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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report:

Second Quarter 2021

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By
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EXECUTIVE SUMMARY

None of the radionuclides detected in samples collected during the second quarter of 2021 could be directly linked with INL Site activities. Levels of detected radionuclides were no different than values measured at other locations across the western United States. All detected radionuclide concentrations were well below standards set by the U.S. Department of Energy (DOE) and regulatory standards established by the U.S. Environmental Protection Agency (EPA) for protection of the public.

This report for the second quarter of 2021 contains results from the Environmental Surveillance, Education, and Research (ESER) Program's monitoring of the Department of Energy's Idaho National Laboratory (INL) Site's offsite environment, April 1 through June 30, 2021. All sample types (media) and the sampling schedule followed during 2021 are listed in Appendix A. This report contains results for the following sample types:

- Air, including particulate air filters, charcoal cartridges, and atmospheric moisture
- Precipitation
- Surface and drinking water
- Milk
- Alfalfa
- Large game animals
- OSLDs
- TLDs

Table ES-1. Summary of Results for the Second Quarter of 2021.

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were no statistically significant differences in monthly and quarterly gross alpha and gross beta concentrations measured at Distant, Boundary, and INL Site sampling locations. Differences were noted when comparing Jackson Hole and Monteview results. No result exceeded the 99%/95% upper tolerance limit (UTL) or the Derived Concentration Standard (DCS) for gross alpha or gross beta activity in air.
	Quarterly Composite	Gamma-emitting radionuclides, strontium-90, actinides (americium and plutonium)	No human-made gamma-emitters or ^{90}Sr, ^{241}Am, ^{238}Pu, and $^{239/240}Pu$ were measured in any composite.
	Charcoal Cartridge	Iodine-131	Iodine-131 was not detected in any of the batches of charcoal cartridges counted during the quarter.
Atmospheric Moisture	Liquid	Tritium	Six of the eleven results showed tritium concentrations greater than the 3s uncertainty during the quarter. None of the sample results exceeded the 99%/95% UTL. No result exceeded the DCS for tritium in air.
Precipitation	Liquid	Tritium	Three of the thirteen results were greater than the 3s uncertainty. All results were below the 99%/95% UTL.
Drinking/ Surface Water	Liquid	Gross alpha, gross beta, tritium	Gross alpha was not detected in any of the drinking water samples or surface water samples. Gross beta was detected in all drinking water samples and in all three surface water samples. All concentrations were generally similar from previous results. Tritium was detected in one drinking water and none of the surface water samples. Concentrations were similar to those measured historically in drinking and surface water and well below the DCS for tritium in drinking water.

Media	Sample Type	Analysis	Results
Milk	Liquid	Iodine-131, other gamma-emitting radionuclides, strontium-90, tritium	Forty-six milk samples were collected at eight locations (including duplicate samples and the offsite control sample from Colorado). No Iodine-131 or other human-made gamma emitting radionuclides were detected. Strontium-90 was found in two of the samples analyzed. The maximum concentration was within range of the past several years. Tritium was not detected in any of the samples analyzed.
Alfalfa	Vegetation	Gamma-emitting radionuclides, strontium-90	Samples were collected from three locations. No human-made gamma emitting radionuclides or ^{90}Sr were found.
Large game animals	Tissue	Gamma emitting radionuclides	One game animal was sampled during the quarter. Muscle, liver, and thyroid samples were collected from the animal. No human-made gamma emitting radionuclides were found in any of the tissue samples.
Environmental Dosimeters	Environmental radiation	Ionizing radiation exposure	Measurements of environmental radiation made using optically stimulated luminescent dosimeters (OSLDs) show similar measurements at Distant locations and Boundary locations. The average measurements over the six-month period were 0.37 mrem/day at Boundary and 0.36 mrem/day at Distant locations. The average measurements made using thermoluminescent dosimeters (TLDs) for the same time period were 0.33 mR/day at Boundary and at Distant locations. The results are consistent with past results.

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LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission
DCS	Derived Concentration Standard
DOE	Department of Energy
DOE – ID	Department of Energy Idaho Operations Office
EAL	Environmental Assessment Laboratory
EFS	Experimental Field Station
EPA	Environmental Protection Agency
ESER	Environmental Surveillance, Education, and Research
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
INEL	Idaho National Engineering Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
ISU	Idaho State University
MDC	minimum detectable concentration
NRF	Naval Reactor Facility
NRTS	National Reactor Testing Station
OSLD	optically stimulated luminescent dosimeter
TLD	thermoluminescent dosimeter
UTL	upper tolerance limit
VNSFS	Veolia Nuclear Solutions – Federal Services

LIST OF UNITS

Bq	becquerel
Ci	curie
g	gram
kg	killogram
L	liter
µCi	microcurie
ml	milliliter
mrem	millirem
mR	milliRoentgen
pCi	picocurie

1. ESER PROGRAM DESCRIPTION

Operations at the Idaho National Laboratory (INL) Site are conducted under requirements imposed by the U.S. Department of Energy (DOE) under authority of the Atomic Energy Act and the U.S. Environmental Protection Agency (EPA) under several acts (e.g., the Clean Air Act and Safe Drinking Water Act). The requirements imposed by DOE are specified in DOE Orders. These requirements include those to monitor the effects of DOE activities both inside and outside the boundaries of DOE facilities (DOE 2011a, DOE 2015a).

During calendar year 2021, environmental monitoring within the INL Site boundaries is primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors. The ESER Program focuses on surveillance off the INL Site and is managed by Veolia Nuclear Solutions-Federal Services (VNSFS).

This report contains monitoring results from the ESER Program for samples collected during the second quarter of 2021 (April 1- June 30, 2021).

The surveillance portion of the ESER Program is designed to satisfy the following program objectives:

- Verify compliance with applicable environmental laws, regulations, and DOE Orders
- Characterize and define trends in the physical, chemical, and biological condition of environmental media on and around the INL Site
- Assess the potential radiation dose to members of the public from INL Site effluents
- Present program results clearly and concisely using reports, presentations, newsletter articles and press releases.

The goal of the surveillance program is to monitor different media at several potential exposure points within the various exposure pathways, including air, water, agricultural products, wildlife, and soil that could possibly contribute to the radiation dose received by the public.

Environmental samples collected include:

- air at 16 locations on and around the INL Site
- atmospheric moisture at one INL Site location and at three locations off the INL Site
- precipitation collected at the same four locations sampled for atmospheric moisture
- drinking water collected from eight locations off the INL Site
- surface water collected from three springs located downgradient of the INL Site and from five locations along the Big Lost River, when it is flowing, on the INL Site
- agricultural products, including milk at six dairies around the INL Site, potatoes from at least eight local producers, alfalfa from three locations off the INL Site, grain (wheat and barley) from approximately 9 local producers, and lettuce from approximately seven home-owned and portable gardens on and around the INL Site
- soil from 12 locations around the INL Site biennially
- environmental dosimeters from 16 locations semi-annually
- various numbers of wildlife including bats, big game (pronghorn, mule deer, and elk) and waterfowl sampled from the INL Site.

Table A-1 in Appendix A lists samples, sampling locations, and collection frequency for the ESER Program.

The ESER Program used two laboratories to perform analyses on routine environmental samples collected during the quarter reported here. The Idaho State University (ISU) Environmental Assessment Laboratory (EAL) performed routine gross alpha, gross beta, tritium, and gamma spectrometry analyses. Analyses requiring radiochemistry including strontium-90 (^{90}Sr), plutonium-238 (^{238}Pu), plutonium-239/240 ($^{239/240}$Pu), and americium-241 (^{241}Am) were performed by GEL Laboratories.

In the event of non-routine occurrences, such as suspected releases of radioactive material, the ESER Program may increase the frequency of sampling and/or the number of sampling locations based on the nature of the release and wind distribution patterns. Any data found to be outside historical norms in the ESER Program is thoroughly investigated to determine if an INL Site origin is likely. Investigation may include re-sampling and/or re-analysis of prior samples, as well as additional analyses of samples.

In the event of any suspected worldwide nuclear incidents, like the 1986 Chernobyl accident or the 2011 Fukushima accident, the EPA may request additional sampling be performed through RadNet. RadNet is a nationwide environmental radiation monitoring system that monitors the nation's air, precipitation, and drinking water for radiation. The ESER Program currently operates a high-volume air sampler and collects precipitation and drinking water in Idaho Falls for this national program and routinely sends samples to EPA's Eastern Environmental Radiation Facility for analyses. The RadNet data collected at Idaho Falls are not reported by the ESER Program but are available through the EPA RadNet website (https://www.epa.gov/radnet).

Once samples have been collected and analyzed, the ESER Program has the responsibility for quality control of the data, entry into the ESER database, and reporting in quarterly reports. The quarterly reports are then consolidated into the INL Site Environmental Report for each calendar year. The annual report also includes data collected by other INL Site contractors.

The results reported in the quarterly and annual reports are assessed in terms of data quality and statistical significance with respect to laboratory analytical uncertainties, sample locations, reported INL Site releases, meteorological data, and worldwide events that might conceivably affect the INL Site environment. First, field collection and laboratory information are reviewed to determine identifiable errors that would invalidate or limit use of the data. Examples of such limitations include insufficient sample volume, torn filters, evidence of laboratory cross-contamination or quality control issues. Data that pass initial screening are further evaluated using statistical methods. Statistical tools are necessary for data evaluation particularly since environmental measurements typically involve the determination of minute concentrations, which are difficult to detect and even more difficult to distinguish from other measurements.

Results are presented in this report with an analytical uncertainty term, *s*, where "*s*" is the estimated sample standard deviation (σ), assuming a Gaussian or normal distribution. All results are reported in this document, even those that do not necessarily represent detections. The term "detected", as used for the discussion of results in this report, does not imply any degree of risk to the public or environment, but rather indicates that the radionuclide was measured at a concentration sufficient for the analytical instrument to record a value that is statistically different from background. Laboratory measurements involve the analysis of a target sample and the analysis of a prepared laboratory blank (i.e., a sample which is identical to the sample collected in the environment, except that the radionuclide of interest is absent). In order to conclude that a radionuclide has been detected, it is essential to consider two fundamental aspects of the problem of detection: (1) the instrument signal for the sample must be greater than that observed for the blank before the decision can be made that the

radionuclide has been detected; and (2) an estimate must be made of the minimum radionuclide concentration that will yield a sufficiently large observed signal before the correct decision can be made for detection or non-detection. Each laboratory currently defines a detection of radioactivity in an individual sample if the result exceeds a detection level calculated by the laboratory after the analysis of a background sample, based on calculations derived by Curie (1984). The minimum detectable concentration (MDC) is defined as the concentration at which there is a 95% confidence that an analyte signal will be distinguishable from an analyte-free sample.

In addition, ESER uses a three standard deviation criterion to minimize the chance that a potentially false positive result is included in the data set. A false positive result is indicated when the range encompassing the result, plus or minus the total uncertainty at three standard deviations, includes zero (e.g., 2.5 +/- 1.0; range of -0.5 to 5.5). Statistically, the probability that a result can exceed the absolute value of its total uncertainty at three standard deviations by chance alone is less than 1%. A result that is greater than three times the total uncertainty of the measurement represents a statistically positive detection with over 99% confidence (DOE 2015b). The ESER reports measured radionuclide concentrations greater than or equal to their respective 3s uncertainties as being *detected with confidence*.

Concentrations between 2s and 3s are reported as *questionably detected*. That is, the radionuclide may be present in the sample; however, the probability that a result can exceed the absolute value of its total uncertainty at two standard deviations by chance alone may be as high as 5%. Measurements made between 2s and 3s are examined further to determine if they are a part of a pattern (temporal or spatial) that might warrant further investigation or recounting. For example, if a radionuclide is routinely detected at > 3s at a specific location, a sample result between 2s and 3s might be considered detected.

If a result is less than or equal to 2s there is even less statistical confidence that the radionuclide is present in the sample. Analytical results in this report are presented as the result value ± one standard deviation (1s) for reporting consistency with the annual report. To obtain the 2s or 3s values simply multiply the uncertainty term by 2 or 3.

Data are also compared to historical measurements using the upper tolerance limit (UTL). The UTL is a value such that 99% of the population (in this case, all valid measurements made between 2011-2020) is less than the UTL with 95% confidence (EPA 2015). With a 99%/95% UTL it is expected that approximately 1% of the measurements will exceed the UTL if the concentration of a radionuclide is within the normal range. This means that if a concentration exceeds the UTL it does not necessarily indicate that the site is outside of the normal range. Rather, it indicates that the measurement should be closely examined to determine if it is unusually high.

For more information concerning the ESER Program, contact Kevin Claver at (208) 526-9038, or visit the Program's web page (http://www.idahoeser.com).

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2. THE INL SITE

The INL Site is a nuclear energy and homeland security research, and environmental management facility. It is owned and administered by the U.S. Department of Energy, Idaho Operations Office (DOE-ID) and occupies about 890 mi^2 (2,300 km^2) of the upper Snake River Plain in Southeastern Idaho (Figure 1). The history of the INL Site began during World War II when the U.S. Naval Ordnance Station was located in Pocatello, Idaho. This station, one of two such installations in the U.S., retooled large guns from U.S. Navy warships. The retooled guns were tested on the nearby, uninhabited plain, known as the Naval Proving Ground. In the years following the war, as the nation worked to develop nuclear power, the Atomic Energy Commission (AEC), predecessor to the DOE, became interested in the Naval Proving Ground and made plans for a facility to build, test, and perfect nuclear power reactors.

The Naval Proving Ground became the National Reactor Testing Station (NRTS) in 1949, under the AEC. By the end of 1951, a reactor at the NRTS became the first to produce useful amounts of electricity. Over time the site has operated 52 various types of reactors, associated research centers, and waste handling areas. The NRTS was renamed the Idaho National Engineering Laboratory (INEL) in 1974, and the Idaho National Engineering and Environmental Laboratory (INEEL) in January 1997. With renewed interest in nuclear power the DOE announced in 2003 that Argonne National Laboratory-West and the INEEL would be the lead laboratories for development of the next generation of power reactors. On February 1, 2005, the INEEL and Argonne National Laboratory-West became the INL. The INL is committed to providing international nuclear leadership for the 21st Century, developing and demonstrating compelling national security technologies, and delivering excellence in science and technology as one of the Department of Energy's multiprogram national laboratories. Battelle Energy Alliance, LLC, is responsible for the management and operations of the INL.

The Idaho Cleanup Project (ICP) Core is a separately managed effort. The ICP Core is charged with safely and cost-effectively completing the majority of cleanup work from past laboratory missions in an ongoing process. Fluor Idaho, LLC, is responsible for the ICP Core.

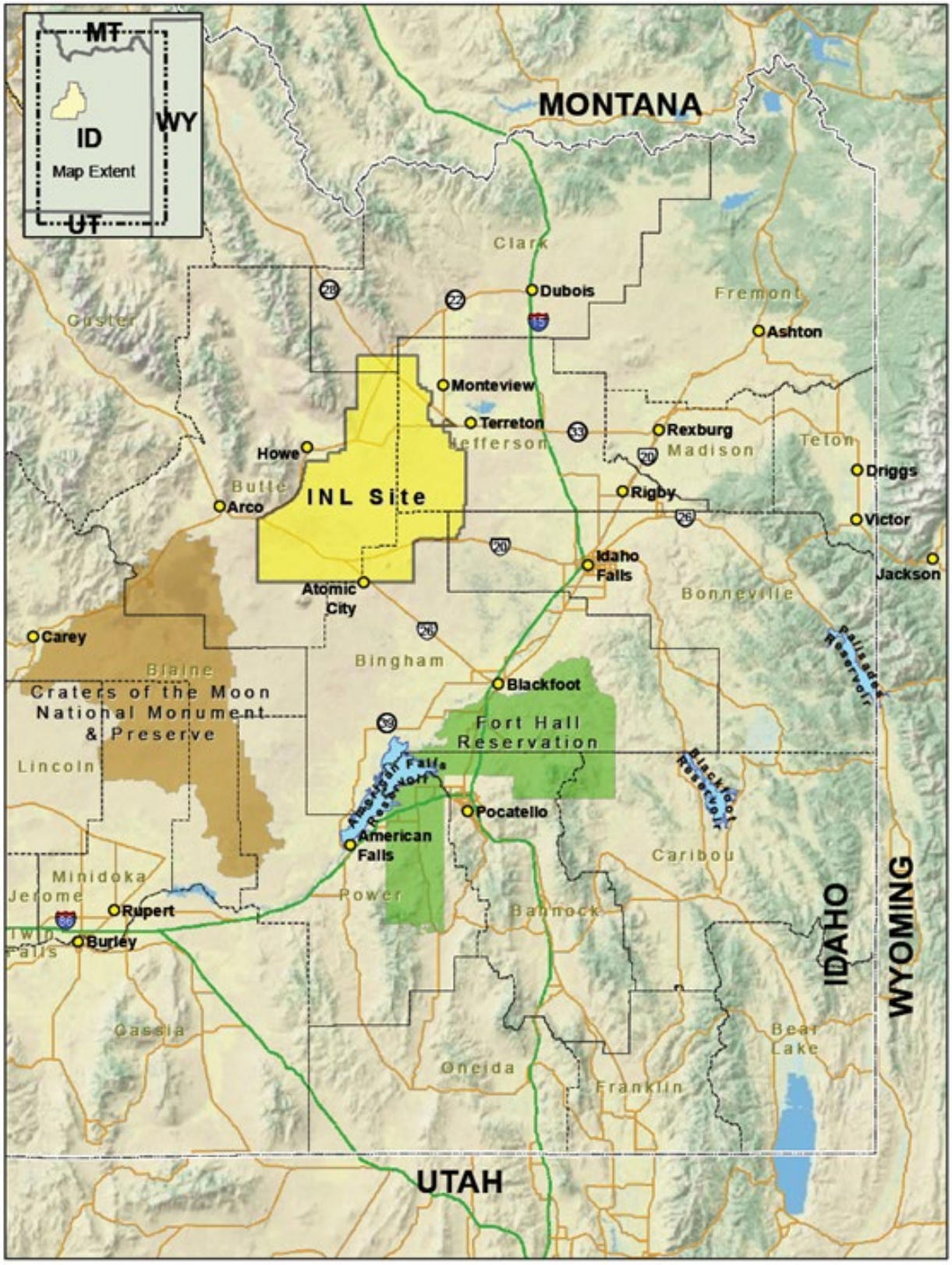

Figure 1. Location of the Idaho National Laboratory Site.

3. AIR SAMPLING

The primary pathway by which radionuclides can move off the INL Site is through the air and for this reason the air pathway is the primary focus of monitoring on and around the INL Site. Samples for particulates and iodine-131 (^{131}I) gas in air were collected weekly for the duration of the quarter at 16 locations using low-volume air samplers. Moisture in the atmosphere was sampled at four locations around the INL Site and analyzed for tritium. Air sampling activities and results for the second quarter of 2021 are discussed below. A summary of approximate minimum detectable concentrations (MDCs) for radiological analyses and DOE Derived Concentration Standard (DCS) (DOE 2011b) values is provided in Appendix B.

LOW-VOLUME AIR SAMPLING

Radioactivity associated with airborne particulates was monitored continuously by 18 low-volume air samplers (two of which are used as replicate samplers) at 16 locations during the second quarter of 2021 (Figure 2). Three of these samplers are located on the INL Site, seven are situated off the INL Site near the boundary, and eight have been placed at locations distant to the INL Site. Samplers are divided into INL Site, Boundary, and Distant groups to determine if there is a gradient of radionuclide concentrations, increasing towards the INL Site. Each replicate sampler is relocated every other year to a new location. Since 2020, one replicate sampler was located at Arco (a Boundary location) and one the other to Mud Lake (also a Boundary location). An average of 19,394 ft^3 (549 m^3) of air was sampled at each location, each week, at an average flow rate of 1.94 ft^3/min (0.05 m^3/min). Particulates in air were collected on membrane particulate filters (1.2-µm pore size). Gases passing through the filter were collected with an activated charcoal cartridge.

