PSEG Nuclear LLC
P.O. Box 236, Hancocks Bridge, New Jersey 08038-0236

PSEG Nuclear LLC

Technical Specification Section 6.9.1.7(Salem)
Technical Specification Section 6.9.1.6 (Hope Creek)

LR-N23-0034
April 27, 2023

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555-001

Salem Nuclear Generating Station, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-70 and DPR-75
NRC Docket NOS. 50-272 and 50-311

Hope Creek Generating Station
Renewed Facility Operating License No. NPF-57
Docket No. 50-354

Subject: 2022 Annual Radiological Environmental Operating Report (AREOR)

As required by Section 6.9.1.7 of Appendix A to Renewed Facility Operating License Nos. DPR-70 (Unit 1) and DPR-75 (Unit 2) for Salem Generating Stations (SGS), and Section 6.9.1.6 of Appendix A to Renewed Facility Operating License NPF-57 for Hope Creek Generating Station (HCGS), PSEG Nuclear, LLC, hereby transmits the combined 2022 Annual Radiological Environmental Operating Report (Enclosure), which contains the results of the radiological environmental surveillance program for the period January 1, 2022 to December 31, 2022 in the vicinity of the Salem and Hope Creek Generating Stations.

There are no regulatory commitments contained in this letter.

If you have any questions or comments on this transmittal, please contact Mr. Rick Heathwaite at (856) 279-1239 (cell), or Rick.Heathwaite@PSEG.com.

Sincerely,

Jason Jennings
Director, Site Regulatory Compliance
PSEG Nuclear LLC

Enclosure: 2022 Annual Radiological Environmental Operating Report for Salem and Hope Creek Generating Stations

cc: Administrator - Region I - USNRC
Project Manager - USNRC
Jacob Dolecki, Salem Senior Resident Inspector - USNRC
Jiger Patel, Hope Creek Senior Resident Inspector - USNRC
Storm Veunephachan, NRC Inspector - Region I - USNRC
Chief - NJ Bureau of Nuclear Engineering (NJBNE)
Corporate Commitment Tracking Coordinator - w/o attachment
Salem/Hope Creek Commitment Tracking Coordinator - w/o attachment

LR-N23-0034

Enclosure

PSEG Nuclear LLC

Salem and Hope Creek Generating Stations

2022 Annual Radiological Environmental Operating Report

(Total Pages 109)

PSEG Nuclear LLC

Salem and Hope Creek Generating Stations

2022

Annual Environmental Operating Report

Document Number: SGS-AREOR-71 / HCGS-AREOR-45

Unit 1	Unit 2	Unit 1
Docket No. 50-272	Docket No. 50-311	Docket No. 50-354
Operating License No. DPR-070	Operating License No. DPR-075	Operating License No. NPF-057

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AREOR (REMP) Review and Approval Confirmation in SAP (I.A.W. AD-AA-1006 SIGNATURE AUTHORITY)

SAP 80132345

Opr.		
0021	Stephen Gattuso, Salem Chemistry Manager	04/20/2023 Date
0022	Joseph Milo, Hope Creek Chemistry Manager	04/19/2023 Date
0023	William Gropp, Salem Radiation Protection Manager	04/19/2023 Date
0024	Mariaz Davis, Hope Creek Radiation Protection Manager	04/20/2023 Date
0025	William Muffley, Salem Senior Director of Operations	04/19/2023 Date
0026	Joshua Moss, Hope Creek Senior Director of Operations	04/20/2023 Date
0027	Richard DeSanctis, Salem Plant Manager	04/20/2023 Date
0028	Thomas Agster, Hope Creek Plant Manager	04/20/2023 Date

Report Prepared By: _____
Rick M. Heathwaite (REMP/REC Program Manager)

1.0 EXECUTIVE SUMMARY

Salem and Hope Creek Generating Stations Radiological Environmental Monitoring Program (REMP) was established prior to the station becoming operational to provide information on background radiation present in the area. The goal of SGS/HCGS REMP is to evaluate the impact of the station on the environment. Environmental samples from different media are monitored as part of the program in accordance with specifications detailed in the Offsite Dose Calculation Manual Common REMP (ODCM). The program compares data from indicator locations near the plant, to control locations farther away from the site to assess operation impacts.

The Annual Radiological Environmental Operating Report (AREOR) provides data obtained through analyses of environmental samples collected at Salem and Hope Creek Generating Station for the reporting period of January 1st through December 31st, 2022. During that time period 1645 analyses were performed on 1289 samples and there was no instance of radioactivity from plant effluents observed in the environment that exceeded any Reporting Levels identified in Salem and Hope Creek Common ODCM Table 3.12-2 [23]. Also, in assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of Salem and Hope Creek Generating Stations had no significant radiological impact on the health and safety of the public or on the environment.

1.1 Summary Of Conclusions

There were three instances of plant related radionuclides above baseline during the reporting period January 1 through December 31, 2022. Tritium was detected in Surface Water but was below reporting levels (see Figure 7, Surface Water Tritium Results). Naturally occurring radionuclides are present in the Earth's crust and atmosphere and exists in detectable quantities throughout the world. It is common to detect natural occurring radionuclides in many of the samples collected for REMP. Some examples of naturally occurring radionuclides that are frequently seen in samples are potassium-40, beryllium-7, actinium-228 (present as a decay product of radium-228), and radium-226. Additionally, some relatively long-lived anthropogenic radioisotopes, such as strontium-90 and cesium-137, are also seen in some REMP samples; these radionuclides exist in measurable quantities throughout the world as a result of fallout from historic atmospheric nuclear weapons testing. Detailed information on the exposure of the U.S. population to ionizing radiation can be found in NCRP Report No. 160 [1].

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2.0 LIST OF ACRONYMS AND DEFINITIONS

1. Airborne Activity Sampling: Continuous sampling of air through the collection of particulates and radionuclides on filter media.
2. APT: Air Particulate
3. AIO: Air Iodine Sample
4. Analyte: The substance being identified and measured in a chemical analysis
5. ARERR: Annual Radioactive Effluent Release Report
6. AREOR: Annual Radioactive Environmental Operating Report
7. BLV: Broad Leaf Vegetation
8. BNE: Bureau of Nuclear Engineering: A New Jersey state agency regulating, as applicable, the nuclear industry within the Department of Environmental Protection.
9. BWR: Boiling Water Reactor
10. CARR: Corrective/Preventive Action Request and Report (GEL CAP)
11. 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.
12. Control (C): A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the Station.
13. Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.
14. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters, Optical Stimulated Luminance dosimeters and pressurized ionization chambers.
15. DOE: Department of Energy
16. DQO: Data Quality Objective
17. DW: Drinking Water
18. ECH: Crab sample
19. ERA: Environmental Resource Associates
20. ESF: Fish sample
21. ESS: Sediment sample
22. EZA: Eckert & Ziegler Analytics, Inc.
23. FPL: Broad Leafy Vegetation sample
24. FPV: Vegetables sample
25. GAM: Game sample
26. GEL: General Engineering Laboratories; Duplicate sample analysis vendor

27. Gr-A: Gross alpha
28. Gr-B: Gross beta
29. Grab Sample: A single discrete sample drawn at one point in time.
30. H-3: Hope Creek Generating Station
31. HCGS: Hope Creek Generating Station
32. IDM: Immersion Dose Monitor sample (direct radiation measurement made with field TLD)
33. Indicator: A sampling location that is likely to be affected by plant effluents due to its proximity and/or direction from the plant.
34. 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.
35. ISFSI: Independent Spent Fuel Storage Installation
36. Kg: Kilogram
37. L: Liter
38. LIMS: Laboratory Information Management System
39. 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.
40. LTS: Laboratory Testing Services
41. m^3: Cubic meter
42. MAPEP: Mixed Analyte Performance Evaluation Program
43. MDA: Minimum Detectable Activity
44. MDC: Minimum Detectable Concentration
45. Mean: The average, i.e., the sum of results divided by the number of results.
46. Microcurie: 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.
47. mL: Milliliter
48. MLK: Milk sample
49. MWe: Megawatts Electric
50. N: Not Acceptable
51. NA: Not Applicable
52. NCR: Nonconformance Report (TBE CAP)
53. NDA: No Detectable Activity
54. NEI: Nuclear Energy Institute

55. NIST: National Institute of Standards and Technology.
56. NPDES: National Pollutant Discharge Elimination System.
57. NRC: Nuclear Regulatory Commission
58. ODCM: Offsite Dose Calculation Manual Common REMP
59. pCi/L: picocuries per Liter
60. Protected Area: An area encompassed by physical barriers and to which access is controlled.
61. PSEG: Public Service Enterprise Group
62. PWR: Pressurized Water Reactor
63. PWR/PWT: Potable Water sample (Raw/Treated)
64. REMP: Radiological Environmental Monitoring Program
65. Restricted Area: An area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.
66. RGPP: Radiological Groundwater Protection Program
67. RL: Reporting Level
68. SA: Salem
69. SCFM: Standard Cubic Feet Per Minute
70. SLC: Selected Licensee Commitment
71. SD: Sample Deviation
72. SGS: Salem Generating Station
73. SOL: Soil Sample
74. Std Quarter: Standard Quarter = 91 days
75. SWA: Surface Water
76. TBE: Teledyne Brown Engineering; Primary sample analysis vendor
77. TLD: Thermoluminescent Dosimeter
78. TRM: Technical Requirement Manual
79. TS: Technical Specification
80. uCi: Microcuries (one-millionth of a Curie)
81. USEPA: United States Environmental Protection Agency
82. VGT: Fodder Crop sample
83. WWA: Ground (well) Water sample

3.0 INTRODUCTION

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 due to radioactive effluents conform to the "As Low as Is Reasonably Achievable" (ALARA) design objectives of 10 CFR 50, Appendix I [2], and implements the requirements of Section IV.B.2 and IV.B.3 of Appendix I. REMP is designed to conform to the Nuclear Regulatory Commission (NRC) Regulatory Guide 4.1 [3], NUREG 1301/1302 [4] [5], and the 1979 NRC Branch Technical Position [6].

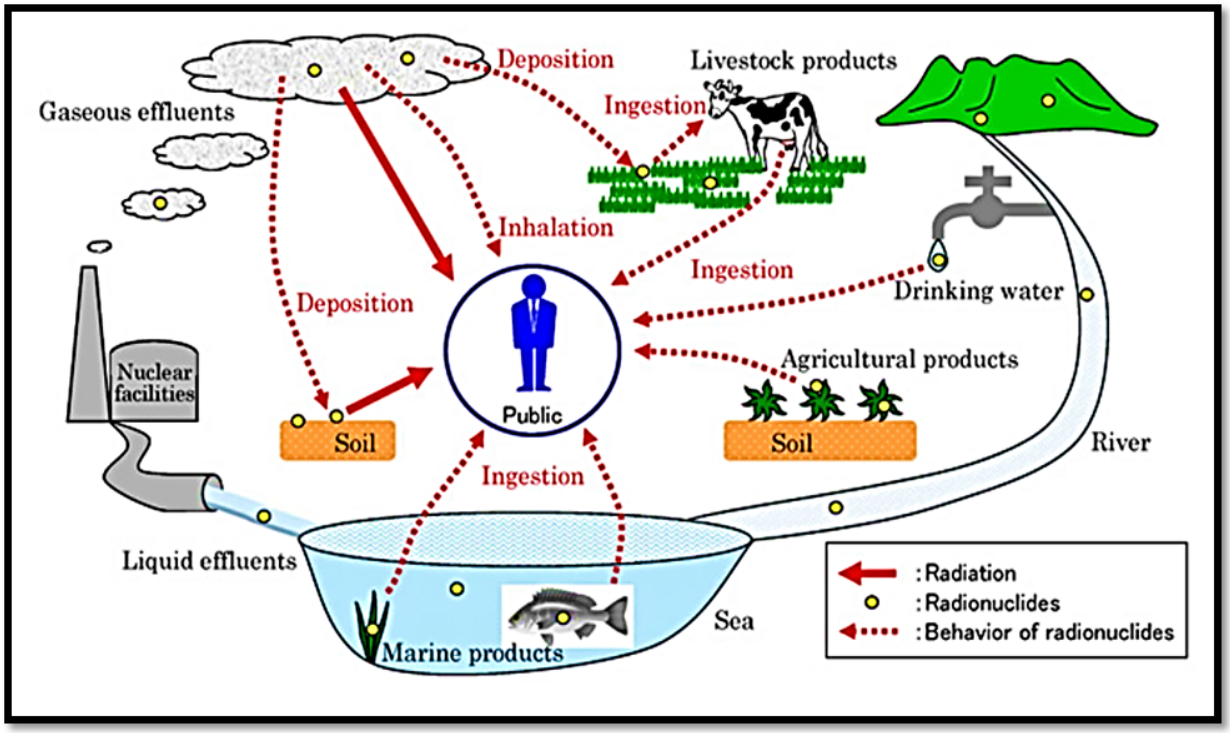

Figure 1, Potential exposure pathways to Members of the Public due to Plant Operations **[7]**

Quality assurance aspects of the sampling program and TLD/OSLD data collection are conducted in accordance with Regulatory Guides 4.15 [8] and 4.13 [9]. REMP also adheres to the requirements of New Jersey, SGS/HCGS Technical Specifications, and Offsite Dose Calculation Manual Common REMP (ODCM). These governing documents dictate the environmental sampling, sample analysis protocols, data reporting and quality assurance requirements for the environmental monitoring program.

The Annual Radiological 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.

To demonstrate compliance with the requirements, samples of air particulates, air iodine, milk, surface water, ground (well) water, potable (drinking) water, vegetables, fodder crops, fish, crabs, oysters, game, and sediment were collected and analyzed. External radiation dose measurements were also made in the vicinity of the Site using passive dosimeters. These environmental media were analyzed for one or more of the following: gamma emitting isotopes, tritium (H-3), iodine-131 (I-131), gross alpha, gross beta, direct and immersion dose. Measurements made in the vicinity of the Site were compared to background or control measurements and the preoperational REMP study performed before SGS Unit 1 became operational. The results of these analyses were used to assess the impact on the health and safety of the public or on the environment of Site operations, thereby demonstrating compliance with the applicable Technical Specifications, ODCM Common REMP, and Federal regulations.

4.0 SITE DESCRIPTION AND SAMPLE LOCATIONS

The Site is located in Lower Alloway's Creek Township, Salem County, New Jersey. SGS consists of two operating pressurized water nuclear power reactors. SGS Unit 1 has an approximate net electrical rating of 1,180 megawatts electric (MWe) and SGS Unit 2 has an approximate net electrical rating of 1,178 MWe. The licensed core thermal power rating for both Units is 3,459 megawatts thermal (MWth). HCGS consists of an operating boiling water nuclear power reactor, which has an approximate net electrical rating of 1,212 MWe. The licensed core thermal power rating is 3,902 MWth.

The Site is located on a man-made peninsula on the east bank of the Delaware River called Artificial Island. The peninsula was created by the deposition of hydraulic fill from dredging operations. The surrounding environment is characterized mainly by the Delaware River Estuary, extensive tidal marshlands, and low-lying meadowlands. These land types make up a vast majority of the land area within five miles of the Site, with most of the remaining land used for agriculture.

Since 1968, a Radiological Environmental Monitoring Program (REMP) has been conducted at the Site. Starting in December 1972, a more extensive radiological monitoring program was initiated in preparation for the operation of SGS Unit 1. The operational REMP was initiated in December 1976 when SGS Unit 1 achieved criticality.

SGS/HCGS sampling media are selected based on site specific information such as meteorology, receptor locations, and water usage around the plant. Sampling and analysis frequencies are documented in the Offsite Dose Calculation Manual and site procedures. Required sampling, analysis frequencies and location of sample collected are captured in the following tables and figures:

- Table 1, Radiological Environmental Sampling Program – Exposure Pathway – Direct Radiation
- Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne
- Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne
- Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion
- Table 5, Radiological Environmental Sampling Program – Exposure Pathway - Terrestrial
- Table 6, REMP Sampling Locations – Direct Radiation
- Figure 2, REMP Sample Locations (On-Site Sampling Locations To 1 Mile)
- Figure 3, REMP Sample Locations (Off-Site Sampling Locations 1 to 10 Miles)
- Figure 4, REMP Sample Locations (Off-Site Sampling Locations Greater Than 10 Miles)

RADIOLOGICAL ENVIRONMENTAL SAMPLING PROGRAM REQUIREMENTS

Table 1, Radiological Environmental Sampling Program – Exposure Pathway – Direct Radiation

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type of Analyses
DIRECT RADIATION a. Dosimeters (IDM) Fifty-seven routine monitoring locations with two or more dosimeters placed as follows: An inner ring of locations, one in each of the land based meteorological sectors in the general area of the SITE BOUNDARY; and An outer ring of locations, one in each of the land based meteorological sector in the 5 to 11 km (3.1 - 6.8 miles) range from the site; and The balance of the locations placed in areas of special interest such as population centers, nearby residences, and schools and in one or two areas to serve as control locations.	See Table 6, REMP Sampling Locations – Direct Radiation	Quarterly	Gamma dose

Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type and Frequency of Analyses
ATMOSPHERIC a. Air Particulate (APT) b. Air Iodine (AIO) 3 samples close to the Site Boundary: 05X1, 06S1, 15S2. One duplicate sample from close to the site boundary: 05S2. 3 samples from different land based sectors: 01F1, 02F6, 05D1. One sample from the vicinity of a community having a highest annual average ground level D/Q: 16E1. One sample from a control location; for example 15 - 30 km distant (9.3 - 18.6 miles) and in the least prevalent wind direction: 14G1	05X1	0.86 mi. E; site access road	Particulate: Continuous sampler operation with sample collection weekly or more frequently if required by dust loading	Gross Beta / weekly Gamma isotopic analysis / quarterly composite
	05S2	0.86 mi. E; site access road		
	06S1	0.19 mi. ESE; station personnel gate		
	15S1	0.57 mi. NW; near river and HCGS barge slip		
	15S2	0.59 mi. NW; near river and HCGS barge slip		
	05D1	3.5 mi. E; local farm along SGS/HCGS access road.		
	16E1	4.1 mi. NNW; Port Penn, DE		
	01F1	5.7 mi. N; Fort Elfsborg, NJ	Iodine: Continuous sampler operation with sample collection weekly or more frequently if required by dust loading	Iodine-131
	02F6	7.3 mi. NNE; Energy & Envmt Resource Center, Salem NJ		
	14G1	13.4 mi. WNW; Route 286, Bethel Church Road, DE		

Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type of Analyses
Surface Water (SWA) One sample upstream: 01F2. One sample downstream: 07E1. One sample outfall: 11A1. One sample cross-stream (mouth of Appoquinimink River): 12B1. And an additional location in the Chesapeake & Delaware Canal: 16F1.	11A1 11A1A 12B1 12B1A 07E1 07E1A 01F2 16F1 16F1A	0.22 mi. SW; SGS outfall area 0.15 mi. SE; Located in the plant barge slip area 1.8 mi. WSW; West bank of Delaware River 3.7 mi. NW; Tip of Augustine Beach Boat Ramp 4.4 mi. SE; river bank 1 mi. W of Mad Horse Creek 9.2 mi. SE; Located at the end of Bayside Road, NJ 7.1 mi. N; midpoint of Delaware River 6.9 mi. NNW; C&D Canal, DE 6.5 mi. NNW; Located at the C&D Canal Tip, DE	Semi-Monthly (composited)	Gamma scan Tritium
Potable Water (Drinking Water) (PWR, PWT) Although no potable water samples are required as liquid effluents discharged from SGS/HCGS do not directly affect this pathway and it is not required by SGS/HCGS ODCM, one raw and one treated water sample from a public water supply (City of Salem Water and Sewer Department) are collected: 02F3 as management audit samples.	02F3	8.0 mi. NNE; Salem Water Company	Monthly (composited weekly)	Gross alpha Gross beta Tritium Gamma scan Iodine-131
Well Water (Ground) (WWA) Although wells in the vicinity of SGS/HCGS are not directly affected by plant operations so sampling is not required by SGS/HCGS ODCM, samples of 03E1 farm's well are collected as management audit samples.	03E1	4.2 mi. NE; local farm	Monthly	Gamma scan Gross alpha Gross beta Tritium

Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type of Analyses
Sediment (ESS) One sample from downstream area: 07E1. One sample from cross-stream area and control location: 12B1. One sample from outfall area: 11A1. One sample from upstream, the C & D Canal: 16F1. One sample from shoreline area: 05A1. One sample from Cooling Tower Blowdown discharge: 15A1. One sample south storm drain discharge line: 15A2.	05A1 07E1 11A1 12B1 15A1 15A2 16F1	0.89 mi. E, shoreline 4.4 mi. SE; river bank 1 mi. W of Mad Horse Creek 0.22 mi. SW; SGS outfall area 1.8 mi. WSW; West bank of Delaware River 0.69 mi. NW; HCGS outfall area 0.66 mi. NW; South Storm Drain outfall 6.9 mi. NNW; C&D Canal, DE	Semi-Annually	Gamma scan

Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type of Analyses
Milk (MLK) Samples from milking animals in 3 locations within 5 km distance (3.1 miles) having the highest dose potential. If there are none, then 1 sample from milking animals in each of 3 areas between 5 - 8 km distant (3.1 - 5.0 miles) where doses are calculated to be greater than 1 mrem per yr: 13E3. 1 Sample from milking animals at a control location 15 30 km distant (9.3 - 18.6 miles): 02G3.* NOTE: *Milk animals are not prevalent in the vicinity of the plant. Only one farm met the requiem for milk. In lieu of samples, broad-leaf vegetation sampling is being conducted*.	13E3 02G3 14F4	5.0 mi. W; local farm, DE 11.8 mi. NNE; Local Milk Farm, Corner of Routes 540 & 45, Mannington, NJ 7.6 mi. WNW; local farm	Semi-monthly (when animals are on pasture)	Gamma scan Iodine-131
			Monthly (when animals are not on pasture)	Gamma scan Iodine-131
Edible Fish (ESF) One sample of each commercially and recreationally important species in vicinity of plant discharge area: 11A1. One sample of same species in area not influenced by plant discharge: 12B1, and an additional location downstream: 07E1.	07E1 11A1 12B1	4.4 mi. SE; river bank 1 mi. W of Mad Horse Creek 0.22 mi. SW; SGS outfall area 1.8 mi. WSW; West bank of Delaware River	Semi-Annually	Gamma scan (flesh)

* Listed as 03G1 in ODCM, see Section 10.0 PROGRAM CHANGES.

Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type of Analyses
Blue Crabs (ECH) One sample of each commercially and recreationally important species in vicinity of plant discharge area 11A1. One sample of same species in area not influenced by plant discharge 12B1.	11A1 12B1	0.22 mi. SW; SGS outfall area 1.8 mi. WSW; West bank of Delaware River	Semi-Annually	Gamma scan (on edible portions)

Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type of Analyses
Vegetables (FPL, FPV) Although the Delaware River at the location of SGS/HCGS is a brackish water source and is not used for irrigation of food products and so sampling is not required by SGS/HCGS ODCM, samples of vegetables are collected as management audit samples from various locations during harvest. In addition, broad leaf vegetation is collected from various offsite locations as well as being planted & collected onsite (06S1, 16S1, 10D1). This is in lieu of having a milk farm within 5 km (3.1 miles) of the Site. * Samples were not taken from these locations in 2022. They are Management Audit samples that are not required by the ODCM and may not be sampled every year due to crop rotation.	06S1 16S1 10D1 01G1 03H5 02F9 02G2 01S3* 15S2* 02F10* 03F6* 03F7* 03F8* 14F4* 15F4* 02G4* 09G1* 09G2*	0.17 mi. SE 0.57 mi. NNW 3.9 mi. SSW; Taylor's Bridge Spur 10.9 mi. NNE; Rte. 49, South Broadway 25 mi. NE; Farm Market, Rt 77 7.5 mi. NNE; Local Farm, Tilbury Rd, Salem 13.5 mi. NNE; Local Farm; Pointers Auburn Road garden 0.58 mi. N 0.57 mi. NNW 9.2 mi. NNE; Local Farm, South Broadway, Pennsville 6.5 mi. NE; Local Farm, Salem/Hancocks BridgeRoad 7.2 mi. NE; Local Farm, Beasley Neck Road, RD#3 9.28 mi. NNE Circle "M" Orchard 7.6 mi. WNW; local farm 7.0 mi. NW; local farm; Port Penn Road; DE 11.3 mi. NNE; Rt 45 & Welchville Rd,Mannington, NJ 10.3 mi. S; Woodland Beach Rd., Smyrna, DE 10.7 mi. S; Woodland Beach Rd, Smyrna, DE	Monthly (during growing season)	Gamma scan
Fodder Crops (VGT) Although not required by SGS/HCGS ODCM, samples of crops normally used as cattle feed (silage) were collected from milk farms as management audit samples: 14F4, 02G3, 13E3.	13E3 14F4 02G3	5.0 mi. W; Local Farm, Odessa, DE 7.6 mi. WNW; local farm 11.8 mi. NNE; Local Milk Farm	Annually (at harvest)	Gamma scan
Game (GAM) Although not required by SGS/HCGS ODCM, game samples were collected as management audit samples from two indicator locations: 03E1 and 13E3	03E1 13E3	4.2 mi. NE; Local Farm 5.0 mi. W; Local Farm, Odessa, DE	Annually	Gamma scan

Table 5, Radiological Environmental Sampling Program – Exposure Pathway - Terrestrial

Requirement	Number of Representative Samples and Sample Locations		Sampling Collection/ Frequency	Type of Analyses
Soil (SOL) Although not required by SGS/HCGS ODCM, samples of soil are collected as management audit samples.	10D1 13E3 14F4 16E1 02F9 02G3 03G1 05F1 06S1	3.9 mi. SSW; Taylor's Bridge Spur 5.0 mi. W; Local Farm, Odessa, DE 7.6 mi. WNW; Local Farm 4.1 mi. NNW; Port Penn 7.5 mi. NNE; Local Farm, Tilbury Rd, Salem 11.8 mi. NNE; Local Milk Farm 16.5 mi. NE; Milk Farm, Woodstown 6.5 mi. E; Canton 0.23 mi. ESE	Every 3 years (2016-2019-2022)	Gamma scan

Table 6, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance (miles)	Description
01Q1	Special Interest	N	0.58	N side of road near ISFSI pad
02S2a	Inner Ring	NNE	0.41	Lamp pole 65 near HC switch yard
07S1	Inner Ring	SE	0.12	Station personnel gate
08S1	Inner Ring	SSE	0.14	Fuel oil storage
08S2	Inner Ring	SSE	0.17	Fuel oil storage
10S1	Inner Ring	SSW	0.11	Circulating water building
11S1	Inner Ring	SW	0.12	Circulating water building
12S1	Inner Ring	WSW	0.09	Outside security fence
14S2	Inner Ring	WNW	0.12	Outside security fence
15S1	Inner Ring	NW	0.57	Near river and HCGS barge slip
15S2	Inner Ring	NW	0.59	Near river and HCGS barge slip
15S3	Inner Ring	NW	0.17	Outside security fence
16S1	Inner Ring	NNW	0.57	On road near fuel oil storage tank
16Q2	Special Interest	NNW	0.6	Near security firing range
01X2	Inner Ring (SB)	N	0.6	382 feet from TLD 01Q1
02X4	Inner Ring (SB)	NNE	0.59	In the equipment laydown area
03X1	Inner Ring (SB)	NE	0.58	Behind refrigeration building
04X1	Inner Ring (SB)	ENE	0.6	Access road near intersection to LDC
05X1	Inner Ring (SB)	E	0.86	Site access road
06X2	Inner Ring (SB)	ESE	0.23	Area around helicopter pad
16X3	Inner Ring (SB)	NNW	0.88	Consolidated spoils facility
04D2	Outer Ring	ENE	3.9	Alloway Creek Neck Road
05D1	Outer Ring	ENE	3.5	Local farm along SGS/HCGS access road.
10D1	Outer Ring	SSW	3.9	Taylor's Bridge Spur, DE
14D1	Outer Ring	WNW	3.3	Bay View, DE
15D1	Outer Ring	NW	3.7	Route 9, Augustine Beach, DE

Table 6, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance (miles)	Description
02E1	Outer Ring	NNE	4.4	Local farm, NJ
03E1	Outer Ring	NE	4.1	Local farm, NJ
12E1	Outer Ring	WSW	4.4	Thomas Landing, DE
13E1	Outer Ring	W	4.1	Diehl House Lab, DE
16E1	Outer Ring	NNW	4.1	Port Penn, DE
11E2	Outer Ring	SW	5	Route 9, DE
01F1	Outer Ring	N	5.7	Fort Elfsborg, NJ
02F2	Outer Ring	NNE	8.5	Salem Substation, Salem, NJ
02F5	Special Interest	NNE	7.3	Salem High School, Salem, NJ
02F6	Outer Ring	NNE	7.3	Energy & Envmt Resource Center, Salem, NJ
03F2	Outer Ring	NE	5.1	Hancocks Bridge, NJ, Munc Bldg
03F3	Special Interest	NE	8.6	Quinton Township Elem. School, NJ
04F2	Outer Ring	ENE	6	Mays Lane, Harmersville, NJ
05F1	Outer Ring	E	6.4	Canton, NJ
06F1	Outer Ring	ESE	6.4	Stow Neck Road, NJ
07F2	Outer Ring	SE	9.3	Bayside, NJ
09F1	Outer Ring	S	5.3	Off Route #9, DE
09F2	Outer Ring	S	5.2	Collins Beach boat ramp.
10F2	Outer Ring	SSW	5.7	Route #9, DE
11F1	Outer Ring	SW	6	Taylor's Bridge, DE
12F1	Outer Ring	WSW	9.4	Townsend Elementary School, DE
13F2	Outer Ring	W	6.5	Odessa, DE
13F3	Special Interest	W	9.3	Redding Middle School, Middletown, DE
13F4	Special Interest	W	9.8	Middletown, DE
14F2	Outer Ring	WNW	6.7	Route 13 and Boyds Corner Rd, DE

Table 6, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance (miles)	Description
15F3	Outer Ring	NW	5.4	Port Penn Rd. At Pole Bridge Rd., DE
16F2	Special Interest	NNW	8.1	Delaware City Public School, DE
01G3	Control	N	19	N. Church Street Wilmington, DE
03G1	Outer Ring	NE	16.5	Local farm, NJ
10G1	Control	SSW	11.6	Smyrna, DE
14G1	Outer Ring	WNW	13.4	Route 286, Bethel Church Road, DE
16G1	Outer Ring	NNW	15.1	Wilmington Airport, DE
03H1	Control	NE	33.1	National Park, NJ

5.0 MAPS OF COLLECTION SITES

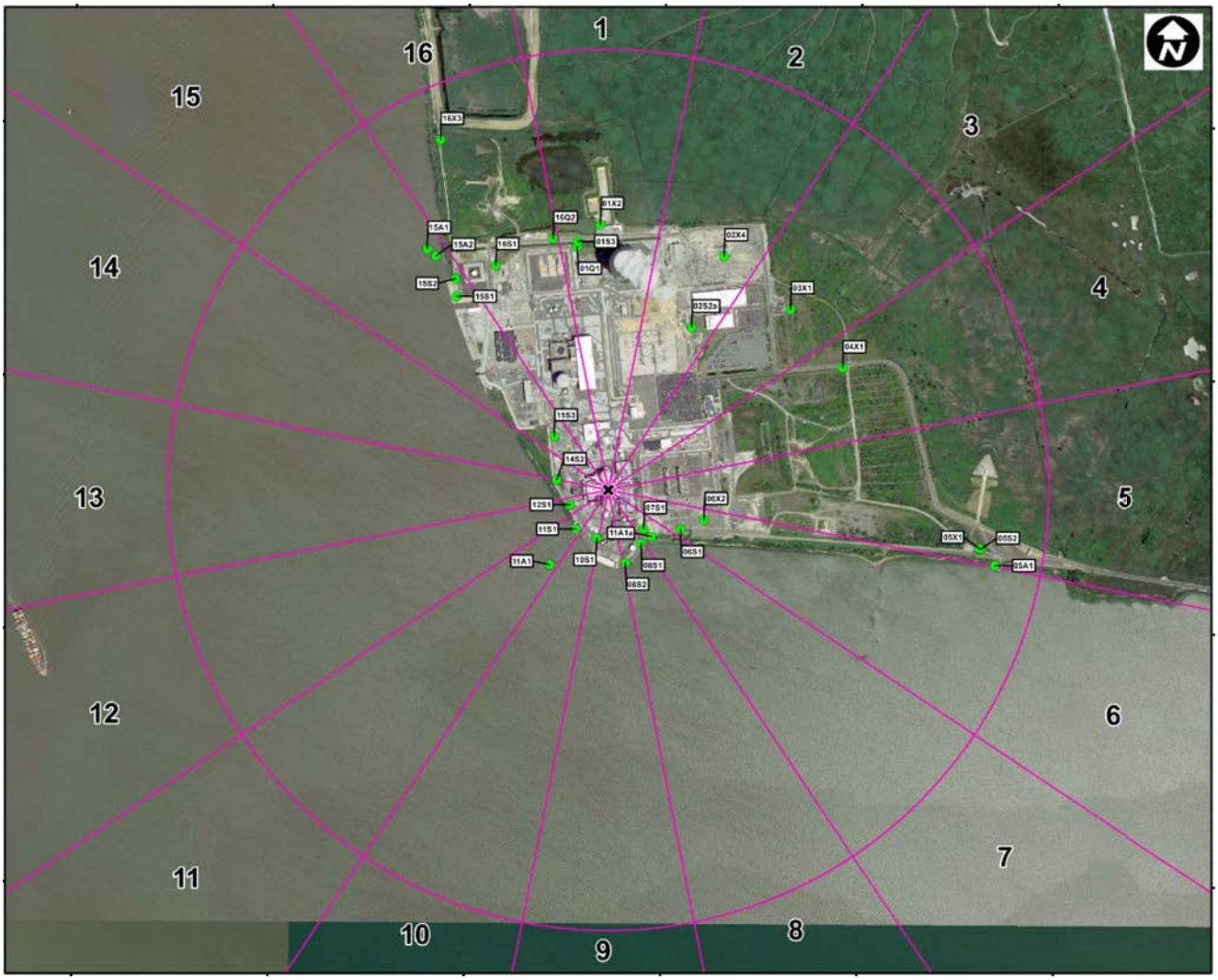

Figure 2, REMP Sample Locations (On-Site Sampling Locations To 1 Mile)

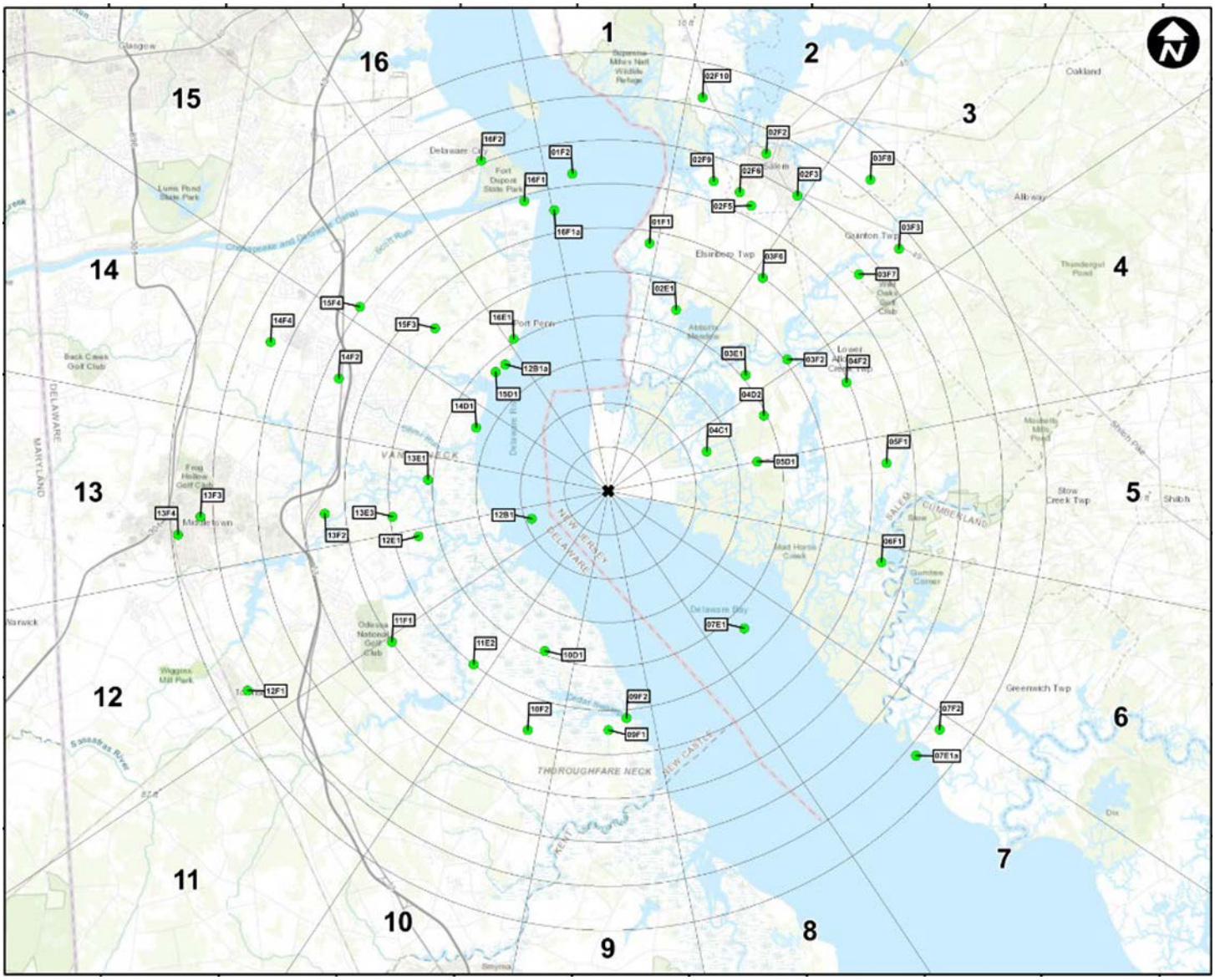

Figure 3, REMP Sample Locations (Off-Site Sampling Locations 1 to 10 Miles)

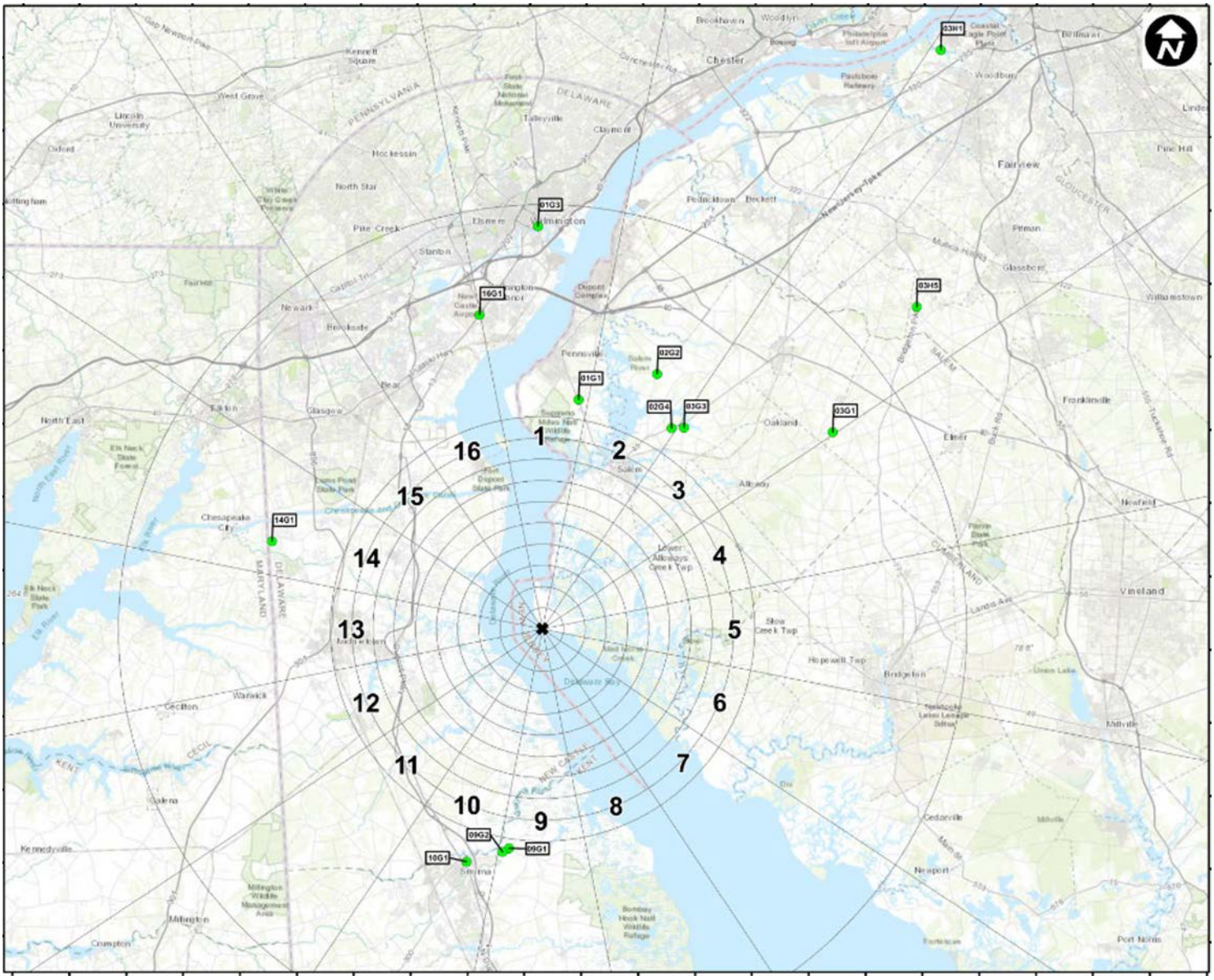

Figure 4, REMP Sample Locations (Off-Site Sampling Locations Greater Than 10 Miles)

6.0 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Table 7, Reporting Levels for Radioactivity Concentrations in Environmental Samples

Radionuclide	Water (pCi/L)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/L)	Food Products (pCi/Kg-wet)
H-3	30,000[1]	NA	NA	NA	NA
Mn-54	1,000	NA	30,000	NA	NA
Fe-59	400	NA	10,000	NA	NA
Co-58	1,000	NA	30,000	NA	NA
Co-60	300	NA	10,000	NA	NA
Zn-65	300	NA	20,000	NA	NA
Zr-Nb-95	400	NA	NA	NA	NA
I-131	20[2]	0.9	NA	3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200	NA	NA	300	NA

Table 8, Maximum Values for the Limit of Detection

Radionuclide	Water (pCi/L)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/L)	Food Products (pCi/Kg-wet)	Sediment (pCi/Kg-dry)
Gross Beta	4	0.01	NA	NA	NA	NA
H-3	3,000[3]	NA	NA	NA	NA	NA
Mn-54	15	NA	130	NA	NA	NA
Fe-59	30	NA	260	NA	NA	NA
Co-58, Co-60	15	NA	130	NA	NA	NA
Zn-65	30	NA	260	NA	NA	NA
Zr-Nb-95	15	NA	NA	NA	NA	NA
I-131	15[4]	0.07	NA	1	60	NA
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15	NA	NA	15	NA	NA

[1] For surface water samples: If a drinking water pathway exists, a value of 20,000 pCi/L shall be used.
[2] For surface water samples: If a drinking water pathway exists, a value of 2 pCi/L shall be used.
[3] For surface water samples: If a drinking water pathway exists, a value of 2,000 pCi/L shall be used.
[4] For surface water samples: If a drinking water pathway exists, a value of 1 pCi/L shall be used.

7.0 SAMPLING PROGRAM, PROGRAM MODIFICATION AND INTEPRETATION OF RESULTS

At most nuclear stations, data was collected prior to plant operation to determine background radioactivity levels in the environment. Annual data is routinely compared to preoperational and/or 10-year average values to determine if changes in the environs are present. Strict comparison is difficult to make due to fallout from historical nuclear weapon testing. Cesium-137 can be routinely found in environmental samples as a results of above ground nuclear weapons testing. It is important to note, levels of Cs-137 in environment are observed to fluctuate, for example as silt distributions shift due to natural erosion and transport processes, Cs-137 may or may not be observed in sediment samples. Results from samples collected and analyzed during the year, 2022, are described below.

In the following sections, results from direct radiation, air, water, and food products analyzed as part of REMP in 2022 will be discussed. Sampling program descriptions and deviations will also be discussed.

7.1 Environmental Direct Radiation Dosimetry Sample Results

Dose is measured as net exposure (field reading less transit reading) normalized to 91-day quarters. Data is treated and analyzed consistent with ANSI/HPS N13.37-2014, which compares the measured dose for each location to the baseline background dose for that location. Environmental dose rates vary by location, depending on geological and land use considerations, and remain relatively constant for any given location (unless land use changes). Some facilities observe seasonal variation in environmental doses. Baseline Background Doses have been determined for both quarterly and annual measurements at each location using historical field measurements. Minimum Differential Doses for Annual and Quarterly periods have been determined based on 3-times the 90^{th} percentile standard deviation for monitoring locations. Doses that exceed the Minimum Differential Dose value above the Baseline Background Dose are considered to indicate Facility-Related Dose; a quality assurance review is performed to verify that any results indicating Facility-Related Dose are accurate.

ANSI/HPS N13.37-2014 uses the concept of minimum differential dose (MDD), which is the minimum facility-related dose that can be detected above the baseline background. Due to natural background variations and measurement sensitivities and uncertainties, minimum differential dose is not zero. MDD is calculated based on performance of the dosimetry system in the environment and is about 5 mrem per quarter and 10 mrem per year. If a dosimeter indicates dose greater than background plus MDD, then the net dose (above background) is reported as Facility Related Dose.

Ambient radiation levels in the environment were monitored at locations on the Site and in the surrounding areas with pairs of passive dosimeters (PD) supplied and analyzed by Stamford Dosimetry/Environmental Dosimetry Co. Packets containing the PDs were placed in the owner-controlled area, around the Site at various distances, and in each land based meteorological sector, Table 6, REMP Sampling Locations – Direct Radiation.

The PDs at each location are changed and analyzed quarterly.

The laboratory utilizes a Panasonic based system using UD-814 dosimeters that are constructed of three rectangular, lead-shielded (protects against low-energy gamma radiation) teflon wafers, impregnated with 25% calcium sulfate phosphor ($CaSO_4$:Dy) to monitor gamma radiation. Additionally, each PD has one lithium borate (LiBO:Mn) element to monitor beta radiation (which is not used). Two PDs (Panasonic type UD-814) are placed at each location.

In 2019 PSEG implemented American National Standards Institute (ANSI) N13.37-2014 Environmental Dosimetry - Criteria for System Design and Implementation for comparing each PD location dose result to its historical background dose. Per the standard a well-functioning dosimetry system should be able to detect a 5 mrem difference in the quarterly data and a 10 mrem difference in the yearly data above background.

7.1.1 Quarterly Facility Dose

During this calendar year 2022, a total of 236 samples were collected and analyzed in accordance with the requirements in Table 1, Radiological Environmental Sampling Program – Exposure Pathway – Direct Radiation.

All of the quarterly “inner ring” and “outer ring” indicator locations (Table 6, REMP Sampling Locations – Direct Radiation) resulted in non-detectable dose.

All of the quarterly offsite “special interest” locations resulted in non-detectable dose.

All of the quarterly control locations resulted in non-detectable dose.

Figure 5, TLD Sample Results demonstrates the historical trend of the TLD program. Also, the direct radiation sample results are in Table 12, Environmental Direct Radiation Dosimetry Sample Results.

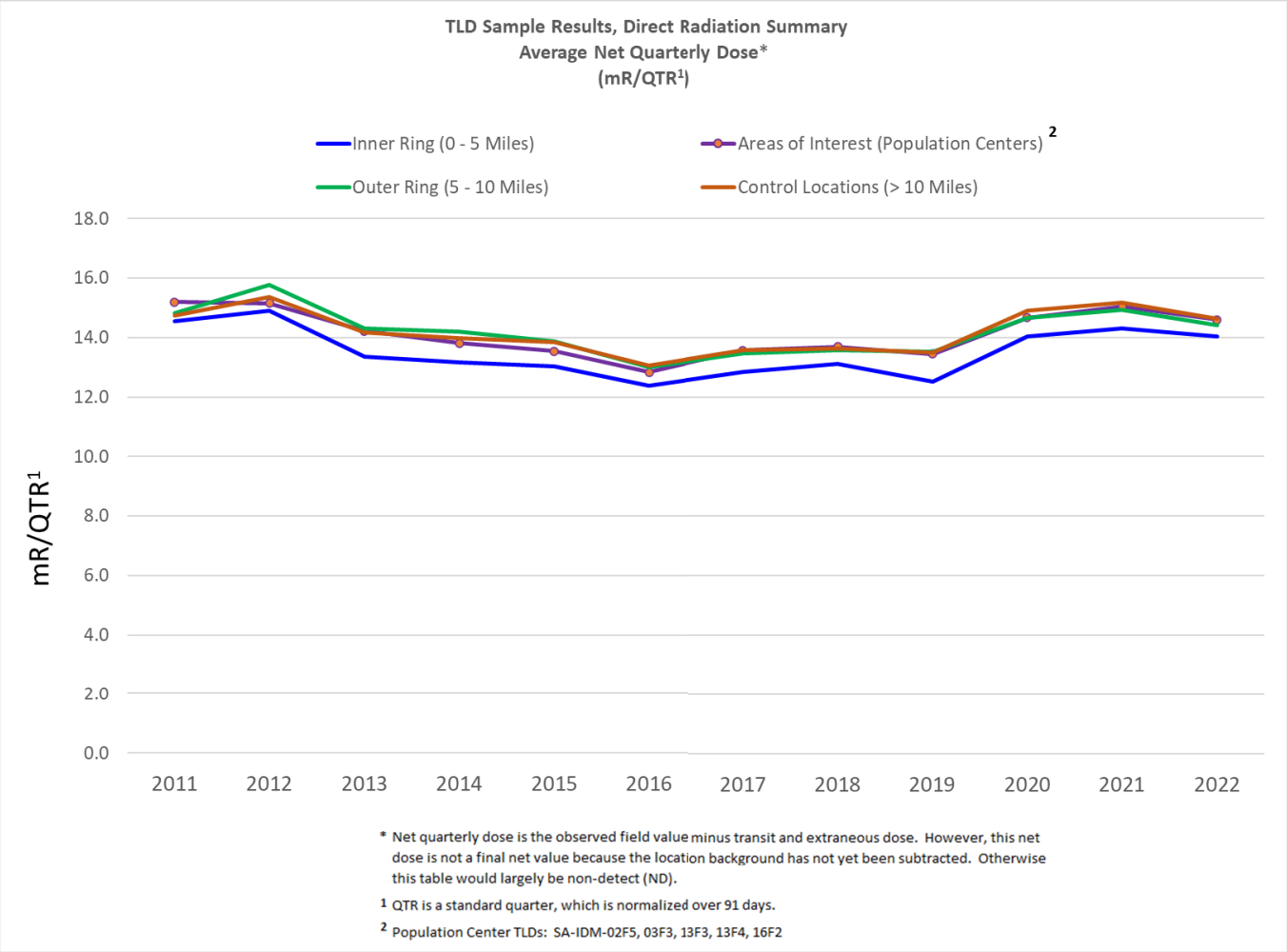

Figure 5, TLD Sample Results

7.1.2 Calculated Annual Facility Dose

There were 6 offsite locations and two site boundary locations that had annual calculated detectable doses.

