	449	0.022 ± 0.004	< 0.011	08-17-22	536	0.020 ± 0.003	< 0.008
02-23-22	541	0.019 ± 0.003	< 0.007	08-23-22	468	0.026 ± 0.004	< 0.007
03-02-22	566	0.018 ± 0.003	< 0.007	08-31-22	621	0.024 ± 0.003	< 0.011
03-09-22	530	0.021 ± 0.003	< 0.008	09-07-22	570	0.021 ± 0.003	< 0.006
03-16-22	651	0.020 ± 0.003	< 0.011	09-14-22	554	0.018 ± 0.003	< 0.009
03-23-22	665	0.017 ± 0.002	< 0.006	09-21-22	541	0.044 ± 0.004	< 0.006
03-30-22	651	0.010 ± 0.002	< 0.006	09-28-22	529	0.016 ± 0.003	< 0.010
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1Q 2022	Mean ± s.d.	0.021 ± 0.005	< 0.011	3Q 2022	Mean ± s.d.	0.022 ± 0.007	< 0.013
04-06-22	653	0.014 ± 0.002	< 0.010	10-05-22	526	0.011 ± 0.003	< 0.007
04-13-22	668	0.008 ± 0.002	< 0.004	10-12-22	505	0.035 ± 0.004	< 0.010
04-20-22	639	0.010 ± 0.002	< 0.011	10-19-22	492	0.026 ± 0.003	< 0.009
04-27-22	646	0.016 ± 0.002	< 0.010	10-26-22	610	0.044 ± 0.003	< 0.007
05-04-22	624	0.017 ± 0.003	< 0.011	11-02-22	635	0.021 ± 0.003	< 0.005
05-11-22	626	0.018 ± 0.003	< 0.006	11-09-22	641	0.036 ± 0.003	< 0.005
05-18-22	680	0.013 ± 0.002	< 0.006	11-16-22	623	0.016 ± 0.002	< 0.004
05-25-22	632	0.011 ± 0.002	< 0.009	11-23-22	653	0.034 ± 0.003	< 0.007
06-01-22	647	0.014 ± 0.002	< 0.005	11-30-22	625	0.042 ± 0.003	< 0.005
06-08-22	573	0.011 ± 0.003	< 0.008	12-07-22	650	0.032 ± 0.003	< 0.006
06-15-22	588	0.015 ± 0.003	< 0.007	12-14-22	674	0.032 ± 0.003	< 0.006
06-22-22	588	0.020 ± 0.003	< 0.007	12-21-22	653	0.026 ± 0.003	< 0.013
06-29-22	573	0.013 ± 0.003	< 0.008	12-28-22	664	0.031 ± 0.003	< 0.008
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2Q 2022	Mean ± s.d.	0.014 ± 0.003	< 0.011	4Q 2022	Mean ± s.d.	0.030 ± 0.010	< 0.013
				Cumulative Average		0.022	

PNPP

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

Location: P-5
 Units: pCi/m³
 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
01-05-22	547	0.031 ± 0.003	< 0.010	07-06-22	631	0.023 ± 0.003	< 0.012
01-12-22	516	0.041 ± 0.004	< 0.012	07-13-22	626	0.014 ± 0.003	< 0.009
01-19-22	431	0.055 ± 0.005	< 0.014	07-20-22	634	0.023 ± 0.003	< 0.011
01-26-22	544	0.026 ± 0.003	< 0.009	07-27-22	637	0.021 ± 0.003	< 0.007
02-02-22	562	0.039 ± 0.003	< 0.008	08-03-22	605	0.015 ± 0.003	< 0.007
02-09-22	529	0.036 ± 0.003	< 0.008	08-10-22	650	0.015 ± 0.002	< 0.009
02-16-22	493	0.022 ± 0.003	< 0.010	08-17-22	612	0.020 ± 0.003	< 0.007
02-23-22	489	0.025 ± 0.003	< 0.007	08-23-22	526	0.021 ± 0.003	< 0.006
03-02-22	484	0.033 ± 0.004	< 0.008	08-31-22	719	0.031 ± 0.003	< 0.010
03-09-22	618	0.022 ± 0.003	< 0.007	09-07-22	583	0.023 ± 0.003	< 0.005
03-16-22	654	0.023 ± 0.003	< 0.011	09-14-22	572	0.018 ± 0.003	< 0.009
03-23-22	678	0.020 ± 0.003	< 0.006	09-21-22	582	0.039 ± 0.003	< 0.006
03-30-22	646	0.014 ± 0.002	< 0.006	09-28-22	560	0.016 ± 0.003	< 0.010
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1Q 2022	Mean ± s.d.	0.030 ± 0.011	< 0.014	3Q 2022	Mean ± s.d.	0.021 ± 0.007	< 0.012
04-06-22	656	0.017 ± 0.002	< 0.010	10-05-22	561	0.012 ± 0.003	< 0.007
04-13-22	660	0.010 ± 0.002	< 0.004	10-12-22	568	0.029 ± 0.003	< 0.009
04-20-22	652	0.011 ± 0.002	< 0.011	10-19-22	562	0.020 ± 0.003	< 0.008
04-27-22	656	0.018 ± 0.002	< 0.010	10-26-22	572	0.042 ± 0.004	< 0.007
				11-02-22	568	0.020 ± 0.003	< 0.006
05-04-22	674	0.016 ± 0.002	< 0.010	11-09-22	570	0.035 ± 0.003	< 0.005
05-11-22	649	0.019 ± 0.003	< 0.006	11-16-22	554	0.016 ± 0.003	< 0.005
05-18-22	655	0.013 ± 0.002	< 0.006	11-23-22	524	0.034 ± 0.004	< 0.009
05-25-22	642	0.012 ± 0.002	< 0.009	11-30-22	529	0.043 ± 0.004	< 0.006
06-01-22	665	0.015 ± 0.002	< 0.005				
06-08-22	611	0.013 ± 0.002	< 0.007	12-07-22	538	0.044 ± 0.004	< 0.007
06-15-22	620	0.016 ± 0.003	< 0.007	12-14-22	555	0.033 ± 0.003	< 0.007
06-22-22	639	0.026 ± 0.003	< 0.007	12-21-22	458	0.028 ± 0.004	< 0.019
06-29-22	621	0.013 ± 0.002	< 0.008	12-28-22	429	0.040 ± 0.004	< 0.012
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2Q 2022	Mean ± s.d.	0.015 ± 0.004	< 0.011	4Q 2022	Mean ± s.d.	0.030 ± 0.011	< 0.019
						Cumulative Average	0.024

