Constellation.

Clinton Power Station
8401 Power Road
Clinton, IL 61727

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U.S. Nuclear Regulatory Commission
Washington, DC 20555

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Clinton Power Station 2024 Annual Radiological Environmental Operation Report

Clinton Power Station is submitting the 2024 Annual Radiological Environmental Operation Report. This report is submitted in accordance with Technical Specification requirement 5.6.2, "Annual Radiological Environmental Operation Report," and covers the period from January 1, 2024, through December 31, 2024.

There are no regulatory commitments contained in this report.

Questions in regard to this letter may be directed to Mr. Mohamad Fakhreddine, Chemistry Manager, at 217-937-3200.

Respectfully,

Krukowski, Andrew

Digitally signed by Krukowski, Andrew
Date: 2025.04.29 06:56:17 -05'00'

Andrew Krukowski
Plant Manager
Clinton Power Station

IE25
NRR

Attachment: Annual Radiological Environmental Operation Report

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – Illinois Emergency Management Agency

U-604832

SUBJECT: Clinton Power Station 2024 Annual Radiological Environmental Operation Report

bcc (with attachment):

A. Krukowski
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R. Johnston
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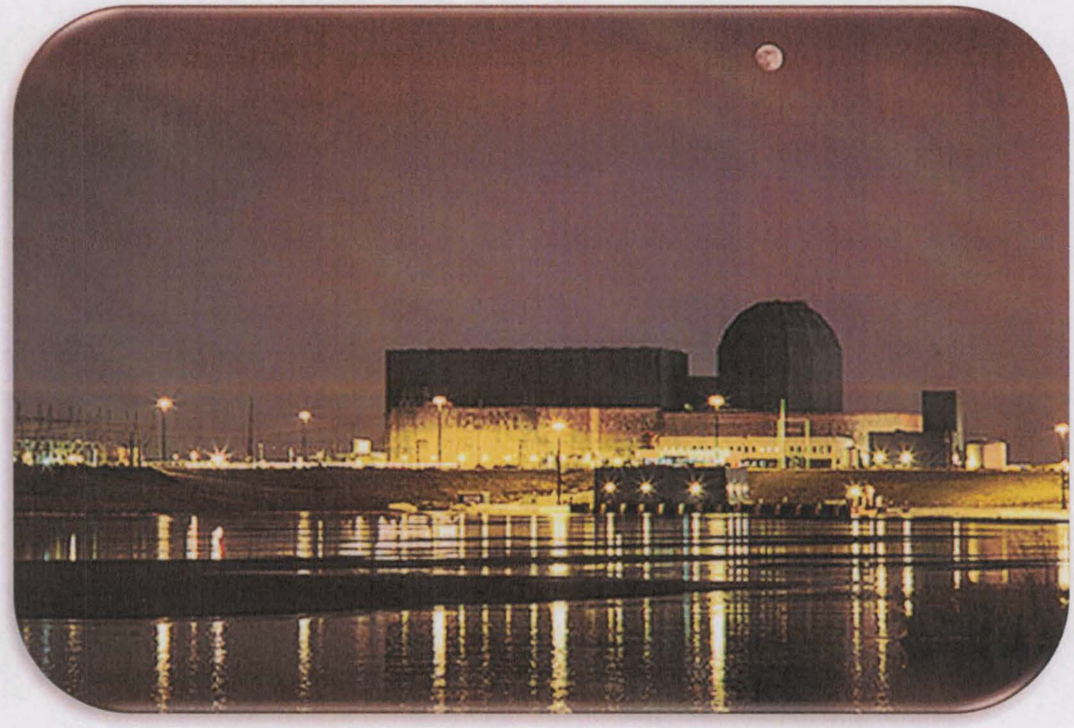

2024 Annual Radiological Environmental Operating Report

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ATTACHMENTS

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. 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. 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

Clinton Clean Energy Center 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 Clinton Station 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) 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 Clinton Station for the reporting period of January 1st through December 31st, 2024. During that time period 1,573 analyses were performed on 1,447 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 Clinton Station, 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 Clinton Station. Naturally occurring radionuclides are present in the Earth's crust and atmosphere and exists in detectable quantities throughout the world. It is common to detect 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. Pre-operational Radiological Environmental Monitoring Program (pre-operational REMP) was conducted to establish background radioactivity levels prior to operation of the Station. The environmental media sampled and analyzed during the pre-operational REMP were atmospheric radiation, fall-out, domestic water, surface water, marine life, milk, and vegetation. The results of the monitoring were detailed in the report entitled, Environmental Radiological Monitoring for Clinton Power Nuclear Power Station, Illinois Power Company, Annual Report 1987, May 1988. Detailed information on the exposure of the U.S. population to ionizing radiation can be found in NCRP Report No. 160 [1].

3.0 INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) provides data on measurable levels of radiation and radioactive materials in the environment. This program also evaluates the relationship between quantities of radioactive materials released from the plant and resultant doses to individuals from principal pathways of exposure. In this capacity, REMP provides a check on the effluent release program and dispersion modeling to ensure that concentrations in the environment due to radioactive effluents conform to the "As Low as Is Reasonably Achievable" (ALARA) design objectives of 10 CFR 50, Appendix I [2], and implements the requirements of Section IV.B.2 and IV.B.3 of Appendix I. REMP is designed to conform to the Nuclear Regulatory Commission (NRC) Regulatory Guide 4.1 [3], NUREG 1301/1302 [4] [5], and the 1979 NRC Branch Technical Position [6].

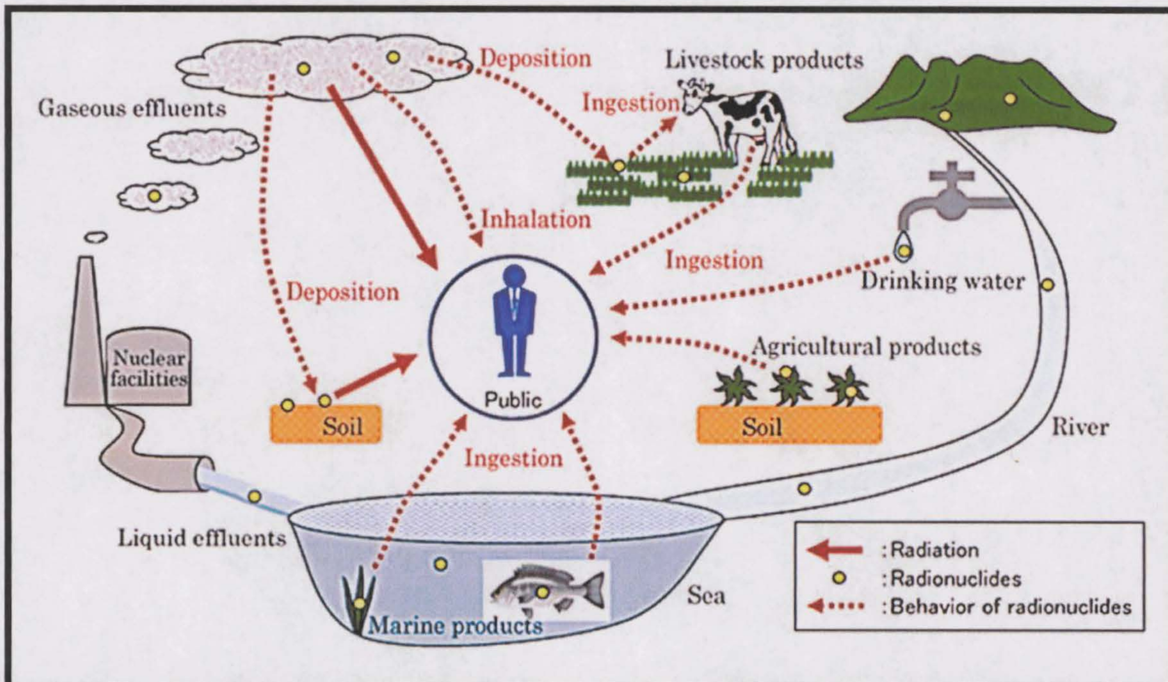

Figure 1, Potential exposure pathways to Members of the Public due to Plant Operations [7]

Quality assurance aspects of the sampling program and TLD/OSLD data collection are conducted in accordance with Regulatory Guides 4.15 [8] and 4.13 [9]. REMP also adheres to the requirements of Illinois, Clinton Station 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 Clinton Clean Energy Center, also known as Clinton Power Station, (CPS), consisting of one approximately 1,120 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Constellation and became operational in 1987. Unit No. 1 went critical on February 27, 1987. The site encloses approximately 13,626 acres. This includes the approximately 4,900-acre, man-made cooling lake and about 95 acres of property not owned by Constellation. The plant is situated on approximately 150 acres. The cooling water discharge flume – which discharges to the eastern arm of the lake – occupies an additional 130 acres. Although the nuclear reactor, supporting equipment and associated electrical generation and distribution equipment lie in Harp Township, portions of the aforementioned 13,626-acre plot reside within Wilson, Rutledge, DeWitt, Creek, Nixon and Santa Anna Townships.

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

- Table 1, Radiological Environmental Sampling Program – Exposure Pathway – Direct Radiation
- Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne
- Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne
- Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion
- Table 5, REMP Sampling Locations – Direct Radiation
- Figure 2, Environmental Sampling Locations Within One Mile of the Clinton Power Station, 2024
- Figure 3, Environmental Sampling Locations Between One and Two Miles of the Clinton Power Station, 2024
- Figure 4, Environmental Sampling Locations Between Two and Five Miles of the Clinton Power Station, 2024
- Figure 5, Environmental Sampling Locations Greater Than Five Miles of the Clinton Power Station, 2024

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS

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

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Direct Radiation 54 DLRs monitoring stations with two dosimeters placed as follows: An inner ring of stations, one in each compass sector in the general area of the site boundary. An outer ring of stations, one in each compass sector at approximately 5 miles from the site. Special interest areas representing special interest areas. A supplemental set and a control	See Table 5	Quarterly	Gamma dose Quarterly

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

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Airborne Radioiodine and Particulates Samples from 10 locations: Five locations close to the site boundary in different sectors of the highest calculated annual average ground level D/Q. Four samples from the vicinity of a community having the highest calculated annual average D/Q. One samples from Control Locations between 4 - 8 miles away in the least predominant wind direction.	CL-1 Camp Quest, 1.8 miles W CL-2 Clinton's Main Access Road, 0.7 miles NNE CL-3 Clinton's Secondary Access Road, 0.7 miles NE CL-4 Residence Near Recreation Area, 0.8 miles SW CL-6 Clinton's Recreation Area, 0.7 miles WSW CL-7 Mascoutin Recreation Area, 2.3 miles SE CL-8 DeWitt Cemetery, 2.2 miles E CL-11 Illinois Power Substation (C), 16 miles S CL-15 Rt. 900N Residence, 0.9 miles N CL-94 Old Clinton Road, 0.6 miles E	One-week composite of continuous air sampling through glass fiber filter paper. One week composite of continuous air sampling through charcoal filter	Particulate sampler: Gross Beta analysis following weekly filter change and Gamma isotopic quarterly on each station. Radioiodine canister: I-131 analysis weekly on near field and control samples.

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

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Surface Water Two samples upstream (control) and two sample downstream	CL-13 Salt Creek Bridge on Rt. 10, 3.6 miles SW CL-90 Discharge Flume, 0.4 miles SE CL-91 Parnell Boat Access (C), 6.1 miles ENE CL-99 North Fork Access (C), 3.5 miles NNE	Monthly grab and composite from a continuous water compositor. Quarterly composite from a continuous water compositor	Gamma isotopic Monthly I-131 Monthly H-3 Quarterly
Drinking (Potable) Water One of sample downstream (indicator)	CL-14 Station Plant Service Bldg, Onsite	Monthly and quarterly composite from a continuous water compositor	Gamma isotopic Monthly Gross Beta Monthly H-3 Quarterly
Groundwater/Well Water Three indicator locations down gradient from the plant, only if likely to be affected.	CL-7D Mascoutin Recreation Area, 2.3 miles ESE CL-12T DeWitt Pump House, 1.6 miles E CL-12R DeWitt Pump House, 1.6 miles E	Quarterly composite from a continuous water compositor	Gamma isotopic Quarterly H-3 Quarterly
Sediment from Shoreline One sample upstream (control) and one sample downstream (indicator)	CL-7B Clinton Lake, 2.1 miles SE CL-105 Lake Shelbyville(C), 50 miles S	Semiannual grab samples	Gamma isotopic Semiannually

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

Requirement	Sample Location Description, Distance, and Direction	Sampling Collection/ Frequency	Type and Frequency of Analyses
Milk One of sample from milking animals at a control location 15 to 30 km distant and in the least prevalent wind direction.	CL-116 Dement Dairy (C), 14 miles WSW	Bi-weekly grab samples when cows are on pasture. Monthly all other times	Gamma isotopic and I-131 analysis on each sample
Fish One sample upstream and one sample downstream of each commercially and recreationally important species in vicinity of site discharge.	CL-19 End of Discharge Flume, 3.4 miles E CL-105 Lake Shelbyville(C), 50 miles S	Semiannually	Gamma isotopic analysis on edible portions
Vegetation Two locations producing vegetables from areas irrigated by water in which liquid plant wastes have been discharged and one sample collected from a control location.	CL-114 Residence WSW of Site (C), 12.5 miles WSW CL-115 Site's Secondary Access Road, 0.7 miles NE CL-118 Site's Main Access Road, 0.7 miles NNE	Monthly grab June through September	Gamma isotopic on each sample Gross Beta on each sample
Grass Four locations from areas irrigated by water in which liquid plant wastes have been discharged and one sample collected from a control location.	CL-1 Camp Quest, 1.8 miles W CL-2 Clinton's Main Access Road, 0.7 miles NNE CL-8 DeWitt Cemetery, 2.2 miles E CL-116 Pasture in Rural Kenney (C), 14 miles WSW	Bi-weekly May through October	Gamma isotopic on each sample

Table 5, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance	Description
CL-1	Inner Ring	W	1.8 miles	
CL-5	Inner Ring	NNE	0.7 miles	
CL-22	Inner Ring	NE	0.6 miles	
CL-23	Inner Ring	ENE	0.5 miles	
CL-24	Inner Ring	E	0.5 miles	
CL-34	Inner Ring	WNW	0.8 miles	
CL-35	Inner Ring	NW	0.7 miles	
CL-36	Inner Ring	N	0.6 miles	
CL-42	Inner Ring	ESE	2.8 miles	
CL-43	Inner Ring	SE	2.8 miles	
CL-44	Inner Ring	SSE	2.3 miles	
CL-45	Inner Ring	S	2.8 miles	
CL-46	Inner Ring	SSW	2.8 miles	
CL-47	Inner Ring	SW	3.3 miles	
CL-48	Inner Ring	WSW	2.3 miles	
CL-63	Inner Ring	NNW	1.3 miles	
CL-51	Outer Ring	NW	4.4 miles	
CL-52	Outer Ring	NNW	4.3 miles	
CL-53	Outer Ring	E	4.3 miles	
CL-54	Outer Ring	ESE	4.6 miles	
CL-55	Outer Ring	SE	4.1 miles	
CL-56	Outer Ring	SSE	4.1 miles	
CL-57	Outer Ring	S	4.6 miles	
CL-58	Outer Ring	SSW	4.3 miles	
CL-60	Outer Ring	SW	4.5 miles	
CL-61	Outer Ring	WSW	4.5 miles	
CL-76	Outer Ring	N	4.6 miles	
CL-77	Outer Ring	NNE	4.5 miles	

Table 5, REMP Sampling Locations – Direct Radiation

Site #	Location Type	Sector	Distance	Description
CL-78	Outer Ring	NE	4.8 miles	
CL-79	Outer Ring	ENE	4.5 miles	
CL-80	Outer Ring	W	4.1 miles	
CL-81	Outer Ring	WNW	4.5 miles	
CL-37	Special Interest	N	3.4 miles	
CL-41	Special Interest	E	2.4 miles	
CL-49	Special Interest	W	3.5 miles	
CL-64	Special Interest	WNW	2.1 miles	
CL-65	Special Interest	ENE	2.6 miles	
CL-74	Special Interest	W	1.9 miles	
CL-75	Special Interest	N	0.9 miles	
CL-2	Supplemental	NNE	0.7 miles	
CL-3	Supplemental	NE	0.7 miles	
CL-4	Supplemental	SW	0.8 miles	
CL-6	Supplemental	WSW	0.8 miles	
CL-7	Supplemental	SE	2.3 miles	
CL-8	Supplemental	E	2.2 miles	
CL-15	Supplemental	N	0.9 miles	
CL-33	Supplemental	SW	11.7 miles	
CL-84	Supplemental	E	0.6 miles	
CL-90	Supplemental	SE	0.4 miles	
CL-91	Supplemental	ENE	6.1 miles	
CL-97	Supplemental	SW	10.3 miles	
CL-99	Supplemental	NNE	3.5 miles	
CL-114(1)	Supplemental	WSW	12.5 miles	
CL-11	Control	S	16 miles	

(1) The location for CL-114 changed at the beginning of 2023 due to a change in control garden location in 2022. CL-114 is a supplemental DLR and a 5-year baseline is being gathered before facility-related dose calculations can be performed. 2023 will be the first full year of a baseline data collection.

6.0 MAPS OF COLLECTION SITES.

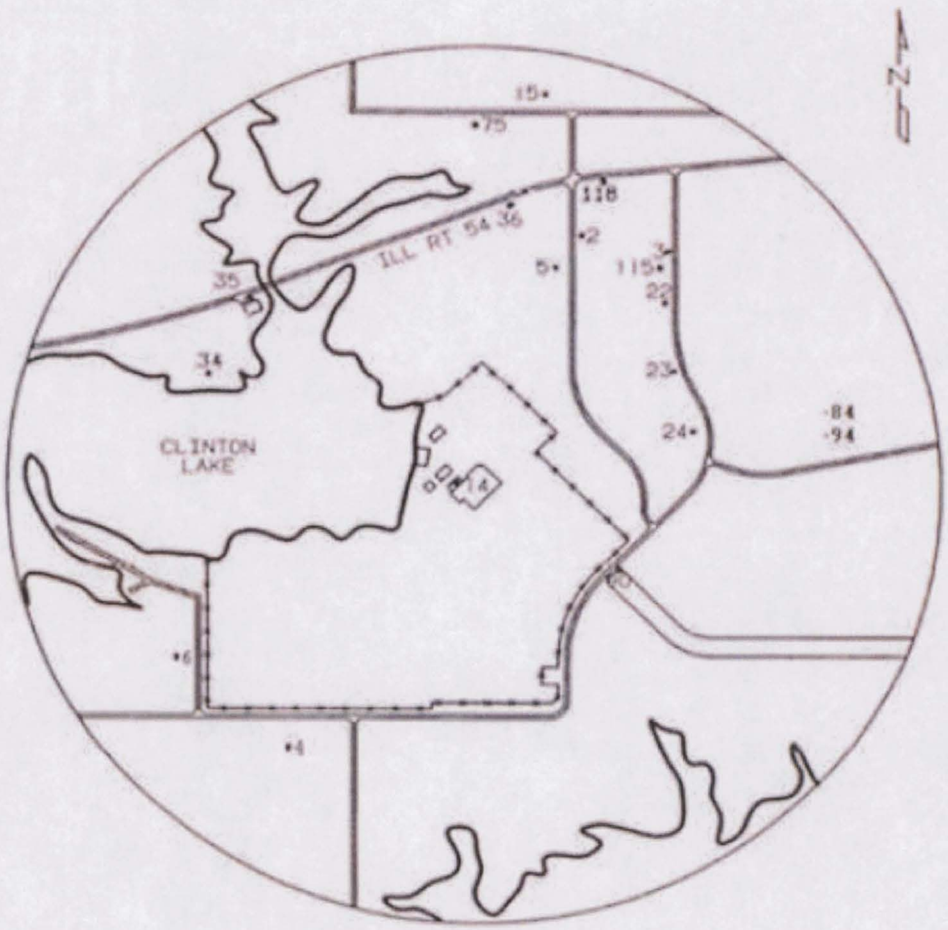

Figure 2, Environmental Sampling Locations Within One Mile of the Clinton Power Station, 2024

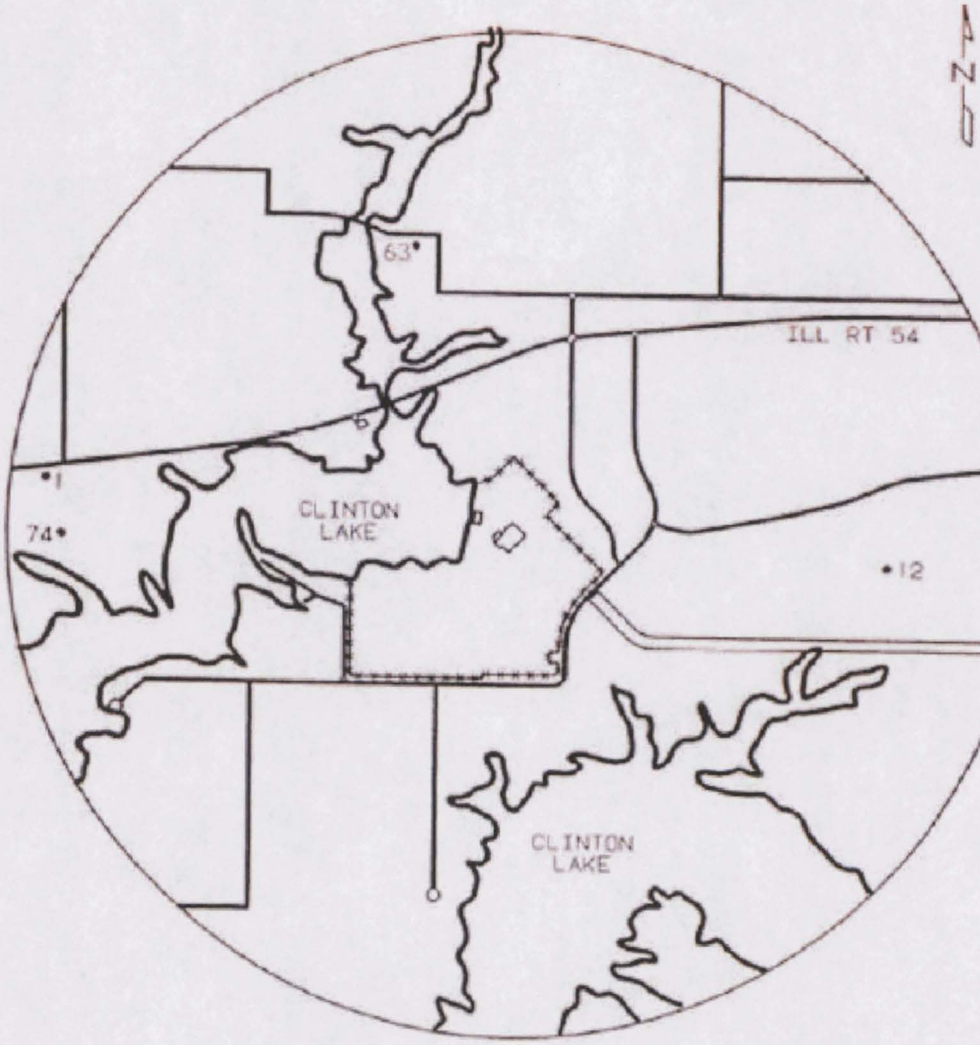

Figure 3, Environmental Sampling Locations Between One and Two Miles of the Clinton Power Station, 2024