Two (10G1 and 03H1) of the three control locations had a detectable calculated annual dose. These control locations are 11.6 miles and 33.1 miles, respectively from the site. Location 10G1 calculated annual dose was 10.4 mrem and 03H1 was 11.0 mrem. These locations are in areas not likely to be affected by plant effluents due to their distances from the Station.

Four locations, 05D1 (3.5 miles, ENE), 02F2 (8.5 miles, NNE), 13F3 (9.3 miles, W) and 13F4 (9.8 miles, W), had calculated annual detectable doses of 10.4, 11.0, 11.8 and 12.0 mrem, respectively. These doses are consistent with the control location doses. Also, each one of these locations had another dosimeter in an intermediary distance to the site with no detectable dose.

Two locations at the site boundary, 02X4 and 03X1 had a calculated annual detectable dose of 12.2 and 12.4 mrem, respectively.

After reviewing REMP TLD data for the 2022 AREOR, several TLDs had a net Annual Facility Dose (F_A) above background despite non-detectable net Quarterly Facility Doses (F_Q) for all four quarters. Coupled with the fact that most of these TLDs were at distances several miles from the site where direct dose impact from the Station was unlikely to be observed. In addition, there were TLDs located in the same sectors but closer to the plants that showed non-detectable dose. Due to these statistical outliers, a new baseline background B_Q and B_A may need to be calculated (80130946/280).

7.1.3 ISFSI Dose

Two on site ISFSI locations, in the controlled area, 01Q1 and 16Q2 showed measurable dose rates above background as seen in Table 12, Environmental Direct Radiation Dosimetry Sample Results. The net dose radiation levels as measured by these special interest locations ranged from 14.9 to 20.3 mrem/Standard Quarter and annual doses of 77.4 and 61.6 mrem for Locations 01Q1 and 16Q2, respectively.

Dose to the nearest resident due to direct radiation from ISFSI was calculated to be 0.007 mrem/yr, which is a very small fraction (0.03%) of the 25 mrem/yr limit per 40 CFR 190 and 10 CFR 72.104. Both regulations limit the dose to a real member of the public to 25 mrem in a year to the total body. The calculation was performed using the formula provided in ANSI/HPS N13.37-2014 as follows:

Where: $$D_2 = OF * \left(\left(D_1 * R_1^{\,2} \right) / R_2^{\,2} \right)$$

D1 = Dose that was measured from TLD Location 16Q2 (1Q1 was also calculated and had a slightly lower dose)

D2 = Dose that will be extrapolated to Nearest Resident

R1 = Distance from the source to the location where D1 was obtained. (Distance from ISFSI to TLD at 16S2)

R2 = Distance from ISFSI to the location that dose will be extrapolated (Nearest Resident)

OF = Occupancy Factor (1 = full time)

Location	R_1 (ft)	D_1 Annual Net Dose (mrem)	R_2 (ft)	OF	D_2 Annual Net Dose (mrem)
Nearest Resident	203	77.4	19,536	1.0	6.65E-03

7.1.4 TLD anomalies

There were four instances of missing or damaged TLD's during the reporting period. A description of these deviations are in section 9.0, Sample Deviations, Anomalies And Unavailability.

7.2 Air Particulate and Radioiodine Sample Results

Air particulate filters and charcoal canisters were collected from locations specified in Table 1, Radiological Environmental Sampling Program – Exposure Pathway – . During this calendar year 2022, a total of 832 samples (416 particulate filters and 416 iodine cartridges) were collected and analyzed for gross beta, gamma emitters and iodine. Particulate samplers are used to analyze for gross beta activity following filter change out which occurs weekly. Gamma isotopic analysis is performed on composite samples collected at each location and is analyzed quarterly. Radioiodine (I-131) analysis is performed weekly on radioiodine sample cartridges.

APT (Air Particulate) samples were collected on glass fiber filters with low-volume air samplers sampling at approximately 1.5 SCFM. Air sample volumes were measured with calibrated dry-gas meters.

AIO samples (Air Iodine) were collected from the air by adsorption on triethylene-diamine (TEDA) impregnated charcoal cartridges connected in series after the APT filters.

7.2.1 Air Particulates

APT samples were collected weekly at seven indicator locations (05X1, 06S1, 15S2, 05D1, 16E1, 01F1, and 02F6), one duplicate location (05S2) and one control location (14G1). Each weekly sample collected was analyzed for gross beta by TBE. Quarterly composites of the weekly samples from each location were analyzed for specific gamma emitters. The duplicate air location sample was shipped to GEL for analysis (Table 13, Table 14, and Table 15).

7.2.2 Gamma Spectroscopy

Gamma spectroscopy was performed on each of the 32 quarterly composite samples. Naturally occurring Be-7 was detected and no other gamma emitters were detected in any of the samples. RMC-TR-77-03 [10].

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in all 28 indicator location composites at concentrations ranging from 37E-03 pCi/m^3 to 78E-03 pCi/m^3 with an average concentration of 61E-03 pCi/m^3, and in the four control location composites ranging in concentration from 36E-03 pCi/m^3 to 52E-03 pCi/m^3 with an average concentration of 43E-03 pCi/m^3. The maximum preoperational level detected was 330E-03 pCi/m^3 with an average concentration of 109E-03 pCi/m^3 (Table 9, Table 13 and RMC-TR-77-03 [10]).

Gross beta activity was detected in all 364 of the indicator location samples at concentrations ranging from 5E-03 pCi/m^3 to 55E-03 pCi/m^3 with an average concentration of 15E-03 pCi/m^3, and in 52 of 52 of the control location samples at concentrations ranging from 6E-03 pCi/m^3 to 28E-03 pCi/m^3 with an average of 14E-03 pCi/m^3. Gross beta activity was less than ten times the yearly mean of control samples. Therefore, per the ODCM gamma isotopic analysis was not required to be performed on the individual samples. The maximum preoperational level detected was 920E-03 pCi/m^3 with an average concentration of 74E-03 pCi/m^3 (Table 9, Table 14, and RMC-TR-77-03 [10]. See Figure 6).

7.2.3 Air Iodine

AIO were collected weekly at seven indicator locations (05X1, 06S1, 15S2, 05D1, 16E1, 01F1, and 02F6), one duplicate location (05S2) and one control location (14G1). The duplicate air location sample was shipped to GEL for analysis. Each sample was analyzed by TBE for I-131, and all 416 samples were less than the MDC for both indicator and control samples during the Reporting Period. The maximum preoperational level detected was 42E-03 pCi/m^3 (Table 9, Table 15 and RMC-TR-77-03 [10]).

Air particulate and radioiodine results from this monitoring period, 2022, were compared to preoperational data as shown in Table 9, Air Particulate and Radioiodine Comparison of Current Year and Historic Data, and there were no significant changes.

Table 9, Air Particulate and Radioiodine Comparison of Current Year and Historic Data

Analysis	Preoperational Data (pCi/m^3)	2022 Sample Result Average (pCi/m^3)
Gamma	109E-03	61E-03
Beta	74E-03	15E-03
Iodine	42E-03	< MDC

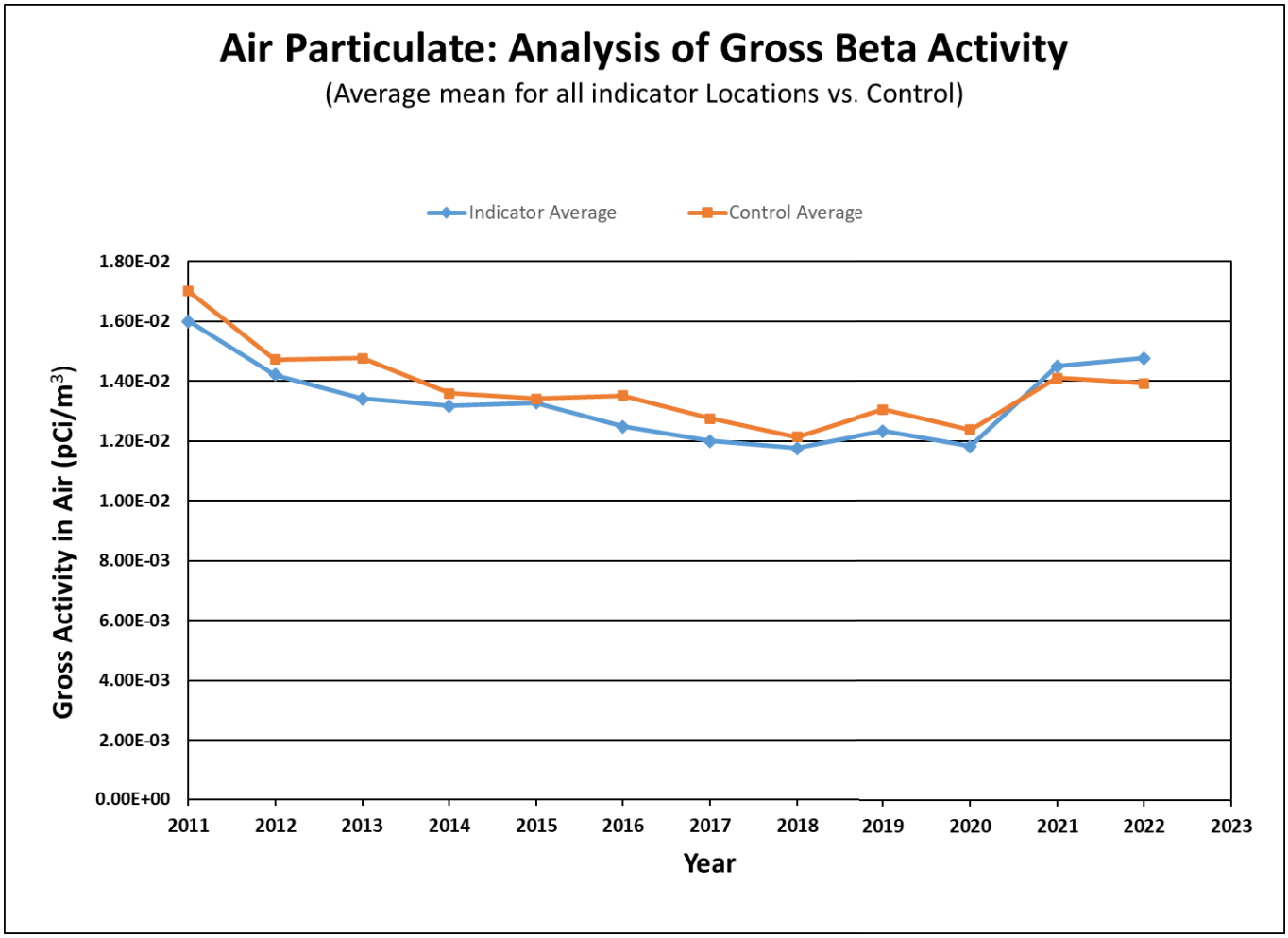

Figure 6, Air Particulate: Analysis for Gross Beta, Average Mean for All Indicator Vs. Control

7.3 Waterborne Sample Results

7.3.1 Surface Water

Surface water samples were collected twice a month at four indicator locations and one control location in the Delaware River Estuary. The two samples for the month were combined to create a single monthly composite sample that was then analyzed. One location (11A1) is at the outfall area (which is the area potentially impacted by effluents discharged from the Site into the Delaware River), one location is downstream from the outfall area (07E1), and one location is directly west of the outfall area at the mouth of the Appoquinimink River (12B1). Samples were collected upstream in the Delaware River (01F2) and at the mouth of the Chesapeake and Delaware Canal (16F1) the latter being sampled when the flow was from the Canal into the river.

Surface water samples were collected offshore in new polyethylene containers that were rinsed twice with the sample medium prior to collection. The surface water samples were transported to TBE for analysis.

Location 12B1, located directly west of the Site, at the mouth of the Appoquinimink River, serves as the control. 12B1 was chosen as the control location because the physical characteristics of this location more closely resemble those of the outfall area than do those at the farther upstream location (01F2). As discussed in the preoperational summary report, due to its tidal nature, there were flow rate and salinity variations in the Delaware River Estuary. These variations accounted for the differences in K-40 concentrations.

During this calendar year 2022, a total of 60 surface water samples were collected and analyzed in accordance with the requirements of Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne.

1. Tritium

   Tritium activity was detected in 3 of the 48 indicator location samples at concentrations ranging from 216 pCi/L to 1020 pCi/L with an average concentration of 496 pCi/L (80130946-90 and 240). Tritium was not detected in the control location samples. The maximum preoperational level detected was 600 pCi/L, with an average concentration of 210 pCi/L (Table 16 and RMC-TR-77-03 [10]). See Figure 7 for graphical presentation.

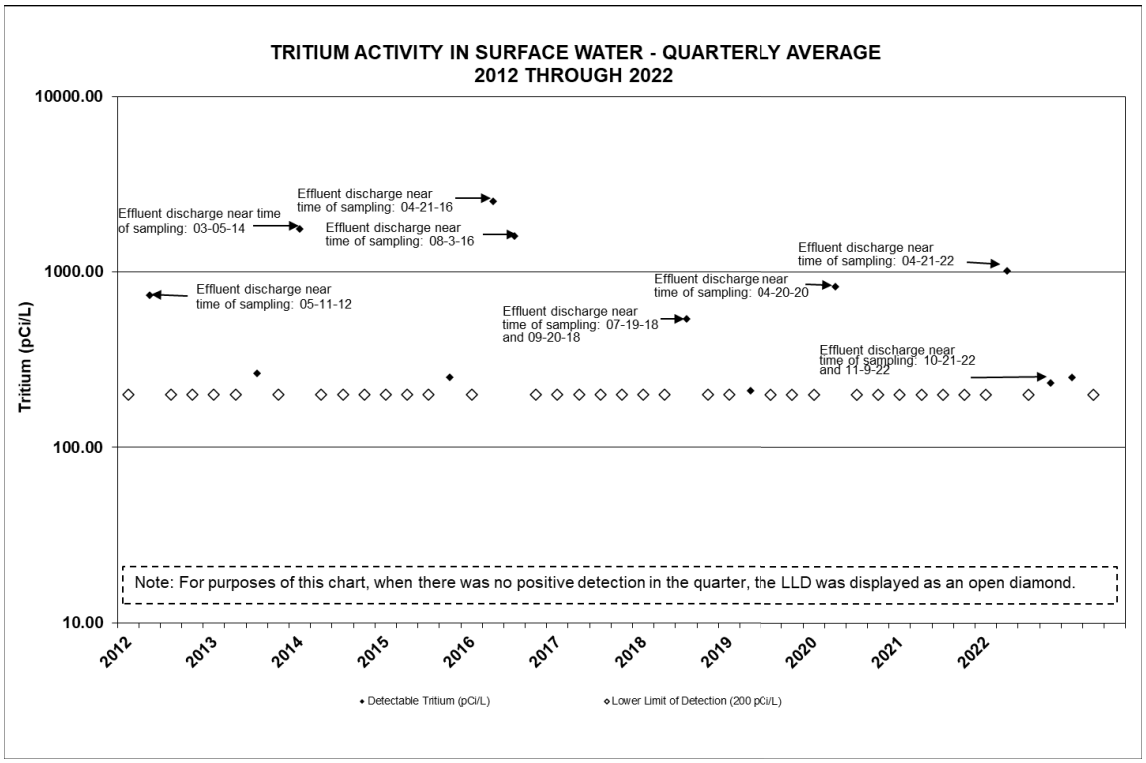

Figure 7, Surface Water Tritium Results

2. Gamma Spectroscopy

   No plant related gamma emitters were detected above the MDC in any of the indicator or control surface water samples.

   Naturally occurring K-40 was detected in 12 of the 48 indicator location samples at concentrations ranging from 81 pCi/L to 213 pCi/L, with an average of 122 pCi/L. K-40 was detected in 1 of the 12 control location samples at an average concentration of 75 pCi/L. The maximum preoperational level detected for K-40 was 200 pCi/L with an average concentration of 48 pCi/L (Table 17 and RMC-TR-77-03 [10]).

3. I-131Low Level

   I-131 was not detected above the MDC in any of the 48 indicator samples or in any of the control location samples (Table 17).

7.3.2 Potable Water (Drinking Water)

Both raw and treated potable water samples were collected and composited at the local water treatment facility. Each sample consisted of weekly aliquots composited into a monthly sample. The raw water source for this plant is a combination of surface water from Laurel Lake and groundwater from its adjacent wells. These are Management Audit samples as no liquid effluents discharged from the Site directly affect this pathway.

1. Gross Alpha

   No Gross alpha activity was detected above the MDC in any of the raw or treated water samples. The maximum preoperational level detected was 2.7 pCi/L (Table 18 and RMC-TR-77-03 [10]).

2. Gross Beta

   Gross beta activity was detected in 11 of 12 raw water samples and 10 of 12 treated water samples. The concentrations for the raw samples ranged from 2.4 pCi/L to 9.1 pCi/L, with an average concentration of 6.2 pCi/L. Concentrations for the treated water ranged from 4.9 pCi/L to 47.9 pCi/L, with an average concentration of 10.6 pCi/L. The maximum preoperational level detected was 9.0 pCi/L with an average concentration of 4.2 pCi/L (Table 18 and RMC-TR-77-03 [10].

3. Tritium

   Tritium activity was not detected above the MDC in any of the 12 raw or 12 treated water samples. The maximum preoperational level detected was 350 pCi/L with an average of 179 pCi/L (Table 18 and RMC-TR-77-03 [10]).

4. I-131

   I-131 activity was not detected above the MDC in any of the 12 raw or 12 treated water samples. No preoperational data were available for comparison, since I-131 was not analyzed as a specific radionuclide prior to 1989. However, I-131 analytical results to date have been below the MDC (Table 19 and RMC-TR-77-03 [10]).

5. Gamma Spectroscopy

   No plant related gamma emitters were detected above the MDC in any of the 24 potable water samples. Naturally occurring K-40 was not detected in any of the potable water samples. No preoperational data were available for comparison. Naturally occurring Ra-226 was not detected in any raw or treated water samples. The maximum preoperational level detected for Ra-226 was 1.4 pCi/L (Table 19 and RMC-TR-77-03 [10]).

7.3.3 Well Water (Ground Water)

Although offsite wells in the vicinity of the Site are not directly affected by plant operations, well water samples were collected monthly from one farm (03E1). Samples from this well are considered Management Audit samples.

1. Gross Alpha

   Gross alpha activity was not detected above the MDC in any of the 12 well water samples. The maximum preoperational level detected was 9.6 pCi/L (Table 20 and RMC-TR-77-03 [10]).

2. Gross Beta

   Gross beta activity was detected in 1 of the 12 well water samples. Concentration was 11.1 pCi/L. The preoperational results ranged from <2.1 pCi/L to 38 pCi/L, with an average value of 9 pCi/L (Table 20 and RMC-TR-77-03 [10]).

3. Tritium

   Tritium activity was not detected above the MDC in any of the 12 well water samples. The maximum preoperational level detected was 380 pCi/L (Table 20 and RMC-TR-77-03 [10]).

4. I-131

   I-131 activity was not detected in any of the 12 well water samples. No preoperational data were available for comparison, since I-131 was not analyzed as a specific radionuclide prior to 1989. However, I-131 analytical results to date have been below the MDC (Table 21 and RMC-TR-77-03 [10]).

5. Gamma Spectroscopy

No plant related gamma emitters were detected above the MDC in any of the indicator or control location well water samples. Naturally occurring K-40 was not detected in any of the well water samples. The maximum preoperational levels detected were 30 pCi/L (Table 21 and RMC-TR-77-03 [10]).

7.3.4 Sediment

Sediment samples were collected semi-annually from five indicator locations and one control location. Location 05A1 was the only shoreline sediment sample location that was directly subjected to tidal fluctuations. The remaining locations were located offshore. Location 15A2, South Storm Drain outfall, was not sampled due to the Windport Project. Only one outfall sample is required (obtained from 15A1) by ODCM table 3.12-1.

Sediment samples were taken with a bottom grab sampler and frozen in sealed polyethylene containers before being transported in ice chests to TBE. For the river bottom sediment, a marine GPS was used to locate the correct site and the sampling boat was maneuvered over the area until the correct amount of sample was obtained (grabbed) with the sediment dredge.

Location 05A1 shoreline sediment sample (an onsite location) was sampled as follows: A square area, measuring one meter on each side was staked out and then divided into a grid of nine smaller boxes, three per side. A one inch deep scoop from the center of each of the small grids was taken. All the aliquots were combined and the total sample transported in the ice chest to TBE and analyzed for gamma emitters.

Naturally occurring K-40 was detected in all 10 indicator location samples at concentrations ranging from 2,007 pCi/kg (dry) to 13,200 pCi/kg (dry), with an average concentration of 7,147 pCi/kg (dry). Both control locations samples had concentrations ranging from 14,400 pCi/kg (dry) to 15,650 pCi/kg (dry) with an average concentration of 15,025 pCi/kg (dry). The maximum preoperational level detected was 21,000 pCi/kg (dry) with an average concentration of 15,000 pCi/kg (dry) Table 22 and RMC-TR-77-03 [10]).

Cs-137 was not detected in any of the indicator or control samples. The maximum preoperational level detected was 400 pCi/kg (dry) with an average concentration of 150 pCi/kg (dry) (Table 22 and RMC-TR-77-03 [10]).

Naturally occurring Ra-226 was not detected above the MDC in any indicator location samples and was detected in 1 of 2 control location samples with a concentration of 2,291 pCi/kg (dry). The maximum preoperational level detected was 1,200 pCi/kg (dry) with an average concentration of 760 pCi/kg (dry) (Table 22 and RMC-TR-77-03 [10]).

Naturally occurring Th-232 was detected in 7 of the 10 indicator location samples at concentrations ranging from 269 pCi/kg (dry) to 755 pCi/kg (dry) with an average concentration of 512 pCi/kg (dry), and 1 of 2 of the control location samples with a concentration of 1,012 pCi/kg (dry). The maximum preoperational level detected was 1,300 pCi/kg (dry) with an average concentration of 840 pCi/kg (dry). All other gamma emitters were less than the MDC (Table 22 and RMC-TR-77-03 [10]).

7.4 Ingestion Pathway Sample Results

7.4.1 Milk

Milk samples (MLK) were taken semi-monthly when cows were on pasture and monthly when cows were not grazing on open pasture, from two indicator locations (13E3, and14F4) and one control location (02G3). Animals were considered on pasture from April to November of each year. Samples were collected in new polyethylene containers, sodium bisulfite was added as a sample preservative, and then samples were frozen and transported in ice chests to TBE. Each sample was analyzed for I-131 and gamma emitters. Note: Location 03G1 was the previous control location, however, the dairy farm is no longer in business, see section 10.0 PROGRAM CHANGES.

There is no dairy farm within three miles of the Site, and there is only one dairy farm within five miles (13E3). Therefore, broadleaf vegetation is grown, maintained, and harvested monthly during the growing season.

1. I-131

   I-131 was not detected above MDC in any of the 60 samples analyzed. The maximum preoperational level detected was 65 pCi/L, which occurred following a period of atmospheric nuclear weapons (Table 23 and RMC-TR-77-03 [10]).

2. Gamma Spectroscopy

   No plant related gamma emitters were detected above the MDC in any of the indicator or control location milk samples.

   Naturally occurring K-40 was detected in all 40 milk samples with concentrations for the 40 indicator location samples ranging from 820 pCi/L to 1,993 pCi/L with an average concentration of 1,299 pCi/L, and the 20 control location sample concentrations ranging from 813 pCi/L to 1,890 pCi/L, with an average concentration of 1,227 pCi/L. The maximum preoperational level detected was 2,000 pCi/L with an average concentration of 1,437 pCi/L (Table 23 and RMC-TR-77-03 [10]).

7.4.2 Fish and Invertebrates

A total of 11 fish and invertebrate samples were analyzed in 2022, for gamma emitting radionuclides in accordance with requirements of Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion. These samples are collected from the indicator and control areas as required by the ODCM.

1. Fish

   Edible species of fish were collected semi-annually at two indicator locations and one control location and analyzed for gamma emitters in edible flesh. Sample species collected in 2022, were striped bass, white catfish, channel catfish and white perch. Edible fish were collected using gill nets while crabs were caught in commercial traps. These samples were processed by separating the flesh from the bone and shell. The flesh was placed in sealed containers and frozen before being transported in ice chests to TBE for analysis.

   No plant related gamma emitters were detected above the MDC in any of the indicator or control location fish samples. Naturally occurring K-40 was detected in all 7 indicator location samples at concentrations ranging from 2,607 pCi/kg (wet) to 4,531 pCi/kg (wet) with an average concentration of 3,736 pCi/kg (wet). The 4 control location samples had concentrations ranging from 3,012 pCi/kg (wet) to 4,344 pCi/kg (wet), with an average of 3,562 pCi/kg (wet). The maximum preoperational detection was 13,000 pCi/kg (wet) with an average concentration of 2,900 pCi/kg (wet) (Table 24 and RMC-TR-77-03 [10]).

2. Blue Crab

   Blue crab samples were collected twice during the season at one indicator and one control location. The edible portions were analyzed for gamma emitters. No plant related gamma emitters were detected above the MDC in any of the indicator or control location blue crab samples. Naturally occurring K-40 was detected in both indicator samples at concentrations of 2,221 pCi/kg (wet) and 4,356 pCi/kg (wet) with an average concentration of 3,289 pCi/kg (wet). The control location samples had concentrations ranging from 2,450 pCi/kg (wet) to 3,213 pCi/kg (wet), with an average concentration of 2,832 pCi/kg (wet). The maximum preoperational level for K-40 detected was 12,000 pCi/kg (wet) with an average concentration of 2,835 pCi/kg (wet). All other gamma emitters were less than the MDC (Table 25 and RMC-TR-77-03 [10]).

7.4.3 Vegetation

A total of 27 food samples were analyzed in 2022, for gamma emitting radionuclides in accordance with requirements of Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion.