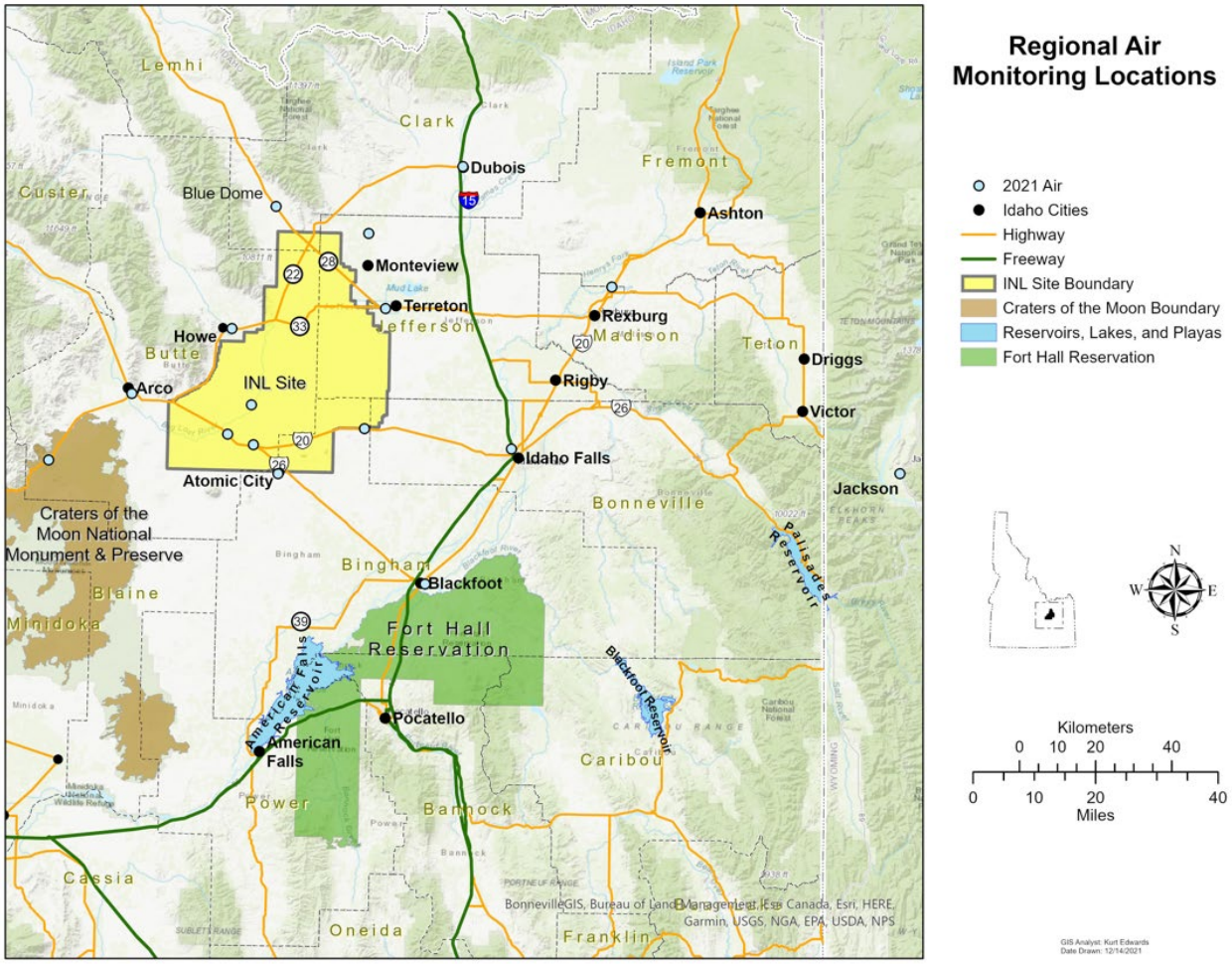

Figure 2. ESER air monitoring locations.

Filters and charcoal cartridges were changed weekly at each station during the quarter. Each particulate filter was analyzed for gross alpha and gross beta radioactivity using thin-window gas flow proportional counting systems after waiting about four days for naturally-occurring daughter products of radon and thorium to decay.

The weekly particulate filters collected during the quarter for each location were composited and analyzed for gamma-emitting radionuclides. Selected composites were also analyzed by location for ^{90}Sr, ^{238}Pu, $^{239/240}Pu$, and ^{241}Am as determined by a rotating quarterly schedule.

Charcoal cartridges were analyzed for gamma-emitting radionuclides, specifically for iodine-131 (^{131}I). Iodine-131 is of particular interest because it is produced in relatively large quantities by nuclear fission, is readily accumulated in human and animal thyroids, and has a half-life of eight days. This means that any elevated level of ^{131}I in the environment could be from a recent release of fission products.

Gross alpha results are reported in Table C-1 and shown in Figures 3 through 6. Gross alpha concentrations measured in individual samples ranged from a low of $(-1.8 \pm 1.0) \times 10^{-16}$ µCi/ml (undetected) collected at Jackson Hole on May 12, 2021, to a high of $(2.4 \pm 0.32) \times 10^{-15}$ µCi/ml collected at Arco on April 7, 2021. All results were less than the Derived Concentration Standard (DCS) of 3.4×10^{-14} µCi/ml for $^{239/240}Pu$ (see Table B-1 of Appendix B). In addition, the

results were consistent with historical data, as represented by the 99%/95% upper tolerance limit (UTL) for gross alpha activity (4.5×10^{-15} µCi/ml). The UTL was determined using ten years of historical data (measured from 2011 through 2020) and the ProUCL statistical software (https://www.epa.gov/land-research/proucl-software).The 99%/95% UTL is a value such that 99% of the population (all possible air measurements) is less than the UTL with 95% confidence. With a 99%/95% UTL it is expected that approximately 1% of the measurements will exceed the UTL if the concentration of gross alpha is within the normal range. This means that if a concentration exceeds the UTL it does not necessarily indicate that the result is outside of the normal range. Rather, it indicates that the measurement should be closely examined to determine if it is unusually high. None of the gross alpha measurements during the second quarter exceeded the UTL.

Gross alpha data have been tested for distribution (normally or lognormally distributed) and generally show no consistent discernible distribution. Because there is no discernible distribution of the data, a parametric test of significance cannot be used. The nonparametric Kruskal-Wallis analysis of variance by ranks test of multiple independent groups was used to determine statistical differences between INL Site, Boundary, and Distant locations. The test assesses the hypothesis that the different samples in the comparison were drawn from the same distribution or from distributions with the same median. In the computation of the Kruskal-Wallis test, each of the N observations is replaced by a rank. That is, all the results from all the locations are combined and ranked in a single series with the smallest result replaced by rank 1 and the largest result replaced by rank N (i.e., the total number of results). The sum of the ranks in each location group (i.e., INL Site, Boundary, and Distant) is found and then averaged for each group. If the samples are from the same populations, the average ranks should be about the same, whereas if the samples are from populations with different medians, the average ranks should differ. Statistically significant difference exists between data groups if the p-value (or probability value) is less than 0.05. Values greater than 0.05 translate into a 95% confidence that the medians are statistically the same. The p-value for each comparison is shown in Table D-1. There was no statistically significant difference among groups for the quarter or for any specific month in the quarter. To determine if there were any differences between stations and where the differences occur, the Kruskal-Wallis analysis of variance by ranks test was used again. No differences were determined (Table D-2).

Gross beta results are presented in Table C-1 and displayed in Figures 7 through 10. Gross beta concentrations measured in individual samples ranged from a low of $(1.4 \pm 0.51) \times 10^{-15}$ µCi/ml collected at Blackfoot on April 14, 2021, to a high of $(4.9 \pm 0.18) \times 10^{-14}$ µCi/ml collected at Arco on April 7, 2021. All results were less than the Derived Concentration Standard (DCS) of 2.5×10^{-11} µCi/ml for ^{90}Sr (see Table B-1 of Appendix B). In addition, the results were consistent with historical data, as represented by the 99%/95% upper tolerance limit (UTL) for gross beta activity (6.3×10^{-14} µCi/ml). The data were tested quarterly and generally are found to be neither normally nor log-normally distributed. Box and whiskers plots were used to present the non-parametric data. Outliers and extreme values were retained in subsequent statistical analyses because they are within the range of measurements made in the past ten years, and because these values could not be attributed to mistakes in collection, analysis, or reporting procedures.

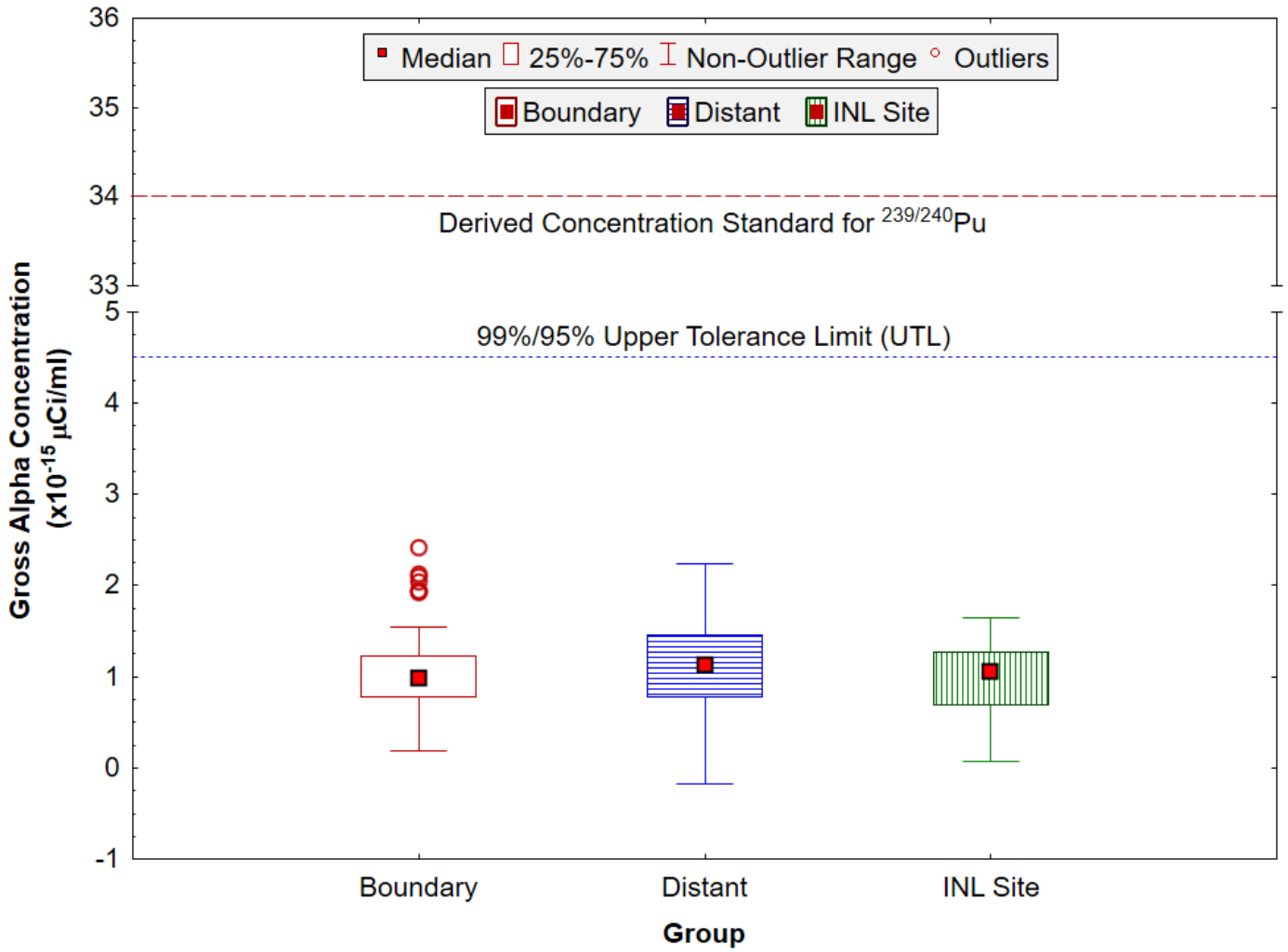

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the second quarter of 2021. The DOE Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

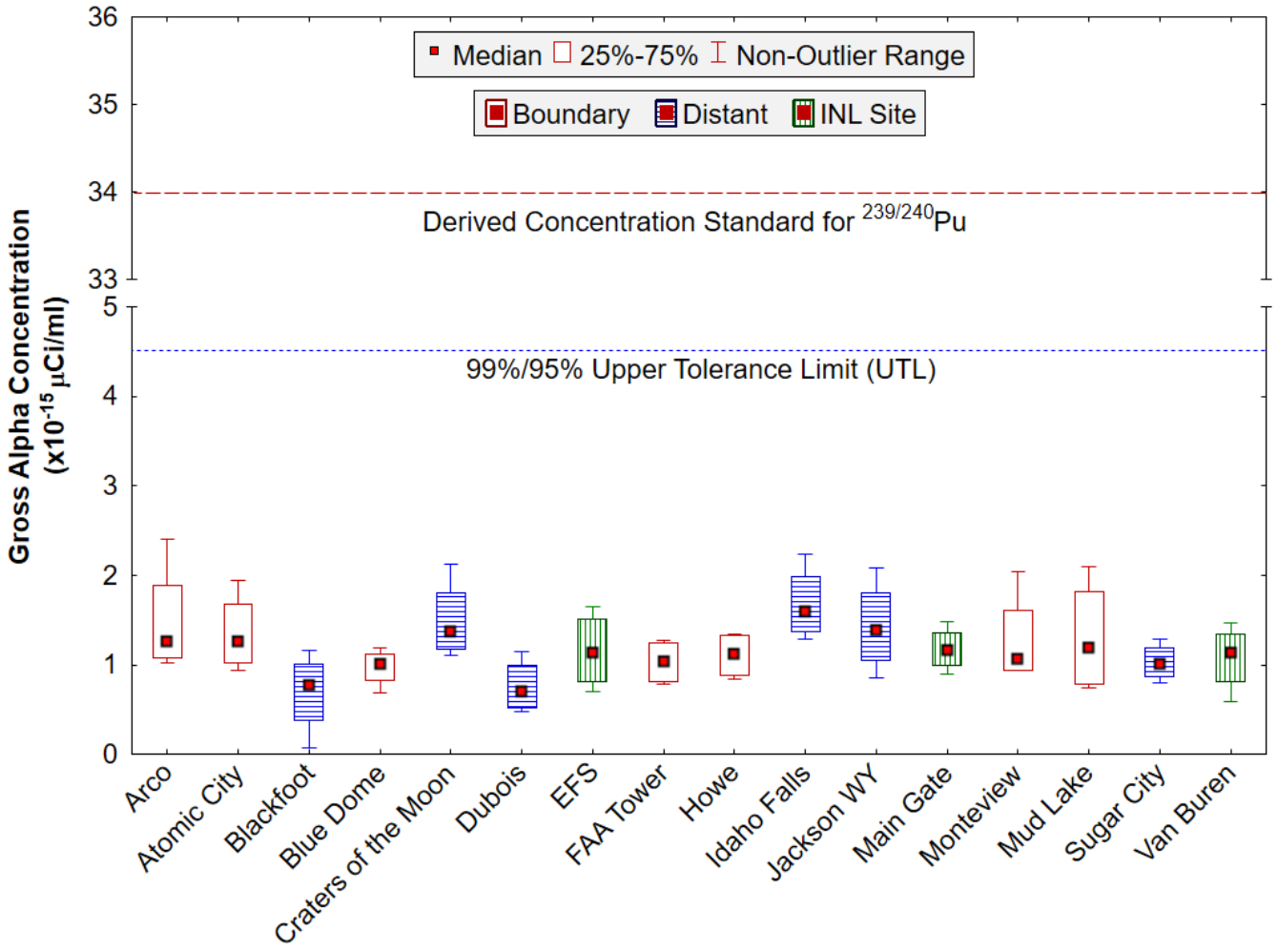

Figure 4. April 2021 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

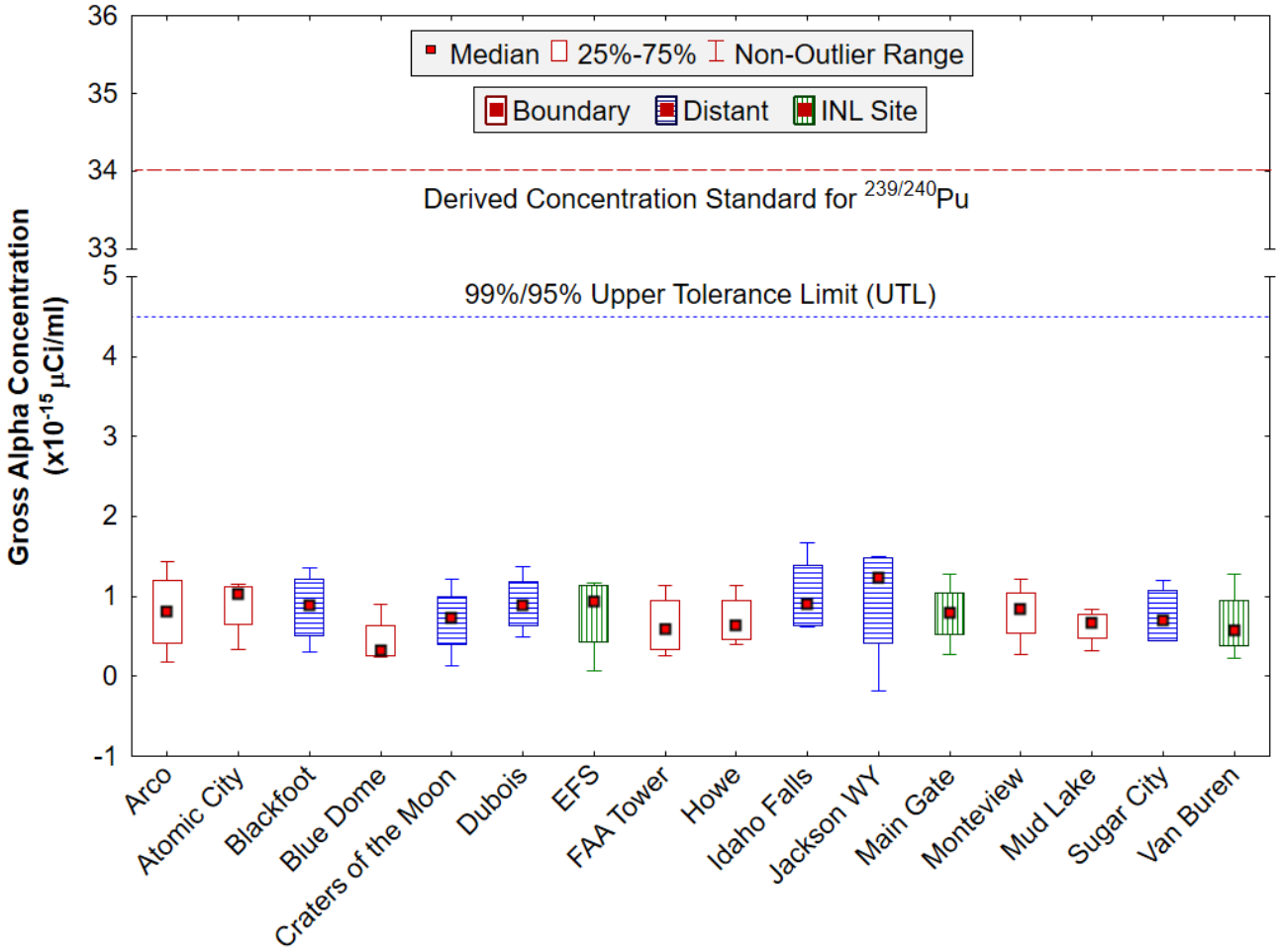

Figure 5. May 2021 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

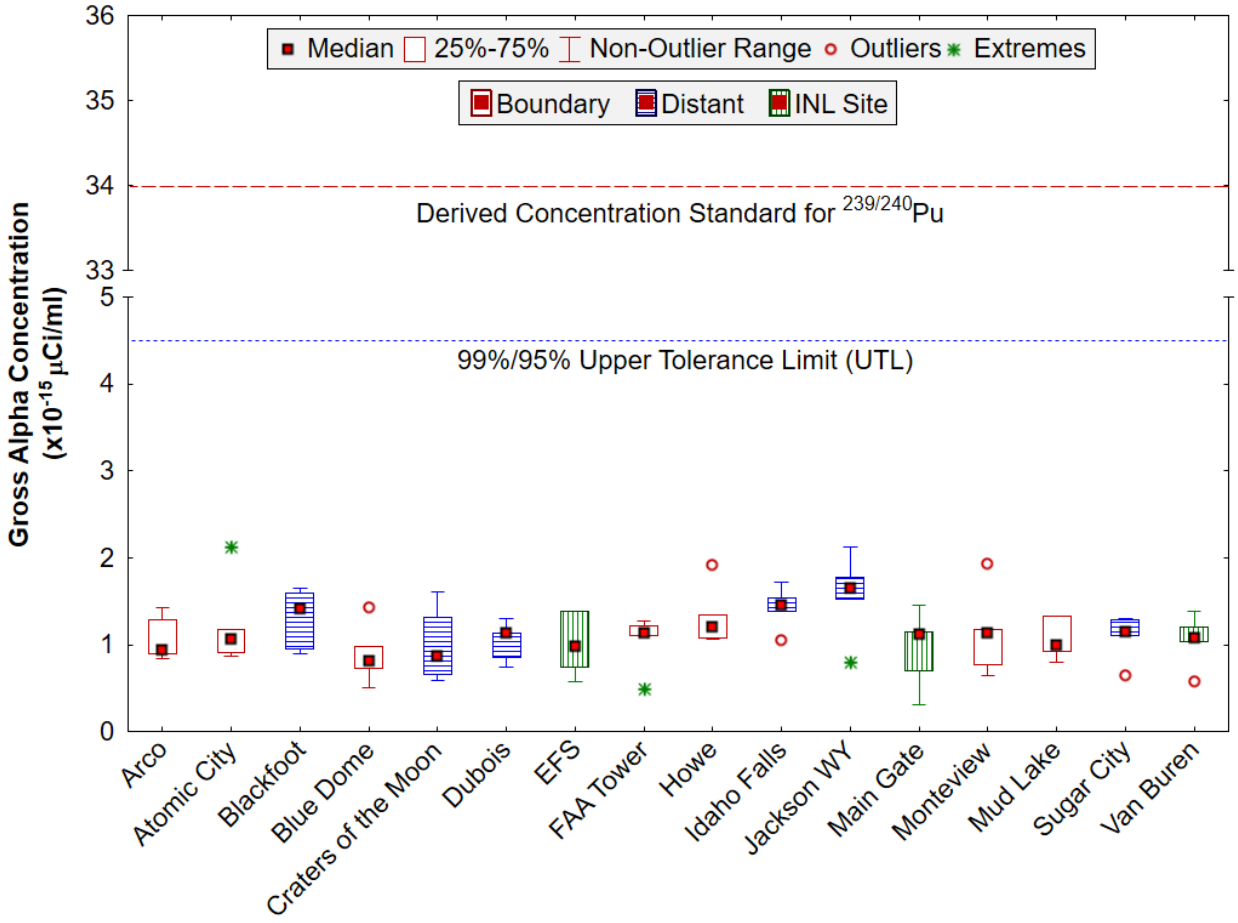

Figure 6. June 2021 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location, except for Craters of the Moon (N = 4). The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

