Constellation

TS 6.9.1.7

LG-25-068

April 29, 2025

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

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: 2024 Annual Radiological Environmental Operating Report

In accordance with the requirements of Section 6.9.1.7 of Limerick Generating Station (LGS) Units 1 and 2 Technical Specifications (TS) and Section 6.1 of the LGS Units 1 and 2 Offsite Dose Calculation Manual (ODCM), this letter submits the 2024 Annual Radiological Environmental Operating Report. This report provides the 2024 results for the Radiological Environmental Monitoring Program (REMP), as called for in the ODCM.

In assessing the data collected for the REMP, it has been concluded that the operation of LGS Units 1 and 2 had no adverse impact on the environment. No plant-produced fission or activation products were found in any pathway modeled by the REMP. The results of the groundwater protection program are also included in this report.

There are no commitments contained in this letter.

If you have any questions or require additional information, please contact Will Pratt at 610-718-2700.

Respectfully,

Michael F. Gillin
Site Vice President – Limerick Generating Station
Constellation Energy Generation, LLC

Attachment: 2024 Annual Radiological Environmental Operating Report

cc: Administrator, Region I, USNRC (w/attachment)
LGS USNRC Senior Resident Inspector (w/attachment)
B. Edwards, Inspector Region I, USNRC (w/attachment)
LGS Senior Project Manager-NRR, USNRC (w/attachment)

Constellation

Limerick Generating Station

Annual Radiological Environmental Operating Report 2024

Docket Nos. 50-352 and 50-353

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1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Airborne Activity Sampling: Continuous sampling of air through the collection of particulates and radionuclides on filter media.

2. ARERR: Annual Radioactive Effluent Release Report

3. AREOR: Annual Radiological Environmental Operating Report

4. BWR: Boiling Water Reactor

5. 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.

6. Control: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the station.

7. Curie (Ci): A measure of radioactivity equal to 3.7×10^{10} disintegrations per second or 2.22×10^{12} disintegrations per minute.

8. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using Thermoluminescent Dosimeters (TLD), Optically Stimulated Luminescence Dosimeters (OSLD) and pressurized ionization chambers.

9. EPA: Environmental Protection Agency

10. GPI: Groundwater Protection Initiative

11. Grab Sample: A single discrete sample drawn at one point in time.

12. Indicator: A sampling location that is likely to be affected by plant effluents due to its proximity and/or direction from the plant.

13. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation or animal products when additional information about particular radionuclides is needed.

14. ISFSI: Independent Spent Fuel Storage Installation

15. Lower Limit of Detection (LLD): An *a priori* measure of the detection capability of a radiochemistry measurement based on instrument setup, calibration, background, decay time, and sample volume. An LLD is expressed as an activity concentration. The MDA is used for reporting results. LLD are specified by a regulator, such as the NRC and are typically listed in the ODCM.

16. MDA: Minimum Detectable Activity. For radiochemistry instruments, the MDA is the *a posteriori* minimum concentration that a counting system detects. It is the smallest concentration or activity of radioactive material in a sample that will yield a net count above instrument background and that is detected with 95% probability, with only five % probability of falsely concluding that a blank observation represents a true signal.

17. MDC: Minimum Detectable Concentration. This is essentially synonymous with MDA for the purposes of radiological monitoring.

18. Mean: The sum of all of the values in a distribution divided by the number of values in the distribution, synonymous with average.

19. Microcurie: 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.

20. N/A: Not Applicable

21. NEI: Nuclear Energy Institute

22. NIST: National Institute of Standards and Technology

23. NRC: Nuclear Regulatory Commission

24. ODCM: Offsite Dose Calculation Manual

25. OSLD: Optically Stimulated Luminescence Dosimeter

26. pCi/L: picocuries / Liter

27. PWR: Pressurized Water Reactor

28. REMP: Radiological Environmental Monitoring Program

29. TLD: Thermoluminescent Dosimeter

2.0 EXECUTIVE SUMMARY

LGS 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 LGS 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 (ODCM) [27] and other site-specific requirements. 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 LGS for the reporting period, of January 1st through December 31st, 2024. During that time period, 1658 analyses were performed on 1362 samples. In assessing all the data gathered for this report and comparing these results with preoperational data and/or 10-year average values, it was concluded that the operation of LGS did not result in detection of plant related radionuclides in the environment.

2.1 Summary of Conclusions:

No measurable activities above background levels were detected. All values were consistent with historical results, which indicate no adverse radiological environmental impacts associated with the operation of LGS. Naturally occurring radionuclides are present in the Earth's crust and atmosphere and exist in detectable quantities throughout the world. It is common to detect naturally 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 and other nuclear events worldwide, such as Fukushima and Chernobyl.

In 2024, Limerick Generating Station released to the environment through the radioactive effluent liquid and gaseous pathways approximately 68 curies of noble gas, fission, and activation products and approximately 62 curies of tritium.

Per the ODCM Control 6.2, the Annual Radioactive Effluent Release Report shall include an assessment of the radiation doses to the hypothetically highest exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources. The ODCM does not require population doses to be calculated. For purposes of this calculation the following assumptions were made:

• Long term annual average meteorology X/Q and D/Q and actual gaseous effluent releases were used.

• Gamma air dose, Beta air dose, Total Body, and Skin doses were attributed to noble gas releases.

• Critical organ and age group dose were attributed to iodine, particulate, Carbon-14, and tritium releases.

• 100 percent occupancy factor was assumed.

• Dosimetry measurements obtained from the REMP for the nearest residence to the Independent Spent Fuel Storage Installation (ISFSI) was used to determine direct radiation exposure.

• The highest dose from the critical organ and critical age group for each release pathway were summed and added to the net dosimetry measurement from the nearest residence to the ISFSI for 40 CFR 190 compliance.

The maximum calculated dose to a real individual would not exceed 0.34 mrem (total body), 1.34 mrem (organ), or 0.29 mrem (thyroid).

All doses calculated were below all ODCM and 40 CFR Part 190 limits to a real individual.

2024 Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS[1]

	Whole Body	Thyroid	Max Other Organ
Limit	**25 mrem**	**75 mrem**	**25 mrem**
Gaseous - Noble Gas	5.00E-03	5.00E-03	8.29E-03
Gaseous - Particulates & Iodine	1.50E-03	1.57E-03	1.50E-03
Carbon-14	2.43E-01	2.43E-01	1.21E+00
Liquid	7.32E-02	2.16E-02	1.05E-01
Direct Shine	0	0	0
Total Site Dose	**3.23E-01**	**2.71E-01**	**1.32E+00**
% Contribution of Carbon-14 to Gaseous Dose	**75**	**90**	**92**
Nearby Facility	1.79E-02	1.79E-02	1.79E-02
Total w/Other Nearby Facility[2]	**3.41E-01**	**2.89E-01**	**1.34+00**
% of Limit	**1.36**	**0.39**	**5.37**

[1] 2024 Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS is a summation of Units to show compliance with 40 CFR Part 190 Limits.
[2] Other fuel cycle sources within 5 miles of the site are considered in this analysis.

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 [1], 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 [2], NUREG 1302 [4], and the 1979 NRC Branch Technical Position [5].

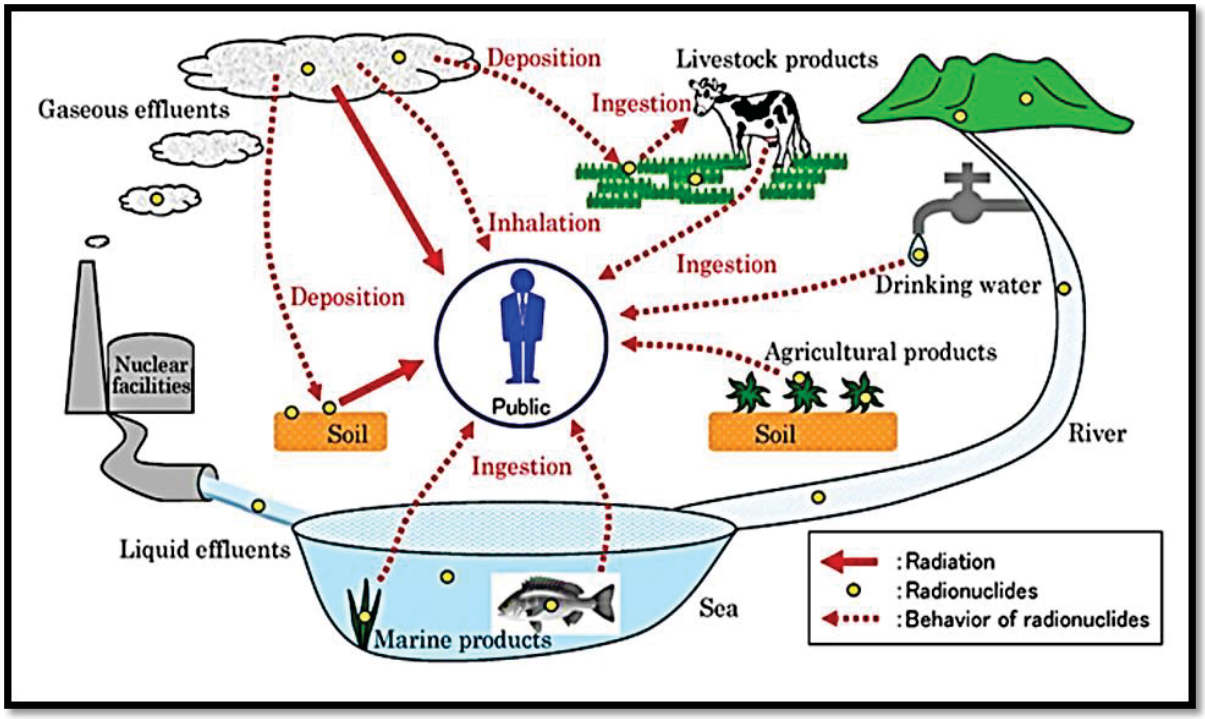

Figure 1, Potential exposure pathways to Members of the Public due to Plant Operations [6]

Quality assurance aspects of the sampling program and TLD/OSLD data collection are conducted in accordance with Regulatory Guides 4.15 [7] and 4.13 [8]. REMP also adheres to the requirements of Pennsylvania, LGS Technical Specifications, and Offsite Dose Calculation Manual (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.

4.0 SITE DESCRIPTION AND SAMPLE LOCATIONS

The Limerick Generating Station (LGS), consisting of two 3,515 MW boiling water reactors owned and operated by Constellation Energy Generation, LLC, is located adjacent to the Schuylkill River in Montgomery County, Pennsylvania. Unit No. 1 went critical on 22 December 1984. Unit No. 2 went critical on 11 August 1989. The site is located in Piedmont countryside, transversed by numerous valleys containing small tributaries that feed into the Schuylkill River. On the eastern riverbank, elevation rises from approximately 110 to 300 feet mean sea level (MSL). On the western riverbank elevation rises to approximately 50 feet MSL to the western site boundary.

A Radiological Environmental Monitoring Program (REMP) for LGS was initiated in 1971. Review of the 1971 through 1977 REMP data resulted in the modification of the program to comply with changes in the Environmental Report Operating License Stage (EROL) [3] and the Branch Technical Position Paper (Rev. 1, 1979) [5]. The preoperational period for most media covers the periods 1 January 1982 through 21 December 1984 and was summarized in a separate report. This report covers those analyses performed by Constellation Generation Solutions (CGS), Landauer, and Teledyne Brown Engineering (TBE)/GEL Laboratories (GEL) on samples collected during the period of January 1, 2024 through December 31, 2024.

On 6 July 1996, a 10 CFR 20.2002 permit was issued to Limerick for storage of slightly contaminated soils, sediments and sludges obtained from the holding pond, cooling tower, and spray pond systems. These materials will decay to background while in storage. Final disposition will be determined at Station decommissioning.

On 21 July 2008, an ISFSI pad was put into service. The ISFSI is dry cask storage, where spent nuclear fuel is stored.

LGS 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 Monitoring Program – Direct Radiation
- Table 2, Radiological Environmental Monitoring Program – Airborne
- Table 3, Radiological Environmental Monitoring Program – Waterborne
- Table 4, Radiological Environmental Monitoring Program – Ingestion
- Table 5, REMP Sampling Locations – Direct Radiation
- Figure 2, REMP Sample Locations (at Distances Less than Five Miles from the Limerick Generating Station)
- Figure 3, REMP Sample Locations (at Distances Greater than Five Miles from the Limerick Generating Station)
- Figure 4, REMP Sample Locations (on Site or Near the Limerick Generating Station)

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS

Table 1, Radiological Environmental Monitoring Program – Direct Radiation

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Direct Radiation 40 Routine monitoring stations either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously placed as follows: (1) An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY: (2) An outer ring of stations, one in each meteorological sector, in the 3-9 mile range from the site (3) The balance of the stations placed in special interest areas, such as population centers, nearby residences, schools and in 1 or 2 areas to serve as control stations	See Table 5	Quarterly	Gamma dose quarterly.

Table 2, Radiological Environmental Monitoring Program – Airborne

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type and Frequency of Analyses
Airborne Radioiodine and Particulates Samples from 5 locations: 3 samples from close to the 3 SITE BOUNDARY locations (in different sectors) of the highest calculated annual average ground level D/Q. 1 sample from the vicinity community having one of the highest calculated annual ground level D/Q. 1 sample from a control Location, as for example 15-30km distant and in the least prevalent wind direction.	6C1	11,305 feet NE of site Limerick Airport	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine canisters: I-131 analysis following canister change Particulate Sampler: Gross beta radioactivity analysis following filter change: Gamma isotopic analysis of composite (by location) at least quarterly
	10S3	2,648 feet E of site Keen Road		
	11S1	2,017 feet ESE of site Retired LGS Information Center		
	11S2 [QC]	2,017 feet ESE of site Retired LGS Information Center		
	14S1	3,319 feet SSE of site Longview Road		
	13S4	1,186 feet SE of site Longview Road		
	15D1	16,877 feet SE of site Spring City Substation		
	22G1 [C]	93,619 feet SW of site Manor Substation		

[C] Indicates a Control location

[QC] Indicates a Quality Control duplicate sample location

Table 3, Radiological Environmental Monitoring Program – Waterborne

Requirement	Sample Location Description, Distance, and Direction		Sampling Collection/ Frequency	Type and Frequency of Analyses
Water a. Surface 1 sample upstream 1 sample downstream	24S1 [C] 13B1	1,058 feet SW of site LGS Intake Building 9,225 feet SE of site Pennsylvania American Water Company River	Sample collected from a continuous water sampler, monthly. In event sampler is inoperable, weekly grab samples will be collected until sampler returned to service.	Gamma isotopic analysis monthly. Composite for tritium analysis quarterly.
b. Ground Samples from 1 or 2 sources only if likely to be affected	No Ground water is sampled and analyzed due to no wells to which groundwater beneath the plant discharges are present in the area. The site is hydrologically isolated from all public groundwater supplies and areas of extensive groundwater development (LGS USFAR Section 2.4.13.2)			
c. Drinking 1 sample of each on 1 to 3 of the nearest water supplies that could be affected by its discharge. 1 sample from a control location	15F7 15F4 16C2 28F3 [C]	33,400 feet SSE of site Phoenixville Water Treatment Plant 45,514 feet SE of site AQUA Water Company 14,034 feet SSE of site Pennsylvania American Water Company Reservoir 30,811 feet WNW of site Pottstown Water	Sample collected from a continuous water sampler, monthly. In event sampler is inoperable, weekly grab samples will be collected until sampler returned to service	I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year. Composite for gross beta and gamma isotopic analysis monthly. Composite for tritium analysis quarterly.
d. Sediment from shoreline 1 sample from downstream area with existing or potential recreational value.	16B2 16C4 33A2 [C]	7,128 feet SSE of site Down River from Plant Discharge Area 11,510 feet SSE of site Down River from Plant Discharge Area 4,435 feet NNW of site	A sediment sample is taken down stream of discharge semi-annually	Gamma isotopic analysis semiannually.