PNPP

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

Location: P-6

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	I-131	Date Collected	Volume (m ³)	Gross Beta	I-131
<u>Required LLD</u>		<u>0.0075</u>	<u>0.050</u>			<u>0.0075</u>	<u>0.050</u>
01-05-22	600	0.022 ± 0.003	< 0.009	07-06-22	493	0.026 ± 0.003	< 0.016
01-12-22	587	0.031 ± 0.003	< 0.010	07-13-22	559	0.016 ± 0.003	< 0.010
01-19-22	588	0.037 ± 0.003	< 0.010	07-20-22	503	0.029 ± 0.003	< 0.014
01-26-22	589	0.020 ± 0.003	< 0.009	07-27-22	494	0.026 ± 0.003	< 0.009
02-02-22	578	0.034 ± 0.003	< 0.008	08-03-22	472	0.018 ± 0.003	< 0.009
02-09-22	579	0.036 ± 0.003	< 0.007	08-10-22	468	0.023 ± 0.003	< 0.012
02-16-22	597	0.024 ± 0.003	< 0.008	08-17-22	454	0.031 ± 0.004	< 0.010
02-23-22	611	0.022 ± 0.003	< 0.006	08-23-22	439	0.027 ± 0.004	< 0.007
03-02-22	579	0.030 ± 0.003	< 0.007	08-31-22	547	0.033 ± 0.003	< 0.013
03-09-22	580	0.022 ± 0.003	< 0.007	09-07-22	493	0.026 ± 0.003	< 0.006
03-16-22	560	0.028 ± 0.003	< 0.013	09-14-22	455	0.023 ± 0.004	< 0.011
03-23-22	564	0.020 ± 0.003	< 0.007	09-21-22	491	0.051 ± 0.004	< 0.007
03-30-22	541	0.012 ± 0.003	< 0.008	09-28-22	447	0.019 ± 0.004	< 0.012
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1Q 2022	Mean ± s.d.	0.026 ± 0.007	< 0.013	3Q 2022	Mean ± s.d.	0.027 ± 0.009	< 0.016
04-06-22	586	0.016 ± 0.003	< 0.011	10-05-22	450	0.016 ± 0.003	< 0.009
04-13-22	587	0.015 ± 0.002	< 0.005	10-12-22	518	0.039 ± 0.004	< 0.009
04-20-22	564	0.014 ± 0.002	< 0.013	10-19-22	528	0.024 ± 0.003	< 0.009
04-27-22	577	0.021 ± 0.003	< 0.011	10-26-22	513	0.050 ± 0.004	< 0.008
				11-02-22	534	0.025 ± 0.003	< 0.006
05-04-22	594	0.017 ± 0.003	< 0.011				
05-11-22	588	0.021 ± 0.003	< 0.007	11-09-22	539	0.037 ± 0.003	< 0.006
05-18-22	580	0.014 ± 0.003	< 0.007	11-16-22	482	0.015 ± 0.003	< 0.005
05-25-22	560	0.016 ± 0.003	< 0.010	11-23-22	504	0.040 ± 0.004	< 0.009
06-01-22	548	0.015 ± 0.003	< 0.006	11-30-22	537	0.054 ± 0.004	< 0.006
06-08-22	529	0.018 ± 0.003	< 0.008				
06-15-22	502	0.020 ± 0.003	< 0.008	12-07-22	509	0.038 ± 0.004	< 0.008
06-22-22	515	0.025 ± 0.003	< 0.008	12-14-22	511	0.040 ± 0.004	< 0.008
06-29-22	481	0.015 ± 0.003	< 0.010	12-21-22	493	0.032 ± 0.004	< 0.018
				12-28-22	538	0.043 ± 0.004	< 0.010
<hr/>				<hr/>			
2Q 2022	Mean ± s.d.	0.017 ± 0.003	< 0.013	4Q 2022	Mean ± s.d.	0.035 ± 0.012	< 0.018
						Cumulative Average	0.026

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

PNPP

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

Location: P-7

Units: pCi/m³

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
01-05-22	570	0.021 ± 0.003	< 0.010	07-06-22	549	0.027 ± 0.003	< 0.014
01-12-22	552	0.031 ± 0.003	< 0.011	07-13-22	549	0.019 ± 0.003	< 0.010
01-19-22	579	0.035 ± 0.003	< 0.010	07-20-22	540	0.026 ± 0.003	< 0.013
01-26-22	590	0.026 ± 0.003	< 0.009	07-27-22	561	0.030 ± 0.003	< 0.008
02-02-22	579	0.033 ± 0.003	< 0.008	08-03-22	547	0.021 ± 0.003	< 0.008
02-09-22	588	0.032 ± 0.003	< 0.007	08-10-22	567	0.019 ± 0.003	< 0.010
02-16-22	602	0.023 ± 0.003	< 0.008	08-17-22	585	0.022 ± 0.003	< 0.008
02-23-22	611	0.023 ± 0.003	< 0.006	08-23-22	500	0.033 ± 0.004	< 0.006
03-02-22	606	0.032 ± 0.003	< 0.007	08-31-22	716	0.028 ± 0.003	< 0.010
03-09-22	613	0.021 ± 0.003	< 0.007	09-07-22	573	0.021 ± 0.003	< 0.006
03-16-22	504	0.028 ± 0.004	< 0.015	09-14-22	578	0.018 ± 0.003	< 0.009
03-23-22	466	0.029 ± 0.004	< 0.009	09-21-22	595	0.037 ± 0.003	< 0.006
03-30-22	635	0.017 ± 0.003	< 0.007	09-28-22	576	0.015 ± 0.003	< 0.009
1Q 2022 Mean ± s.d.		0.027 ± 0.006	< 0.015	3Q 2022 Mean ± s.d.		0.024 ± 0.006	< 0.014
04-06-22	659	0.022 ± 0.003	< 0.010	10-05-22	585	0.010 ± 0.003	< 0.007
04-13-22	676	0.016 ± 0.002	< 0.004	10-12-22	578	0.031 ± 0.003	< 0.008
04-20-22	662	0.015 ± 0.002	< 0.011	10-19-22	601	0.021 ± 0.003	< 0.008
04-27-22	661	0.025 ± 0.003	< 0.010	10-26-22	591	0.035 ± 0.003	< 0.007
05-04-22	678	0.026 ± 0.003	< 0.010	11-02-22	628	0.022 ± 0.003	< 0.005
05-11-22	680	0.024 ± 0.003	< 0.006	11-09-22	627	0.029 ± 0.003	< 0.005
05-18-22	659	0.018 ± 0.002	< 0.006	11-16-22	619	0.012 ± 0.002	< 0.004
05-25-22	659	0.017 ± 0.002	< 0.008	11-23-22	653	0.028 ± 0.003	< 0.007
06-01-22	654	0.019 ± 0.003	< 0.005	11-30-22	659	0.036 ± 0.003	< 0.005
06-08-22	545	0.018 ± 0.003	< 0.008	12-07-22	655	0.029 ± 0.003	< 0.006
06-15-22	530	0.020 ± 0.003	< 0.008	12-14-22	679	0.029 ± 0.003	< 0.006
06-22-22	552	0.030 ± 0.003	< 0.008	12-21-22	675	0.028 ± 0.003	< 0.013
06-29-22	535	0.016 ± 0.003	< 0.009	12-28-22	657	0.029 ± 0.003	< 0.008
2Q 2022 Mean ± s.d.		0.020 ± 0.005	< 0.011	4Q 2022 Mean ± s.d.		0.026 ± 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-35
 Units: pCi/m³
 Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	I-131	Date Collected	Volume (m ³)	Gross Beta	I-131
Required LLD		<u>0.0075</u>	<u>0.050</u>			<u>0.0075</u>	<u>0.050</u>
01-05-22	544	0.025 ± 0.003	< 0.012	07-06-22	543	0.025 ± 0.003	< 0.013
01-12-22	535	0.037 ± 0.004	< 0.017	07-13-22	543	0.017 ± 0.003	< 0.013
01-19-22	528	0.040 ± 0.004	< 0.013	07-20-22	539	0.024 ± 0.003	< 0.012
01-26-22	547	0.026 ± 0.003	< 0.014	07-27-22	549	0.023 ± 0.003	< 0.005
02-02-22	509	0.039 ± 0.004	< 0.017	08-03-22	528	0.017 ± 0.003	< 0.009
02-09-22	526	0.036 ± 0.003	< 0.012	08-10-22	538	0.018 ± 0.003	< 0.005
02-16-22	505	0.028 ± 0.003	< 0.017	08-17-22	543	0.020 ± 0.003	< 0.013
02-23-22	522	0.029 ± 0.003	< 0.011	08-23-22	453	0.024 ± 0.004	< 0.008
03-02-22	504	0.033 ± 0.004	< 0.011	08-31-22	614	0.028 ± 0.003	< 0.007
03-09-22	603	0.022 ± 0.003	< 0.015	09-07-22	575	0.024 ± 0.003	< 0.009
03-16-22	764	0.021 ± 0.002	< 0.009	09-14-22	573	0.018 ± 0.003	< 0.014
03-23-22	699	0.019 ± 0.002	< 0.009	09-21-22	581	0.043 ± 0.003	< 0.007
03-30-22	661	0.011 ± 0.002	< 0.010	09-28-22	565	0.015 ± 0.003	< 0.012
1Q 2022 Mean ± s.d.		0.028 ± 0.009	< 0.017	3Q 2022 Mean ± s.d.		0.023 ± 0.007	< 0.014
04-06-22	672	0.017 ± 0.002	< 0.011	10-05-22	577	0.012 ± 0.003	< 0.006
04-13-22	673	0.013 ± 0.002	< 0.008	10-12-22	570	0.029 ± 0.003	< 0.011
04-20-22	664	0.011 ± 0.002	< 0.010	10-19-22	573	0.023 ± 0.003	< 0.005
04-27-22	667	0.018 ± 0.002	< 0.008	10-26-22	566	0.042 ± 0.004	< 0.004
05-04-22	682	0.018 ± 0.002	< 0.010	11-02-22	587	0.028 ± 0.003	< 0.008
05-11-22	674	0.020 ± 0.002	< 0.008	11-09-22	587	0.030 ± 0.003	< 0.015
05-18-22	652	0.014 ± 0.002	< 0.010	11-16-22	578	0.014 ± 0.003	< 0.009
05-25-22	657	0.014 ± 0.002	< 0.008	11-23-22	589	0.031 ± 0.003	< 0.019
06-01-22	669	0.012 ± 0.002	< 0.008	11-30-22	583	0.044 ± 0.003	< 0.011
06-08-22	545	0.017 ± 0.003	< 0.008	12-07-22	575	0.032 ± 0.003	< 0.007
06-15-22	527	0.020 ± 0.003	< 0.012	12-14-22	597	0.033 ± 0.003	< 0.007
06-22-22	541	0.025 ± 0.003	< 0.007	12-21-22	601	0.024 ± 0.003	< 0.014
06-29-22	528	0.016 ± 0.003	< 0.009	12-28-22	586	0.034 ± 0.003	< 0.009
2Q 2022 Mean ± s.d.		0.017 ± 0.004	< 0.012	4Q 2022 Mean ± s.d.		0.029 ± 0.009	< 0.019
Cumulative Average						0.024	