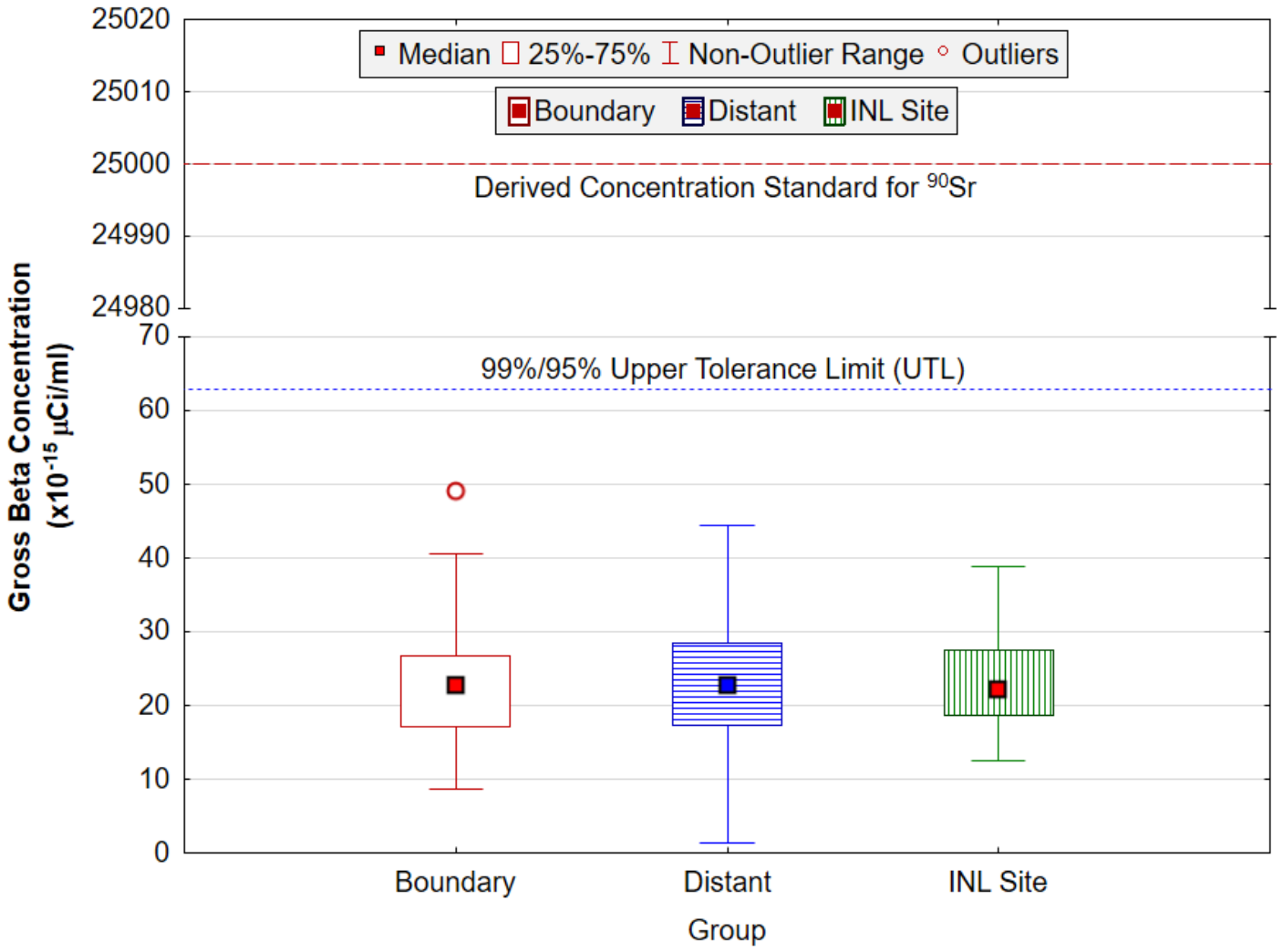

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the second quarter of 2021. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentration. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

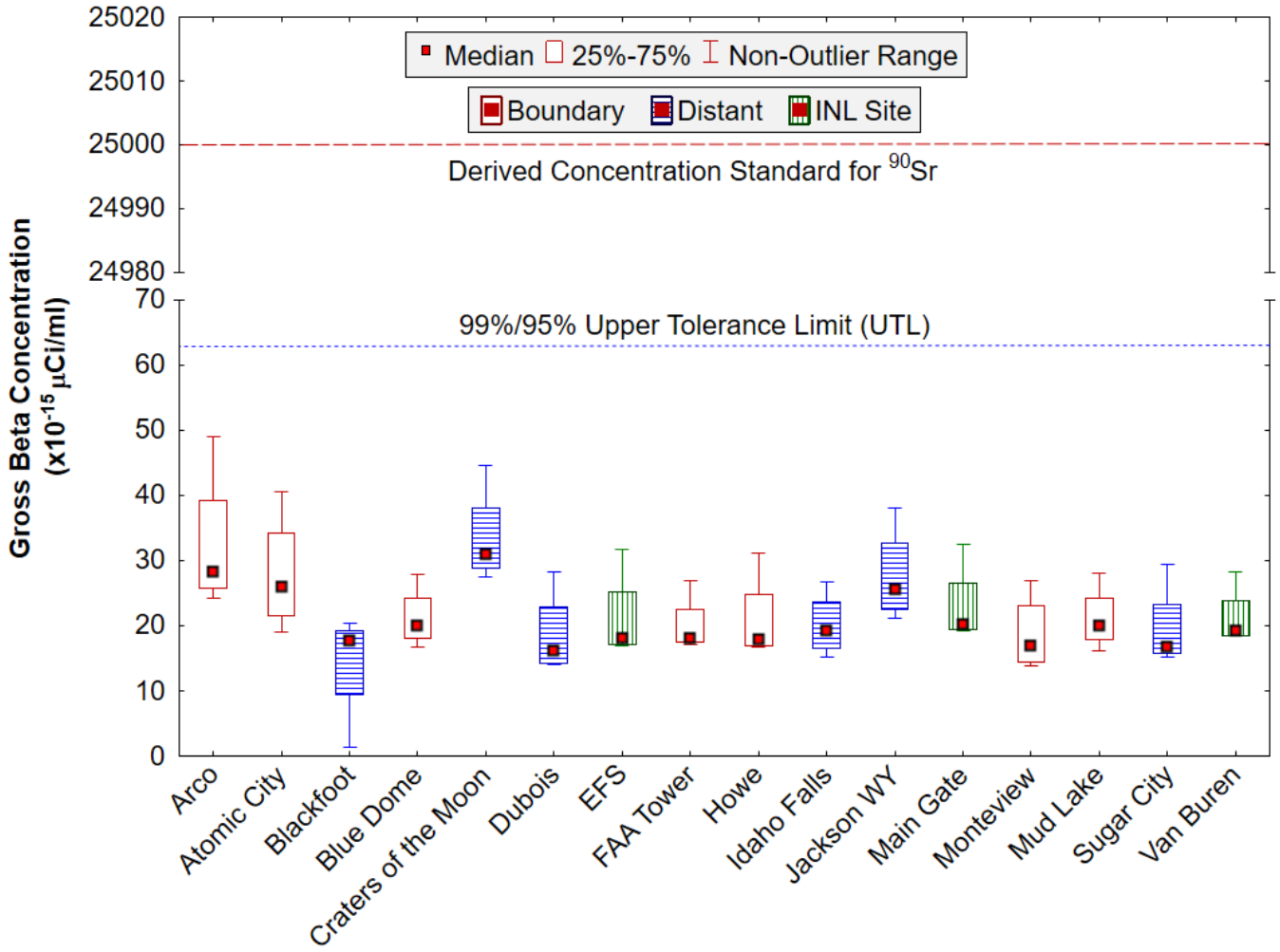

Figure 8. April 2021 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

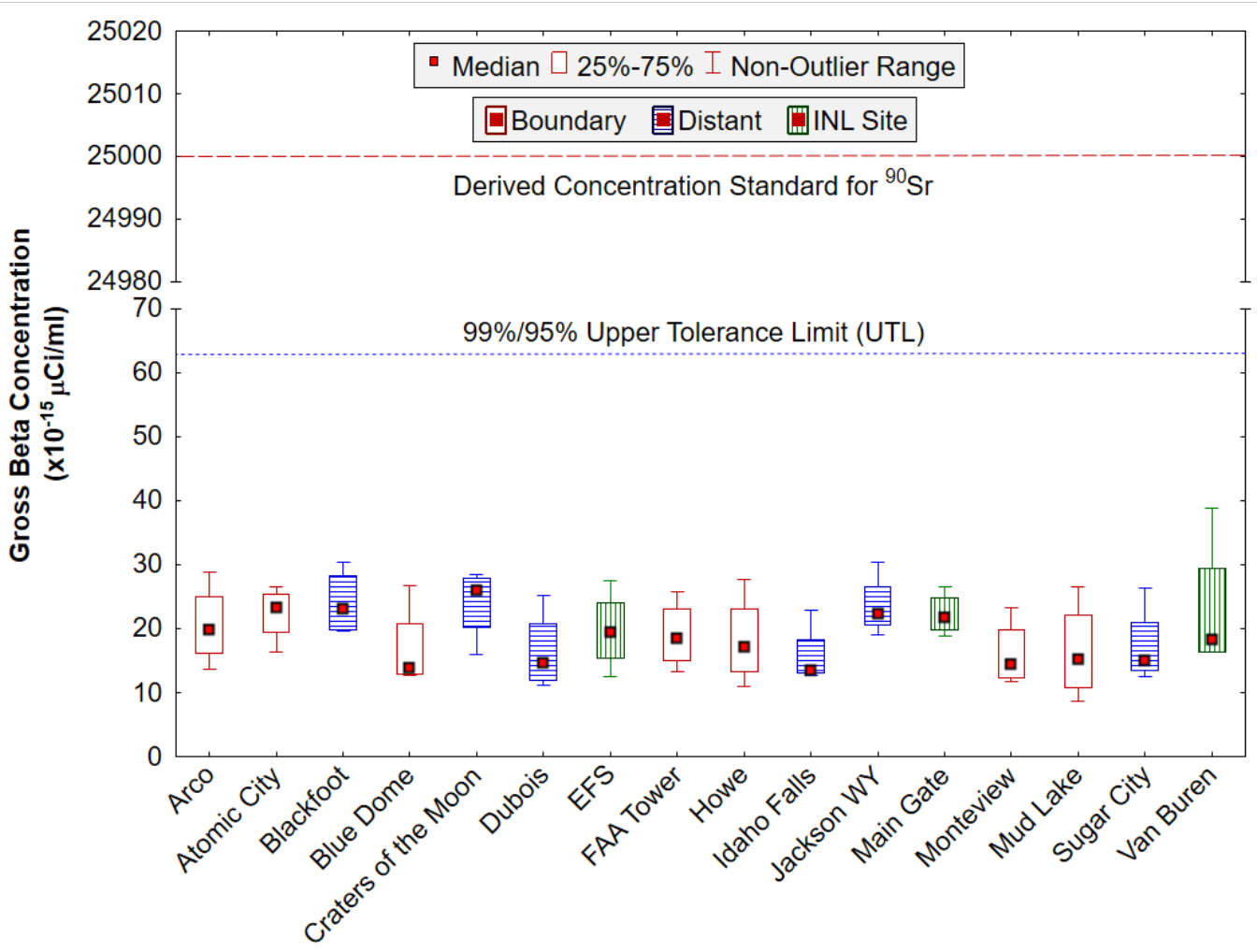

Figure 9. May 2021 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

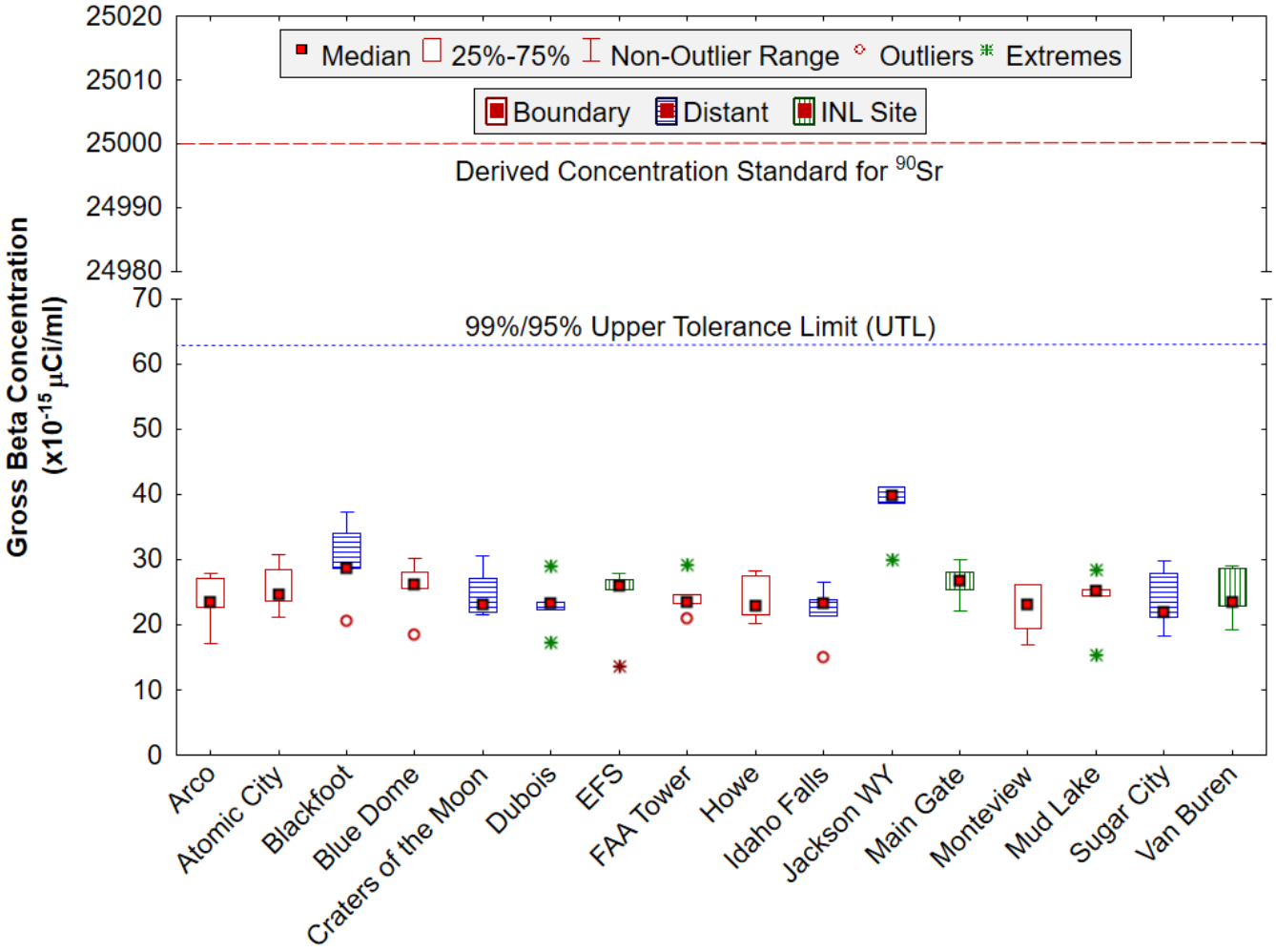

Figure 10. June 2021 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location, except for Craters of the Moon (N = 4). The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter The UTL represents the value below which 99% of the population are expected to fall with 95% confidence.

There were no statistically significant differences in the gross beta data between groups for the quarter or for any month, using the Kruskal-Wallis analysis of variance by ranks test (Table D-1). To determine if there were any differences between stations and where the differences occur, multiple comparisons were also made using the Kruskal-Wallis analysis of variance by ranks test between gross beta concentrations measured at all locations. Results measured at all locations were determined to be statistically similar except when comparing Jackson Hole and Monteview (Table D-3). The results measured at these locations, were determined to be statistically different. The highest mean rank was calculated for Jackson Hole whereas the lowest mean rank was calculated for Monteview (Table D-3). The differences between the locations may be due to variations in local meteorology, geology, or other natural factors.

Iodine-131 was not detected in any of the 26 sets of charcoal cartridges measured during the second quarter. Weekly ^{131}I results for each location are listed in Table C-2.

No ^{137}Cs or other human-made gamma-emitting radionuclides were found in quarterly air composites. No ^{90}Sr, ^{238}Pu, $^{239/240}Pu$, or ^{241}Am were detected either (Table C-3).

ATMOSPHERIC MOISTURE SAMPLING

Atmospheric moisture is collected by pulling air through a column of absorbent material (molecular sieve material) to absorb water vapor. The water is then extracted from the absorbent material by heat distillation. The resulting water samples are then analyzed for tritium using liquid scintillation.

Results were available for eleven atmospheric moisture samples collected at the INL Site, Boundary, and Distant locations during the second quarter of 2021 (Figure 11). Six of the concentrations exceeded the 3s uncertainty level for tritium, with a maximum reported value of $(1.08 \pm 0.19) \times 10^{-12}$ $\mu Ci/ml_{air}$ at EFS. The maximum result did not exceed the 99%/95% UTL of 1.6×10^{-12} $\mu Ci/ml_{air}$ and is within the range of values observed for the past 10 years. All samples were significantly below the DOE DCS for tritium in air (as water vapor) of 2.1×10^{-7} $\mu Ci/ml_{air}$. Results are shown in Table C-4.

4. PRECIPITATION AND WATER SAMPLING

PRECIPITATION SAMPLING

Precipitation samples are gathered when enough precipitation occurs to allow for the collection of the minimum sample volume of approximately 50 ml. Samples are taken of monthly composites from Idaho Falls, and weekly (when available) from the EFS on the INL Site and Atomic City and Howe on the INL Site boundary. These are the same locations that atmospheric moisture samples are collected at. Precipitation samples are analyzed for tritium. Storm events in the second quarter of 2021 produced sufficient precipitation to yield 13 samples.

Tritium was measured above the 3s values in three of the 13 samples collected during the second quarter (Figure 11). These results are listed in Table C-5 (Appendix C). Low levels of tritium always exist in the environment as a result of cosmic ray reactions with water molecules in the upper atmosphere. Long-term data collected around the globe since 1961 by the International Atomic Energy Agency suggest that that tritium levels have steadily decreased since the Nuclear Test Ban Treaty in 1963 and are close to their pre-nuclear test values (Cauquoin et al. 2015) and that there are no longer remnants of fallout from nuclear weapons testing. When detected, tritium values have remained well within the historical range. The maximum value in the second quarter was (165 ± 25) pCi/L in an EFS sample collected in late April. The result was below the 99%/95% UTL of 300 pCi/ml.