Locally grown vegetables (FPV) were collected at the time of harvest at four locations (02F9, 01G1, 02G2, and 03H5); fodder crops (VGT) were sampled at three locations (13E3, 14F4, and 02G3); and broad leaf vegetation (FPL) was sampled at five locations (06S1, 16S1, 10D1, 01G1 and 03H5). The vegetables and fodder samples are additional samples (Management Audit) taken to enhance the radiological monitoring program.

1. Broadleaf Vegetation (FPL)

   Broadleaf vegetation samples were collected since there were no dairy farms operating within the five km (three mile) radius of the Site. The closest dairy farm (13E3) was located in Odessa, DE at miles to the West.

   All samples were analyzed for gamma emitters and included kale, hosta, cabbage and lambs ear. These samples were obtained from five indicator locations and one control locations. The results for these samples are discussed below.

   No plant related gamma emitters were detected above the MDC in any of the indicator or control location broadleaf vegetation samples.

   Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected above the MDC in 4 of the 6 indicator location samples with concentrations ranging from 478 pCi/kg (wet) to 3,083 pCi/kg (wet), with an average concentration of 1,742 pCi/kg (wet). Be-7 was detected in 4 of the 4 control location samples, with concentrations ranging from 389 pCi/kg (wet) to 1,622 pCi/kg (wet), and an average concentration of 1,080 pCi/kg (wet). No preoperational Be-7 data was available for comparison (Table 26).

   Naturally occurring K-40 was detected in all 6 indicator samples, with concentrations ranging from 2,124 pCi/kg (wet) to 11,380 pCi/kg (wet) with an average concentration of 6,120 pCi/kg (wet). K-40 was detected in all of the control location samples, with concentrations ranging from 4,081 pCi/kg (wet) to 10,340 pCi/kg (wet), and an average concentration of 7,027 pCi/kg (wet). The maximum preoperational level detected was 4,800 pCi/kg (wet) with an average concentration of 2,140 pCi/kg (wet) (Table 26 and RMC-TR-77-03 [10]).

   Naturally occurring Th-232 was not detected in any of the indicator location samples or control location samples (Table 26).

2. Vegetables

   There are no farm products that are irrigated with water in which plant effluents have been discharged. The Delaware River at the location of the Site is brackish and therefore is not used for irrigation.

A variety of food products were sampled on and around the Site; however, the variety was dependent on the farmer's preference. These vegetables were collected as Management Audit samples.

All samples were analyzed for gamma emitters and included asparagus, sweet corn, peppers, tomatoes, and peaches. These samples were obtained from four indicator locations (14 samples). The results for these samples are discussed below.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location vegetable samples.

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was not detected above the MDC in any of the vegetable samples.

Naturally occurring K-40 was detected in all 14 indicator samples, with concentrations ranging from 1,348 pCi/kg (wet) to 2,913 pCi/kg (wet) with an average concentration of 1,968 pCi/kg (wet). The maximum preoperational level detected was 4,800 pCi/kg (wet) with an average concentration of 2,140 pCi/kg (wet) (Table 27 and RMC-TR-77-03 [10]).

3. Fodder Crops

Although not required by the Site ODCM, three samples of silage normally used as cattle feed were collected from three indicator locations. It was determined that these products could be an element in the food-chain pathway. These fodder crops were collected as Management Audit samples and analyzed for gamma emitters. All three locations from which samples were collected are milk sampling locations.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location fodder crop samples. Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in 2 of 3 indicator samples with concentrations ranging from 490 pCi/kg (wet) to 634 pCi/kg (wet) with an average concentration of 562 pCi/kg). The maximum preoperational level detected for fodder was 4,700 pCi/kg (wet) with an average concentration of 2,000 pCi/kg (wet) (Table 28 and RMC-TR-77-03 [10]).

Naturally occurring K-40 was detected in all three indicator samples at concentrations ranging from 2,724 pCi/kg (wet) to 4,922 pCi/kg (wet) with an average concentration of 3,964 pCi/kg (wet). Preoperational results averaged 7,000 pCi/kg (wet) (Table 28 and RMC-TR-77-03 [10]).

4. Game

Although not required by the Site ODCM, two muskrat samples were collected from two indicator locations. The game samples were collected as Management Audit samples and analyzed for gamma emitters.

No plant related gamma emitters were detected above the MDC in any of the indicator game samples. Naturally occurring K-40 was detected in all 2 samples at concentrations ranging from 2,920 to 3,007 pCi/kg (wet) with an average concentration of 2,964 pCi/kg (wet). No preoperational data was available for comparison (Table 29 and RMC-TR-77-03 [10]).

7.5 Terrestrial

7.5.1 Soil

Soil is sampled every three years and analyzed for gamma emitters. Nine locations were sampled in 2022. These Management Audit samples were collected in areas that have been relatively undisturbed since the last collection in order to determine any change in the radionuclide inventory of the area.

The 2022 samples had naturally occurring K-40 was detected in all nine indicator samples at concentrations ranging from 5,448 to 13,690 pCi/kg (dry) with an average concentration of 9,315 pCi/kg (dry). The maximum preoperational level detected was 24,000 pCi/kg (dry) with an average of 10,000 pCi/kg (dry)(Table 30).

Cs-137 was detected in 5 of 9 indicator samples at concentrations ranging from 75 to 184 pCi/kg (dry) with an average concentration of 128 pCi/kg (dry). The maximum preoperational level detected was 2,800 pCi/kg (dry) with an average of 800 pCi/kg (dry). See Figure 8 for graphical presentation (Table 30 and RMC-TR-77-03 [10]).

Naturally occurring Ra-226 was detected in 8 of 9 indicator samples at concentrations ranging from 1,398 pCi/kg (dry) to 2,836 pCi/kg (dry) with an average concentration of 1,989 pCi/kg (dry) (Table 30).

Naturally occurring Th-232 was detected in 8 of 9 indicator samples at concentrations ranging from 436 pCi/kg (dry) to 975 pCi/kg (dry) with an average concentration of 742 pCi/kg (dry), Th-232 was not detected in the control location. All other gamma emitters were less than the MDC (Table 30).

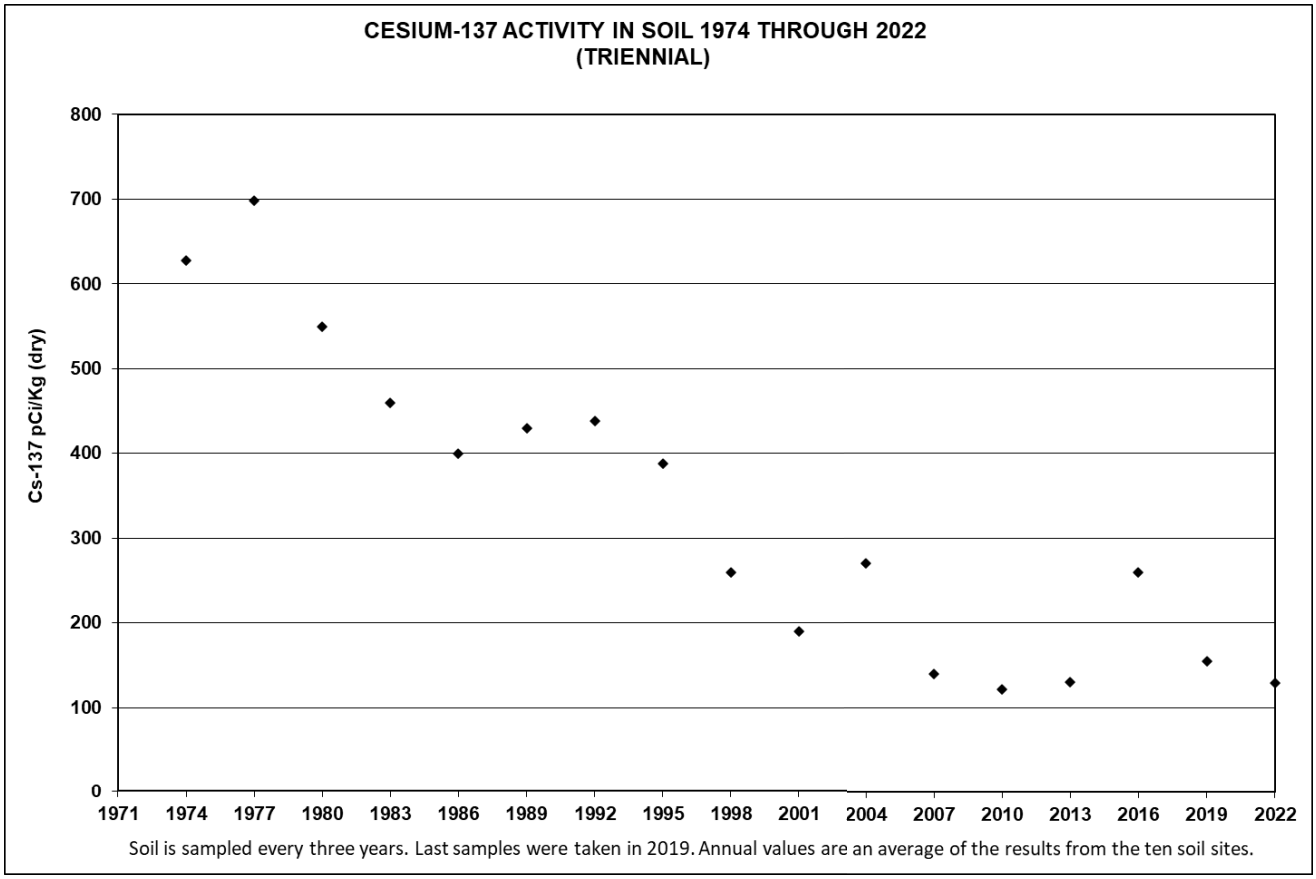

Figure 8, Cesium-137 Activity in Soil 1974 Through 2022

Historically, Cs-137 has been observed in REMP soil samples and attributed to weapons testing. The values observed in these samples are consistent with prior results, and are below the NRC's predicted values of Cs-137 for the New Jersey area soils as a result of fallout from atmospheric weapons testing. Furthermore, the analyzed samples were at concentrations many orders of magnitude above the theoretical impact by plant operation given the Cs-137 concentrations in plant effluents back through 2005.

Additionally, soil is not a formal component of the REMP, nor is it required to be collected as part of the REMP in accordance with the ODCM; it is collected as a REMP Management Audit sample. As such, the ODCM specifies no reportability or LLD thresholds for soil samples. PSEG REMP Implementation procedure, Attachment 1 (Analytical Results Investigation Levels) provides an investigation threshold of 1,000 pCi/kg for Cs-137 in soil and sediment, which is based on the expected concentrations for our region from sources other than plant operation as recognized by the NRC in DOCKET NO.50-219, RFTA NO. 99-040.

This evaluation validated suppositions and will appropriately characterize positive sample results obtained in future sampling evolutions as related to atmospheric testing, provided that:

- Soil concentrations are less than 1,000 pCi/kg
- Annual gaseous Cs-137 effluents are reviewed and do not show a significant increase
- Cs-134 is not detected (Cs-134 is plant related and has a much shorter half-life than Cs-137)
- D/Q values continue to be routinely evaluated and are updated as necessary

For the above reasons, it can be concluded that the samples are primarily the result of atmospheric testing, with negligible contribution from site operations at PSEG Nuclear's three reactors.

Although it has been concluded the Cs-137 in the soil is due to fallout from atmospheric weapons testing, there is essentially no radiological impact to the environment or a member of the public with respect to the annual dose. To demonstrate this, a skin dose calculation was performed for a theoretical person who stood on the soil at location 05F1 (184 pCi/kg) for 1,000 hours per year (arbitrary number). This calculation concluded the dose to a member of the public beyond the site boundary would be a mere 2.16E-1 mrem/yr (1.4% of the annual skin dose limit of 15 mrem/yr), which conforms to 10 CFR 50 Appendix I. Since this activity has been determined to be non-site related, a better comparison is the calculated skin dose against background radiation levels (or approximately 0.1% of the 300 mrem/yr background dose).

8.0 LAND USE CENSUS EXPOSURE PATHWAY

Annual Land Use Census required by the Offsite Dose Calculation Manual is performed to ensure that changes in the use of areas at or beyond the site boundary are identified and modifications to REMP are made if required by changes in land use. Land use census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR 50 [2]. NUREG-1301/1302 Control 3.12.2 specifies that "a land use census shall be conducted and shall identify within a distance of 8 km (5 mi.) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation." Note, per NUREG-1301/1302, Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census.

A Land Use Census was conducted during the calendar year, 2022, within the growing season to identify changes in land use, receptor locations, and new exposure pathways. The results for the 2022 Land Use Census are listed in Table 10, Land Use Census – Nearest Pathway within 5 miles. In summary, the highest D/Q locations for nearest garden, nearest residence and nearest milk animal did not change following the 2022 census.

Table 10, Land Use Census – Nearest Pathway within 5 miles

Sector	Direction	Nearest Residence (Miles)	Nearest Milk Animal (Miles)	Garden (Miles)	Meat Animal Distance (Miles)
1	N	None	None	None	None
2	NNE	5.0	None	None	None
3	NE	3.9	None	None	None
4	ENE	3.9	None	None	None
5	E	None	None	None	None
6	ESE	None	None	None	None
7	SE	None	None	None	None
8	SSE	None	None	None	None
9	S	None	None	None	None
10	SSW	3.9	None	None	None
11	SW	4.3	None	None	None
12	WSW	4.4	None	None	None
13	W	4.0	5.0	None	None
14	WNW	3.4	None	None	None
15	NW	3.7	None	None	None
16	NNW	4.2	None	None	None

9.0 SAMPLE DEVIATIONS, ANOMALIES AND UNAVAILABILITY

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, errors that prevents 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 with no available sample (i.e., food crop, TLD).

All required samples were collected and analyzed as scheduled except for the following:

Table 11, Sample Deviation Summary

Sample Type and Analysis	Analysis	Location	Collection Date or Period	Reason for not conducting REMP sampling as required by ODCM	Plans for preventing reoccurrence
APT/AIO[1]	Gross β Iodine	16E1	4/4/22 - 4/11/22	Power Outage	N/A
TLD[2]	Gamma Dose	13S1,02F5 and 09F2	4/1/22 – 6/30/22	TLD Lost	Replaced mesh container
APT/AIO[3]	Gross β Iodine	02F6	4/11/22 – 4/18/22	Meter Failure	Replaced meter
APT/AIO[4]	Gross β Iodine	14G1	5/31/22 – 6/6/22	GFCI Trip	Reset GFCI and monitored
APT/AIO[5]	Gross β Iodine	02F6*	8/1/22 – 8/8/22	GFCI Trip	Replaced pump
APT/AIO[6]	Gross β Iodine	05S2	8/5/22 – 8/22/22	Duplicate sample lost during shipment	N/A
APT/AIO[7]	Gross β Iodine	05D1	9/19/22 – 9/26/22	Power Outage	N/A
APT/AIO[8]	Gross β Iodine	05D1	10/10/22 - 10/17/22	Totalizer Failure	Replaced pump
PWT[9]	Gross α	02F3	8/30/22	LLD not met	Subsequent samples met LLD
APT/AIO[10]	Gross β Iodine	05X1/05S2	11/7/22 – 11/14/22	Power Outage	N/A
APT/AIO[11]	Gross β Iodine	16E1	12/27/22 – 1/3/23	Power Surge	Replaced pump
TLD[12]	Gamma Dose	15S1	10/1/22 – 12/31/22	TLD Missing	Replaced TLD
APT/AIO[13]	Gross β Iodine	15S2	12/20/22 – 12/27/22	Cracked Filter	Replaced Filter

1. Sample Deviation (Order 80130946/60)**:** Air sampler 16E1 lost power during the 4/4/2022 to 4/11/2022 collection period. The total time the sampler was in operation was 162.1 hours. The total outage duration was 5.1 hours. A total of volume 13,950 cubic feet was collected for the sample period. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement.

9.0 (Continued)

2. Sample Deviation (Order 80130946/70**):** Three TLDs (location 13S1, 02F5 and 09F2) were not recovered during the 2nd quarter swap out. Location 13S1 and 02F5 appears to be a failure in the green mesh bag container. Location 09F2 location appears to have been vandalized, the TLD is located at a public boat launch area. The TLDs were replaced and collected in the subsequent quarter.

3. Sample Deviation (Order 80130946/80**):** Air sampler 2F6 had a meter failure during the 4/11/2022 to 4/18/2022 collection period. The total time the sampler was in operation was 171.1 hours. A total of volume 3,700 cubic feet was recorded for the sample period, however, the actual volume is unknown due to the meter failure. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement.. The air sampler meter was replaced.

4. Sample Deviation (Order 80130946/100**):** Air sampler 14G1 GFCI trip during the 5/31/2022 to 6/6/2022 collection period. The total time the sampler was in operation was 97.3 hours. The total outage duration was 45.9 hours. A total of volume 9,300 cubic feet was collected for the sample period. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement. The GFCI was reset and monitored.

5. Sample Deviation (Order 80130946/110**):** Air sampler 02F6 GFCI trip during the 8/1/2022 to 8/8/2022 collection period. The total time the sampler was in operation was 78.0 hours. The total outage duration was 90.6 hours. A total of volume 7,870 cubic feet was collected for the sample period. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement.

6. Sample Anomaly (Order 80130946/130**):** Air sample from location 05S2 for the 8/15/22 to 8/22/22 collection period was lost during shipment. 05S2 is a duplicate sample sent to an alternate offsite laboratory and used for quality assurance purposes. The normal sample, 05X1, was shipped to the normal offsite laboratory and was analyzed.

7. Sample Deviation (Order 80130946/140**):** Air sampler 05D1 lost power during the 9/19/2022 to 9/26/2022 collection period. The total time the sampler was in operation was 153.4 hours. The total outage duration was 13.6 hours. A total of volume 14,200 cubic feet was collected for the sample period. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement.

9.0 (Continued)

8. Sample Deviation (Order 80130946/150**):** Air sampler 05D1 totalizer failure during the 10/10/2022 to 10/17/2022 collection period. The total time the sampler was in operation was 164.5 hours. A total of volume 13,400 cubic feet was collected for the sample period. Totalizer was suspect because it recorded a flow rate of 4.96 scfm. The calculated flowrate was 1.36 scfm which is expected. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement. Entire pump was replaced.

9. Sample Anomaly (Order 80130946/160**):** Gross Alpha LLD was not achieved on a "Treated" potable water sample collected on 8/30/2022 at location 2F3. The sample had larger amounts of sediment than usual. Gross Alpha was not detected in either analysis. Also, because of the high solid content, Gross-Beta was higher than normal (48 pCi/L, normal is 5 to 10 pCi/L) in the "Treated" sample. The "Raw" water sample was not affected. Because the "Raw" sample was not affected the abnormal result was likely due to the water treatment process.

10. Sample Deviation (Order 80130946/200**):** Air sampler 05X1 and 05S2 (duplicate) lost power during the 11/07/2022 to 11/14/2022 collection period. The total time the samplers were in operation was 160.7 hours. The total outage duration was 7.8 hours. A total of volume 15,000/14,970 cubic feet was collected for the sample period. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement.

11. Sample Deviation (Order 80130946/250**):** Air sampler 16E1 lost power during the 12/27/2022 to 01/03/2023 collection period. The GFCI was tripped, the totalizer was burned and the fuse was blown. Total run time and outage time could not be determined. A total of volume 6,200 cubic feet was collected for the sample period. Adequate sample volume was achieved during the sample collection period to meet the Gross Beta and I-131 ODCM LLD requirement.

12. Sample Deviation (Order 80130946/260**):** TLD for location 15S1 was not recovered during the 4th quarter change out. The TLD was replaced for the 1st quarter 2023 monitoring period.

13. Sample Anomaly (Order 80130946/270**):** Gross beta results were lower than normal on the 15S2 particulate filter. It was noted by the vendor laboratory that the filter had a small tear, which may have resulted in loss of some sample during the collection period. The gross beta result was 5.3E-03 pCi/m$^{3.}$ Normal result for 15S2 is approximately 1.4E-02 pCi/m^3.

10.0 PROGRAM CHANGES

The milk farm used as the control (03G1, 16.5 miles, NE) went out of business. The farm located 11.8 miles, NNE, location 02G3 was used as an alternate for the control location within 30 days in accordance with ODCM, Part 1, 3.12.1.c. The location at 03G1 was not removed in the 2021 revision of the ODCM, because it was not determined if the location change was permanent. Section 11.4 contains the errata information for the 2021 AREOR. The next revision of the ODCM will replace location 03G1 with 02G3 (80130863 Operation 20).

11.0 OTHER SUPPLEMENTAL INFORMATION

11.1 NEI 07-07 Onsite Radiological Groundwater Monitoring Program

Salem and Hope Creek Generating Stations has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater in order to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. It is important to note, samples and results taken in support of NEI 07-07 groundwater monitoring program are not part of the Radiological Environmental Monitoring Program (REMP). Results of NEI 07-07 Radiological Groundwater Monitoring Program for onsite Wells are communicated in the ARERR.

11.2 Independent Spent Fuel Storage Installation (ISFSI) Monitoring Program

ISFSI information is reported in the Salem and Hope Creek Generating Stations Annual Radiological Effluent Release Report.

11.3 Hope Creek Technical Specification Limit For Primary Water Iodine Concentration

The HCGS primary coolant results for Dose Equivalent Iodine-131, Total Gamma, and Total Beta were reviewed. The specific activity of the primary coolant did not exceed 0.2 micro curies per gram Dose Equivalent I-131 (DEI).

The Total Gamma and the Total Beta activity (microcuries per gram) did not exceed the 100/E-Bar limit.

Therefore, HCGS did not exceed the Technical Specifications limit specified in section 3.4.5.

11.4 Corrections to Previous Reports

11.4.1 Corrections to 2021 AREOR

Table 7 in the 2021 AREOR was created as part of an industry project to maintain alignment with the AREOR format. The 2022 template has been revised and this table has been replaced.

Corrected page 27 of the 2021 AREOR. Location 01G3 was listed as Measurement Type "I" (Indicator). Changed to "C" (Control). (See Attachment 4, 2021 AREOR Errata)

Corrected page 28 of the 2021 AREOR (See Attachment 4, 2021 AREOR Errata):

Location 03G1 was listed as "C" (Control) in the IDM column, changed to "OR" (Outer Ring).

Location 10G1 was listed as "I" (Indicator) in the Measurement Type column, changed to "C" (Control).

Location 14G1 was listed as "C" (Control) in the Measurement Type column and "C" (Control) in the IDM column and changed to "I" (Indicator) and "OR" (Outer Ring).

Location 16G1 was listed as "C" (Control) in the IDM column, changed to "OR" (Outer Ring).

Location 03H1 was listed as "I" (Indicator) in the Measurement Type column, changed to "C" (Control).

Corrected page 18 of the 2021 AREOR. The Milk sample control location was listed as 03G1 per the ODCM. This location was no longer producing milk in 2021. An alternate control location, 02G3, was used and will be added to the next revision of the ODCM. (See Attachment 4, 2021 AREOR Errata)

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[32] "Regulatory Guide 4.13, Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, Revision 2," Nuclear Regulatory Commision, June, 2019.

[33] "Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment," Nuclear Regulatory Commission, July, 2007.

[34] "10 CFR 50 - Domestic Licensing of Production and Utilization Facilities," US Nuclear Regulatory Commission, Washington, DC.

[35] "40 CFR 190 - Environmental Radiation Protection Standards for Nuclear Power Operation," US Environmental Protection Agency, Washington, DC.

[36] "NUREG-0324 - XOQDOQ, Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations," Nuclear Regulatory Commission, September, 1977.

[37] "Regulatory Guide 1.109 - Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Demonstrating Compliance with 10 CFR Part 50, Appendix I," Nuclear Regulatory Commission, Ocotober, 1977.

[38] "40 CFR 141 - National Primary Drinking Water Regulations," US Environmental Protection Agency, Washington, DC..

[39] "10 CFR 20 - Standards for Protection Against Radiation," US Nuclear Regulatory Commission, Washington, DC.

[40] "Offsite Dose Calculation Manual (ODCM) For The Common Radiological Environmental Monitoring Program (REMP)," PSEG Nuclear, LLC, 2021.