PNPP

Table 3. Airborne particulates, analyses for gamma-emitting isotopes.
 Collection: Quarterly Composite
 Units: pCi/m³

Location	PE-1				
Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Lab Code	PEAP - 1218	PEAP - 2115	PEAP - 3406	PEAP - 4306	
Vol. (m ³)	6563	6898	7802	7774	
Be-7	0.083 ± 0.011	0.079 ± 0.010	0.076 ± 0.008	0.053 ± 0.003	-
Co-58	< 0.0006	< 0.0005	< 0.0005	< 0.0002	-
Co-60	< 0.0003	< 0.0002	< 0.0002	< 0.0003	-
Cs-134	< 0.0005	< 0.0005	< 0.0003	< 0.0001	0.005
Cs-137	< 0.0003	< 0.0004	< 0.0004	< 0.0002	0.045

Location	PE-3				
Lab Code	PEAP - 1219	PEAP - 2116	PEAP - 3407	PEAP - 4307	
Vol. (m ³)	7563	8029	7742	7402	
Be-7	0.058 ± 0.011	0.066 ± 0.009	0.063 ± 0.009	0.052 ± 0.003	-
Co-58	< 0.0005	< 0.0005	< 0.0004	< 0.0002	-
Co-60	< 0.0003	< 0.0003	< 0.0002	< 0.0002	-
Cs-134	< 0.0005	< 0.0004	< 0.0004	< 0.0002	0.005
Cs-137	< 0.0004	< 0.0003	< 0.0002	< 0.0001	0.045

Location	PE-4				
Lab Code	PEAP - 1220	PEAP - 2117	PEAP - 3408	PEAP - 4308	
Vol. (m ³)	7426	8137	7312	7951	
Be-7	0.066 ± 0.011	0.061 ± 0.008	0.059 ± 0.009	0.059 ± 0.003	-
Co-58	< 0.0004	< 0.0003	< 0.0003	< 0.0001	-
Co-60	< 0.0003	< 0.0002	< 0.0002	< 0.0002	-
Cs-134	< 0.0005	< 0.0004	< 0.0004	< 0.0001	0.005
Cs-137	< 0.0003	< 0.0004	< 0.0004	< 0.0001	0.045

Location	PE-5				
Lab Code	PEAP - 1221	PEAP - 2118	PEAP - 3409	PEAP - 4309	
Vol. (m ³)	7191	8400	7937	6988	
Be-7	0.073 ± 0.012	0.063 ± 0.007	0.063 ± 0.007	0.055 ± 0.009	-
Co-58	< 0.0005	< 0.0004	< 0.0004	< 0.0005	-
Co-60	< 0.0005	< 0.0002	< 0.0004	< 0.0009	-
Cs-134	< 0.0003	< 0.0003	< 0.0004	< 0.0004	0.005
Cs-137	< 0.0005	< 0.0003	< 0.0003	< 0.0007	0.045

PNPP

Table 3. Airborne particulates, analyses for gamma-emitting isotopes.
 Collection: Quarterly Composite
 Units: pCi/m³

Location PE-6					
Quarter	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD
Lab Code	PEAP - 1222	PEAP - 2119	PEAP - 3410	PEAP - 4310	
Vol. (m ³)	7553	7211	6315	6656	
Be-7	0.072 ± 0.009	0.079 ± 0.009	0.075 ± 0.009	0.072 ± 0.010	-
Co-58	< 0.0004	< 0.0003	< 0.0003	< 0.0006	-
Co-60	< 0.0002	< 0.0002	< 0.0002	< 0.0003	-
Cs-134	< 0.0003	< 0.0004	< 0.0004	< 0.0005	0.005
Cs-137	< 0.0002	< 0.0002	< 0.0002	< 0.0003	0.045
Location PE-7					
Lab Code	PEAP - 1223	PEAP - 2120	PEAP - 3411	PEAP - 4311	
Vol. (m ³)	7495	8150	7436	8207	
Be-7	0.064 ± 0.008	0.084 ± 0.009	0.068 ± 0.006	0.054 ± 0.008	-
Co-58	< 0.0003	< 0.0004	< 0.0003	< 0.0002	-
Co-60	< 0.0003	< 0.0003	< 0.0003	< 0.0004	-
Cs-134	< 0.0004	< 0.0004	< 0.0003	< 0.0004	0.005
Cs-137	< 0.0004	< 0.0002	< 0.0003	< 0.0004	0.045
Location PE-35					
Lab Code	PEAP - 1224	PEAP - 2121	PEAP - 3412	PEAP - 4312	
Vol. (m ³)	7447	8151	7144	7569	
Be-7	0.071 ± 0.010	0.073 ± 0.008	0.070 ± 0.012	0.058 ± 0.003	-
Co-58	< 0.0005	< 0.0004	< 0.0006	< 0.0002	-
Co-60	< 0.0003	< 0.0003	< 0.0004	< 0.0003	-
Cs-134	< 0.0004	< 0.0003	< 0.0006	< 0.0001	0.005
Cs-137	< 0.0002	< 0.0002	< 0.0005	< 0.0002	0.045