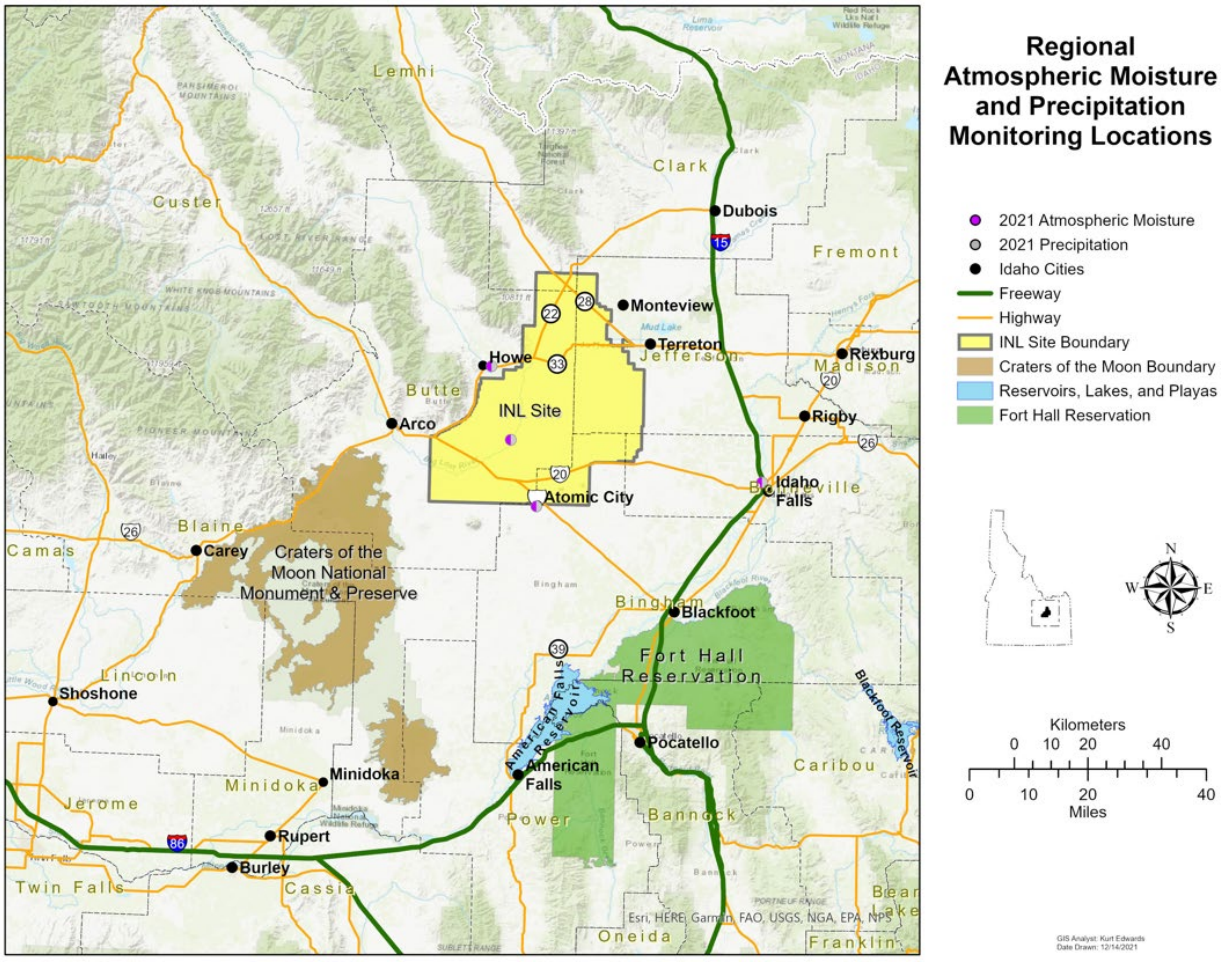

Figure 11. ESER atmospheric moisture and precipitation monitoring locations.

WATER SAMPLING

Drinking water samples were collected at eight locations (plus a duplicate). A control sample of bottled water was also prepared. Surface water samples were collected at three Thousand Springs locations. All samples were analyzed for gross alpha, gross beta, and tritium. Locations are shown in Figure 12 and results are listed in Table C-6 of Appendix C.

Gross alpha activity was not detected in any of the ten drinking water samples or the three surface water samples. Gross beta activity was detected in all of the drinking water samples (including the control), and in all three of the surface water samples. All concentrations were generally similar to previous results from drinking and surface water sampling. Natural levels of radioactive decay products of thorium and uranium exist in the Snake River Plain Aquifer and are the likely source of the measured concentrations. The highest reported gross beta value was (9.5 ± 0.54) pCi/L in the surface water sample collected from Alpheus Spring near Twin Falls. This location has historically shown the highest levels of natural activity.

Tritium was also detected in one of the ten drinking water samples and none of the three surface water samples. The concentration was similar to those found in atmospheric moisture and precipitation samples and were consistent with previous results. The maximum value was (116 ± 32) pCi/L in drinking water at Rest Area. The results are well below the DCS of 1.9×10^6 pCi/L for tritium in drinking water.

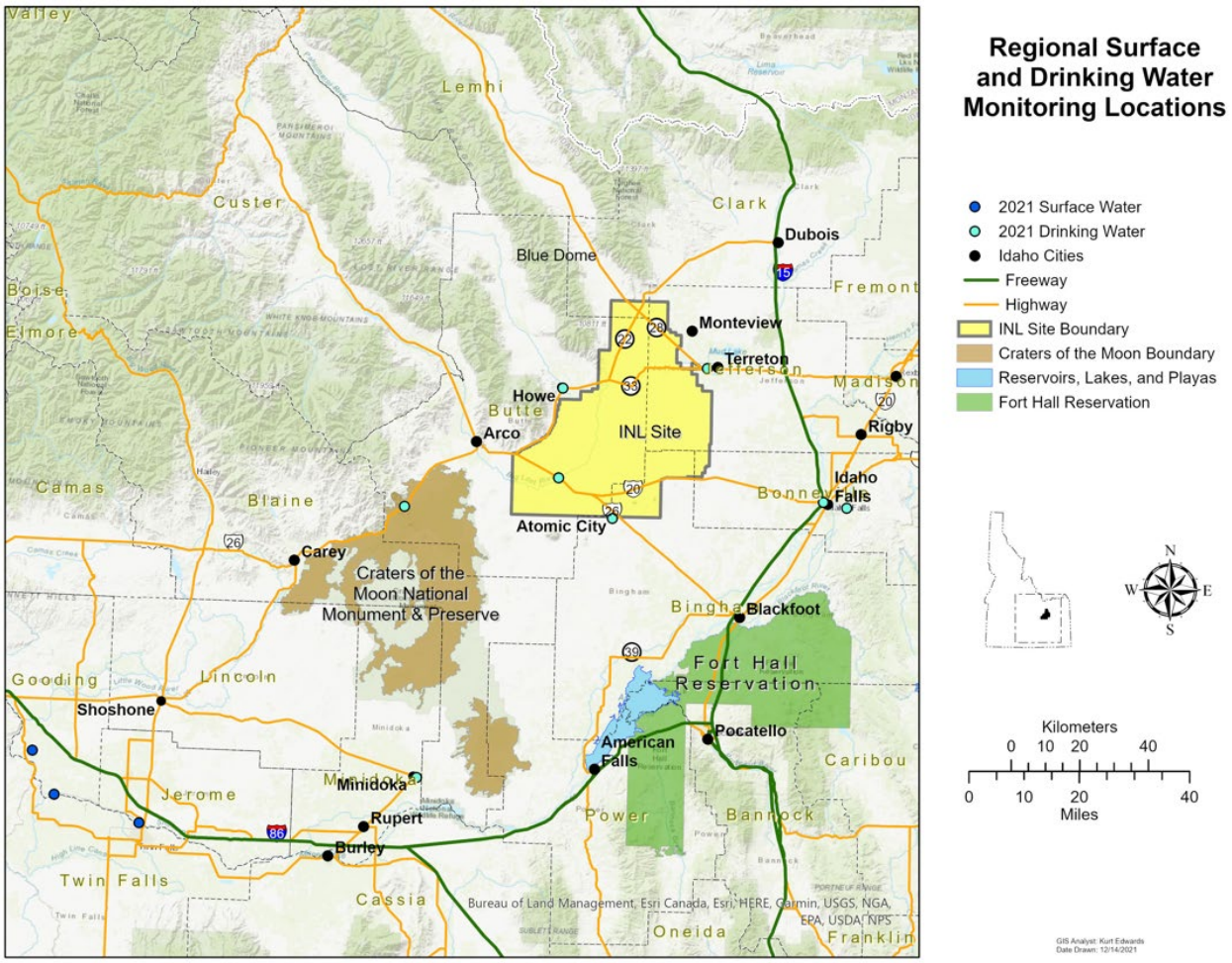

Figure 12. ESER surface and drinking water monitoring locations.

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5. AGRICULTURAL PRODUCT, WILDLIFE, AND SOIL SAMPLING

Another potential pathway for contaminants to reach humans is through the food chain. The ESER Program samples multiple agricultural products and game animals from around the INL Site and Southeast Idaho. Specifically, milk, alfalfa, grain, potatoes, lettuce, large game animals, and waterfowl are sampled. Milk is sampled throughout the year and large game animals are sampled whenever large game animals are killed onsite from vehicle collisions. Alfalfa is collected during the second quarter, lettuce and grain are sampled during the third quarter, while potatoes are collected during the fourth quarter. Waterfowl are collected in either the third or fourth quarter. See Table A-1, Appendix A, for more details on agricultural product and wildlife sampling. This section discusses results from milk, alfalfa and wildlife samples available during the second quarter of 2021.

MILK SAMPLING

Milk samples were collected weekly at Idaho Falls and Terreton. Monthly samples were collected at five other locations around the INL Site (Figure 13) during the second quarter of 2021. In addition to the local locations, commercially-available organic milk (from Colorado) was purchased as a control sample each month. All samples were analyzed for gamma emitting radionuclides, with particular emphasis on Iodine-131. Samples were also analyzed for strontium-90 and tritium in May.

Neither ^{131}I nor ^{137}Cs was detected in any weekly or monthly samples during the second quarter. No other human-made gamma-emitting radionuclides were found either. Data for ^{131}I and ^{137}Cs in milk samples are listed in Appendix C, Table C-7.

Results for ^{90}Sr and tritium are listed in Appendix C, Table C-8. Strontium-90 was detected in two of the eight milk samples analyzed. The maximum concentration of 0.78 pCi/L from the Idaho Falls sample is within range of concentrations observed over the past several years. There is no DCS for ^{90}Sr in milk; however, for comparison the results were well below the drinking water DCS of 1.1×10^3 pCi/L.

Tritium was not detected in any of the eight samples analyzed. All results were similar to those previously measured and similar to those found in other liquid media like precipitation. There is no DCS for tritium in milk, but the results were well below the DCS for tritium in drinking water (1.9×10^6 pCi/L).

ALFALFA SAMPLING

Four samples of alfalfa (including one duplicate) were obtained from growers in the Howe, Mud Lake, and Idaho Falls areas. All samples were analyzed for gamma-emitting radionuclides and three samples were analyzed for ^{90}Sr. Data for ^{137}Cs and ^{90}Sr in alfalfa samples are listed in Appendix C, Table C-9. No human-made gamma emitting radionuclides or ^{90}Sr were found in any of the samples this year.

LARGE GAME ANIMAL SAMPLING

One large game animal, killed by vehicular collision, was available for sampling during the second quarter of 2021. The elk was struck by a vehicle near the Naval Reactor Facility (NRF). Muscle, liver, and thyroid samples were collected from the animal. No human-made gamma-emitting radionuclides were detected in any of the tissues. Results for the tissue samples are listed in Appendix C, Table C-10.

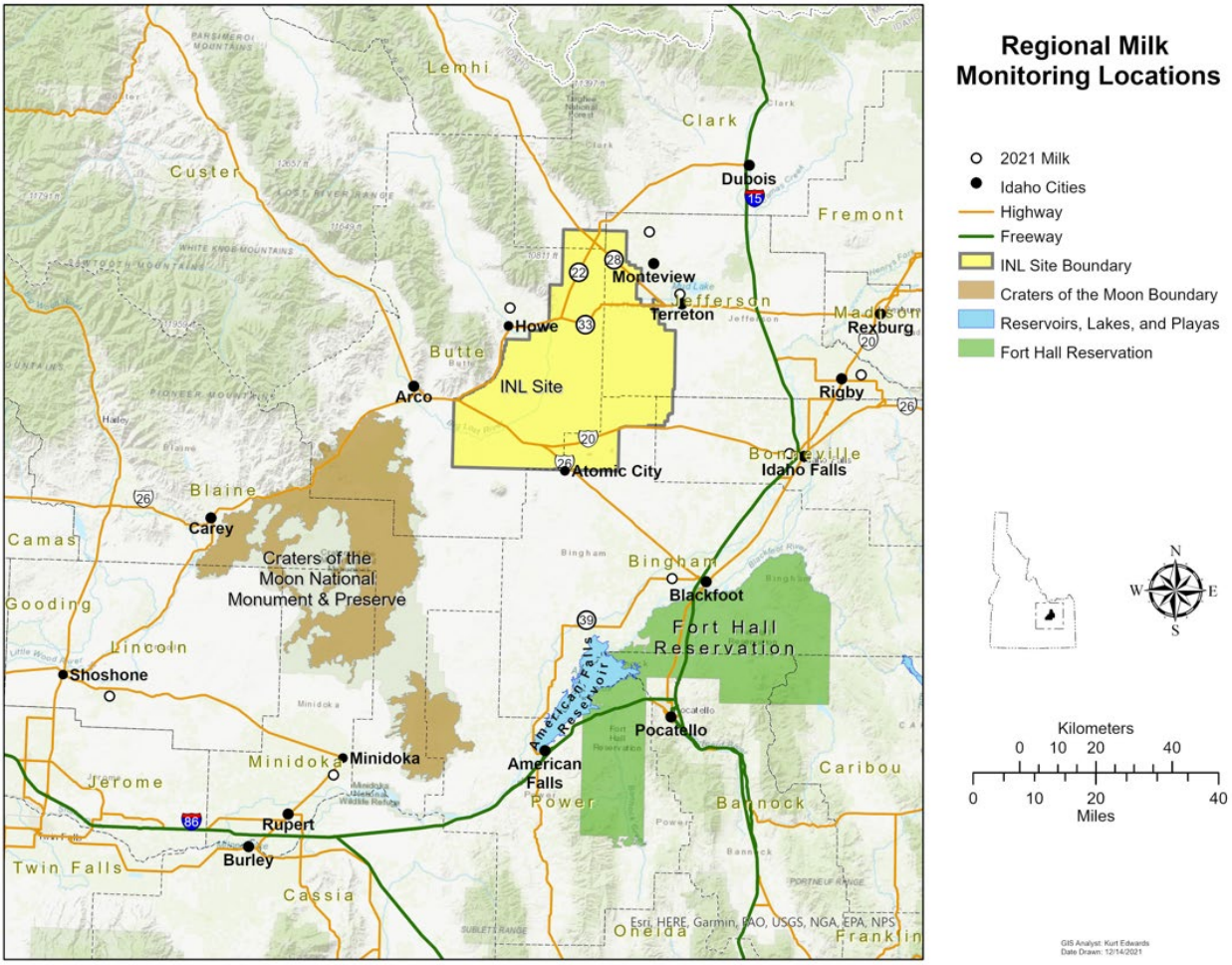

Figure 13. ESER milk sampling locations.

6. ENVIRONMENTAL RADIATION

An array of optically stimulated luminescent dosimeters (OSLDs) and thermoluminescent dosimeters (TLDs) is distributed throughout the Eastern Snake River Plain to monitor for environmental radiation. Beginning in November 2011, two OSLDs were place in the same locations (Figure 14) as the TLDs to run a side-by-side comparison of the two dosimeter technologies. OSLDs and TLDs are changed out at the beginning of May and again at the beginning of November after six months in the field.

OSLD results from dosimeters collected during the second quarter are displayed in Appendix C, Table C-11. Results are presented in dose units of millirem (mrem). The Boundary OSLD values ranged from 64.05 mrem at Blue Dome to 70.50 mrem at Atomic City, with an overall average of 67.44 mrem. This equates to an average dose of 0.37 mrem per day. Distant results varied from 55.75 mrem at Dubois to 78.65 mrem at Sugar City. The Distant average was 65.91 mrem, which also equates to 0.36 mrem per day. Results vary between sampling locations based on the geologic composition of the soils in the vicinity of the OSLD and the elevation of the station.

TLD results from the second quarter are presented in Appendix C, Table C-12. The results for TLDs are provided in exposure units of milliroentgen (mR). The second quarter Boundary group, six-month exposures ranged from 52.1 milliRotengens (mR) at Blue Dome to 66.1 mR at Mud Lake. The overall Boundary exposure was 60.5 mR with an average exposure of 0.33 mR per day. Distant exposures for second quarter ranged from 51.7 mR at Dubois to 74.1 mR for the TLD at Sugar City. The average Distant exposure was 60.8 mR with an average exposure of 0.33 mR per day.

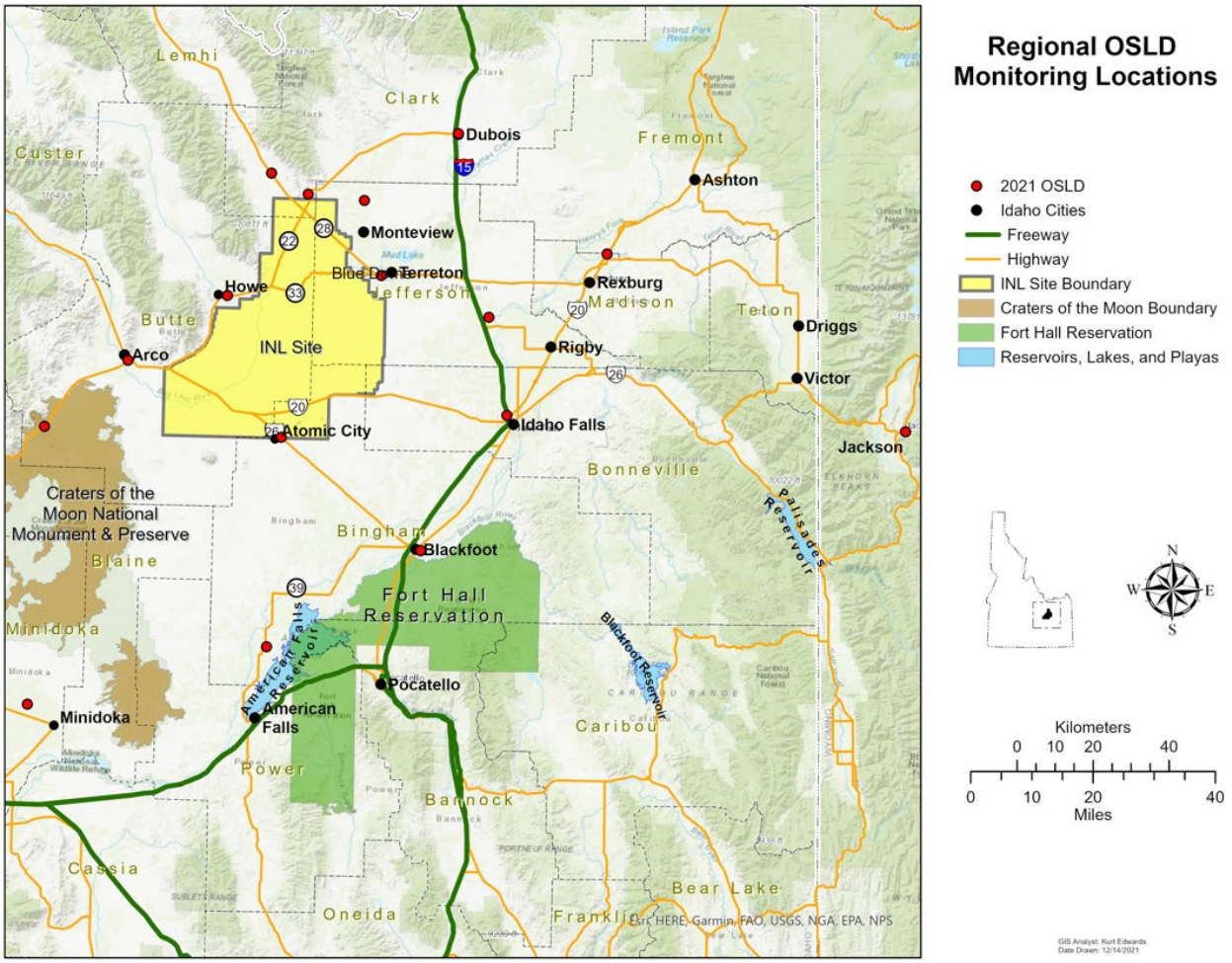

Figure 14. ESER optically stimulated luminescent dosimeter (OSLD) locations.

7. QUALITY ASSURANCE

The ESER Quality Assurance Program consists of five ongoing tasks which measure:

1. method uncertainty
2. data completeness
3. data accuracy, using spike, performance evaluation and laboratory control samples
4. data precision, using split samples, duplicate samples and recounts
5. presence of contamination in samples, using blanks.

Sample results are compared to criteria described in the Quality Assurance Project Plan for the INL Site Offsite Environmental Surveillance Program (VNSFS 2019). Criteria established by DOE for Quality Assurance activities include:

- Quality assurance program
- Personnel training and qualification
- Quality improvement process
- Documents and records
- Established work processes
- Established standards for design and verification
- Established procurement requirements
- Inspection and acceptance testing
- Management assessment
- Independent assessment

Assessments of ESER data quality are achieved through analysis of spike, performance evaluation, and duplicate samples; through sample recounts; through analysis of blank samples; and through comparison of sample results to established method quality objectives. These assessments are documented in the ESER Quality Assurance Report for the Second Quarter of 2021 (VNSFS 2022).

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APPENDIX A

SUMMARY OF SAMPLING SCHEDULE

Table A-1. Summary of the ESER Program's Sampling Schedule.