[C] Indicates a Control location

Table 4, Radiological Environmental Monitoring Program – Ingestion

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Ingestion a. Milk Samples from milking animals in 3 locations within 5 km distance having the highest dose potential. If there are none, then 1 sample from milking animals in each of 3 areas between 5 to 8 km distance where dose is calculated to be greater than 1 mrem per year. 1 sample from milking animals at a control location (15-30km distance) and in the least prevalent wind direction.	18E1 22,704 feet S of site Miller Farm 19B1 10,317 feet SSW of site Kolb's Farm 22B1 20,011 feet SW of site Pigeon Creek Farm 8G1 [C] 54,504 feet ENE of site Knechel Farm	Semimonthly when animals are on pasture (April 1-Oct 1), monthly at other times.	Gamma isotopic and I-131 analyses semimonthly when animals are on pasture : monthly at other times.
b. Fish and Invertebrates 1 sample of each commercially and recreationally important species in vicinity of plant discharge area. 1 sample of same species in area not influenced by plant discharge.	16C5 9,251 feet SE of site LGS Discharge Area 29C1 [C] 13,725 feet WNW of site Area not influenced by Plant Discharge	Sample in season, or semiannually if they are not seasonal.	Gamma isotopic analyses on edible portions

[C] Indicates a Control location

Table 4, Radiological Environmental Monitoring Program – Ingestion

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
c. Food Products 1 sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have been discharged Samples of 3 different kinds of broad leaf vegetation grown nearest each of 2 different offsite locations of highest predicted annual average ground level D/Q if milk sampling is not performed. 1 sample of each of the similar broad leaf vegetation grown 15-30 km distance in the least prevalent wind direction if milk sampling is not performed.	There are no downstream food products that are irrigated by water in which liquid plant wastes have been discharged. 11S3 1,848 feet ESE of site Retired LGS Information Center 13S3 1,267 feet SE of site Longview Rd at the 500kv Substation 31G1 [C] 71,808 feet NW of site Jollyview Farm (1560 Memorial Highway, Oley) No broadleaf vegetation sampling is credited toward REMP because milk sampling is performed.	At time of harvest Monthly during the growing season	Gamma isotopic and I-131 analyses on each sample Gamma isotopic and I-131 analyses on each sample

[C] Indicates a Control location

Table 5, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance (in feet)	Description
36S2	Inner Ring	N	3,183	Evergreen/Sanatoga Roads
3S1	Inner Ring	NNE	2,301	Field NNE Sector
5S1	Inner Ring	NE	2,350	Possum Hollow
7S1	Inner Ring	ENE	3,099	Training Center
10S3	Inner Ring	E	2,648	Keen Road
11S1	Inner Ring	ESE	2,017	Retired LGS Information Center
13S2	Inner Ring	SE	2,149	Longview Road
14S1	Inner Ring	SSE	3,319	Longview Road
18S2	Inner Ring	S	1,390	Intake Building Area
21S2	Inner Ring	SSW	977	Intake Building Area
23S2	Inner Ring	SW	2,793	Transmission Tower
25S2	Inner Ring	WSW	2,445	Taylor House
26S3	Inner Ring	W	2,088	Meteorological Tower #2
29S1	Inner Ring	WNW	2,886	Field WNW Sector
31S1	Inner Ring	NW	1,395	NW Sector
34S2	Inner Ring	NNW	3,071	Meteorological Tower #1

Table 5, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance (in feet)	Description
36D1	Outer Ring	N	18,527	Romig Road
2E1	Outer Ring	NNE	25,112	Laughing Water
4E1	Outer Ring	NE	25,221	Neiffer Road
7E1	Outer Ring	ENE	22,489	Game Farm
10E1	Outer Ring	E	20,826	Royersford Road
10F3	Outer Ring	ESE	29,442	Trappe Substation
13E1	Outer Ring	SE	22,772	Vaughn Road
16F1	Outer Ring	SSE	26,608	Pikeland Substation
19D1	Outer Ring	S	18,439	Snowden Substation
20F1	Outer Ring	SSW	27,648	Sheeder Substation
24D1	Outer Ring	SW	20,972	Porters Mill Road
25D1	Outer Ring	WSW	21,044	Hoffecker Rd/Keim St
28D2	Outer Ring	W	20,231	West Cedarville Road
29E1	Outer Ring	WNW	26,110	High Substation
31D2	Outer Ring	NW	20,446	Poplar Substation
34E1	Outer Ring	NNW	24,243	Yarnell Road

Table 5, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance (in feet)	Description
5H1	Control	NE	130,742	Birch Station
6C1	Special Interest	NE	11,305	Limerick Airport
9C1	Special Interest	E	11,377	Reed Road
13C1	Special Interest	SE	14,980	King Road
15D1	Special Interest	SE	16,877	Spring City Substation
17B1	Special Interest	S	8,462	Linfield Substation
20D1	Special Interest	SSW	16,157	Ellis Woods Road
31D1	Special Interest	WNW	15,853	Lincoln Substation

6.0 MAPS OF COLLECTION SITES

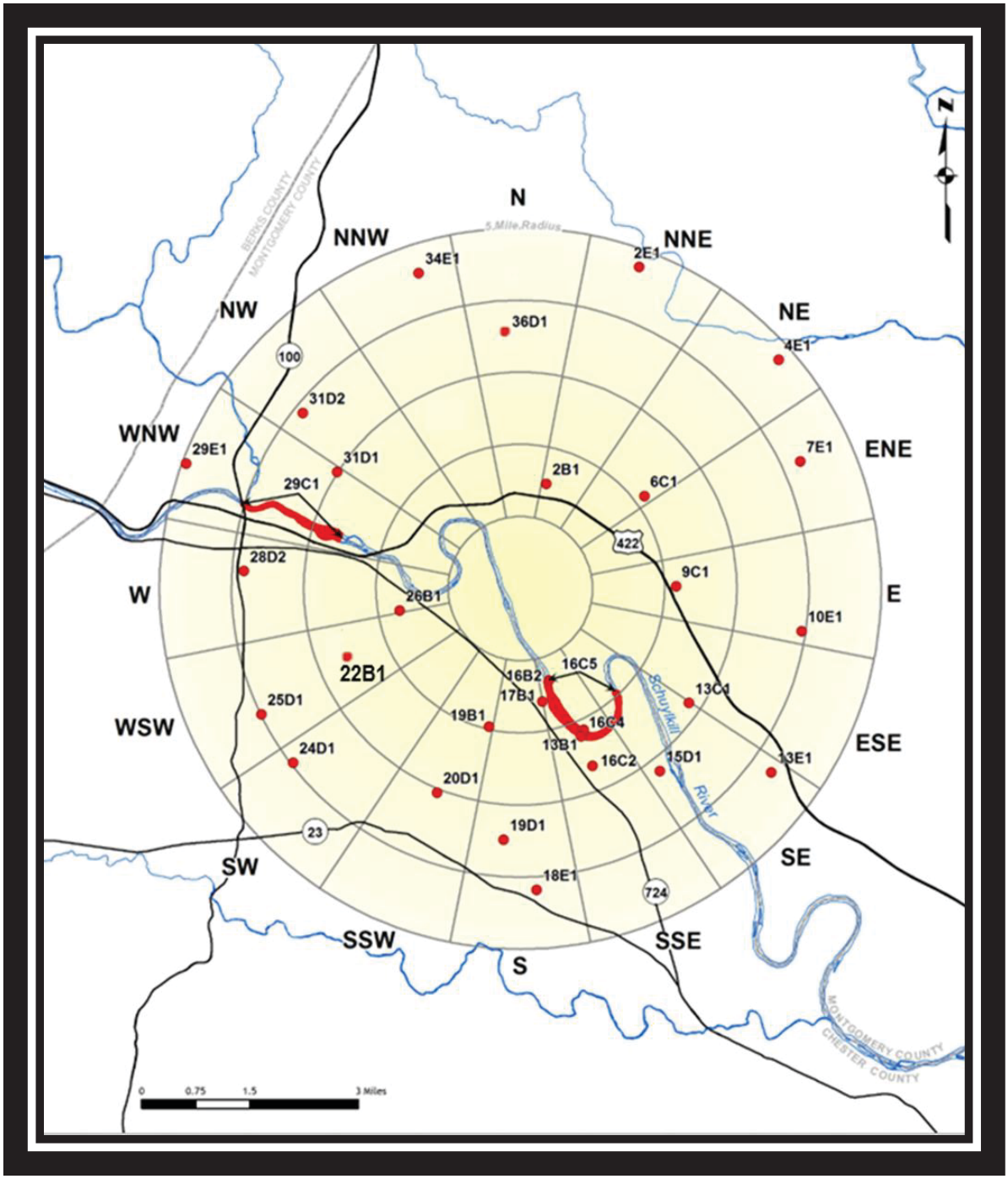

Figure 2, REMP Sample Locations at Distances Less than Five Miles from the Limerick Generating Station

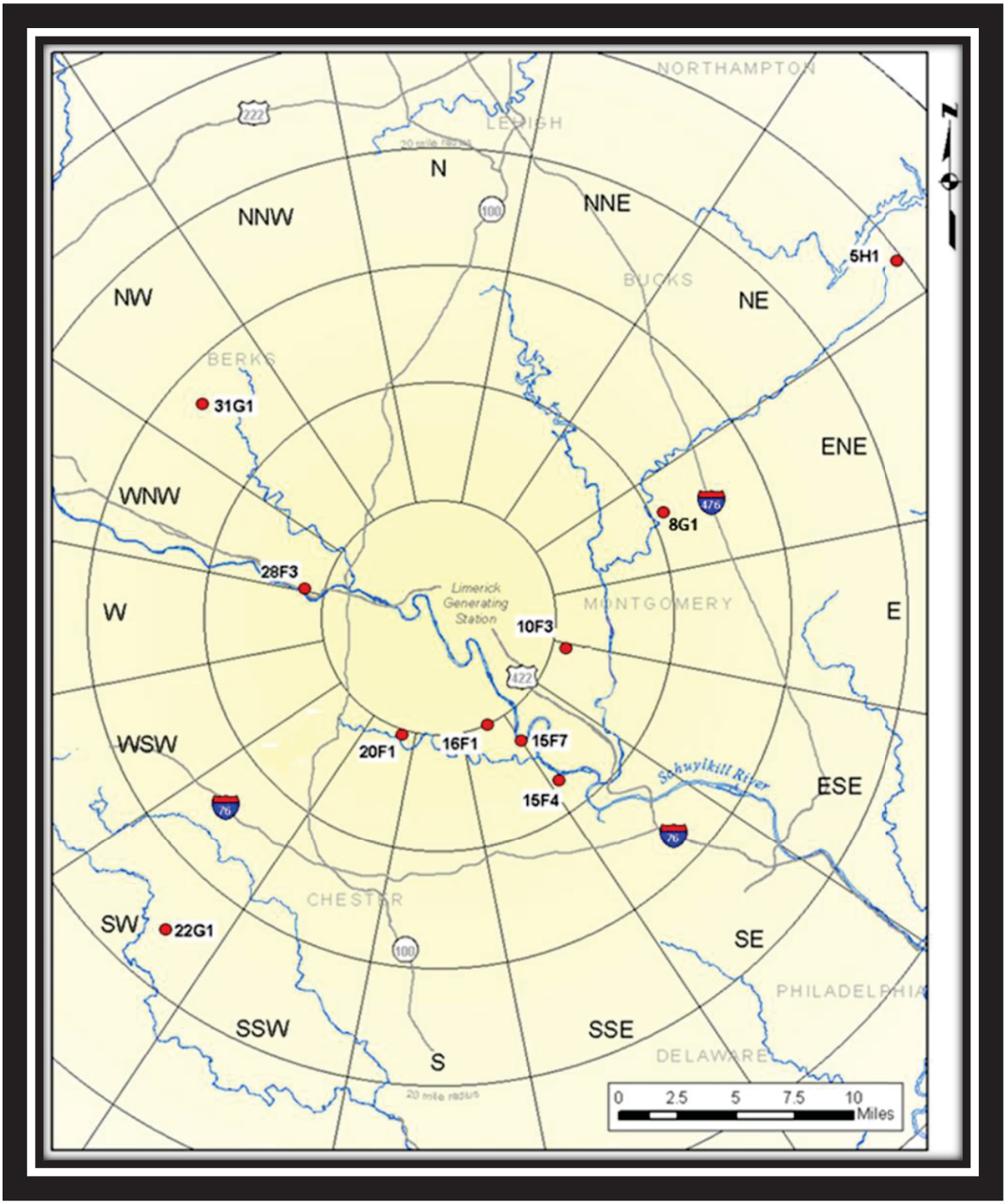

Figure 3, REMP Sample Locations at Distances Greater than Five Miles from the Limerick Generating Station

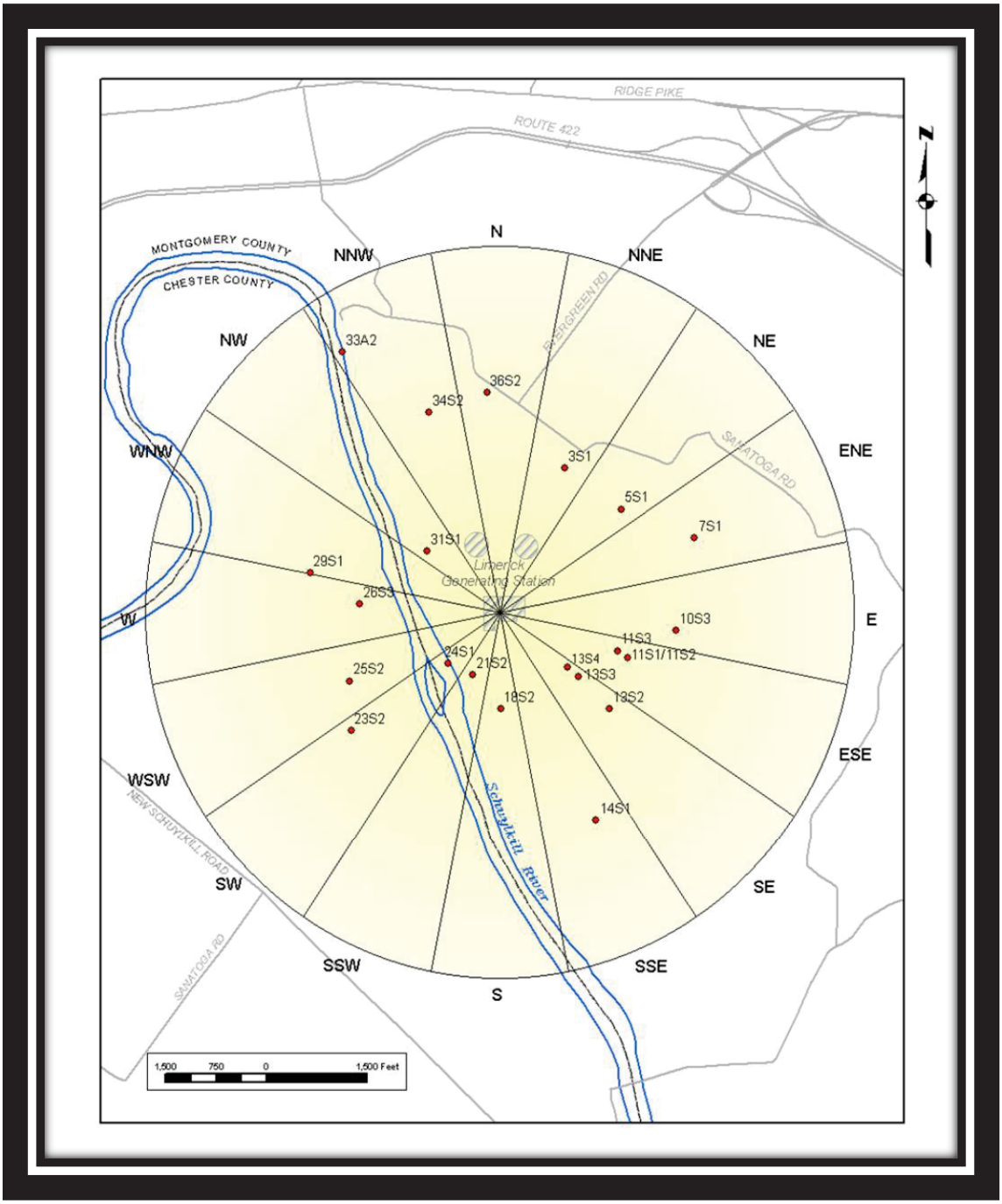

Figure 4, REMP Sample Locations on Site or Near the Limerick Generating Station

7.0 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Table 6, 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	20,000 (1)				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2 (2)	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

Table 7, 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	0.01				
H-3	2,000 (3)					
Mn-54	15		130			
Fe-59	30		260			
Co-58, Co-60	15		130			
Zn-65	30		260			
Zr-95, Nb-95	30, 15					
I-131	1 (4)	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-140, La-140	60, 15			15		

[1] For drinking water samples: If no drinking water pathway exists, a value of 30,000 pCi/L may be used.
[2] If no drinking water pathway exists, a value of 20 pCi/l may be used
[3] If no drinking water pathway exists, a value of 3,000 pCi/L may be used. Some states may require a lower LLD for drinking water sources- per 40 CFR 141 Safe Drinking Water Act.
[4] If no drinking water pathway exists, a value of 15 pCi/l may be used

8.0 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 result of above ground nuclear weapons testing. It is important to note, levels of Cs-137 in the 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 2024 are described below.

In the following sections, results from direct radiation, air, water, and food products analyzed as part of REMP in 2024 will be discussed. Sampling program descriptions and deviations will also be discussed.

8.1 Environmental Direct Radiation Dosimetry 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 [19], 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.

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 background. Due to natural background variations and measurement sensitivities and uncertainties, minimum differential dose is not zero. MDD is calculated based on statistical performance of the dosimetry system in the environment and is site specific.

Normalized 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.

During the calendar year 2024, a total of 40 locations were monitored and data analyzed in accordance with the requirements in Table 1, Radiological Environmental Monitoring Program – Direct Radiation. Attachment 4, Environmental Direct Radiation Dosimetry Results, provides the annual direct radiation dosimetry analysis.

There was no direct radiation dose detected from the facility. All OSLD measurements were analyzed, and none were found to have radiation levels that had increased over normal background radiation levels.

8.2 Air Particulate and Radioiodine Sample Results

Air particulate filters and charcoal canisters were collected from locations specified in Table 1, Radiological Environmental Monitoring Program – Direct Radiation. During the calendar year 2024, a total of 364 samples were collected and analyzed for gross beta, gamma emitters, and iodine. Particulate samplers are used to continuously collect airborne particulates on a filter. The samples are analyzed for gross beta activity following filter changeout, which occurs weekly. Gamma isotopic analysis is also performed on the samples collected at each location and is analyzed quarterly.

Air particulate samples were analyzed for concentrations of gross beta and gamma-emitting nuclides. Gross beta and cosmogenic naturally occurring beryllium-7 (Be-7) were detected at levels consistent with those detected in previous years. No fission or activation products were detected. High-sensitivity I-131 analyses were performed on weekly air samples. All I-131 results were less than minimum detectable activity. Gross Beta results are plotted in Figure 5, below.