PNPP

Table 4. Lake water, analyses for gross beta and gamma emitting isotopes.
 Location: P-34 Collection: Monthly composites Units: pCi/L

Lab Code	PELW- 248	PELW- 394	PELW- 1163	PELW- 1168	Req. LLD
Start Date	12-28-21	01-25-22	02-23-22	03-29-22	
End Date	01-25-22	02-23-22	03-29-22	04-26-22	
Gross beta	< 0.9	3.0 ± 0.7	1.3 ± 0.6	1.0 ± 0.6	3.0
Mn-54	< 1.5	< 2.2	< 1.1	< 2.5	11
Fe-59	< 6.3	< 5.2	< 3.3	< 2.6	22
Co-58	< 1.7	< 1.6	< 1.5	< 1.6	11
Co-60	< 2.5	< 1.7	< 0.8	< 1.6	11
Zn-65	< 3.1	< 6.7	< 2.1	< 2.4	22
Zr-95	< 5.3	< 5.2	< 2.3	< 4.4	22
Nb-95	< 3.2	< 3.5	< 2.3	< 4.5	11
Cs-134	< 2.9	< 2.9	< 1.0	< 2.5	11
Cs-137	< 2.2	< 2.3	< 1.1	< 2.8	13
Ba-140	< 32.6	< 16.3	< 31.5	< 44.0	45
La-140	< 5.1	< 2.8	< 9.9	< 8.9	11
Lab Code	PELW- 1705	PELW- 1920	PELW- 2486	PELW- 2721	Req. LLD
Start Date	04-26-22	05-24-22	06-28-22	07-27-22	
End Date	05-24-22	06-28-22	07-27-22	08-30-22	
Gross beta	1.6 ± 0.6	1.0 ± 0.5	< 0.9	< 0.9	3.0
Mn-54	< 2.2	< 4.5	< 2.5	< 2.5	11
Fe-59	< 3.0	< 6.3	< 3.9	< 2.3	22
Co-58	< 1.0	< 4.8	< 1.6	< 2.3	11
Co-60	< 1.3	< 4.4	< 1.5	< 1.7	11
Zn-65	< 1.7	< 8.5	< 3.4	< 2.3	22
Zr-95	< 4.4	< 6.8	< 4.1	< 2.7	22
Nb-95	< 3.2	< 4.6	< 3.7	< 2.5	11
Cs-134	< 1.9	< 5.1	< 2.5	< 2.7	11
Cs-137	< 2.1	< 4.7	< 3.3	< 2.6	13
Ba-140	< 33.3	< 32.4	< 29.3	< 15.0	45
La-140	< 9.7	< 9.7	< 5.6	< 3.0	11
Lab Code	PELW- 3094	PELW- 3517	PELW- 3932	PELW- 4164	Req. LLD
Start Date	08-30-22	09-27-22	10-25-22	11-29-22	
End Date	09-27-22	10-25-22	11-29-22	12-27-22	
Gross beta	1.0 ± 0.6	< 0.9	1.6 ± 0.6	1.4 ± 0.6	3.0
Mn-54	< 2.6	< 1.9	< 2.8	< 3.2	11
Fe-59	< 1.9	< 4.2	< 2.7	< 5.0	22
Co-58	< 1.5	< 2.5	< 3.3	< 4.1	11
Co-60	< 1.5	< 2.2	< 2.8	< 1.9	11
Zn-65	< 3.2	< 3.3	< 2.3	< 7.9	22
Zr-95	< 4.7	< 3.4	< 3.6	< 7.3	22
Nb-95	< 2.1	< 2.4	< 2.8	< 4.2	11
Cs-134	< 2.3	< 2.6	< 2.9	< 3.6	11
Cs-137	< 2.8	< 2.0	< 3.3	< 4.9	13
Ba-140	< 9.9	< 9.4	< 9.5	< 19.4	45
La-140	< 2.5	< 3.0	< 3.8	< 4.2	11

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

PNPP

Location: P-36

Collection: Monthly composites

Units: pCi/L

Lab Code	PELW- 249	PELW- 395	PELW- 1164	PELW- 1169	Req. LLD
Start Date	12-28-21	01-25-22	02-23-22	03-29-22	
End Date	01-25-22	02-23-22	03-29-22	04-26-22	
Gross beta	< 0.8	1.1 ± 0.5	< 0.9	0.9 ± 0.5	3.0
Mn-54	< 2.0	< 2.1	< 0.9	< 1.3	11
Fe-59	< 4.0	< 3.6	< 2.0	< 2.5	22
Co-58	< 2.6	< 3.2	< 1.6	< 0.8	11
Co-60	< 2.0	< 1.6	< 0.6	< 1.1	11
Zn-65	< 4.0	< 5.0	< 2.2	< 1.8	22
Zr-95	< 5.5	< 3.4	< 3.7	< 2.1	22
Nb-95	< 3.3	< 3.2	< 2.4	< 2.0	11
Cs-134	< 2.6	< 2.8	< 1.1	< 1.0	11
Cs-137	< 3.1	< 3.3	< 1.2	< 1.2	13
Ba-140	< 23.3	< 15.9	< 43.6	< 13.6	45
La-140	< 7.3	< 4.4	< 9.6	< 5.1	11
Lab Code	PELW- 1706	PELW- 1921	PELW- 2487	PELW- 2722	Req. LLD
Start Date	04-26-22	05-24-22	06-28-22	07-27-22	
End Date	05-24-22	06-28-22	07-27-22	08-30-22	
Gross beta	< 0.9	1.7 ± 0.6	0.9 ± 0.5	1.2 ± 0.5	3.0
Mn-54	< 1.7	< 2.7	< 6.7	< 1.1	11
Fe-59	< 4.4	< 4.4	< 1.4	< 1.1	22
Co-58	< 1.9	< 2.4	< 3.9	< 1.0	11
Co-60	< 1.6	< 1.9	< 4.2	< 0.9	11
Zn-65	< 2.5	< 3.3	< 6.9	< 2.1	22
Zr-95	< 2.6	< 3.9	< 10.8	< 2.3	22
Nb-95	< 2.7	< 3.6	< 6.9	< 1.2	11
Cs-134	< 1.8	< 3.5	< 5.5	< 1.1	11
Cs-137	< 2.3	< 4.0	< 2.6	< 1.2	13
Ba-140	< 40.4	< 21.8	< 28.1	< 6.9	45
La-140	< 8.4	< 4.1	< 7.3	< 2.2	11
Lab Code	PELW- 3095	PELW- 3518	PELW- 3934	PELW- 4165	Req. LLD
Start Date	08-30-22	09-27-22	10-25-22	11-29-22	
End Date	09-27-22	10-25-22	11-29-22	12-27-22	
Gross beta	1.3 ± 0.5	< 0.9	< 0.9	1.1 ± 0.5	3.0
Mn-54	< 1.4	< 2.2	< 2.3	< 3.9	11
Fe-59	< 3.1	< 2.4	< 7.8	< 6.2	22
Co-58	< 1.6	< 2.1	< 3.0	< 5.1	11
Co-60	< 1.7	< 2.9	< 1.6	< 2.4	11
Zn-65	< 3.5	< 4.6	< 1.5	< 8.5	22
Zr-95	< 4.5	< 3.5	< 5.3	< 4.5	22
Nb-95	< 3.0	< 1.9	< 2.8	< 2.4	11
Cs-134	< 2.4	< 2.6	< 2.5	< 4.1	11
Cs-137	< 1.9	< 2.2	< 3.3	< 3.8	13
Ba-140	< 7.4	< 12.1	< 32.9	< 20.2	45
La-140	< 3.4	< 2.9	< 9.2	< 4.5	11