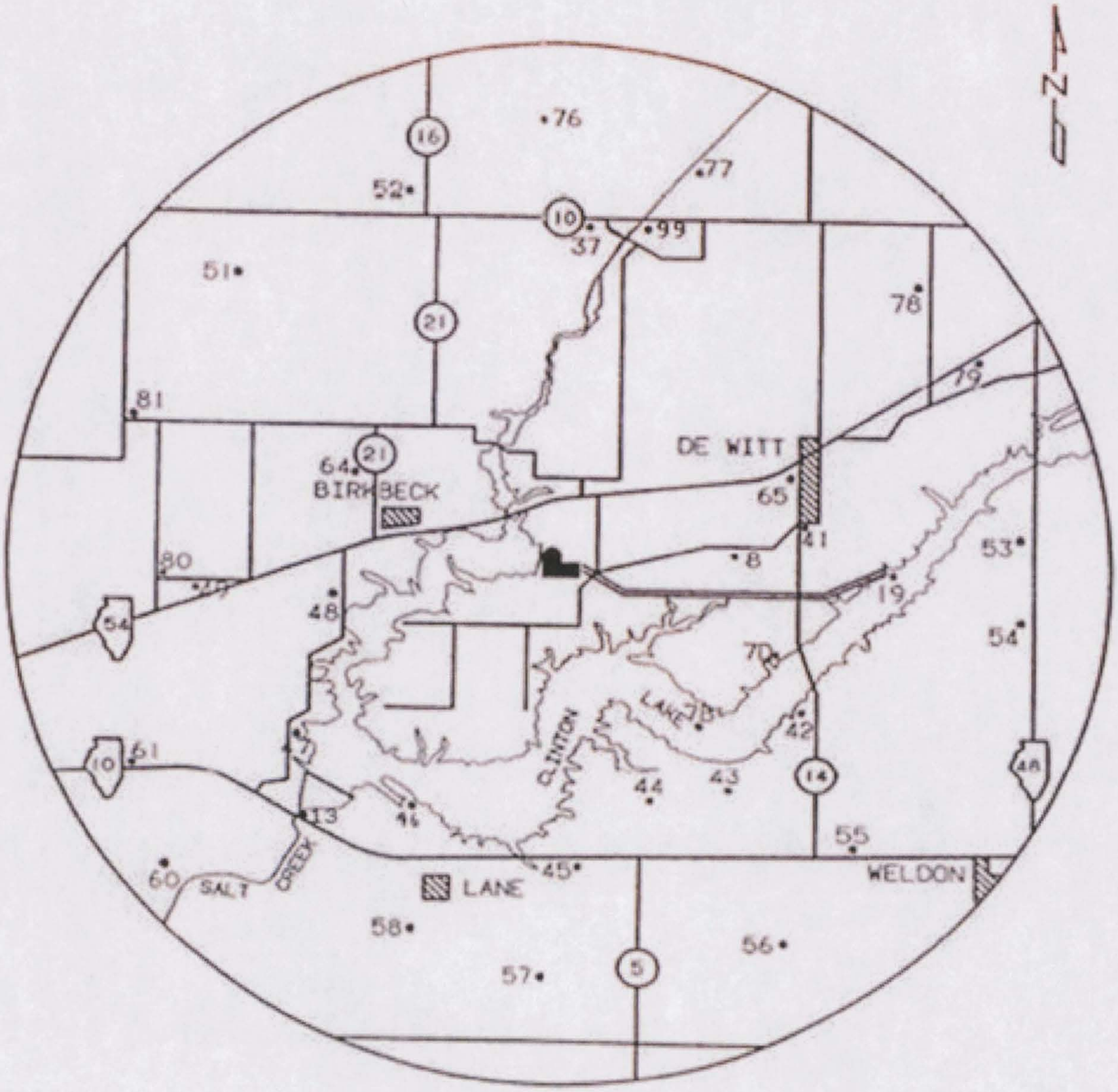

Figure 4, Environmental Sampling Locations Between Two and Five Miles of the Clinton Power Station, 2024

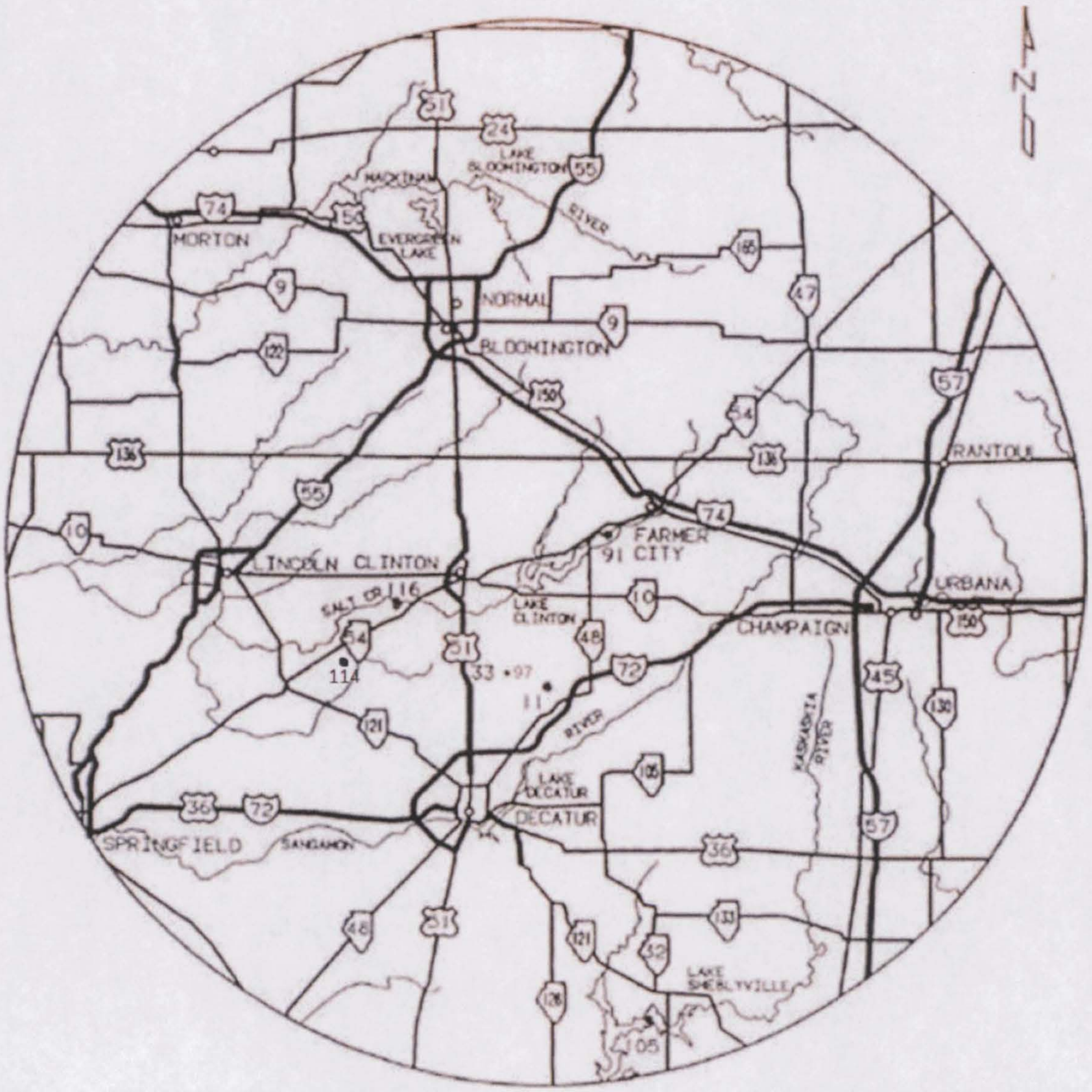

Figure 5, Environmental Sampling Locations Greater Than Five Miles of the Clinton Power Station, 2024

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

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

[1] **For** 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 results of above ground nuclear weapons testing. It is important to note, levels of Cs-137 in environment are observed to fluctuate, for example as silt distributions shift due to natural erosion and transport processes, Cs-137 may or may not be observed in sediment samples. Results from samples collected and analyzed during the year, 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, 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 54 locations were monitored and data analyzed in accordance with the requirements in Table 1, Radiological Environmental Sampling Program – Exposure Pathway – Direct Radiation. Attachment 4, 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 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne. During the calendar year 2024, a total of 520 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. Radioiodine (I-131) analysis is performed weekly on radioiodine sample cartridges.

All gross beta analyses of air particulate filters detected gross beta activity at levels consistent with previous years. All air particulate quarterly gamma composite samples were below the detection limit except for naturally occurring radionuclides.

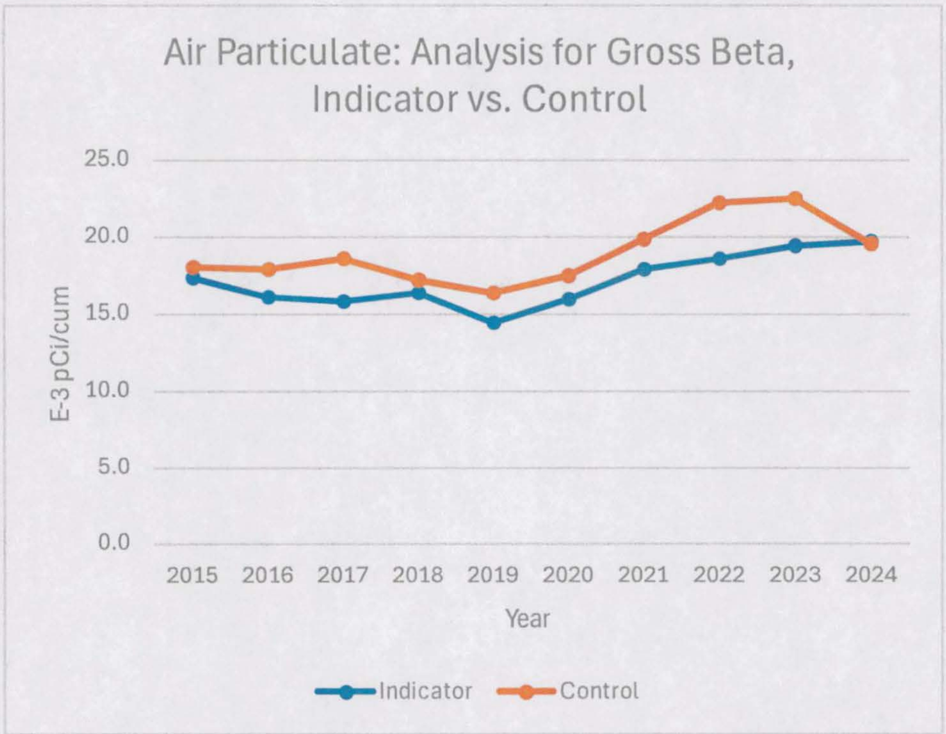

Figure 6, Air Particulate: Analysis for Gross Beta, Average for All Indicator vs. Control Location

Air particulate and radioiodine results from this monitoring period, 2024, were compared to 10-year average as shown in Figure 6, 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. During the calendar year 2024, a total of 16 surface water samples were collected and analyzed in accordance with the requirements in the ODCM and shown in Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne. Samples were analyzed for Iodine-131 (Low Level). There was no detectable Iodine-131 and all required LLDS were met. Samples were analyzed for gamma-emitting nuclides. No nuclides were detected and all required LLDs were met. Tritium concentrations in surface water were well below the EPA tritium drinking water limit of 20,000 pCi/L There has been no detectable tritium in any surface water samples in 2024 or the previous 10 years, therefore, no trend has been established above the detection limit to plot on a trending graph.

8.3.2 REMP Groundwater

Groundwater samples were collected from control location upgradient from the plant and indicator location down gradient from the plant. During the calendar year 2024, a total of 11 groundwater water samples were collected from offsite monitoring wells and analyzed in accordance with the requirements in the ODCM and shown in Table 3: Radiological Environmental Sampling Program – Exposure Pathway - Waterborne. A total of 3 indicator sample locations were collected. These samples were analyzed for tritium and gamma quarterly. All groundwater samples were collected in new containers, which were rinsed with source water prior to collection.

Samples from all locations were analyzed for gamma-emitting nuclides. No nuclides were detected and all required LLDs were met. Tritium concentrations in groundwater were well below the EPA tritium drinking water limit of 20,000 pCi/L. There has been no detectable tritium in any REMP groundwater samples in 2024 or the previous 10 years, therefore, no trend has been established above the detection limit to plot on a trending graph.

8.3.3 Drinking Water

A total of 12 drinking water samples were obtained in 2024. These samples were analyzed for gross beta, gamma, and I-131 monthly and tritium quarterly, in accordance with requirements in the ODCM and shown in Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne. Gross Beta was not detected in any of the samples and all required LLDs were met. No gamma-emitting nuclides were detected and all required LLDs were met. Tritium concentrations in drinking water were well below the EPA tritium drinking water limit of 20,000 pCi/L. There has been no detectable tritium in any REMP drinking water samples in 2024 or in the previous 10 years, therefore, no trend has been established above the detection limit to plot on a trending graph.

8.3.4 Sediment from Shoreline

Shoreline sediment collections were made in May and September, 2024 and analyzed for gamma-emitting isotopes. Samples are collected at both indicator and control locations. A total of 4 shoreline samples were analyzed in accordance with requirements in the ODCM and shown in Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne

No nuclides potentially associated with Clinton Station were detected and all required LLDs were met.

8.4 Ingestion Pathway Sample Results

8.4.1 Milk

Milk samples from milking animals were collected at 1 location within 5 km having the highest dose potential. Samples were collected January-December. Samples were analyzed for gamma-emitting isotopes and I-131(Low Level).

No nuclides potentially associated with Clinton Station were detected and all required LLDs were met.

8.4.2 Fish

A total of 16 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 Sampling Program – Exposure Pathway - Ingestion. These samples are collected from the indicator and control areas as required by the ODCM.

Naturally occurring potassium-40 was identified in all fish samples with concentrations consistent with previous years.

8.4.3 Vegetation

A total of 34 food product type samples were analyzed in 2024, for gamma emitting radionuclides in accordance with requirements of the ODCM, as summarized in Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion.

No nuclides potentially associated with Clinton Station were detected and all required LLDs were met.

8.4.4 Grass

In accordance with the ODCM and as described in Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion, 48 grass 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 from the indicator and control locations biweekly May through October.

No nuclides potentially associated with Clinton Station were detected and all required LLDs were met.

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 [2]. NUREG-1301/1302 Control 3.12.2 specifies that "a Land Use Census shall be conducted and shall identify within a distance of 8 km (5 mi.) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation. Note, per NUREG-1301/1302, Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census.

A Land Use Census was conducted during the calendar year, 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. In summary, the highest D/Q locations for nearest garden, nearest residence and nearest milk animal did not change following the 2024 census

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

Sector	Direction	Residence (Miles)	Milk Farm (Miles)	Livestock (Miles)
A	N	0.9	0.9	0.9
B	NNE	0.9	1.1	
C	NE	1.3		
D	ENE	1.8		
E	E	1.0		
F	ESE	3.2		
G	SE	2.4		
H	SSE	1.8		
J	S	3.0		
K	SSW	2.9		
L	SW	0.7		
M	WSW	2.2	2.7	
N	W	1.2		
P	WNW	1.6		
Q	NW	1.6	2.4	
R	NNW	1.3	1.3	

10.0 SAMPLE DEVIATIONS, ANOMALIES AND UNAVAILABILITY

Sampling and analysis are performed for media types addressed in the Offsite Dose Calculation Manual. Sampling and analysis challenges may be experienced due to a multitude of reasons including environmental factors, loss of TLDs/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 prevents the sample from being analyzed as it normally would, or may have altered the outcome of the analysis (i.e., cross contamination, human error).

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

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

Table 9: Sample Deviation Summary

Sample Type	Location	Collection Date or Period	Reason for not conducting REMP sampling as required by ODCM	Plans for preventing reoccurrence
AP	CL-7, CL-8, CL-15, and CL-94	01/03/2024	Four air samplers were found with approximately 4-5 hours missing from the collection timer. The less than expected sample collection time indicates a brief loss of power in the area. Affected air samplers include ODCM sample locations CL-8 and CL-15, as well as supplemental ODCM sample locations CL-7 and CL-94. (IR 04736473)	
AP	CL-4	03/27/24-04/03/24	Gross-beta analysis for air sampler CL-4 indicated no activity was detected. The sample collection sheet indicated the sampler flow rate was within the procedural requirement, however, upon further investigation, the CL-4 particulate filter paper appeared to be damaged and torn. Due to the filter appearance and low activity identified, the validity of sample collection is suspect and does not appear to be representative for the collection period. CL-4 is a non-ODCM required, supplemental air sampler. This was marked as a missed sample. (IR 04765877)	
AP	CL-1	04/24/2024	Air sampler CL-1 was found with a short collection timer. The timer recorded 162.7 hours of collection time, indicating a short power outage during the collection week. CL-1 is a non-ODCM required, supplemental air sampler. (IR 04773743)	
AP	CL-1	04/17/2024-04/24/2024	Air sampler collection timers were missing hours from the collection period, indicating a short power outage in the area. CL-1 is a non-ODCM required, supplemental air sampler and was missing approximately 7.4 hours of collection. (IR 04778746)	
AP	CL-3 and CL-4	05/15/2024-05/22/2024	Air sampler collection timers were missing hours from the collection period, indicating a short power outage in the area. CL-4 is a non-ODCM required, supplemental air sampler and was missing approximately 16.2 hours of collection CL-3 is an ODCM required air sampler and was missing approximately 4.2 hours of collection. (IR 04778746)	
AP	CL-4 and CL-6	08/07/2024	Two air samplers were found with approximately 1.5 hours missing from the collection timer. The less than expected sample collection time indicates a brief loss of power in the area. Affected air samplers include non-ODCM required, supplemental air samplers CL-4 and CL-6. (IR 04792335)	

Table 9: Sample Deviation Summary Cont'd

Sample Type	Location	Collection Date or Period	Reason for not conducting REMP sampling as required by ODCM	Plans for preventing reoccurrence
AP	CL-7	08/28/2024-09/04/2024	The REMP vendor identified electrical work being performed near CL-7. The vendor stated that the power was out during the sample collection, so the flow rate and Vmax were estimated based on previous week's values. The samples were collected and the filter media was exchanged as normal. Collection timer was unavailable for reading, and utility worker stated power would be returned to the air sampler later that same day, causing collection to be short a couple hours. CL-7 collection timer was short by approximately 1.4 hours. (IR 04798678)	
AP	CL-1	08/28/2024-09/04/2024	Air sampler CL-1 collection timer was missing approximately 5-6 hours for the collection, indicating a brief power outage in the area. CL-1 is a non-ODCM required, supplemental air sampler. (IR 04803884)	
OSLD	CL-57	09/18/2024	The REMP sampling vendor identified CL-57 OSLDs and holder were missing, likely caused by mowing activities in the area. CL-57 is an ODCM-required sampling location and is located in the outer ring of dosimeters at 4.6 miles S of the station. CL-57 was present at the location during the August monthly visual check, and the amount of time the OSLD has been missing during the month of September is unknown. This was marked as a missed sample. (IR 04802846)	
Vegetation	CL-118	09/25/2024	It was identified that the amount of vegetation collected at CL-118 was not of adequate size to reach the requirement of 1 kg. Brush and tree overgrowth in the area has led to decreased amounts of sunlight which could be preventing vegetation growth. (IR 04804779)	
AP and Charcoal	CL-3 and CL-4	10/23/2024	There was a labeling discrepancy for the iodine and particulate samples at REMP locations CL-3 and CL-4. The particulate filters from both locations were originally labeled as collected from CL-3 with one of samples later corrected from CL-3 to CL-4. The charcoal cartridges from both locations were labeled as CL-4. Determining which charcoal cartridge was labeled correctly could not be determined. (IR 04813077)	

Table 9: Sample Deviation Summary Cont'd

Sample Type	Location	Collection Date or Period	Reason for not conducting REMP sampling as required by ODCM	Plans for preventing reoccurrence
Surface Water	CL-99	10/02/2024	During the weekly compositor walkdowns in October, it was identified that the hose connected to surface water compositor CL-99 had washed up on the bank and was not able to collect a sample. A grab sample was collected for the week in place of the composite sample. The monthly surface water sample for the month of November required a grab sample due to low water level in the creek. (IR 04811494)	
AP	CL-6	12/18/2024	Non-ODCM required, supplemental air sampler CL-6 collection timer recorded approximately 2.6 hours less than the weekly expected collection time due to the pump requiring minor maintenance in the field. The missing time corresponds to the time the pump was down for maintenance. (IR 04824580)	
Groundwater	CL-7D	12/31/2024	The REMP sampling vendor was unable to collect the quarterly ground water sample at CL-7D due to the park building being locked for the holiday. (IR 04827058)	The sample collection was rescheduled to January 2nd, 2025, and the sample was able to be successfully obtained at that time.
Drinking Water	CL-14	2024	During 2024, the drinking water compositor located at CL-14 was non-functional due to issues overcoming the pressurized drinking water system causing leaks from the compositor.	Weekly grab samples were obtained from this location and composited for the monthly and quarterly analyses.