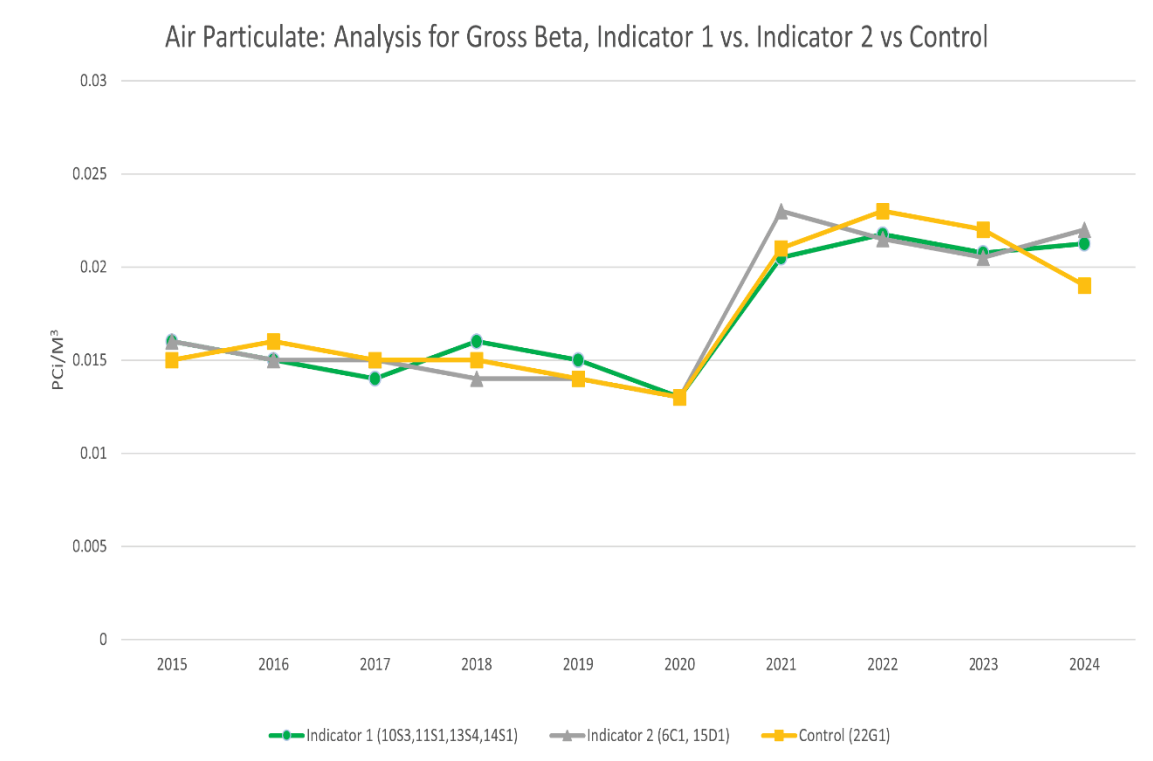

Figure 5, Air Particulate: Analysis for Gross Beta, Average for Group 1 Indicator vs. Group 2 Indicator vs. Control Location

Air particulate and radioiodine results from this monitoring period, 2024, were compared to 10 year average as shown in Figure 5, and there were no significant changes.

8.3 Waterborne Sample Results

8.3.1 Surface Water (i.e., Bay, Lake etc.)

Composite water samples are collected monthly at the upstream control location and at the downstream indicator locations. Monthly composite samples are analyzed for gamma emitters. Aliquots from the monthly composites are combined to form a quarterly composite, which is then analyzed for tritium. Tritium was not detected in any samples in 2024, as tritium concentrations were below minimum detectable activity. During the calendar year 2024, a total of 24 surface water samples were collected and analyzed in accordance with the requirements in the ODCM and shown in Table 3, Radiological Environmental Monitoring Program – Waterborne. Tritium concentrations in surface water were well below the EPA tritium drinking water limit of 20,000 pCi/L.

The ODCM does not require low level iodine analysis from locations 13B1 and 24S1. Thus, beginning in 2024, 24S1 is no longer analyzed for low level iodine. Figure 6 shows surface water tritium results for the last 10 years.

ODCM requires gamma isotopic analysis on monthly samples and tritium analysis quarterly on composited samples. (ODCM Table 3.3-1 3.WATERBORNE, a. Surface, 4th column).

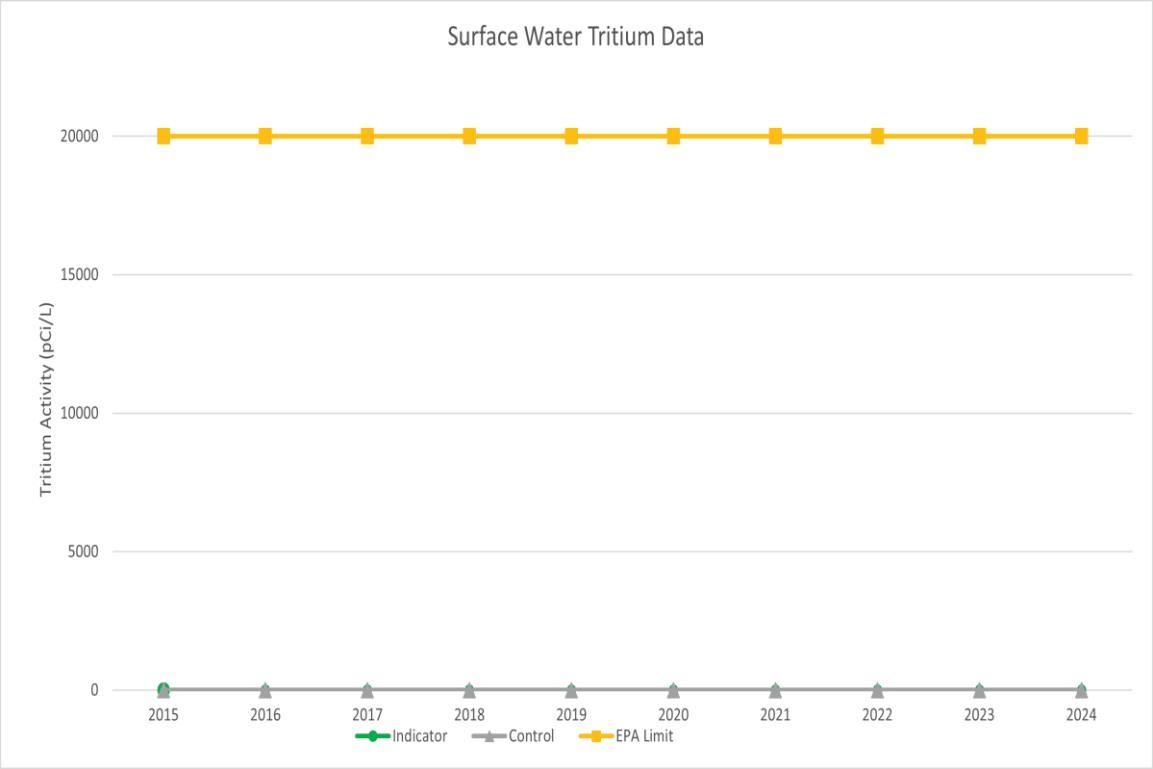

Figure 6, Surface Water Tritium Results

8.3.2 16C2 Beta Analysis Comparison; CGS vs. TBE 2024

Constellation Generation Solutions (CGS) Laboratory participates in a split sample program with Teledyne Brown Engineering (TBE). Below is the comparison of the 2024 split sample analyses of 16C2 for beta emitters.

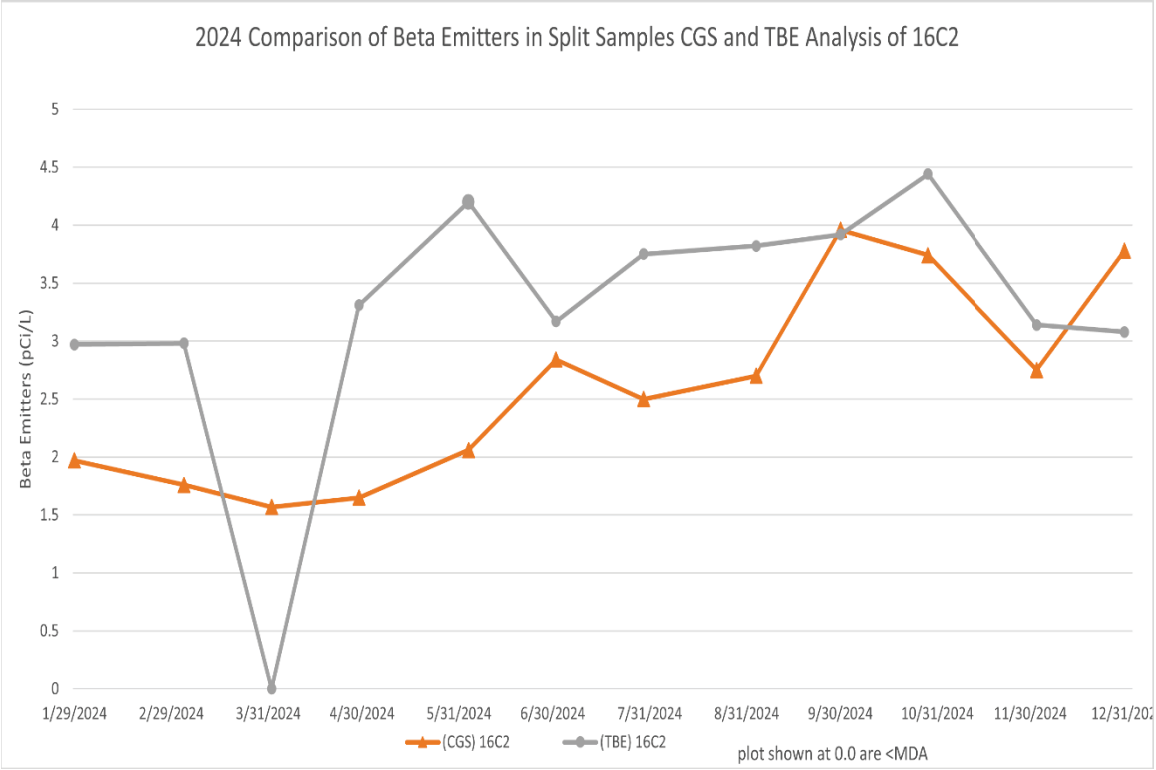

Figure 7, 2024 Comparison of Beta Emitters in Split Samples CGS and TBE Analysis of 16C2

8.3.3 Drinking Water

A total of 48 drinking water samples were obtained in 2024. These samples were analyzed for gross beta, low level iodine, and gamma analysis monthly. These samples were analyzed for tritium quarterly in accordance with requirements in the ODCM and shown in Table 3, Radiological Environmental Monitoring Program – Waterborne. Total gross beta activities detected were consistent with those detected in previous years. No other fission or activation products were detected. Tritium concentrations in drinking water were less than MDA, thus far below the EPA tritium drinking water limit of 20,000 pCi/L.

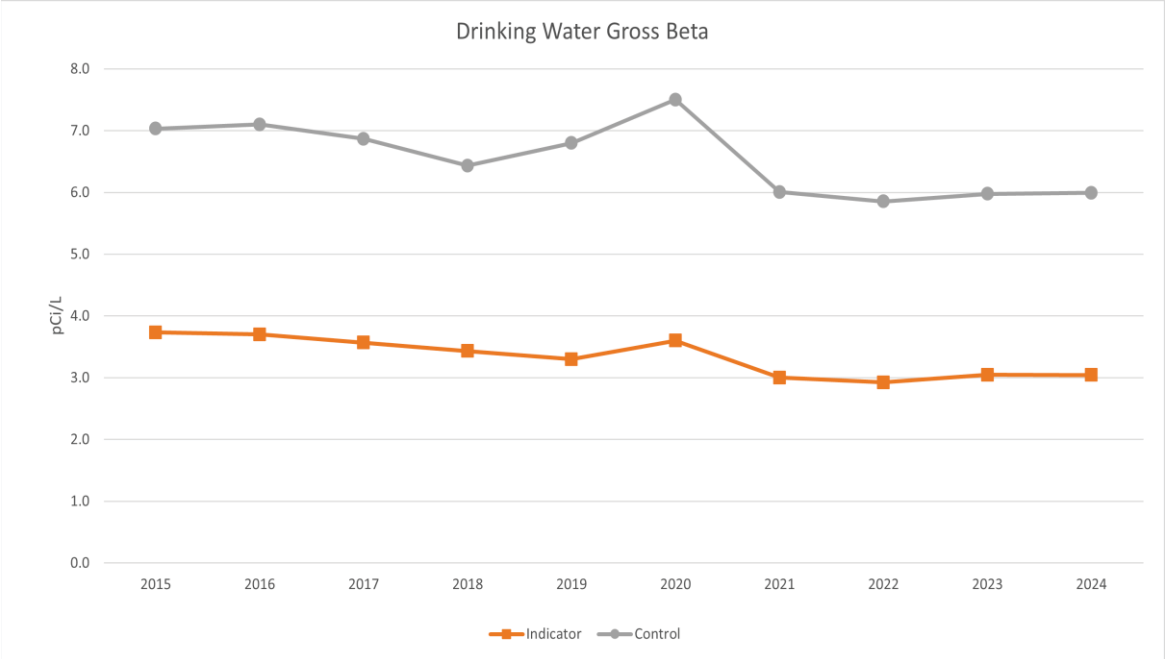

Figure 8, Drinking Water Gross Beta Samples Control vs. Indicator Comparison

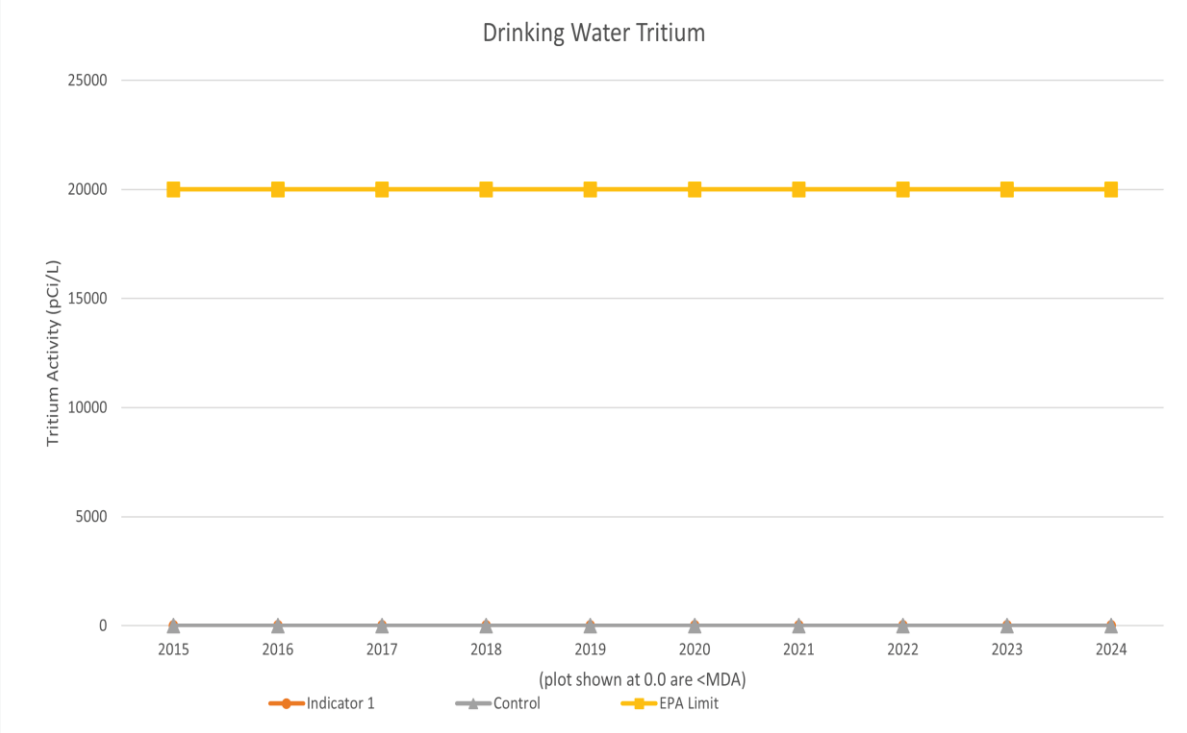

Figure 9, Drinking Water Tritium Sample Results

8.3.4 Sediment from Shoreline

Shoreline sediment collections were made in June and November of 2024 and analyzed for gamma-emitting isotopes. Samples are collected at both indicator and control locations. A total of 6 shoreline samples were analyzed in accordance with requirements in the ODCM and shown in Table 3, Radiological Environmental Monitoring Program – Waterborne.

Sediment samples from all locations were analyzed for gamma-emitting nuclides. All analyses were less than minimum detectable activities. No fission or activation products were detected.

8.4 Ingestion Pathway Sample Results

8.4.1 Milk

Milk samples from milking animals were collected at 3 locations within 5 km having the highest dose potential, along with samples collected from a control location 15-30 km in the least prevalent wind direction. Samples were collected and analyzed monthly when cows were not on pasture and biweekly when cows were on pasture. Samples were analyzed for low level iodine and gamma-emitting nuclides. Concentrations of naturally occurring potasssium-40 were consistent with those detected in previous years. No fission or activation products were found.

8.4.2 Fish and Invertebrates

A total of 8 fish samples were collected in 2024. These samples were analyzed for gamma emitting radionuclides in edible portions, in accordance with requirements of the ODCM and summarized in Table 4, Radiological Environmental Monitoring Program – Ingestion. These samples are collected from the indicator and control areas as required by the ODCM (with a bottom feeder species and a predator species collected at each location). All non-natural gamma emitters were less than the minimal detectable activity. Concentrations of naturally occurring potassium-40 (K-40) were consistent with those detected in previous years.

8.4.3 Food Products

A total of 36 vegetation samples were analyzed in 2024 for gamma emitting radionuclides in accordance with requirements of the ODCM, as summarized in Table 4, Radiological Environmental Monitoring Program – Ingestion.

8.4.4 Leafy Vegetation

In accordance with the ODCM and as described in Table 4, Radiological Environmental Monitoring Program – Ingestion, 36 broad leaf vegetation samples were collected from growing locations nearest site boundary in areas of highest predicted annual average ground level D/Q. Samples are collected and analyzed for gamma isotopic activity from the indicator and control locations monthly during growing season. It is common to detect Cs-137 in broadleaf samples at both indicator and control locations. Cs-137 can be attributed to offsite sources such as weapons testing, Chernobyl, and Fukushima events. All non-natural gamma emitters were less than the minimal detectable activity.

9.0 LAND USE CENSUS

An annual land use census is required by the Offsite Dose Calculation Manual and 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. The land use census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR 50 [1]. NUREG-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-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 2024, within the growing season, to identify changes in land use, receptor locations, and new exposure pathways. The results for the 2024 Land Use Census are listed in Table 8: Land Use Census – Nearest Receptors within 5 miles. The nearest gardens in all other sectors reported in the 2024 report are the same as the previous year’s report. There was no observed water usage for agricultural irrigation of root vegetables drawn directly from the Schuylkill River downriver from Limerick Generating Station.