Attachment 1, Data Table Summary

SALEM GENERATING STATION **DOCKET NO. 50-272/-311**
HOPE CREEK GENERATING STATION **DOCKET NO. 50-354**
SALEM COUNTY, NEW JERSEY **REPORTING PERIOD: January 1, 2022 to December 31, 2022**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND ***TOTAL NUMBER*** OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
I. DIRECT							
DIRECT RADIATION (mR/standard quarter)	**TLD-QUARTERLY** ***236***	N/A	14.9 (224/224) *(11.2/33.9)*	SA-IDM-01Q1 0.58 MILES N	33.0 (4/4) *(32.2/33.9)*	14.6 (12/12) *(13.1/16.3)*	0
II. AIRBORNE							
AIR PARTICULATE ($E-3$ pCi/m^3)	**Gr-B** ***416***	10	15 (364/364) (5/55)	SA-APT-02F6 7.3 MILES NNE	16 (52/52) (6/55)	14 (52/52) (6/28)	0
	GAMMA ***32***						
	Be-7	N/A	61.3 (28/28) (36.9/77.6)	SA-APT-05X1 0.86 MILES E	64.2 (4/4) (46.1/76.4)	42.7 (4/4) (36.4/51.7)	0
	K-40	N/A	<MDC	N/A	N/A	<MDC	0
	Cs-134	50	<MDC	N/A	N/A	<MDC	0
	Cs-137	60	<MDC	N/A	N/A	<MDC	0
AIR IODINE ($E-3$ pCi/m^3)	**GAMMA** ***416***						
	I-131	70	<MDC	N/A	N/A	<MDC	0
III. WATERBORNE							
SURFACE WATER (pCi/L)	**H-3** ***60***	200	496 (3/48) (216/1020)	SA-SWA-11A1 0.20 MILES SW	496 (3/12) (216/1020)	<MDC	0
	I-131 (LOW LVL) ***60***	1	<MDC	N/A	N/A	<MDC	0
	GAMMA ***60***						
	K-40	N/A	122 (12/48) (81/213)	SA-SWA-11A1 0.20 MILES SW	129 (5/12) (110/142)	75 (1/12)	0

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND *TOTAL NUMBER* OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
Surface Water (cont.) (pCi/L)	Mn-54	15	<MDC	N/A	N/A	<MDC	0
	Co-58	15	<MDC	N/A	N/A	<MDC	0
	Fe-59	30	<MDC	N/A	N/A	<MDC	0
	Co-60	15	<MDC	N/A	N/A	<MDC	0
	Zn-65	30	<MDC	N/A	N/A	<MDC	0
	ZrNb-95	15	<MDC	N/A	N/A	<MDC	0
	Cs-134	15	<MDC	N/A	N/A	<MDC	0
	Cs-137	18	<MDC	N/A	N/A	<MDC	0
	BaLa-140	15	<MDC	N/A	N/A	<MDC	0
POTABLE WATER (RAW) (pCi/L)	**Gr-A** ***12***	3	<MDC	N/A	N/A	N/A	0
	Gr-B ***12***	4	6.2 (11/12) (2.4/9.1)	SA-PWR-02F3 8.0 MILES NNE	6.2 (11/12) (2.4/9.1)	N/A	0
	H-3 ***12***	200	<MDC	N/A	N/A	N/A	0
	I-131 (LOW LVL) ***12***	1	<MDC	N/A	N/A	N/A	0
	GAMMA ***12***						
	K-40	N/A	<MDC	N/A	N/A	N/A	0
	Mn-54	15	<MDC	N/A	N/A	N/A	0
	Co-58	15	<MDC	N/A	N/A	N/A	0

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SALEM COUNTY, NEW JERSEY **REPORTING PERIOD: January 1, 2022 to December 31, 2022**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND *TOTAL NUMBER* OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
POTABLE WATER (RAW) (cont.) (pCi/L)	Fe-59	30	<MDC	N/A	N/A	N/A	0
	Co-60	15	<MDC	N/A	N/A	N/A	0
	Zn-65	30	<MDC	N/A	N/A	N/A	0
	ZrNb-95	15	<MDC	N/A	N/A	N/A	0
	Cs-134	15	<MDC	N/A	N/A	N/A	0
	Cs-137	18	<MDC	N/A	N/A	N/A	0
	BaLa-140	15	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
POTABLE WATER (TREATED) (pCi/L)	**Gr-A** ***12***	**3**	<MDC	N/A	N/A	N/A	0
	Gr-B ***12***	**4**	10.6 (10/12) (4.9/47.9)	SA-PWT-02F3 8.0 MILES NNE	10.6 (10/12) (4.9/47.9)	N/A	0
	H-3 ***12***	**200**	<MDC	N/A	N/A	N/A	0
	I-131 (LOW LVL) ***12***	**1**	<MDC	N/A	N/A	N/A	0
	GAMMA ***12***						
	K-40	N/A	<MDC	N/A	N/A	N/A	0
	Mn-54	15	<MDC	N/A	N/A	N/A	0
	Co-58	15	<MDC	N/A	N/A	N/A	0

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SALEM COUNTY, NEW JERSEY **REPORTING PERIOD: January 1, 2022 to December 31, 2022**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND *TOTAL NUMBER* OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN (f) ** (RANGE)	NAME DISTANCE AND DIRECTION	MEAN (f) ** (RANGE)	MEAN (f) ** (RANGE)	
POTABLE WATER (TREATED) (Cont) (pCi/L)	Fe-59	30	<MDC	N/A	N/A	N/A	0
	Co-60	15	<MDC	N/A	N/A	N/A	0
	Zn-65	30	<MDC	N/A	N/A	N/A	0
	ZrNb-95	15	<MDC	N/A	N/A	N/A	0
	Cs-134	15	<MDC	N/A	N/A	N/A	0
	Cs-137	18	<MDC	N/A	N/A	N/A	0
	BaLa-140	15	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
WELL WATER (pCi/L)	**Gr-A** ***12***	3	<MDC	N/A	N/A	N/A	0
	Gr-B ***12***	4	11.1 (1/12)	SA-WWA-03E1 4.2 MILES NE	11.1 (1/12)	N/A	0
	H-3 ***12***	200	<MDC	N/A	N/A	N/A	0
	I-131 (LOW LVL) ***12***	1	<MDC	N/A	N/A	N/A	0
	GAMMA ***12***						
	K-40	N/A	<MDC	N/A	N/A	N/A	0
	Mn-54	15	<MDC	N/A	N/A	N/A	0
	Co-58	15	<MDC	N/A	N/A	N/A	0

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND *TOTAL NUMBER* OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
WELL WATER (cont.) (pCi/L)	Fe-59	30	<MDC	N/A	N/A	N/A	0
	Co-60	15	<MDC	N/A	N/A	N/A	0
	Zn-65	30	<MDC	N/A	N/A	N/A	0
	ZrNb-95	15		N/A	N/A	N/A	0
	Cs-134	15	<MDC	N/A	N/A	N/A	0
	Cs-137	18	<MDC	N/A	N/A	N/A	0
	BaLa-140	15	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
SEDIMENT (pCi/kg dry)	**GAMMA** ***12***						
	Be-7	N/A	<MDC	N/A	N/A	<MDC	0
	K-40	N/A	7147 (10/10) *(2007/13200)*	SA-ESS-12B1 (C) 2.5 MILES WSW	15025 (2/2) *(14400/15650)*	15025 (2/2) *(14400/15650)*	0
	Cs-134	150	<MDC	N/A	N/A	<MDC	0
	Cs-137	180	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	SA-ESS-12B1 (C) 2.5 MILES WSW	2291 (1/2)	2291 (1/2)	0
	Th-232	N/A	512 (7/10) (269/755)	SA-ESS-12B1 (C) 2.5 MILES WSW	1012 (0/1)	1012 (1/2)	0

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MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND *TOTAL NUMBER* OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
IV. INGESTION							
MILK (pCi/L)	**I-131 (LOW LVL)** ***60***	1	<MDC	N/A	N/A	<MDC	0
	GAMMA ***60***						
	K-40	N/A	1299 (40/40) *(820/1993)*	SA-MLK-13E3 4.2 MILES W	1310 (20/20) *(820/1993)*	1227 (20/20) *(813/1890)*	0
	Cs-134	15	<MDC	N/A	N/A	<MDC	0
	Cs-137	18	<MDC	N/A	N/A	<MDC	0
	BaLa-140	15	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
FISH (pCi/kg wet)	**GAMMA** ***11***						
	K-40	N/A	3736 (7/7) *(2607/4531)*	SA-ESF-11A1 0.2 MILES SW	3941 (4/4) *(3626/4389)*	3562 (4/4) *(3012/4344)*	0
	Mn-54	130	<MDC	N/A	N/A	<MDC	0
	Co-58	130	<MDC	N/A	N/A	<MDC	0
	Fe-59	260	<MDC	N/A	N/A	<MDC	0
	Co-60	130	<MDC	N/A	N/A	<MDC	0
	Zn-65	260	<MDC	N/A	N/A	<MDC	0
	Cs-134	130	<MDC	N/A	N/A	<MDC	0

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			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
FISH (cont.) (pCi/kg wet)	Cs-137	150	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
BLUE CRABS (cont.) (pCi/kg wet)	**GAMMA** ***4***						
	K-40	N/A	3289 (2/2) *(2221/4356)*	SA-ECH-11A1 0.2 MILES SW	3289 (2/2) *(2221/4356)*	2832 (2/2) *(2450/3213)*	0
	Mn-54	130	<MDC	N/A	N/A	<MDC	0
	Co-58	130	<MDC	N/A	N/A	<MDC	0
	Fe-59	260	<MDC	N/A	N/A	<MDC	0
	Co-60	130	<MDC	N/A	N/A	<MDC	0
	Zn-65	260	<MDC	N/A	N/A	<MDC	0
	Cs-134	130	<MDC	N/A	N/A	<MDC	0
	Cs-137	150	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
BROAD-LEAF VEGETATION, FPL (pCi/kg wet)	**GAMMA** ***10***						
	Be-7	N/A	1742 (4/6) *(477.5/3083)*	SA-FPL-06S1 0.17 MILES ESE	1780 (2/2) *(477.5/3083)*	1080 (4/4) (389.1/1622)	0
	K-40	N/A	6120 (6/6) *(2124/11380)*	SA-FPL-16S1 0.57 MILES NNW	8982 (2/2) *(8411/9552)*	7027 (4/4) *(4081/10340)*	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
BROAD-LEAF VEGETATION, FPL (cont.) (pCi/kg wet)	I-131	60	<MDC	N/A	N/A	<MDC	0
	Cs-134	60	<MDC	N/A	N/A	<MDC	0
	Cs-137	80	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
	Th-232	N/A	<MDC	N/A	N/A	N/A	0
VEGETABLES, FPV (pCi/kg wet)	**GAMMA** ***14***						
	Be-7	N/A	<MDC	N/A	N/A	N/A	0
	K-40	N/A	1968 (14/14) *(1348/2913)*	SA-FPV-02F9 7.5 MILES NNE	2913 (1/1)	N/A	0
	I-131	60	<MDC	N/A	N/A	N/A	0
	Cs-134	60	<MDC	N/A	N/A	N/A	0
	Cs-137	80	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
	Th-232	N/A	<MDC	N/A	N/A	N/A	0
FODDER CROPS (pCi/kg wet)	**GAMMA** ***3***						
	Be-7	N/A	562 (2/3) (490.2/633.7)	SA-VGT-14F4 7.6 MILES WNW	633.7 (1/1)	N/A	0
	K-40	N/A	3964 (3/3) *(2724/4922)*	SA-VGT-13E3 5.0 MILES W	4922 (1/1)	N/A	0
	I-131	60	<MDC	N/A	N/A	N/A	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
FODDER CROPS (cont.) (pCi/kg wet)	Cs-134	60	<MDC	N/A	N/A	N/A	0
	Cs-137	80	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
	Th-232	N/A	<MDC	N/A	N/A	N/A	0
GAME (pCi/kg wet)	**GAMMA** ***2***						
	Be-7	N/A	<MDC	N/A	N/A	N/A	0
	K-40	N/A	2964 (2/2) *(2920/3007)*	SA-GAM-13E3 9.3 MILES W	3007 (1/1)	N/A	0
	I-131	60	<MDC	N/A	N/A	N/A	0
	Cs-134	60	<MDC	N/A	N/A	N/A	0
	Cs-137	80	<MDC	N/A	N/A	N/A	0
V. TERRESTRIAL							
SOIL (pCi/kg dry)	**GAMMA** ***9***						
	Be-7	N/A	N/A	N/A	N/A	N/A	0
	K-40	N/A	9315 (9/9) (5448/13690)	SA-SOL-13E3 5.0 MILES W	13690 (1/1)	N/A	0
	Cs-134	150	N/A	N/A	N/A	N/A	0
	Cs-137	180	128 (5/9) (75/184)	SA-SOL-05F1 6.5 MILES E	184 (1/1)	N/A	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
SOIL (cont.) (pCi/kg dry)	Ra-226	N/A	1989 (8/9) (1398/2836)	SA-SOL-05F1 6.5 MILES E	2836 (1/1)	N.A	0
	Th-232	N/A	742 (8/9) (436/975)	SA-SOL-14F4 7.6 MILES WNW	975 (1/1)	N/A	0

* The LLD listed is the Lower Limit of Detection, which was requested by PSEG to be achieved.
** Mean was calculated using values above the MDC only. f = the fraction of measurements above the MDC.
(C) = Control Location
N/A = Not Applicable

Attachment 2, Complete Data Table for All Analysis Results Obtained In 2022

Table 12, Environmental Direct Radiation Dosimetry Sample Results

Monitoring Location	Quarterly Baseline, B_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem)				Annual Baseline, B_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem)
		1	2	3	4	1	2	3	4			
01Q1	13.6	33.5	32.5	33.9	32.2	20.0	18.9	20.3	18.6	54.6	132.1	77.4
16Q2	13.6	29.3	28.4	29.6	28.9	15.8	14.9	16.1	15.3	54.6	116.3	61.6
01X2	13.6	14.0	13.1	13.9	13.6	ND	ND	ND	ND	54.6	54.6	ND
02X4	11.4	15.3	13.9	14.3	14.5	ND	ND	ND	ND	45.7	58.0	12.2
03X1	10.0	13.4	13.0	12.9	13.2	ND	ND	ND	ND	40.2	52.5	12.4
04X1	11.9	13.9	12.7	13.2	13.2	ND	ND	ND	ND	47.8	52.9	ND
05X1	10.7	13.3	12.6	12.8	12.6	ND	ND	ND	ND	42.8	51.3	ND
06X2	15.0	14.4	13.9	13.8	13.6	ND	ND	ND	ND	60.5	55.7	ND
16X3	11.8	13.3	14.3	13.4	12.8	ND	ND	ND	ND	47.6	53.8	ND
2S2A	16.6	15.7	14.8	15.1	14.6	ND	ND	ND	ND	68.0	60.2	ND
04X1 Dup	11.9	14.0	12.7	13.3	13.1	ND	ND	ND	ND	47.8	53.1	ND
07S1	16.6	13.7	13.1	13.0	12.9	ND	ND	ND	ND	66.9	52.7	ND
08S1	10.5	12.0	11.3	11.4	11.4	ND	ND	ND	ND	43.2	46.2	ND
08S2	10.8	12.1	12.4	12.6	11.3	ND	ND	ND	ND	44.3	48.4	ND
10S1	11.6	12.8	11.3	11.7	12.3	ND	ND	ND	ND	47.3	48.1	ND
11S1	10.7	12.8	12.2	12.8	12.7	ND	ND	ND	ND	43.8	50.5	ND
12S1	13.4	15.5	14.9	15.3	14.7	ND	ND	ND	ND	53.8	60.4	ND
13S1	15.9	TNR	17.2	17.3	18.9	TNR	ND	ND	ND	61.7	71.2	ND
15S1	10.8	12.9	12.6	12.4	NR	ND	ND	ND	NR	43.3	50.6	ND
15S2	11.8	14.7	13.7	13.6	13.6	ND	ND	ND	ND	53.3	55.6	ND
15S3	15.9	17.8	17.9	17.4	16.7	ND	ND	ND	ND	62.8	69.9	ND
16S1	12.8	14.9	15.0	15.3	14.6	ND	ND	ND	ND	51.4	59.9	ND
04D2	13.0	15.7	15.4	15.3	14.8	ND	ND	ND	ND	52.3	61.1	ND
05D1	11.7	14.9	14.5	13.9	13.9	ND	ND	ND	ND	46.9	57.3	10.4

Table 12, Environmental Direct Radiation Dosimetry Sample Results

Monitoring Location	Quarterly Baseline, B_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem)				Annual Baseline, B_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem)
		1	2	3	4	1	2	3	4			
10D1	13.7	15.3	15.3	16.2	15.1	ND	ND	ND	ND	55.2	62.0	ND
14D1	12.0	14.2	13.5	13.6	14.3	ND	ND	ND	ND	48.1	55.6	ND
15D1	13.6	15.4	14.8	15.1	14.2	ND	ND	ND	ND	54.7	59.5	ND
02E1	12.3	14.4	13.5	14.6	13.6	ND	ND	ND	ND	49.5	56.2	ND
03E1	10.4	12.6	12.3	12.9	12.5	ND	ND	ND	ND	42.0	50.4	ND
11E2	13.5	16.3	15.5	16.2	15.2	ND	ND	ND	ND	54.4	63.1	ND
12E1	13.7	15.8	15.5	16.2	15.4	ND	ND	ND	ND	55.4	62.9	ND
13E1	10.9	13.8	12.6	13.0	12.4	ND	ND	ND	ND	44.0	51.9	ND
16E1	12.8	15.0	13.9	14.7	13.9	ND	ND	ND	ND	51.7	57.5	ND
01F1	14.7	19.8	18.1	20.1	18.1	5.1	ND	5.4	ND	68.0	76.1	ND
02F2	10.9	14.3	13.6	13.5	13.2	ND	ND	ND	ND	43.6	54.6	11.0
02F5	12.8	TNR	14.3	15.4	14.7	TNR	ND	ND	ND	51.4	59.3	ND
02F6	11.9	14.4	13.3	14.1	13.6	ND	ND	ND	ND	47.6	55.4	ND
03F2	11.1	13.5	12.8	13.3	12.7	ND	ND	ND	ND	44.6	52.4	ND
03F3	11.0	13.9	12.8	12.9	12.8	ND	ND	ND	ND	44.2	52.4	ND
04F2	10.7	13.1	12.7	13.2	12.5	ND	ND	ND	ND	43.1	51.5	ND
05F1	11.5	14.0	14.0	13.6	13.2	ND	ND	ND	ND	46.1	54.8	ND
06F1	9.5	12.0	11.2	11.4	11.8	ND	ND	ND	ND	38.3	46.5	ND
07F2	12.0	13.7	13.9	13.9	13.5	ND	ND	ND	ND	49.6	55.1	ND
09F1	14.2	16.3	13.1	12.5	12.3	ND	ND	ND	ND	57.0	54.2	ND
09F2	14.8	TNR	15.5	16.9	15.5	TNR	ND	ND	ND	58.4	63.9	ND
10F2	13.2	15.4	14.7	15.4	14.5	ND	ND	ND	ND	52.9	60.1	ND
11F1	13.8	16.3	15.4	16.4	15.7	ND	ND	ND	ND	55.4	63.7	ND
12F1	12.9	15.8	14.7	15.5	14.4	ND	ND	ND	ND	51.7	60.5	ND

Table 12, Environmental Direct Radiation Dosimetry Sample Results

Monitoring Location	Quarterly Baseline, B_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem)				Annual Baseline, B_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem)
		1	2	3	4	1	2	3	4			
13F2	12.6	15.4	14.2	15.1	14.3	ND	ND	ND	ND	51.0	59.0	ND
13F3	12.7	16.2	15.2	16.2	15.0	ND	ND	ND	ND	50.8	62.6	11.8
13F4	13.0	16.2	15.5	16.8	15.7	ND	ND	ND	ND	52.3	64.3	12.0
14F2	14.0	16.6	15.1	15.7	15.1	ND	ND	ND	ND	56.2	62.5	ND
15F3	14.5	16.5	15.7	16.7	15.4	ND	ND	ND	ND	58.2	64.3	ND
16F2	11.7	14.8	13.6	14.3	13.7	ND	ND	ND	ND	47.1	56.3	ND
01G3	14.9	15.0	14.5	14.2	14.2	ND	ND	ND	ND	61.3	57.9	ND
03G1	13.3	16.4	15.2	16.3	15.1	ND	ND	ND	ND	53.4	63.0	ND
10G1	13.1	16.0	15.5	16.3	15.4	ND	ND	ND	ND	52.8	63.2	10.4
14G1	13.4	16.0	15.1	15.6	15.3	ND	ND	ND	ND	54.1	62.2	ND
16G1	12.7	15.0	13.6	14.3	13.2	ND	ND	ND	ND	50.5	56.0	ND
03H1	10.6	13.9	13.1	13.5	13.1	ND	ND	ND	ND	42.6	53.6	11.0

MDD_Q = Quarterly Minimum Differential Dose = 5.10 mrem
MDD_A = Annual Minimum Differential Dose = 9.83 mrem
ND = Not Detected, where $M_Q \leq (B_Q+MDD_Q)$ or $M_A \leq (B_A+MDD_A)$
TNR = TLD Not Recovered, See section 9.0

Table 13, Concentrations of Gamma Emitters in Quarterly Composites of Air Particulates, 2022

Results in Units of E-03 pCi/m^3 ± 2σ

STATION ID	COLLECTION PERIOD START		COLLECTION PERIOD STOP	<----------GAMMA EMITTERS----------> Be-7	K-40	Cs-134	Cs-137
SA-APT-14G1 (C)	01/03/22	-	04/04/22	52 ± 13	< 34	< 2	< 1
	04/04/22	-	07/05/22	44 ± 12	< 23	< 1	< 1
	07/05/22	-	10/03/22	39 ± 20	< 20	< 2	< 1
	10/03/22	-	01/03/23	36 ± 14	< 22	< 1	< 1
			AVERAGE*	43 ± 14	-	-	-
SA-APT-05X1	01/04/22	-	04/04/22	65 ± 14	< 24	< 1	< 1
	04/04/22	-	07/05/22	69 ± 16	< 22	< 2	< 1
	07/05/22	-	10/03/22	76 ± 23	< 29	< 2	< 2
	10/03/22	-	01/03/23	46 ± 14	< 41	< 2	< 2
			AVERAGE*	64 ± 26	-	-	-
SA-APT-06S1	01/04/22	-	04/04/22	72 ± 15	< 29	< 1	< 1
	04/04/22	-	07/05/22	68 ± 15	< 32	< 2	< 2
	07/05/22	-	10/03/22	63 ± 17	< 30	< 1	< 2
	10/03/22	-	01/03/23	51 ± 12	< 27	< 1	< 1
			AVERAGE*	63 ± 19	-	-	-
SA-APT-15S2	01/04/22	-	04/04/22	68 ± 14	< 22	< 1	< 1
	04/04/22	-	07/05/22	73 ± 16	< 32	< 1	< 1
	07/05/22	-	10/03/22	78 ± 18	< 27	< 2	< 1
	10/03/22	-	01/03/23	37 ± 13	< 33	< 2	< 2
			AVERAGE*	64 ± 37	-	-	-
SA-APT-05D1	01/04/22	-	04/04/22	75 ± 12	< 22	< 1	< 1
	04/04/22	-	07/05/22	69 ± 14	< 18	< 1	< 1
	07/05/22	-	10/03/22	63 ± 18	< 23	< 1	< 1
	10/03/22	-	01/03/23	43 ± 14	< 32	< 2	< 2
			AVERAGE*	63 ± 28	-	-	-
SA-APT-16E1	01/03/22	-	04/04/22	56 ± 13	< 21	< 1	< 1
	04/04/22	-	07/05/22	70 ± 20	< 39	< 1	< 2
	07/05/22	-	10/03/22	55 ± 16	< 30	< 1	< 1
	10/03/22	-	01/03/23	47 ± 13	< 30	< 2	< 1
			AVERAGE*	57 ± 19	-	-	-

Table 13, Concentrations of Gamma Emitters in Quarterly Composites of Air Particulates, 2022

Results in Units of E-03 pCi/m^3 ± 2σ

STATION ID	COLLECTION PERIOD START		COLLECTION PERIOD STOP	<----------GAMMA EMITTERS----------> Be-7	K-40	Cs-134	Cs-137
SA-APT-01F1	01/04/22	-	04/04/22	65 ± 13	< 26	< 2	< 1
	04/04/22	-	07/05/22	63 ± 18	< 39	< 2	< 3
	07/05/22	-	10/03/22	59 ± 22	< 24	< 2	< 2
	10/03/22	-	01/03/23	41 ± 10	< 21	< 2	< 1
			AVERAGE*	57 ± 22	-	-	-
SA-APT-02F6	01/04/22	-	04/04/22	57 ± 15	< 44	< 2	< 2
	04/04/22	-	07/05/22	68 ± 13	< 24	< 1	< 2
	07/05/22	-	10/03/22	67 ± 16	< 19	< 2	< 1
	10/03/22	-	01/03/23	54 ± 12	< 25	< 1	< 1
			AVERAGE*	61 ± 15	-	-	-
			ALL INDICATOR AVERAGE * .	**61** ± 22	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 14, Concentrations of Gross Beta Emitters in Air Particulates, 2022