11.0 OTHER SUPPLEMENTAL INFORMATION

11.1 NEI 07-07 Onsite Radiological Groundwater Monitoring Program

Clinton Clean Energy Center has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater in order to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. It is important to note, samples and results taken in support of NEI 07-07 on-site groundwater monitoring program are separate from the Radiological Environmental Monitoring Program (REMP). Results of the NEI 07-07 Radiological Groundwater Monitoring Program for onsite groundwater wells are provided in the ARERR.

11.2 Corrections to Previous Reports

No corrections made in previous reports in 2024

12.0 BIBLIOGRAPHY

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Attachment 1, Data Table Summary

Table 10: Clinton Station Data Summary Table

Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)		Lower Limit of Detection (LLD)	Indicator Mean[5]; (f[6]). Range[5]	Location with Highest Annual Mean		Control Mean[5] (f[6]). Range[5]	Number of Nonroutine Reported Measurements
					Name Distance and Direction	Mean[5] (f[6]) Range[5]		
Air Particulates (E-03 pCi/m³)	Gross Beta, 520		10	20 (467/468) (7/36)	CL-3 Clinton's Secondary Access Road 0.7 miles NE	20 (52/52) (9/36)	20 (52/52) (7/35)	0
	Gamma, 40	Co-60	N/A	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ru-103	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ru-106	N/A	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	50	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	60	< LLD	< LLD	< LLD	< LLD	0
		Ce-141	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0
Airborne Radioiodine (E-03 pCi/m³)	Gamma, 520 I-131		70	< LLD	< LLD	< LLD	N/A	0
Direct Radiation (mrem/qtr.)	Gamma Dose, 215		N/A	18.6 (211/211) (11.9/23.3)	CL-49 3.5 miles W	20.8 (4/4) (20.2/21.9)	17.3 (4/4) (13.9/18.8)	0

5 Mean and range are based on detectable measurements only.

6 Fraction are based on detectable measurements at specified locations is indicated in parentheses

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					Name Distance and Direction	Mean[5] (f[6]) Range[5]		
Milk (pCi/L)	I-131(Low Level), 19		1	< LLD	< LLD	< LLD	< LLD	0
	Gamma, 19	K-40	N/A	N/A	CL-116 Dement Dairy 14 miles WSW	1074 (19/19) (883/1252)	1074 (19/19) (883/1252)	0
		Mn-54	N/A	N/A	< LLD	< LLD	< LLD	0
		Co-58	N/A	N/A	< LLD	< LLD	< LLD	0
		Fe-59	N/A	N/A	< LLD	< LLD	< LLD	0
		Co-60	N/A	N/A	< LLD	< LLD	< LLD	0
		Zn-65	N/A	N/A	< LLD	< LLD	< LLD	0
		Nb-95	N/A	N/A	< LLD	< LLD	< LLD	0
		Zr-95	N/A	N/A	< LLD	< LLD	< LLD	0
		Cs-134	15	N/A	< LLD	< LLD	< LLD	0
		Cs-137	18	N/A	< LLD	< LLD	< LLD	0
		Ba-140	60	N/A	< LLD	< LLD	< LLD	0
		La-140	15	N/A	< LLD	< LLD	< LLD	0
		Ce-144	N/A	N/A	< LLD	< LLD	< LLD	0

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					Name Distance and Direction	Mean[5] (f[6]) Range[5]		
Vegetation (pCi/kg Wet)	Gamma, 34	Mn-54	N/A	< LLD	< LLD	< LLD	< LLD	0
		Co-58	N/A	< LLD	< LLD	< LLD	< LLD	0
		Fe-59	N/A	< LLD	< LLD	< LLD	< LLD	0
		Co-60	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zn-65	N/A	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		I-131	60	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	60	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	80	< LLD	< LLD	< LLD	< LLD	0
		Ba-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		La-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0
Grass (pCi/kg Wet)	Gamma, 48	Mn-54	N/A	< LLD	< LLD	< LLD	< LLD	0
		Co-58	N/A	< LLD	< LLD	< LLD	< LLD	0
		Fe-59	N/A	< LLD	< LLD	< LLD	< LLD	0
		Co-60	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zn-65	N/A	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		I-131	60	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	60	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	80	< LLD	< LLD	< LLD	< LLD	0
		Ba-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		La-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0

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

[6] Fraction are based on detectable measurements at specified locations is indicated in parentheses

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Table 10: Clinton Station Data Summary Table

Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)		Lower Limit of Detection (LLD)	Indicator Mean[5]; (f[6]). Range[5]	Location with Highest Annual Mean		Control Mean[5] (f[6]). Range[5]	Number of Nonroutine Reported Measurements
					Name Distance and Direction	Mean[5] (f[6]) Range[5]		
Surface Water (pCi/L)	I-131 (Low Level), 12		1	< LLD	< LLD	< LLD	< LLD	0
	H-3, 16		200	< LLD	< LLD	< LLD	< LLD	0
	Gamma, 48	Mn-54	15	< LLD	< LLD	< LLD	< LLD	0
		Co-58	15	< LLD	< LLD	< LLD	< LLD	0
		Fe-59	30	< LLD	< LLD	< LLD	< LLD	0
		Co-60	15	< LLD	< LLD	< LLD	< LLD	0
		Zn-65	30	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	15	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	30	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	15	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	18	< LLD	< LLD	< LLD	< LLD	0
		Ba-140	60	< LLD	< LLD	< LLD	< LLD	0
		La-140	15	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0

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[6] Fraction are based on detectable measurements at specified locations is indicated in parentheses

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Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)		Lower Limit of Detection (LLD)	Indicator Mean[5]; (f[6]). Range[5]	Location with Highest Annual Mean: Name Distance and Direction	Location with Highest Annual Mean: Mean[5] (f[6]) Range[5]	Control Mean[5] (f[6]). Range[5]	Number of Nonroutine Reported Measurements
Drinking water (pCi/L)	I-131 (Low Level), 12		1	< LLD	< LLD	< LLD	N/A	0
	Gross Beta, 12		4	< LLD	< LLD	< LLD	N/A	0
	H-3, 4		200	< LLD	< LLD	< LLD	N/A	0
	Gamma, 12	Mn-54	15	< LLD	< LLD	< LLD	< LLD	0
		Co-58	15	< LLD	< LLD	< LLD	< LLD	0
		Fe-59	30	< LLD	< LLD	< LLD	< LLD	0
		Co-60	15	< LLD	< LLD	< LLD	< LLD	0
		Zn-65	30	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	15	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	30	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	15	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	18	< LLD	< LLD	< LLD	< LLD	0
		Ba-140	60	< LLD	< LLD	< LLD	< LLD	0
		La-140	15	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0

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

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Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)		Lower Limit of Detection (LLD)	Indicator Mean[5]; (f[6]). Range[5]	Location with Highest Annual Mean		Control Mean[5] (f[6]). Range[5]	Number of Nonroutine Reported Measurements
					Name Distance and Direction	Mean[5] (f[6]) Range[5]		
Ground/Well Water (pCi/L)	H-3, 11		200	< LLD	< LLD	< LLD	N/A	0
	Gamma, 11	Mn-54	15	< LLD	< LLD	< LLD	N/A	0
		Co-58	15	< LLD	< LLD	< LLD	N/A	0
		Fe-59	30	< LLD	< LLD	< LLD	N/A	0
		Co-60	15	< LLD	< LLD	< LLD	N/A	0
		Zn-65	30	< LLD	< LLD	< LLD	N/A	0
		Nb-95	15	< LLD	< LLD	< LLD	N/A	0
		Zr-95	30	< LLD	< LLD	< LLD	N/A	0
		Cs-134	15	< LLD	< LLD	< LLD	N/A	0
		Cs-137	18	< LLD	< LLD	< LLD	N/A	0
		Ba-140	60	< LLD	< LLD	< LLD	N/A	0
		La-140	15	< LLD	< LLD	< LLD	N/A	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0
Fish (pCi/kg Wet)	Gamma, 16	Mn-54	130	< LLD	< LLD	< LLD	< LLD	0
		Co-58	130	< LLD	< LLD	< LLD	< LLD	0
		Fe-59	260	< LLD	< LLD	< LLD	< LLD	0
		Co-60	130	< LLD	< LLD	< LLD	< LLD	0
		Zn-65	260	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	130	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	150	< LLD	< LLD	< LLD	< LLD	0
		Ba-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		La-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0

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

[6] Fraction are based on detectable measurements at specified locations is indicated in parentheses

Attachment 1, Data Table Summary

Table 10: Clinton Station Data Summary Table

Medium or Pathway Sampled (Units)	Type, Total Number of Analyses performed (e.g., I-131, 400)		Lower Limit of Detection (LLD)	Indicator Mean[5]; (f[6]). Range[5]	Location with Highest Annual Mean		Control Mean[5] (f[6]). Range[5]	Number of Nonroutine Reported Measurements
					Name Distance and Direction	Mean[5] (f[6]) Range[5]		
Sediment (pCi/kg Dry)	Gamma, 4	Mn-54	N/A	< LLD	< LLD	< LLD	< LLD	0
		Co-58	N/A	< LLD	< LLD	< LLD	< LLD	0
		Fe-59	N/A	< LLD	< LLD	< LLD	< LLD	0
		Co-60	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zn-65	N/A	< LLD	< LLD	< LLD	< LLD	0
		Nb-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Zr-95	N/A	< LLD	< LLD	< LLD	< LLD	0
		Cs-134	150	< LLD	< LLD	< LLD	< LLD	0
		Cs-137	180	< LLD	< LLD	< LLD	< LLD	0
		Ba-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		La-140	N/A	< LLD	< LLD	< LLD	< LLD	0
		Ce-144	N/A	< LLD	< LLD	< LLD	< LLD	0

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

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

Note: Throughout Attachment 2, bold data entries are for the reported concentration

Table 11, Weekly Air Particulate Gross Beta (E^{-3} pCi/m^3)

Collection Date	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94	CL-1	CL-7	CL-8	CL-11
01/03/2024	**23** ± 5	**26** ± 5	**26** ± 5	**25** ± 5	**25** ± 5	**26** ± 5	**28** ± 5	**24** ± 5	**24** ± 5	**26** ± 5
01/10/2024	**23** ± 5	**28** ± 5	**28** ± 5	**29** ± 5	**25** ± 5	**29** ± 5	**26** ± 5	**28** ± 5	**29** ± 5	**23** ± 5
01/17/2024	**20** ± 4	**18** ± 4	**20** ± 4	**16** ± 4	**20** ± 4	**17** ± 4	**18** ± 4	**18** ± 4	**20** ± 4	**19** ± 4
01/24/2024	**13** ± 4	**11** ± 3	**13** ± 4	**15** ± 4	**13** ± 4	**11** ± 3	**13** ± 4	**11** ± 3	**15** ± 4	**13** ± 4
01/31/2024	**12** ± 4	**12** ± 4	**18** ± 4	**19** ± 4	**9** ± 4	**15** ± 4	**15** ± 4	**17** ± 4	**16** ± 4	**13** ± 4
02/07/2024	**17** ± 4	**17** ± 4	**22** ± 4	**22** ± 4	**17** ± 4	**20** ± 4	**19** ± 4	**19** ± 4	**19** ± 4	**19** ± 4
02/14/2024	**16** ± 4	**22** ± 4	**21** ± 4	**22** ± 4	**22** ± 4	**24** ± 5	**20** ± 4	**22** ± 4	**19** ± 4	**24** ± 4
02/21/2024	**24** ± 4	**25** ± 4	**24** ± 4	**23** ± 4	**25** ± 5	**24** ± 4	**23** ± 4	**24** ± 4	**22** ± 4	**22** ± 4
02/28/2024	**14** ± 4	**17** ± 4	**18** ± 4	**19** ± 4	**18** ± 4	**18** ± 4	**18** ± 4	**16** ± 4	**13** ± 4	**18** ± 4
03/06/2024	**16** ± 4	**18** ± 4	**21** ± 4	**17** ± 4	**17** ± 4	**15** ± 4	**14** ± 4	**18** ± 4	**19** ± 4	**20** ± 4
03/13/2024	**14** ± 4	**18** ± 4	**15** ± 4	**16** ± 4	**18** ± 4	**15** ± 4	**16** ± 4	**18** ± 4	**17** ± 4	**16** ± 4
03/20/2024	**12** ± 4	**14** ± 4	**15** ± 4	**13** ± 4	**13** ± 4	**10** ± 4	**14** ± 4	**12** ± 4	**13** ± 4	**12** ± 4
03/27/2024	**16** ± 4	**20** ± 4	< 5(1)	**16** ± 4	**15** ± 4	**17** ± 4	**15** ± 4	**13** ± 4	**13** ± 4	**15** ± 4
04/03/2024	**9** ± 3	**9** ± 3	**7** ± 3	**7** ± 3	**7** ± 3	**9** ± 3	**8** ± 3	**8** ± 3	**10** ± 4	**7** ± 3
04/10/2024	**19** ± 4	**20** ± 5	**18** ± 4	**17** ± 4	**18** ± 4	**16** ± 4	**18** ± 4	**17** ± 4	**12** ± 4	**13** ± 4
04/17/2024	**12** ± 4	**12** ± 4	**13** ± 4	**19** ± 5	**16** ± 4	**14** ± 4	**13** ± 4	**14** ± 4	**15** ± 4	**14** ± 4
04/24/2024	**18** ± 4	**15** ± 4	**13** ± 4	**14** ± 4	**19** ± 4	**16** ± 4	**12** ± 4	**11** ± 4	**13** ± 4	**16** ± 4
05/01/2024	**13** ± 4	**16** ± 4	**12** ± 4	**15** ± 4	**12** ± 4	**12** ± 4	**13** ± 4	**12** ± 4	**14** ± 4	**14** ± 4
05/08/2024	**12** ± 4	**14** ± 4	**14** ± 4	**14** ± 4	**13** ± 4	**13** ± 4	**13** ± 4	**9** ± 4	**14** ± 4	**13** ± 4
05/15/2024	**20** ± 4	**21** ± 4	**22** ± 5	**23** ± 4	**20** ± 4	**19** ± 4	**22** ± 4	**19** ± 4	**22** ± 4	**19** ± 4
05/22/2024	**12** ± 4	**12** ± 4	**9** ± 4	**11** ± 4	**8** ± 4	**9** ± 4	**7** ± 4	**9** ± 4	**9** ± 4	**8** ± 4

(1) See Sample Deviations Table

Table 11, Weekly Air Particulate Gross Beta (E-3 pCi/m3) Cont'd

Collection Date	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94	CL-1	CL-7	CL-8	CL-11
05/29/2024	**13** ± 4	**14** ± 4	**17** ± 4	**16** ± 4	**15** ± 4	**17** ± 4	**14** ± 4	**14** ± 4	**16** ± 4	**15** ± 4
06/05/2024	**12** ± 4	**10** ± 4	**14** ± 4	**13** ± 4	**15** ± 4	**13** ± 4	**13** ± 4	**12** ± 4	**9** ± 3	**14** ± 4
06/12/2024	**15** ± 4	**16** ± 4	**18** ± 4	**20** ± 5	**19** ± 5	**18** ± 5	**17** ± 4	**15** ± 4	**21** ± 5	**13** ± 4
06/19/2024	**16** ± 4	**22** ± 4	**17** ± 4	**18** ± 4	**18** ± 4	**13** ± 4	**18** ± 4	**18** ± 4	**19** ± 4	**16** ± 4
06/26/2024	**14** ± 4	**17** ± 4	**16** ± 4	**12** ± 4	**18** ± 4	**17** ± 4	**17** ± 4	**14** ± 4	**11** ± 4	**14** ± 4
07/03/2024	**17** ± 4	**16** ± 4	**17** ± 4	**17** ± 4	**15** ± 4	**15** ± 4	**12** ± 4	**18** ± 4	**18** ± 4	**16** ± 4
07/10/2024	**16** ± 5	**16** ± 4	**17** ± 5	**17** ± 5	**12** ± 4	**17** ± 5	**17** ± 5	**14** ± 4	**18** ± 5	**17** ± 5
07/17/2024	**18** ± 4	**22** ± 5	**15** ± 4	**16** ± 4	**17** ± 4	**17** ± 4	**21** ± 4	**17** ± 4	**20** ± 4	**21** ± 4
07/24/2024	**14** ± 4	**20** ± 4	**18** ± 4	**18** ± 4	**17** ± 4	**15** ± 4	**17** ± 4	**15** ± 4	**16** ± 4	**21** ± 5
07/31/2024	**19** ± 4	**24** ± 5	**22** ± 4	**21** ± 4	**23** ± 5	**25** ± 5	**21** ± 4	**23** ± 5	**24** ± 5	**20** ± 4
08/07/2024	**23** ± 5	**22** ± 4	**15** ± 4	**19** ± 4	**19** ± 4	**20** ± 4	**18** ± 4	**18** ± 4	**19** ± 4	**19** ± 4
08/14/2024	**22** ± 5	**22** ± 5	**19** ± 4	**21** ± 4	**20** ± 4	**17** ± 4	**21** ± 4	**19** ± 4	**19** ± 4	**20** ± 4
08/21/2024	**27** ± 5	**30** ± 5	**32** ± 5	**26** ± 5	**29** ± 5	**24** ± 5	**27** ± 5	**24** ± 5	**32** ± 5	**26** ± 5
08/28/2024	**22** ± 4	**18** ± 4	**18** ± 4	**23** ± 5	**19** ± 4	**22** ± 4	**26** ± 5	**16** ± 4	**22** ± 5	**23** ± 5
09/04/2024	**20** ± 5	**20** ± 5	**17** ± 4	**19** ± 4	**19** ± 5	**21** ± 5	**23** ± 5	**19** ± 4	**23** ± 5	**22** ± 5
09/11/2024	**32** ± 5	**29** ± 5	**31** ± 5	**22** ± 5	**25** ± 5	**26** ± 5	**29** ± 5	**22** ± 5	**27** ± 5	**25** ± 5
09/18/2024	**21** ± 5	**30** ± 5	**21** ± 5	**24** ± 5	**21** ± 5	**23** ± 5	**23** ± 5	**20** ± 5	**25** ± 5	**22** ± 5
09/25/2024	**18** ± 4	**21** ± 5	**18** ± 4	**17** ± 4	**15** ± 4	**18** ± 4	**21** ± 5	**11** ± 4	**18** ± 4	**15** ± 4
10/02/2024	**29** ± 5	**31** ± 5	**30** ± 5	**26** ± 5	**31** ± 5	**28** ± 5	**31** ± 5	**34** ± 5	**31** ± 5	**29** ± 5
10/09/2024	**31** ± 5	**29** ± 5	**31** ± 5	**31** ± 5	**30** ± 5	**31** ± 5	**32** ± 5	**23** ± 4	**30** ± 5	**30** ± 5
10/16/2024	**26** ± 5	**28** ± 5	**27** ± 5	**30** ± 5	**27** ± 5	**31** ± 5	**29** ± 5	**22** ± 5	**33** ± 5	**32** ± 5
10/23/2024	**36** ± 5	**28** ± 5	**34** ± 5	**31** ± 5	**31** ± 5	**33** ± 5	**26** ± 5	**25** ± 5	**31** ± 5	**35** ± 5

Table 11, Weekly Air Particulate Gross Beta (E-3 pCi/m3) Cont'd

Collection Date	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94	CL-1	CL-7	CL-8	CL-11
10/30/2024	**18** ± 4	**15** ± 4	**19** ± 4	**16** ± 4	**16** ± 4	**18** ± 4	**15** ± 4	**15** ± 4	**16** ± 4	**16** ± 4
11/06/2024	**16** ± 4	**15** ± 4	**14** ± 4	**16** ± 4	**18** ± 5	**16** ± 4	**15** ± 4	**12** ± 4	**13** ± 4	**15** ± 4
11/13/2024	**26** ± 5	**23** ± 5	**25** ± 5	**30** ± 5	**24** ± 5	**29** ± 5	**26** ± 5	**22** ± 4	**25** ± 5	**31** ± 5
11/20/2024	**20** ± 4	**14** ± 4	**23** ± 4	**15** ± 4	**19** ± 4	**18** ± 4	**20** ± 4	**19** ± 4	**18** ± 4	**19** ± 4
11/27/2024	**27** ± 5	**36** ± 5	**36** ± 5	**35** ± 5	**30** ± 5	**32** ± 5	**33** ± 5	**34** ± 5	**31** ± 5	**34** ± 5
12/04/2024	**21** ± 5	**23** ± 5	**22** ± 5	**16** ± 4	**19** ± 5	**22** ± 5	**21** ± 5	**22** ± 5	**23** ± 5	**17** ± 4
12/11/2024	**28** ± 5	**27** ± 5	**26** ± 5	**28** ± 5	**26** ± 5	**25** ± 5	**28** ± 5	**25** ± 5	**26** ± 5	**29** ± 5
12/18/2024	**23** ± 5	**26** ± 6	**25** ± 5	**24** ± 5	**25** ± 5	**23** ± 5	**20** ± 5	**24** ± 5	**22** ± 5	**22** ± 5
12/24/2024	**29** ± 5	**31** ± 5	**27** ± 5	**30** ± 5	**27** ± 5	**31** ± 5	**28** ± 5	**31** ± 5	**32** ± 5	**30** ± 5