Table 8, Land Use Census – Nearest Receptors within 5 Miles

Sector	Direction	Nearest Residence (Miles)	Nearest Garden (1) (Miles)	Nearest Dairy Animal (Miles)
A	N	0.63	0.63	Not Found in Sector
B	NNE	0.72	0.72	Not Found in Sector
C	NE	2.64	2.64	Not Found in Sector
D	ENE	1.41	1.41	10.32*
E	E	0.78	0.78	Not Found in Sector
F	ESE	0.65	0.65	Not Found in Sector
G	SE	1.21	1.21	Not Found in Sector
H	SSE	1.31	1.31	Not Found in Sector
J	S	1.16	1.16	4.19*
K	SSW	1.09	1.09	1.97*
L	SW	1.20	1.20	3.79*
M	WSW	0.84	0.84	Not Found in Sector
N	W	1.68	1.68	Not Found in Sector
P	WNW	0.84	0.84	Not Found in Sector
Q	NW	1.55	1.55	Not Found in Sector
R	NNW	1.36	1.36	Not Found in Sector
(1) Larger than 500 square feet (as can best be determined from a distance)				
* Denotes current REMP Dairy sample location				
Red Denotes the site/site information has been updated from the previous year's Land Use Census				

10.0 SAMPLE DEVIATIONS, ANOMALIES AND UNAVAILABILITY

Sampling and analysis are performed for media types addressed in the Offsite Dose Calculation Manual (ODCM). Sampling and analysis challenges may be experienced due to a multitude of reasons including environmental factors, loss of OSLDs, contamination of samples, etc. To aid classification of sampling and analysis challenges experienced in 2024, the following three terms are used to describe the issues: Sample Anomalies, Sample Deviation, and Unavailable Samples.

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 prevent the sample from being analyzed as it normally would, or errors that 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. There were no sample deviations or anomalies that required corrective action.

Table 9, Sample Deviation Summary

Sample Type and Analysis	Location	Collection Date or Period	Reason for not conducting REMP sampling as required by ODCM	Plans for preventing reoccurrence
N/A				

11.0 OTHER SUPPLEMENTAL INFORMATION

11.1 Offsite Dose Calculation Manual (ODCM) Changes

Date of Change	Revision	Description of Change
3/18/2024	35	The ODCM revision 35 changes included revising Table A-1 “Radiological Environmental Monitoring Program” to remove inactive milk farm 25C1 and replace with milk farm 22B1 due to the milk farm going out of business. Revised Table A-1 “Radiological Environmental Monitoring Program” to remove inactive control milk farm 23F1 and replace with control milk farm 8G1 due to the milk farm going out of business. Revised Table II2-32 “Nearest Gaseous Effluent Dose Receptors Distances” to reflect the 2022 Land Use Census Results. Revised table to fix Table A-1 typographical error for number of TLDs at each REMP TLD location. Each TLD used to have 4 elements each, now each OSLD has 2 elements each. Revised Table A-1 to fix typographical error for airborne 6C1 sector from N to NE. Air sampler 6C1 Location is in the right sector based on coordinates and map was incorrect in Table A-1.
10/4/2024	36	The ODCM revision 36 changes included revising Table 4.2-1 "Radioactive Liquid Waste Sampling and Analysis Program". The Hold Pond sampling frequency and minimum analysis frequency of principal gamma emitters, I-131, dissolved and entrained gases (gamma emitters) was changed from D (Daily), at least once per 24 hours to once per calendar day. The Note g, Samples from the Hold Pond are grab samples obtained daily, was also deleted. The Hold Pond was added to the ODCM revision 33 as a liquid discharge point. The sample table frequency in the ODCM is based on technical specifications and daily means once per 24 hours. Sampling once per calendar day is a more conservative sample and analysis frequency to ensure the Hold Pond is sampled every calendar day.

11.2 NEI 07-07 Onsite Radiological Groundwater Monitoring Program

Limerick Generating Station 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 that samples and results taken in support of NEI 07-07 on-site groundwater monitoring program are separate from the Radiological Environmental Monitoring Program (REMP).

The Station conformed with its Radiological Groundwater Protection Program (RGPP) in 2024 with respect to sampling protocol. The 2024 RGPP sample locations effectively monitored Systems, Structures, and Components of the Station. Therefore, RGPP sample locations should continue to be sampled in accordance with site procedures. Based on precipitation recapture sample results, tritium present in precipitation is not likely to adversely affect groundwater conditions at the Station. Based on the evaluation of groundwater flow direction, the wells sampled effectively monitored groundwater conditions at the facility.

There were no spills to ground containing radioactive material in 2024.

Samples were collected from onsite wells throughout the year in accordance with the station RGPP. Analytical results and anomalies are discussed below:

RGPP Wells:

Tritium

Limerick Generating Station has two background, four perimeter, and seven source designated wells that are sampled as part of the RGPP. Samples collected from source designated wells are analyzed for tritium quarterly; and samples collected from background and perimeter designated wells are analyzed for tritium annually. Samples from 13 locations were analyzed for tritium activity. Tritium values ranged from non-detectable to 3,580 pCi/L. There is no drinking water pathway available from these groundwater sample locations.

Strontium

Samples were analyzed for Sr-89 and Sr-90 and were not detected at concentrations greater than their respective LLDs in samples collected in 2024.

Gross Alpha (dissolved and suspended)

Gross-alpha (dissolved) was detected in four samples collected during the 2nd quarter 2024 RGPP sampling round. The gross-alpha concentrations did not exceed the current Alert Levels (three times the historic average).

Gamma Emitters

Gamma-radionuclide analysis was performed during the 2nd quarter 2024 RGPP sampling round. Gamma radionuclides, associated with station radionuclides, were not detected at concentrations exceeding their respective LLDS in 2024. The next time gamma-radionuclide analysis will be performed is 2026.

Select Transuranics

No samples were analyzed for select transuranics in 2024.

Hard-To-Detect

Hard-to-detect (HTD) analyses were performed in 2021 on 7 groundwater locations. Hard to detects (Fe-55 and Ni-63) were not detected at concentrations greater than their respective LLDs. The next sampling event is scheduled to take place in 2026.

Precipitation Recapture:

Tritium

The Station collected precipitation recapture samples in January and July 2024. Eight samples were collected during the January and July 2024 sampling rounds. Tritium was detected in six of the eight samples collected in January 2024 with detections ranging between 214 pCi/L (RS-4, south-southwest sector) and 516 pCi/L (RS-3, southwest sector). Tritium was not detected in the samples collected during the July 2024 precipitation sampling round.

Intermittent, low-level tritium detections in monitoring well MW-LR-9 are currently being investigated. Tritium concentrations in MW-LR-9 decreased to historic concentrations since the Unit 1 Steam Seal Evaporator was temporarily repaired on December 17, 2023. As of the 4th quarter 2024, the maximum tritium concentration was 1,920 pCi/L (MW-LR-9). This is documented in issue report 04540232.

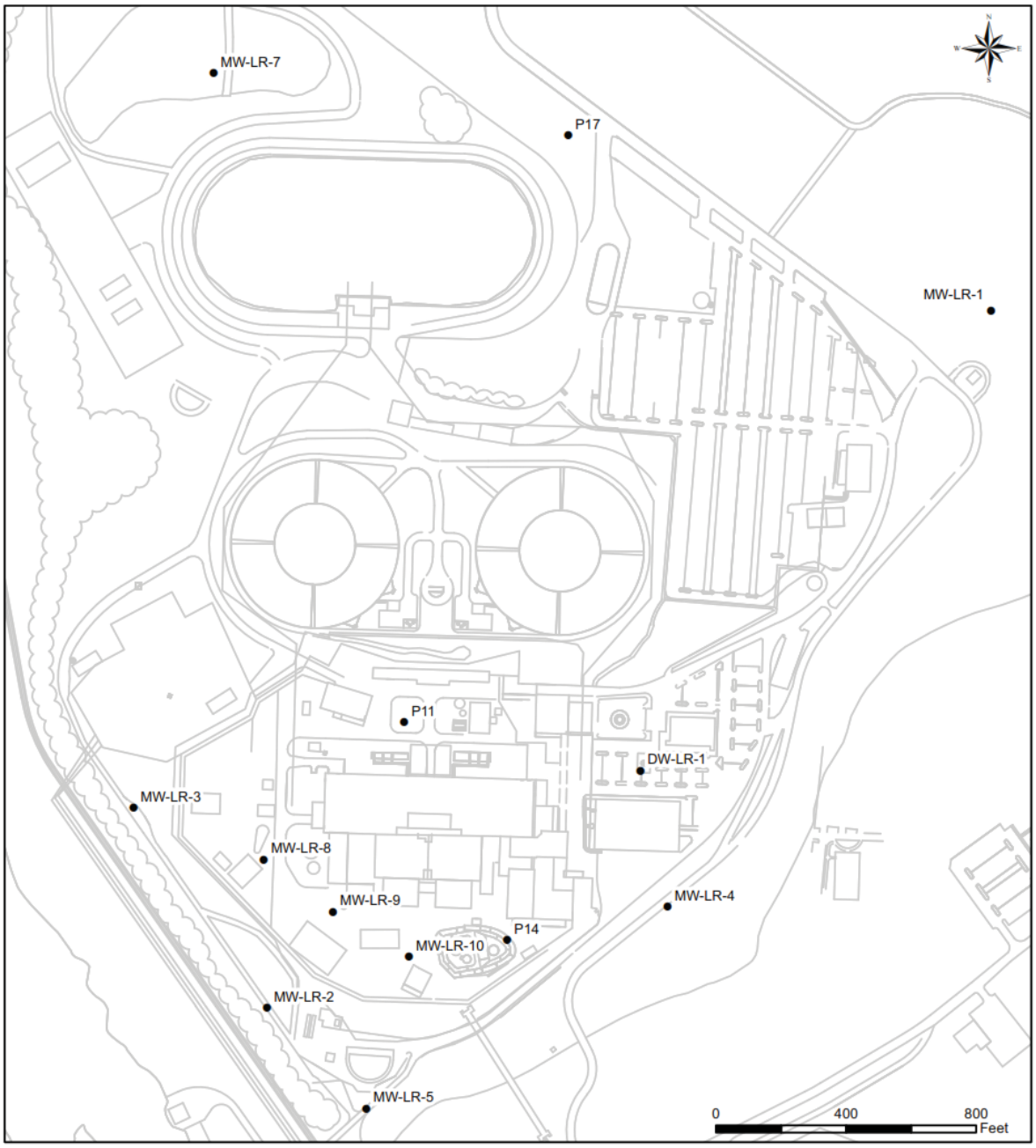

Figure 10, RGPP Sample Locations

11.3 Independent Spent Fuel Storage Installation (ISFSI) Monitoring Program

On July 21, 2008, an ISFSI pad was placed in service. The results from the dosimeter location 36S2 were used to determine the direct radiation exposure to the nearest residence from the ISFSI pad. For the 10 CFR 20.2002 permitted storage area, 0 cubic feet was placed on the pad.

11.4 Corrections to Previous Reports

11.4.1 2023 AREOR

1. In the 2023 AREOR, it was identified that the dose totals for Tables 1 and 2 should include a summation of all (Units 0, 1, and 2) release points. The spreadsheets (for Gaseous Releases only) used to calculate these values only included Unit 0. The changes to final numbers were negligible against totals and dose limits, which resulted in them not being initially identified. Adding Unit 1 and 2 gaseous release values had no significant impact on margin to any dose limits. Specifically, all values are less than or equal to 10 percent of their applicable dose limits (in all cases less than 0.01 percent of allowed limits were observed). These errors are documented in issue report 04853176. Table 1 note 2 was removed from Gaseous – Noble Gas due to separation of gaseous effluents.

2. In 2023, the tritium released from the U1 and U2 MTLO Exhaust Vents was greater than 1 percent when compared to all gaseous tritium released from the site. The increase of tritium in the U1 and U2 MTLO Exhaust Vents in 2023 compared to previous years was due to a decrease in the site gaseous tritium released. Per RG 1.21 Revision 2, a significant release point is when any location from which radioactive material is released, contributes greater than 1 percent of the activity discharged from all the release points for a particular type of effluent considered. A significant release point is required to be included in the dose summary tables of the AREOR. There were 12 U1 MTLO Exhaust Vent abnormal release permits and 12 U2 MTLO Exhaust Vent abnormal release permits generated for 2023. The U1 and U2 MTLO Exhaust Vents were included in the gaseous dose summary tables. These errors are documented in issue report 04798720.

3. The corrections to the 2023 AREOR Table 1, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS and Table 2, Limerick Generating Station Site Dose Summary are as follows:

Table 1, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for LGS[1]

	Whole Body	Thyroid	Max Other Organ
Limit	**25 mrem**	**75 mrem**	**25 mrem**
Gaseous[2] - Noble Gas	1.08E-03	1.08E-03	1.81E-03
Gaseous - Particulates & Iodine	~~1.13E-04~~ 6.46E-04	~~1.79E-04~~ 7.03E-04	~~1.14E-04~~ 6.53E-04
Carbon-14	2.39E-01	2.39E-01	1.19E+00
Liquid	8.06E-03	4.91E-03	1.04E-02
Direct Shine	0	0	0
Total Site Dose	~~**2.48E-01**~~ **2.49E-01**	~~**2.45E-01**~~ **2.46E-01**	**1.20E+00**
% Contribution of Carbon-14 to Gaseous Dose	96	97	99
Nearby Facility	2.17E-02	2.17E-02	2.17E-02
Total w/Other Nearby Facility[3]2	~~**2.70E-01**~~ **2.71E-01**	~~**2.66E-01**~~ **2.67E-01**	**1.22E+00**
% of Limit	**1.08**	**0.36**	~~**4.90**~~ **4.88**

[1] Table 1 is a summation of Units to show compliance with 40 CFR Part 190 Limits.
~~[2] Gaseous dose values in Table 1 include organ dose from Noble Gas, Iodine, Tritium, and particulates.~~
[3]2 Other fuel cycle sources within 5 miles of the site are considered in this analysis.

Table 2, Limerick Generating Station Site Dose Summary[1]

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liquid Effluents						
	Limit	**3 mrem**	**3 mrem**	**3 mrem**	**3 mrem**	**6 mrem**
	Total Body Dose[2]	1.39E-04	5.37E-03	2.56E-03	1.62E-06	8.06E-03
	% Of Limit	0.005	0.179	0.085	<0.001	0.134
	Limit	**10 mrem**	**10 mrem**	**10 mrem**	**10 mrem**	**20 mrem**
	Maximum Organ Dose[3]	1.83E-04	6.75E-03	3.42E-03	1.62E-06	1.04E-02
	% Of Limit	0.002	0.068	0.034	<0.001	0.052
Gaseous Effluents						
	Limit	**10 mrad**	**10 mrad**	**10 mrad**	**10 mrad**	**20 mrad**
	Gamma Air Dose[4]	3.45E-04	6.35E-04	1.07E-04	5.54E-05	1.14E-03
	% Of Limit	0.003	0.006	0.001	0.001	0.006
	Limit	**20 mrad**	**20 mrad**	**20 mrad**	**20 mrad**	**40 mrad**
	Beta Air Dose[5]	2.04E-04	3.97E-04	6.39E-05	3.24E-05	6.97E-04
	% Of Limit	0.001	0.002	<0.001	<0.001	0.002
	Limit	**5 mrem**	**5 mrem**	**5 mrem**	**5 mrem**	**10 mrem**
	NG Total Body Dose[6]	3.28E-04	6.02E-04	1.02E-04	5.28E-05	1.08E-03
	% Of Limit	0.007	0.012	0.002	0.001	0.011
	Limit	**15 mrem**	**15 mrem**	**15 mrem**	**15 mrem**	**30 mrem**
	NG Skin Dose[7]	5.43E-04	1.01E-03	1.68E-04	8.76E-05	1.81E-03
	% Of Limit	0.004	0.007	0.001	0.001	0.006
	Limit	**15 mrem**	**15 mrem**	**15 mrem**	**15 mrem**	**30 mrem**
	Maximum Organ Dose[8]	~~1.04E-05~~ 1.79E-05	~~5.99E-05~~ 5.05E-04	~~4.05E-05~~ 4.79E-05	~~6.78E-05~~ 1.32E-04	~~1.79E-04~~ 7.03E-04
	% Of Limit	<0.001	~~<0.001~~ 0.003	<0.001	~~<0.001~~ 0.001	~~0.001~~ 0.002

[1] Table 2 demonstrates compliance with 10 CFR Part 50, App. I Limits. Carbon-14 dose is not included in this table.
[2] Adult, LGS Outfall
[3] Teenager, LGS Outfall, Liver
[4] Site Boundary, All Age Groups
[5] Site Boundary, All Age Groups
[6] Site Boundary, All Age Groups
[7] Site Boundary, All Age Groups
[8] Child, Vegetation, Thyroid

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- c. GL-RAD-A-004 Sr89/90, Liquid
- d. GL-RAD-A-040 Fe-55

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- d. TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices
- e. TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation
- f. TBE-2012 Radioiodine in Various Matrices
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[35] GHD, Inc. Hydrogeologic Investigation Report, Limerick Generating Station, 3146 Sanatoga Road, Pottstown, Pennsylvania, Ref. No. 11189800(1), December, 2019

Attachment 1, Data Table Summary

Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)	Lower Limit of Detection (LLD)	Indicator Mean[1]; (f^2). Range[1]	Location with Highest Annual Mean		Control Mean[1] (f^2). Range[1]	Number of Nonroutine Reported Measurements
				Name Distance and Direction	Mean[1] (f^2) Range[1]		
Air Particulates (pCi/m^3)	Gross Beta, (364)	1.0	2.12E-02 (312/312) (5.73E-03-5.41E-02)	13S4, 1,186 feet SE	2.25E-02 (52/52) (6.45E-03-4.02E-02)	1.90E-02 (52/52) (6.52E-03-3.24E-02)	0
Direct Radiation (mrem/qtr.)	OSLD (320)	N/A	17.5 (312/312) (11.1-26.4)	13S2, 2,149 feet SE	25.10 (8/8) (23.7-26.4)	21.40 (8/8) (18.1-25.2)	0
Surface Water (pCi/L)	Gross Beta (48)	4	3.04, (36/36) (1.57-5.16)	15F4, 45,514 feet SE	3.39, (12/12) (1.84-5.16)	2.95 (12/12) (1.84-4.09)	0

[1] Mean and range are based on detectable measurements only.
[2] Fraction of detectable measurements at specified locations is indicated in parentheses.