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD		CONTROL	INDICATORS						
START	STOP	SA-APT-14G1	SA-APT-05X1	SA-APT-06S1	SA-APT-15S2	SA-APT-05D1	SA-APT-16E1	SA-APT-01F1	SA-APT-02F6
01/03/22	01/10/22	20 ± 3	24 ± 4	23 ± 4	24 ± 4	24 ± 4	23 ± 4	21 ± 4	22 ± 4
01/10/22	01/18/22	18 ± 3	22 ± 3	24 ± 4	22 ± 3	18 ± 3	17 ± 3	24 ± 3	18 ± 3
01/18/22	01/24/22	14 ± 4	22 ± 4	22 ± 4	21 ± 4	21 ± 4	18 ± 4	16 ± 3	14 ± 3
01/24/22	01/31/22	17 ± 3	18 ± 3	18 ± 3	17 ± 3	22 ± 3	16 ± 3	19 ± 3	18 ± 3
01/31/22	02/07/22	10 ± 3	11 ± 3	12 ± 3	14 ± 3	13 ± 3	9 ± 3	10 ± 3	11 ± 3
02/07/22	02/15/22	13 ± 3	15 ± 4	18 ± 3	15 ± 3	13 ± 3	16 ± 3	14 ± 3	16 ± 4
02/15/22	02/22/22	13 ± 3	10 ± 3	13 ± 3	14 ± 3	12 ± 3	14 ± 3	14 ± 3	14 ± 3
02/22/22	02/28/22	9 ± 3	17 ± 4	11 ± 3	12 ± 4	11 ± 4	12 ± 4	10 ± 3	12 ± 3
02/28/22	03/07/22	16 ± 3	17 ± 3	21 ± 3	17 ± 3	19 ± 3	23 ± 4	18 ± 3	16 ± 3
03/07/22	03/14/22	8 ± 3	11 ± 3	9 ± 3	9 ± 3	9 ± 3	9 ± 3	9 ± 3	10 ± 3
03/14/22	03/21/22	13 ± 3	12 ± 3	11 ± 3	13 ± 3	13 ± 3	17 ± 4	15 ± 3	16 ± 3
03/21/22	03/28/22	7 ± 3	6 ± 3	6 ± 3	8 ± 3	8 ± 3	7 ± 3	7 ± 3	6 ± 2
03/28/22	04/04/22	11 ± 3	10 ± 3	12 ± 3	8 ± 3	11 ± 3	8 ± 3	9 ± 3	11 ± 3
04/04/22	04/11/22	8 ± 3	6 ± 3	5 ± 3	8 ± 3	8 ± 3	6 ± 3	5 ± 3	7 ± 3
04/11/22	04/18/22	10 ± 3	12 ± 3	12 ± 3	13 ± 3	13 ± 3	12 ± 3	9 ± 3	55[1] ± 13
04/18/22	04/25/22	13 ± 3	14 ± 3	13 ± 3	14 ± 3	13 ± 3	10 ± 3	15 ± 3	17 ± 3
04/25/22	05/02/22	13 ± 3	20 ± 4	18 ± 3	18 ± 3	19 ± 4	19 ± 3	18 ± 3	21 ± 4
05/02/22	05/09/22	7 ± 3	9 ± 3	9 ± 3	8 ± 3	11 ± 3	9 ± 3	9 ± 3	9 ± 3
05/09/22	05/16/22	10 ± 3	9 ± 3	11 ± 3	9 ± 3	11 ± 3	9 ± 3	10 ± 3	9 ± 3
05/16/22	05/23/22	10 ± 3	13 ± 3	10 ± 3	15 ± 3	16 ± 3	11 ± 3	12 ± 3	14 ± 3
05/23/22	05/31/22	9 ± 2	14 ± 3	9 ± 3	9 ± 3	11 ± 3	11 ± 3	9 ± 3	11 ± 3
05/31/22	06/06/22	11 ± 4	17 ± 4	19 ± 4	15 ± 4	19 ± 4	15 ± 4	16 ± 4	18 ± 4
06/06/22	06/14/22	12 ± 3	17 ± 3	12 ± 3	14 ± 3	13 ± 3	11 ± 3	11 ± 3	10 ± 2
06/14/22	06/21/22	6 ± 2	8 ± 3	7 ± 3	9 ± 3	10 ± 3	8 ± 3	10 ± 3	8 ± 2
06/21/22	06/28/22	7 ± 3	11 ± 3	11 ± 3	11 ± 3	11 ± 3	11 ± 3	9 ± 3	11 ± 3
06/28/22	07/05/22	6 ± 2	9 ± 3	11 ± 3	11 ± 3	9 ± 3	11 ± 3	8 ± 3	7 ± 3
07/05/22	07/11/22	8 ± 3	12 ± 3	11 ± 3	14 ± 3	12 ± 3	12 ± 3	10 ± 3	10 ± 3
07/11/22	07/19/22	9 ± 3	13 ± 3	11 ± 3	16 ± 3	15 ± 3	15 ± 3	14 ± 3	17 ± 3
07/19/22	07/25/22	19 ± 4	24 ± 4	18 ± 4	23 ± 4	21 ± 4	26 ± 4	21 ± 4	22 ± 4
07/25/22	08/01/22	14 ± 3	20 ± 3	20 ± 4	22 ± 4	16 ± 3	20 ± 4	15 ± 3	19 ± 3
08/01/22	08/08/22	10 ± 3	15 ± 3	15 ± 3	15 ± 3	16 ± 3	13 ± 3	13 ± 3	18 ± 5
08/08/22	08/15/22	15 ± 3	15 ± 3	17 ± 3	15 ± 3	15 ± 3	17 ± 3	14 ± 3	15 ± 3
08/15/22	08/22/22	15 ± 3	19 ± 3	17 ± 3	16 ± 3	20 ± 4	16 ± 3	17 ± 3	17 ± 3

[1] Volume meter failure, could not determine actual volume, see section 9.0

Table 14, Concentrations of Gross Beta Emitters in Air Particulates, 2022

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD		CONTROL	INDICATORS						
START	STOP	SA-APT-14G1	SA-APT-05X1	SA-APT-06S1	SA-APT-15S2	SA-APT-05D1	SA-APT-16E1	SA-APT-01F1	SA-APT-02F6
08/22/22 -	08/30/22	28 ± 4	21 ± 3	21 ± 3	23 ± 3	21 ± 3	18 ± 3	21 ± 3	21 ± 3
08/30/22 -	09/06/22	16 ± 3	12 ± 3	13 ± 3	13 ± 3	14 ± 3	9 ± 3	11 ± 3	14 ± 3
09/06/22 -	09/12/22	14 ± 3	14 ± 3	12 ± 3	15 ± 3	15 ± 3	12 ± 3	13 ± 3	14 ± 3
09/12/22 -	09/19/22	14 ± 3	17 ± 3	16 ± 3	16 ± 3	19 ± 3	11 ± 3	15 ± 3	18 ± 3
09/19/22 -	09/26/22	25 ± 4	23 ± 3	26 ± 4	15 ± 3	25 ± 4	13 ± 3	19 ± 3	23 ± 3
09/26/22 -	10/03/22	10 ± 3	11 ± 3	10 ± 3	7 ± 3	12 ± 3	11 ± 3	11 ± 3	12 ± 3
10/03/22 -	10/10/22	14 ± 3	13 ± 3	14 ± 3	9 ± 3	15 ± 3	13 ± 3	12 ± 3	12 ± 3
10/10/22 -	10/17/22	25 ± 4	19 ± 3	26 ± 4	16 ± 3	31 ± 4	24 ± 4	20 ± 4	24 ± 4
10/17/22 -	10/24/22	17 ± 3	20 ± 3	18 ± 3	12 ± 3	17 ± 3	18 ± 3	13 ± 3	17 ± 3
10/24/22 -	10/31/22	8 ± 3	8 ± 3	7 ± 3	6 ± 3	7 ± 3	8 ± 3	7 ± 2	8 ± 3
10/31/22 -	11/07/22	17 ± 3	16 ± 3	18 ± 3	11 ± 3	18 ± 3	14 ± 3	16 ± 3	18 ± 3
11/07/22 -	11/14/22	12 ± 3	15 ± 3	12 ± 3	12 ± 3	13 ± 3	11 ± 3	10 ± 3	14 ± 3
11/14/22 -	11/21/22	19 ± 3	18 ± 3	18 ± 3	15 ± 3	14 ± 3	16 ± 3	15 ± 3	17 ± 3
11/21/22 -	11/28/22	26 ± 4	23 ± 4	23 ± 4	21 ± 4	31 ± 4	20 ± 3	20 ± 3	26 ± 4
11/28/22 -	12/05/22	21 ± 3	21 ± 3	22 ± 3	13 ± 3	19 ± 3	18 ± 3	16 ± 3	20 ± 3
12/05/22 -	12/12/22	19 ± 4	17 ± 3	16 ± 3	14 ± 3	14 ± 3	16 ± 3	14 ± 3	13 ± 3
12/12/22 -	12/20/22	15 ± 3	15 ± 3	14 ± 3	11 ± 3	13 ± 3	12 ± 3	14 ± 3	14 ± 3
12/20/22 -	12/27/22	20 ± 3	20 ± 3	19 ± 3	5 ± 2	17 ± 3	17 ± 3	18 ± 3	20 ± 3
12/27/22 -	01/03/23	23 ± 4	23 ± 4	22 ± 4	13 ± 3	19 ± 3	32 ± 7	18 ± 3	19 ± 3
	AVERAGE*	14 ± 11	15 ± 10	15 ± 10	14 ± 9	16 ± 10	14 ± 10	14 ± 9	16 ± 15
							ALL INDICATOR AVERAGE*	**15** ± 11	

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING ONLY THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

Table 15, Concentrations of Iodine-131 in Filtered Air, 2022

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS						
START		STOP	SA-AIO-14G1	SA-AIO-05X1	SA-AIO-06S1	SA-AIO-15S2	SA-AIO-05D1	SA-AIO-16E1	SA-AIO-01F1	SA-AIO-02F6
01/03/22	-	01/10/22	< 11	< 27	< 31	< 32	< 28	< 27	< 27	< 27
01/10/22	-	01/18/22	< 19	< 14	< 9	< 20	< 14	< 18	< 14	< 14
01/18/22	-	01/24/22	< 27	< 15	< 25	< 26	< 18	< 26	< 18	< 18
01/24/22	-	01/31/22	< 26	< 15	< 25	< 26	< 13	< 26	< 15	< 15
01/31/22	-	02/07/22	< 17	< 6	< 9	< 14	< 14	< 17	< 14	< 15
02/07/22	-	02/15/22	< 13	< 19	< 15	< 15	< 17	< 13	< 18	< 19
02/15/22	-	02/22/22	< 16	< 22	< 16	< 16	< 22	< 15	< 22	< 19
02/22/22	-	02/28/22	< 28	< 24	< 28	< 28	< 25	< 27	< 25	< 19
02/28/22	-	03/07/22	< 14	< 15	< 13	< 13	< 15	< 13	< 15	< 16
03/07/22	-	03/14/22	< 17	< 23	< 16	< 13	< 23	< 16	< 23	< 23
03/14/22	-	03/21/22	< 26	< 20	< 10	< 25	< 20	< 26	< 20	< 18
03/21/22	-	03/28/22	< 18	< 26	< 18	< 18	< 27	< 14	< 27	< 23
03/28/22	-	04/04/22	< 29	< 18	< 29	< 29	< 18	< 28	< 19	< 19
04/04/22	-	04/11/22	< 20	< 28	< 20	< 19	< 28	< 21	< 26	< 28
04/11/22	-	04/18/22	< 8	< 16	< 20	< 21	< 18	< 22	< 17	< 55
04/18/22	-	04/25/22	< 10	< 25	< 24	< 25	< 26	< 24	< 26	< 10
04/25/22	-	05/02/22	< 19	< 18	< 19	< 20	< 18	< 8	< 17	< 18
05/02/22	-	05/09/22	< 22	< 17	< 22	< 22	< 18	< 22	< 14	< 17
05/09/22	-	05/16/22	< 32	< 33	< 13	< 33	< 31	< 32	< 32	< 34
05/16/22	-	05/23/22	< 25	< 19	< 24	< 24	< 18	< 25	< 18	< 20
05/23/22	-	05/31/22	< 10	< 18	< 23	< 23	< 18	< 23	< 18	< 17
05/31/22	-	06/06/22	< 35	< 36	< 25	< 25	< 38	< 26	< 36	< 33
06/06/22	-	06/14/22	< 22	< 15	< 23	< 24	< 7	< 15	< 15	< 13
06/14/22	-	06/21/22	< 17	< 19	< 17	< 17	< 19	< 18	< 19	< 8
06/21/22	-	06/28/22	< 17	< 24	< 16	< 17	< 25	< 14	< 24	< 27
06/28/22	-	07/05/22	< 22	< 24	< 22	< 23	< 24	< 23	< 24	< 10
07/05/22	-	07/11/22	< 21	< 28	< 19	< 13	< 30	< 20	< 27	< 28
07/11/22	-	07/19/22	< 18	< 27	< 18	< 18	< 27	< 18	< 11	< 27
07/19/22	-	07/25/22	< 39	< 12	< 37	< 38	< 34	< 38	< 33	< 31
07/25/22	-	08/01/22	< 27	< 27	< 27	< 27	< 31	< 27	< 30	< 27
08/01/22	-	08/08/22	< 14	< 10	< 13	< 13	< 25	< 14	< 25	< 46
08/08/22	-	08/15/22	< 18	< 12	< 17	< 17	< 16	< 17	< 16	< 15
08/15/22	-	08/22/22	< 30	< 24	< 27	< 27	< 24	< 27	< 23	< 9

Table 15, Concentrations of Iodine-131 in Filtered Air, 2022

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS						
START		STOP	SA-AIO-14G1	SA-AIO-05X1	SA-AIO-06S1	SA-AIO-15S2	SA-AIO-05D1	SA-AIO-16E1	SA-AIO-01F1	SA-AIO-02F6
08/22/22	-	08/30/22	< 21	< 15	< 17	< 17	< 16	< 15	< 15	< 10
08/30/22	-	09/06/22	< 37	< 31	< 37	< 35	< 32	< 37	< 12	< 30
09/06/22	-	09/12/22	< 14	< 39	< 34	< 33	< 41	< 34	< 38	< 38
09/12/22	-	09/19/22	< 23	< 28	< 23	< 9	< 28	< 24	< 27	< 28
09/19/22	-	09/26/22	< 21	< 22	< 22	< 8	< 24	< 22	< 22	< 22
09/26/22	-	10/03/22	< 20	< 25	< 8	< 21	< 27	< 21	< 25	< 25
10/03/22	-	10/10/22	< 17	< 20	< 16	< 15	< 9	< 21	< 21	< 20
10/10/22	-	10/17/22	< 26	< 17	< 26	< 25	< 20	< 26	< 18	< 17
10/17/22	-	10/24/22	< 22	< 22	< 22	< 21	< 23	< 23	< 10	< 22
10/24/22	-	10/31/22	< 21	< 23	< 22	< 21	< 23	< 22	< 21	< 22
10/31/22	-	11/07/22	< 36	< 28	< 34	< 33	< 11	< 35	< 27	< 28
11/07/22	-	11/14/22	< 23	< 27	< 23	< 23	< 26	< 23	< 26	< 26
11/14/22	-	11/21/22	< 14	< 18	< 15	< 15	< 17	< 8	< 18	< 18
11/21/22	-	11/28/22	< 21	< 22	< 21	< 21	< 22	< 21	< 14	< 22
11/28/22	-	12/05/22	< 66	< 24	< 29	< 28	< 25	< 25	< 24	< 11
12/05/22	-	12/12/22	< 22	< 27	< 21	< 21	< 28	< 21	< 26	< 25
12/12/22	-	12/20/22	< 17	< 22	< 18	< 17	< 22	< 22	< 23	< 9
12/20/22	-	12/27/22	< 20	< 18	< 20	< 21	< 8	< 20	< 19	< 18
12/27/22	-	01/03/23	< 19	< 17	< 21	< 20	< 16	< 22	< 16	< 16
AVERAGE*			-	-	-	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING ONLY THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 16, Concentrations of Tritium in Surface Water, 2022

Results in Units of pCi/L ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS			
START		STOP	SA-SWA-12B1 (C)	SA-SWA-11A1	SA-SWA-07E1	SA-SWA-01F2	SA-SWA-016F1
01/08/22	-	01/18/22	< 187	< 198	< 171	< 189	< 189
02/09/22	-	02/24/22	< 199	< 184	< 178	< 182	< 186
03/10/22	-	03/24/22	< 173	< 176	< 176	< 198	< 196
04/05/22	-	04/21/22	< 182	**1,020** ± 175	< 182	< 170	< 169
05/04/22	-	05/20/22	< 172	< 181	< 193	< 176	< 176
06/08/22	-	06/20/22	< 180	< 189	< 164	< 190	< 194
07/07/22	-	07/22/22	< 177	< 196	< 186	< 178	< 184
08/11/22	-	08/23/22	< 175	< 173	< 177	< 187	< 184
09/08/22	-	09/21/22	< 197	< 192	< 185	< 182	< 192
10/06/22	-	10/21/22	< 198	**216** ± 128	< 187	< 198	< 198
11/09/22	-	11/22/22	< 198	**252** ± 141	< 194	< 193	< 191
12/05/22	-	12/21/22	< 175	< 180	< 184	< 197	< 183
		AVERAGE*	-	**496** ± 908	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 17, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2022

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-12B1 (C)	01/08/22	< 0.9	< 104	< 5	< 4	< 10	< 6	< 6	< 5	< 5	< 6	< 11
	02/09/22	< 0.9	< 44	< 4	< 5	< 9	< 5	< 11	< 4	< 4	< 4	< 5
	03/10/22	< 0.4	< 111	< 6	< 4	< 12	< 5	< 7	< 5	< 5	< 5	< 8
	04/05/22	< 0.9	< 105	< 6	< 6	< 11	< 6	< 7	< 6	< 7	< 5	< 11
	05/04/22	< 0.6	< 143	< 6	< 5	< 13	< 6	< 12	< 5	< 6	< 6	< 9
	06/08/22	< 0.8	< 124	< 6	< 6	< 14	< 7	< 12	< 6	< 6	< 6	< 9
	07/07/22	< 0.7	< 112	< 6	< 6	< 13	< 6	< 12	< 6	< 6	< 6	< 6
	08/11/22	< 0.8	< 35	< 3	< 4	< 9	< 4	< 7	< 4	< 4	< 4	< 8
	09/08/22	< 0.8	75 ± 35	< 2	< 2	< 5	< 2	< 4	< 2	< 2	< 2	< 3
	10/06/22	< 0.8	< 121	< 5	< 6	< 12	< 6	< 12	< 6	< 6	< 6	< 9
	11/09/22	< 0.9	< 105	< 5	< 4	< 11	< 5	< 9	< 5	< 5	< 5	< 11
	12/05/22	< 0.9	< 126	< 4	< 5	< 12	< 5	< 11	< 6	< 6	< 6	< 10
	AVERAGE*	-	**75** ± 35	-	-	-	-	-	-	-	-	-
SA-SWA-11A1	01/08/22	< 0.7	< 91	< 4	< 5	< 11	< 4	< 6	< 4	< 3	< 4	< 6
	02/09/22	< 0.8	< 93	< 5	< 5	< 10	< 5	< 10	< 4	< 5	< 5	< 10
	03/10/22	< 0.8	< 76	< 3	< 3	< 9	< 4	< 6	< 3	< 4	< 4	< 7
	04/05/22	< 0.8	< 117	< 5	< 6	< 11	< 5	< 12	< 7	< 5	< 6	< 10
	05/04/22	< 0.9	< 46	< 5	< 5	< 9	< 4	< 9	< 4	< 5	< 6	< 6
	06/08/22	< 0.9	< 154	< 5	< 5	< 15	< 6	< 14	< 7	< 7	< 6	< 6
	07/07/22	< 0.8	**130** ± 65	< 7	< 6	< 12	< 6	< 12	< 6	< 7	< 6	< 10
	08/11/22	< 0.9	**132** ± 66	< 4	< 5	< 9	< 5	< 9	< 5	< 5	< 5	< 9
	09/08/22	< 0.8	**131** ± 40	< 2	< 3	< 4	< 3	< 4	< 2	< 2	< 2	< 4
	10/06/22	< 0.9	**142** ± 69	< 5	< 4	< 12	< 6	< 12	< 6	< 7	< 7	< 13
	11/09/22	< 0.6	**110** ± 70	< 6	< 5	< 11	< 6	< 12	< 6	< 5	< 4	< 11
	12/05/22	< 0.9	< 38	< 4	< 4	< 10	< 5	< 7	< 5	< 6	< 5	< 6
	AVERAGE*	-	**129** ± 23	-	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 17, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2022

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-07E1	01/08/22	< 0.8	< 101	< 4	< 4	< 10	< 6	< 7	< 6	< 6	< 4	< 7
	02/09/22	< 0.9	**97** ± 48	< 5	< 4	< 10	< 5	< 9	< 4	< 6	< 5	< 7
	03/10/22	< 0.8	< 54	< 5	< 5	< 11	< 6	< 12	< 6	< 5	< 6	< 8
	04/05/22	< 1.0	< 126	< 6	< 5	< 10	< 6	< 13	< 6	< 6	< 6	< 8
	05/04/22	< 0.9	< 120	< 6	< 4	< 10	< 6	< 10	< 5	< 6	< 5	< 6
	06/08/22	< 0.9	< 68	< 6	< 7	< 15	< 7	< 14	< 7	< 6	< 5	< 9
	07/07/22	< 0.9	< 55	< 6	< 5	< 13	< 9	< 12	< 7	< 6	< 7	< 9
	08/11/22	< 1.0	**103** ± 46	< 4	< 4	< 11	< 6	< 10	< 4	< 4	< 4	< 9
	09/08/22	< 1.0	**114** ± 31	< 2	< 2	< 5	< 3	< 5	< 2	< 2	< 2	< 4
	10/06/22	< 0.9	**213** ± 71	< 5	< 4	< 11	< 7	< 10	< 7	< 7	< 6	< 11
	11/09/22	< 0.9	**113** ± 65	< 5	< 5	< 9	< 5	< 10	< 5	< 5	< 4	< 8
	12/05/22	< 0.9	< 78	< 4	< 6	< 14	< 6	< 12	< 7	< 6	< 7	< 10
	AVERAGE*	-	**128** ± 96	-	-	-	-	-	-	-	-	-
SA-SWA-01F2	01/08/22	< 1.0	< 53	< 3	< 3	< 6	< 3	< 6	< 3	< 4	< 3	< 6
	02/09/22	< 0.9	< 22	< 2	< 2	< 5	< 2	< 4	< 2	< 2	< 2	< 3
	03/10/22	< 0.8	< 38	< 4	< 4	< 6	< 5	< 8	< 4	< 3	< 4	< 7
	04/05/22	< 0.8	< 100	< 6	< 7	< 10	< 5	< 8	< 4	< 5	< 5	< 5
	05/04/22	< 0.7	< 75	< 4	< 4	< 8	< 5	< 8	< 4	< 5	< 4	< 6
	06/08/22	< 1.0	< 138	< 8	< 7	< 11	< 9	< 18	< 9	< 7	< 6	< 13
	07/07/22	< 0.9	< 147	< 5	< 5	< 14	< 4	< 11	< 7	< 7	< 6	< 9
	08/11/22	< 0.8	< 70	< 5	< 4	< 9	< 4	< 5	< 5	< 4	< 3	< 6
	09/08/22	< 0.9	**81** ± 35	< 2	< 2	< 4	< 2	< 5	< 2	< 2	< 2	< 4
	10/06/22	< 0.9	< 129	< 7	< 4	< 13	< 8	< 12	< 7	< 6	< 7	< 11
	11/09/22	< 0.9	< 85	< 3	< 5	< 8	< 4	< 9	< 4	< 5	< 4	< 5
	12/05/22	< 0.8	< 101	< 4	< 4	< 9	< 6	< 12	< 5	< 5	< 5	< 11
	AVERAGE*	-	**81** ± 35	-	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 17, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2022

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-16F1	01/08/22	< 0.7	< 29	< 3	< 3	< 6	< 3	< 6	< 3	< 3	< 3	< 5
	02/09/22	< 0.9	< 87	< 3	< 5	< 11	< 5	< 8	< 6	< 5	< 4	< 9
	03/10/22	< 0.9	< 86	< 4	< 6	< 9	< 7	< 7	< 6	< 5	< 6	< 8
	04/05/22	< 0.9	< 61	< 5	< 5	< 10	< 5	< 11	< 5	< 5	< 5	< 8
	05/04/22	< 0.8	< 82	< 4	< 3	< 8	< 4	< 8	< 4	< 5	< 4	< 7
	06/08/22	< 0.9	< 116	< 5	< 5	< 12	< 7	< 13	< 6	< 7	< 6	< 8
	07/07/22	< 0.9	< 97	< 5	< 6	< 11	< 5	< 14	< 6	< 7	< 7	< 6
	08/11/22	< 0.7	< 91	< 4	< 4	< 10	< 5	< 9	< 5	< 4	< 5	< 8
	09/08/22	< 0.9	**104** ± 32	< 2	< 2	< 4	< 3	< 4	< 2	< 2	< 2	< 3
	10/06/22	< 0.9	< 115	< 4	< 5	< 11	< 7	< 10	< 4	< 6	< 5	< 9
	11/09/22	< 0.9	< 35	< 4	< 4	< 9	< 4	< 10	< 4	< 5	< 4	< 7
	12/05/22	< 0.9	< 59	< 5	< 3	< 9	< 5	< 10	< 7	< 5	< 5	< 9
	AVERAGE*	**-**	**104± 32**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
ALL INDICATOR AVERAGE*			**122 ± 66**									

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 18, Concentrations of Gross Alpha and Gross Beta Emitters, and Tritium in Raw and Treated Potable Water, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	Gross Alpha	Gross Beta	H-3
SA-PWR-02F3**	12/27/21	-	01/31/22	< 2.4	5.7 ± 1.9	< 187
	01/31/22	-	02/28/22	< 0.9	< 3.0	< 185
	02/28/22	-	03/28/22	< 2.1	6.2 ± 2.2	< 184
	03/28/22	-	04/25/22	< 1.4	4.3 ± 1.9	< 194
	04/25/22	-	05/31/22	< 1.8	7.9 ± 2.3	< 189
	05/31/22	-	06/28/22	< 1.9	7.6 ± 2.2	< 190
	06/28/22	-	07/25/22	< 1.4	4.9 ± 2.1	< 170
	07/25/22	-	08/30/22	< 1.5	5.8 ± 1.9	< 176
	08/30/22	-	09/26/22	< 1.8	2.4 ± 1.5	< 190
	09/26/22	-	10/31/22	< 2.2	7.3 ± 1.3	< 191
	10/31/22	-	11/28/22	< 1.4	9.1 ± 1.9	< 199
	11/28/22	-	12/27/22	< 1.4	6.6 ± 1.6	< 183
AVERAGE*				-	**6.2** ± 3.7	-
SA-PWT-02F3**	12/27/21	-	01/31/22	< 2.4	6.0 ± 1.9	< 171
	01/31/22	-	02/28/22	< 0.9	< 3.0	< 181
	02/28/22	-	03/28/22	< 2.0	6.2 ± 2.1	< 194
	03/28/22	-	04/25/22	< 1.3	5.0 ± 2.0	< 190
	04/25/22	-	05/31/22	< 1.8	7.3 ± 2.3	< 194
	05/31/22	-	06/28/22	< 1.9	5.8 ± 2.1	< 171
	06/28/22	-	07/25/22	< 1.5	6.8 ± 2.3	< 179
	07/25/22	-	08/30/22	< 13.9	47.9 ± 13.6	< 180
	08/30/22	-	09/26/22	< 1.7	< 1.9	< 192
	09/26/22	-	10/31/22	< 2.6	7.8 ± 1.4	< 198
	10/31/22	-	11/28/22	< 1.4	8.6 ± 1.8	< 193
	11/28/22	-	12/27/22	< 1.6	4.9 ± 1.7	< 176
AVERAGE*				-	**10.6** ± 26.3	-