Table 12, Quarterly Air Particulate Gamma Isotopic (pCi/m^3 ± 2 Sigma)

Station	Nuclide	Q1	Q2	Q3	Q4
CL-2	Co-60	< 4	< 5	< 3	< 2
	Nb-95	< 3	< 4	< 2	< 2
	Zr-95	< 6	< 8	< 4	< 4
	Ru-103	< 3	< 4	< 3	< 2
	Ru-106	< 28	< 33	< 21	< 19
	Cs-134	< 4	< 5	< 3	< 3
	Cs-137	< 2	< 4	< 2	< 2
	Ce-141	< 3	< 6	< 4	< 3
	Ce-144	< 11	< 18	< 10	< 9
CL-3	Co-60	< 3	< 2	< 4	< 2
	Nb-95	< 3	< 2	< 4	< 2
	Zr-95	< 5	< 3	< 6	< 3
	Ru-103	< 2	< 2	< 4	< 2
	Ru-106	< 17	< 14	< 29	< 16
	Cs-134	< 3	< 2	< 3	< 2
	Cs-137	< 2	< 2	< 3	< 2
	Ce-141	< 2	< 2	< 4	< 2
	Ce-144	< 9	< 6	< 12	< 6

Station	Nuclide	Q1	Q2	Q3	Q4
CL-4	Co-60	< 3	< 3	< 3	< 2
	Nb-95	< 2	< 3	< 3	< 3
	Zr-95	< 3	< 5	< 3	< 4
	Ru-103	< 2	< 3	< 3	< 3
	Ru-106	< 15	< 20	< 15	< 17
	Cs-134	< 2	< 3	< 2	< 3
	Cs-137	< 2	< 2	< 2	< 2
	Ce-141	< 2	< 4	< 3	< 3
	Ce-144	< 8	< 11	< 10	< 9
CL-6	Co-60	< 3	< 2	< 2	< 2
	Nb-95	< 2	< 2	< 2	< 3
	Zr-95	< 3	< 4	< 4	< 6
	Ru-103	< 2	< 2	< 2	< 3
	Ru-106	< 17	< 14	< 13	< 17
	Cs-134	< 2	< 2	< 2	< 3
	Cs-137	< 2	< 2	< 2	< 2
	Ce-141	< 2	< 3	< 3	< 3
	Ce-144	< 8	< 8	< 6	< 10

Table 12, Quarterly Air Particulate Gamma Isotopic (pCi/m3 ± 2 Sigma) Cont'd

Station	Nuclide	Q1	Q2	Q3	Q4
CL-15	Co-60	< 2	< 4	< 2	< 3
	Nb-95	< 2	< 4	< 3	< 2
	Zr-95	< 3	< 7	< 4	< 4
	Ru-103	< 2	< 5	< 2	< 2
	Ru-106	< 16	< 27	< 19	< 17
	Cs-134	< 2	< 3	< 2	< 2
	Cs-137	< 2	< 4	< 2	< 2
	Ce-141	< 2	< 5	< 3	< 3
	Ce-144	< 8	< 12	< 9	< 8
CL-94	Co-60	< 2	< 2	< 3	< 2
	Nb-95	< 2	< 3	< 3	< 2
	Zr-95	< 3	< 5	< 6	< 5
	Ru-103	< 2	< 2	< 3	< 2
	Ru-106	< 23	< 18	< 21	< 23
	Cs-134	< 2	< 2	< 4	< 3
	Cs-137	< 2	< 2	< 3	< 2
	Ce-141	< 3	< 3	< 5	< 3
	Ce-144	< 8	< 7	< 12	< 9

Station	Nuclide	Q1	Q2	Q3	Q4
CL-1	Co-60	< 3	< 2	< 2	< 1
	Nb-95	< 2	< 3	< 2	< 2
	Zr-95	< 4	< 4	< 4	< 4
	Ru-103	< 2	< 2	< 2	< 2
	Ru-106	< 18	< 18	< 17	< 19
	Cs-134	< 2	< 3	< 2	< 2
	Cs-137	< 2	< 2	< 2	< 2
	Ce-141	< 3	< 2	< 3	< 3
	Ce-144	< 9	< 6	< 8	< 9
CL-7	Co-60	< 3	< 3	< 5	< 2
	Nb-95	< 3	< 3	< 5	< 3
	Zr-95	< 5	< 5	< 8	< 5
	Ru-103	< 2	< 2	< 5	< 3
	Ru-106	< 22	< 19	< 31	< 21
	Cs-134	< 3	< 3	< 3	< 3
	Cs-137	< 3	< 2	< 4	< 3
	Ce-141	< 3	< 3	< 6	< 5
	Ce-144	< 11	< 7	< 16	< 13

Table 12, Quarterly Air Particulate Gamma Isotopic (pCi/m3 ± 2 Sigma) Cont'd

Station	Nuclide	Q1	Q2	Q3	Q4
CL-8	Co-60	< 3	< 2	< 3	< 2
	Nb-95	< 2	< 2	< 2	< 2
	Zr-95	< 5	< 4	< 4	< 4
	Ru-103	< 2	< 2	< 3	< 2
	Ru-106	< 17	< 17	< 19	< 17
	Cs-134	< 2	< 2	< 2	< 2
	Cs-137	< 2	< 2	< 2	< 2
	Ce-141	< 2	< 3	< 3	< 3
	Ce-144	< 9	< 7	< 10	< 7
CL-11	Co-60	< 3	< 3	< 4	< 3
	Nb-95	< 3	< 3	< 4	< 2
	Zr-95	< 4	< 5	< 6	< 4
	Ru-103	< 2	< 3	< 3	< 3
	Ru-106	< 24	< 19	< 27	< 21
	Cs-134	< 2	< 2	< 3	< 3
	Cs-137	< 2	< 2	< 3	< 2
	Ce-141	< 3	< 3	< 4	< 3
	Ce-144	< 13	< 9	< 9	< 8

Table 13, Weekly Air Iodine I-131 (E^{-3} pCi/m^3)

Collection Date	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94	CL-1	CL-7	CL-8	CL-11
01/03/2024	< 48	< 33	< 49	< 49	< 39	< 39	< 49	< 39	< 39	< 18
01/10/2024	< 23	< 54	< 54	< 54	< 57	< 57	< 55	< 57	< 56	< 24
01/17/2024	< 37	< 37	< 37	< 37	< 49	< 49	< 17	< 50	< 50	< 21
01/24/2024	< 35	< 36	< 36	< 36	< 20	< 15	< 15	< 19	< 19	< 19
01/31/2024	< 37	< 38	< 38	< 38	< 29	< 43	< 19	< 43	< 43	< 43
02/07/2024	< 24	< 11	< 23	< 23	< 25	< 24	< 23	< 24	< 24	< 16
02/14/2024	< 30	< 13	< 30	< 30	< 43	< 38	< 30	< 38	< 38	< 37
02/21/2024	< 36	< 36	< 36	< 15	< 46	< 46	< 36	< 45	< 45	< 19
02/28/2024	< 18	< 43	< 43	< 43	< 54	< 53	< 43	< 53	< 23	< 52
03/06/2024	< 38	< 37	< 18	< 38	< 19	< 37	< 38	< 37	< 37	< 37
03/13/2024	< 17	< 42	< 41	< 42	< 29	< 29	< 42	< 29	< 22	< 29
03/20/2024	< 23	< 23	< 23	< 11	< 16	< 25	< 23	< 24	< 24	< 24
03/27/2024	< 18	< 42	< 41	< 42	< 55	< 23	< 42	< 54	< 54	< 54
04/03/2024	< 35	< 35	< 15	< 35	< 36	< 35	< 35	< 36	< 15	< 35
04/10/2024	< 58	< 58	< 58	< 58	< 58	< 58	< 25	< 24	< 58	< 58
04/17/2024	< 41	< 41	< 41	< 41	< 37	< 38	< 22	< 37	< 38	< 29
04/24/2024	< 39	< 40	< 17	< 40	< 18	< 43	< 40	< 43	< 43	< 45
05/01/2024	< 40	< 41	< 41	< 41	< 24	< 34	< 18	< 34	< 34	< 34
05/08/2024	< 15	< 37	< 37	< 37	< 39	< 40	< 36	< 39	< 39	< 17
05/15/2024	< 58	< 59	< 27	< 58	< 19	< 39	< 59	< 39	< 40	< 40
05/22/2024	< 40	< 17	< 40	< 40	< 46	< 43	< 39	< 19	< 44	< 45

Table 13, Weekly Air Iodine I-131 (E-3 pCi/m3) Cont'd

Collection Date	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94	CL-1	CL-7	CL-8	CL-11
05/29/2024	< 48	< 21	< 49	< 49	< 59	< 26	< 50	< 58	< 58	< 58
06/05/2024	< 44	< 19	< 44	< 44	< 49	< 47	< 44	< 49	< 21	< 48
06/12/2024	< 33	< 23	< 34	< 34	< 34	< 16	< 34	< 33	< 33	< 33
06/19/2024	< 37	< 38	< 37	< 37	< 22	< 51	< 16	< 51	< 51	< 51
06/26/2024	< 15	< 33	< 33	< 33	< 26	< 17	< 33	< 26	< 26	< 26
07/03/2024	< 28	< 41	< 41	< 41	< 39	< 18	< 41	< 39	< 39	< 38
07/10/2024	< 26	< 39	< 39	< 39	< 29	< 13	< 39	< 29	< 29	< 29
07/17/2024	< 40	< 21	< 41	< 41	< 52	< 37	< 41	< 51	< 52	< 51
07/24/2024	< 44	< 45	< 45	< 45	< 37	< 38	< 33	< 16	< 37	< 38
07/31/2024	< 43	< 43	< 29	< 43	< 42	< 59	< 43	< 57	< 58	< 57
08/07/2024	< 35	< 35	< 35	< 35	< 40	< 39	< 26	< 40	< 40	< 30
08/14/2024	< 21	< 43	< 43	< 43	< 37	< 37	< 43	< 36	< 37	< 19
08/21/2024	< 39	< 39	< 39	< 39	< 45	< 19	< 30	< 45	< 45	< 45
08/28/2024	< 43	< 42	< 43	< 43	< 37	< 40	< 33	< 36	< 37	< 37
09/04/2024	< 34	< 47	< 47	< 47	< 37	< 36	< 47	< 36	< 36	< 39
09/11/2024	< 40	< 40	< 31	< 40	< 44	< 22	< 40	< 45	< 45	< 44
09/18/2024	< 41	< 41	< 32	< 42	< 37	< 19	< 41	< 38	< 38	< 37
09/25/2024	< 38	< 20	< 39	< 38	< 35	< 34	< 38	< 25	< 33	< 34
10/02/2024	< 38	< 51	< 51	< 51	< 47	< 33	< 51	< 47	< 48	< 48
10/09/2024	< 51	< 51	< 50	< 51	< 51	< 24	< 38	< 50	< 50	< 50
10/16/2024	< 21	< 41	< 41	< 41	< 31	< 32	< 41	< 32	< 32	< 24
10/23/2024	< 26	< 38	< 38	< 38	< 19	< 41	< 38	< 41	< 41	< 41

Table 13, Weekly Air Iodine I-131 (E-3 pCi/m3) Cont'd

Collection Date	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94	CL-1	CL-7	CL-8	CL-11
10/30/2024	< 27	< 41	< 41	< 41	< 30	< 40	< 42	< 39	< 39	< 39
11/06/2024	< 47	< 20	< 48	< 47	< 54	< 53	< 48	< 53	< 53	< 39
11/13/2024	< 45	< 31	< 45	< 46	< 43	< 43	< 45	< 20	< 43	< 43
11/20/2024	< 39	< 39	< 39	< 39	< 44	< 21	< 30	< 44	< 44	< 44
11/27/2024	< 17	< 40	< 40	< 40	< 48	< 48	< 41	< 48	< 48	< 35
12/04/2024	< 17	< 36	< 36	< 36	< 28	< 26	< 37	< 27	< 27	< 29
12/11/2024	< 46	< 46	< 51	< 46	< 50	< 21	< 46	< 50	< 50	< 50
12/18/2024	< 42	< 22	< 42	< 42	< 41	< 40	< 42	< 41	< 41	< 45
12/24/2024	< 25	< 25	< 25	< 25	< 28	< 41	< 16	< 41	< 41	< 41

Table 14, Monthly/Bi-Weekly Milk I-131 (pCi/L ± 2 Sigma)

Collection Date	CL-116
01/31/2024	< 0.6
02/28/2024	< 0.9
03/27/2024	< 0.9
04/24/2024	< 0.9
05/15/2024	< 0.8
05/29/2024	< 0.8
06/12/2024	< 0.9
06/26/2024	< 0.7
07/10/2024	< 0.9
07/24/2024	< 0.8
08/07/2024	< 0.7
08/21/2024	< 0.8
09/04/2024	< 0.8
09/18/2024	< 0.8
10/02/2024	< 0.7
10/16/2024	< 0.9
10/30/2024	< 0.8
11/27/2024	< 0.9
12/31/2024	< 0.9

Table 15, Monthly/Bi-Weekly Milk Gamma Isotopic (pCi/L ± 2 Sigma)

Station	Collection Dates	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-116	01/31/2024	**1058** ± 187	< 9	< 8	< 18	< 8	< 16	< 9	< 14	< 9	< 8	< 32	< 12	< 49
	02/28/2024	**1252** ± 171	< 5	< 5	< 11	< 7	< 11	< 7	< 10	< 7	< 6	< 19	< 7	< 47
	03/27/2024	**1116** ± 160	< 7	< 9	< 15	< 9	< 16	< 7	< 13	< 6	< 8	< 31	< 10	< 59
	04/24/2024	**883** ± 143	< 5	< 8	< 15	< 10	< 16	< 7	< 11	< 6	< 8	< 28	< 8	< 39
	05/15/2024	**1059** ± 155	< 6	< 7	< 14	< 8	< 16	< 7	< 11	< 8	< 6	< 28	< 8	< 47
	05/29/2024	**1066** ± 160	< 7	< 7	< 19	< 7	< 17	< 8	< 12	< 8	< 8	< 35	< 7	< 53
	06/12/2024	**1204** ± 198	< 8	< 9	< 17	< 10	< 19	< 6	< 13	< 8	< 7	< 38	< 8	< 50
	06/26/2024	**1172** ± 153	< 6	< 8	< 16	< 7	< 14	< 6	< 11	< 6	< 7	< 29	< 9	< 45
	07/10/2024	**1008** ± 164	< 7	< 6	< 16	< 7	< 17	< 8	< 12	< 9	< 7	< 32	< 9	< 52
	07/24/2024	**1094** ± 148	< 8	< 7	< 17	< 8	< 15	< 7	< 13	< 9	< 7	< 31	< 8	< 50
	08/07/2024	**991** ± 155	< 6	< 6	< 14	< 7	< 18	< 7	< 12	< 8	< 8	< 30	< 9	< 54
	08/21/2024	**1081** ± 144	< 8	< 8	< 19	< 6	< 15	< 8	< 13	< 8	< 8	< 36	< 11	< 44
	09/04/2024	**1077** ± 195	< 8	< 9	< 18	< 9	< 20	< 7	< 16	< 9	< 8	< 32	< 13	< 45
	09/18/2024	**1049** ± 161	< 8	< 8	< 18	< 10	< 17	< 7	< 11	< 9	< 7	< 34	< 9	< 45
	10/02/2024	**1198** ± 91	< 4	< 4	< 10	< 5	< 11	< 4	< 7	< 5	< 4	< 19	< 6	< 28
	10/16/2024	**1202** ± 148	< 7	< 7	< 14	< 8	< 17	< 7	< 11	< 7	< 6	< 29	< 8	< 44
	10/30/2024	**994** ± 146	< 7	< 8	< 16	< 9	< 15	< 6	< 11	< 8	< 7	< 32	< 12	< 44
	11/27/2024	**910** ± 139	< 6	< 6	< 13	< 7	< 18	< 8	< 12	< 8	< 7	< 28	< 8	< 50
	12/31/2024	**986** ± 159	< 6	< 7	< 16	< 7	< 18	< 8	< 13	< 8	< 8	< 27	< 10	< 42

Table 16, Annual Vegetation Gamma Isotopic (pCi/kg Wet ± 2 Sigma)

Station		Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-114	KALE	06/26/2024	< 41	< 32	< 76	< 43	< 76	< 38	< 63	< 38	< 36	< 48	< 142	< 43	< 220
	LETTUCE	06/26/2024	< 36	< 29	< 71	< 40	< 77	< 37	< 63	< 47	< 32	< 37	< 127	< 41	< 177
	SWISS CHARD	06/26/2024	< 37	< 24	< 79	< 47	< 86	< 29	< 63	< 35	< 49	< 40	< 165	< 46	< 176
	KALE	07/24/2024	< 32	< 31	< 88	< 34	< 48	< 30	< 54	< 37	< 34	< 38	< 117	< 36	< 161
	LETTUCE	07/24/2024	< 18	< 17	< 41	< 16	< 41	< 17	< 30	< 28	< 18	< 20	< 77	< 24	< 120
	SWISS CHARD	07/24/2024	< 31	< 28	< 67	< 47	< 71	< 35	< 58	< 53	< 36	< 40	< 152	< 55	< 223
	BROCCOLI	08/28/2024	< 33	< 23	< 71	< 41	< 64	< 38	< 46	< 44	< 37	< 29	< 143	< 43	< 212
	KALE	08/28/2024	< 22	< 25	< 54	< 22	< 48	< 28	< 44	< 35	< 25	< 19	< 105	< 27	< 119
	SWISS CHARD	08/28/2024	< 40	< 32	< 75	< 38	< 89	< 36	< 64	< 48	< 40	< 32	< 139	< 44	< 193
	BROCCOLI	09/25/2024	< 31	< 20	< 62	< 31	< 59	< 27	< 43	< 47	< 33	< 30	< 133	< 44	< 179
	KALE	09/25/2024	< 23	< 20	< 47	< 27	< 61	< 14	< 31	< 30	< 21	< 19	< 94	< 20	< 124
	SWISS CHARD	09/25/2024	< 19	< 23	< 45	< 25	< 54	< 22	< 38	< 36	< 24	< 20	< 88	< 29	< 97

Table 16, Annual Vegetation Gamma Isotopic (pCi/kg Wet ± 2 Sigma) Cont'd

Station		Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-115	KALE	06/26/2024	< 41	< 36	< 86	< 33	< 98	< 48	< 70	< 53	< 45	< 38	< 173	< 20	< 215
	LETTUCE	06/26/2024	< 42	< 33	< 74	< 42	< 91	< 42	< 52	< 46	< 46	< 35	< 125	< 37	< 214
	SWISS CHARD	06/26/2024	< 30	< 28	< 69	< 30	< 59	< 32	< 39	< 48	< 28	< 29	< 117	< 28	< 183
	KALE	07/24/2024	< 28	< 27	< 58	< 22	< 66	< 31	< 45	< 36	< 33	< 27	< 122	< 35	< 139
	LETTUCE	07/24/2024	< 29	< 40	< 81	< 37	< 91	< 35	< 60	< 47	< 41	< 33	< 133	< 48	< 187
	SWISS CHARD	07/24/2024	< 42	< 32	< 80	< 30	< 90	< 31	< 73	< 50	< 35	< 28	< 94	< 52	< 198
	KALE	08/28/2024	< 29	< 31	< 70	< 35	< 61	< 33	< 47	< 45	< 40	< 35	< 118	< 53	< 171
	LETTUCE/KALE	08/28/2024	< 35	< 31	< 77	< 38	< 81	< 30	< 56	< 48	< 34	< 35	< 151	< 50	< 183
	SWISS CHARD	08/28/2024	< 31	< 36	< 71	< 32	< 80	< 30	< 57	< 49	< 34	< 23	< 132	< 41	< 189
	KALE	09/25/2024	< 21	< 18	< 49	< 23	< 52	< 19	< 35	< 32	< 24	< 19	< 86	< 20	< 104
	KALE/SWISS CHARD	09/25/2024	< 18	< 18	< 41	< 21	< 45	< 17	< 30	< 34	< 21	< 19	< 94	< 31	< 116
	SWISS CHARD	09/25/2024	< 15	< 16	< 36	< 17	< 37	< 16	< 32	< 28	< 15	< 18	< 78	< 20	< 111

Table 16, Annual Vegetation Gamma Isotopic (pCi/kg Wet ± 2 Sigma) Cont'd

Station		Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-118	KALE	06/26/2024	< 38	< 34	< 87	< 45	< 90	< 37	< 65	< 52	< 38	< 41	< 166	< 57	< 184
	LETTUCE	06/26/2024	< 39	< 39	< 98	< 40	< 74	< 40	< 55	< 46	< 41	< 38	< 117	< 46	< 224
	SWISS CHARD	06/26/2024	< 33	< 40	< 94	< 42	< 58	< 37	< 70	< 50	< 40	< 43	< 172	< 41	< 196
	KALE	07/24/2024	< 28	< 20	< 56	< 35	< 87	< 31	< 42	< 36	< 34	< 25	< 110	< 40	< 152
	LETTUCE	07/24/2024	< 33	< 43	< 56	< 43	< 77	< 42	< 49	< 46	< 40	< 39	< 142	< 49	< 209
	SWISS CHARD	07/24/2024	< 25	< 24	< 43	< 36	< 71	< 26	< 44	< 36	< 31	< 30	< 113	< 38	< 161
	KALE/LETTUCE	08/28/2024	< 27	< 33	< 77	< 40	< 90	< 37	< 55	< 47	< 35	< 31	< 145	< 42	< 184
	LETTUCE	08/28/2024	< 39	< 29	< 84	< 37	< 101	< 39	< 80	< 45	< 47	< 43	< 146	< 48	< 207
	SWISS CHARD	08/28/2024	< 32	< 34	< 90	< 37	< 79	< 38	< 56	< 53	< 37	< 39	< 170	< 42	< 204
	KALE/LETTUCE/SWISS CHARD	09/25/2024	< 22	< 25	< 65	< 33	< 56	< 25	< 51	< 37	< 28	< 24	< 107	< 33	< 111