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

PNPP

Location: P-39

Collection: Monthly composites

Units: pCi/L

Lab Code	PELW- 250	PELW- 396	PELW- 1165	PELW- 1170	Req. LLD
Start Date	12-28-21	01-25-22	02-23-22	03-29-22	
End Date	01-25-22	02-23-22	03-29-22	04-26-22	
Gross beta	0.9 ± 0.5	1.6 ± 0.5	< 0.9	< 0.9	3.0
Mn-54	< 1.5	< 2.0	< 1.1	< 2.0	11
Fe-59	< 2.7	< 3.7	< 3.2	< 2.8	22
Co-58	< 1.5	< 1.9	< 1.4	< 2.2	11
Co-60	< 1.3	< 2.6	< 1.2	< 1.9	11
Zn-65	< 4.0	< 2.6	< 2.3	< 3.3	22
Zr-95	< 6.0	< 4.0	< 2.3	< 3.6	22
Nb-95	< 2.8	< 4.4	< 2.7	< 3.6	11
Cs-134	< 2.8	< 3.3	< 1.0	< 2.7	11
Cs-137	< 1.5	< 2.6	< 1.1	< 2.2	13
Ba-140	< 36.4	< 16.7	< 39.5	< 38.6	45
La-140	< 3.7	< 4.5	< 9.6	< 9.4	11
Lab Code	PELW- 1707	PELW- 1922	PELW- 2488	PELW- 2723	Req. LLD
Start Date	04-26-22	05-24-22	06-28-22	07-27-22	
End Date	05-24-22	06-28-22	07-27-22	08-30-22	
Gross beta	< 0.9	< 0.8	< 0.9	1.2 ± 0.6	3.0
Mn-54	< 4.4	< 3.3	< 3.5	< 4.6	11
Fe-59	< 3.2	< 4.5	< 10.2	< 6.1	22
Co-58	< 4.9	< 1.3	< 5.1	< 4.0	11
Co-60	< 2.0	< 1.3	< 3.3	< 2.4	11
Zn-65	< 4.6	< 3.5	< 8.5	< 4.7	22
Zr-95	< 8.0	< 4.3	< 10.1	< 6.8	22
Nb-95	< 6.5	< 3.3	< 9.0	< 3.6	11
Cs-134	< 4.4	< 2.9	< 4.5	< 4.7	11
Cs-137	< 3.4	< 3.2	< 5.0	< 3.2	13
Ba-140	< 30.0	< 32.7	< 36.5	< 20.7	45
La-140	< 4.1	< 6.4	< 7.2	< 3.2	11
Lab Code	PELW- 3096	PELW- 3519	PELW- 3935	PELW- 4166	Req. LLD
Start Date	08-30-22	09-27-22	10-25-22	11-29-22	
End Date	09-27-22	10-25-22	11-29-22	12-27-22	
Gross beta	< 0.9	< 0.9	< 0.9	1.0 ± 0.8	3.0
Mn-54	< 2.5	< 1.9	< 5.9	< 1.8	11
Fe-59	< 7.5	< 4.3	< 7.8	< 5.4	22
Co-58	< 4.0	< 2.3	< 5.0	< 3.5	11
Co-60	< 1.7	< 2.0	< 4.7	< 7.1	11
Zn-65	< 2.7	< 5.2	< 6.3	< 7.1	22
Zr-95	< 6.5	< 2.4	< 9.7	< 5.0	22
Nb-95	< 2.3	< 3.2	< 6.3	< 2.8	11
Cs-134	< 3.7	< 2.9	< 5.9	< 3.4	11
Cs-137	< 3.9	< 1.6	< 4.4	< 5.9	13
Ba-140	< 11.7	< 11.4	< 40.8	< 17.5	45
La-140	< 3.9	< 1.6	< 11.0	< 1.7	11

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

PNPP

	Location: P-59		Collection: Monthly composites		Units: pCi/L
Lab Code	PELW- 251	PELW- 397	PELW- 1166	PELW- 1171	
Start Date	12-28-21	01-25-22	02-23-22	03-29-22	Req. LLD
End Date	01-25-22	02-23-22	03-29-22	04-26-22	
Gross beta	1.1 ± 0.5	2.1 ± 0.6	< 0.9	< 0.9	3.0
Mn-54	< 2.5	< 2.5	< 0.8	< 1.7	11
Fe-59	< 6.5	< 3.3	< 1.2	< 6.2	22
Co-58	< 2.4	< 2.8	< 0.9	< 1.7	11
Co-60	< 2.2	< 2.5	< 0.5	< 1.2	11
Zn-65	< 5.0	< 5.8	< 1.2	< 2.4	22
Zr-95	< 3.6	< 2.8	< 1.8	< 4.6	22
Nb-95	< 3.0	< 2.9	< 1.6	< 2.7	11
Cs-134	< 2.9	< 2.9	< 0.6	< 2.5	11
Cs-137	< 3.0	< 2.6	< 0.8	< 2.7	13
Ba-140	< 33.5	< 17.4	< 20.9	< 37.5	45
La-140	< 6.7	< 3.1	< 8.4	< 8.1	11
Lab Code	PELW- 1708	PELW- 1923	PELW- 2489	PELW- 2725	
Start Date	04-26-22	05-24-22	06-28-22	07-27-22	Req. LLD
End Date	05-24-22	06-28-22	07-27-22	08-30-22	
Gross beta	< 0.9	0.9 ± 0.5	1.0 ± 0.5	< 0.9	3.0
Mn-54	< 2.1	< 2.8	< 3.3	< 1.8	11
Fe-59	< 5.0	< 10.5	< 4.5	< 2.3	22
Co-58	< 2.0	< 4.4	< 3.6	< 1.9	11
Co-60	< 1.4	< 3.4	< 3.7	< 1.2	11
Zn-65	< 3.1	< 4.3	< 6.4	< 3.8	22
Zr-95	< 4.0	< 7.5	< 7.7	< 3.3	22
Nb-95	< 2.7	< 5.0	< 3.9	< 2.7	11
Cs-134	< 1.8	< 5.1	< 4.2	< 1.9	11
Cs-137	< 2.1	< 4.8	< 3.2	< 1.8	13
Ba-140	< 37.0	< 36.7	< 40.0	< 10.5	45
La-140	< 10.4	< 5.4	< 7.7	< 2.9	11
Lab Code	PELW- 3098	PELW- 3520	PELW- 3936	PELW- 4167	
Start Date	08-30-22	09-27-22	10-25-22	11-29-22	Req. LLD
End Date	09-27-22	10-25-22	11-29-22	12-27-22	
Gross beta	< 0.9	0.9 ± 0.5	< 0.9	1.5 ± 0.6	3.0
Mn-54	< 1.7	< 1.6	< 2.8	< 2.4	11
Fe-59	< 3.5	< 4.3	< 3.0	< 4.4	22
Co-58	< 2.1	< 1.6	< 2.8	< 3.8	11
Co-60	< 1.7	< 1.4	< 2.6	< 2.3	11
Zn-65	< 2.6	< 3.4	< 3.5	< 6.3	22
Zr-95	< 2.2	< 3.8	< 5.8	< 5.9	22
Nb-95	< 1.6	< 1.9	< 3.7	< 4.6	11
Cs-134	< 2.0	< 2.2	< 2.3	< 3.6	11
Cs-137	< 1.7	< 2.3	< 2.2	< 3.5	13
Ba-140	< 8.3	< 8.3	< 21.8	< 18.4	45
La-140	< 1.2	< 3.0	< 5.1	< 4.0	11