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
AIR SAMPLING				
LOW-VOLUME AIR				
Gross Alpha, Gross Beta, ^{131}I	weekly	Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Sugar City	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Blue Dome	Main Gate, EFS, Van Buren
Gamma Spec	quarterly	Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Sugar City	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Blue Dome	Main Gate, EFS, Van Buren
^{90}Sr, Transuranics	quarterly	Rotating schedule	Rotating schedule	Rotating schedule
ATMOSPHERIC MOISTURE				
Tritium	2 to 13 weeks	Idaho Falls	Atomic City, Howe	EFS
PRECIPITATION				
Tritium	monthly	Idaho Falls	None	None
Tritium	weekly	None	Atomic City, Howe	EFS
WATER SAMPLING				
DRINKING WATER				
Gross Alpha, Gross Beta, Tritium	Semiannually	Craters of the Moon, Idaho Falls, Minidoka, Shoshone	Atomic City, Howe, Mud Lake, Rest Area	None
SURFACE WATER				
Gross Alpha, Gross Beta, Tritium	Semiannually	Buhl, Hagerman, Twin Falls	None	Big Lost River (when flowing)
ENVIRONMENTAL RADIATION SAMPLING				
TLDs/OSLDs				
Gamma Radiation	semiannual	Aberdeen, Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Minidoka, Sugar City, Roberts	Arco, Atomic City, Birch Creek, Blue Dome, Howe, Monteview, Mud Lake	None
SOIL SAMPLING				
SOIL				
Gamma Spec, ^{90}Sr, Transuranics	biennially	Carey, Blackfoot, St. Anthony	Butte City, Monteview, Atomic City, FAA Tower, Howe, Mud Lake (2), Birch Creek, Frenchman's Cabin	None

Table A-1. continued.

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
AGRICULTURAL PRODUCT SAMPLING				
MILK				
Gamma Spec (^{131}I)	weekly	Idaho Falls	Terreton	None
Gamma Spec (^{131}I)	monthly	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka	Howe, Terreton	None
Tritium, ^{90}Sr	Semi-annually	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka	Howe, Terreton	None
POTATOES				
Gamma Spec, ^{90}Sr	annually	Varies among Blackfoot, Idaho Falls, Rupert, Shelley, Hamer, Driggs, occasional samples across the U.S.	Varies among Arco, Monteview, Mud Lake, Terreton	None
ALFALFA				
Gamma Spec, ^{90}Sr	annually	Idaho Falls	Howe, Mud Lake	None
GRAIN				
Gamma Spec, ^{90}Sr	annually	Varies among American Falls, Blackfoot, Carey, Idaho Falls, Rupert/Minidoka, Roberts	Varies among Arco, Monteview, Mud Lake, Taber, Terreton	None
LETTUCE				
Gamma Spec, ^{90}Sr	annually	Varies among Blackfoot, Carey, Idaho Falls, Rigby, Sugar City	Varies among Arco, Atomic City, FAA Tower, Howe, Monteview	EFS
WILDLIFE SAMPLING				
BIG GAME				
Gamma Spec	varies	Occasional samples across the U.S.	Public Highways	INL Site roads
WATERFOWL				
Gamma Spec, ^{90}Sr, Transuranics	annually	Varies among: Heise, Firth, Fort Hall, Mud Lake, Market Lake, and American Falls	None	INL Site wastewater disposal ponds

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APPENDIX B

SUMMARY OF MDCs AND DCSs

Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses Performed during Second Quarter 2021.

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha	4.6×10^{-16} µCi/ml	3.4×10^{-14} µCi/ml[c]
	Gross beta	3.0×10^{-15} µCi/ml	2.5×10^{-11} µCi/ml[d]
	^{137}Cs	2.8×10^{-17} µCi/ml	9.8×10^{-11} µCi/ml
	^{90}Sr	2.8×10^{-17} µCi/ml	2.5×10^{-11} µCi/ml
	^{241}Am	2.3×10^{-18} µCi/ml	4.1×10^{-14} µCi/ml
	^{238}Pu	2.9×10^{-18} µCi/ml	3.7×10^{-14} µCi/ml
	$^{239/240}$Pu	3.1×10^{-18} µCi/ml	3.4×10^{-14} µCi/ml
Air (charcoal cartridge)[e]	^{131}I	9.0×10^{-16} µCi/ml	4.1×10^{-10} µCi/ml
Air (atmospheric moisture)	^{3}H	91.1 pCi/L_{water} 4.2×10^{-13} µCi/ml_{air}	1.9×10^{6} pCi/L_{water} 2.1×10^{-7} µCi/ml_{air}
Air (precipitation)	^{3}H	91.7 pCi/L	1.9×10^{6} pCi/L_{water}
Milk	^{131}I	0.6 pCi/L	1.3×10^{3} pCi/L[f]
	^{137}Cs	1.0 pCi/L	3.0×10^{3} pCi/L[f]
	^{90}Sr	0.3 pCi/L	1.1×10^{3} pCi/L[f]
	^{3}H	91.6 pCi/L	1.9×10^{6} pCi/L[f]
Drinking Water/Surface Water	Gross alpha	0.7 pCi/L	1.4×10^{-7} µCi/ml[c]
	Gross beta	1.1 pCi/L	1.1×10^{-6} µCi/ml[d]
	^{3}H	91.1 pCi/L	1.9×10^{6} pCi/L_{water}
Alfalfa	^{137}Cs	32.3 pCi/kg	[g]
	^{90}Sr	36.4 pCi/kg	--
Large Game	^{131}I	31.6 pCi/kg (thyroid)	--
	^{137}Cs	1.4 pCi/kg (muscle/liver)	--

Table B-1. continued.

a. The MDC is an estimate of the concentration of radioactivity in a given sample type that can be identified with a 95% level of confidence. MDCs are calculated and reported by the laboratories based on actual ESER sample results following analysis.
b. DCSs, set by the DOE, represent reference values for radiation exposure. They are based on a radiation dose of 100 mrem/yr for exposure through a particular exposure mode such as direct exposure, inhalation, or ingestion of water.
c. Based on the most restrictive human-made alpha emitter (^{239}Pu).
d. Based on the most restrictive human-made beta emitter (^{90}Sr).
e. The approximate MDC is based on an average filtered air volume (pressure corrected) of 445 m^3/week.
f. There is no DCS established for radionuclides in milk. However, the DCS shown is for the radionuclide ingested in water.
g. – No appropriate DCS available.

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APPENDIX C

SAMPLE ANALYSIS RESULTS

Table C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air.

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
BOUNDARY															
ARCO	04/07/21	2.41	±	0.32	8.92	±	1.20	Yes	49.00	±	1.75	181.30	±	6.48	Yes
	04/14/21	1.38	±	0.24	5.11	±	0.90	Yes	27.10	±	1.26	100.27	±	4.66	Yes
	04/21/21	1.15	±	0.23	4.26	±	0.86	Yes	29.60	±	1.39	109.52	±	5.14	Yes
	04/28/21	1.02	±	0.23	3.77	±	0.87	Yes	24.30	±	1.32	89.91	±	4.88	Yes
	05/05/21	0.98	±	0.21	3.61	±	0.78	Yes	18.60	±	1.13	68.82	±	4.18	Yes
	05/12/21	0.19	±	0.10	0.68	±	0.38	No	21.20	±	1.57	78.44	±	5.81	Yes
	05/19/21	1.43	±	0.24	5.29	±	0.88	Yes	28.80	±	1.44	106.56	±	5.33	Yes
	05/26/21	0.63	±	0.18	2.33	±	0.66	Yes	13.60	±	1.03	50.32	±	3.81	Yes
	06/02/21	0.84	±	0.20	3.09	±	0.74	Yes	22.60	±	1.26	83.62	±	4.66	Yes
	06/09/21	0.93	±	0.21	3.46	±	0.78	Yes	27.90	±	1.44	103.23	±	5.33	Yes
	06/16/21	1.43	±	0.23	5.29	±	0.87	Yes	23.50	±	1.29	86.95	±	4.77	Yes
	06/23/21	1.29	±	0.23	4.77	±	0.86	Yes	27.10	±	1.36	100.27	±	5.03	Yes
	06/30/21	0.89	±	0.22	3.30	±	0.83	Yes	17.20	±	1.32	63.64	±	4.88	Yes
QA-1	4/7/2021[a]		±			±		No		±			±		No
(ARCO)	04/14/21	0.83	±	0.19	3.09	±	0.71	Yes	22.00	±	1.10	81.40	±	4.07	Yes
	04/21/21	0.70	±	0.18	2.59	±	0.68	Yes	19.50	±	1.11	72.15	±	4.11	Yes
	04/28/21	1.09	±	0.22	4.03	±	0.83	Yes	18.30	±	1.13	67.71	±	4.18	Yes
	05/05/21	0.84	±	0.19	3.10	±	0.71	Yes	18.70	±	1.10	69.19	±	4.07	Yes
	05/12/21	0.22	±	0.10	0.83	±	0.38	No	18.80	±	1.55	69.56	±	5.74	Yes
	05/19/21	1.40	±	0.24	5.18	±	0.87	Yes	26.90	±	1.40	99.53	±	5.18	Yes
	05/26/21	0.93	±	0.21	3.44	±	0.76	Yes	16.50	±	1.11	61.05	±	4.11	Yes
	06/02/21	0.74	±	0.19	2.73	±	0.71	Yes	25.30	±	1.32	93.61	±	4.88	Yes
	06/09/21	1.00	±	0.21	3.70	±	0.79	Yes	28.90	±	1.43	106.93	±	5.29	Yes
	06/16/21	1.04	±	0.20	3.85	±	0.74	Yes	19.70	±	1.18	72.89	±	4.37	Yes
	06/23/21	1.19	±	0.22	4.40	±	0.82	Yes	29.40	±	1.38	108.78	±	5.11	Yes
	06/30/21	1.28	±	0.27	4.74	±	0.98	Yes	20.60	±	1.48	76.22	±	5.48	Yes
ATOMIC CITY	04/07/21	1.94	±	0.28	7.18	±	1.03	Yes	40.60	±	1.52	150.22	±	5.62	Yes
	04/14/21	1.11	±	0.22	4.11	±	0.82	Yes	19.10	±	1.09	70.67	±	4.03	Yes
	04/21/21	0.94	±	0.21	3.46	±	0.76	Yes	24.00	±	1.22	88.80	±	4.51	Yes
	04/28/21	1.41	±	0.27	5.22	±	0.98	Yes	27.80	±	1.42	102.86	±	5.25	Yes
	05/05/21	1.10	±	0.24	4.07	±	0.90	Yes	22.40	±	1.34	82.88	±	4.96	Yes
	05/12/21	0.34	±	0.12	1.25	±	0.46	No	24.00	±	1.78	88.80	±	6.59	Yes
	05/19/21	1.15	±	0.21	4.26	±	0.79	Yes	26.60	±	1.36	98.42	±	5.03	Yes
	05/26/21	0.97	±	0.21	3.59	±	0.77	Yes	16.40	±	1.11	60.68	±	4.11	Yes
	06/02/21	0.91	±	0.21	3.36	±	0.76	Yes	23.70	±	1.29	87.69	±	4.77	Yes
	06/09/21	1.07	±	0.22	3.96	±	0.82	Yes	28.40	±	1.45	105.08	±	5.37	Yes
	06/16/21	1.18	±	0.21	4.37	±	0.78	Yes	24.70	±	1.28	91.39	±	4.74	Yes
	06/23/21	2.12	±	0.29	7.84	±	1.07	Yes	30.80	±	1.48	113.96	±	5.48	Yes
	06/30/21	0.87	±	0.23	3.22	±	0.85	Yes	21.20	±	1.44	78.44	±	5.33	Yes
BLUE DOME	04/07/21	1.19	±	0.22	4.40	±	0.82	Yes	27.80	±	1.27	102.86	±	4.70	Yes
	04/14/21	0.97	±	0.21	3.60	±	0.77	Yes	19.40	±	1.08	71.78	±	4.00	Yes
	04/21/21	1.04	±	0.21	3.85	±	0.78	Yes	16.70	±	1.06	61.79	±	3.92	Yes
	04/28/21	0.69	±	0.19	2.55	±	0.71	Yes	20.50	±	1.15	75.85	±	4.26	Yes
	05/05/21	0.24	±	0.13	0.88	±	0.50	No	15.00	±	1.00	55.50	±	3.69	Yes
	05/12/21	0.37	±	0.12	1.37	±	0.43	Yes	12.90	±	1.55	47.73	±	5.74	Yes
	05/19/21	0.90	±	0.19	3.32	±	0.70	Yes	26.70	±	1.34	98.79	±	4.96	Yes
	05/26/21	0.29	±	0.14	1.05	±	0.51	No	12.80	±	0.96	47.36	±	3.56	Yes
	06/02/21	0.73	±	0.20	2.69	±	0.73	Yes	26.10	±	1.36	96.57	±	5.03	Yes
	06/09/21	1.43	±	0.25	5.29	±	0.91	Yes	28.00	±	1.44	103.60	±	5.33	Yes
	06/16/21	0.81	±	0.19	2.99	±	0.68	Yes	25.50	±	1.31	94.35	±	4.85	Yes
	06/23/21	0.98	±	0.21	3.62	±	0.78	Yes	30.20	±	1.42	111.74	±	5.25	Yes
	06/30/21	0.51	±	0.20	1.89	±	0.75	No	18.50	±	1.39	68.45	±	5.14	Yes

Table C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air.

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
FAA TOWER	04/07/21	1.27	±	0.23	4.70	±	0.85	Yes	26.90	±	1.26	99.53	±	4.66	Yes
	04/14/21	1.23	±	0.23	4.55	±	0.84	Yes	18.20	±	1.07	67.34	±	3.96	Yes
	04/21/21	0.78	±	0.19	2.89	±	0.71	Yes	18.00	±	1.09	66.60	±	4.03	Yes
	04/28/21	0.84	±	0.21	3.11	±	0.77	Yes	17.20	±	1.10	63.64	±	4.07	Yes
	05/05/21	0.76	±	0.19	2.80	±	0.70	Yes	16.60	±	1.06	61.42	±	3.92	Yes
	05/12/21	0.26	±	0.11	0.95	±	0.42	No	20.50	±	1.69	75.85	±	6.25	Yes
	05/19/21	1.13	±	0.22	4.18	±	0.80	Yes	25.70	±	1.37	95.09	±	5.07	Yes
	05/26/21	0.42	±	0.16	1.55	±	0.61	No	13.30	±	1.05	49.21	±	3.89	Yes
	06/02/21	1.11	±	0.22	4.11	±	0.83	Yes	24.70	±	1.32	91.39	±	4.88	Yes
	06/09/21	1.27	±	0.24	4.70	±	0.88	Yes	23.50	±	1.37	86.95	±	5.07	Yes
	06/16/21	1.14	±	0.21	4.22	±	0.77	Yes	23.30	±	1.26	86.21	±	4.66	Yes
	06/23/21	1.22	±	0.23	4.51	±	0.84	Yes	29.20	±	1.39	108.04	±	5.14	Yes
	06/30/21	0.49	±	0.21	1.82	±	0.77	No	21.00	±	1.47	77.70	±	5.44	Yes
HOWE	04/07/21	1.33	±	0.23	4.92	±	0.87	Yes	31.10	±	1.33	115.07	±	4.92	Yes
	04/14/21	1.34	±	0.23	4.96	±	0.84	Yes	17.10	±	1.00	63.27	±	3.70	Yes
	04/21/21	0.84	±	0.20	3.12	±	0.73	Yes	18.70	±	1.11	69.19	±	4.11	Yes
	04/28/21	0.91	±	0.21	3.38	±	0.77	Yes	16.80	±	1.08	62.16	±	4.00	Yes
	05/05/21	0.76	±	0.19	2.80	±	0.72	Yes	18.50	±	1.13	68.45	±	4.18	Yes
	05/12/21	0.39	±	0.12	1.45	±	0.44	Yes	10.90	±	1.57	40.33	±	5.81	Yes
	05/19/21	1.13	±	0.22	4.18	±	0.80	Yes	27.70	±	1.41	102.49	±	5.22	Yes
	05/26/21	0.52	±	0.17	1.94	±	0.62	Yes	15.60	±	1.06	57.72	±	3.92	Yes
	06/02/21	1.08	±	0.22	4.00	±	0.82	Yes	22.90	±	1.28	84.73	±	4.74	Yes
	06/09/21	1.20	±	0.23	4.44	±	0.84	Yes	27.50	±	1.40	101.75	±	5.18	Yes
	06/16/21	1.92	±	0.27	7.10	±	1.00	Yes	21.60	±	1.30	79.92	±	4.81	Yes
	06/23/21	1.34	±	0.24	4.96	±	0.87	Yes	28.30	±	1.39	104.71	±	5.14	Yes
	06/30/21	1.07	±	0.25	3.96	±	0.91	Yes	20.20	±	1.43	74.74	±	5.29	Yes
MONTEVIEW	04/07/21	2.04	±	0.28	7.55	±	1.03	Yes	27.00	±	1.26	99.90	±	4.66	Yes
	04/14/21	1.17	±	0.22	4.33	±	0.80	Yes	13.80	±	0.94	51.06	±	3.47	Yes
	04/21/21	0.95	±	0.20	3.51	±	0.74	Yes	19.00	±	1.10	70.30	±	4.07	Yes
	04/28/21	0.93	±	0.21	3.45	±	0.78	Yes	15.00	±	1.05	55.50	±	3.89	Yes
	05/05/21	0.81	±	0.19	2.99	±	0.70	Yes	16.20	±	1.04	59.94	±	3.85	Yes
	05/12/21	0.27	±	0.11	1.00	±	0.40	No	11.80	±	1.53	43.66	±	5.66	Yes
	05/19/21	1.22	±	0.22	4.51	±	0.80	Yes	23.30	±	1.30	86.21	±	4.81	Yes
	05/26/21	0.86	±	0.20	3.17	±	0.73	Yes	12.80	±	1.01	47.36	±	3.74	Yes
	06/02/21	0.78	±	0.20	2.87	±	0.73	Yes	23.00	±	1.28	85.10	±	4.74	Yes
	06/09/21	1.18	±	0.22	4.37	±	0.83	Yes	26.10	±	1.36	96.57	±	5.03	Yes
	06/16/21	1.13	±	0.21	4.18	±	0.77	Yes	19.40	±	1.17	71.78	±	4.33	Yes
	06/23/21	1.93	±	0.28	7.14	±	1.03	Yes	26.20	±	1.40	96.94	±	5.18	Yes
	06/30/21	0.64	±	0.21	2.36	±	0.78	Yes	17.00	±	1.35	62.90	±	5.00	Yes
MUD LAKE	04/07/21	1.54	±	0.25	5.70	±	0.91	Yes	28.00	±	1.27	103.60	±	4.70	Yes
	04/14/21	2.10	±	0.43	7.77	±	1.59	Yes	19.70	±	1.75	72.89	±	6.48	Yes
	04/21/21	0.83	±	0.20	3.09	±	0.72	Yes	20.40	±	1.13	75.48	±	4.18	Yes
	04/28/21	0.74	±	0.19	2.75	±	0.69	Yes	16.10	±	1.02	59.57	±	3.77	Yes
	05/05/21	0.70	±	0.18	2.58	±	0.68	Yes	17.50	±	1.09	64.75	±	4.03	Yes
	05/12/21	0.32	±	0.11	1.17	±	0.40	No	8.61	±	1.45	31.86	±	5.37	Yes
	05/19/21	0.85	±	0.18	3.13	±	0.68	Yes	26.60	±	1.32	98.42	±	4.88	Yes
	05/26/21	0.64	±	0.18	2.35	±	0.67	Yes	12.80	±	1.01	47.36	±	3.74	Yes
	06/02/21	0.79	±	0.20	2.93	±	0.72	Yes	25.30	±	1.31	93.61	±	4.85	Yes
	06/09/21	1.33	±	0.23	4.92	±	0.83	Yes	25.20	±	1.30	93.24	±	4.81	Yes
	06/16/21	0.93	±	0.20	3.44	±	0.72	Yes	24.50	±	1.29	90.65	±	4.77	Yes
	06/23/21	1.33	±	0.23	4.92	±	0.84	Yes	28.50	±	1.35	105.45	±	5.00	Yes
	06/30/21	0.99	±	0.24	3.67	±	0.87	Yes	15.40	±	1.32	56.98	±	4.88	Yes

Table C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air.