Table 17, Bi-weekly Grass Gamma Isotopic (pCi/kg Wet ± 2 Sigma)

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-01	05/15/2024	< 32	< 29	< 67	< 30	< 113	< 26	< 53	< 44	< 49	< 33	< 125	< 42	< 166
	05/29/2024	< 24	< 26	< 57	< 33	< 59	< 26	< 39	< 35	< 27	< 27	< 115	< 33	< 122
	06/12/2024	< 29	< 28	< 56	< 27	< 64	< 29	< 52	< 47	< 31	< 31	< 135	< 39	< 187
	06/26/2024	< 32	< 29	< 66	< 33	< 68	< 33	< 46	< 43	< 36	< 29	< 123	< 28	< 160
	07/10/2024	< 22	< 21	< 53	< 29	< 54	< 25	< 47	< 37	< 26	< 24	< 109	< 33	< 141
	07/24/2024	< 38	< 27	< 65	< 41	< 66	< 35	< 54	< 40	< 28	< 33	< 149	< 34	< 203
	08/07/2024	< 23	< 25	< 51	< 30	< 58	< 26	< 44	< 43	< 28	< 26	< 123	< 28	< 173
	08/21/2024	< 25	< 27	< 70	< 29	< 67	< 29	< 59	< 39	< 28	< 32	< 133	< 39	< 212
	09/04/2024	< 23	< 18	< 52	< 22	< 55	< 25	< 45	< 36	< 26	< 22	< 111	< 26	< 116
	09/18/2024	< 32	< 33	< 78	< 38	< 92	< 41	< 72	< 50	< 44	< 40	< 151	< 41	< 202
	10/02/2024	< 23	< 23	< 55	< 29	< 59	< 24	< 46	< 38	< 25	< 22	< 99	< 25	< 150
	10/16/2024	< 20	< 19	< 43	< 21	< 43	< 19	< 33	< 29	< 23	< 20	< 84	< 19	< 109

Table 17, Bi-weekly Grass Gamma Isotopic (pCi/kg Wet ± 2 Sigma) Cont'd

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-02	05/15/2024	< 29	< 31	< 75	< 37	< 65	< 29	< 49	< 37	< 32	< 28	< 162	< 27	< 140
	05/29/2024	< 24	< 23	< 46	< 23	< 53	< 23	< 37	< 34	< 23	< 23	< 96	< 28	< 145
	06/12/2024	< 32	< 33	< 83	< 44	< 76	< 39	< 54	< 52	< 32	< 35	< 161	< 43	< 202
	06/26/2024	< 28	< 28	< 76	< 38	< 70	< 31	< 59	< 45	< 34	< 30	< 142	< 33	< 256
	07/10/2024	< 28	< 35	< 78	< 38	< 68	< 22	< 54	< 40	< 29	< 23	< 130	< 43	< 156
	07/24/2024	< 20	< 19	< 43	< 18	< 50	< 20	< 38	< 26	< 20	< 19	< 72	< 26	< 105
	08/07/2024	< 31	< 36	< 70	< 28	< 63	< 27	< 47	< 42	< 30	< 29	< 112	< 38	< 167
	08/21/2024	< 30	< 28	< 62	< 36	< 78	< 32	< 47	< 50	< 35	< 28	< 127	< 38	< 176
	09/04/2024	< 30	< 24	< 58	< 33	< 66	< 27	< 41	< 39	< 25	< 26	< 97	< 22	< 154
	09/18/2024	< 18	< 16	< 38	< 19	< 41	< 17	< 28	< 25	< 17	< 17	< 71	< 21	< 88
	10/02/2024	< 20	< 20	< 48	< 23	< 54	< 23	< 37	< 35	< 22	< 22	< 100	< 26	< 136
	10/16/2024	< 20	< 22	< 40	< 21	< 47	< 22	< 38	< 33	< 22	< 22	< 98	< 29	< 122

Table 17, Bi-weekly Grass Gamma Isotopic (pCi/kg Wet ± 2 Sigma) Cont'd

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-08	05/15/2024	< 27	< 34	< 57	< 32	< 69	< 28	< 42	< 42	< 26	< 32	< 128	< 33	< 140
	05/29/2024	< 20	< 18	< 38	< 15	< 43	< 19	< 29	< 26	< 18	< 18	< 77	< 15	< 113
	06/12/2024	< 38	< 35	< 107	< 33	< 90	< 38	< 62	< 46	< 28	< 39	< 160	< 36	< 202
	06/26/2024	< 20	< 23	< 47	< 23	< 53	< 16	< 31	< 31	< 25	< 22	< 87	< 22	< 142
	07/10/2024	< 29	< 35	< 63	< 29	< 68	< 31	< 54	< 54	< 31	< 33	< 130	< 43	< 197
	07/24/2024	< 22	< 22	< 58	< 28	< 57	< 23	< 44	< 27	< 22	< 23	< 95	< 31	< 116
	08/07/2024	< 21	< 23	< 52	< 22	< 55	< 24	< 41	< 32	< 25	< 26	< 87	< 30	< 122
	08/21/2024	< 29	< 26	< 53	< 43	< 65	< 30	< 47	< 46	< 32	< 29	< 141	< 34	< 152
	09/04/2024	< 26	< 25	< 61	< 31	< 60	< 27	< 43	< 39	< 27	< 24	< 105	< 26	< 132
	09/18/2024	< 31	< 36	< 82	< 39	< 94	< 32	< 62	< 50	< 35	< 33	< 142	< 41	< 182
	10/02/2024	< 32	< 33	< 83	< 34	< 85	< 35	< 55	< 55	< 45	< 35	< 171	< 45	< 163
	10/16/2024	< 25	< 26	< 57	< 28	< 69	< 28	< 46	< 42	< 27	< 28	< 119	< 34	< 162

Table 17, Bi-weekly Grass Gamma Isotopic (pCi/kg Wet ± 2 Sigma) Cont'd

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-116	05/15/2024	< 27	< 28	< 68	< 28	< 69	< 28	< 56	< 44	< 32	< 26	< 105	< 45	< 140
	05/29/2024	< 27	< 25	< 63	< 25	< 48	< 24	< 32	< 32	< 25	< 25	< 114	< 31	< 156
	06/12/2024	< 28	< 30	< 82	< 41	< 72	< 38	< 55	< 49	< 35	< 40	< 159	< 36	< 178
	06/26/2024	< 23	< 33	< 65	< 44	< 76	< 38	< 48	< 42	< 36	< 28	< 115	< 31	< 203
	07/10/2024	< 18	< 24	< 47	< 28	< 47	< 22	< 40	< 36	< 23	< 20	< 94	< 25	< 151
	07/24/2024	< 27	< 28	< 62	< 36	< 77	< 25	< 46	< 46	< 31	< 31	< 139	< 23	< 212
	08/07/2024	< 29	< 35	< 87	< 30	< 81	< 40	< 61	< 49	< 38	< 37	< 119	< 26	< 178
	08/21/2024	< 25	< 28	< 58	< 31	< 61	< 32	< 41	< 43	< 30	< 28	< 116	< 35	< 193
	09/04/2024	< 20	< 21	< 59	< 24	< 59	< 24	< 40	< 36	< 27	< 26	< 105	< 26	< 149
	09/18/2024	< 37	< 33	< 77	< 41	< 76	< 33	< 58	< 50	< 35	< 32	< 128	< 50	< 165
	10/02/2024	< 6	< 6	< 15	< 7	< 16	< 7	< 12	< 10	< 7	< 6	< 27	< 9	< 28
	10/16/2024	< 20	< 20	< 41	< 22	< 47	< 19	< 34	< 32	< 20	< 21	< 85	< 25	< 108

Table 18, Monthly Surface Water Iodine-131 (pCi/L ± 2 Sigma)

Station	Collection Dates	I-131
CL-90	12/27/2023	< 0.6
	01/31/2024	< 0.8
	02/28/2024	< 0.8
	03/27/2024	< 0.9
	04/24/2024	< 0.8
	05/29/2024	< 0.8
	06/26/2024	< 0.7
	07/31/2024	< 0.8
	08/28/2024	< 0.7
	09/25/2024	< 0.9
	10/30/2024	< 0.7
	11/27/2024	< 0.8

Table 19, Monthly Surface Water Gamma Isotopic (pCi/L ± 2 Sigma)

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-90	12/27/2023 - 01/31/2024	< 9	< 6	< 7	< 7	< 13	< 7	< 12	< 8	< 7	< 29	< 9	< 42
	01/31/2024 - 02/28/2024	< 6	< 6	< 12	< 5	< 16	< 8	< 12	< 7	< 7	< 23	< 11	< 40
	02/28/2024 - 03/27/2024	< 7	< 8	< 16	< 9	< 15	< 8	< 13	< 9	< 9	< 37	< 13	< 43
	03/27/2024 - 04/24/2024	< 5	< 6	< 12	< 6	< 13	< 5	< 10	< 5	< 6	< 25	< 7	< 42
	04/24/2024 - 05/29/2024	< 5	< 6	< 12	< 5	< 12	< 6	< 9	< 8	< 8	< 18	< 11	< 40
	05/29/2024 - 06/26/2024	< 7	< 6	< 13	< 8	< 13	< 7	< 10	< 6	< 7	< 26	< 10	< 44
	06/26/2024 - 07/31/2024	< 6	< 5	< 10	< 6	< 11	< 5	< 9	< 5	< 5	< 26	< 6	< 37
	07/31/2024 - 08/28/2024	< 7	< 7	< 17	< 8	< 6	< 6	< 14	< 7	< 9	< 35	< 14	< 50
	08/28/2024 - 09/25/2024	< 5	< 6	< 12	< 5	< 12	< 6	< 9	< 8	< 6	< 29	< 11	< 41
	09/25/2024 - 10/30/2024	< 8	< 6	< 16	< 8	< 13	< 8	< 14	< 9	< 8	< 30	< 12	< 52
	10/30/2024 - 11/27/2024	< 5	< 6	< 11	< 7	< 10	< 5	< 10	< 6	< 5	< 26	< 9	< 42
	11/27/2024 - 12/31/2024	< 7	< 6	< 11	< 9	< 15	< 7	< 12	< 7	< 6	< 39	< 8	< 41

Table 19, Monthly Surface Water Gamma Isotopic (pCi/L ± 2 Sigma) Cont'd

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-13	01/31/2024 - 01/31/2024	< 8	< 7	< 16	< 9	< 17	< 7	< 14	< 7	< 8	< 34	< 8	< 44
	02/28/2024 - 02/28/2024	< 6	< 6	< 13	< 6	< 13	< 4	< 8	< 7	< 6	< 21	< 9	< 39
	03/27/2024 - 03/27/2024	< 8	< 10	< 15	< 9	< 13	< 10	< 15	< 8	< 10	< 35	< 13	< 48
	04/24/2024 - 04/24/2024	< 5	< 6	< 8	< 6	< 12	< 5	< 9	< 6	< 7	< 24	< 8	< 37
	05/29/2024 - 05/29/2024	< 5	< 7	< 16	< 10	< 12	< 8	< 10	< 7	< 7	< 23	< 13	< 43
	06/26/2024 - 06/26/2024	< 7	< 8	< 16	< 8	< 16	< 7	< 13	< 7	< 8	< 34	< 9	< 55
	07/31/2024 - 07/31/2024	< 4	< 5	< 8	< 4	< 9	< 4	< 8	< 5	< 4	< 19	< 8	< 28
	08/28/2024 - 08/28/2024	< 6	< 5	< 13	< 7	< 17	< 7	< 11	< 6	< 7	< 30	< 8	< 55
	09/25/2024 - 09/25/2024	< 6	< 5	< 8	< 5	< 9	< 7	< 9	< 6	< 5	< 25	< 7	< 44
	10/30/2024 - 10/30/2024	< 7	< 7	< 13	< 6	< 12	< 7	< 12	< 7	< 8	< 32	< 12	< 41
	11/27/2024 - 11/27/2024	< 7	< 7	< 13	< 7	< 13	< 7	< 11	< 7	< 7	< 33	< 9	< 54
	12/31/2024 - 12/31/2024	< 6	< 5	< 13	< 7	< 11	< 6	< 10	< 6	< 6	< 33	< 14	< 42

Table 19, Monthly Surface Water Gamma Isotopic (pCi/L ± 2 Sigma) Cont'd

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-91	12/27/2023 - 01/31/2024	< 7	< 8	< 16	< 7	< 14	< 6	< 15	< 8	< 8	< 32	< 10	< 61
	01/31/2024 - 02/28/2024	< 6	< 6	< 11	< 6	< 13	< 7	< 10	< 7	< 5	< 20	< 7	< 44
	02/28/2024 - 03/27/2024	< 5	< 7	< 12	< 15	< 10	< 5	< 9	< 6	< 4	< 29	< 13	< 40
	03/27/2024 - 04/24/2024	< 7	< 6	< 11	< 7	< 12	< 6	< 12	< 6	< 5	< 26	< 10	< 39
	04/24/2024 - 05/29/2024	< 6	< 5	< 15	< 6	< 13	< 7	< 13	< 7	< 6	< 27	< 11	< 42
	05/29/2024 - 06/26/2024	< 7	< 7	< 8	< 4	< 13	< 6	< 13	< 7	< 7	< 32	< 11	< 45
	06/26/2024 - 07/31/2024	< 6	< 6	< 11	< 7	< 10	< 7	< 11	< 7	< 6	< 25	< 9	< 42
	07/31/2024 - 08/28/2024	< 7	< 8	< 16	< 11	< 14	< 9	< 13	< 9	< 8	< 37	< 10	< 59
	08/28/2024 - 09/25/2024	< 8	< 8	< 17	< 8	< 17	< 8	< 11	< 6	< 7	< 33	< 11	< 43
	09/25/2024 - 10/30/2024	< 6	< 6	< 15	< 8	< 20	< 9	< 13	< 8	< 8	< 29	< 11	< 48
	10/30/2024 - 11/27/2024	< 8	< 8	< 15	< 9	< 19	< 7	< 14	< 8	< 9	< 43	< 10	< 66
	11/27/2024 - 12/31/2024	< 5	< 7	< 13	< 10	< 16	< 8	< 13	< 8	< 8	< 38	< 9	< 41

Table 19, Monthly Surface Water Gamma Isotopic (pCi/L ± 2 Sigma) Cont'd

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-99	12/27/2023 - 01/31/2024	< 6	< 6	< 12	< 5	< 15	< 6	< 12	< 7	< 5	< 20	< 5	< 43
	01/31/2024 - 02/28/2024	< 6	< 5	< 12	< 6	< 11	< 6	< 8	< 6	< 6	< 27	< 7	< 48
	02/28/2024 - 03/27/2024	< 7	< 7	< 16	< 5	< 15	< 6	< 14	< 7	< 7	< 41	< 15	< 47
	03/27/2024 - 04/24/2024	< 5	< 4	< 9	< 6	< 10	< 4	< 6	< 4	< 4	< 22	< 6	< 32
	04/24/2024 - 05/29/2024	< 6	< 4	< 16	< 7	< 14	< 7	< 12	< 7	< 7	< 24	< 14	< 43
	05/29/2024 - 06/26/2024	< 5	< 7	< 12	< 8	< 10	< 6	< 9	< 6	< 6	< 26	< 10	< 42
	06/26/2024 - 07/31/2024	< 5	< 6	< 18	< 6	< 11	< 6	< 11	< 8	< 7	< 26	< 12	< 42
	07/31/2024 - 08/28/2024	< 7	< 8	< 15	< 9	< 15	< 7	< 13	< 9	< 6	< 27	< 11	< 40
	08/28/2024 - 09/25/2024	< 5	< 6	< 11	< 6	< 13	< 6	< 9	< 7	< 5	< 25	< 9	< 36
	09/25/2024 - 10/30/2024	< 6	< 4	< 11	< 7	< 12	< 5	< 10	< 6	< 5	< 21	< 6	< 37
	10/30/2024 - 11/27/2024	< 6	< 5	< 10	< 6	< 11	< 6	< 8	< 6	< 5	< 22	< 8	< 34
	11/27/2024 - 12/31/2024	< 7	< 7	< 12	< 7	< 17	< 7	< 12	< 7	< 8	< 31	< 11	< 46

Table 20, Quarterly Surface Water Tritium (pCi/L ± 2 Sigma)

Station	Collection Dates	H-3
CL-90	12/27/2023 - 03/27/2024	< 183
	03/27/2024 - 06/26/2024	< 196
	06/26/2024 - 09/23/2024	< 185
	09/23/2024 - 12/31/2024	< 183
CL-13	12/27/2023 - 03/27/2024	< 185
	03/27/2024 - 06/26/2024	< 195
	06/26/2024 - 09/23/2024	< 181
	09/23/2024 - 12/31/2024	< 178
CL-91	12/27/2023 - 03/27/2024	< 181
	03/27/2024 - 06/26/2024	< 193
	06/26/2024 - 09/23/2024	< 183
	09/23/2024 - 12/31/2024	< 175
CL-99	12/27/2023 - 03/27/2024	< 185
	03/27/2024 - 06/26/2024	< 200
	06/26/2024 - 09/23/2024	< 181
	09/23/2024 - 12/31/2024	< 176

Table 21, Monthly Drinking Water Gross Beta and I-131 (pCi/L ± 2 Sigma)

Station	Collection Dates	Gr-B	I-131
CL-14	01/31/2024	< 1.6	< 0.8
	02/28/2024	< 1.6	< 0.8
	03/27/2024	< 1.7	< 0.8
	04/24/2024	< 1.6	< 0.8
	05/29/2024	< 1.7	< 0.9
	06/26/2024	< 1.7	< 0.9
	07/03/2024	< 1.6	< 0.7
	08/07/2024	< 1.4	< 0.9
	09/04/2024	< 1.6	< 0.7
	10/02/2024	< 2.3	< 0.9
	11/06/2024	< 1.3	< 0.9
	12/04/2024	< 1.6	< 0.9

Table 22, Monthly Drinking Water Gamma Isotopic (pCi/L ± 2 Sigma)

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-14	01/31/2024 - 01/31/2024	< 5	< 7	< 17	< 8	< 13	< 7	< 11	< 9	< 10	< 24	< 15	< 48
	02/28/2024 - 02/28/2024	< 5	< 6	< 11	< 6	< 12	< 6	< 10	< 7	< 6	< 23	< 8	< 38
	03/27/2024 - 03/27/2024	< 6	< 4	< 14	< 8	< 17	< 5	< 11	< 5	< 6	< 28	< 10	< 40
	04/24/2024 - 04/24/2024	< 5	< 5	< 16	< 5	< 10	< 6	< 10	< 6	< 6	< 27	< 6	< 36
	05/29/2024 - 05/29/2024	< 6	< 6	< 12	< 9	< 12	< 6	< 10	< 7	< 6	< 29	< 10	< 39
	06/26/2024 - 06/26/2024	< 5	< 7	< 12	< 5	< 10	< 6	< 9	< 7	< 4	< 27	< 10	< 41
	07/03/2024 - 07/31/2024	< 6	< 7	< 12	< 6	< 14	< 6	< 11	< 6	< 7	< 31	< 8	< 43
	08/07/2024 - 08/28/2024	< 6	< 5	< 10	< 5	< 11	< 6	< 10	< 6	< 7	< 26	< 7	< 44
	09/04/2024 - 09/25/2024	< 7	< 7	< 13	< 9	< 17	< 7	< 12	< 8	< 7	< 36	< 12	< 48
	10/02/2024 - 10/30/2024	< 6	< 7	< 14	< 7	< 13	< 6	< 11	< 7	< 8	< 34	< 11	< 46
	11/06/2024 - 11/27/2024	< 6	< 6	< 13	< 7	< 12	< 6	< 12	< 6	< 7	< 27	< 8	< 45
	12/04/2024 - 12/31/2024	< 6	< 6	< 10	< 6	< 15	< 6	< 9	< 9	< 8	< 29	< 10	< 37

Table 23, Quarterly Drinking Water Tritium (pCi/L ± 2 Sigma)

Station	Collection Dates	H-3
CL-14	01/31/2024 - 03/27/2024	< 186
	04/24/2024 - 06/26/2024	< 197
	07/03/2024 - 09/25/2024	< 197
	10/30/2024 - 12/31/2024	< 179

Table 24, Quarterly Groundwater Tritium (pCi/L ± 2 Sigma)

Collection Date	CL-07D	CL-12R	CL-12T
03/27/2024	< 191	< 189	< 189
06/26/2024	< 174	< 174	< 193
09/25/2024	< 175	< 177	< 178
12/31/2024	*(1)*	< 183	< 185

(1) See Sample Deviation Table

Table 25, Quarterly Ground Water Gamma Isotopic (pCi/L ± 2 Sigma)