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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- 252	PELW- 398	PELW- 1167	PELW- 1172	Req. LLD
Start Date	12-28-21	01-25-22	02-23-22	03-29-22	
End Date	01-25-22	02-23-22	03-29-22	04-26-22	
Gross beta	1.3 ± 0.6	1.7 ± 0.6	1.2 ± 0.6	< 0.9	3.0
Mn-54	< 2.0	< 2.9	< 1.2	< 1.5	11
Fe-59	< 5.5	< 5.9	< 3.3	< 4.6	22
Co-58	< 3.6	< 2.9	< 1.2	< 2.0	11
Co-60	< 0.9	< 1.9	< 0.9	< 1.7	11
Zn-65	< 6.5	< 4.7	< 1.9	< 3.3	22
Zr-95	< 4.4	< 4.9	< 2.0	< 3.4	22
Nb-95	< 4.1	< 2.6	< 2.6	< 3.0	11
Cs-134	< 2.9	< 2.8	< 1.0	< 1.7	11
Cs-137	< 2.5	< 2.6	< 0.9	< 1.9	13
Ba-140	< 37.8	< 21.9	< 41.1	< 20.6	45
La-140	< 6.9	< 6.0	< 10.8	< 4.4	11
Lab Code	PELW- 1709	PELW- 1924	PELW- 2490	PELW- 2726	Req. LLD
Start Date	04-26-22	05-24-22	06-28-22	07-27-22	
End Date	05-24-22	06-28-22	07-27-22	08-30-22	
Gross beta	1.1 ± 0.5	< 1.0	< 0.9	< 1.0	3.0
Mn-54	< 1.9	< 4.5	< 1.7	< 2.9	11
Fe-59	< 5.4	< 10.1	< 4.5	< 6.1	22
Co-58	< 1.4	< 2.5	< 1.4	< 2.8	11
Co-60	< 1.9	< 5.0	< 1.4	< 1.8	11
Zn-65	< 5.0	< 7.6	< 3.3	< 6.2	22
Zr-95	< 3.5	< 8.9	< 3.3	< 10.8	22
Nb-95	< 3.9	< 6.3	< 3.5	< 5.9	11
Cs-134	< 2.0	< 6.1	< 2.1	< 4.6	11
Cs-137	< 1.9	< 4.3	< 1.9	< 4.8	13
Ba-140	< 43.5	< 42.5	< 23.1	< 29.8	45
La-140	< 9.4	< 6.0	< 4.3	< 6.2	11
Lab Code	PELW- 3099	PELW- 3521	PELW- 3937	PELW- 4169	Req. LLD
Start Date	08-30-22	09-27-22	10-25-22	11-29-22	
End Date	09-27-22	10-25-22	11-29-22	12-27-22	
Gross beta	3.2 ± 1.2	< 0.9	< 1.0	1.9 ± 0.6	3.0
Mn-54	< 3.1	< 1.8	< 3.3	< 2.0	11
Fe-59	< 4.2	< 3.5	< 7.7	< 4.4	22
Co-58	< 2.3	< 1.6	< 3.8	< 2.0	11
Co-60	< 1.8	< 1.9	< 2.4	< 2.4	11
Zn-65	< 3.0	< 3.1	< 4.2	< 2.7	22
Zr-95	< 4.9	< 1.8	< 6.8	< 2.6	22
Nb-95	< 3.3	< 1.8	< 4.1	< 2.1	11
Cs-134	< 2.6	< 1.7	< 3.5	< 2.6	11
Cs-137	< 2.9	< 2.1	< 2.9	< 2.6	13
Ba-140	< 15.0	< 9.4	< 43.2	< 9.0	45
La-140	< 0.9	< 1.2	< 9.7	< 2.4	11

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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- 1292	PELW- 1947	PELW- 3227	PELW- 4170
H-3	165.6 ± 86	184.2 ± 85	230.5 ± 86	180.4 ± 83
Location P-36				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1293	PELW- 1948	PELW- 3228	PELW- 4171
H-3	184.5 ± 87	< 161	< 157	< 157
Location P-39				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1294	PELW- 1949	PELW- 3229	PELW- 4172
H-3	< 164	177.1 ± 85	167.0 ± 83	< 157
Location P-59				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1295	PELW- 1950	PELW- 3230	PELW- 4173
H-3	< 164	< 161	202.3 ± 85	201.0 ± 85
Location P-60				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	PELW- 1296	PELW- 1951	PELW- 3231	PELW- 4174
H-3	< 164	< 161	171.7 ± 83	< 157

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

Collection: Monthly

Units: pCi/kg wet

Location: P-2

Lab Code	PEVE- 2243	PEVE- 2656	PEVE- 2657	PEVE- 2658	Req. LLD
Date Collected	07-20-22	08-24-22	08-24-22	08-24-22	
Sample Type	Turnip greens	Turnip Greens	Collard Greens	Kale	
Be-7	404 ± 99	1141 ± 119	289 ± 45	511 ± 109	-
K-40	3280 ± 239	4560 ± 254	2662 ± 105	3605 ± 285	-
Co-58	< 7	< 7	< 3	< 11	-
Co-60	< 6	< 8	< 4	< 11	-
I-131	< 19	< 10	< 10	< 24	45
Cs-134	< 6	< 7	< 3	< 9	45
Cs-137	< 7	< 9	< 4	< 11	60
Lab Code	PEVE- 2659	PEVE- 2885	PEVE- 2886	PEVE- 2887	Req. LLD
Date Collected	08-24-22	09-13-22	09-13-22	09-13-22	
Sample Type	Swiss Chard	Swiss Chard	Collard Greens	Turnip Greens	
Be-7	401 ± 75	1275 ± 155	575 ± 152	801 ± 106	-
K-40	2561 ± 204	8279 ± 412	3647 ± 331	4120 ± 270	-
Co-58	< 7	< 13	< 10	< 5	-
Co-60	< 4	< 14	< 8	< 9	-
I-131	< 15	< 17	< 19	< 12	45
Cs-134	< 6	< 12	< 12	< 8	45
Cs-137	< 7	< 15	< 12	< 9	60
Lab Code	PEVE- 2888	PEVE- 3196	PEVE- 3197	PEVE- 3198	Req. LLD
Date Collected	09-13-22	10-04-22	10-04-22	10-04-22	
Sample Type	Kale	Turnip Greens	Collard Greens	Kale	
Be-7	551 ± 116	1195 ± 68	416 ± 186	< 110	-
K-40	3657 ± 283	5674 ± 153	4560 ± 381	4507 ± 313	-
Co-58	< 8	< 3	< 12	< 8	-
Co-60	< 7	< 4	< 13	< 7	-
I-131	< 8	< 18	< 39	< 22	45
Cs-134	< 8	< 4	< 13	< 8	45
Cs-137	< 10	< 6	< 11	< 12	60
Lab Code	PEVE- 3199				Req. LLD
Date Collected	10-04-22				
Sample Type	Swiss Chard				
Be-7	474 ± 101				-
K-40	6806 ± 377				-
Co-58	< 8				-
Co-60	< 8				-
I-131	< 25				45
Cs-134	< 8				45
Cs-137	< 8				60

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

Collection: Monthly

Units: pCi/kg wet

Location: P-16

Lab Code	PEVE- 2244	PEVE- 2245	PEVE- 2660	PEVE- 2662	Req. LLD
Date Collected	07-20-22	07-20-22	08-24-22	08-24-22	
Sample Type	Turnip Greens	Swiss Chard	Turnip Greens	Collard Greens	
Be-7	141 ± 75	164 ± 78	737 ± 76	218 ± 57	-
K-40	4270 ± 235	4540 ± 300	5574 ± 155	4231 ± 142	-
Co-58	< 5	< 8	< 5	< 4	-
Co-60	< 4	< 3	< 5	< 3	-
I-131	< 10	< 18	< 15	< 13	45
Cs-134	< 6	< 8	< 5	< 4	45
Cs-137	< 6	< 8	< 5	< 5	60