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

****** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 19, Concentrations of Iodine-131 and Gamma Emitters in Raw and Treated Potable Water, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	I-131 LL	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - > K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	ZrNb-95	Cs-134	Cs-137	BaLa-140	Ra-226
SA-PWR-02F3**	12/27/21	-	01/31/22	< 0.8	< 118	< 6	< 8	< 13	< 6	< 13	< 7	< 7	< 6	< 8	< 149
	01/31/22	-	02/28/22	< 0.8	< 130	< 6	< 7	< 13	< 5	< 11	< 6	< 7	< 6	< 7	< 162
	02/28/22	-	03/28/22	< 0.6	< 119	< 7	< 6	< 11	< 5	< 15	< 7	< 6	< 6	< 8	< 162
	03/28/22	-	04/25/22	< 0.9	< 99	< 6	< 5	< 13	< 7	< 11	< 6	< 8	< 7	< 10	< 167
	04/25/22	-	05/31/22	< 0.9	< 91	< 6	< 5	< 12	< 7	< 7	< 6	< 5	< 5	< 6	< 167
	05/31/22	-	06/28/22	< 0.9	< 99	< 5	< 5	< 11	< 6	< 10	< 4	< 5	< 5	< 9	< 135
	06/28/22	-	07/25/22	< 0.6	< 152	< 7	< 7	< 13	< 8	< 17	< 7	< 7	< 8	< 8	< 193
	07/25/22	-	08/30/22	< 0.8	< 53	< 3	< 3	< 7	< 3	< 7	< 3	< 3	< 4	< 5	< 71
	08/30/22	-	09/26/22	< 0.7	< 126	< 5	< 5	< 14	< 5	< 12	< 5	< 7	< 5	< 7	< 144
	09/26/22	-	10/31/22	< 0.8	< 114	< 5	< 6	< 12	< 6	< 13	< 6	< 7	< 7	< 8	< 176
	10/31/22	-	11/28/22	< 0.5	< 140	< 6	< 6	< 13	< 8	< 13	< 6	< 8	< 6	< 9	< 197
	11/28/22	-	12/27/22	< 0.9	< 157	< 7	< 6	< 14	< 7	< 10	< 7	< 8	< 6	< 8	< 201
AVERAGE*				-	-	-	-	-	-	-	-	-	-	-	-
SA-PWT-02F3**	12/27/21	-	01/31/22	< 0.8	< 119	< 6	< 6	< 9	< 6	< 13	< 6	< 6	< 6	< 7	< 177
	01/31/22	-	02/28/22	< 0.9	< 107	< 7	< 6	< 13	< 7	< 13	< 7	< 6	< 7	< 9	< 155
	02/28/22	-	03/28/22	< 0.5	< 123	< 5	< 7	< 7	< 6	< 8	< 5	< 7	< 6	< 10	< 126
	03/28/22	-	04/25/22	< 0.9	< 79	< 5	< 4	< 9	< 5	< 10	< 5	< 6	< 4	< 8	< 113
	04/25/22	-	05/31/22	< 0.7	< 73	< 4	< 4	< 11	< 4	< 11	< 5	< 6	< 6	< 6	< 119
	05/31/22	-	06/28/22	< 0.8	< 81	< 4	< 5	< 9	< 5	< 11	< 6	< 6	< 6	< 5	< 169
	06/28/22	-	07/25/22	< 0.9	< 138	< 8	< 4	< 11	< 11	< 17	< 6	< 7	< 7	< 9	< 183
	07/25/22	-	08/30/22	< 0.8	< 108	< 5	< 6	< 10	< 7	< 10	< 4	< 6	< 6	< 5	< 160
	08/30/22	-	09/26/22	< 0.7	< 120	< 5	< 9	< 12	< 5	< 11	< 7	< 5	< 4	< 8	< 158
	09/26/22	-	10/31/22	< 0.7	< 115	< 6	< 6	< 10	< 6	< 12	< 6	< 6	< 5	< 6	< 171
	10/31/22	-	11/28/22	< 0.7	< 115	< 5	< 6	< 10	< 8	< 12	< 6	< 7	< 4	< 7	< 179
	11/28/22	-	12/27/22	< 0.9	< 148	< 5	< 6	< 14	< 8	< 14	< 6	< 8	< 7	< 7	< 169
AVERAGE*				-	-	-	-	-	-	-	-	-	-	-	-

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

****** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 20, Concentration of Gross Alpha and Beta Emitters, and Tritium in Well Water, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION DATE	Gross Alpha	Gross Beta	H-3
SA-WWA-03E1**	01/24/22	< 1.6	< 2.4	< 177
	02/22/22	< 2.0	< 2.6	< 182
	03/21/22	< 2.0	< 2.2	< 171
	04/18/22	< 1.4	< 2.3	< 189
	05/16/22	< 1.6	< 2.4	< 178
	06/21/22	< 2.2	< 2.3	< 181
	07/19/22	< 1.8	< 2.5	< 178
	08/22/22	< 2.8	< 2.5	< 187
	09/19/22	< 2.6	< 2.3	< 198
	10/17/22	< 2.1	< 2.7	< 194
	11/21/22	< 2.4	< 2.1	< 194
	12/20/22	< 2.1	11.1 ± 2.5	< 182
	AVERAGE*	-	**11.1** ± 2.5	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 21, Concentrations of Iodine-131 and Gamma Emitters in Well Water, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION DATE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >											
		I-131 LL	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	ZrNb-95	Cs-134	Cs-137	BaLa-140	Ra-226
SA-WWA-03E1**	01/24/22	< 0.7	< 96	< 6	< 5	< 11	< 6	< 11	< 7	< 7	< 7	< 8	< 171
	02/22/22	< 0.9	< 101	< 6	< 6	< 11	< 5	< 12	< 7	< 7	< 6	< 8	< 184
	03/21/22	< 0.8	< 81	< 4	< 4	< 9	< 5	< 11	< 6	< 6	< 6	< 7	< 138
	04/18/22	< 0.6	< 109	< 5	< 6	< 11	< 5	< 9	< 7	< 6	< 6	< 12	< 157
	05/16/22	< 0.9	< 126	< 8	< 7	< 14	< 9	< 16	< 9	< 7	< 7	< 11	< 171
	06/21/22	< 0.8	< 114	< 6	< 6	< 11	< 8	< 14	< 10	< 9	< 8	< 11	< 203
	07/19/22	< 0.8	< 116	< 6	< 7	< 16	< 8	< 14	< 6	< 7	< 7	< 8	< 173
	08/22/22	< 1.0	< 104	< 7	< 6	< 12	< 5	< 16	< 8	< 5	< 8	< 6	< 162
	09/19/22	< 0.8	< 91	< 7	< 6	< 11	< 6	< 15	< 7	< 7	< 7	< 10	< 162
	10/17/22	< 0.9	< 88	< 7	< 6	< 11	< 6	< 11	< 6	< 6	< 7	< 8	< 165
	11/21/22	< 0.9	< 104	< 6	< 6	< 9	< 4	< 12	< 6	< 6	< 5	< 6	< 124
	12/20/22	< 0.8	< 147	< 7	< 8	< 16	< 6	< 13	< 9	< 9	< 7	< 11	< 166
	AVERAGE*	-	-	-	-	-	-	-	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 22, Concentrations of Gamma Emitters in Sediment, 2022

Results in Units of pCi/kg (dry) ± 2σ

STATION ID	Collection Date	<----------GAMMA EMITTERS---------->					
		Be-7	K-40	Cs-134	Cs-137	Ra-226	Th-232
SA-ESS-12B1 (C)	07/26/22	< 439	15,650 ± 1,201	< 69	< 52	< 890	**1,012** ± 165
	11/15/22	< 597	14,400 ± 1,637	< 87	< 60	**2,291** ± 1,277	< 470
	AVERAGE*	**-**	15,025 ± 1,768	**-**	**-**	**2,291** ± 1,277	**1,012** ± 165
SA-ESS-05A1	08/01/22	< 495	**5,661** ± 1,090	< 73	< 70	< 1,370	**449** ± 163
	11/29/22	< 575	**8,925** ± 1,407	< 95	< 88	< 1,702	**617** ± 175
	AVERAGE*	**-**	**7,293** ± 4,616	**-**	**-**	**-**	**533** ± 237
SA-ESS-11A1	07/26/22	< 431	**3,743** ± 697	< 50	< 45	< 1,072	< 268
	11/15/22	< 462	**2,007** ± 732	< 59	< 55	< 1,275	< 287
	AVERAGE*	**-**	**2,875** ± 2,455	**-**	**-**	**-**	**-**
SA-ESS-15A1	07/26/22	< 272	2,711 ± 538	< 44	< 34	< 771	269 ± 82
	11/15/22	< 509	8,120 ± 1,232	< 69	< 55	< 926	325 ± 187
	AVERAGE*	**-**	**5,416** ± 7,649	-	-	-	**297** ± 79
SA-ESS-15A2	(a)						
	(a)						
	AVERAGE*	**-**	**-**	**-**	**-**	**-**	**-**
SA-ESS-07E1	07/26/22	< 509	13,200 ± 1,266	< 73	< 62	< 1,095	755 ± 138
	11/15/22	< 558	10,170 ± 1,373	< 74	< 66	< 1,295	627 ± 179
	AVERAGE*	-	**11,685** ± 4,285	-	-	-	**691** ± 181
SA-ESS-16F1	07/26/22	< 492	5,872 ± 912	< 56	< 56	< 1,175	< 292
	11/15/22	< 580	11,060 ± 1,293	< 76	< 74	< 1,496	540 ± 168
	AVERAGE*	**-**	**8,466** ± 7,337	-	-	-	**540** ± 168
ALL INDICATOR AVERAGE		**-**	**7,147** ± 7,505	-	-	-	**512** ± 348

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

(a) STATION 15A2 COULD NOT BE COLLECTED DUE TO A WIND PORT PROJECT.

Table 23, Concentrations of Iodine-131 and Gamma Emitters in Milk, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - > I-131 LL	K-40	Cs-134	Cs-137	BaLa-140	Ra-226
SA-MLK-02G3 (C)	01/02/22	-	01/03/22	< 0.9	**1,367** ± 189	< 7	< 8	< 12	< 178
	02/06/22	-	02/07/22	< 0.7	**1,374** ± 192	< 9	< 8	< 13	< 228
	03/06/22	-	03/07/22	< 0.9	**1,890** ± 156	< 6	< 5	< 7	< 123
	04/03/22	-	04/04/22	< 0.8	**1,196** ± 151	< 9	< 7	< 13	< 187
	04/17/22	-	04/18/22	< 0.9	**1,147** ± 164	< 7	< 8	< 8	< 182
	05/01/22	-	05/02/22	< 0.9	**1,316** ± 175	< 9	< 9	< 12	< 164
	05/15/22	-	05/16/22	< 0.9	**1,248** ± 163	< 8	< 6	< 11	< 184
	06/05/22	-	06/06/22	< 0.8	**1,298** ± 189	< 8	< 6	< 7	< 158
	06/20/22	-	06/21/22	< 0.8	**1,239** ± 157	< 7	< 8	< 12	< 163
	07/04/22	-	07/05/22	< 0.8	**1,136** ± 158	< 5	< 6	< 8	< 108
	07/17/22	-	07/18/22	< 0.9	**1,213** ± 184	< 8	< 7	< 12	< 161
	08/07/22	-	08/08/22	< 0.7	**1,230** ± 180	< 7	< 8	< 14	< 158
	08/21/22	-	08/22/22	< 0.5	**1,344** ± 160	< 6	< 7	< 8	< 169
	09/05/22	-	09/06/22	< 0.7	**975** ± 163	< 9	< 9	< 10	< 217
	09/11/22	-	09/12/22	< 0.9	**1,061** ± 187	< 9	< 7	< 13	< 157
	10/02/22	-	10/03/22	< 0.9	**1,259** ± 181	< 9	< 10	< 11	< 215
	10/16/22	-	10/17/22	< 0.8	**1,153** ± 125	< 7	< 6	< 7	< 146
	11/06/22	-	11/07/22	< 0.8	**1,137** ± 153	< 9	< 7	< 11	< 204
	11/13/22	-	11/14/22	< 0.5	**1,136** ± 168	< 9	< 8	< 11	< 183
	12/04/22	-	12/05/22	< 0.7	**813** ± 148	< 6	< 7	< 11	< 164
	AVERAGE*			-	**1227** ± 413	-	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 23, Concentrations of Iodine-131 and Gamma Emitters in Milk, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - > I-131 LL	K-40	Cs-134	Cs-137	BaLa-140	Ra-226
SA-MLK-13E3	01/02/22	-	01/03/22	< 0.8	**1,931** ± 226	< 10	< 7	< 12	< 231
	02/06/22	-	02/07/22	< 0.9	**1,653** ± 202	< 9	< 7	< 8	< 163
	03/06/22	-	03/07/22	< 0.9	**1,993** ± 152	< 5	< 6	< 6	< 132
	04/03/22	-	04/04/22	< 0.8	**1,131** ± 168	< 8	< 7	< 14	< 175
	04/17/22	-	04/18/22	< 0.8	**1,241** ± 183	< 8	< 8	< 11	< 151
	05/01/22	-	05/02/22	< 0.9	**1,146** ± 204	< 10	< 8	< 5	< 163
	05/15/22	-	05/16/22	< 0.9	**1,378** ± 146	< 6	< 5	< 9	< 129
	06/05/22	-	06/06/22	< 0.9	**1,228** ± 143	< 6	< 6	< 10	< 165
	06/20/22	-	06/21/22	< 0.8	**1,238** ± 178	< 8	< 6	< 8	< 148
	07/04/22	-	07/05/22	< 0.8	**1,209** ± 123	< 5	< 6	< 8	< 115
	07/17/22	-	07/18/22	< 0.7	**1,443** ± 164	< 8	< 8	< 13	< 158
	08/07/22	-	08/08/22	< 0.7	**1,466** ± 194	< 7	< 6	< 10	< 168
	08/21/22	-	08/22/22	< 0.4	**1,331** ± 157	< 8	< 7	< 8	< 146
	09/05/22	-	09/06/22	< 0.8	**820** ± 161	< 10	< 7	< 9	< 187
	09/11/22	-	09/12/22	< 0.9	**1,359** ± 150	< 7	< 7	< 11	< 161
	10/02/22	-	10/03/22	< 0.8	**1,311** ± 172	< 9	< 8	< 12	< 204
	10/16/22	-	10/17/22	< 0.8	**1,240** ± 118	< 6	< 6	< 7	< 141
	11/08/22	-	11/09/22	< 0.8	**967** ± 176	< 9	< 7	< 11	< 166
	11/13/22	-	11/14/22	< 0.9	**954** ± 134	< 7	< 8	< 10	< 165
	12/04/22	-	12/05/22	< 0.8	**1,154** ± 124	< 6	< 6	< 7	< 149
	AVERAGE*			-	**1,310** ± 584	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 23, Concentrations of Iodine-131 and Gamma Emitters in Milk, 2022

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >					
				I-131 LL	K-40	Cs-134	Cs-137	BaLa-140	Ra-226
SA-MLK-14F4	01/02/22	-	01/03/22	< 0.9	1,686 ± 198	< 9	< 7	< 11	< 168
	02/06/22	-	02/07/22	< 0.7	1,642 ± 181	< 9	< 9	< 12	< 177
	03/06/22	-	03/07/22	< 1.0	1,968 ± 144	< 6	< 6	< 8	< 119
	04/03/22	-	04/04/22	< 0.9	1,282 ± 147	< 8	< 7	< 13	< 152
	04/17/22	-	04/18/22	< 0.9	1,377 ± 150	< 8	< 6	< 7	< 155
	05/01/22	-	05/02/22	< 0.9	1,227 ± 156	< 6	< 7	< 9	< 161
	05/15/22	-	05/16/22	< 0.9	1,325 ± 187	< 8	< 7	< 11	< 178
	06/06/22	-	06/07/22	< 0.9	1,307 ± 195	< 10	< 8	< 6	< 202
	06/20/22	-	06/21/22	< 1.0	1,199 ± 198	< 7	< 9	< 11	< 151
	07/04/22	-	07/05/22	< 0.8	1,058 ± 148	< 8	< 7	< 9	< 169
	07/17/22	-	07/18/22	< 0.8	1,169 ± 180	< 10	< 11	< 9	< 236
	08/07/22	-	08/08/22	< 0.8	1,477 ± 175	< 7	< 7	< 7	< 171
	08/21/22	-	08/22/22	< 0.5	1,249 ± 186	< 9	< 8	< 11	< 159
	09/05/22	-	09/06/22	< 0.4	1,177 ± 171	< 8	< 6	< 14	< 189
	09/11/22	-	09/12/22	< 0.8	1,136 ± 174	< 7	< 6	< 12	< 164
	10/02/22	-	10/03/22	< 0.7	1,165 ± 168	< 8	< 10	< 13	< 180
	10/16/22	-	10/17/22	< 0.9	1,245 ± 151	< 6	< 7	< 9	< 161
	11/06/22	-	11/07/22	< 0.8	1,038 ± 175	< 9	< 7	< 9	< 162
	11/13/22	-	11/14/22	< 0.9	972 ± 125	< 6	< 7	< 8	< 149
	12/04/22	-	12/05/22	< 0.8	1,050 ± 135	< 8	< 8	< 11	< 177
	AVERAGE*			-	**1,287** ± 491	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 24, Concentrations of Gamma Emitters in Edible Fish, 2022

Results in Units of pCi/kg (wet) ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	Collection Date	K-40			Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	Ra-226
SA-ESF-12B1 (C)	05/02/22	**3,012**	±	990	< 49	< 58	< 151	< 42	< 111	< 44	< 62	< 1,184
	05/02/22	**3,287**	±	796	< 53	< 47	< 97	< 50	< 96	< 53	< 51	< 889
	05/02/22	**4,344**	±	1,191	< 46	< 62	< 102	< 50	< 111	< 50	< 70	< 850
	10/07/22	**3,606**	±	586	< 37	< 36	< 67	< 41	< 71	< 33	< 43	< 745
	AVERAGE*	**3,562**	±	1,150	-	-	-	-	-	-	-	-
SA-ESF-11A1	05/02/22	**3,626**	±	1,131	< 67	< 65	< 130	< 61	< 141	< 67	< 77	< 1,426
	05/02/22	**3,872**	±	1,377	< 58	< 95	< 235	< 127	< 245	< 102	< 106	< 2,250
	05/02/22	**3,878**	±	1,293	< 76	< 59	< 134	< 67	< 149	< 60	< 64	< 1,604
	10/07/22	**4,389**	±	1,214	< 61	< 49	< 127	< 75	< 148	< 59	< 72	< 1,359
	AVERAGE*	**3,941**	±	642	-	-	-	-	-	-	-	-
SA-ESF-07E1	05/02/22	**2,607**	±	1,348	< 97	< 82	< 218	< 112	< 168	< 115	< 120	< 1,588
	05/03/22	**3,250**	±	1,233	< 91	< 75	< 147	< 88	< 163	< 91	< 89	< 1,622
	10/07/22	**4,531**	±	1,108	< 97	< 77	< 185	< 89	< 180	< 82	< 85	< 1,591
	AVERAGE*	**3,463**	±	1,959	-	-	-	-	-	-	-	-
ALL INDICATOR AVERAGE*		**3,736**	±	1,322								

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

*** SEE 'SAMPLE ANOMOLIES AND PROGRAM EXCEPTIONS' SECTION OF THIS REPORT.

Table 25, Concentrations of Gamma Emitters in Blue Crabs, 2022

Results in Units of pCi/kg (wet) ± 2σ

		<----------GAMMA EMITTERS---------->								
STATION ID	**Collection Date**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**Cs-134**	**Cs-137**	**Ra-226**
SA-ECH-12B1 (C)	07/12/22	**3,213** ± 1,185	< 64	< 50	< 161	< 66	< 122	< 79	< 67	< 1,546
	09/22/22	**2,450** ± 874	< 83	< 65	< 100	< 67	< 155	< 70	< 83	< 1,510
	AVERAGE*	**2,832** ± 1,079	-	-	-	-	-	-	-	-
STATION ID	**Collection Date**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**Cs-134**	**Cs-137**	**Ra-226**
SA-ECH-11A1	07/12/22	**4,356** ± 1,276	< 56	< 77	< 199	< 65	< 159	< 51	< 69	< 1,334
	09/22/22	**2,221** ± 315	< 16	< 17	< 38	< 17	< 35	< 18	< 16	< 248
	AVERAGE*	**3,289** ± 3,019	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 26, Concentrations of Gamma Emitters in Broadleaf Vegetation (FPL), 2022

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-FPL-01G1	10/27/22	Cabbage	< 162	**2,535** ± 425	< 27	< 20	< 23	< 512	< 77
SA-FPL-03H5	08/02/22	Cabbage	< 98	**2,716** ± 326	< 16	< 15	< 10	< 241	< 56
SA-FPL-06S1	08/29/22	Kale	**3,083** ± 341	**11,380** ± 729	< 50	< 32	< 31	< 660	< 133
SA-FPL-06S1	08/29/22	Lamb's Ear	**478** ± 138	**2,124** ± 299	< 23	< 19	< 19	< 446	< 80
SA-FPL-16S1	08/29/22	Kale	**1,644** ± 261	**8,411** ± 661	< 38	< 34	< 32	< 604	< 133
SA-FPL-16S1	08/29/22	Lamb's Ear	**1,762** ± 280	**9,552** ± 752	< 40	< 37	< 35	< 629	< 149
SA-FPL-10D1 (C)	06/28/22	Lamb's Ear	**1,456** ± 392	**7,669** ± 899	< 53	< 41	< 31	< 714	< 157
SA-FPL-10D1 (C)	08/29/22	Hosta	**854** ± 247	**4,081** ± 579	< 41	< 36	< 35	< 764	< 151
SA-FPL-10D1 (C)	08/29/22	Kale	**1,622** ± 398	**10,340** ± 1,157	< 58	< 56	< 51	< 981	< 203
SA-FPL-10D1 (C)	08/29/22	Lamb's Ear	**389** ± 187	**6,017** ± 590	< 39	< 33	< 32	< 542	< 131
ALL INDICATOR AVERAGE*			**1,742 ± 2,131**	**6,120 ± 8,251**	-	-	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 27, Concentrations of Gamma Emitters in Vegetables (FPV), 2022

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-FPV-02F9**	05/04/22	Asparagus	< 338	**2,913** ± 547	< 53	< 36	< 33	< 776	< 174
SA-FPV-01G1**	05/04/22	Asparagus	< 221	**2,331** ± 438	< 32	< 30	< 32	< 519	< 97
SA-FPV-01G1**	08/02/22	Peaches	< 117	**1,858** ± 283	< 21	< 14	< 13	< 326	< 70
SA-FPV-01G1**	08/02/22	Peppers	< 151	**1,348** ± 387	< 31	< 25	< 21	< 448	< 84
SA-FPV-01G1**	08/02/22	Tomatoes	< 134	**1,747** ± 315	< 24	< 17	< 16	< 346	< 75
SA-FPV-01G1**	08/02/22	Corn	< 137	**1,806** ± 380	< 22	< 21	< 19	< 405	< 76
SA-FPV-02G2**	05/04/22	Asparagus	< 185	**2,427** ± 479	< 38	< 26	< 30	< 639	< 116
SA-FPV-02G2**	08/02/22	Peppers	< 235	**1,657** ± 465	< 38	< 24	< 29	< 627	< 96
SA-FPV-02G2**	08/02/22	Corn	< 99	**2,309** ± 264	< 20	< 13	< 15	< 314	< 54
SA-FPV-02G2**	08/02/22	Tomatoes	< 164	**1,596** ± 338	< 24	< 18	< 18	< 397	< 49
SA-FPV-03H5**	08/02/22	Corn	< 109	**2,211** ± 395	< 26	< 14	< 18	< 380	< 75
SA-FPV-03H5**	08/02/22	Peppers	< 118	**1,586** ± 279	< 22	< 14	< 15	< 339	< 64
SA-FPV-03H5**	08/02/22	Tomatoes	< 87	**1,998** ± 255	< 17	< 10	< 10	< 236	< 44
SA-FPV-03H5**	08/02/22	Peaches	< 116	**1,759** ± 301	< 19	< 13	< 14	< 259	< 53
AVERAGE*			-	**1,968** ± 843	-	-	-	-	-

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

****** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 28, Concentrations of Gamma Emitters in Fodder Crops**, 2022

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-VGT-13E3**	09/12/22	Silage	**490** ± 249	**4,922** ± 692	< 36	< 36	< 32	< 572	< 135
SA-VGT-14F4**	09/12/22	Silage	**634** ± 218	**2,724** ± 400	< 27	< 17	< 18	< 469	< 79
SA-VGT-02G3**	09/12/22	Silage	< 194	**4,246** ± 452	< 17	< 17	< 16	< 386	< 71
AVERAGE*			**562** ± 203	**3,964** ± 2,252	-	-	-	-	-

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

****** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 29, Concentrations of Gamma Emitters in Game, 2022

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	<----------GAMMA EMITTERS---------->				
			Be-7	K-40	I-131	Cs-134	Cs-137
SA-GAM-03E1	12/24/22	Muskrat	< 92	**2,920** ± 320	< 25	< 12	< 13
SA-GAM-13E3	03/07/22	Muskrat	< 72	**3,007** ± 250	< 13	< 11	< 9
ALL INDICATOR AVERAGE*			-	**2,964 ± 123**	-	-	-

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY ONE POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 30, Concentrations of Gamma Emitters in Soil**, 2022

Results in Units of pCi/kg (dry) ± 2σ

STATION ID	COLLECTION DATE	GAMMA EMITTERS					
		Be-7	K-40	Cs-134	Cs-137	Ra-226	Th-232
SA-SOL-10D1**	3/22/2022	< 344	**10,330** ± 919	< 53	**121** ± 49	**1398** ± 832	**608** ± 121
SA-SOL-13E3**	3/22/2022	< 326	**13,690** ± 996	< 52	< 51	**1,799** ± 817	**843** ± 127
SA-SOL-16E1**	3/22/2022	< 349	**9,936** ± 917	< 49	< 44	**1,775** ± 839	**741** ± 102
SA-SOL-02F9**	3/22/2022	< 421	**5,448** ± 897	< 57	**153** ± 64	**1,621** ± 970	**436** ± 131
SA-SOL-05F1**	3/22/2022	< 394	**7,476** ± 1,193	< 69	**184** ± 58	**2,836** ± 1,359	**884** ± 156
SA-SOL-14F4**	3/22/2022	< 450	**11,460** ± 1,147	< 69	< 71	**1,916** ± 1,126	**975** ± 150
SA-SOL-02G3**	3/22/2022	< 464	**7,511** ± 1,031	< 70	**108** ± 69	**2,793** ± 1,250	< 358
SA-SOL-03G1**	3/22/2022	< 316	**8,217** ± 796	< 46	**75** ± 33	**1,774** ± 909	**855** ± 92
SA-SOL-06S1**	3/22/2022	< 438	**9,765** ± 1,091	< 66	< 71	< 1,262	**593** ± 140
	AVERAGE*	-	**9,315** ± 4,907	-	**128** ± 84	**1,989** ± 1,064	**742** ± 364

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES, IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Attachment 3, Cross Check Intercomparison Program

Teledyne Brown Engineering

Participation in cross check intercomparison studies is mandatory for laboratories performing analyses of REMP samples satisfying the requirements in the Offsite Site Dose Calculation Manual. Intercomparison studies provide a consistent and effective means to evaluate the accuracy and precision of analyses performed by a laboratory. Study results should fall within specified control limits and results that fall outside the control limits are investigated and corrected.