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-07D	03/27/2024 - 03/27/2024	< 4	< 4	< 8	< 4	< 9	< 4	< 6	< 5	< 4	< 17	< 6	< 25
	06/26/2024 - 06/26/2024	< 5	< 7	< 13	< 6	< 14	< 7	< 15	< 8	< 7	< 29	< 10	< 48
	09/25/2024 - 09/25/2024	< 5	< 5	< 12	< 6	< 12	< 6	< 11	< 6	< 6	< 28	< 10	< 38
	12/31/2024 - 12/31/2024	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*
CL-12R	03/27/2024 - 03/27/2024	< 3	< 4	< 7	< 4	< 8	< 4	< 6	< 4	< 4	< 16	< 5	< 26
	06/26/2024 - 06/26/2024	< 8	< 8	< 17	< 8	< 11	< 8	< 13	< 9	< 7	< 30	< 10	< 41
	09/25/2024 - 09/25/2024	< 7	< 8	< 16	< 7	< 15	< 7	< 13	< 7	< 7	< 37	< 9	< 45
	12/31/2024 - 12/31/2024	< 4	< 5	< 15	< 3	< 11	< 6	< 9	< 7	< 6	< 24	< 11	< 32
CL-12T	03/27/2024 - 03/27/2024	< 4	< 4	< 8	< 4	< 8	< 4	< 7	< 5	< 5	< 17	< 7	< 26
	06/26/2024 - 06/26/2024	< 7	< 6	< 17	< 8	< 16	< 9	< 13	< 8	< 6	< 33	< 7	< 44
	09/25/2024 - 09/25/2024	< 9	< 7	< 17	< 10	< 15	< 7	< 10	< 8	< 7	< 39	< 10	< 46
	12/31/2024 - 12/31/2024	< 6	< 7	< 12	< 8	< 17	< 7	< 10	< 6	< 7	< 30	< 10	< 46

(1) See Sample Deviation Table

Table 26, Semi-Annual Fish Gamma Isotopic (pCi/kg Wet ± 2 Sigma)

Station		Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-19	Largemouth Bass	05/16/2024	< 68	< 62	< 85	< 57	< 126	< 55	< 108	< 62	< 66	< 264	< 114	< 316
	Bluegill	05/16/2024	< 51	< 67	< 115	< 90	< 123	< 58	< 68	< 55	< 58	< 236	< 61	< 206
	Channel Catfish	05/16/2024	< 58	< 53	< 112	< 66	< 115	< 56	< 105	< 65	< 46	< 242	< 90	< 224
	Carp	05/16/2024	< 52	< 62	< 121	< 69	< 156	< 68	< 123	< 75	< 68	< 270	< 77	< 306
	Blue Catfish	09/26/2024	< 73	< 83	< 133	< 83	< 154	< 80	< 140	< 58	< 72	< 655	< 199	< 301
	Bluegill	09/26/2024	< 47	< 59	< 151	< 72	< 130	< 57	< 110	< 59	< 62	< 458	< 187	< 301
	Common Carp	09/26/2024	< 69	< 59	< 131	< 64	< 149	< 77	< 71	< 56	< 49	< 638	< 168	< 228
	Largemouth Bass	09/26/2024	< 76	< 84	< 216	< 83	< 164	< 89	< 164	< 79	< 75	< 847	< 259	< 419

Table 26, Semi-Annual Fish Gamma Isotopic (pCi/kg Wet ± 2 Sigma) Cont'd

Station		Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-105	Largemouth Bass	05/16/2024	< 53	< 49	< 87	< 91	< 114	< 42	< 77	< 53	< 55	< 205	< 51	< 200
	Bluegill	05/16/2024	< 40	< 33	< 96	< 47	< 87	< 41	< 66	< 39	< 42	< 192	< 52	< 174
	Crappie	05/16/2024	< 18	< 18	< 37	< 20	< 40	< 17	< 30	< 19	< 18	< 86	< 27	< 100
	Carp	05/16/2024	< 48	< 42	< 62	< 55	< 83	< 42	< 80	< 51	< 42	< 223	< 52	< 211
	Bluegill	09/30/2024	< 54	< 53	< 155	< 79	< 102	< 81	< 141	< 70	< 72	< 574	< 187	< 292
	Common Carp	09/30/2024	< 77	< 97	< 188	< 72	< 213	< 95	< 142	< 88	< 87	< 601	< 238	< 362
	Largemouth Bass	09/30/2024	< 43	< 52	< 104	< 46	< 103	< 50	< 94	< 49	< 45	< 381	< 103	< 215
	White Crappie	09/30/2024	< 69	< 72	< 203	< 64	< 160	< 69	< 108	< 86	< 53	< 508	< 159	< 337

Table 27, Semi-Annual Shoreline Sediment Gamma Isotopic (pCi/kg Dry ± 2 Sigma)

Station	Collection Dates	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-07B	05/16/2024	< 40	< 41	< 80	< 43	< 94	< 41	< 75	< 48	< 39	< 186	< 57	< 192
	09/26/2024	< 32	< 35	< 93	< 37	< 80	< 37	< 69	< 39	< 32	< 219	< 67	< 192
CL-105	05/16/2024	< 40	< 33	< 84	< 43	< 84	< 37	< 70	< 42	< 38	< 170	< 49	< 181
	09/30/2024	< 40	< 36	< 90	< 27	< 93	< 40	< 59	< 44	< 35	< 202	< 54	< 191

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 Offsite Site Dose Calculation Manual. Intercomparison studies provide a consistent and effective means to evaluate the accuracy and precision of analyses performed by a laboratory. Study results should fall within specified control limits and results that fall outside the control limits are investigated and corrected.

Teledyne Brown Engineering Inc. (TBE) participated in the following proficiency testing studies provided by Eckert Ziegler Analytics, DOE's Mixed Analyte Performance Evaluation Program (MAPEP), and/or Environmental Resource Associates (ERA) in 2024. The Laboratory's intercomparison program results for 2024 are summarized below.

For the TBE laboratory, 152 out of 167 analyses performed met the specified acceptance criteria. Fifteen analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. A summary is found below:

I. NCR 24-02: ERA March MRAD-40 study with Air Particulate AM-241 evaluated as "Not Acceptable." TBE reported 38.8 pCi/filter and the known value returned at 55.0 pCi/filter (range 39.3-73.3). The root cause investigation determined that the sample was not logged into the system correctly and therefore not prepared with the required tracer. To correct and prevent recurrence, personnel involved are to utilize a template to ensure all analyses are logged as required and the QA Manager will perform sample log review as a back up to ensure accuracy. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

II. NCR 24-03: ERA March MRAD-40 air particulate study GR-B evaluated as "Not Acceptable." TBE reported 42.1 pCi/filter and the known value returned at 22.2 pCi/filter (range 13.5-33.5). The root cause investigation determined that alpha-to-beta crosstalk was more significant than normal which caused the beta activity to report falsely high data. To correct and prevent recurrence, personnel involved are to adjust the alpha-to-beta crosstalk via correction calculation measures when high alpha activities are observed. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

III. NCR 24-05: ERA April RAD-137 water study GR-A evaluated as "Not Acceptable." TBE reported 35.2 pCi/L and the known value returned at 52.6 pCi/L (range 39.6-65.6). The root cause investigation determined that the provided samples contained a solids content that was significantly higher than the typical client samples tested by the laboratory. A set aliquot volume for prior ERA samples was used and not adjusted to account for the sudden increase in solid content. To correct and prevent recurrence, new sample types were ordered from ERA that used Am-241 to better reflect client sample testing and acceptable results were achieved. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

IV. NCR 24-06: E&Z Analytics March E14092 air particulate study Co-60 evaluated as

"Not Acceptable." TBE reported 168 pCi and the known value returned at 126 pCi. Additionally, March E14093 soil Ce-141 evaluated as "Not Acceptable." TBE reported 0.106pCi/g and the known value returned at 0.071pCi/g. The root cause investigation was unable to determine any anomaly thus no proposed corrective action. No recurrence has occurred.

V. CAR 24-02 (CAR 23-31): MAPEP February 24-MaS50 soil study Fe-55 evaluated as "Not Acceptable." TBE reported 297 Bg/Kg and the known value returned at 650 Bg/Kb (range 455-845). The root cause investigation suspects that the current analytical procedure is not sufficient to add the interferences added to the sample by MAPEP. This investigation is still ongoing (See NCR 24-16) as the suggested corrective action did not provide desired results.

VI. NCR 24-08: MAPEP February 24-MaS50 soil study Ni-63 evaluated as "Not Acceptable." TBE reported 1070 Bg/Kg and the known value returned at 1530 Bg/Kb (range 1071-1989). The root cause investigation suspected that the sample contained added interferences that are not typically seen in client samples. All QC efforts associated with the sample were acceptable and no anomalies found, even after reanalysis. To correct and prevent recurrence, samples suspected of additional interferences will include the addition of Ni-59 tracer to determine yield results when calculating results. TBE analytical procedure TBE-2013 was updated to include this change.

VII. NCR 24-09: MAPEP February 24-MaSU50 urine study Zn-65 evaluated as "Not Acceptable." The root cause investigation determined that the sample was spiked lower than TBE's typical detection limit and client requirements. The report was revised by MAPEP indicating "Not Evaluated," resulting in this nuclide to not be considered a failure.

VIII. NCR 24-10: MAPEP February 24-MaW50 water study Tc-99 evaluated as "Not Acceptable." TBE reported 9.95Bg/L and the known value returned 7.47Bg/L (range 5.23-9.71). The root cause investigation suspects Thorium interference that was not removed during the column separation process of the analytical procedure; however, it cannot be confirmed as all QC efforts associated with the sample were acceptable and with no anomalies found. To potentially correct and prevent recurrence, an additional rinse step was added to the procedure. Acceptable results returned in a later sample study, supporting effectiveness of corrective action.

IX. NCR 24-11: MAPEP February 24-RdV50 vegetation study Sr-90 evaluated as "Not Acceptable." TBE reported 0.276Bg/sample and the known value returned 0.529Bg/sample (range 0.370-0.688). The root cause investigation determined a laboratory accident resulting in a spilled (loss) of sample. No corrective action was performed as the cause was an unintentional sample spill.

X. NCR 24-14: ERA September MRAD-41 air particulate study U-234/238 evaluated as "Not Acceptable." TBE reported 14.0/14.2 pCi/filter and the known value returned at 31.1/30.9 pCi/filter (range 23.1-36.9). The root cause investigation determined that the laboratory technician placed double the amount of tracer in the sample by error. To correct and prevent recurrence, samples that have been digested/leached with carrier/tracer added will have a label placed over the cap indicating it has already been added. Additionally, the beaker that aliquot is put in should have markings to indicate carrier/tracer has already been added to the sample.

XI. NCR 24-15: ERA September MRAD-41 water study Fe-55 evaluated as “Not Acceptable.” TBE reported 615 pCi/L and the known value returned at 1230 pCi/L (range 723-1790). The root cause is still under investigation.

XII. NCR 24-16: MAPEP August 24-MaS50 soil study Fe-55 evaluated as “Not Acceptable.” TBE did not report a value and the known value returned 780Bg/Kg (range 546-1014). The root cause is still under investigation.

XIII. NCR 24-17: MAPEP August 24-RdV51 vegetation study Sr-90 evaluated as “Not Acceptable.” TBE reported 0.95Bg/sample and the known value returned 2.39Bg/sample (range 1.67-3.11). The root cause is still under investigation.

Table 28: Analytics Environmental Radioactivity Cross Check Program

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Ratio of TBE to Analytics Result	Evaluation (b)
March 2024	E14089	Milk	Sr-89	pCi/L	79.6	78.2	1.02	A
			Sr-90	pCi/L	12.6	11.9	1.06	A
	E14090	Milk	Ce-141	pCi/L	75.6	85.0	0.89	A
			Co-58	pCi/L	-0.069	Not Measured		
			Co-60	pCi/L	139	158	0.88	A
			Cr-51	pCi/L	212	230	0.92	A
			Cs-134	pCi/L	167	198	0.84	A
			Cs-137	pCi/L	158	171	0.93	A
			Fe-59	pCi/L	81.1	86.5	0.94	A
			I-131	pCi/L	80.9	90.8	0.89	A
			Mn-54	pCi/L	173	183	0.95	A
			Zn-65	pCi/L	165	176	0.93	A
	E14091	Charcoal	I-131	pCi	90.1	90.3	1.00	A
	E14092	AP	Ce-141	pCi	68.1	67.5	1.01	A
			Co-58	pCi	1.73	Not Measured		
			Co-60	pCi	168	126	1.34	N(1)
			Cr-51	pCi	182	183	0.99	A
			Cs-134	pCi	157	157	1.00	A
			Cs-137	pCi	132	136.0	0.97	A
			Fe-59	pCi	70.3	68.6	1.02	A
			Mn-54	pCi	144	145	0.99	A
			Zn-65	pCi	125	140	0.89	A
	E14093	Soil	Ce-141	pCi/g	0.106	0.071	1.48	N(1)
			Co-58	pCi/g	-0.005	Not Measured		
			Co-60	pCi/g	0.121	0.133	0.91	A
			Cr-51	pCi/g	0.198	0.194	1.02	A
			Cs-134	pCi/g	0.206	0.166	1.24	W
			Cs-137	pCi/g	0.207	0.209	0.99	A
			Fe-59	pCi/g	0.063	0.073	0.87	A
			Mn-54	pCi/g	0.140	0.153	0.91	A
			Zn-65	pCi/g	0.149	0.148	1.01	A
	E14094	AP	Sr-89	pCi	83.9	90.6	0.93	A
			Sr-90	pCi	11.7	13.8	0.85	A

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

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

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

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

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

(*1*) See **NCR 24-06**

Table 28: Analytics Environmental Radioactivity Cross Check Program Cont'd

Teledyne Brown Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Ratio of TBE to Analytics Result	Evaluation (b)
September 2024	E14095	Milk	Sr-89	pCi/L	88.0	92.3	0.95	A
			Sr-90	pCi/L	12.4	15.2	0.82	A
	E14096	Milk	Ce-141	pCi/L	124	124	1.00	A
			Co-58	pCi/L	154	150	1.03	A
			Co-60	pCi/L	232	236	0.98	A
			Cr-51	pCi/L	284	274	1.04	A
			Cs-134	pCi/L	180.0	187	0.96	A
			Cs-137	pCi/L	126	127	0.99	A
			Fe-59	pCi/L	127.0	113	1.12	A
			I-131	pCi/L	85.3	89.0	0.96	A
			Mn-54	pCi/L	162	162	1.00	A
			Zn-65	pCi/L	294	275	1.07	A
	E14097	Charcoal	I-131	pCi	98.8	92.6	1.07	A
	E14098	AP	Ce-141	pCi	82.0	76.7	1.07	A
			Co-58	pCi	91.0	92.6	0.98	A
			Co-60	pCi	180	146	1.23	W
			Cr-51	pCi	208	170	1.22	W
			Cs-134	pCi	116	116	1.00	A
			Cs-137	pCi	83.1	78.9	1.05	A
			Fe-59	pCi	75.6	70.2	1.08	A
			Mn-54	pCi	101	100	1.01	A
			Zn-65	pCi	167	170	0.98	A
	E14099	Soil	Ce-141	pCi/g	0.224	0.222	1.01	A
			Co-58	pCi/g	0.249	0.268	0.93	A
			Co-60	pCi/g	0.420	0.423	0.99	A
			Cr-51	pCi/g	0.492	0.492	1.00	A
			Cs-134	pCi/g	0.278	0.336	0.83	A
			Cs-137	pCi/g	0.276	0.295	0.94	A
			Fe-59	pCi/g	0.233	0.204	1.14	A
			Mn-54	pCi/g	0.279	0.290	0.96	A
			Zn-65	pCi/g	0.538	0.494	1.09	A
	E14100	AP	Sr-89	pCi	79.8	82.7	0.96	A
			Sr-90	pCi	12.0	13.6	0.88	A
	E14197	Liquid	Gr-A (Am241)	pCi/L	47.6	50.1	0.95	A
			Gr-B (Cs137)	pCi/L	248	270	0.92	A

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

(b) Analytics evaluation based on TBE internal QC limits:
A = Acceptable - reported result falls within ratio limits of 0.80-1.20
W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

Table 29: DOE's Mixed Analyte Performance Evaluation Program (MAPEP)

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Acceptance Range	Evaluation (b)
February 2024	24-MaS50	Soil	Fe-55	Bq/kg	297	650	455 - 845	N(3)
			Ni-63	Bq/kg	1070	1530	1071 - 1989	N(4)
			Tc-99	Bq/kg	325	336	235 - 437	A
			Th-228	Bq/kg	34.6	48.8	34.2 - 63.4	W
			Th-230	Bq/kg	49.7	54.0	38.0 - 70.0	A
			Th-232	Bq/kg	36.4	45.1	31.6 - 58.6	A
	24-MaSU50	Urine	Cs-134	Bq/L	1.12	1.36	0.95 - 1.77	A
			Cs-137	Bq/L	2.00	2.23	1.56 - 2.90	A
			Co-57	Bq/L	1.06	1.26	0.88 - 1.64	A
			Co-60	Bq/L	2.26	2.38	1.67 - 3.09	A
			K-40	Bq/L	-1.80	NR	-	
			Mn-54	Bq/L	1.44	1.51	1.06 - 1.96	A
			U-234	Bq/L	0.00101		*(1)*	A
			U-238	Bq/L	0.00228		*(1)*	A
			Zn-65	Bq/L	-0.42	0.84	0.59 - 1.09	NE(5)
	24-MaW50	Water	Ni-63	Bq/L	0.338	0.80	*(2)*	A
			Tc-99	Bq/L	9.95	7.47	5.23 - 9.71	N(6)
	24-RdV50	Vegetation	Cs-134	Bq/sample	2.80	3.67	2.57 - 4.77	W
			Cs-137	Bq/sample	2.21	2.57	1.80 - 3.34	A
			Co-57	Bq/sample	2.23	2.53	1.77 - 3.29	A
			Co-60	Bq/sample	2.42	2.96	2.07 - 3.85	A
			Mn-54	Bq/sample	0.033		*(1)*	A
			Sr-90	Bq/sample	0.276	0.529	0.370 - 0.688	N(7)
			Zn-65	Bq/sample	6.83	8.02	5.61 - 10.43	A

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

(b) DOE/MAPEP evaluation:

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

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

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

(1) False positive test

(2) Sensitivity evaluation

(3) See **CAR 23-31 - Analyte not on XCHK list**

(4) See **NCR 24-08**

(5) Not Evaluated

(6) See **NCR 24-10**

(7) See **NCR 24-11**

(8) Not Reported

(9) See **NCR 24-16**

(10) See **NCR 24-17**

Table 29: DOE's Mixed Analyte Performance Evaluation Program (MAPEP) Cont'd

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Acceptance Range	Evaluation (b)
August 2024	24-MaS51	Soil	Fe-55	Bq/kg	*(8)*	780	546 - 1014	N(9)
			Ni-63	Bq/kg	1140.00	1450.00	1015 - 1885	W
			Tc-99	Bq/kg	155.00	171.00	120 - 222	A
			Th-228	Bq/kg	38.00	43.30	30.3 - 56.3	A
			Th-230	Bq/kg	46.10	44.00	30.8 - 57.2	A
			Th-232	Bq/kg	38.90	42.60	29.8 - 55.4	A
	24-MaW51	Water	Ni-63	Bq/L	0.60	-	*(1)*	A
			Tc-99	Bq/L	11.90	11.20	7.8 - 14.6	A
	24-RdV51	Vegetation	Cs-134	Bq/sample	3.12	2.89	2.02 - 3.76	A
			Cs-137	Bq/sample	2.18	1.91	1.34 - 2.48	A
			Co-57	Bq/sample	0.00	-	*(1)*	A
			Co-60	Bq/sample	2.24	2.01	1.41 - 2.61	A
			Mn-54	Bq/sample	3.76	3.53	2.47 - 4.59	A
			Sr-90	Bq/sample	0.95	2.39	1.67 - 3.11	N(10)
			Zn-65	Bq/sample	10.30	9.13	6.39 - 11.87	A

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

(b) DOE/MAPEP evaluation:

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

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

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

(1) False positive test

(2) Sensitivity evaluation

(3) See **CAR 23-31 - Analyte not on XCHK list**

(4) See **NCR 24-08**

(5) Not Evaluated

(6) See **NCR 24-10**

(7) See **NCR 24-11**

(8) Not Reported

(9) See **NCR 24-16**

(10) See **NCR 24-17**

Table 30: ERA Environmental Radioactivity Cross Check Program

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value (a)	Acceptance Limits	Evaluation (b)
March 2024	MRAD-40	Water	Am-241	pCi/L	101	139	95.4 - 178	A
			Fe-55	pCi/L	2185	2480	1460- 3610	A
			Pu-238	pCi/L	62.0	70.4	42.3 - 91.2	A
			Pu-239	pCi/L	61.2	76.5	47.3 - 94.3	A
		Soil	Am-241	pCi/kg	NR	1880	1020 - 2660	
			Pu-238	pCi/kg	667	512	255 - 778	A
			Pu-239	pCi/kg	562	545	297 - 784	A
			Sr-90	pCi/kg	4050	3630	1130 - 5650	A
			U-234	pCi/kg	3040	4360	2040 - 5710	A
			U-238	pCi/kg	3270	4320	2370 - 5800	A
		AP	Am-241	pCi/filter	38.8	55.0	39.3 - 73.3	N(1)
			Fe-55	pCi/filter	387	386	141 - 616	A
			Pu-238	pCi/filter	45.9	41.1	31.0 - 50.5	A
			Pu-239	pCi/filter	54.9	56.1	41.9 - 67.7	A
			U-234	pCi/filter	11.1	11.6	8.60 - 13.6	A
			U-238	pCi/filter	12.8	11.5	8.68 - 13.7	A
			GR-A	pCi/filter	116	95.9	50.1 - 158	A
			GR-B	pCi/filter	42.1	22.2	13.5 - 33.5	N(2)
April 2024	RAD-137	Water	Ba-133	pCi/L	62.8	65.9	50.1 - 81.7	A
			Cs-134	pCi/L	51.0	57.8	42.8 - 72.8	A
			Cs-137	pCi/L	153	186	149 - 223	A
			Co-60	pCi/L	92.1	98.8	79.7 - 118	A
			Zn-65	pCi/L	208	240	188 - 292	A
			GR-A	pCi/L	35.2	52.6	39.6 - 65.6	N(3)
			GR-B	pCi/L	49	46.5	33.9 - 59.1	A
			U-Nat	pCi/L	56.0	59.3	52.8-65.8	A
			H-3	pCi/L	19,000	21,300	18,200 - 24,400	A
			Sr-89	pCi/L	48.9	52.2	37.8 - 66.6	A
			Sr-90	pCi/L	32.6	37.6	32.0 - 43.2	A
			I-131	pCi/L	21.8	25.1	21.7 - 28.5	A