Lab Code	PEVE- 2663	PEVE- 2664	PEVE- 2896	PEVE- 2897	Req. LLD
Date Collected	08-24-22	08-24-22	09-13-22	09-13-22	
Sample Type	Kale	Swiss Chard	Turnip Greens	Collard Greens	
Be-7	414 ± 131	607 ± 104	835 ± 53	690 ± 95	-
K-40	4765 ± 345	5204 ± 231	5994 ± 159	4249 ± 199	-
Co-58	< 8	< 8	< 4	< 8	-
Co-60	< 9	< 4	< 4	< 7	-
I-131	< 32	< 18	< 5	< 9	45
Cs-134	< 11	< 7	< 4	< 7	45
Cs-137	< 13	< 7	< 5	< 6	60

Lab Code	PEVE- 2898	PEVE- 2899	PEVE- 3200	PEVE- 3201	Req. LLD
Date Collected	09-13-22	09-13-22	10-04-22	10-04-22	
Sample Type	Kale	Swiss Chard	Turnip Greens	Collard Greens	
Be-7	571 ± 96	510 ± 94	203 ± 91	299 ± 98	-
K-40	4560 ± 258	4872 ± 261	4742 ± 261	3215 ± 252	-
Co-58	< 5	< 5	< 9	< 6	-
Co-60	< 4	< 8	< 10	< 7	-
I-131	< 12	< 17	< 25	< 25	45
Cs-134	< 8	< 8	< 9	< 8	45
Cs-137	< 10	< 8	< 5	< 7	60

Lab Code	PEVE- 3202	PEVE- 3203			Req. LLD
Date Collected	10-04-22	10-04-22			
Sample Type	Kale	Swiss Chard			
Be-7	480 ± 102	614 ± 60			-
K-40	4564 ± 300	6562 ± 204			-
Co-58	< 7	< 7			-
Co-60	< 10	< 7			-
I-131	< 29	< 24			45
Cs-134	< 9	< 7			45
Cs-137	< 12	< 7			60

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

Collection: Monthly

Units: pCi/kg wet

Location: P-20

Lab Code	PEVE- 2246	PEVE- 2247	PEVE- 2248	PEVE- 2249	Req. LLD
Date Collected	07-21-22	07-21-22	07-21-22	07-21-22	
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	282 ± 87	119 ± 57	140 ± 56	373 ± 83	-
K-40	6276 ± 290	4249 ± 211	4466 ± 186	7676 ± 249	-
Co-58	< 5	< 4	< 6	< 8	-
Co-60	< 5	< 4	< 6	< 7	-
I-131	< 27	< 17	< 25	< 25	45
Cs-134	< 7	< 5	< 6	< 6	45
Cs-137	< 6	< 5	< 5	< 6	60
Lab Code	PEVE- 2665	PEVE- 2666	PEVE- 2667	PEVE- 2668	Req. LLD
Date Collected	08-24-22	08-24-22	08-24-22	08-24-22	
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	1669 ± 152	427 ± 87	1295 ± 143	1183 ± 115	-
K-40	4692 ± 296	3194 ± 230	4126 ± 276	9736 ± 251	-
Co-58	< 5	< 9	< 7	< 7	-
Co-60	< 5	< 7	< 6	< 7	-
I-131	< 13	< 18	< 25	< 27	45
Cs-134	< 8	< 8	< 10	< 8	45
Cs-137	< 10	< 7	< 10	< 5	60
Lab Code	PEVE- 2889	PEVE- 2890	PEVE- 2891	PEVE- 2892	Req. LLD
Date Collected	09-13-22	09-13-22	09-13-22	09-13-22	
Sample Type	Swiss Chard	Collard Greens	Turnip Greens	Kale	
Be-7	854 ± 78	485 ± 52	844 ± 113	258 ± 70	-
K-40	5484 ± 219	3856 ± 137	4506 ± 308	3171 ± 219	-
Co-58	< 4	< 3	< 7	< 5	-
Co-60	< 6	< 4	< 8	< 5	-
I-131	< 5	< 7	< 18	< 7	45
Cs-134	< 5	< 4	< 10	< 6	45
Cs-137	< 7	< 3	< 8	< 6	60
Lab Code	PEVE- 3205	PEVE- 3206	PEVE- 3207	PEVE- 3208	Req. LLD
Date Collected	10-04-22	10-04-22	10-04-22	10-04-22	
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	968 ± 150	241 ± 67	225 ± 103	595 ± 130	-
K-40	5262 ± 267	4361 ± 194	4796 ± 413	6255 ± 388	-
Co-58	< 11	< 4	< 15	< 10	-
Co-60	< 13	< 3	< 16	< 6	-
I-131	< 36	< 13	< 45	< 26	45
Cs-134	< 10	< 5	< 15	< 11	45
Cs-137	< 8	< 5	< 12	< 11	60

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

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

Collection: Monthly		Units: pCi/kg wet			
Location: P-37					
Lab Code	PEVE- 2250	PEVE- 2251	PEVE- 2252	PEVE- 2253	Req. LLD
Date Collected	07-21-22	07-21-22	07-21-22	07-21-22	
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	231 ± 90	< 69	117 ± 62	< 136	-
K-40	4902 ± 248	3224 ± 182	4410 ± 186	3906 ± 365	-
Co-58	< 6	< 7	< 6	< 12	-
Co-60	< 7	< 6	< 6	< 11	-
I-131	< 32	< 31	< 28	< 19	45
Cs-134	< 7	< 7	< 5	< 10	45
Cs-137	< 9	< 7	< 5	< 12	60
Lab Code	PEVE- 2669	PEVE- 2670	PEVE- 2671	PEVE- 2672	Req. LLD
Date Collected	08-24-22	08-24-22	08-24-22	08-24-22	
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	1219 ± 101	652 ± 84	781 ± 133	598 ± 111	-
K-40	5678 ± 240	3533 ± 207	3717 ± 330	5236 ± 265	-
Co-58	< 8	< 6	< 10	< 7	-
Co-60	< 7	< 8	< 10	< 9	-
I-131	< 16	< 15	< 15	< 18	45
Cs-134	< 7	< 6	< 10	< 8	45
Cs-137	< 8	< 6	< 7	< 8	60
Lab Code	PEVE- 2893	PEVE- 2894	PEVE- 2895	PEVE- 2900	Req. LLD
Date Collected	09-13-22	09-13-22	09-13-22	09-13-22	
Sample Type	Turnip Greens	Kale	Collard Greens	Swiss Chard	
Be-7	1211 ± 243	404 ± 95	519 ± 217	1038 ± 177	-
K-40	4628 ± 525	2640 ± 263	2861 ± 457	6877 ± 534	-
Co-58	< 11	< 6	< 18	< 22	-
Co-60	< 10	< 9	< 10	< 14	-
I-131	< 25	< 8	< 32	< 25	45
Cs-134	< 16	< 10	< 21	< 18	45
Cs-137	< 14	< 12	< 16	< 22	60
Lab Code	PEVE- 3209	PEVE- 3210	PEVE- 3211	PEVE- 3212	Req. LLD
Date Collected	10-04-22	10-04-22	10-04-22	10-04-22	
Sample Type	Turnip Greens	Collard Greens	Kale	Swiss Chard	
Be-7	748 ± 121	765 ± 124	281 ± 96	590 ± 87	-
K-40	5929 ± 360	3498 ± 256	5422 ± 290	4005 ± 270	-
Co-58	< 11	< 9	< 5	< 5	-
Co-60	< 10	< 9	< 9	< 6	-
I-131	< 31	< 29	< 32	< 21	45
Cs-134	< 11	< 9	< 8	< 7	45
Cs-137	< 12	< 10	< 10	< 9	60