Teledyne Brown Engineering (TBE) and GEL Analytical Services (GEL) participated in the following proficiency testing studies provided by Environmental Resource Associates (ERA), Eckert Ziegler Analytics and DOE Mixed Analyte Performance Evaluation in 2022. The Laboratory's intercomparison program results for 2022 are summarized below.

Teledyne Brown Engineering Summary of Results

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate (AP), air iodine, milk, soil, vegetation, and water matrices for various analytes. The PE samples supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

A. Analytics Evaluation Criteria

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

B. ERA Evaluation Criteria

The ERA evaluation report provides an acceptance range for control and warning limits with associated flag values. Acceptance limits for drinking/potable water are established per The NELAC Institute's (TNI) guidance. The TNI Standard uses Fields of Proficiency Testing (FoPT) Tables to calculate upper and lower acceptance limits set at the Mean ± 2 standard deviations (SD). ERA's acceptance limits for other matrices differ based on historical data from past studies.

C. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

- Acceptable (flag = "A") - result within ± 20% of the reference value
- Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
- Not Acceptable (flag = "N") - bias is greater than 30% of the reference value

ANALYTICAL SERVICES QUALITY CONTROL SYNOPSIS

Interlaboratory Cross-Check Program

During this reporting period, 27 nuclides associated with six media types (Air Filter, Charcoal [Air Iodine], Milk, Soil, Vegetation and Water) were analyzed. Samples were obtained from Analytics, the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) and Environmental Resource Associates (ERA). Media types representative of client analyses performed during this reporting period were selected. The results data are available upon request.

1. Analytics Environmental Cross Check Program

   Twelve nuclides were evaluated in air particulate, charcoal filter, milk and soil matrices during this reporting period. All analyses were within acceptable criteria except for one AP Ce-141 and one AP Co-60 (first failure for each). **NCRs 22-04** and **22-21** were initiated and closed. All raw and associated QC data was reviewed and found to be within acceptable limits.

2. DOE's MAPEP Quality Assessment Program

   Fourteen nuclides in water, air particulate (AP), soil, urine and vegetation samples were evaluated in January - December 2022. All of the environmental analyses performed were evaluated as within the acceptable/acceptable with warning criteria except for the urine U-234 & U-238 and water Tc-99 (first failure for each). **NCRs 22-05** and **22-22** were initiated and closed.

   NOTE: The soil Tc-99 result for 1st quarter was not within the acceptable range and is not on the ICP list. The 3rd quarter sample result was acceptable. (TBE is running this for our information only at this point.)

3. ERA Environmental Cross Check Program (RAD/MRAD)

   Eighteen nuclides were evaluated in water, soil, and air particulate samples during 2022. All analyses performed were within acceptable criteria except for the MRAD 3rd quarter AP Pu-238 and RAD 4th quarter water U Natural. **NCRs 22-19** and **22-20** were initiated and closed. All raw and associated QC data was reviewed and found to be within acceptable limits.

NOTE:The soil U-238 result for 3rd quarter was not within the acceptable range and is not on the ICP list. (TBE is running this for our information only at this point.

GEL Laboratories Summary of Results

During 2022, forty-five (45) radioisotopes associated with seven (7) matrix types were analyzed under GEL's Performance Evaluation program in participation with ERA, MAPEP, and Eckert & Ziegler Analytics. Matrix types were representative of client analyses performed during 2022. Of the four hundred sixty-three (463) total results, 97.8% (453 of 463) were found to be acceptable within the PT providers three sigma or other statistical criteria. The list below contains the type of matrix evaluated by GEL..

- Air Filter
- Cartridge
- Water
- Milk
- Soil
- Liquid
- Vegetation

Summary of Participation in the Eckert & Ziegler Analytics Environmental Cross-Check Program

Eckert & Ziegler Analytics provided samples for one hundred thirteen (113) individual environmental analyses. The accuracy of each result reported to Eckert & Ziegler Analytics, Inc. is measured by the ratio of GEL's result to the known value. All results fell within GEL's acceptance criteria (100% within acceptance).

Summary of Participation in the ERA MRaD PT Program

The ERA MRad program provided samples (MRAD-36 and MRAD-37) for one hundred sixty-three (163) individual environmental analyses reported. Of the 163 analyses reported, 98.8% (161 of the 163) fell within the PT provider's acceptance criteria.

Summary of Participation in the MAPEP Monitoring Program

MAPEP Series 46 and 47 were analyzed by the laboratory. Of the one hundred thirty-seven (137) analyses reported, 96.4% (134 out of 137) fell within the PT provider's acceptance criteria.

Summary of Participation in the ERA PT Program

The ERA program provided samples (RAD-128, RAD-129 and RAD-130) for forty-seven (47) individual environmental analyses. Of the 47 analyses, 93.6% fell within the PT provider's acceptance criteria.

All corrective actions for unacceptable PTs are summarized in Table below.

Corrective Action Request and Report (CARR)

There are two categories of corrective action at GEL. One is corrective action implemented at the analytical and data review level in accordance with the analytical SOP. The other is formal corrective action documented by the Quality Systems Team in accordance with GL-QS-E-002. A formal corrective action is initiated when a nonconformance reoccurs or is so significant that permanent elimination or prevention of the problem is required. Formal corrective action investigations include root cause analysis.

GEL includes quality requirements in most analytical standard operating procedures to ensure that data are reported only if the quality control criteria are met or the quality control measures that did not meet the acceptance criteria are documented. A formal corrective action is implemented according to GL-QS-E-002 for Conducting Corrective/Preventive Action and Identifying Opportunities for Improvement. Recording and documentation is performed following guidelines stated in GL-QS-E-012 for Client NCR Database Operation.

Any employee at GEL can identify and report a nonconformance and request that corrective action be taken. Any GEL employee can participate on a corrective action team as requested by the QS team or Group Leaders. The steps for conducting corrective action are detailed in GL-QS-E-002. In the event that correctness or validity of the laboratory's test results in doubt, the laboratory will take corrective action. If investigations show that the results have been impacted, affected clients will be informed of the issue in writing within five (5) calendar days of the discovery.

The table below provides the status of CARRs for radiological performance testing during 2022. **It has been determined that causes of the unacceptable results did not impact any data reported to our clients.**

CORRECTIVE ACTION & PE FAILURE

Summary of RAD-124 Drinking Water Study Unacceptable Ratings

Sample ID	Parm	Reported Value	Reference Value	Acceptance Range
MAPEP-22-MaS46 (Radiological)	Fe-55 Tc-99	725 Bq/kg 506 Bq/kg	1100 Bq/kg 778 Bq/kg	770-1430 Bq/kg 545-1011 Bq/kg
MAPEP-22-RdV46	Sr-90	1.12 Bq/sample	0.789 Bq/sample	0.552-1.026 Bq/sample
MAPEP-22-MaS47 (Radiological)	U-234 U-238 (W)	88.9 Bq/kg 196 Bq/kg	50.8 Bq/kg 157 Bq/kg	35.6-66.0 Bq/kg 110-204 Bq/kg
MRAD 37 Vegetation	Strontium-90	4560 pCi/kg	2960 pCi/kg	1670-3860 pCi/L
MRAD 37 Water	Strontium-90	283 pCi/kg	224 pCi/L	61-277 pCi/L

Root Cause(s):

Iron-55: The laboratory reviewed the data and noted that the tracer recoveries for this analysis were higher than typical soil tracer recoveries. The higher tracer recoveries possibly contributed to the low bias seen in the result.

Technetium-99: The laboratory reviewed both the inorganic and radiological data for contributors to the low bias. Both analyses include the addition of Hydrofluoric Acid to the 1M Hydrochloric leach process. The laboratory has concluded that since both the reported results were low, the HF leach may not have been performed long enough for the HF to effectively isolate the Technetium

Strontium-90: The data for the Sr-90 analysis was reviewed and no anomalies were noted. The QC in the analysis batch met acceptance criteria. The laboratory evaluated both the prep and instrument processes for possible areas of contamination that contributed to the positive bias. A definitive source was not determined.

Uranium-234: The laboratory could not definitively identify the cause of the high bias in the results for these parameters. The lab will continue to monitor the recoveries of these parameters in all methods to ensure that there are no continued issues. Strontium-90 (MRAD 37): The lab will continue to monitor the recoveries of these parameters to ensure that there are no continued issues. During the analysis time period for MRAD-37, the laboratory successfully completed the analysis of Strontium-90 in these matrices in PT study MAPEP-47. In which, the samples were prepared and analyzed by the same processes and procedures.

Summary of Results: Split Sample Comparison Program

To meet the requirement of ODCM 3/4.12.3, INTERLABORATORY COMPARISON PROGRAM, several duplicate environmental samples each year are sent to a second independent laboratory to compare results. The laboratory chosen for these Quality Control Analyses is General Engineering Laboratories (GEL).

Duplicate samples were obtained for some samples of weekly air iodine and particulates, quarterly air particulate, sediment, broad leaf vegetation, milk, and surface water. These samples were analyzed by GEL as comparison and quality assurance of TBE results. The GEL duplicate analysis results are shown in below.

Agreement between TBE and GEL is based on criteria for accepting measurements in NRC Inspection Procedure 84525.

Air Iodine

I-131 was not detected (less than MDC) by both TBE and GEL for all 52 air samples.

Air Particulates

Gross beta was detected by GEL and TBE in 51 of the duplicate weekly APT samples. One duplicate sample was lost during shipment as described in section 9.0. GEL detects significantly higher gross beta results. The variance between the lab results is due to different calibration energy sources used by each lab.

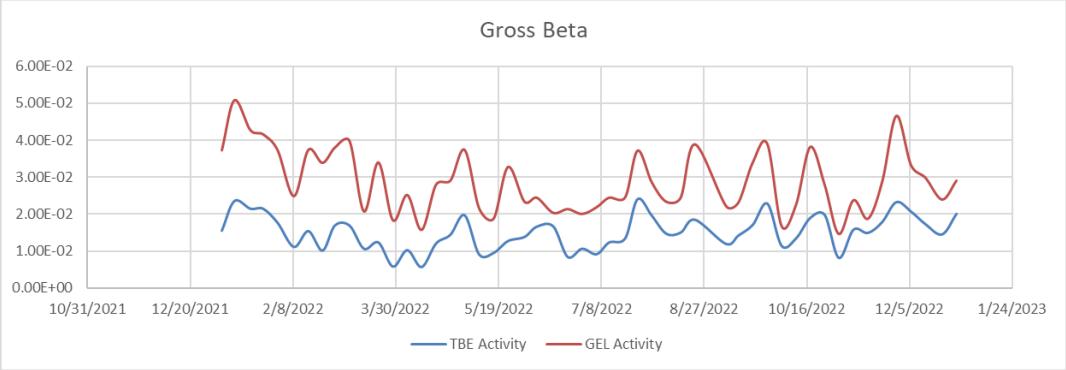

Figure 9, TBE vs GEL Gross Beta

All four duplicate quarterly composite samples analyzed had positive results for Be-7.

AIR PARTICULATE COMPOSITES												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L95790-1	Q1 2022	Be-7	6.48E-02	6.86E-03	9	578151	Be-7	6.53E-02	1.01	0.60	1.66	YES
L96921-1	Q2 2022	Be-7	6.95E-02	7.78E-03	9	587086	Be-7	7.62E-02	1.10	0.60	1.66	YES
L98320-1	Q3 2022	Be-7	7.64E-02	1.15E-02	7	599946	Be-7	7.38E-02	0.97	0.50	2.00	YES
L99129-1	Q4 2022	Be-7	4.61E-02	7.11E-03	7	609536	Be-7	5.46E-02	1.19	0.50	2.00	YES

Surface Water

Naturally occurring K-40 was not detected in TBE samples. K-40 was detected in all of the GEL samples.

SURFACE WATER												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L95625-2	3/24/22	K-40	<75.54	N/A	N/A	574915	K-40	<19.5	No comparison result <MDL			
L96666-2	6/20/22	K-40	<154.1	N/A	N/A	584060	K-40	68.6	No comparison result <MDL			
L97846-2	9/21/22	K-40	130.6	2.02E+01	6	594749	K-40	112.0	1.17	0.50	2.00	YES
L98931-2	12/5/22	K-40	<38.35	N/A	N/A	605466	K-40	107.0	No comparison result <MDL			

Milk

Naturally occurring K-40 was detected in 11 duplicate samples. One of the duplicate samples was not in agreement. Because of the variability in environmental samples, i.e. time of year, food source, etc. one non-agreement does not constitute an issue with the primary laboratory.

MILK												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L94699-3	1/3/2022	K-40	1686	9.88E+01	17	566668	K-40	1510	1.12	0.75	1.33	YES
L95107-3	2/7/2022	K-40	1642	9.03E+01	18	570004	K-40	1160	1.42	0.75	1.33	NO
L95391-3	3/7/2022	K-40	1350	9.65E+01	14	572851	K-40	924	1.46	0.60	1.66	YES
L95711-3R1	4/4/2022	K-40	1282	7.37E+01	17	575800	K-40	1180	1.09	0.75	1.33	YES
L96073-3	5/2/2022	K-40	1227	7.82E+01	16	578907	K-40	934	1.31	0.60	1.66	YES
L96501-3	6/7/2022	K-40	1307	9.44E+01	14	582516	K-40	1620	0.81	0.60	1.66	YES
L96885-3	7/5/2022	K-40	1058	7.39E+01	14	585471	K-40	768	1.38	0.60	1.66	YES
L97329-3	8/8/2022	K-40	1477	8.74E+01	17	589434	K-40	1677	0.88	0.75	1.33	YES
I-97655-3	9/6/2022	K-40	1177	8.57E+01	14	592546	K-40	1190	0.99	0.60	1.66	YES
I-97955-3	10/2/2022	K-40	1165	8.40E+01	14	595515	K-40	1300	0.90	0.60	1.66	YES
I-98462-3	11/7/2022	K-40	1038	8.77E+01	12	600356	K-40	942	1.10	0.60	1.66	YES

Sediment

Naturally occurring K-40 was detected in the sample by both GEL and TBE. Results are in agreement.

SEDIMENT												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L97237-3	7/26/22	K-40	3.74E+03	3.48E+02	11	588476	K-40	5.74E+03	0.65	0.60	1.66	YES

Broad Leaf Vegetation

Naturally occurring K-40 was detected by GEL and TBE in all 9 duplicate samples analyzed. All nine split samples were in agreement

VEGETATION												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L96110-1	5/4/22	K-40	2913	2.74E+02	11	579139	K-40	1.77E+03	1.65	0.60	1.66	YES
L96110-2	5/4/22	K-40	2427	2.40E+02	10	579139	K-40	2.72E+03	0.89	0.60	1.66	YES
L97258-9	8/2/22	K-40	2716	1.63E+02	17	588779	K-40	2.36E+03	1.15	0.75	1.33	YES
L97258-11	8/2/22	K-40	2309	1.32E+02	17	588779	K-40	2.66E+03	0.87	0.75	1.33	YES
L97258-1	8/2/22	K-40	1806	1.90E+02	10	588779	K-40	2.36E+03	0.77	0.60	1.66	YES
L97258-3	8/2/22	K-40	1858	1.41E+02	13	588779	K-40	1.62E+03	1.15	0.60	1.66	YES
L97258-6	8/2/22	K-40	1998	1.28E+02	16	588779	K-40	2.22E+03	0.90	0.60	1.66	YES
L97258-7	8/2/22	K-40	1759	1.50E+02	12	588779	K-40	1.83E+03	0.96	0.60	1.66	YES
L97258-2	8/2/22	K-40	1747	1.58E+02	11	588779	K-40	2.07E+03	0.84	0.60	1.66	YES

TLD Annual QA Status Report

1.0 EXECUTIVE SUMMARY

Routine quality control (QC) testing was performed for dosimeters issued by the Environmental Dosimetry Company (EDC).

During this annual period 100% (72/72) of the individual dosimeters, evaluated against the EDC internal performance acceptance criteria (high-energy photons only), met the criterion for accuracy and 100% (72/72) met the criterion for precision (Table 31). In addition, 100% (12/12) of the dosimeter sets evaluated against the internal tolerance limits met EDC acceptance criteria (Table 32) and 100% (6/6) of independent testing passed the performance criteria (Table 3). Trending graphs, which evaluate performance statistic for high-energy photon irradiations and co-located stations are given in Appendix A.

One internal assessment was performed in 2022.There were no findings.

Table 31 provides a summary of individual dosimeter results evaluated against the EDC internal acceptance criteria for high-energy photons only. During this period 100% (72/72) of the individual dosimeters, evaluated against these criteria, met the tolerance limits for accuracy and 100% (72/72) met the criterion for precision

Table 32 provides the bias and standard deviation results for each group (N=6) of dosimeters evaluated against the internal tolerance criteria. Overall,100% (12/12) of the dosimeter sets, evaluated against the internal tolerance performance criteria, met these criteria

Table 33 presents the independent blind spike results for dosimeters processed during this annual period. All results passed the performance acceptance criterion.

Table 31, Percentage of Individual Dosimeters that Passed EDC Internal Criteria, January – December 2022

Dosimeter Type	Number Tested	% Passed Bias Criteria	% Passed Precision Criteria
Panasonic Environmental	72	100	100

This table summarizes results of tests conducted by EDC.
Environmental dosimeter results are free in air.

Table 32, Mean Dosimeter Analyses (N=6), January – December 2022

Process Date	Exposure Level	Mean Bias %	Standard Deviation %	Tolerance Limit +/-15%
4/25/2022	43	1.2	1.8	Pass
4/27/2022	62	6.2	1.0	Pass
5/05/2022	99	2.3	0.7	Pass
7/26/2022	34	-2.6	1.2	Pass
7/27/2022	81	0.6	1.7	Pass
8/07/2022	107	-3.5	0.7	Pass
10/27/2022	52	1.8	0.9	Pass
11/02/2022	76	2.0	0.9	Pass
11/07/2022	27	7.0	0.7	Pass
01/24/2023	38	1.5	1.7	Pass
01/26/2023	115	-0.3	2.0	Pass
02/14/2023	49	2.3	4.0	Pass

This table summarizes results of tests conducted by EDC for TLDs issued in 2022.
Environmental dosimeter results are free in air.

Table 33, Summary of Independent Dosimeter Testing, January – December 2022

Issuance Period	Client	Mean Bias %	Standard Deviation %	Pass / Fail
1st Qtr. 2022	Millstone	-0.6	0.6	Pass
2nd Qtr.2022	Millstone	-3.9	1.0	Pass
3rd Qtr. 2022	Millstone	0.1	0.5	Pass
4th Qtr.2022	Millstone	-2.6	1.2	Pass
4th Qtr.2022	PSEG(PNNL) 48mR	1.1	1.5	Pass
4th Qtr.2022	PSEG(PNNL) 95mR	0.7	0.3	Pass
4th Qtr.2022	PSEG(PNNL) 143mR	2.3	0.8	Pass
4th Qtr.2022	PSEG(PNNL) 190mR	1.4	0.8	Pass
4th Qtr.2022	SONGS	-5.6	1.1	Pass

Performance criteria are +/- 15%.
Blind spike irradiations using Cs-137

Attachment 4, 2021 AREOR Errata

Table 7, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, 4, and 5. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI/S)	Airborne	Waterborne	Ingestion	MA
13F3	I	W	9.3 mi.; Redding Middle School, Middletown, DE	OR, SI				
13F4	I	W	9.8 mi.; Middletown, DE	OR, SI				
14F2	I	WNW	6.7 mi.; Route 13 and Boyds Corner Rd, DE	OR				
14F4	I, D	WNW	8.0 mi.; local farm, DE				MLK	SOL, VGT, FPV
15F3	I	NW	5.4 mi., Port Penn Rd. at Pole Bridge Rd., DE	OR				
15F4	I, D	NW	7.0 mi.; local farm; Port Penn Road; DE					FPV
16F1	I	NNW	6.9 mi.; C&D Canal, DE			ESS, SWA		
16F1A	A	NNW	6.5 mi.; Located at the C&D Canal Tip, DE			SWA		
16F2	I	NNW	8.1 mi.; Delaware City Public School, DE	OR, SI				
01G1	I, D	NNE	10.9 mi.; Route 49, South Broadway, NJ				FPL	FPV
01G3	~~I~~ C	N	19 mi.; N. Church Street Wilmington, DE	C				
02G2	I, D	NNE	13.5 mi.; Local Farm; Pointers Auburn Road (Route 540), Salem, NJ					FPV

Table 7, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, 4, and 5. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI/S)	Airborne	Waterborne	Ingestion	MA
02G3	C	NNE	11.8 mi.; Local Milk Farm, NJ				MLK	VGT, SOL
03G1	I	NE	16.5 mi.; local farm, NJ	~~C~~ OR				SOL
10G1	~~I~~ C	SSW	11.6 mi.; Smyrna, DE	C				
14G1	~~C~~ I	WNW	13.4 mi.; Route 286, Bethel Church Road, DE	~~C~~ OR	AIO,APT			
16G1	I	NNW	15.1 mi.; Wilmington Airport, DE	~~C~~ OR				
03H1	~~I~~ C	NE	33.1 mi.; National Park, NJ	C				
03H5	C, D	NE	25 mi.; Farm Market, Route 77, NJ				FPL	FPV

TABLE 7 NOTATIONS:
Vegetable samples are not always collected in consecutive years from the same farmer due to crop rotation.

Table 5, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion

Exposure Pathway	Number of Representative Samples and Sample Locations	Sampling Collection/ Frequency	Type and Frequency of Analyses
Milk (MLK)	Samples from milking animals in 3 locations within 5 km distance (3.1 miles) having the highest dose potential. If there are none, then 1 sample from milking animals in each of 3 areas between 5 - 8 km distant (3.1 - 5.0 miles) where doses are calculated to be greater than 1 mrem per yr: 13E3. 1 Sample from milking animals at a control location 15 30 km distant (9.3 - 18.6 miles): ~~03G1~~ 02G3. NOTE: *Milk animals are not prevalent in the vicinity of the plant. Only one farm met the requiem for milk. In lieu of samples, broad-leaf vegetation sampling is being conducted.*	Semi-monthly (when animals are on pasture) Monthly (when animals are not on pasture)	Gamma scan / semi-monthly Iodine-131 / semi-monthly Gamma scan / monthly Iodine-131 / monthly
Edible Fish (ESF)	One sample of each commercially and recreationally important species in vicinity of plant discharge area: 11A1. One sample of same species in area not influenced by plant discharge: 12B1, and an additional location downstream: 07E1.	Semi-Annually	Gamma scan (flesh) / on collection
Blue Crabs (ECH)	One sample of each commercially and recreationally important species in vicinity of plant discharge area 11A1. One sample of same species in area not influenced by plant discharge 12B1.	Semi-Annually	Gamma scan (flesh) /on collection

A total of 59 Immersion Dose Monitor (IDM) locations were established to monitor for direct radiation during 2021, including:

21 on-site locations:

01Q1, 01X2, 02S2a, 02X4, 03X1, 04X1, 05X1, 06X2, 07S1, 08S1, 08S2, 10S1, 11S1, 12S1, 14S2, 15S1, 15S2, 15S3 16S1, 16Q2, and 16X3

27 off-site locations within the 10 mile zone:

04D2, 05D1, 10D1, 14D1, 15D1, 02E1, 03E1, 11E2, 12E1, 13E1, 16E1, 01F1, 02F2, 02F6, 03F2, 04F2, 05F1, 06F1, 07F2, 09F1, 09F2, 10F2, 11F1, 12F1, 13F2, , 14F2, and 15F3

5 areas of interest (population centers, nearby residences, and schools)

02F5, 03F3, 13F3, 13F4 and 16F2

3 locations beyond 10 miles:

03G1, 14G1, and 16G1

~~6~~ 3 control locations beyond 10 miles:

~~01G3, 03G1, 10G1, 14G1, 16G1, and 03H1.~~
01G3, 10G1, and 03H1

The PDs at each location are changed and analyzed quarterly.

Two PDs (Panasonic type UD-814) are placed at each location. The laboratory utilizes a Panasonic based system using UD-814 dosimeters that are constructed of three rectangular, lead-shielded (protects against low-energy gamma radiation) teflon wafers, impregnated with 25% calcium sulfate phosphor ($CaSO_4$:Dy) to monitor gamma radiation. Additionally, each PD has one lithium borate (LiBO:Mn) element to monitor beta radiation (which is not used).

In 2019 PSEG implemented American National Standards Institute (ANSI) N13.37-2014 Environmental Dosimetry - Criteria for System Design and Implementation for comparing each PD location dose result to its historical background dose. Per the standard a well-functioning dosimetry system should be able to detect a 5 mrem difference in the quarterly data and a 10 mrem difference in the yearly data above background.