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

(b) ERA evaluation:

A = Acceptable - Reported value falls within the Acceptance Limits

N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 24-02***

*(2) See **NCR 24-03***

*(3) See **NCR 24-05***

*(4) See **NCR 24-15***

*(5) See **NCR 24-14***

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 $F_Q \le MDD_Q$)				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 $F_A \le MDD_A$)
			1	2	3	4	1	2	3	4				
CL-01	18.5	25.1	18.9	22.1	17.5	18.9	ND	ND	ND	ND	74	83.5	77.4	ND
CL-02	19.2	25.8	20.4	21.4	20.1	19.5	ND	ND	ND	ND	76.7	86.2	81.4	ND
CL-03	18.7	25.3	18	19.2	17.1	18.7	ND	ND	ND	ND	74.7	84.2	73	ND
CL-04	18.2	24.8	17.8	17.9	17.1	18.5	ND	ND	ND	ND	72.8	82.3	71.3	ND
CL-05	19.1	25.7	18.7	19.6	18.4	18.3	ND	ND	ND	ND	76.5	86	75	ND
CL-06	16.5	23.1	14.5	18.4	16.1	18.8	ND	ND	ND	ND	65.8	75.3	67.8	ND
CL-07	17.4	24	17.7	19.5	17	17.4	ND	ND	ND	ND	69.5	79	71.6	ND
CL-08	18.5	25.1	17.2	19.9	18.3	18.6	ND	ND	ND	ND	74	83.5	74	ND
CL-11	17.3	23.9	18.5	18.8	13.9	18	ND	ND	ND	ND	69.3	78.8	69.2	ND
CL-114*(1)*	18.1	24.7	20.8	17.9	18	21.2	*(1)*	*(1)*	*(1)*	*(1)*	72.3	81.8	77.9	*(1)*
CL-15	16.6	23.2	14.5	16.8	15.8	17.9	ND	ND	ND	ND	66.3	75.8	65	ND
CL-22	19.4	26	18.8	21	17.9	19.7	ND	ND	ND	ND	77.6	87.1	77.4	ND
CL-23	20.4	27	17.8	21.6	17.9	18.7	ND	ND	ND	ND	81.5	91	76	ND
CL-24	20.1	26.7	19.1	23.2	17.4	19.8	ND	ND	ND	ND	80.5	90	79.5	ND
CL-33	19.8	26.4	17.6	21.4	15.6	19.8	ND	ND	ND	ND	79.2	88.7	74.4	ND
CL-34	19.4	26	19.2	18.7	15.9	18.5	ND	ND	ND	ND	77.5	87	72.3	ND
CL-35	17.9	24.5	19	17.1	18.3	19.2	ND	ND	ND	ND	71.6	81.1	73.6	ND
CL-36	18.6	25.2	18	21.9	15.1	18.6	ND	ND	ND	ND	74.2	83.7	73.6	ND
CL-37	17.8	24.4	17.1	19.3	17.6	19.3	ND	ND	ND	ND	71.1	80.6	73.3	ND
CL-41	19.8	26.4	18.3	23.3	18	20.2	ND	ND	ND	ND	79.4	88.9	79.8	ND

MDD_Q = Quarterly Minimum Differential Dose = 6.6 mrem
MDD_A = Annual Minimum Differential Dose = 9.5 mrem
ND = Not Detected, where $M_Q \le (B_Q+MDD_Q)$ or $M_A \le (B_A+MDD_A)$
(1) The location of CL-114 was changed when the location of CL-114 garden location was changed. The data collected during the 2023 year was collected to begin the 5-year baseline of the location. There is no requirement in the ODCM to have this location monitored, and there is not a requirement in ANSI/HPS 13.37. CL-114 a supplemental monitoring 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				
CL-42	18.6	25.2	15.7	20.4	17.6	19.6	ND	ND	ND	ND	74.2	83.7	73.3	ND
CL-43	19.9	26.5	19.8	21.9	19.7	20.9	ND	ND	ND	ND	79.7	89.2	82.3	ND
CL-44	18.9	25.5	18.3	21.1	21.4	18.9	ND	ND	ND	ND	75.4	84.9	79.7	ND
CL-45	20.2	26.8	20.6	19.8	19.9	20.8	ND	ND	ND	ND	80.6	90.1	81.1	ND
CL-46	19.2	25.8	16.6	18.7	16.4	19.3	ND	ND	ND	ND	73	82.5	71	ND
CL-47	19.9	26.5	17.1	20.6	17.2	19.6	ND	ND	ND	ND	79.4	88.9	74.5	ND
CL-48	18.6	25.2	17.9	19.1	17.2	20	ND	ND	ND	ND	74.2	83.7	74.2	ND
CL-49	20	26.6	20.8	21.9	20.3	20.2	ND	ND	ND	ND	79.8	89.3	83.2	ND
CL-51	20.2	26.8	19.8	18.9	19.9	19	ND	ND	ND	ND	76.6	86.1	77.6	ND
CL-52	19.9	26.5	19.1	22	18.7	18.8	ND	ND	ND	ND	75.6	85.1	78.6	ND
CL-53	18	24.6	17.7	16.4	18.8	19	ND	ND	ND	ND	71.9	81.4	71.9	ND
CL-54	19.5	26.1	18.6	19.5	16.9	17.1	ND	ND	ND	ND	78	87.5	72.1	ND
CL-55	19.7	26.3	19.4	20.5	17.9	21.1	ND	ND	ND	ND	78.7	88.2	78.9	ND
CL-56	20.3	26.9	18.5	19.4	19.6	22	ND	ND	ND	ND	81	90.5	79.5	ND
CL-57	20.4	27	17.3	20.7	(2)	21.1	ND	ND	ND	ND	81.6	91.1	78.8	ND
CL-58	19.8	26.4	18.3	21.4	17.9	19.1	ND	ND	ND	ND	79.1	88.6	76.7	ND
CL-60	19.8	26.4	17.6	18.7	18.9	18.1	ND	ND	ND	ND	79	88.5	73.3	ND
CL-61	19.5	26.1	17.4	19.2	15	17.4	ND	ND	ND	ND	78.1	87.6	69	ND
CL-63	16.7	23.3	17.9	17.7	16.4	18.1	ND	ND	ND	ND	66.6	76.1	70.1	ND

MDD_Q = Quarterly Minimum Differential Dose = 6.6 mrem

MDD_A = Annual Minimum Differential Dose = 9.5 mrem

ND = Not Detected, where $M_Q \leq (B_Q + MDD_Q)$ or $M_A \leq (B_A + MDD_A)$

(2) Refer to Sample Deviations Table

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 $F_Q \le MDD_Q$)				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 $F_A \le MDD_A$)
			1	2	3	4	1	2	3	4				
CL-64	19	25.6	20.1	20.5	18.7	17.6	ND	ND	ND	ND	75.9	85.4	76.9	ND
CL-65	20.1	26.7	20.5	20.6	18.4	18.1	ND	ND	ND	ND	80.5	90	77.6	ND
CL-74	17	23.6	18.4	18.3	16.4	17.4	ND	ND	ND	ND	68	77.5	70.5	ND
CL-75	18.9	25.5	17.5	20.9	16.5	17.8	ND	ND	ND	ND	75.7	85.2	72.7	ND
CL-76	19.7	26.3	18.3	20.1	20.7	19.6	ND	ND	ND	ND	78.7	88.2	78.7	ND
CL-77	18.1	24.7	15.4	18.8	14.6	18.8	ND	ND	ND	ND	72.2	81.7	67.6	ND
CL-78	18	24.6	18.2	20.3	18.3	19	ND	ND	ND	ND	72	81.5	75.8	ND
CL-79	19.3	25.9	19.6	21.5	20.1	19.5	ND	ND	ND	ND	77.1	86.6	80.7	ND
CL-80	18.9	25.5	19	22.1	16.6	18.2	ND	ND	ND	ND	75.5	85	75.9	ND
CL-81	19.2	25.8	15.9	20.4	16	17.9	ND	ND	ND	ND	76.8	86.3	70.2	ND
CL-84	19.1	25.7	19.4	21.6	15.6	18.7	ND	ND	ND	ND	76.3	85.8	75.3	ND
CL-90	15.6	22.2	13.7	16.8	11.9	15	ND	ND	ND	ND	62.2	71.7	57.4	ND
CL-91	17.4	24	16.6	19.1	13.9	17.3	ND	ND	ND	ND	69.5	79	66.9	ND
CL-97	19.4	26	19.1	20.4	17.2	18	ND	ND	ND	ND	77.6	87.1	74.7	ND
CL-99	15.1	21.7	16.1	17.6	15.2	16.5	ND	ND	ND	ND	60.6	70.1	65.4	ND

MDD_Q = Quarterly Minimum Differential Dose = 6.6 mrem
MDD_A = Annual Minimum Differential Dose = 9.5 mrem
ND = Not Detected, where $M_Q \le (B_Q+MDD_Q)$ or $M_A \le (B_A+MDD_A)$

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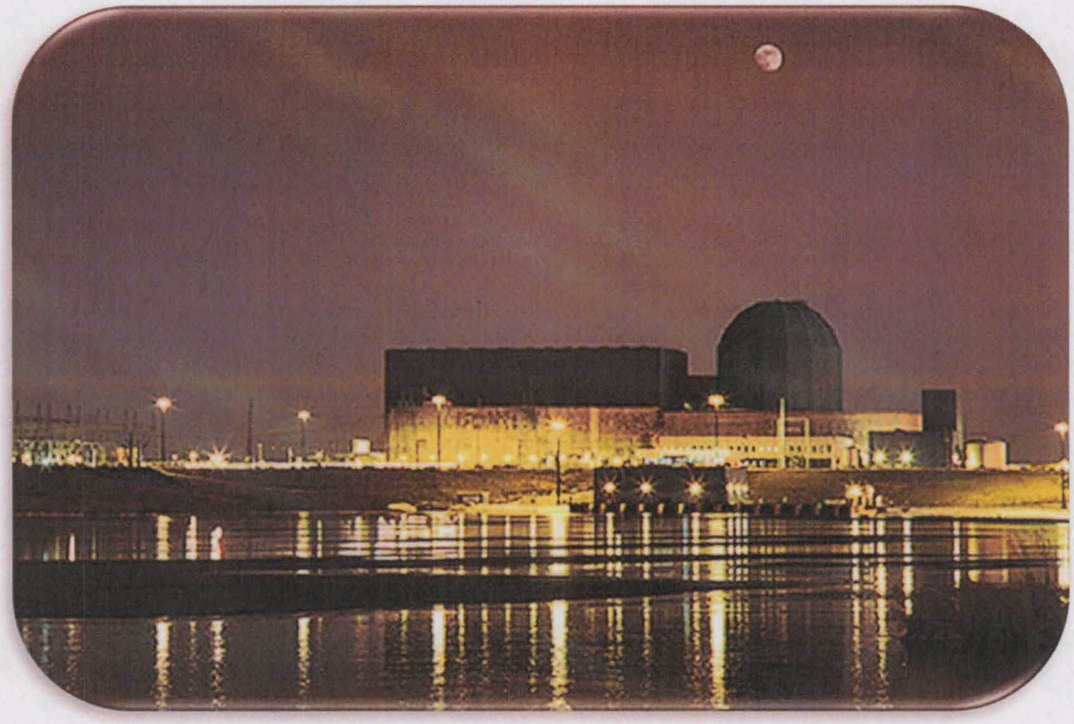

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1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Alpha Particle (α): A charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude of a helium nucleus.

2. BWR: Boiling Water Reactor

3. 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.

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

5. Counting Error: An estimate of the two-sigma uncertainty associated with the sample results based on total counts accumulated.

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

7. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters (TLDs), optically stimulated luminescent dosimeters (OSLDs), and/or pressurized ionization chambers.

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

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

10. 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.

11. ISFSI: Independent Spent Fuel Storage Installation

12. LLD: Lower Limit of Detection. 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.

13. MDA: Minimum Detectable Activity. For radiochemistry instruments, the MDA is the *a posteriori* minimum concentration that a counting system detects. 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 5% probability of falsely concluding that a blank observation represents a true signal.

14. MDC: Minimum Detectable Concentration. Essentially synonymous with MDA for the purposes of radiological monitoring.

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

16. Microcurie (μCi): 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.

17. millirem (mrem): 1/1000 rem; a unit of radiation dose equivalent in tissue.

18. Milliroentgen (mR): 1/1000 Roentgen; a unit of exposure to X- or gamma radiation.

19. N/A: Not Applicable

20. NEI: Nuclear Energy Institute

21. NRC: Nuclear Regulatory Commission

22. ODCM: Offsite Dose Calculation Manual

23. OSLD: Optically Stimulated Luminescence Dosimeter

24. Protected Area: A 10 CFR 73 security term is an area encompassed by physical barriers and to which access is controlled for security purposes. The fenced area immediately surrounding the plant and around ISFSI are commonly classified by the licensee as "Protected areas." Access to the protected area requires a security badge or escort.

25. PWR: Pressurized Water Reactor

26. REC: Radiological Effluent Control

27. REMP: Radiological Environmental Monitoring Program

28. Restricted Area: A 10 CFRR 20 defined term where access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.

29. TEDE: Total Effective Dose Equivalent (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

30. TLD: Thermoluminescent Dosimeter

31. TRM: Technical Requirements Manual

32. TS: Technical Specification

33. Unrestricted Area: An area, access to which is neither limited nor controlled by the licensee.

2.0 INTRODUCTION

2.1 About Nuclear Power

Commercial nuclear power plants are generally classified as either Boiling Water Reactors (BWRs) or Pressurized Water Reactors (PWRs), based on their design. A BWR includes a single coolant system where water used as reactor coolant boils as it passes through the core and the steam generated is used to turn the turbine generator for power production. A PWR, in contrast, includes two separate water systems: radioactive reactor coolant and a secondary system. Reactor coolant is maintained under high pressure, preventing boiling. The high-pressure coolant is passed through a heat exchanger called a steam generator where the secondary system water is boiled, and the steam is used to turn the turbine generator for power production.

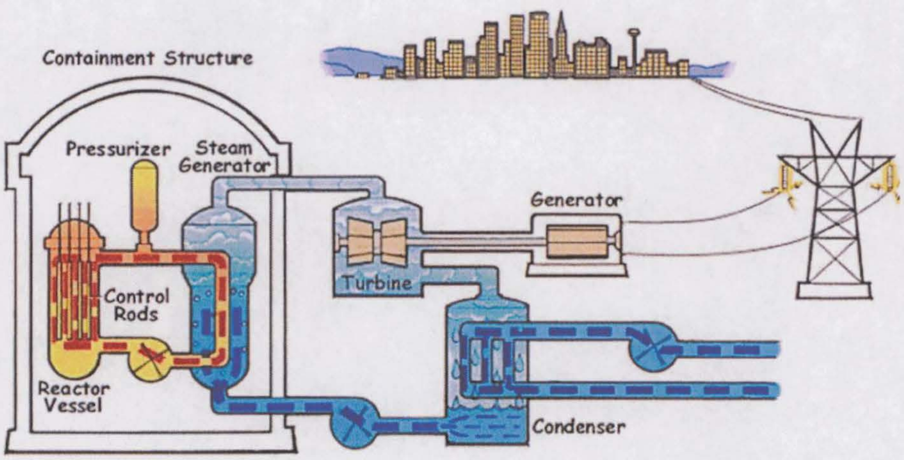

Figure 1, Pressurized Water Reactor (PWR) [1]

2.1

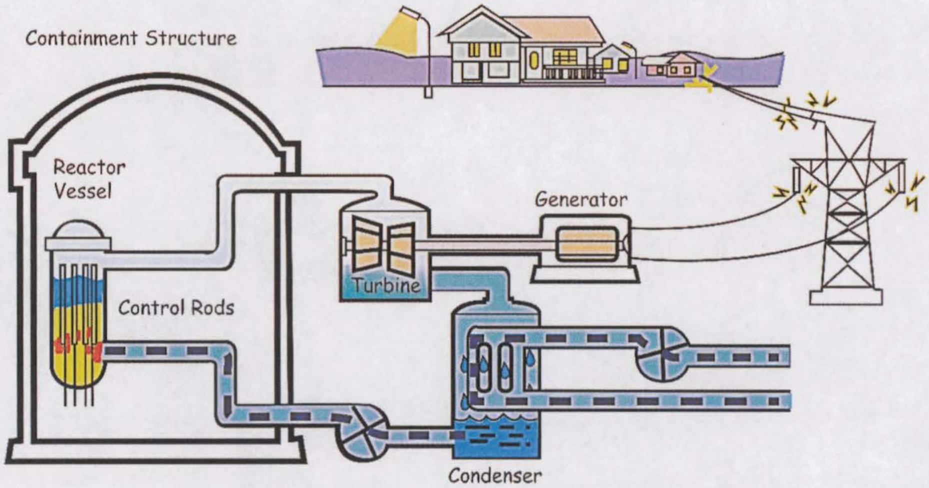

Figure 2, Boiling Water Reactor (BWR) [2]

Electricity is generated by a nuclear power plant similarly to the way that electricity is generated at other conventional types of power plants, such as those powered by coal or natural gas. Water is boiled to generate steam; the steam turns a turbine that is attached to a generator and the steam is condensed back into water to be returned to the boiler. What makes nuclear power different from these other types of power plants is that the heat is generated by fission and decay reactions occurring within and around the core containing fissionable uranium (U-235).

Nuclear fission occurs when certain nuclides (primarily U-233, U-235, or Pu-239) absorb a neutron and break into several smaller nuclides (called fission products) as well as producing some additional neutrons.

Fission results in production of radioactive materials including gases and solids that must be contained to prevent release or treated prior to release. These effluents are generally treated by filtration and/or hold-up prior to release. Releases are generally monitored by sampling and by continuously indicating radiation monitors. The effluent release data is used to calculate doses in order to ensure that dose to the public due to plant operation remains within required limits.

2.2 About Radiation Dose

Ionizing radiation, including alpha, beta, and gamma radiation from radioactive decay, has enough energy to break chemical bonds in tissues and result in damage to tissue or genetic material. The amount of ionization that will be generated by a given exposure to ionizing radiation is quantified as dose. Radiation dose is generally reported in units of millirem (mrem) in the US.

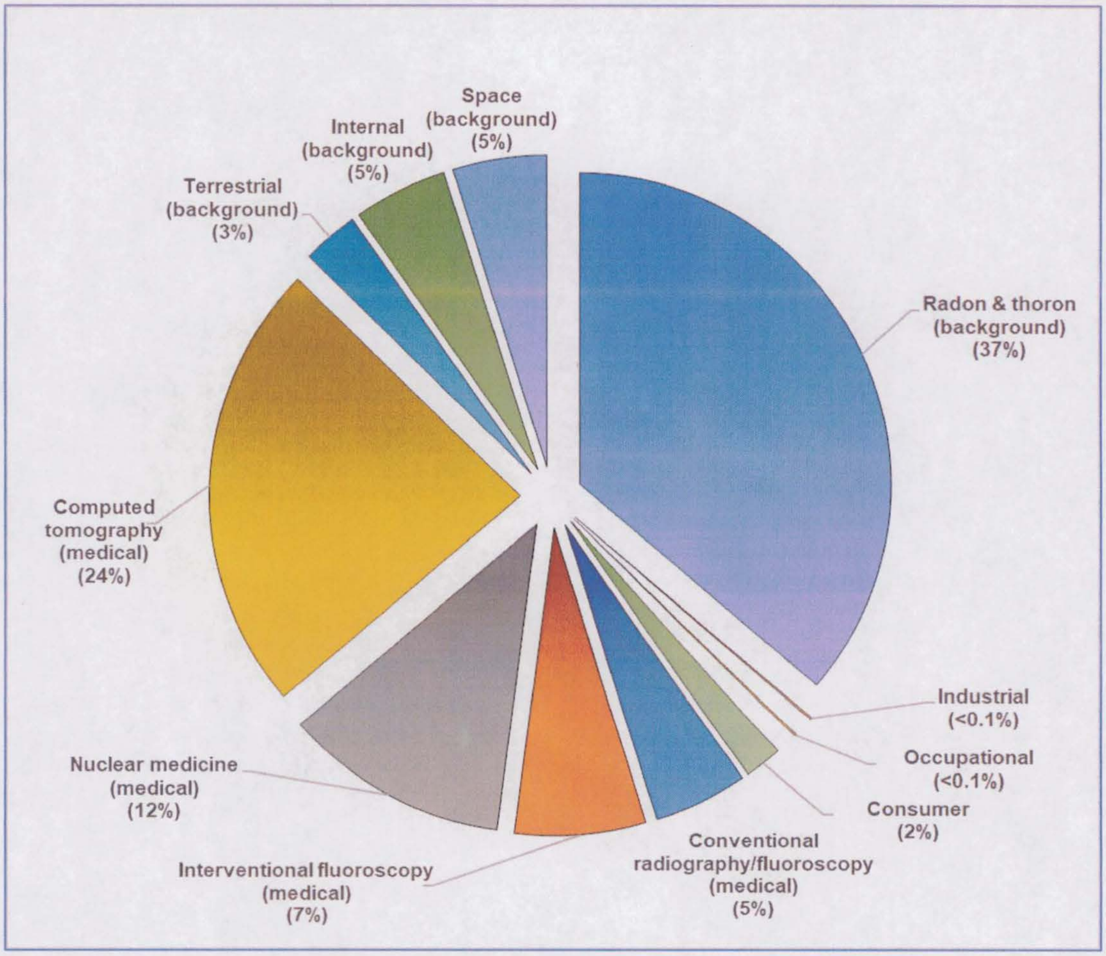

Figure 3, Sources of Radiation Exposure (NCRP Report No. 160) [3]

The National Council on Radiation Protection (NCRP) has evaluated the population dose for the US and determined that the average individual is exposed to approximately 620 mrem per year [3]. There are many sources for radiation dose, ranging from natural background sources to medical procedures, air travel, and industrial processes. Approximately half (310 mrem) of the average exposure is due to natural sources of radiation including exposure to radon, cosmic radiation, and internal radiation and terrestrial due to naturally occurring radionuclides. The remaining 310 mrem of exposure is due to man-made sources of exposure, with the most significant contributors being medical (48% of total mrem per year) due to radiation used in various types of medical scans and treatments. Of the remaining 2% of dose, most is due to consumer activities such as air travel, smoking cigarettes, and building materials. A small fraction of this 2% is due to industrial activities including generation of nuclear power.