Attachment 2, Complete Data Table for All Analysis Results Obtained In 2024

Table 10, Monthly Sample Results

Monthly Radionuclides in Surface Water (pCi/L)

	24S1 (Control)			13B1		
Date	Gamma Emitters	Gross Beta Activity	Uncertainty (2-σ)	Gamma Emitters	Gross Beta Activity	Uncertainty (2-σ)
1/29/2024	*	ND	ND	*	ND	ND
3/4/2024	*	ND	ND	*	ND	ND
4/1/2024	*	ND	ND	*	ND	ND
4/29/2024	*	ND	ND	*	ND	ND
6/3/2024	*	ND	ND	*	ND	ND
7/1/2024	*	ND	ND	*	ND	ND
7/29/2024	*	ND	ND	*	ND	ND
9/3/2024	*	ND	ND	*	ND	ND
9/30/2024	*	ND	ND	*	ND	ND
10/28/2024	*	ND	ND	*	ND	ND
12/2/2024	*	ND	ND	*	ND	ND
12/30/2024	*	ND	ND	*	ND	ND

Table 10, Monthly Sample Results

Monthly Radionuclides in Drinking Water (pCi/L)

	28F3 (Control)			16C2			15F4			15F7		
Date	Gamma Emitters	Gross Beta Activity	Uncertainty (2-σ)	Gamma Emitters	Gross Beta Activity	Uncertainty (2-σ)	Gamma Emitters	Gross Beta Activity	Uncertainty (2-σ)	Gamma Emitters	Gross Beta Activity	Uncertainty (2-σ)
1/29/2024	*	2.22E+00	8.28E-01	*	1.97E+00	8.20E-01	*	1.84E+00	8.05E-01	*	1.85E+00	8.01E-01
3/4/2024	*	1.84E+00	7.85E-01	*	1.76E+00	7.84E-01	*	1.85E+00	7.90E-01	*	1.70E+00	7.75E-01
4/1/2024	*	2.11E+00	8.03E-01	*	1.57E+00	7.70E-01	*	2.48E+00	8.29E-01	*	2.16E+00	8.03E-01
4/29/2024	*	1.91E+00	7.50E-01	*	1.65E+00	7.36E-01	*	2.16E+00	7.69E-01	*	1.80E+00	7.41E-01
6/3/2024	*	2.54E+00	8.04E-01	*	2.06E+00	7.72E-01	*	2.80E+00	8.23E-01	*	3.39E+00	8.62E-01
7/1/2024	*	3.22E+00	8.25E-01	*	2.84E+00	8.01E-01	*	3.92E+00	8.73E-01	*	3.81E+00	8.68E-01
7/29/2024	*	4.09E+00	9.14E-01	*	2.50E+00	8.10E-01	*	4.04E+00	9.10E-01	*	2.68E+00	8.76E-01
9/3/2024	*	2.85E+00	8.38E-01	*	2.70E+00	8.27E-01	*	3.64E+00	8.93E-01	*	3.59E+00	8.86E-01
9/30/2024	*	3.48E+00	8.19E-01	*	3.96E+00	8.51E-01	*	4.70E+00	9.02E-01	*	4.76E+00	9.06E-01
10/28/2024	*	3.88E+00	9.29E-01	*	3.74E+00	9.22E-01	*	4.29E+00	9.55E-01	*	4.60E+00	9.76E-01
12/2/2024	*	4.00E+00	9.56E-01	*	2.75E+00	8.76E-01	*	5.16E+00	1.02E+00	*	3.96E+00	9.52E-01
12/30/2024	*	3.24E+00	8.59E-01	*	3.78E+00	1.13E+00	*	3.81E+00	8.96E-01	*	3.27E+00	8.62E-01

Table 10, Monthly Sample Results

Monthly Radionuclides in Milk (pCi/L)

Date	18E1	19B1	22B1	8G1 (Control)
1/17/2024	*	*	*	*
2/12/2024		*	*	*
2/13/2024	*			
3/12/2024	*	*	*	*
4/2/2024	*	*	*	*
4/16/2024	*	*	*	*
4/30/2024	*	*	*	*
5/14/2024	*	*	*	*
5/28/2024	*	*	*	*
6/11/2024	*	*	*	*
6/25/2024	*	*	*	*
7/9/2024	*	*	*	*
7/23/2024	*	*	*	*
8/6/2024	*	*	*	*
8/20/2024	*	*	*	*
9/3/2024	*	*	*	*
9/16/2024	*	*	*	*
10/1/2024	*	*	*	*

Table 10, Monthly Sample Results

Monthly Radionuclides in Milk (pCi/L)

Date	18E1	19B1	22B1	8G1 (Control)
10/14/2024	*	*	*	*
10/28/2024	*	*	*	*
11/12/2024	*	*	*	*
11/25/2024	*	*	*	*
12/10/2024	*	*	*	*

Table 10, Monthly Sample Results

Monthly Radionuclides in Vegetation (pCi/kg wet)

Sample Date	Sample Code	Sample Type	Gamma Emitters
6/18/2024	11S3 ESE Sector at retired LGS Information Center	Horseradish	*
6/18/2024		Broccoli	*
6/18/2024		Collards	*
7/16/2024		Cabbage	*
7/16/2024		Broccoli	*
7/16/2024		Cauliflower	*
8/13/2024		Cabbage	*
8/13/2024		Kale	*
8/13/2024		Collards	*
9/10/2024		Collards	*
9/10/2024		Kale	*
9/10/2024		Horseradish	*

Table 10, Monthly Sample Results

Monthly Radionuclides in Vegetation (pCi/kg wet)

Sample Date	Sample Code	Sample Type	Gamma Emitters
6/18/2024	13S3 SE Sector along Longview Road at the 500Kv substation	Collards	*
6/18/2024		Lettuce	*
6/18/2024		Horseradish	*
7/16/2024		Collards	*
7/16/2024		Cabbage	*
7/16/2024		Broccoli	*
8/13/2024		Cabbage	*
8/13/2024		Collards	*
8/13/2024		Kale	*
9/10/2024		Collards	*
9/10/2024		Horseradish	*
9/10/2024		Kale	*

Table 10, Monthly Sample Results

Monthly Radionuclides in Vegetation (pCi/kg wet)

Sample Date	Sample Code	Sample Type	Gamma Emitters
6/18/2024	31G1 (Control) NW sector, Jollyview Farm	Broccoli	*
6/18/2024		Cauliflower	*
6/18/2024		Kale	*
7/16/2024		Rhubarb	*
7/16/2024		Cabbage	*
7/16/2024		Squash	*
8/13/2024		Rhubarb	*
8/13/2024		Cabbage	*
8/13/2024		Squash	*
9/10/2024		Squash	*
9/10/2024		Collards	*
9/10/2024		Rhubarb	*

* All Non-Natural Radionuclides <MDA
ND - No Data, Sample collected as required.

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for I-131 (pCi/m3)

Date	6C1	10S3	11S1	14S1	13S4	15D1	22G1 (Control)
1/8/2024	*	*	*	*	*	*	*
1/16/2024	*	*	*	*	*	*	*
1/22/2024	*	*	*	*	*	*	*
1/29/2024	*	*	*	*	*	*	*
2/6/2024	*	*	*	*	*	*	*
2/12/2024	*	*	*	*	*	*	*
2/19/2024	*	*	*	*	*	*	*
2/26/2024	*	*	*	*	*	*	*
3/4/2024	*	*	*	*	*	*	*
3/11/2024	*	*	*	*	*	*	*
3/18/2024	*	*	*	*	*	*	*
3/25/2024	*	*	*	*	*	*	*
4/1/2024	*	*	*	*	*	*	*
4/8/2024	*	*	*	*	*	*	*
4/15/2024	*	*	*	*	*	*	*
4/22/2024	*	*	*	*	*	*	*
4/29/2024	*	*	*	*	*	*	*
5/6/2024	*	*	*	*	*	*	*
5/13/2024	*	*	*	*	*	*	*
5/20/2024	*	*	*	*	*	*	*
5/28/2024	*	*	*	*	*	*	*

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for I-131 (pCi/m3)

Date	6C1	10S3	11S1	14S1	13S4	15D1	22G1 (Control)
6/3/2024	*	*	*	*	*	*	*
6/10/2024	*	*	*	*	*	*	*
6/17/2024	*	*	*	*	*	*	*
6/25/2024	*	*	*	*	*	*	*
7/1/2024	*	*	*	*	*	*	*
7/8/2024	*	*	*	*	*	*	*
7/15/2024	*	*	*	*	*	*	*
7/22/2024	*	*	*	*	*	*	*
7/29/2024	*	*	*	*	*	*	*
8/5/2024	*	*	*	*	*	*	*
8/12/2024	*	*	*	*	*	*	*
8/19/2024	*	*	*	*	*	*	*
8/26/2024	*	*	*	*	*	*	*
9/3/2024	*	*	*	*	*	*	*
9/9/2024	*	*	*	*	*	*	*
9/16/2024	*	*	*	*	*	*	*
9/23/2024	*	*	*	*	*	*	*
9/30/2024	*	*	*	*	*	*	*
10/7/2024	*	*	*	*	*	*	*
10/14/2024	*	*	*	*	*	*	*

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for I-131 (pCi/m3)

10/21/2024	*	*	*	*	*	*	*
10/29/2024	*	*	*	*	*	*	*
11/4/2024	*	*	*	*	*	*	*
11/11/2024	*	*	*	*	*	*	*
11/18/2024	*	*	*	*	*	*	*
11/25/2024	*	*	*	*	*	*	*
12/2/2024	*	*	*	*	*	*	*
12/9/2024	*	*	*	*	*	*	*
12/16/2024	*	*	*	*	*	*	*
12/23/2024	*	*	*	*	*	*	*
12/30/2024	*	*	*	*	*	*	*

*<MDA, Minimum Detectable Activity

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for Gross Beta activity in Air Particulates (pCi/m^3)

	6C1		10S3		11S1		14S1		13S4		15D1		22G1 (Control)	
Date	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)
1/8/2024	1.21E-02	2.02E-03	1.67E-02	2.20E-03	1.50E-02	2.13E-03	1.42E-02	2.09E-03	1.39E-02	2.08E-03	1.60E-02	2.17E-03	1.46E-02	2.12E-03
1/16/2024	2.72E-02	2.08E-03	2.47E-02	2.01E-03	2.74E-02	2.13E-03	2.34E-02	1.98E-03	1.94E-02	1.84E-03	2.84E-02	2.13E-03	2.00E-02	1.83E-03
1/22/2024	3.12E-02	2.66E-03	2.65E-02	2.51E-03	2.86E-02	2.57E-03	2.62E-02	2.49E-03	3.31E-02	2.73E-03	3.02E-02	2.60E-03	2.66E-02	2.55E-03
1/29/2024	1.79E-02	1.98E-03	1.56E-02	1.90E-03	1.72E-02	1.96E-03	1.50E-02	1.87E-03	1.35E-02	1.81E-03	1.68E-02	1.96E-03	1.30E-02	1.78E-03
2/6/2024	1.62E-02	1.81E-03	1.55E-02	1.78E-03	1.44E-02	1.75E-03	1.32E-02	1.70E-03	1.45E-02	1.75E-03	1.57E-02	1.78E-03	1.44E-02	1.73E-03
2/12/2024	2.02E-02	2.33E-03	2.14E-02	2.37E-03	1.94E-02	2.30E-03	1.88E-02	2.29E-03	2.12E-02	2.36E-03	2.00E-02	2.35E-03	1.84E-02	2.34E-03
2/19/2024	2.50E-02	2.22E-03	2.39E-02	2.19E-03	2.27E-02	2.15E-03	2.05E-02	2.07E-03	2.44E-02	2.20E-03	2.21E-02	2.15E-03	1.95E-02	2.00E-03
2/26/2024	2.13E-02	2.12E-03	2.07E-02	2.10E-03	2.20E-02	2.14E-03	2.02E-02	2.08E-03	2.33E-02	2.19E-03	2.10E-02	2.11E-03	1.86E-02	2.02E-03
3/4/2024	2.26E-02	2.13E-03	2.15E-02	2.10E-03	2.09E-02	2.08E-03	1.93E-02	2.02E-03	2.28E-02	2.14E-03	2.08E-02	2.08E-03	2.00E-02	2.06E-03
3/11/2024	7.76E-03	1.60E-03	6.89E-03	1.56E-03	5.73E-03	1.50E-03	6.17E-03	1.53E-03	6.45E-03	1.54E-03	6.89E-03	1.56E-03	6.52E-03	1.54E-03
3/18/2024	2.88E-02	2.35E-03	2.74E-02	2.31E-03	2.93E-02	2.37E-03	2.85E-02	2.34E-03	2.90E-02	2.36E-03	2.89E-02	2.35E-03	2.75E-02	2.31E-03
3/25/2024	1.41E-02	1.91E-03	1.56E-02	1.96E-03	1.14E-02	1.80E-03	1.26E-02	1.85E-03	1.35E-02	1.88E-03	1.44E-02	1.92E-03	1.32E-02	1.90E-03
4/1/2024	1.83E-02	1.95E-03	2.13E-02	2.06E-03	1.81E-02	1.94E-03	1.65E-02	1.88E-03	1.99E-02	2.01E-03	1.97E-02	2.00E-03	1.77E-02	1.90E-03
4/8/2024	9.30E-03	1.55E-03	7.86E-03	1.48E-03	1.07E-02	1.62E-03	7.86E-03	1.48E-03	9.66E-03	1.57E-03	9.26E-03	1.55E-03	7.54E-03	1.47E-03
4/15/2024	1.96E-02	2.03E-03	1.85E-02	1.99E-03	1.84E-02	1.98E-03	1.66E-02	1.92E-03	1.76E-02	1.96E-03	1.87E-02	2.00E-03	1.72E-02	1.94E-03

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for Gross Beta activity in Air Particulates (pCi/m^3)

	6C1		10S3		11S1		14S1		13S4		15D1		22G1 (Control)	
Date	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)
4/22/2024	1.68E-02	1.97E-03	1.68E-02	1.97E-03	1.60E-02	1.94E-03	1.42E-02	1.87E-03	1.73E-02	1.99E-03	1.75E-02	2.00E-03	1.59E-02	1.94E-03
4/29/2024	2.36E-02	2.24E-03	1.99E-02	2.12E-03	1.93E-02	2.10E-03	1.88E-02	2.09E-03	2.15E-02	2.18E-03	1.98E-02	2.13E-03	1.97E-02	2.16E-03
5/6/2024	1.79E-02	2.04E-03	1.79E-02	2.04E-03	1.64E-02	1.98E-03	1.42E-02	1.89E-03	1.82E-02	2.04E-03	1.87E-02	2.05E-03	1.46E-02	1.87E-03
5/13/2024	1.22E-02	1.79E-03	1.11E-02	1.75E-03	1.17E-02	1.77E-03	7.80E-03	1.60E-03	1.25E-02	1.80E-03	1.25E-02	1.80E-03	1.07E-02	1.73E-03
5/20/2024	1.46E-02	1.91E-03	1.54E-02	1.94E-03	1.53E-02	1.94E-03	1.23E-02	1.83E-03	1.47E-02	1.91E-03	1.37E-02	1.88E-03	1.35E-02	1.91E-03
5/28/2024	2.23E-02	1.92E-03	2.05E-02	1.86E-03	2.13E-02	1.89E-03	1.97E-02	1.83E-03	2.28E-02	1.94E-03	2.14E-02	1.89E-03	2.07E-02	1.88E-03
6/3/2024	2.04E-02	2.29E-03	1.89E-02	2.23E-03	2.01E-02	2.28E-03	1.84E-02	2.22E-03	2.08E-02	2.31E-03	2.10E-02	2.31E-03	1.76E-02	2.13E-03
6/10/2024	2.31E-02	2.16E-03	1.87E-02	2.01E-03	2.13E-02	2.10E-03	1.69E-02	1.94E-03	2.27E-02	2.15E-03	2.14E-02	2.10E-03	1.87E-02	2.04E-03
6/17/2024	1.82E-02	2.01E-03	1.94E-02	2.06E-03	1.66E-02	1.95E-03	1.55E-02	1.91E-03	1.86E-02	2.03E-03	1.81E-02	2.01E-03	1.60E-02	1.93E-03
6/25/2024	2.60E-02	2.05E-03	2.75E-02	2.10E-03	2.67E-02	2.08E-03	2.19E-02	1.93E-03	2.50E-02	1.94E-03	2.56E-02	2.05E-03	2.22E-02	1.95E-03
7/1/2024	1.74E-02	2.16E-03	1.79E-02	2.18E-03	1.59E-02	2.09E-03	1.52E-02	2.07E-03	1.91E-02	2.23E-03	2.03E-02	2.26E-03	1.79E-02	2.16E-03
7/8/2024	2.13E-02	2.09E-03	2.01E-02	2.05E-03	1.88E-02	2.01E-03	1.71E-02	1.95E-03	2.15E-02	2.11E-03	2.09E-02	2.09E-03	2.00E-02	2.06E-03
7/15/2024	2.02E-02	2.12E-03	1.96E-02	2.10E-03	1.95E-02	2.09E-03	1.57E-02	1.96E-03	2.15E-02	2.16E-03	1.88E-02	2.07E-03	1.82E-02	2.05E-03
7/22/2024	2.39E-02	2.23E-03	2.54E-02	2.29E-03	2.50E-02	2.27E-03	2.08E-02	2.13E-03	2.95E-02	2.41E-03	2.54E-02	2.30E-03	2.03E-02	2.34E-03
7/29/2024	2.09E-02	2.10E-03	2.09E-02	2.10E-03	1.98E-02	2.06E-03	1.89E-02	2.03E-03	2.13E-02	2.12E-03	2.19E-02	2.14E-03	1.91E-02	2.04E-03