Company: Energy Harbor

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

Collection: Monthly

Units: pCi/kg wet

Location: P-70

Lab Code	PEVE- 2254	PEVE- 2673	PEVE- 2674	PEVE- 2675	Req. LLD
Date Collected	07-21-22	08-24-22	08-24-22	08-24-22	
Sample Type	Turnip Greens	Turnip Greens	Collard Greens	Kale	
Be-7	223 ± 100	1778 ± 196	411 ± 87	214 ± 128	-
K-40	4729 ± 316	5299 ± 350	3834 ± 260	4223 ± 432	-
Co-58	< 6	< 9	< 7	< 12	-
Co-60	< 5	< 10	< 5	< 16	-
I-131	< 19	< 29	< 17	< 23	45
Cs-134	< 8	< 12	< 8	< 16	45
Cs-137	< 10	< 10	< 5	< 14	60
Lab Code	PEVE- 2676	PEVE- 2901	PEVE- 2902	PEVE- 2903	Req. LLD
Date Collected	08-24-22	09-13-22	09-13-22	09-13-22	
Sample Type	Swiss Chard	Turnip Greens	Collard Greens	Kale	
Be-7	832 ± 106	1314 ± 77	566 ± 56	243 ± 86	-
K-40	10965 ± 292	6163 ± 167	4352 ± 146	3216 ± 198	-
Co-58	< 9	< 4	< 6	< 6	-
Co-60	< 11	< 6	< 5	< 4	-
I-131	< 22	< 4	< 7	< 13	45
Cs-134	< 9	< 5	< 5	< 7	45
Cs-137	< 6	< 3	< 6	< 9	60
Lab Code	PEVE- 2904	PEVE- 3213	PEVE- 3214	PEVE- 3215	Req. LLD
Date Collected	09-13-22	10-04-22	10-04-22	10-04-22	
Sample Type	Swiss Chard	Turnip Greens	Collard Greens	Kale	
Be-7	650 ± 161	836 ± 161	346 ± 126	219 ± 96	-
K-40	7586 ± 402	5354 ± 337	3600 ± 315	4999 ± 261	-
Co-58	< 13	< 7	< 9	< 8	-
Co-60	< 16	< 10	< 8	< 7	-
I-131	< 20	< 22	< 25	< 32	45
Cs-134	< 13	< 11	< 11	< 9	45
Cs-137	< 18	< 8	< 11	< 6	60
Lab Code	PEVE- 3216				Req. LLD
Date Collected	10-04-22				
Sample Type	Swiss Chard				
Be-7	443 ± 96				-
K-40	6046 ± 364				-
Co-58	< 12				-
Co-60	< 9				-
I-131	< 28				45
Cs-134	< 9				45
Cs-137	< 7				60

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Table 9: Fish, analyses for gamma emitting isotopes.
Collection: Semiannually

Units: pCi/kg wet

Location					
P-25					
Lab Code	PEF- 1925	PEF- 1926	PEF- 1927	PEF- 1928	Req. LLC
Date Collected	06-15-22	06-15-22	06-21-22	06-21-22	
Sample Type	Smallmouth Bass	Yellow Perch	Walleye	White Perch	
K-40	957 ± 195	756 ± 294	1405 ± 304	1240 ± 273	-
Mn-54	< 7	< 11	< 14	< 17	94
Fe-59	< 40	< 74	< 30	< 40	195
Co-58	< 13	< 24	< 16	< 10	97
Co-60	< 8	< 10	< 12	< 12	97
Zn-65	< 19	< 25	< 28	< 20	195
Cs-134	< 9	< 17	< 16	< 12	97
Cs-137	< 7	< 20	< 16	< 15	112

Location					
P-25					
Lab Code	PEF- 1929	PEF- 3424	PEF- 3425	PEF- 3426	Req. LLC
Date Collected	06-21-22	10-06-22	10-06-22	10-06-22	
Sample Type	Freshwater Drum	Channel Catfish	Redhorse Sucker	Gizzard Shad	
K-40	1115 ± 407	1068 ± 151	1007 ± 137	789 ± 177	-
Mn-54	< 19	< 9	< 9	< 13	94
Fe-59	< 62	< 46	< 44	< 42	195
Co-58	< 35	< 18	< 14	< 20	97
Co-60	< 14	< 11	< 17	< 13	97
Zn-65	< 37	< 20	< 21	< 30	195
Cs-134	< 20	< 9	< 9	< 12	97
Cs-137	< 25	< 10	< 14	< 13	112

Location					
P-25					
Lab Code	PEF- 3427	PEF- 3428			
Date Collected	10-06-22	10-06-22			
Sample Type	Walleye	Smallmouth Bass			
K-40	2539 ± 137	1255 ± 179			
Mn-54	< 9	< 13			
Fe-59	< 48	< 34			
Co-58	< 15	< 17			
Co-60	< 9	< 8			
Zn-65	< 11	< 27			
Cs-134	< 8	< 10			
Cs-137	< 8	< 10			

Company: Energy Harbor

Plant: Perry Nuclear Power Plant

Table 9. Fish, analyses for gamma emitting isotopes.
Collection: Semiannually

Units: pCi/kg wet

Location		P-32				
Lab Code	PEF- 1930	PEF- 1932	PEF- 1933	PEF- 3429		Req. LLC
Date Collected	06-15-22	06-15-22	06-15-22	10-06-22		
Sample Type	Walleye	Freshwater Drum	White Perch	Walleye		
K-40	1150 ± 318	1076 ± 122	1051 ± 168	3246 ± 179		-
Mn-54	< 24	< 9	< 25	< 30		94
Fe-59	< 134	< 31	< 93	< 141		195
Co-58	< 40	< 12	< 33	< 31		97
Co-60	< 12	< 9	< 15	< 59		97
Zn-65	< 45	< 15	< 52	< 75		195
Cs-134	< 28	< 8	< 21	< 29		97
Cs-137	< 22	< 8	< 21	< 45		112

Location		P-32		
Lab Code	PEF- 3505	PEF- 3506		Req. LLC
Date Collected	10-06-22	10-06-22		
Sample Type	Yellow Perch	Smallmouth Bass		
K-40	1524 ± 274	2155 ± 156		-
Mn-54	< 42	< 9		94
Fe-59	< 99	< 42		195
Co-58	< 36	< 12		97
Co-60	< 43	< 7		97
Zn-65	< 89	< 21		195
Cs-134	< 36	< 8		97
Cs-137	< 36	< 8		112

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Table 11. Sediments, analyses for gamma emitting isotopes.

Collection: Semiannually

Units: pCi/kg dry

Location	P-64		
Lab Code	PEBS- 1710	PEBS- 3339	
Date Collected	06-01-22	10-04-22	Req. LLD
K-40	10008 ± 401	8969 ± 406	-
Co-58	< 12.8	< 25.6	50
Co-60	< 15.5	< 22.5	40
Cs-134	< 11.7	< 11.3	112
Cs-137	< 9.3	< 15.0	135

Location	P-66		
Lab Code	PEBS- 1712	PEBS- 3340	
Date Collected	05-24-22	10-07-22	Req. LLD
K-40	9706 ± 547	8274 ± 412	-
Co-58	< 23.2	< 25.2	50
Co-60	< 16.6	< 12.7	40
Cs-134	< 19.8	< 10.0	112
Cs-137	< 21.5	< 14.6	135