Readers that are curious about common sources and effects of radiation dose that they may encounter can find excellent sources of information from the Health Physics Society, including the Radiation Fact Sheets [4], and from the US Nuclear Regulatory Commission website [5].

2.3 About Dose Calculation

Concentrations of radioactive material in the environment resulting from plant operations are very small and it is not possible to determine doses directly using measured activities of environmental samples. To overcome this, dose calculations based on measured activities of effluent streams are used to model the dose impact for Members of the Public due to plant operation and effluents. There are several mechanisms that can result in dose to Members of the Public, including: Ingestion of radionuclides in food or water; Inhalation of radionuclides in air; Immersion in a plume of noble gases; and Direct Radiation from the ground, the plant or from an elevated plume.

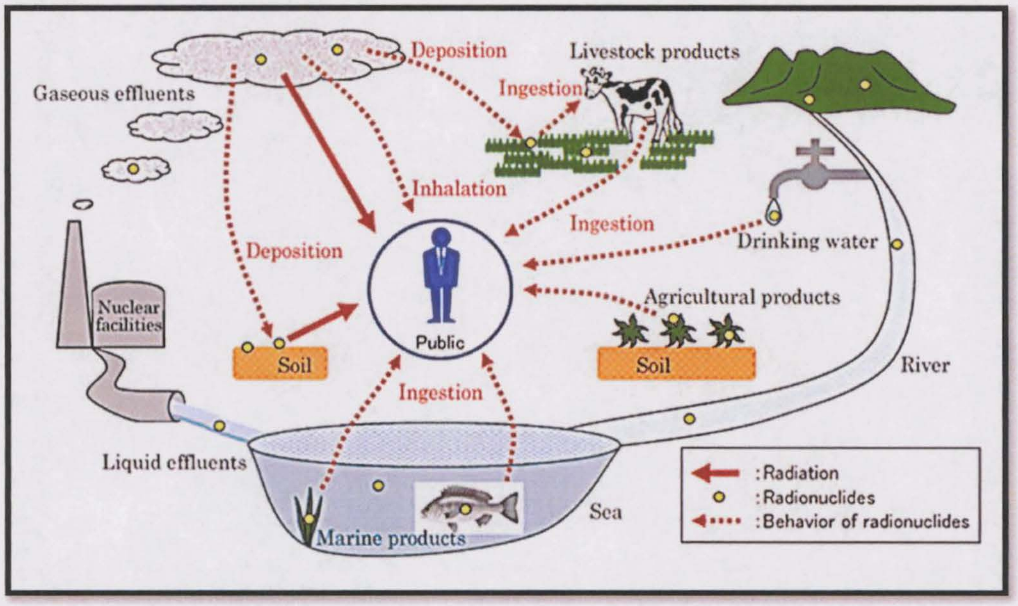

Figure 4, Potential exposure pathways to Members of the Public due to Plant Operations [6]

Each plant has an Offsite Dose Calculation Manual (ODCM) that specifies the methodology used to obtain the doses in the Dose Assessment section of this report. The dose assessment methodology in the ODCM is based on NRC Regulatory Guide 1.109 [7] and NUREG-0133 [8]. Doses are calculated by determining what the nuclide concentration will be in air, water, on the ground, or in food products based on plant effluent releases. Release points are continuously monitored to quantify what concentrations of nuclides are being released. For gaseous releases meteorological data is used to determine how much of the released activity will be present at a given location outside of the plant either deposited onto the ground or in gaseous form. Intake patterns and nuclide bio-concentration factors are used to determine how much activity will be transferred into animal milk or meat. Finally, human ingestion factors and dose factors are used to determine how much activity will be consumed and how much dose the consumer will receive. Inhalation dose is calculated by determining the concentration of nuclides and how much air is breathed by the individual.

For liquid releases, dilution and mixing factors are used to model the environmental concentrations in water. Drinking water pathways are modeled by determining the concentration of nuclides in the water at the point where the drinking water is sourced (e.g., taken from wells, rivers, or lakes). Fish and invertebrate pathways are determined by using concentration at the release point, bioaccumulation factors for the fish or invertebrate and an estimate of the quantity of fish consumed.

Each year a Land Use Census is performed to determine what potential dose pathways currently exist within a five-mile radius around the plant, the area most affected by plant operations. The Annual Land Use Census identifies the locations of vegetable gardens, nearest residences, milk animals and meat animals. The data from the census is used to determine who is the likely to be most exposed to radiation dose as a result of plant operation.

There is significant uncertainty in dose calculation results, due to modeling dispersion of material released and bioaccumulation factors, as well as assumptions associated with consumption and land-use patterns. Even with these sources of uncertainty, the calculations do provide a reasonable estimate of the order of magnitude of the exposure. Conservative assumptions are made in the calculation inputs such as the number of various foods and water consumed, the amount of air inhaled, and the amount of direct radiation exposure from the ground or plume, such that the actual dose received are likely lower than the calculated dose. Even with the built-in conservatism, doses calculated for the maximum exposed individual due to plant operation are a very small fraction of the annual dose that is received due to other sources. The calculated doses due to plant effluents, along with REMP results, serve to provide assurance that radioactive effluents releases are not exceeding safety standards for the environment or people living near the plant.

3.0 NEI 07-07 ONSITE RADIOLOGICAL GROUNDWATER MONITORING PROGRAM

Clinton Clean Energy Center has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document [9]. 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. During 2024, Clinton Station collected and analyzed groundwater samples in accordance with the requirements of approved procedures following regulatory methods..

This section is included in this report to communicate results of NEI 07-07 Radiological Groundwater Monitoring Program. Monitoring wells installed as part of GPI program are sampled and analyzed as summarized in Table 1, Groundwater Protection Program Monitoring Well Sampling Locations. In addition to reporting results from NEI 07-07 monitoring wells, voluntary communications to offsite governmental agencies for onsite leaks or spills per NEI 07-07 Objective 2.2, are also reported as part of this report. It is important to note, samples and results taken in support of NEI 07-07 groundwater monitoring program are not part of the Radiological Environmental Monitoring Program (REMP) but should be reported as part of ARERR.

Table 1, Groundwater Protection Program Monitoring Well Sampling Locations

Site	Site Type
B-3	Monitoring Well
MW-CL-1	Monitoring Well
MW-CL-2	Monitoring Well
MW-CL-12I	Monitoring Well
MW-CL-13I	Monitoring Well
MW-CL-13S	Monitoring Well
MW-CL-14S	Monitoring Well
MW-CL-15I	Monitoring Well
MW-CL-15S	Monitoring Well
MW-CL-16S	Monitoring Well
MW-CL-17S	Monitoring Well
MW-CL-18I	Monitoring Well
MW-CL-18S	Monitoring Well
MW-CL-19S	Monitoring Well
MW-CL-20S	Monitoring Well
MW-CL-21S	Monitoring Well
MW-CL-22S	Monitoring Well
RG-E	Precipitation Water
RG-ENE	Precipitation Water
RG-ESE	Precipitation Water

Table 1, Groundwater Protection Program Monitoring Well Sampling Locations Cont'd

Site	Site Type
RG-N	Precipitation Water
RG-NE	Precipitation Water
RG-NNW	Precipitation Water
RG-S	Precipitation Water
RG-SE	Precipitation Water
RG-SW	Precipitation Water
RG-SW2	Precipitation Water
RG-W	Precipitation Water
RG-WNW	Precipitation Water
RG-WSW	Precipitation Water

MAP OF COLLECTION SITES

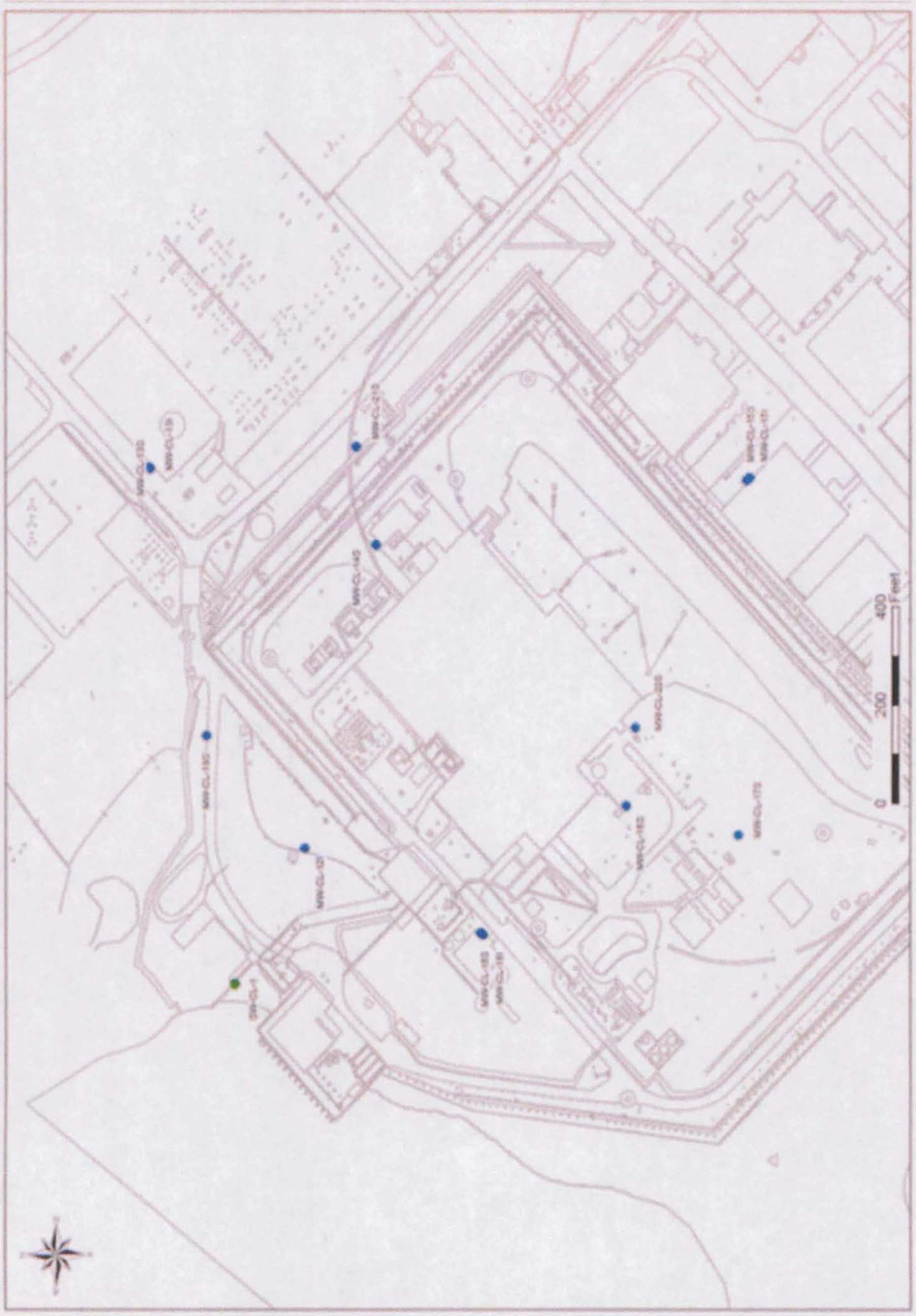

Figure 5, Onsite Sampling Locations at Clinton Power Station, 2024

Figure 6, Sampling Locations South of Clinton Power Station, 2024

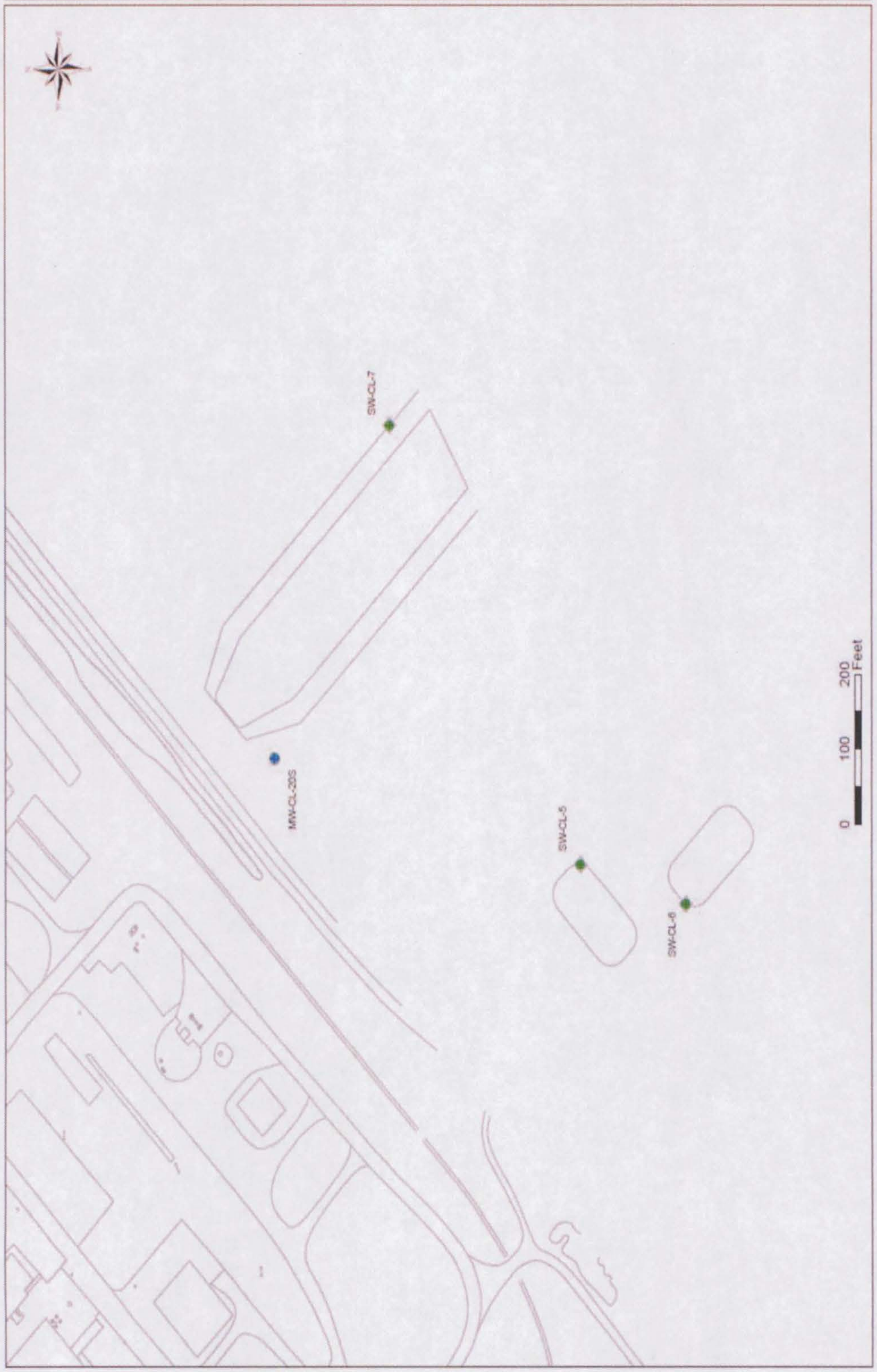

Figure 7, Sampling Locations East of Clinton Power Station, 2024

Explanation:
2023 Precipitation Recapture Sample Location
- Result >200 pCi/L
- Result <200 pCi/L

- Precipitation recapture samples collected in January and June, 2023.

Figure 8, Recapture Sampling Locations of Clinton Power Station, 2024

Radiological Groundwater Monitoring Program tritium results are summarized in Table 2, Groundwater Protection Monitoring Well Tritium and Strontium in Ground Water Samples (pCi/L ± 2 sigma). No groundwater monitoring locations analyzed for gross alpha, gamma, or HTD in 2024.

Table 2, Groundwater Protection Monitoring Well Tritium and Strontium in Ground Water Samples (pCi/L ± 2 sigma)

Site	Collection Date	H-3	Sr-89	Sr-90
B-3	4/24/2024	< 196		
MW-CL-12I	3/13/2024	< 186		
MW-CL-12I	4/24/2024	< 199	< 8	< 0.8
MW-CL-12I	8/27/2024	< 189		
MW-CL-12I	10/30/2024	< 189		
MW-CL-13S	3/13/2024	< 181		
MW-CL-13S	4/24/2024	< 196	< 5	< 0.9
MW-CL-13S	8/27/2024	< 191		
MW-CL-13S	10/30/2024	< 191		
MW-CL-14S	3/14/2024	659 ± 150		
MW-CL-14S *Reanalysis*	3/14/2024	791 ± 165		
MW-CL-14S	4/25/2024	471 ± 139	< 3	< 0.8
MW-CL-14S	8/28/2024	< 190		
MW-CL-14S	10/31/2024	< 190		
MW-CL-16S	3/14/2024	< 182		
MW-CL-16S	4/25/2024	218 ± 129	< 4	< 0.8
MW-CL-16S	8/28/2024	< 192		
MW-CL-16S	10/31/2024	< 189		
MW-CL-17S	3/14/2024	< 184		
MW-CL-17S	4/25/2024	< 196	< 3	< 0.8
MW-CL-17S	8/28/2024	< 185		
MW-CL-17S	10/31/2024	< 184		
MW-CL-18I	3/14/2024	< 185		
MW-CL-18I	4/25/2024	< 195	< 5	< 0.9
MW-CL-18I	8/28/2024	< 190		
MW-CL-18I	10/31/2024	< 190		
MW-CL-18S	3/14/2024	< 187		
MW-CL-18S	4/25/2024	< 194	< 4	< 0.7
MW-CL-18S	8/28/2024	< 184		
MW-CL-18S	10/31/2024	< 188		
MW-CL-19S	3/13/2024	< 179		
MW-CL-19S	4/24/2024	< 194	< 9	< 0.8
MW-CL-19S	8/27/2024	< 194		
MW-CL-19S	10/30/2024	< 194		

Table 2, Groundwater Protection Monitoring Well Tritium and Strontium in Ground Water Samples (pCi/L ± 2 sigma) Cont'd

Site	Collection Date	H-3	Sr-89	Sr-90
MW-CL-21S	3/13/2024	< 188		
MW-CL-21S	4/24/2024	< 198	< 9	< 0.8
MW-CL-21S	8/27/2024	< 191		
MW-CL-21S	10/30/2024	< 188		
MW-CL-22S	3/14/2024	< 183		
MW-CL-22S	4/25/2024	< 198	< 3	< 0.9
MW-CL-22S	8/28/2024	< 189		
MW-CL-22S	10/31/2024	< 191		
MW-CL-1	4/24/2024	< 194		
MW-CL-13I	4/24/2024	< 196		
MW-CL-15I	4/24/2024	< 198		
MW-CL-15S	4/24/2024	< 196		
MW-CL-2	4/24/2024	< 197		
MW-CL-20S	4/24/2024	< 193		

Table 3, Groundwater Protection Program Monitoring Well Gamma Isotopic in Groundwater Samples (pCi/L ± 2 sigma)

Site	Collection Date	Be-7	K-40	Co-58	Fe-59	Co-60	Zn-65	Nb-96	Zr-95	Cs-134	Cs-137	Ba-140	La-140

No Groundwater Samples Analyzed for Gamma Isotopic in 2024

Table 4, Groundwater Protection Program Monitoring Well Tritium in Surface Water Samples (pCi/L ± 2 sigma)

No Surface Water Samples Analyzed for Tritium in 2024

Table 5, Groundwater Protection Program Monitoring Well Tritium in Precipitation Water Samples
(pCi/L ± 2 sigma)

Site	Collection Date	H-3		
RG-E	10/1/2024		<	192
RG-E	11/20/2024		<	193
RG-ENE	10/1/2024		<	192
RG-ENE	11/20/2024	309	±	132
RG-ESE	10/1/2024		<	194
RG-ESE	11/20/2024		<	188
RG-N	10/1/2024		<	186
RG-N	11/20/2024		<	192
RG-NE	10/1/2024		<	190
RG-NE	11/20/2024		<	189
RG-NNW	10/1/2024		<	195
RG-NNW	11/20/2024		<	181
RG-S	10/1/2024		<	192
RG-S	11/20/2024		<	188
RG-SE	10/1/2024	205	±	127
RG-SE	11/20/2024	196	±	126
RG-SW	10/1/2024		<	191
RG-SW	11/20/2024		<	192
RG-SW2	10/1/2024		<	192
RG-SW2	11/20/2024	292	±	125
RG-W	10/1/2024		<	193
RG-W	11/20/2024		<	177
RG-WNW	10/1/2024		<	191
RG-WNW	11/20/2024		<	179
RG-WSW	10/1/2024		<	191
RG-WSW	11/20/2024		<	179

3.1 Voluntary Notification

During 2024, Clinton Clean Energy Center did not make a voluntary NEI 07-07 notification to State/Local officials, NRC, and to other stakeholders required by site procedures.

4.0 BIBLIOGRAPHY

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