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for Gross Beta activity in Air Particulates (pCi/m^3)

	6C1		10S3		11S1		14S1		13S4		15D1		22G1 (Control)	
Date	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)
8/5/2024	2.77E-02	2.34E-03	2.75E-02	2.34E-03	2.56E-02	2.28E-03	2.17E-02	2.15E-03	3.03E-02	2.43E-03	2.89E-02	2.39E-03	2.47E-02	2.25E-03
8/12/2024	1.76E-02	2.02E-03	1.76E-02	2.02E-03	1.69E-02	1.99E-03	1.63E-02	1.97E-03	2.11E-02	2.14E-03	1.91E-02	2.07E-03	1.72E-02	1.98E-03
8/19/2024	2.28E-02	2.18E-03	2.42E-02	2.23E-03	2.30E-02	2.19E-03	2.02E-02	2.10E-03	2.45E-02	2.24E-03	2.12E-02	2.13E-03	2.02E-02	2.12E-03
8/26/2024	1.96E-02	2.07E-03	1.91E-02	2.08E-03	2.00E-02	2.11E-03	1.60E-02	1.97E-03	2.17E-02	2.17E-03	1.86E-02	2.06E-03	1.63E-02	1.99E-03
9/3/2024	3.02E-02	2.27E-03	3.91E-02	2.46E-03	3.63E-02	2.39E-03	2.67E-02	2.12E-03	3.13E-02	2.25E-03	3.29E-02	2.30E-03	2.90E-02	2.16E-03
9/9/2024	1.41E-02	2.08E-03	1.54E-02	2.17E-03	1.38E-02	2.10E-03	1.52E-02	2.16E-03	1.61E-02	2.20E-03	1.58E-02	2.18E-03	1.41E-02	2.12E-03
9/16/2024	3.52E-02	2.61E-03	3.16E-02	2.48E-03	3.20E-02	2.49E-03	3.01E-02	2.43E-03	3.73E-02	2.64E-03	3.39E-02	2.54E-03	2.96E-02	2.38E-03
9/23/2024	3.24E-02	2.41E-03	2.80E-02	2.31E-03	2.73E-02	2.29E-03	2.47E-02	2.20E-03	3.27E-02	2.45E-03	2.92E-02	2.35E-03	2.44E-02	2.23E-03
9/30/2024	1.11E-02	1.71E-03	8.68E-03	1.61E-03	9.12E-03	1.63E-03	8.96E-03	1.62E-03	1.10E-02	1.71E-03	1.10E-02	1.71E-03	6.56E-03	1.51E-03
10/7/2024	2.05E-02	2.08E-03	2.15E-02	2.12E-03	2.04E-02	2.08E-03	1.82E-02	2.00E-03	2.35E-02	2.18E-03	2.14E-02	2.12E-03	1.83E-02	2.01E-03
10/14/2024	3.30E-02	2.50E-03	4.80E-02	2.87E-03	4.27E-02	2.73E-03	3.29E-02	2.45E-03	3.59E-02	2.54E-03	4.11E-02	2.69E-03	3.24E-02	2.40E-03
10/21/2024	2.19E-02	2.08E-03	1.60E-02	1.89E-03	1.84E-02	1.99E-03	1.65E-02	1.91E-03	2.18E-02	2.10E-03	1.90E-02	2.00E-03	1.62E-02	1.93E-03
10/29/2024	3.26E-02	2.32E-03	3.04E-02	2.27E-03	2.97E-02	2.25E-03	3.00E-02	2.25E-03	3.63E-02	2.43E-03	3.23E-02	2.32E-03	3.05E-02	2.27E-03
11/4/2024	4.00E-02	2.94E-03	5.41E-02	3.31E-03	4.41E-02	3.05E-03	3.92E-02	2.91E-03	4.02E-02	2.94E-03	4.16E-02	2.99E-03	3.21E-02	2.71E-03
11/11/2024	2.02E-02	2.09E-03	2.08E-02	2.11E-03	2.04E-02	2.10E-03	1.60E-02	1.94E-03	2.35E-02	2.20E-03	2.10E-02	2.13E-03	1.91E-02	2.05E-03

Table 11, Weekly Airborne Samples

Weekly Airborne Samples for Gross Beta activity in Air Particulates (pCi/m^3)

	6C1		10S3		11S1		14S1		13S4		15D1		22G1 (Control)	
Date	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)	Gross Beta Activity	(2-σ)
11/18/2024	1.80E-02	2.05E-03	1.83E-02	2.06E-03	1.63E-02	1.99E-03	1.40E-02	1.90E-03	1.97E-02	2.11E-03	1.91E-02	2.09E-03	1.43E-02	1.92E-03
11/25/2024	2.63E-02	2.22E-03	2.47E-02	2.17E-03	2.31E-02	2.11E-03	2.15E-02	2.06E-03	2.73E-02	2.25E-03	2.74E-02	2.25E-03	2.56E-02	2.17E-03
12/2/2024	2.95E-02	2.40E-03	2.68E-02	2.31E-03	2.62E-02	2.29E-03	2.35E-02	2.21E-03	3.16E-02	2.46E-03	3.30E-02	2.50E-03	2.71E-02	2.36E-03
12/9/2024	2.22E-02	2.20E-03	2.10E-02	2.16E-03	2.19E-02	2.19E-03	1.91E-02	2.09E-03	2.43E-02	2.27E-03	2.16E-02	2.18E-03	2.07E-02	2.12E-03
12/16/2024	2.49E-02	2.20E-03	2.87E-02	2.32E-03	2.65E-02	2.25E-03	2.23E-02	2.11E-03	3.09E-02	2.39E-03	3.03E-02	2.37E-03	2.20E-02	2.10E-03
12/23/2024	1.46E-02	1.86E-03	1.62E-02	1.94E-03	1.31E-02	1.82E-03	1.45E-02	1.87E-03	1.68E-02	1.95E-03	1.49E-02	1.87E-03	1.33E-02	1.84E-03
12/30/2024	1.88E-02	2.02E-03	2.03E-02	2.06E-03	1.88E-02	2.01E-03	1.75E-02	1.97E-03	2.34E-02	2.17E-03	2.00E-02	2.07E-03	1.51E-02	1.88E-03

Table 12, Quarterly isotopic data – Air (pCi/m^3), Water (pCi/L)

Location	Nuclide	Q1	Q2	Q3	Q4
Quarterly Air Filter Composite for Gamma Emitters (pCi/m^3)					
6C1	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
10S3	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
11S1	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
14S1	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
15D1	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
22G1 (Control)	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
13S4	Cs134, Cs137	<MDAs	<MDAs	<MDAs	<MDAs
Quarterly Tritium in Water (pCi/L)					
24S1	H-3	<MDA	<MDA	<MDA	<MDA
13B1	H-3	<MDA	<MDA	<MDA	<MDA
28F3	H-3	<MDA	<MDA	<MDA	<MDA
16C2	H-3	<MDA	<MDA	<MDA	<MDA
15F4	H-3	<MDA	<MDA	<MDA	<MDA
15F7	H-3	<MDA	<MDA	<MDA	<MDA

* All Non-Natural Gamma Emitters <MDA

Table 13, Complete REMP Results

Radionuclides in Fish (pCi/kg wet)			
Sample Code	Sample Date	Sample Type	Gamma Emitters
29C1 BKG (Control) Area not influenced by Plant Discharge	05/2/2024	Bottom Feeder	*
	05/2/2024	Predator Fish	*
	10/9/2024	Bottom Feeder	*
	10/9/2024	Predator Fish	*
16C5 IND LGS Discharge Area	05/30/2024	Bottom Feeder	*
	05/30/2024	Predator Fish	*
	10/10/2024	Bottom Feeder	*
	10/10/2024	Predator Fish	*
Radionuclides in Sediment (pCi/kg dry)			
Sample Code	Sample Date		Gamma Emitters
16C4 SSE Sector, Down River from Plant Discharge Area	06/7/2024		*
	11/15/2024		*
16B2 SSE Sector, Down River from Plant Discharge Area	06/7/2024		*
	11/15/2024		*
33A2 (Control) NNW Sector, Upstream from Plant Discharge Area	06/7/2024		*
	11/15/2024		*

* All Non-Natural Gamma Emitters <MDA

Table 13, Complete REMP Results

Complete RGPP Results (pCi/L ± 2-σ)

Location	Sample Date	Gross Alpha (dissolved)	Gross Alpha (suspended)	Sr89	Sr90	Gamma Emitters*	Qualifier
DW-LR-1	4/9/2024	5.08±5.2	<0.876	<4.46	<0.852	<MDA	
DW-LR-1	5/3/2024	4.64±1.45	<0.696	ND	ND	ND	Resample
MW-LR-1	4/10/2024	<0.923	<1.1	<7.09	<0.897	<MDA	
MW-LR-2	4/10/2024	ND	ND	ND	ND	<MDA	
MW-LR-3	4/10/2024	ND	ND	ND	ND	<MDA	
MW-LR-4	4/9/2024	<1.44	<1.09	<2.97	<0.880	<MDA	
MW-LR-5	4/10/2024	ND	ND	ND	ND	<MDA	
MW-LR-5	4/10/2024	ND	ND	ND	ND	<MDA	Dup
MW-LR-5	4/10/2024	ND	ND	ND	ND	<MDA	QA
MW-LR-7	4/10/2024	ND	ND	ND	ND	<MDA	
MW-LR-8	4/9/2024	1.65±0.973	<0.878	<2.68	<0.869	<MDA	
MW-LR-9	4/9/2024	2.5 ±1.16	4.32±1.61	<3.93	<0.905	<MDA	
MW-LR-9	4/9/2024	<1.45	2.17±1.33	<4.65	<0.948	<MDA	Dup
MW-LR-9	4/9/2024	<7.08	ND	<1.09	<0.819	<MDA	QA
MW-LR-10	4/9/2024	1.75±0.991	<0.878	<3.61	<0.753	<MDA	
P11	4/9/2024	<1.38	<0.88	<5.45	<0.95	<MDA	
P14	4/9/2024	<1.33	<0.906	<3.51	<0.958	<MDA	
P17	4/10/2024	ND	ND	ND	ND	<MDA	

ND - No Data, Sample collected as required.
(Dup) – Sample analyzed in duplicate by TBE.
(QA) – Additional sample collected and analyzed for Quality Assurance by GEL.
* All non-natural gamma emitters less than minimum detectable activity.

Table 13, Complete REMP Results

Concentration of Tritium in Groundwater (pCi/L ± 2σ)

Location	Q1	Q2	Q3	Q4
DW-LR-1	<194	<192	<172	<186
MW-LR-1	ND	<193	ND	ND
MW-LR-2	ND	<198	ND	ND
MW-LR-3	ND	<193	ND	ND
MW-LR-4	<194	<194	<187	<184
MW-LR-4 (Dup)	ND	ND	<186	ND
MW-LR-4 (QA)	ND	ND	<169	ND
MW-LR-5	ND	<194	ND	ND
MW-LR-5 (Dup)	ND	<195	ND	ND
MW-LR-5 (QA)	ND	<97.7	ND	ND
MW-LR-7	ND	<193	ND	ND
MW-LR-8	480±131	765±159	1330±217 / 721±155	430±132
MW-LR-8 (Dup)	ND	ND	727±160 /ND	ND
MW-LR-9	3580±423	3000±372	2650±338	1810±253
MW-LR-9(Dup)	3400±403	2740±346	No Data	1920±262
MW-LR-9 (QA)	3270±283	2370±228	±	1880±144
MW-LR-10	<186	<184	<191	<182
LR-P11	<196	<178	<190	<186
LR-P14	<189	<196	<190	<184
LR-P17	ND	<197	ND	ND

ND - No Data, Sample collected as required.
(Dup) – Sample analyzed in duplicate by TBE.
(QA) – Additional sample collected and analyzed for Quality Assurance by GEL.

Table 13, Complete REMP Results

Concentration of Tritium in Recapture Samples (pCi/L ± 2σ)

LOCATION	1/18/2024	8/26/2024
RS-1	<195	<185
RS-2	288±134	<188
RS-3	516±141	<186
RS-4	214±130	<186
RS-5	226±130	<185
RS-6	235±131	<188
RS-7	244±132	<186
RS-8	<187	<188

Attachment 3, Cross Check Intercomparison Program

Participation in cross check intercomparison studies is mandatory for laboratories performing analyses of REMP samples satisfying the requirements in the ODCM. 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.

Constellation Generation Solutions Laboratory participated in the following proficiency testing studies provided by Environmental Resource Associates (ERA) and Eckert Ziegler Analytics (EZA) in 2024. The Laboratory's intercomparison program results for 2024 are summarized below.

Attachment 3 is a summary of Constellation Generation Solutions (CGS) laboratory's quality assurance program. It consists of Table 14, which is a compilation of the results of the CGS laboratory's participation in an interlaboratory comparison program with Environmental Resource Associates (ERA) located in Arvada, Colorado and Eckert and Ziegler Analytics, Inc. (EZA) located in Atlanta, Georgia.

It also includes a compilation of the results of the Constellation Generation Solutions (CGS) Laboratory's participation in a split sample program with Teledyne Brown Engineering located in Knoxville, Tennessee.

The CGS laboratory's intercomparison results are in full agreement when they were evaluated using designated acceptance ranges and the Resolution Test Criteria in accordance with the Constellation Radiochemistry Quality Control procedure, except as noted in the Pass/Fail column and described below. The CGS laboratory's results are provided with their analytical uncertainties of 2 sigma. When evaluating with the Resolution Test, a one sigma uncertainty is used to determine Pass or Fail and noted accordingly.

All results reported passed their respective acceptance ranges and Resolution Test Criteria with the following two exceptions:

> RAD-137 I-131 water study on 04/08/2024 on Detector 6 (D6) failed high at 29.7 pCi/L for a true value of 25.1 pCi/L with an acceptance range of 21.7 – 28.5 pCi/L. This was a new detector and the study had very low area counts. Of the three runs, the other two values would have passed. Results on all other detectors were successful. Further review of the data indicated all the Ba-133 results in the other RAD-137 water study were in acceptable range. In that study, Ba-133 is meant to approximate I-131 results as it has an energy very close to I-131 in the spectrum. The detector is new in the lab and there is an ongoing review of its performance to identify the optimal operating range and any inherent bias.

E14044 Filter study on 12/05/24 failed low for Cs-134 on D6 reporting 91.3 +/- 3.25 pCi for a true value of 116 pCi. This study also had unusually low area counts in this range of the spectrum. The result did pass the acceptance range of 81.2 – 150.8 pCi, however due to the extremely low activity level, count times were extended significantly to capture other isotopes with lower yields resulting in very low uncertainties for higher yield isotopes. In the case of Cs-134 the uncertainty was less than 5% and at the level of recovery observed, the result failed the resolution test. Routine analysis is normally performed to achieve 15% +/- 5 %. Review of all other studies performed on this detector showed successful performance for Cs-134 and all other isotopes. The evaluation of detector performance is ongoing to identify inherent bias or variability at low count rates as is observed in environmental samples.

The vendor laboratories used by CGS for subcontracting and interlaboratory comparison samples, GEL Laboratories and Teledyne Brown Engineering (TBE), also participate in the ERA and EZA interlaboratory comparison program. A presentation of their full data report is provided in their Annual Environmental Quality Assurance Program Reports, (Ref 42,43). In summary, GEL and TBE reported results met vendor and laboratory acceptance ranges with the following exceptions described here.

For TBE, the following three studies reported data that did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. Investigations of the failures are described as follows:

TBE Crosschecks failed high for MRAD-40 Gross Beta at 42.1 pCi/Filter. The true value was 22.2 pCi/Filter and the acceptable range was 13.5-33.5 pCi/Filter. All QC associated with the original sample was acceptable and no anomalies were found. This sample was used as the WG duplicate with a result of 42.5 pCi. Both samples were counted on the same detector. Upon comparison to historical sample data, the alpha activity of this ERA submitted sample was the highest assigned result, and the beta activity was the lowest. Therefore, the alpha-to-beta crosstalk was more significant than normal, causing the beta activity to report falsely high data. The counting room laboratory staff will adjust the alpha-to-beta crosstalk via correction calculation measures when high alpha are observed. Subsequent study MRAD-41 for Gross Beta filter returned acceptable results.

RAD-137 Gross Alpha in water failed low at 35.2 pCi/L. The true value was 52.6 pCi/L and the acceptable range was 39.6 – 65.6 pCi/L. A QuiKResponse repeat study was analyzed and failed high at 40.3 pCi/L and the acceptable range was 21.5 – 38.5 pCi/L. Investigation showed higher than usual solids in the ERA study, out of the usual range of client samples received by the lab. Also, a different attenuation curve, Th-230, was used for the crosscheck than had been used historically. This curve was less representative of client samples. The lab review of data also showed that a replicate run of the sample would have passed but the lab chose the wrong replicate to report. The lab has gone to a lower volume of sample and resumed using the Am-241

attenuation curve which more closely mirrors client samples and subsequent crosschecks are reporting acceptable.

Quarter 1-2024 gamma results for Co-60 (air filter) and Ce-141 (soil) both failed high. The reported result for the filter for Co-60 was 168+/- 12.7 pCi/Filter and the known value was 126+/-2.1 pCi/Filter; the reported results for the soil Ce-141 was 0.106 pCi/g and the known value was 0.0714+/- 0.0013 pCi/g. The root cause investigation showed successful results for the filter on another detector. All QC associated with this sample was acceptable. The soil was recounted on another detector and Ce-141 result of 0.085 was acceptable and generally the same for other geometries. All QC associated with this sample was acceptable. No effective corrective action can be taken at this time. Historically, the result for the filter for Co-60 and the result for the soil for Ce-141 have been well within TBE QC acceptance ranges. TBE has successfully passed cross-check results and it appears that these two results are anomalous. If there is a recurrence, a root cause investigation will be done promptly.