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
QA-2	04/07/21	1.77	±	0.27	6.55	±	0.98	Yes	29.40	±	1.33	108.78	±	4.92	Yes
(MUD LAKE)	04/14/21	0.98	±	0.34	3.64	±	1.27	No	18.90	±	1.79	69.93	±	6.62	Yes
	04/21/21	0.62	±	0.19	2.30	±	0.68	Yes	17.50	±	1.12	64.75	±	4.14	Yes
	04/28/21	0.74	±	0.20	2.73	±	0.73	Yes	15.40	±	1.06	56.98	±	3.92	Yes
	05/05/21	0.73	±	0.19	2.68	±	0.69	Yes	17.00	±	1.07	62.90	±	3.96	Yes
	05/12/21	0.34	±	0.12	1.27	±	0.46	No	24.20	±	1.76	89.54	±	6.51	Yes
	05/19/21	0.91	±	0.19	3.37	±	0.71	Yes	29.50	±	1.41	109.15	±	5.22	Yes
	05/26/21	0.87	±	0.21	3.22	±	0.76	Yes	12.20	±	1.04	45.14	±	3.85	Yes
	06/02/21	0.80	±	0.20	2.95	±	0.73	Yes	20.70	±	1.22	76.59	±	4.51	Yes
	06/09/21	1.14	±	0.21	4.22	±	0.77	Yes	25.30	±	1.28	93.61	±	4.74	Yes
	06/16/21	1.60	±	0.24	5.92	±	0.88	Yes	20.30	±	1.19	75.11	±	4.40	Yes
	06/23/21	0.90	±	0.20	3.33	±	0.75	Yes	24.80	±	1.30	91.76	±	4.81	Yes
	06/30/21	0.45	±	0.19	1.65	±	0.70	No	15.10	±	1.25	55.87	±	4.63	Yes
DISTANT															
BLACKFOOT	04/07/21	1.16	±	0.26	4.29	±	0.94	Yes	17.40	±	1.25	64.38	±	4.63	Yes
	04/14/21	0.07	±	0.10	0.25	±	0.35	No	1.40	±	0.51	5.18	±	1.90	No
	04/21/21	0.86	±	0.20	3.19	±	0.73	Yes	20.40	±	1.13	75.48	±	4.18	Yes
	04/28/21	0.68	±	0.18	2.52	±	0.68	Yes	18.00	±	1.06	66.60	±	3.92	Yes
	05/05/21	0.71	±	0.21	2.61	±	0.76	Yes	20.10	±	1.26	74.37	±	4.66	Yes
	05/12/21	0.30	±	0.13	1.12	±	0.48	No	26.10	±	1.93	96.57	±	7.14	Yes
	05/19/21	1.35	±	0.24	5.00	±	0.90	Yes	30.30	±	1.53	112.11	±	5.66	Yes
	05/26/21	1.07	±	0.21	3.96	±	0.79	Yes	19.70	±	1.16	72.89	±	4.29	Yes
	06/02/21	0.90	±	0.22	3.32	±	0.82	Yes	28.70	±	1.48	106.19	±	5.48	Yes
	06/09/21	1.42	±	0.26	5.25	±	0.96	Yes	37.20	±	1.69	137.64	±	6.25	Yes
	06/16/21	1.59	±	0.26	5.88	±	0.98	Yes	28.70	±	1.51	106.19	±	5.59	Yes
	06/23/21	1.65	±	0.26	6.11	±	0.96	Yes	34.00	±	1.51	125.80	±	5.59	Yes
	06/30/21	0.96	±	0.25	3.53	±	0.91	Yes	20.60	±	1.49	76.22	±	5.51	Yes
CRATERS OF	04/07/21	2.13	±	0.32	7.88	±	1.17	Yes	44.50	±	1.72	164.65	±	6.36	Yes
THE MOON	04/14/21	1.24	±	0.26	4.59	±	0.97	Yes	31.70	±	1.49	117.29	±	5.51	Yes
	04/21/21	1.49	±	0.27	5.51	±	1.00	Yes	30.30	±	1.48	112.11	±	5.48	Yes
	04/28/21	1.11	±	0.27	4.11	±	0.99	Yes	27.50	±	1.53	101.75	±	5.66	Yes
	05/05/21	0.77	±	0.23	2.86	±	0.84	Yes	28.40	±	1.52	105.08	±	5.62	Yes
	05/12/21	0.13	±	0.11	0.48	±	0.42	No	24.50	±	1.83	90.65	±	6.77	Yes
	05/19/21	1.21	±	0.22	4.48	±	0.82	Yes	27.30	±	1.40	101.01	±	5.18	Yes
	05/26/21	0.67	±	0.19	2.49	±	0.71	Yes	15.90	±	1.13	58.83	±	4.18	Yes
	06/02/21	0.73	±	0.19	2.72	±	0.71	Yes	21.60	±	1.24	79.92	±	4.59	Yes
	6/9/2021[a]		±			±		No		±			±		No
	06/16/21	1.01	±	0.21	3.74	±	0.76	Yes	22.40	±	1.28	82.88	±	4.74	Yes
	06/23/21	1.61	±	0.26	5.96	±	0.96	Yes	30.60	±	1.47	113.22	±	5.44	Yes
	06/30/21	0.58	±	0.21	2.16	±	0.79	No	23.60	±	1.50	87.32	±	5.55	Yes
DUBOIS	04/07/21	1.15	±	0.22	4.26	±	0.80	Yes	28.20	±	1.25	104.34	±	4.63	Yes
	04/14/21	0.48	±	0.15	1.78	±	0.55	Yes	14.00	±	0.88	51.80	±	3.27	Yes
	04/21/21	0.83	±	0.25	3.07	±	0.91	Yes	17.70	±	1.35	65.49	±	5.00	Yes
	04/28/21	0.57	±	0.20	2.09	±	0.73	No	14.60	±	1.11	54.02	±	4.11	Yes
	05/05/21	0.78	±	0.21	2.89	±	0.76	Yes	16.50	±	1.14	61.05	±	4.22	Yes
	05/12/21	0.49	±	0.12	1.81	±	0.44	Yes	11.10	±	1.51	41.07	±	5.59	Yes
	05/19/21	1.37	±	0.24	5.07	±	0.88	Yes	25.10	±	1.39	92.87	±	5.14	Yes
	05/26/21	0.99	±	0.21	3.67	±	0.77	Yes	12.70	±	1.02	46.99	±	3.77	Yes
	06/02/21	1.13	±	0.22	4.18	±	0.82	Yes	22.30	±	1.26	82.51	±	4.66	Yes
	06/09/21	1.14	±	0.22	4.22	±	0.80	Yes	29.00	±	1.39	107.30	±	5.14	Yes
	06/16/21	1.30	±	0.23	4.81	±	0.83	Yes	23.30	±	1.29	86.21	±	4.77	Yes
	06/23/21	0.85	±	0.21	3.15	±	0.76	Yes	23.40	±	1.31	86.58	±	4.85	Yes
	06/30/21	0.74	±	0.24	2.73	±	0.87	Yes	17.30	±	1.46	64.01	±	5.40	Yes

Table C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air.

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
IDAHO FALLS	04/07/21	2.24	±	0.28	8.29	±	1.05	Yes	26.70	±	1.24	98.79	±	4.59	Yes
	04/14/21	1.72	±	0.25	6.36	±	0.92	Yes	15.20	±	0.96	56.24	±	3.56	Yes
	04/21/21	1.46	±	0.24	5.40	±	0.87	Yes	20.60	±	1.13	76.22	±	4.18	Yes
	04/28/21	1.29	±	0.23	4.77	±	0.87	Yes	17.90	±	1.11	66.23	±	4.11	Yes
	05/05/21	1.12	±	0.21	4.14	±	0.79	Yes	13.60	±	1.00	50.32	±	3.69	Yes
	05/12/21	0.67	±	0.13	2.48	±	0.49	Yes	13.50	±	1.57	49.95	±	5.81	Yes
	05/19/21	1.67	±	0.25	6.18	±	0.92	Yes	22.90	±	1.30	84.73	±	4.81	Yes
	05/26/21	0.61	±	0.18	2.27	±	0.67	Yes	12.70	±	1.02	46.99	±	3.77	Yes
	06/02/21	1.05	±	0.22	3.89	±	0.83	Yes	23.30	±	1.32	86.21	±	4.88	Yes
	06/09/21	1.46	±	0.24	5.40	±	0.89	Yes	23.90	±	1.32	88.43	±	4.88	Yes
	06/16/21	1.72	±	0.26	6.36	±	0.94	Yes	21.30	±	1.27	78.81	±	4.70	Yes
	06/23/21	1.54	±	0.26	5.70	±	0.98	Yes	26.50	±	1.44	98.05	±	5.33	Yes
	06/30/21	1.39	±	0.29	5.14	±	1.05	Yes	15.00	±	1.47	55.50	±	5.44	Yes
JACKSON	04/07/21	2.08	±	0.32	7.70	±	1.18	Yes	38.10	±	1.66	140.97	±	6.14	Yes
	04/14/21	1.52	±	0.28	5.62	±	1.04	Yes	27.20	±	1.40	100.64	±	5.18	Yes
	04/21/21	0.85	±	0.22	3.15	±	0.80	Yes	21.10	±	1.25	78.07	±	4.63	Yes
	04/28/21	1.24	±	0.26	4.59	±	0.96	Yes	23.90	±	1.37	88.43	±	5.07	Yes
	05/05/21	1.50	±	0.26	5.55	±	0.95	Yes	22.10	±	1.27	81.77	±	4.70	Yes
	05/12/21	-0.18	±	0.10	-0.65	±	0.37	No	22.60	±	1.98	83.62	±	7.33	Yes
	05/19/21	1.47	±	0.26	5.44	±	0.98	Yes	30.40	±	1.62	112.48	±	5.99	Yes
	05/26/21	1.00	±	0.24	3.69	±	0.90	Yes	19.00	±	1.34	70.30	±	4.96	Yes
	06/02/21	1.53	±	0.29	5.66	±	1.07	Yes	39.80	±	1.80	147.26	±	6.66	Yes
	06/09/21	2.13	±	0.35	7.88	±	1.28	Yes	41.10	±	2.02	152.07	±	7.47	Yes
	06/16/21	1.77	±	0.30	6.55	±	1.12	Yes	38.60	±	1.86	142.82	±	6.88	Yes
	06/23/21	1.65	±	0.31	6.11	±	1.14	Yes	41.10	±	1.91	152.07	±	7.07	Yes
	06/30/21	0.79	±	0.28	2.94	±	1.02	No	29.90	±	1.92	110.63	±	7.10	Yes
SUGAR CITY	04/07/21	1.29	±	0.23	4.77	±	0.85	Yes	29.50	±	1.30	109.15	±	4.81	Yes
	04/14/21	0.80	±	0.19	2.95	±	0.68	Yes	17.00	±	0.99	62.90	±	3.66	Yes
	04/21/21	0.95	±	0.20	3.50	±	0.74	Yes	16.60	±	1.04	61.42	±	3.85	Yes
	04/28/21	1.08	±	0.22	4.00	±	0.80	Yes	15.10	±	1.03	55.87	±	3.81	Yes
	05/05/21	0.46	±	0.16	1.72	±	0.59	No	15.70	±	1.03	58.09	±	3.81	Yes
	05/12/21	0.44	±	0.12	1.63	±	0.43	Yes	14.20	±	1.51	52.54	±	5.59	Yes
	05/19/21	1.20	±	0.21	4.44	±	0.78	Yes	26.30	±	1.32	97.31	±	4.88	Yes
	05/26/21	0.93	±	0.20	3.46	±	0.73	Yes	12.60	±	0.98	46.62	±	3.61	Yes
	06/02/21	1.30	±	0.24	4.81	±	0.90	Yes	21.10	±	1.29	78.07	±	4.77	Yes
	06/09/21	1.29	±	0.23	4.77	±	0.85	Yes	27.90	±	1.39	103.23	±	5.14	Yes
	06/16/21	1.15	±	0.22	4.26	±	0.80	Yes	21.90	±	1.26	81.03	±	4.66	Yes
	06/23/21	1.11	±	0.21	4.11	±	0.79	Yes	29.80	±	1.36	110.26	±	5.03	Yes
	06/30/21	0.65	±	0.22	2.39	±	0.80	No	18.20	±	1.39	67.34	±	5.14	Yes
INL SITE															
EFS	04/07/21	1.65	±	0.25	6.11	±	0.94	Yes	31.80	±	1.34	117.66	±	4.96	Yes
	04/14/21	0.92	±	0.20	3.39	±	0.74	Yes	18.70	±	1.04	69.19	±	3.85	Yes
	04/21/21	1.36	±	0.23	5.03	±	0.87	Yes	17.40	±	1.08	64.38	±	4.00	Yes
	04/28/21	0.70	±	0.19	2.60	±	0.72	Yes	17.00	±	1.09	62.90	±	4.03	Yes
	05/05/21	1.17	±	0.22	4.33	±	0.83	Yes	18.00	±	1.12	66.60	±	4.14	Yes
	05/12/21	0.07	±	0.13	0.25	±	0.49	No	20.70	±	2.18	76.59	±	8.07	Yes
	05/19/21	1.09	±	0.23	4.03	±	0.84	Yes	27.50	±	1.50	101.75	±	5.55	Yes
	05/26/21	0.78	±	0.20	2.87	±	0.74	Yes	12.60	±	1.05	46.62	±	3.89	Yes
	06/02/21	0.75	±	0.20	2.77	±	0.72	Yes	25.90	±	1.34	95.83	±	4.96	Yes
	06/09/21	1.38	±	0.25	5.11	±	0.92	Yes	27.00	±	1.45	99.90	±	5.37	Yes
	06/16/21	0.99	±	0.22	3.65	±	0.80	Yes	25.30	±	1.41	93.61	±	5.22	Yes
	06/23/21	1.38	±	0.27	5.11	±	0.99	Yes	27.80	±	1.54	102.86	±	5.70	Yes
	06/30/21	0.57	±	0.23	2.11	±	0.84	No	13.60	±	1.40	50.32	±	5.18	Yes

Table C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air.

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
MAIN GATE	04/07/21	1.23	±	0.23	4.55	±	0.85	Yes	32.50	±	1.38	120.25	±	5.11	Yes
	04/14/21	1.48	±	0.24	5.48	±	0.90	Yes	20.50	±	1.10	75.85	±	4.07	Yes
	04/21/21	0.90	±	0.20	3.33	±	0.74	Yes	19.80	±	1.12	73.26	±	4.14	Yes
	04/28/21	1.10	±	0.23	4.07	±	0.84	Yes	19.20	±	1.15	71.04	±	4.26	Yes
	05/05/21	0.80	±	0.20	2.96	±	0.72	Yes	20.60	±	1.16	76.22	±	4.29	Yes
	05/12/21	0.27	±	0.11	1.00	±	0.42	No	23.00	±	1.66	85.10	±	6.14	Yes
	05/19/21	1.27	±	0.23	4.70	±	0.83	Yes	26.50	±	1.38	98.05	±	5.11	Yes
	05/26/21	0.77	±	0.19	2.85	±	0.71	Yes	18.90	±	1.16	69.93	±	4.29	Yes
	06/02/21	0.70	±	0.19	2.59	±	0.70	Yes	25.40	±	1.32	93.98	±	4.88	Yes
	06/09/21	1.45	±	0.25	5.37	±	0.91	Yes	29.90	±	1.47	110.63	±	5.44	Yes
	06/16/21	1.15	±	0.22	4.26	±	0.80	Yes	26.70	±	1.35	98.79	±	5.00	Yes
	06/23/21	1.12	±	0.22	4.14	±	0.82	Yes	28.00	±	1.39	103.60	±	5.14	Yes
	06/30/21	0.31	±	0.19	1.16	±	0.71	No	22.10	±	1.47	81.77	±	5.44	Yes
VAN BUREN GATE	04/07/21	1.47	±	0.24	5.44	±	0.89	Yes	28.20	±	1.27	104.34	±	4.70	Yes
	04/14/21	1.21	±	0.22	4.48	±	0.82	Yes	19.70	±	1.07	72.89	±	3.96	Yes
	04/21/21	0.58	±	0.17	2.16	±	0.63	Yes	18.70	±	1.07	69.19	±	3.96	Yes
	04/28/21	1.05	±	0.22	3.89	±	0.83	Yes	18.40	±	1.14	68.08	±	4.22	Yes
	05/05/21	0.62	±	0.18	2.30	±	0.65	Yes	16.50	±	1.05	61.05	±	3.89	Yes
	05/12/21	0.23	±	0.12	0.85	±	0.43	No	20.10	±	1.73	74.37	±	6.40	Yes
	05/19/21	1.28	±	0.28	4.74	±	1.02	Yes	38.80	±	1.96	143.56	±	7.25	Yes
	05/26/21	0.53	±	0.19	1.98	±	0.69	No	16.30	±	1.19	60.31	±	4.40	Yes
	06/02/21	1.03	±	0.23	3.81	±	0.87	Yes	22.90	±	1.38	84.73	±	5.11	Yes
	06/09/21	1.08	±	0.22	4.00	±	0.83	Yes	29.10	±	1.47	107.67	±	5.44	Yes
	06/16/21	1.20	±	0.22	4.44	±	0.80	Yes	23.50	±	1.28	86.95	±	4.74	Yes
	06/23/21	1.38	±	0.24	5.11	±	0.89	Yes	28.70	±	1.40	106.19	±	5.18	Yes
	06/30/21	0.57	±	0.20	2.11	±	0.73	No	19.20	±	1.33	71.04	±	4.92	Yes

a. Invalid sample due to a low air volume.

Table C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
BOUNDARY								
ARCO	04/07/21	-0.29	±	1.45	-1.07	±	5.37	No
	04/14/21	0.14	±	2.05	0.53	±	7.59	No
	04/21/21	1.48	±	1.35	5.48	±	5.00	No
	04/28/21	-2.79	±	2.29	-10.32	±	8.47	No
	05/05/21	-0.16	±	1.24	-0.60	±	4.59	No
	05/12/21	0.36	±	1.04	1.34	±	3.85	No
	05/19/21	-2.55	±	2.06	-9.44	±	7.62	No
	05/26/21	1.23	±	1.12	4.55	±	4.14	No
	06/02/21	-0.83	±	1.44	-3.07	±	5.33	No
	06/09/21	-1.18	±	1.93	-4.37	±	7.14	No
	06/16/21	1.73	±	1.90	6.40	±	7.03	No
	06/23/21	0.86	±	1.37	3.19	±	5.07	No
	06/30/21	4.09	±	1.53	15.13	±	5.66	No
QA-1	4/7/2021[a]		±			±		No
(ARCO)	04/14/21	0.13	±	1.89	0.48	±	6.99	No
	04/21/21	1.37	±	1.25	5.07	±	4.63	No
	04/28/21	-2.53	±	2.08	-9.36	±	7.70	No
	05/05/21	-0.15	±	1.18	-0.57	±	4.37	No
	05/12/21	0.37	±	1.05	1.36	±	3.89	No
	05/19/21	-2.56	±	2.06	-9.47	±	7.62	No
	05/26/21	1.24	±	1.12	4.59	±	4.14	No
	06/02/21	-0.84	±	1.46	-3.11	±	5.40	No
	06/09/21	-1.14	±	1.87	-4.22	±	6.92	No
	06/16/21	1.69	±	1.86	6.25	±	6.88	No
	06/23/21	0.84	±	1.33	3.11	±	4.92	No
	06/30/21	4.46	±	1.67	16.50	±	6.18	No
ATOMIC CITY	04/07/21	-0.26	±	1.31	-0.97	±	4.85	No
	04/14/21	0.14	±	2.01	0.51	±	7.44	No
	04/21/21	1.37	±	1.26	5.07	±	4.66	No
	04/28/21	-2.86	±	2.35	-10.58	±	8.70	No
	05/05/21	-0.19	±	1.45	-0.70	±	5.37	No
	05/12/21	0.41	±	1.17	1.51	±	4.33	No
	05/19/21	-2.48	±	2.00	-9.18	±	7.40	No
	05/26/21	1.25	±	1.13	4.63	±	4.18	No
	06/02/21	-0.84	±	1.45	-3.09	±	5.37	No
	06/09/21	-1.18	±	1.92	-4.37	±	7.10	No
	06/16/21	1.67	±	1.83	6.18	±	6.77	No
	06/23/21	0.88	±	1.39	3.24	±	5.14	No
	06/30/21	4.31	±	1.61	15.95	±	5.96	No
BLUE DOME	04/07/21	-0.04	±	1.17	-0.14	±	4.33	No
	04/14/21	0.03	±	1.19	0.10	±	4.40	No
	04/21/21	-0.10	±	1.84	-0.37	±	6.81	No
	04/28/21	-2.03	±	1.17	-7.51	±	4.33	No
	05/05/21	-0.78	±	1.11	-2.88	±	4.11	No
	05/12/21	2.61	±	1.78	9.66	±	6.59	No
	05/19/21	3.05	±	1.21	11.29	±	4.48	No
	05/26/21	2.03	±	1.77	7.51	±	6.55	No
	06/02/21	-1.41	±	1.38	-5.22	±	5.11	No
	06/09/21	-1.78	±	1.22	-6.59	±	4.51	No
	06/16/21	-0.25	±	1.27	-0.92	±	4.70	No
	06/23/21	-0.52	±	1.14	-1.94	±	4.22	No
	06/30/21	-1.67	±	1.19	-6.18	±	4.40	No