For the GEL Laboratory, the following six studies reported data that did not meet the specified acceptance criteria and were addressed through the GEL's internal nonconformance system. A summary is found below:

RAD-136 water Sr-90 failed high, while I-131 failed low.
RAD-136 water Strontium-90: The Group Leader has reviewed the method to identify the bias. The method LCS trend was reviewed and no anomalies were identified. The calibration used for the analysis was compared to the new calibration performed recently and the original reported data was processed with both calibrations for comparison. Data still maintained a high bias but was within the limits of the study. A sample of known Strontium concentration was analyzed, and the results were processed using the new calibration. The result was within the mid-range of the acceptance limits. Instrument run logs were reviewed and there was no indication of possible bias from a previously counted sample.

RAD-136 water Iodine-131: The laboratory has reviewed the data and found no errors. All batch QC samples, including a duplicate, met acceptance criteria. The carrier yields were found to be slightly higher than typically seen in this method, possibly contributing to the low bias in the result. The laboratory will continue to investigate all steps of the analytical process.

RAD-137 water Sr-90 and I-131 studies both failed low.
RAD-137 water Strontium-90: The unacceptable result was analyzed by a modified method of 905.0 and recovered 83% of the known value which is acceptable for the laboratory's LCS. The PT sample was also analyzed by EPA DW method 905.0 and achieved an acceptable result recovering 94% of the assigned value. The RPD between the methods was 12%. The laboratory is evaluating calibration, yield determination, techniques, reagents, carriers, and each step of the process for areas of improvement.

RAD-137 water Iodine-131: The laboratory has reviewed the data and no errors were noted. All batch QC samples, including an in-batch duplicate, met acceptance criteria. It was noted that the carrier yields were found to be slightly higher than are typically seen in this method including the reference sample used to calculate the LCS, potentially contributing to the low bias in the result.

RAD-138 Sr-90 and I-131 on water failed low.
Strontium-90: The laboratory conducted an in-depth review of all available data and did not identify any specific errors or anomalies that could explain the performance evaluation failure. The instrument calibrations were reviewed for possible significant areas of variance when compared to previous calibrations and none were noted. The quality department conducted direct observations of the analytical processes noting minor areas of improvement during precipitations and column separations. A definitive root cause was not isolated during the investigation.

Iodine-131: The laboratory has reviewed the data and found no errors. All batch QC samples, including an in-batch duplicate, met the acceptance criteria. As part of the investigation, the quality department observed the preparation process. During the review, it was identified that a reagent may have been improperly diluted, potentially contributing to the low bias observed in the results. This procedural discrepancy has been noted as a probable cause requiring corrective action.

The laboratory has since successfully completed a single-blind spiked sample, achieving results within the acceptance criteria for both Sr-90 and I-131.

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
3/14/2024	E14036 Milk	pCi/L	I-131	96.7	90.8	63.6	118	Pass
		pCi/L	Cs-134	182	198	139	257	Pass
		pCi/L	Cs-137	181	171	120	222	Pass
		pCi/L	Ce-141	88.1	85	59.5	111	Pass
		pCi/L	Cr-51	281	230	161	299	Pass
		pCi/L	Mn-54	187	183	128	238	Pass
		pCi/L	Fe-59	93.6	86.5	60.6	112	Pass
		pCi/L	Co-60	152	158	111	205	Pass
		pCi/L	Zn-65	161	176	123	229	Pass
3/14/2024	E14037 Water	pCi/L	Beta Cs-137	238	231	162	300	Pass
3/14/2024	E14038 Charcoal	pCi	I-131	75.9	90.2	63.1	117	Pass
		pCi	I-131	79.0	90.2	63.1	117	Pass
		pCi	I-131	77.1	90.2	63.1	117	Pass
		pCi	I-131	77.3	90.2	63.1	117	Pass
4/8/2024	RAD-137 Water	pCi/L	I-131	27.1	25.1	21.7	28.5	Pass
		pCi/L	I-131	25.1	25.1	21.7	28.5	Pass
		pCi/L	I-131	27.5	25.1	21.7	28.5	Pass
4/8/2024	RAD-137 Water	pCi/L	I-131	29.7	25.1	21.7	28.5	Fail [1]

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
4/8/2024	RAD-137 Water	pCi/L	Beta Cs-137	36.6	46.5	33.9	59.1	Pass
		pCi/L	Cs-134	55.9	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	190	186	149	223	Pass
		pCi/L	Co-60	98.8	98.8	79.7	118	Pass
		pCi/L	Zn-65	228	240	188	292	Pass
4/8/2024	RAD-137 Water	pCi/L	Cs-134	60.7	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	185	186	149	223	Pass
		pCi/L	Co-60	97.7	98.8	79.7	118	Pass
		pCi/L	Zn-65	233	240	188	292	Pass
4/8/2024	RAD-137 Water	pCi/L	Cs-134	59.8	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	190	186	149	223	Pass
		pCi/L	Co-60	97.2	98.8	79.7	118	Pass
		pCi/L	Zn-65	240	240	188	292	Pass
4/8/2024	RAD-137 Water	pCi/L	Cs-134	58.6	57.8	42.8	72.8	Pass
		pCi/L	Cs-137	185	186	149	223	Pass
4/8/2024	RAD-137 Water	pCi/L	Co-60	102	98.8	79.7	118	Pass
		pCi/L	Zn-65	227	240	188	292	Pass
6/13/2024	E14101 Soil	pCi/g	Cs-134	0.406	0.408	0.286	0.530	Pass

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
6/13/2024	E14101 Soil	pCi/g	Cs-137	0.402	0.451	0.316	0.586	Pass
		pCi/g	Cs-134	0.372	0.408	0.286	0.530	Pass
		pCi/g	Cs-137	0.365	0.451	0.316	0.586	Pass
6/13/2024	E14039 Water	pCi/L	Beta Cs-137	265	262	183	341	Pass
6/13/2024	E14040	pCi/L	Ce-141	45.4	37.5	26.3	48.8	Pass
		pCi/L	Co-60	402	391	274	508	Pass
		pCi/L	Cr-51	250	291	204	378	Pass
		pCi/L	Cs-134	237	242	169	315	Pass
		pCi/L	Cs-137	233	229	160	298	Pass
		pCi/L	Fe-59	183	174	122	226	Pass
		pCi/L	Mn-54	209	204	143	265	Pass
		pCi/L	Zn-65	89.6	99.1	69.4	129	Pass
6/13/2024	E14040	pCi/L	Ce-141	40	37.5	26.3	48.8	Pass
		pCi/L	Co-60	397	391	274	508	Pass
		pCi/L	Cr-51	286	291	204	378	Pass
		pCi/L	Cs-134	238	242	169	315	Pass
		pCi/L	Cs-137	237	229	160	298	Pass
		pCi/L	Fe-59	183	174	122	226	Pass
		pCi/L	Mn-54	212	204	143	265	Pass
		pCi/L	Zn-65	95.4	99.1	69.4	129	Pass
6/13/2024	E14041 Filter	pCi	Ce-141	25.4	25.2	17.6	32.8	Pass
		pCi	Co-60	258	262	183	341	Pass

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
6/13/2024	E14041 Filter	pCi	Cr-51	211	195	137	254	Pass
		pCi	Cs-134	137	162	113	211	Pass
		pCi	Cs-137	159	153	107	199	Pass
		pCi	Fe-59	132	117	81.9	152	Pass
		pCi	Mn-54	143	137	95.9	178	Pass
		pCi	Zn-65	71.0	66.4	46.5	86.3	Pass
6/13/2024	E14042A Filter	pCi	Beta Cs-137	249	220	154	286	Pass
9/12/2024	E14043 Filter	pCi	Beta Cs-137	242	221	84.7	157	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.318	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.287	0.295	0.207	0.384	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.299	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.269	0.295	0.207	0.384	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.305	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.277	0.295	0.207	0.384	Pass
9/12/2024	E14102 Soil	pCi/g	Cs-134	0.312	0.336	0.235	0.437	Pass
		pCi/g	Cs-137	0.282	0.295	0.207	0.384	Pass
9/16/2024	MRAD-41 Filter	pCi	Cs-134	499	581	377	712	Pass
		pCi	Cs-137	880	848	696	1110	Pass

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
9/16/2024	MRAD-41 Filter	pCi	Co-60	865	839	713	1070	Pass
		pCi	Zn-65	269	239	196	365	Pass
10/4/2024	RAD-139 Water	pCi/L	Cs-134	79.6	80.2	63.0	97.4	Pass
		pCi/L	Cs-137	49.7	46.3	23.3	69.3	Pass
		pCi/L	Co-60	47.9	45.3	31.6	59.0	Pass
		pCi/L	Zn-65	108	114	75.0	153	Pass
10/4/2024	RAD-139 Water	pCi/L	Cs-134	79.8	80.2	63.0	97.4	Pass
		pCi/L	Cs-137	46.0	46.3	23.3	69.3	Pass
		pCi/L	Co-60	49.4	45.3	31.6	59.0	Pass
10/4/2024	RAD-139 Water	pCi/L	Zn-65	106	114	75.0	153	Pass
10/4/2024	RAD-139 Water	pCi/L	Cs-134	79.4	80.2	63.0	97.4	Pass
		pCi/L	Cs-137	46.3	46.3	23.3	69.3	Pass
		pCi/L	Co-60	47.5	45.3	31.6	59.0	Pass
		pCi/L	Zn-65	106	114	75.0	153	Pass
10/4/2024	RAD-139 Water	pCi/L	I-131	26.4	26.3	22.7	29.9	Pass
10/4/2024	RAD-139 Water	pCi/L	I-131	26.3	26.3	22.7	29.9	Pass

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
12/5/2024	E14044 Filter	pCi	Ce-141	75.7	74.8	52	97	Pass
		pCi	Co-58	105	97.9	69	127	Pass
		pCi	Cr-60	220	219	153	285	Pass
		pCi	Cr-51	182	185	130	241	Pass
		pCi	Cs-134	97.9	116	81	151	Pass
		pCi	Cs-137	144	144	101	187	Pass
		pCi	Fe-59	130	107	75	139	Pass
		pCi	Mn-54	113	104	73	135	Pass
		pCi	Zn-65	164	155	109	202	Pass
12/5/2024	E14044 Filter	pCi	Ce-141	69.3	74.8	52	97	Pass
		pCi	Co-58	93.7	97.9	69	127	Pass
		pCi	Cr-60	196	219	153	285	Pass
		pCi	Cr-51	166	185	130	241	Pass
		pCi	Cs-134	91.3	116	81	151	Fail [1]
		pCi	Cs-137	135	144	101	187	Pass
		pCi	Fe-59	113	107	75	139	Pass
		pCi	Mn-54	106	104	73	135	Pass
		pCi	Zn-65	146	155	109	202	Pass
12/5/2024	E14044 Filter	pCi	Ce-141	66.6	74.8	52	97	Pass
		pCi	Co-58	92.4	97.9	69	127	Pass
		pCi	Cr-60	204	219	153	285	Pass
		pCi	Cr-51	175	185	130	241	Pass
		pCi	Cs-134	95.7	116	81	151	Pass
		pCi	Cs-137	139	144	101	187	Pass

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
12/5/2024	E14044 Filter	pCi	Fe-59	119	107	75	139	Pass
		pCi	Mn-54	102	104	73	135	Pass
		pCi	Zn-65	139	155	109	202	Pass
12/5/2024	E14045 Water	pCi/L	Beta Cs-137	257	240	168	312	Pass
12/5/2024	E14046 Charcoal	pCi	I-131	58.0	65.3	45.7	84.9	Pass
		pCi	I-131	59.3	65.3	45.7	84.9	Pass
		pCi	I-131	59.4	65.3	45.7	84.9	Pass
12/5/2024	E14047 Milk	pCi/L	Ce-141	74.7	71.6	50.1	93.1	Pass
		pCi/L	Co-58	95.2	93.7	65.6	122	Pass
		pCi/L	Co-60	211	210	147	273	Pass
		pCi/L	Cr-51	164	177	124	230	Pass
		pCi/L	Cs-134	114	111	77.7	144	Pass
		pCi/L	Cs-137	150	138	96.6	179	Pass
		pCi/L	Fe-59	112	102	71.4	133	Pass
		pCi/L	I-131	50.1	51.0	35.7	66.3	Pass
		pCi/L	Mn-54	106	99.5	69.7	129	Pass
		pCi/L	Zn-65	141	149	104	194	Pass
12/5/2024	E14047 Milk	pCi/L	Ce-141	77.8	71.6	50.1	93.1	Pass
		pCi/L	Co-58	96.9	93.7	65.6	122	Pass
		pCi/L	Co-60	208	210	147	273	Pass
		pCi/L	Cr-51	205	177	124	230	Pass

Table 14, Cross Check Intercomparison Results

Study Date	Study ID	Units	Radionuclide	Reported Value	Assigned Value	Acceptance		Performance Evaluation
						Lower Limit	Upper Limit	
12/5/2024	E14047 Milk	pCi/L	Cs-134	110	111	77.7	144	Pass
		pCi/L	Cs-137	140	138	96.6	179	Pass
		pCi/L	Fe-59	100	102	71.4	133	Pass
		pCi/L	I-131	45.5	51.0	35.7	66.3	Pass
		pCi/L	Mn-54	109	99.5	69.7	129	Pass
		pCi/L	Zn-65	136	149	104	194	Pass
12/5/2024	E14047 Milk	pCi/L	Ce-141	71.9	71.6	50.1	93.1	Pass
		pCi/L	Co-58	89.7	93.7	65.6	122	Pass
		pCi/L	Co-60	232	210	147	273	Pass
		pCi/L	Cr-51	180	177	124	230	Pass
		pCi/L	Cs-134	113	111	77.7	144	Pass
		pCi/L	Cs-137	149	138	96.6	179	Pass
		pCi/L	Fe-59	112	102	71.4	133	Pass
		pCi/L	I-131	63.3	51.0	35.7	66.3	Pass
		pCi/L	Mn-54	105	99.5	69.7	129	Pass
		pCi/L	Zn-65	148	149	104	194	Pass

[1] See Discussion at the beginning of Attachment 3

Table 15, Split Sample Intercomparison Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Analysis w 2σ		Split Analysis w 2σ	Pass/Fail (Split)
Water	16C2	1/29/2024	Gross Beta	pCi/L	1.97	0.828	2.97±1.57	Pass
Water	16C2	1/29/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	1/29/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	3/04/2024	Gross Beta	pCi/L	1.76	0.784	2.98±1.44	Pass
Water	16C2	3/04/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	3/04/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	4/01/2024	Gross Beta	pCi/L	1.57	0.770	<MDA	Pass
Water	16C2	4/01/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	4/01/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	4/01/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	16C2	4/29/2024	Gross Beta	pCi/L	1.65	0.736	3.31±1.68	Pass
Water	16C2	4/29/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	4/29/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	6/3/2024	Gross Beta	pCi/L	2.06	0.772	4.2±1.67	Pass
Water	16C2	6/3/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	6/3/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	7/1/2024	Gross Beta	pCi/L	2.84	0.801	3.17±1.68	Pass
Water	16C2	7/1/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	7/1/2024	Gamma	pCi/L	<MDA		<MDA	Pass

Table 15, Split Sample Intercomparison Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Analysis w 2σ		Split Analysis w 2σ	Pass/Fail (Split)
Water	16C2	7/1/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	16C2	7/29/2024	Gross Beta	pCi/L	2.50	0.810	3.75±1.80	Pass
Water	16C2	7/29/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	7/29/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	9/3/2024	Gross Beta	pCi/L	2.70	0.827	3.82±1.68	Pass
Water	16C2	9/3/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	9/3/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	9/30/2024	Gross Beta	pCi/L	3.96	0.851	3.92±1.75	Pass
Water	16C2	9/30/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	9/30/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	9/30/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Water	16C2	10/28/2024	Gross Beta	pCi/L	3.74	0.922	4.44±2.33	Pass
Water	16C2	10/28/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	10/28/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	12/2/2024	Gross Beta	pCi/L	2.75	0.876	3.14±1.93	Pass
Water	16C2	12/2/2024	LLI	pCi/L	<MDA		<MDA	Pass
Water	16C2	12/2/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	12/30/2024	Gross Beta	pCi/L	3.78	1.13	3.08±1.63	Pass
Water	16C2	12/30/2024	LLI	pCi/L	<MDA		<MDA	Pass

Table 15, Split Sample Intercomparison Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Analysis w 2σ		Split Analysis w 2σ	Pass/Fail (Split)
Water	16C2	12/30/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	16C2	12/30/2024	Tritium	pCi/L	<MDA		<MDA	Pass
Milk	19B1	1/17/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	19B1	1/17/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	22B1	1/17/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	22B1	1/17/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	19B1	4/2/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	19B1	4/2/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	22B1	4/2/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	22B1	4/2/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	19B1	7/9/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	19B1	7/9/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	22B1	7/9/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	22B1	7/9/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	19B1	10/01/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	19B1	10/01/2024	LLI	pCi/L	<MDA		<MDA	Pass
Milk	22B1	10/01/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Milk	22B1	10/01/2024	LLI	pCi/L	<MDA		<MDA	Pass

Table 15, Split Sample Intercomparison Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Analysis w 2σ		Split Analysis w 2σ	Pass/Fail (Split)
Filter Composite	11S2	4/01/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	11S2	7/01/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	11S2	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	11S2	12/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Sediment	J2-1	10/29/24	Gamma	pCi/Kg	<MDA		<MDA	Pass
Water	WA1	6/28/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Water	WA2	6/28/2024	Gamma	pCi/L	<MDA		<MDA	Pass
Oysters	IA3	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Oysters	IA6	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Bottom Sediment	WBS4	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Bottom Sediment	WBS2	6/19/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	IB10	7/22/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	IB11	7/22/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	IB12	7/22/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Vegetation	East	7/23/2024	Gamma	pCi/Kg	<MDA		<MDA	Pass
Milk	Farm A	09/03/2024	Gamma	Gamma	pCi/L		<MDA	Pass
Milk	Farm A	09/03/2024	Gamma	LLI	pCi/L		<MDA	Pass
Milk	Farm B	09/03/2024	Gamma	Gamma	pCi/L		<MDA	Pass