Table C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
FAA TOWER	04/07/21	-0.04	±	1.19	-0.14	±	4.40	No
	04/14/21	0.03	±	1.21	0.10	±	4.48	No
	04/21/21	-0.10	±	1.86	-0.37	±	6.88	No
	04/28/21	-2.15	±	1.24	-7.96	±	4.59	No
	05/05/21	-0.79	±	1.13	-2.93	±	4.18	No
	05/12/21	2.67	±	1.82	9.88	±	6.73	No
	05/19/21	3.22	±	1.28	11.91	±	4.74	No
	05/26/21	2.24	±	1.95	8.29	±	7.22	No
	06/02/21	-1.35	±	1.33	-5.00	±	4.92	No
	06/09/21	-1.84	±	1.26	-6.81	±	4.66	No
	06/16/21	-0.24	±	1.23	-0.89	±	4.55	No
	06/23/21	-0.51	±	1.11	-1.89	±	4.11	No
	06/30/21	-1.73	±	1.23	-6.40	±	4.55	No
HOWE	04/07/21	-0.04	±	1.18	-0.14	±	4.37	No
	04/14/21	0.03	±	1.12	0.10	±	4.14	No
	04/21/21	-0.10	±	1.86	-0.37	±	6.88	No
	04/28/21	-2.01	±	1.16	-7.44	±	4.29	No
	05/05/21	-0.83	±	1.18	-3.06	±	4.37	No
	05/12/21	2.70	±	1.84	9.99	±	6.81	No
	05/19/21	3.22	±	1.28	11.91	±	4.74	No
	05/26/21	2.10	±	1.83	7.77	±	6.77	No
	06/02/21	-1.35	±	1.33	-5.00	±	4.92	No
	06/09/21	-1.74	±	1.19	-6.44	±	4.40	No
	06/16/21	-0.25	±	1.29	-0.94	±	4.77	No
	06/23/21	-0.52	±	1.13	-1.91	±	4.18	No
	06/30/21	-1.65	±	1.17	-6.11	±	4.33	No
MONTEVIEW	04/07/21	-0.04	±	1.15	-0.14	±	4.26	No
	04/14/21	0.03	±	1.14	0.10	±	4.22	No
	04/21/21	-0.10	±	1.80	-0.36	±	6.66	No
	04/28/21	-2.05	±	1.18	-7.59	±	4.37	No
	05/05/21	-0.78	±	1.11	-2.87	±	4.11	No
	05/12/21	2.61	±	1.78	9.66	±	6.59	No
	05/19/21	3.09	±	1.23	11.43	±	4.55	No
	05/26/21	2.10	±	1.83	7.77	±	6.77	No
	06/02/21	-1.36	±	1.34	-5.03	±	4.96	No
	06/09/21	-1.72	±	1.18	-6.36	±	4.37	No
	06/16/21	-0.24	±	1.22	-0.88	±	4.51	No
	06/23/21	-0.53	±	1.16	-1.96	±	4.29	No
	06/30/21	-1.65	±	1.17	-6.11	±	4.33	No
MUD LAKE	04/07/21	-0.04	±	1.16	-0.14	±	4.29	No
	04/14/21	0.06	±	2.44	0.21	±	9.03	No
	04/21/21	-0.10	±	1.84	-0.37	±	6.81	No
	04/28/21	-1.91	±	1.10	-7.07	±	4.07	No
	05/05/21	-0.80	±	1.14	-2.95	±	4.22	No
	05/12/21	2.54	±	1.73	9.40	±	6.40	No
	05/19/21	2.99	±	1.19	11.06	±	4.40	No
	05/26/21	2.14	±	1.86	7.92	±	6.88	No
	06/02/21	-1.34	±	1.31	-4.96	±	4.85	No
	06/09/21	-1.62	±	1.11	-5.99	±	4.11	No
	06/16/21	-0.25	±	1.26	-0.91	±	4.66	No
	06/23/21	-0.49	±	1.07	-1.81	±	3.96	No
	06/30/21	-1.63	±	1.16	-6.03	±	4.29	No

Table C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
QA-2	04/07/21	-0.04	±	1.20	-0.14	±	4.44	No
(MUD LAKE)	04/14/21	0.06	±	2.67	0.23	±	9.88	No
	04/21/21	-0.11	±	2.01	-0.40	±	7.44	No
	04/28/21	-2.06	±	1.19	-7.62	±	4.40	No
	05/05/21	-0.79	±	1.13	-2.93	±	4.18	No
	05/12/21	2.71	±	1.85	10.03	±	6.85	No
	05/19/21	3.10	±	1.23	11.47	±	4.55	No
	05/26/21	2.22	±	1.93	8.21	±	7.14	No
	06/02/21	-1.34	±	1.31	-4.96	±	4.85	No
	06/09/21	-1.57	±	1.08	-5.81	±	4.00	No
	06/16/21	-0.23	±	1.18	-0.86	±	4.37	No
	06/23/21	-0.52	±	1.13	-1.91	±	4.18	No
	06/30/21	-1.56	±	1.11	-5.77	±	4.11	No
DISTANT								
BLACKFOOT	04/07/21	-0.33	±	1.67	-1.23	±	6.18	No
	04/14/21	0.13	±	1.83	0.47	±	6.77	No
	04/21/21	1.35	±	1.24	5.00	±	4.59	No
	04/28/21	-2.37	±	1.95	-8.77	±	7.22	No
	05/05/21	-0.19	±	1.42	-0.69	±	5.25	No
	05/12/21	0.45	±	1.27	1.65	±	4.70	No
	05/19/21	-2.75	±	2.21	-10.18	±	8.18	No
	05/26/21	1.21	±	1.10	4.48	±	4.07	No
	06/02/21	-0.93	±	1.62	-3.45	±	5.99	No
	06/09/21	-1.27	±	2.08	-4.70	±	7.70	No
	06/16/21	1.97	±	2.16	7.29	±	7.99	No
	06/23/21	0.88	±	1.39	3.24	±	5.14	No
	06/30/21	4.55	±	1.70	16.84	±	6.29	No
CRATERS	04/07/21	-0.30	±	1.52	-1.12	±	5.62	No
OF THE MOON	04/14/21	0.17	±	2.44	0.63	±	9.03	No
	04/21/21	1.60	±	1.47	5.92	±	5.44	No
	04/28/21	-3.29	±	2.70	-12.17	±	9.99	No
	05/05/21	-0.21	±	1.58	-0.76	±	5.85	No
	05/12/21	0.42	±	1.21	1.57	±	4.48	No
	05/19/21	-2.54	±	2.05	-9.40	±	7.59	No
	05/26/21	1.32	±	1.20	4.88	±	4.44	No
	06/02/21	-0.83	±	1.44	-3.08	±	5.33	No
	6/9/2021[a]		±			±		No
	06/16/21	1.81	±	1.98	6.70	±	7.33	No
	06/23/21	0.89	±	1.41	3.30	±	5.22	No
	06/30/21	4.43	±	1.66	16.39	±	6.14	No
DUBOIS	04/07/21	-0.04	±	1.14	-0.13	±	4.22	No
	04/14/21	0.02	±	1.08	0.09	±	4.00	No
	04/21/21	-0.15	±	2.66	-0.54	±	9.84	No
	04/28/21	-2.30	±	1.32	-8.51	±	4.88	No
	05/05/21	-0.89	±	1.27	-3.29	±	4.70	No
	05/12/21	2.58	±	1.76	9.55	±	6.51	No
	05/19/21	3.30	±	1.31	12.21	±	4.85	No
	05/26/21	2.11	±	1.84	7.81	±	6.81	No
	06/02/21	-1.33	±	1.30	-4.92	±	4.81	No
	06/09/21	-1.67	±	1.14	-6.18	±	4.22	No
	06/16/21	-0.25	±	1.26	-0.91	±	4.66	No
	06/23/21	-0.55	±	1.19	-2.02	±	4.40	No
	06/30/21	-1.81	±	1.29	-6.70	±	4.77	No

Table C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
IDAHO FALLS	04/07/21	-0.04	±	1.12	-0.13	±	4.14	No
	04/14/21	0.03	±	1.09	0.09	±	4.03	No
	04/21/21	-0.09	±	1.74	-0.35	±	6.44	No
	04/28/21	-1.99	±	1.14	-7.36	±	4.22	No
	05/05/21	-0.78	±	1.11	-2.87	±	4.11	No
	05/12/21	2.63	±	1.79	9.73	±	6.62	No
	05/19/21	3.04	±	1.21	11.25	±	4.48	No
	05/26/21	2.17	±	1.89	8.03	±	6.99	No
	06/02/21	-1.40	±	1.38	-5.18	±	5.11	No
	06/09/21	-1.70	±	1.16	-6.29	±	4.29	No
	06/16/21	-0.25	±	1.27	-0.92	±	4.70	No
	06/23/21	-0.57	±	1.24	-2.09	±	4.59	No
	06/30/21	-1.84	±	1.31	-6.81	±	4.85	No
JACKSON	04/07/21	-0.32	±	1.60	-1.18	±	5.92	No
	04/14/21	0.17	±	2.39	0.61	±	8.84	No
	04/21/21	1.57	±	1.44	5.81	±	5.33	No
	04/28/21	-2.97	±	2.44	-10.99	±	9.03	No
	05/05/21	-0.17	±	1.32	-0.64	±	4.88	No
	05/12/21	0.47	±	1.36	1.75	±	5.03	No
	05/19/21	-3.00	±	2.42	-11.10	±	8.95	No
	05/26/21	1.55	±	1.40	5.74	±	5.18	No
	06/02/21	-1.03	±	1.78	-3.81	±	6.59	No
	06/09/21	-1.56	±	2.56	-5.77	±	9.47	No
	06/16/21	2.31	±	2.54	8.55	±	9.40	No
	06/23/21	1.16	±	1.85	4.29	±	6.85	No
	06/30/21	5.68	±	2.13	21.02	±	7.88	No
SUGAR CITY	04/07/21	-0.04	±	1.18	-0.14	±	4.37	No
	04/14/21	0.03	±	1.14	0.10	±	4.22	No
	04/21/21	-0.10	±	1.79	-0.36	±	6.62	No
	04/28/21	-1.95	±	1.12	-7.22	±	4.14	No
	05/05/21	-0.79	±	1.12	-2.91	±	4.14	No
	05/12/21	2.49	±	1.70	9.21	±	6.29	No
	05/19/21	2.96	±	1.18	10.95	±	4.37	No
	05/26/21	1.99	±	1.73	7.36	±	6.40	No
	06/02/21	-1.40	±	1.38	-5.18	±	5.11	No
	06/09/21	-1.69	±	1.16	-6.25	±	4.29	No
	06/16/21	-0.25	±	1.28	-0.93	±	4.74	No
	06/23/21	-0.49	±	1.07	-1.82	±	3.96	No
	06/30/21	-1.67	±	1.19	-6.18	±	4.40	No
INL SITE								
EFS	04/07/21	-0.25	±	1.27	-0.93	±	4.70	No
	04/14/21	0.13	±	1.91	0.49	±	7.07	No
	04/21/21	1.34	±	1.23	4.96	±	4.55	No
	04/28/21	-2.55	±	2.09	-9.44	±	7.73	No
	05/05/21	-0.16	±	1.23	-0.60	±	4.55	No
	05/12/21	0.54	±	1.54	1.98	±	5.70	No
	05/19/21	-2.85	±	2.30	-10.55	±	8.51	No
	05/26/21	1.31	±	1.19	4.85	±	4.40	No
	06/02/21	-0.85	±	1.48	-3.15	±	5.48	No
	06/09/21	-1.20	±	1.96	-4.44	±	7.25	No
	06/16/21	1.97	±	2.16	7.29	±	7.99	No
	06/23/21	1.05	±	1.66	3.89	±	6.14	No
	06/30/21	4.82	±	1.80	17.83	±	6.66	No

Table C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
MAIN GATE	04/07/21	-0.27	±	1.33	-0.98	±	4.92	No
	04/14/21	0.13	±	1.90	0.49	±	7.03	No
	04/21/21	1.36	±	1.24	5.03	±	4.59	No
	04/28/21	-2.55	±	2.10	-9.44	±	7.77	No
	05/05/21	-0.16	±	1.23	-0.59	±	4.55	No
	05/12/21	0.38	±	1.09	1.41	±	4.03	No
	05/19/21	-2.52	±	2.03	-9.32	±	7.51	No
	05/26/21	1.25	±	1.13	4.63	±	4.18	No
	06/02/21	-0.84	±	1.45	-3.10	±	5.37	No
	06/09/21	-1.14	±	1.87	-4.22	±	6.92	No
	06/16/21	1.76	±	1.93	6.51	±	7.14	No
	06/23/21	0.88	±	1.40	3.26	±	5.18	No
	06/30/21	4.48	±	1.68	16.58	±	6.22	No
VAN BUREN GATE	04/07/21	-0.25	±	1.26	-0.93	±	4.66	No
	04/14/21	0.13	±	1.90	0.49	±	7.03	No
	04/21/21	1.33	±	1.22	4.92	±	4.51	No
	04/28/21	-2.59	±	2.13	-9.58	±	7.88	No
	05/05/21	-0.16	±	1.19	-0.57	±	4.40	No
	05/12/21	0.41	±	1.18	1.52	±	4.37	No
	05/19/21	-3.60	±	2.91	-13.32	±	10.77	No
	05/26/21	1.42	±	1.29	5.25	±	4.77	No
	06/02/21	-0.95	±	1.64	-3.50	±	6.07	No
	06/09/21	-1.19	±	1.94	-4.40	±	7.18	No
	06/16/21	1.73	±	1.90	6.40	±	7.03	No
	06/23/21	0.88	±	1.39	3.24	±	5.14	No
	06/30/21	4.06	±	1.52	15.02	±	5.62	No

a. Invalid sample due to a low air volume.

Table C-3. Quarterly Cesium-137, Strontium-90, and Actinide Concentrations in Composite Air Filters.

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-14}$ Bq/mL)			Result > 3s
BOUNDARY									
ARCO	06/30/21	CESIUM-137	97.10	±	177.00	359.27	±	654.90	No
		STRONTIUM-90	12.90	±	8.95	47.73	±	33.12	No
QA-1 (ARCO)	06/30/21	CESIUM-137	37.10	±	154.00	137.27	±	569.80	No
		STRONTIUM-90	16.20	±	10.70	59.94	±	39.59	No
ATOMIC CITY	06/30/21	CESIUM-137	-47.40	±	149.00	-175.38	±	551.30	No
		STRONTIUM-90	27.10	±	9.14	100.27	±	33.82	No
BLUE DOME	06/30/21	CESIUM-137	-322.00	±	158.00	-1191.40	±	584.60	No
		STRONTIUM-90	17.90	±	7.48	66.23	±	27.68	No
FAA TOWER	06/30/21	CESIUM-137	-74.20	±	150.00	-274.54	±	555.00	No
HOWE	06/30/21	AMERICIUM-241	0.97	±	0.92	3.58	±	3.39	No
		CESIUM-137	-160.00	±	156.00	-592.00	±	577.20	No
		PLUTONIUM-238	-0.32	±	0.79	-1.17	±	2.91	No
		PLUTONIUM-239/240	0.61	±	0.84	2.26	±	3.12	No
MONTEVIEW	06/30/21	CESIUM-137	-73.60	±	127.00	-272.32	±	469.90	No
MUD LAKE	06/30/21	AMERICIUM-241	1.04	±	0.86	3.85	±	3.18	No
		CESIUM-137	-7.11	±	111.00	-26.31	±	410.70	No
		PLUTONIUM-238	0.62	±	0.58	2.29	±	2.13	No
		PLUTONIUM-239/240	1.21	±	0.87	4.48	±	3.22	No
QA-2 (MUD LAKE)	06/30/21	AMERICIUM-241	0.97	±	0.68	3.60	±	2.52	No
		CESIUM-137	-24.70	±	171.00	-91.39	±	632.70	No
		PLUTONIUM-238	-0.34	±	0.84	-1.25	±	3.10	No
		PLUTONIUM-239/240	0.84	±	1.12	3.09	±	4.14	No
DISTANT									
BLACKFOOT	06/30/21	CESIUM-137	140.00	±	120.00	518.00	±	444.00	No
CRATERS	06/30/21	CESIUM-137	-26.30	±	148.00	-97.31	±	547.60	No

Table C-3. Quarterly Cesium-137, Strontium-90, and Actinide Concentrations in Composite Air Filters.

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-14}$ Bq/mL)			Result > 3s
DUBOIS	06/30/21	AMERICIUM-241	0.61	±	0.54	2.27	±	2.01	No
		CESIUM-137	-201.00	±	180.00	-743.70	±	666.00	No
		PLUTONIUM-238	0.13	±	0.78	0.47	±	2.89	No
		PLUTONIUM-239/240	-0.11	±	0.87	-0.42	±	3.21	No
IDAHO FALLS	06/30/21	CESIUM-137	110.00	±	176.00	407.00	±	651.20	No
JACKSON	06/30/21	AMERICIUM-241	2.18	±	0.90	8.07	±	3.32	No
		CESIUM-137	49.80	±	153.00	184.26	±	566.10	No
		PLUTONIUM-238	0.41	±	1.07	1.50	±	3.96	No
		PLUTONIUM-239/240	2.43	±	1.28	8.99	±	4.74	No
SUGAR CITY	06/30/21	CESIUM-137	34.80	±	167.00	128.76	±	617.90	No
		STRONTIUM-90	5.80	±	6.68	21.46	±	24.72	No
INL SITE									
EFS	06/30/21	CESIUM-137	43.60	±	118.00	161.32	±	436.60	No
		STRONTIUM-90	21.20	±	7.95	78.44	±	29.42	No
MAIN GATE	06/30/21	AMERICIUM-241	0.21	±	0.67	0.76	±	2.48	No
		CESIUM-137	-56.30	±	150.00	-208.31	±	555.00	No
		PLUTONIUM-238	0.83	±	0.61	3.08	±	2.27	No
		PLUTONIUM-239/240	1.66	±	0.81	6.14	±	2.99	No
VAN BUREN GATE	06/30/21	AMERICIUM-241	2.23	±	0.92	8.25	±	3.41	No
		CESIUM-137	-163.00	±	185.00	-603.10	±	684.50	No
		PLUTONIUM-238	0.09	±	0.88	0.34	±	3.26	No
		PLUTONIUM-239/240	0.45	±	1.06	1.67	±	3.92	No

Table C-4. Tritium Concentrations in Atmospheric Moisture.

Sampling Group and Location	Start Date	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-13}$ µCi/mL$_{air}$)			Result ± 1s Uncertainty ($\times 10^{-9}$ Bq/mL$_{air}$)			Result > 3s
BOUNDARY									
ATOMIC CITY	2/17/2021	4/14/2021	2.35	±	0.59	8.70	±	2.20	**Yes**
	4/14/2021	5/19/2021	6.82	±	2.10	25.23	±	7.77	**Yes**
	5/19/2021	6/16/2021	6.77	±	1.76	25.05	±	6.51	**Yes**
HOWE	3/24/2021	5/5/2021	2.75	±	1.23	10.18	±	4.55	No
	5/5/2021	6/2/2021	4.34	±	2.08	16.06	±	7.70	No
DISTANT									
IDAHO FALLS	3/10/2021	4/14/2021	4.41	±	1.69	16.32	±	6.25	No
	4/14/2021	5/12/2021	5.51	±	1.88	20.39	±	6.96	No
	5/12/2021	6/2/2021	4.26	±	1.93	15.76	±	7.14	No
INL SITE									
EFS	3/10/2021	4/7/2021	9.36	±	2.64	34.63	±	9.77	**Yes**
	4/7/2021	5/12/2021	7.64	±	2.17	28.27	±	8.03	**Yes**
	5/12/2021	6/2/2021	10.80	±	1.89	39.96	±	6.99	**Yes**

Table C-5. Monthly and Weekly Tritium Concentrations in Precipitation.

Location	Start Date	End Date	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
BOUNDARY									
ATOMIC CITY	03/31/21	04/07/21	-6.76	±	24.00	-0.25	±	0.89	No
	04/21/21	04/28/21	49.40	±	23.90	1.83	±	0.88	No
	04/28/21	05/05/21	56.20	±	31.90	2.08	±	1.18	No
HOWE	04/21/21	04/28/21	41.30	±	24.60	1.53	±	0.91	No
	05/19/21	05/26/21	-30.90	±	24.10	-1.14	±	0.89	No
	06/23/21	06/30/21	164.00	±	32.10	6.07	±	1.19	**Yes**
DISTANT									
IDAHO FALLS	04/01/21	04/29/21	49.20	±	24.10	1.82	±	0.89	No
	05/01/21	05/31/21	26.70	±	24.80	0.99	±	0.92	No
	06/01/21	06/30/21	99.70	±	31.70	3.69	±	1.17	**Yes**
INL SITE									
EFS	03/31/21	04/07/21	37.10	±	24.00	1.37	±	0.89	No
	04/21/21	04/28/21	165.00	±	25.50	6.11	±	0.94	**Yes**
	04/28/21	05/05/21	69.20	±	24.90	2.56	±	0.92	No
	05/19/21	05/26/21	52.30	±	24.70	1.94	±	0.91	No

Table C-6. Gross Alpha, Gross Beta, and Tritium Concentrations in Surface and Drinking Water.

Location	Sampling Date	Analyte	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
SURFACE WATER									
Alpheus Spring	05/10/21	GROSS ALPHA	-1.21	±	0.28	-0.04	±	0.01	No
		GROSS BETA	9.53	±	0.54	0.35	±	0.02	**Yes**
		TRITIUM	-13.70	±	23.60	-0.51	±	0.87	No
Bill Jones, Jr. Trout Farm	05/10/21	GROSS ALPHA	0.43	±	0.26	0.02	±	0.01	No
		GROSS BETA	4.62	±	0.40	0.17	±	0.01	**Yes**
		TRITIUM	-55.60	±	23.90	-2.06	±	0.89	No
Clear Springs	05/10/21	GROSS ALPHA	-0.25	±	0.28	-0.01	±	0.01	No
		GROSS BETA	4.85	±	0.44	0.18	±	0.02	**Yes**
		TRITIUM	-39.40	±	23.30	-1.46	±	0.86	No
DRINKING WATER									
Atomic City	05/12/21	GROSS ALPHA	0.09	±	0.19	0.00	±	0.01	No
		GROSS BETA	2.59	±	0.33	0.10	±	0.01	**Yes**
		TRITIUM	24.00	±	32.10	0.89	±	1.19	No
Control	05/13/21	GROSS ALPHA	0.01	±	0.19	0.00	±	0.01	No
		GROSS BETA	4.39	±	0.36	0.16	±	0.01	**Yes**
		TRITIUM	-49.80	±	23.30	-1.84	±	0.86	No
Craters of the Moon	05/12/21	GROSS ALPHA	0.32	±	0.25	0.01	±	0.01	No
		GROSS BETA	3.44	±	0.39	0.13	±	0.01	**Yes**
		TRITIUM	-0.17	±	30.90	-0.01	±	1.14	No
Howe	05/12/21	GROSS ALPHA	0.19	±	0.25	0.01	±	0.01	No
		GROSS BETA	1.81	±	0.37	0.07	±	0.01	**Yes**
		TRITIUM	35.70	±	31.10	1.32	±	1.15	No
Idaho Falls	05/12/21	GROSS ALPHA	0.02	±	0.33	0.00	±	0.01	No
		GROSS BETA	4.01	±	0.46	0.15	±	0.02	**Yes**
		TRITIUM	42.30	±	31.20	1.57	±	1.16	No
Minidoka	05/10/21	GROSS ALPHA	0.27	±	0.19	0.01	±	0.01	No
		GROSS BETA	1.40	±	0.32	0.05	±	0.01	**Yes**
		TRITIUM	80.10	±	31.40	2.97	±	1.16	No
Mud Lake	05/12/21	GROSS ALPHA	-0.09	±	0.17	0.00	±	0.01	No
		GROSS BETA	3.28	±	0.33	0.12	±	0.01	**Yes**
		TRITIUM	59.20	±	31.10	2.19	±	1.15	No
Mud Lake (Duplicate)	05/12/21	GROSS ALPHA	-0.21	±	0.16	-0.01	±	0.01	No
		GROSS BETA	3.99	±	0.34	0.15	±	0.01	**Yes**
		TRITIUM	-99.90	±	22.60	-3.70	±	0.84	No
Rest Area	05/12/21	GROSS ALPHA	0.28	±	0.25	0.01	±	0.01	No
		GROSS BETA	3.10	±	0.38	0.11	±	0.01	**Yes**
		TRITIUM	116.00	±	31.50	4.30	±	1.17	**Yes**
Shoshone	05/10/21	GROSS ALPHA	-0.18	±	0.22	-0.01	±	0.01	No
	05/10/21	GROSS BETA	2.79	±	0.37	0.10	±	0.01	**Yes**
	05/10/21	TRITIUM	57.80	±	31.10	2.14	±	1.15	No

Table C-7. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk.

		Iodine-131							Cesium-137						
Location	Sampling Date	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
BLACKFOOT	04/04/21	0.21	±	1.02	0.01	±	0.04	No	0.79	±	0.68	0.03	±	0.03	No
	05/02/21	-2.57	±	1.54	-0.10	±	0.06	No	1.25	±	1.39	0.05	±	0.05	No
	06/01/21	-1.47	±	1.12	-0.05	±	0.04	No	0.47	±	1.38	0.02	±	0.05	No
CONTROL	04/06/21	2.09	±	1.84	0.08	±	0.07	No	0.58	±	1.33	0.02	±	0.05	No
	05/04/21	1.13	±	1.92	0.04	±	0.07	No	-0.35	±	1.42	-0.01	±	0.05	No
	06/01/21	0.32	±	1.72	0.01	±	0.06	No	-0.58	±	1.42	-0.02	±	0.05	No
DIETRICH	04/05/21	0.90	±	1.17	0.03	±	0.04	No	1.55	±	1.43	0.06	±	0.05	No
	05/03/21	-0.88	±	1.31	-0.03	±	0.05	No	1.90	±	1.08	0.07	±	0.04	No
	06/01/21	-0.67	±	1.75	-0.02	±	0.06	No	0.97	±	1.34	0.04	±	0.05	No
HOWE	04/06/21	2.24	±	1.27	0.08	±	0.05	No	-0.66	±	1.42	-0.02	±	0.05	No
	05/04/21	1.02	±	1.66	0.04	±	0.06	No	-0.34	±	1.42	-0.01	±	0.05	No
	06/01/21	-0.97	±	1.21	-0.04	±	0.04	No	0.15	±	1.02	0.01	±	0.04	No
Duplicate	06/01/21	-1.33	±	1.65	-0.05	±	0.06	No	-0.07	±	1.39	0.00	±	0.05	No
IDAHO FALLS	04/06/21	0.23	±	0.97	0.01	±	0.04	No	0.14	±	0.64	0.01	±	0.02	No
Duplicate	04/07/21	0.97	±	1.20	0.04	±	0.04	No	-1.06	±	1.45	-0.04	±	0.05	No
	04/13/21	-0.53	±	1.05	-0.02	±	0.04	No	0.57	±	1.41	0.02	±	0.05	No
	04/20/21	0.45	±	1.05	0.02	±	0.04	No	1.27	±	1.44	0.05	±	0.05	No
	04/27/21	-0.16	±	0.87	-0.01	±	0.03	No	-0.21	±	0.63	-0.01	±	0.02	No
	05/04/21	-2.17	±	1.18	-0.08	±	0.04	No	2.27	±	1.37	0.08	±	0.05	No
	05/11/21	0.22	±	1.58	0.01	±	0.06	No	-0.21	±	1.40	-0.01	±	0.05	No
	05/18/21	1.27	±	1.12	0.05	±	0.04	No	1.47	±	1.37	0.05	±	0.05	No
	05/25/21	-0.05	±	1.01	0.00	±	0.04	No	1.03	±	1.42	0.04	±	0.05	No
	06/01/21	-2.08	±	0.97	-0.08	±	0.04	No	-0.02	±	0.63	0.00	±	0.02	No
	06/08/21	3.04	±	1.68	0.11	±	0.06	No	-0.36	±	1.30	-0.01	±	0.05	No
	06/15/21	-1.73	±	1.13	-0.06	±	0.04	No	2.31	±	1.47	0.09	±	0.05	No
	06/22/21	-0.12	±	1.17	0.00	±	0.04	No	-1.55	±	1.07	-0.06	±	0.04	No
	06/30/21	0.45	±	0.96	0.02	±	0.04	No	1.14	±	1.52	0.04	±	0.06	No
MINIDOKA	04/05/21	-0.34	±	1.76	-0.01	±	0.07	No	-1.70	±	1.38	-0.06	±	0.05	No
	05/03/21	-0.55	±	1.78	-0.02	±	0.07	No	-1.41	±	1.34	-0.05	±	0.05	No
	06/01/21	1.95	±	1.19	0.07	±	0.04	No	-0.74	±	1.52	-0.03	±	0.06	No
MONTEVIEW	04/07/21	0.30	±	0.97	0.01	±	0.04	No	0.82	±	0.66	0.03	±	0.02	No
	05/04/21	-1.87	±	1.78	-0.07	±	0.07	No	1.43	±	1.41	0.05	±	0.05	No
	06/01/21	-0.46	±	1.07	-0.02	±	0.04	No	0.16	±	0.65	0.01	±	0.02	No
TERRETON	04/06/21	0.91	±	1.33	0.03	±	0.05	No	0.94	±	1.03	0.03	±	0.04	No
	04/14/21	-1.06	±	1.53	-0.04	±	0.06	No	0.83	±	1.35	0.03	±	0.05	No
	04/20/21	-0.46	±	1.63	-0.02	±	0.06	No	1.00	±	1.34	0.04	±	0.05	No
	04/28/21	-0.92	±	1.51	-0.03	±	0.06	No	0.79	±	1.43	0.03	±	0.05	No
	05/04/21	-0.18	±	1.30	-0.01	±	0.05	No	-0.40	±	1.02	-0.01	±	0.04	No
	05/12/21	-0.11	±	0.94	0.00	±	0.03	No	-0.09	±	1.33	0.00	±	0.05	No
	05/18/21	0.97	±	1.22	0.04	±	0.05	No	0.09	±	1.00	0.00	±	0.04	No
	05/26/21	-0.41	±	1.11	-0.02	±	0.04	No	0.76	±	1.07	0.03	±	0.04	No
	06/01/21	-0.02	±	0.95	0.00	±	0.04	No	1.54	±	0.70	0.06	±	0.03	No

Table C-7. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk.

		Iodine-131							Cesium-137						
Location	Sampling Date	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
	06/09/21	-0.15	±	0.92	-0.01	±	0.03	No	1.00	±	1.38	0.04	±	0.05	No
	06/15/21	-0.86	±	1.22	-0.03	±	0.05	No	-0.38	±	1.01	-0.01	±	0.04	No
	06/23/21	-0.54	±	1.51	-0.02	±	0.06	No	-1.24	±	1.43	-0.05	±	0.05	No
	06/29/21	1.34	±	1.66	0.05	±	0.06	No	0.38	±	1.41	0.01	±	0.05	No

Table C-8. Strontium-90 and Tritium Concentrations in Milk.

Location	Sampling Date	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
Strontium-90								
CONTROL	05/04/21	-0.63	±	0.08	-0.02	±	0.00	No
DIETRICH	05/03/21	-0.50	±	0.12	-0.02	±	0.00	No
HOWE	05/04/21	-0.06	±	0.06	0.00	±	0.00	No
IDAHO FALLS	05/04/21	0.78	±	0.11	0.03	±	0.00	**Yes**
MINIDOKA	05/03/21	0.14	±	0.05	0.01	±	0.00	No
MONTEVIEW	05/04/21	0.51	±	0.06	0.02	±	0.00	**Yes**
TERRETON	05/04/21	0.16	±	0.06	0.01	±	0.00	No
Tritium								
BLACKFOOT	05/02/21	62.60	±	31.80	2.32	±	1.18	No
CONTROL	05/04/21	8.21	±	23.20	0.30	±	0.86	No
DIETRICH	05/03/21	19.40	±	31.50	0.72	±	1.17	No
HOWE	05/04/21	17.60	±	31.50	0.65	±	1.17	No
IDAHO FALLS	05/04/21	43.90	±	32.70	1.63	±	1.21	No
MINIDOKA	05/03/21	5.79	±	31.40	0.21	±	1.16	No
MONTEVIEW	05/04/21	-29.20	±	23.40	-1.08	±	0.87	No
TERRETON	05/04/21	12.00	±	31.50	0.44	±	1.17	No

Table C-9. Gamma-emitting Radionuclides and Strontium-90 in Alfalfa.

Location	Sampling Date	Result ± 1s Uncertainty pCi/kg			Result ± 1s Uncertainty Bq/kg			Result > 3s
Cesium-137								
HOWE	06/10/21	16.90	±	71.70	0.63	±	2.66	No
IDAHO FALLS	06/10/21	-51.40	±	109.00	-1.90	±	4.04	No
MUD LAKE	06/10/21	-132.00	±	116.00	-4.89	±	4.30	No
MUD LAKE (duplicate)	06/10/21	51.20	±	71.50	1.90	±	2.65	No
Strontium-90								
HOWE	06/10/21	-4.16	±	14.80	-0.15	±	0.55	No
IDAHO FALLS	06/10/21	17.40	±	8.76	0.64	±	0.32	No
MUD LAKE	06/10/21	5.28	±	7.47	0.20	±	0.28	No

Table C-10. Gamma-emitting Radionuclides in Large Game Animals.

Species	Collection Date	Tissue	Analyte	Result ± 1s Uncertainty (pCi/kg wet weight)			Result ± 1s Uncertainty (x 10^{-2} Bq/kg wet weight)			Result > 3s
ELK	04/26/21	Liver	^{131}I	-0.65	±	2.15	-2.39	±	7.96	No
			^{137}Cs	-1.17	±	2.02	-4.33	±	7.47	No
ELK	04/26/21	Muscle	^{131}I	-0.70	±	1.26	-2.58	±	4.66	No
			^{137}Cs	1.67	±	1.07	6.18	±	3.96	No
ELK	04/26/21	Thyroid	^{131}I	-188.00	±	271.00	-695.60	±	1002.70	No
			^{137}Cs	67.90	±	171.00	251.23	±	632.70	No

Table C-11. Environmental Radiation Measurements Using OSLDs.

Location	Start Date	End Date	Radiation Measurement ± 1s Uncertainty mrem	Dose mrem/day
BOUNDARY				
ARCO	11/04/20	05/05/21	68.00 ± 3.40	0.37
ATOMIC CITY	11/04/20	05/05/21	70.50 ± 3.53	0.39
BIRCH CREEK	11/03/20	05/05/21	64.70 ± 3.24	0.35
BLUE DOME	11/04/20	05/05/21	64.05 ± 3.21	0.35
HOWE	11/04/20	05/05/21	66.50 ± 3.33	0.37
MONTEVIEW	11/04/20	05/05/21	68.05 ± 3.41	0.37
MUD LAKE	11/04/20	05/05/21	70.25 ± 3.51	0.39
Boundary Average			**67.44**	**0.37**
DISTANT				
ABERDEEN	11/02/20	05/03/21	70.45 ± 3.52	0.39
BLACKFOOT	11/04/20	05/05/21	60.30 ± 3.02	0.33
CRATERS	11/04/20	05/05/21	63.30 ± 3.17	0.35
DUBOIS	11/04/20	05/05/21	55.75 ± 2.79	0.31
IDAHO FALLS	11/04/20	05/05/21	67.80 ± 3.40	0.37
JACKSON	11/05/20	05/10/21	61.25 ± 3.06	0.33
MINIDOKA	11/02/20	05/03/21	64.05 ± 3.20	0.35
ROBERTS	11/03/20	05/04/21	71.65 ± 3.59	0.39
SUGAR CITY	11/04/20	05/05/21	78.65 ± 3.94	0.43
Distant Average			**65.91**	**0.36**

Table C-12. Environmental Radiation Measurements Using TLDs.

Location	Start Date	End Date	Radiation Measurement ± 1s Uncertainty mR	Exposure mR/day
BOUNDARY				
ARCO	11/04/20	05/05/21	63.70 ± 6.24	0.35
ATOMIC CITY	11/04/20	05/05/21	65.50 ± 6.42	0.36
BIRCH CREEK	11/03/20	05/05/21	55.80 ± 5.47	0.30
BLUE DOME	11/04/20	05/05/21	52.10 ± 5.11	0.29
HOWE	11/04/20	05/05/21	58.40 ± 5.73	0.32
MONTEVIEW	11/04/20	05/05/21	62.00 ± 6.08	0.34
MUD LAKE	11/04/20	05/05/21	66.10 ± 6.47	0.36
Boundary Average			**60.51**	**0.33**
DISTANT				
ABERDEEN	11/02/20	05/03/21	65.60 ± 6.43	0.36
BLACKFOOT	11/04/20	05/05/21	56.40 ± 5.53	0.31
CRATERS	11/04/20	05/05/21	59.70 ± 5.85	0.33
DUBOIS	11/04/20	05/05/21	51.70 ± 5.06	0.28
IDAHO FALLS	11/04/20	05/05/21	60.60 ± 5.94	0.33
JACKSON	11/05/20	05/10/21	55.50 ± 5.44	0.30
MINIDOKA	11/02/20	05/03/21	57.50 ± 5.64	0.32
ROBERTS	11/03/20	05/04/21	66.20 ± 6.49	0.36
SUGAR CITY	11/04/20	05/05/21	74.10 ± 7.26	0.41
Distant Average			**60.81**	**0.33**

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APPENDIX D

STATISTICAL ANALYSIS RESULTS

Table D-1. Results of the Kruskal-Wallace one-way analysis of variance by ranks between INL Site, Boundary, and Distant sample groups by quarter and by month.

Gross Alpha					
Quarter	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	91	8995.500	98.8516		
Distant	77	8758.000	113.7403	3.274784	0.1945
INL Site	39	3774.500	96.7821		
April	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	28	918.5000	32.80357		
Distant	24	777.0000	32.37500	0.0157985	0.9921
INL Site	12	384.5000	32.04167		
May	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	28	821.0000	29.32143		
Distant	24	883.0000	36.79167	2.138371	0.3433
INL Site	12	376.0000	31.33333		
June	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	35	1304.000	37.25714		
Distant	29	1351.500	46.60345	4.056329	0.1316
INL Site	15	504.500	33.63333		
Gross Beta					
Quarter	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	91	9022.500	99.1484		
Distant	77	8310.000	107.9221	1.066261	0.5868
INL Site	39	4195.500	107.5769		
April	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	28	926.0000	33.07143		
Distant	24	750.5000	31.27083	0.1748291	0.9163
INL Site	12	403.5000	33.62500		
May	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	28	823.5000	29.41071		
Distant	24	809.0000	33.70833	1.667071	0.4345
INL Site	12	447.5000	37.29167		
June	Valid N	Sum of Ranks	Mean Ranks	H[a]	P[b]
Boundary	35	1276.500	36.47143		
Distant	29	1256.500	43.32759	1.529804	0.4654
INL Site	15	627.000	41.80000		

a. Kruskal Wallis test statistic calculated using mean ranks. This test assumes H is approximately distributed as χ^2.

b. A p-value (probability value) greater than 0.05 signifies no statistical difference between data groups. Any values below 0.05 are indicated in red.

Table D-2. Results of multiple comparisons of gross alpha results between locations during the second quarter. A 'p' value greater than 0.05 signifies no statistical difference between data groups. Any values below 0.05 are indicated in red. R represents the average rank for each location.

Multiple Comparisons p values (2-tailed); Coded result ($x10^{-15}$) (2nd-QTR-21-LVf in 2nd-Qtr-21-LVf)
Independent (grouping) variable: GeographicName
Kruskal-Wallis test: H (17, N= 232) =24.84153 p =.0983
Include condition: v8='gross alpha'

Depend.: Coded result ($x10^{-15}$)	Arco R:128.65	Atomic City R:133.96	Blackfoot R:113.00	Blue Dome R:77.962	Craters of the Moon R:118.54	Dubois R:97.462	EFS R:113.46	FAA Tower R:103.58	Howe R:123.23	Idaho Falls R:169.15	Jackson WY R:165.19	Main Gate R:111.50	Monteview R:117.88	Mud Lake R:106.77	Sugar City R:112.00	Van Buren R:106.77
Arco		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Atomic City	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Blackfoot	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Blue Dome	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	0.081414	0.140937	1.000000	1.000000	1.000000	1.000000	1.000000
Craters of the Moon	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Dubois	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	0.988845	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
EFS	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
FAA Tower	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Howe	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Idaho Falls	1.000000	1.000000	1.000000	0.081414	1.000000	0.988845	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Jackson WY	1.000000	1.000000	1.000000	0.140937	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000
Main Gate	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000
Monteview	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000
Mud Lake	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000
Sugar City	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000
Van Buren	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	

Table D-3. Results of multiple comparisons of gross beta results between locations during the second quarter. A 'p' value greater than 0.05 signifies no statistical difference between data groups. Any values below 0.05 are indicated in red. R represents the average rank for each location.

Multiple Comparisons p values (2-tailed); Coded result ($x10^{-15}$) (2nd-QTR-21-LVf in 2nd-Qtr-21-LVf)
Independent (grouping) variable: GeographicName
Kruskal-Wallis test: H (17, N= 232) =35.76509 p =.0049
Include condition: v8='gross beta'

Depend.: Coded result ($x10^{-15}$)	Arco R:139.69	Atomic City R:145.50	Blackfoot R:130.77	Blue Dome R:108.23	Craters of the Moon R:164.29	Dubois R:86.500	EFS R:109.73	FAA Tower R:105.54	Howe R:105.04	Idaho Falls R:83.654	Jackson WY R:176.46	Main Gate R:137.58	Monteview R:80.923	Mud Lake R:100.73	Sugar City R:94.308	Van Buren R:118.73
Arco		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Atomic City	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Blackfoot	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Blue Dome	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Craters of the Moon	1.000000	1.000000	1.000000	1.000000		0.579553	1.000000	1.000000	1.000000	0.411399	1.000000	1.000000	0.293231	1.000000	1.000000	1.000000
Dubois	1.000000	1.000000	1.000000	1.000000	0.579553		1.000000	1.000000	1.000000	1.000000	0.096768	1.000000	1.000000	1.000000	1.000000	1.000000
EFS	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
FAA Tower	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Howe	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Idaho Falls	1.000000	1.000000	1.000000	1.000000	0.411399	1.000000	1.000000	1.000000	1.000000		0.064693	1.000000	1.000000	1.000000	1.000000	1.000000
Jackson WY	1.000000	1.000000	1.000000	1.000000	1.000000	0.096768	1.000000	1.000000	1.000000	0.064693		1.000000	0.043508	0.614801	0.276037	1.000000
Main Gate	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000
Monteview	1.000000	1.000000	1.000000	1.000000	0.293231	1.000000	1.000000	1.000000	1.000000	1.000000	0.043508	1.000000		1.000000	1.000000	1.000000
Mud Lake	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.614801	1.000000	1.000000		1.000000	1.000000
Sugar City	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.276037	1.000000	1.000000	1.000000		1.000000
Van Buren	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	