Table 15, Split Sample Intercomparison Results

Sample Type	Location	Sample Date	Analysis	Result Units	CGS Analysis w 2σ		Split Analysis w 2σ	Pass/Fail (Split)
Milk	Farm B	09/03/2024	Gamma	LLI	pCi/L		<MDA	Pass
Milk	#55	09/09/2024	Gamma	Gamma	pCi/L		<MDA	Pass
Milk	#55	09/09/2024	Gamma	LLI	pCi/L		<MDA	Pass
Fish (Spanish Mackerel)	IA1	8/14/2024	Gamma	pCi/kg	<MDA		<MDA	Pass
Filter Composite	CC-A1	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-A2	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-A3	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-A4	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-A5	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-SFA1	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-SFA2	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-SFA3	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass
Filter Composite	CC-SFA4	9/30/2024	Gamma	pCi/m^3	<MDA		<MDA	Pass

LLI=Low Level Iodine

Table 15, Split Sample Intercomparison Results

Air Particulate Beta and Air Iodine Co-Located

Sample Type	Location	Sample Date	Analysis	Result Units	11S1 CGS Result ± 2σ		11S2 (Q) TBE Split Result ± 2σ	
Filter	11S1 / 11S2 (Q)	1/8/2024	Beta	pCi/M^3	1.50E-02	2.13E-03	9.90E-03	3.75E-03
Filter	11S1 / 11S2 (Q)	1/16/2024	Beta	pCi/M^3	2.74E-02	2.13E-03	1.39E-02	3.47E-03
Filter	11S1 / 11S2 (Q)	1/22/2024	Beta	pCi/M^3	2.86E-02	2.57E-03	1.80E-02	4.61E-03
Filter	11S1 / 11S2 (Q)	1/29/2024	Beta	pCi/M^3	1.72E-02	1.96E-03	1.05E-02	3.42E-03
Filter	11S1 / 11S2 (Q)	2/6/2024	Beta	pCi/M^3	1.44E-02	1.75E-03	1.58E-02	3.56E-03
Filter	11S1 / 11S2 (Q)	2/12/2024	Beta	pCi/M^3	1.94E-02	2.30E-03	1.43E-02	4.13E-03
Filter	11S1 / 11S2 (Q)	2/19/2024	Beta	pCi/M^3	2.27E-02	2.15E-03	1.65E-02	3.75E-03
Filter	11S1 / 11S2 (Q)	2/26/2024	Beta	pCi/M^3	2.20E-02	2.14E-03	1.86E-02	3.95E-03
Filter	11S1 / 11S2 (Q)	3/4/2024	Beta	pCi/M^3	2.09E-02	2.08E-03	1.65E-02	3.69E-03
Filter	11S1 / 11S2 (Q)	3/11/2024	Beta	pCi/M^3	5.73E-03	1.50E-03	4.73E-03	3.00E-03
Filter	11S1 / 11S2 (Q)	3/18/2024	Beta	pCi/M^3	2.93E-02	2.37E-03	2.16E-02	4.13E-03
Filter	11S1 / 11S2 (Q)	3/25/2024	Beta	pCi/M^3	1.14E-02	1.80E-03	9.19E-03	3.44E-03
Filter	11S1 / 11S2 (Q)	4/1/2024	Beta	pCi/M^3	1.81E-02	1.94E-03	1.64E-02	3.88E-03
Filter	11S1 / 11S2 (Q)	4/8/2024	Beta	pCi/M^3	1.07E-02	1.62E-03	7.40E-03	3.12E-03
Filter	11S1 / 11S2 (Q)	4/15/2024	Beta	pCi/M^3	1.84E-02	1.98E-03	1.52E-02	3.76E-03
Filter	11S1 / 11S2 (Q)	4/22/2024	Beta	pCi/M^3	1.60E-02	1.94E-03	1.75E-02	3.94E-03
Filter	11S1 / 11S2 (Q)	4/29/2024	Beta	pCi/M^3	1.93E-02	2.10E-03	1.44E-02	4.15E-03
Filter	11S1 / 11S2 (Q)	5/6/2024	Beta	pCi/M^3	1.64E-02	1.98E-03	1.01E-02	3.56E-03
Filter	11S1 / 11S2 (Q)	5/13/2024	Beta	pCi/M^3	1.17E-02	1.77E-03	9.62E-03	3.11E-03
Filter	11S1 / 11S2 (Q)	5/20/2024	Beta	pCi/M^3	1.53E-02	1.94E-03	1.23E-02	3.60E-03
Filter	11S1 / 11S2 (Q)	5/28/2024	Beta	pCi/M^3	2.13E-02	1.89E-03	1.72E-02	3.39E-03
Filter	11S1 / 11S2 (Q)	6/3/2024	Beta	pCi/M^3	2.01E-02	2.28E-03	1.14E-02	4.30E-03
Filter	11S1 / 11S2 (Q)	6/10/2024	Beta	pCi/M^3	2.13E-02	2.10E-03	1.55E-02	4.01E-03
Filter	11S1 / 11S2 (Q)	6/17/2024	Beta	pCi/M^3	1.66E-02	1.95E-03	1.32E-02	3.83E-03
Filter	11S1 / 11S2 (Q)	6/25/2024	Beta	pCi/M^3	2.67E-02	2.08E-03	1.64E-02	3.52E-03

Table 15, Split Sample Intercomparison Results

Air Particulate Beta and Air Iodine Co-Located

Sample Type	Location	Sample Date	Analysis	Result Units	11S1 CGS Result ± 2σ		11S2 (Q) TBE Split Result ± 2σ	
Filter	11S1 / 11S2 (Q)	7/1/2024	Beta	pCi/M^3	1.59E-02	2.09E-03	1.57E-02	4.17E-03
Filter	11S1 / 11S2 (Q)	7/8/2024	Beta	pCi/M^3	1.88E-02	2.01E-03	1.74E-02	3.78E-03
Filter	11S1 / 11S2 (Q)	7/15/2024	Beta	pCi/M^3	1.95E-02	2.09E-03	1.66E-02	3.81E-03
Filter	11S1 / 11S2 (Q)	7/22/2024	Beta	pCi/M^3	2.50E-02	2.27E-03	1.74E-02	4.10E-03
Filter	11S1 / 11S2 (Q)	7/29/2024	Beta	pCi/M^3	1.98E-02	2.06E-03	1.47E-02	3.68E-03
Filter	11S1 / 11S2 (Q)	8/5/2024	Beta	pCi/M^3	2.56E-02	2.28E-03	2.40E-02	4.52E-03
Filter	11S1 / 11S2 (Q)	8/12/2024	Beta	pCi/M^3	1.69E-02	1.99E-03	1.43E-02	3.88E-03
Filter	11S1 / 11S2 (Q)	8/19/2024	Beta	pCi/M^3	2.30E-02	2.19E-03	1.38E-02	4.02E-03
Filter	11S1 / 11S2 (Q)	8/26/2024	Beta	pCi/M^3	2.00E-02	2.11E-03	1.78E-02	3.96E-03
Filter	11S1 / 11S2 (Q)	9/3/2024	Beta	pCi/M^3	3.63E-02	2.39E-03	2.15E-02	4.07E-03
Filter	11S1 / 11S2 (Q)	9/9/2024	Beta	pCi/M^3	1.38E-02	2.10E-03	9.44E-03	4.37E-03
Filter	11S1 / 11S2 (Q)	9/16/2024	Beta	pCi/M^3	3.20E-02	2.49E-03	2.50E-02	4.62E-03
Filter	11S1 / 11S2 (Q)	9/23/2024	Beta	pCi/M^3	2.73E-02	2.29E-03	2.14E-02	4.23E-03
Filter	11S1 / 11S2 (Q)	9/30/2024	Beta	pCi/M^3	9.12E-03	1.63E-03	6.31E-03	3.25E-03
Filter	11S1 / 11S2 (Q)	10/7/2024	Beta	pCi/M^3	2.04E-02	2.08E-03	1.55E-02	3.84E-03
Filter	11S1 / 11S2 (Q)	10/14/2024	Beta	pCi/M^3	4.27E-02	2.73E-03	1.87E-02	4.17E-03
Filter	11S1 / 11S2 (Q)	10/21/2024	Beta	pCi/M^3	1.84E-02	1.99E-03	1.13E-02	3.87E-03
Filter	11S1 / 11S2 (Q)	10/29/2024	Beta	pCi/M^3	2.97E-02	2.25E-03	2.46E-02	4.23E-03
Filter	11S1 / 11S2 (Q)	11/4/2024	Beta	pCi/M^3	4.41E-02	3.05E-03	1.85E-02	4.62E-03
Filter	11S1 / 11S2 (Q)	11/11/2024	Beta	pCi/M^3	2.04E-02	2.10E-03	1.18E-02	3.99E-03
Filter	11S1 / 11S2 (Q)	11/18/2024	Beta	pCi/M^3	1.63E-02	1.99E-03	1.28E-02	3.98E-03
Filter	11S1 / 11S2 (Q)	11/25/2024	Beta	pCi/M^3	2.31E-02	2.11E-03	1.82E-02	4.17E-03
Filter	11S1 / 11S2 (Q)	12/2/2024	Beta	pCi/M^3	2.62E-02	2.29E-03	1.99E-02	4.20E-03
Filter	11S1 / 11S2 (Q)	12/9/2024	Beta	pCi/M^3	2.19E-02	2.19E-03	1.34E-02	4.03E-03
Filter	11S1 / 11S2 (Q)	12/16/2024	Beta	pCi/M^3	2.65E-02	2.25E-03	1.78E-02	4.06E-03
Filter	11S1 / 11S2 (Q)	12/23/2024	Beta	pCi/M^3	1.31E-02	1.82E-03	7.32E-03	3.44E-03

Table 15, Split Sample Intercomparison Results

Air Particulate Beta and Air Iodine Co-Located

Sample Type	Location	Sample Date	Analysis	Result Units	11S1 CGS Result ± 2σ		11S2 (Q) TBE Split Result ± 2σ	
Filter	11S1 / 11S2 (Q)	12/30/2024	Beta	pCi/M^3	1.88E-02	2.01E-03	1.38E-02	3.69E-03
Charcoal	11S1 / 11S2 (Q)	1/8/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	1/16/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	1/22/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	1/29/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	2/6/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	2/12/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	2/19/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	2/26/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	3/4/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	3/11/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	3/18/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	3/25/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	4/1/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	4/8/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	4/15/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	4/22/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	4/29/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	5/6/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	5/13/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	5/20/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	5/28/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	6/3/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	6/10/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	6/17/2024	I-131	pCi/M^3	<MDA		<MDA	

Table 15, Split Sample Intercomparison Results

Air Particulate Beta and Air Iodine Co-Located

Sample Type	Location	Sample Date	Analysis	Result Units	11S1 CGS Result ± 2σ		11S2 (Q) TBE Split Result ± 2σ	
Charcoal	11S1 / 11S2 (Q)	6/25/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	7/1/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	7/8/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	7/15/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	7/22/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	7/29/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	8/5/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	8/12/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	8/19/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	8/26/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	9/3/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	9/9/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	9/16/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	9/23/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	9/30/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	10/7/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	10/14/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	10/21/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	10/29/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	11/4/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	11/11/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	11/18/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	11/25/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	12/2/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	12/9/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	12/16/2024	I-131	pCi/M^3	<MDA		<MDA	

Table 15, Split Sample Intercomparison Results

Air Particulate Beta and Air Iodine Co-Located

Sample Type	Location	Sample Date	Analysis	Result Units	11S1 CGS Result ± 2σ		11S2 (Q) TBE Split Result ± 2σ	
Charcoal	11S1 / 11S2 (Q)	12/23/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	12/30/2024	I-131	pCi/M^3	<MDA		<MDA	
Charcoal	11S1 / 11S2 (Q)	1/2/2025	I-131	pCi/M^3	<MDA		<MDA	

(Q) - Indicates a Quality Control duplicate sample location

Attachment 4, Environmental Direct Radiation Dosimetry Results

Monitoring Location	Quarterly Baseline, B_Q (mrem)	B_Q + MDD_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem, or "ND" if $F_Q \leq MDD_Q$)				Annual Baseline, B_A (mrem)	B_A + MDD_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem, or "ND" if $F_A \leq MDD_A$)
			1	2	3	4	1	2	3	4				
10E1	17.7	22.5	16.4	18.8	16.8	18.7	ND	ND	ND	ND	71.0	82.7	70.7	ND
10F3	17.4	22.2	19.4	18.9	17.2	17.3	ND	ND	ND	ND	69.7	81.4	72.8	ND
10S3	17.7	22.4	17.8	19.1	19.2	18.9	ND	ND	ND	ND	70.9	82.6	75.0	ND
11S1	20.8	25.5	22.1	22.6	21.0	22.3	ND	ND	ND	ND	83.1	94.8	88.1	ND
13C1	12.5	17.2	14.8	12.4	11.8	13.0	ND	ND	ND	ND	49.8	61.5	52.0	ND
13E1	17.5	22.2	18.7	20.0	18.2	19.5	ND	ND	ND	ND	70.1	81.8	76.5	ND
13S2	28.0	32.8	24.6	25.7	23.7	26.4	ND	ND	ND	ND	112.1	123.8	100.4	ND
14S1	15.8	20.5	16.6	18.0	15.8	16.2	ND	ND	ND	ND	63.2	74.9	66.6	ND
15D1	18.1	22.9	16.2	21.9	16.6	18.4	ND	ND	ND	ND	72.5	84.2	73.2	ND
16F1	18.4	23.1	18.7	19.2	17.8	18.6	ND	ND	ND	ND	73.4	85.1	74.3	ND
17B1	16.7	21.4	17.1	17.6	15.4	16.4	ND	ND	ND	ND	66.8	78.5	66.6	ND
18S2	19.6	24.3	19.7	20.0	18.7	19.1	ND	ND	ND	ND	78.4	90.1	77.5	ND
19D1	16.6	21.3	17.2	16.8	16.4	18.3	ND	ND	ND	ND	66.3	78.0	68.6	ND
20D1	15.7	20.5	17.6	16.2	15.6	15.9	ND	ND	ND	ND	63.0	74.7	65.3	ND
20F1	16.9	21.6	17.0	17.4	16.4	18.0	ND	ND	ND	ND	67.5	79.2	68.8	ND
21S2	16.0	20.7	16.2	16.9	14.9	16.1	ND	ND	ND	ND	64.1	75.8	64.1	ND
23S2	16.0	20.7	15.4	16.8	15.4	16.8	ND	ND	ND	ND	63.9	75.6	64.5	ND
24D1	14.9	19.6	14.4	14.6	15.0	14.2	ND	ND	ND	ND	59.7	71.4	58.1	ND
25D1	14.1	18.8	14.1	15.9	13.6	14.8	ND	ND	ND	ND	56.5	68.2	58.3	ND
25S2	14.5	19.3	17.8	15.1	15.3	16.0	ND	ND	ND	ND	58.1	69.8	64.2	ND
26S3	15.1	19.8	14.2	16.2	13.8	15.4	ND	ND	ND	ND	60.4	72.1	59.6	ND
28D2	15.9	20.6	18.5	16.0	15.3	15.5	ND	ND	ND	ND	63.5	75.2	65.3	ND
29E1	15.6	20.3	16.5	17.7	15.3	16.9	ND	ND	ND	ND	62.3	74.0	66.5	ND
29S1	15.3	20.1	15.8	16.3	13.8	16.2	ND	ND	ND	ND	61.4	73.1	62.0	ND

Attachment 4, Environmental Direct Radiation Dosimetry Results

Monitoring Location	Quarterly Baseline, B_Q (mrem)	B_Q + MDD_Q (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem)				Quarterly Facility Dose, $F_Q=M_Q-B_Q$ (mrem, or "ND" if FQ ≤ MDDQ)				Annual Baseline, B_A (mrem)	B_A + MDD_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A=M_A-B_A$ (mrem, or "ND" if $F_A \leq MDD_A$)
			1	2	3	4	1	2	3	4				
2E1	18.0	22.7	17.7	18.4	20.5	18.8	ND	ND	ND	ND	71.9	83.6	75.3	ND
31D1	20.7	25.5	21.7	20.2	17.8	19.2	ND	ND	ND	ND	83.0	94.7	79.0	ND
31D2	17.8	22.5	19.7	18.4	17.3	17.0	ND	ND	ND	ND	71.2	82.9	72.3	ND
31S1	17.9	22.6	17.8	19.4	17.9	18.5	ND	ND	ND	ND	71.6	83.3	73.5	ND
34E1	16.8	21.5	18.3	18.9	16.2	17.9	ND	ND	ND	ND	67.0	78.7	71.2	ND
34S2	17.9	22.6	18.5	18.4	16.1	17.3	ND	ND	ND	ND	71.6	83.3	70.2	ND
36D1	15.5	20.3	15.5	15.9	13.8	15.1	ND	ND	ND	ND	62.1	73.8	60.4	ND
36S2	18.3	23.1	17.1	18.7	18.6	17.7	ND	ND	ND	ND	73.4	85.1	72.1	ND
3S1	17.5	22.3	17.4	18.1	18.0	17.4	ND	ND	ND	ND	70.1	81.8	70.8	ND
4E1	12.9	17.6	14.2	12.5	11.1	12.8	ND	ND	ND	ND	51.4	63.1	50.7	ND
5H1	21.6	26.3	22.1	25.2	18.1	20.2	ND	ND	ND	ND	86.3	98.0	85.6	ND
5S1	20.0	24.7	19.4	21.1	17.9	20.2	ND	ND	ND	ND	80.0	91.7	78.6	ND
6C1	17.4	22.1	16.2	19.6	19.0	18.7	ND	ND	ND	ND	69.5	81.2	73.4	ND
7E1	18.6	23.4	17.3	19.5	18.9	19.2	ND	ND	ND	ND	74.6	86.3	74.9	ND
7S1	18.3	23.0	19.9	17.9	17.6	18.4	ND	ND	ND	ND	73.1	84.8	73.8	ND
9C1	17.0	21.7	18.1	17.5	17.2	18.5	ND	ND	ND	ND	68.1	79.8	71.4	ND

MDD_Q = Quarterly Minimum Differential Dose = 4.73 mrem
MDD_A = Annual Minimum Differential Dose = 11.7 mrem
ND = Not Detected, where $M_Q \leq (B_Q+MDD_Q)$ or $M_A \leq (B_A+MDD_A)$