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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report: Fourth Quarter 2019

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Executive Summary

Some human-made radionuclides were detected in samples collected during the fourth quarter of 2019. None of the radionuclides detected in samples collected during the fourth quarter of 2019 could be directly linked with INL Site activities. 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 fourth quarter of 2019 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, October 1 through December 30, 2019. All sample types (media) and the sampling schedule followed during 2019 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
- Drinking and surface water
- Milk
- Potatoes
- Waterfowl
- OSLDs
- TLDs

Table ES-1. Summary of Results for the Fourth Quarter of 2019.

Media	Sample Type	Analysis	Results
Air	Particulate 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. One difference was noted in fourth quarter gross alpha results categorized by location, with Jackson, WY being statistically higher than Blue Dome. This is believed to be due to natural factors such as local geology and meteorology. No result exceeded the 99%/95% upper tolerance limit (UTL) or the 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-emitting radionuclides or ^{90}Sr, ^{241}Am, ^{238}Pu, and $^{239/240}$Pu were detected in any of the fourth quarter composite air samples.
	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	Five of nine results showed tritium concentrations greater than the 3s uncertainty during the quarter. The maximum reported value exceeded the UTL prompting further inspection of the result. The result is valid and within range of values for the past ten years. No sample result exceeded the DCS for tritium in air.
Precipitation	Liquid	Tritium	A total of twenty-two samples were collected during the fourth quarter. Seven of the tritium 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 activity was detected in three drinking water samples and one surface water sample. Gross beta activity was detected in seven of the nine

Media	Sample Type	Analysis	Results
			drinking water and all four surface water samples. All concentrations were generally similar from previous results. Tritium was detected in two drinking water but none of the surface water samples. Results were similar to previous results and those in precipitation.
Milk	Liquid	Iodine-131, other gamma-emitting radionuclides, strontium-90	Forty-three milk samples were collected at seven locations (including the offsite control sample from Colorado). No gamma emitting radionuclides of concern or tritium were detected. Strontium-90 was detected in one of the milk samples. The result is consistent with ^{90}Sr concentrations observed in previous years.
Potatoes	Vegetation	Gamma-emitting radionuclides, strontium-90	No human-made gamma-emitting radionuclides were found in any of the nine samples (including a duplicate) collected this year. Strontium-90 was not detected in any of the samples analyzed.
Waterfowl	Tissue	Gamma-emitting radionuclides, strontium-90, actinides (americium and plutonium)	Five human-made radionuclides were detected in some ducks at levels suggesting that they were ingested from ATR effluent ponds. The maximum dose from eating the edible tissue of a contaminated duck was estimated to be 0.004 mrem/year, lower than in the previous year.
Environmental Dosimeters	Environmental radiation	External radioactivity	Measurements of environmental radiation made using optically stimulated luminescent dosimeters (OSLDs) show similar measurements at Distant locations and Boundary locations. The average of all measurements is about 68 mrem for the quarter. The second quarter average of all TLD measurements is approximately 59 mR, whereas, the fourth quarter average is about 65 mR.

List of Abbreviations

AEC	Atomic Energy Commission
ATR	Advanced Test Reactor
BLR	Big Lost River
CFA	Central Facilities Area
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
ERAMS	Environmental Radiation Ambient Monitoring System
ESER	Environmental Surveillance, Education, and Research
FAA	Federal Aviation Administration
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 Reactors Facility
NRTS	National Reactor Testing Station
ORAU	Oak Ridge Associated Universities
OSLD	Optically Stimulated Luminescent Dosimeter
RWMC	Radioactive Waste Management Complex
VNSFS	Veolia Nuclear Solutions – Federal Services

List of Units

Bq	becquerel
Ci	curie
g	gram
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 2019, environmental monitoring within the INL Site boundaries was 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 fourth quarter of 2019 (October 1- December 31, 2019).

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 a number of 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
- moisture in air at four locations around the INL Site
- precipitation from four locations (at the same sites where air moisture is sampled) on and around the INL Site
- drinking water from eight locations and surface water from three locations around the INL Site and five locations along the Big Lost River on the INL Site
- agricultural products, including milk at six dairies around the INL Site, potatoes from seven local producers, alfalfa from three farms, grain (wheat and barley) from approximately 10 local producers, and lettuce from approximately nine 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 dead bats, road-killed 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 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.

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 percent 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 3.5). 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 percent. A result that is greater than three times the total uncertainty of the measurement represents a statistically positive detection with over 99 percent confidence (DOE 2015b, NBS 1961). 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 percent. 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 2009-2018) 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 VNSFS at (208) 525-8250, or visit the Program’s web page (http://www.idahoeser.com).

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 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 multi-program 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.

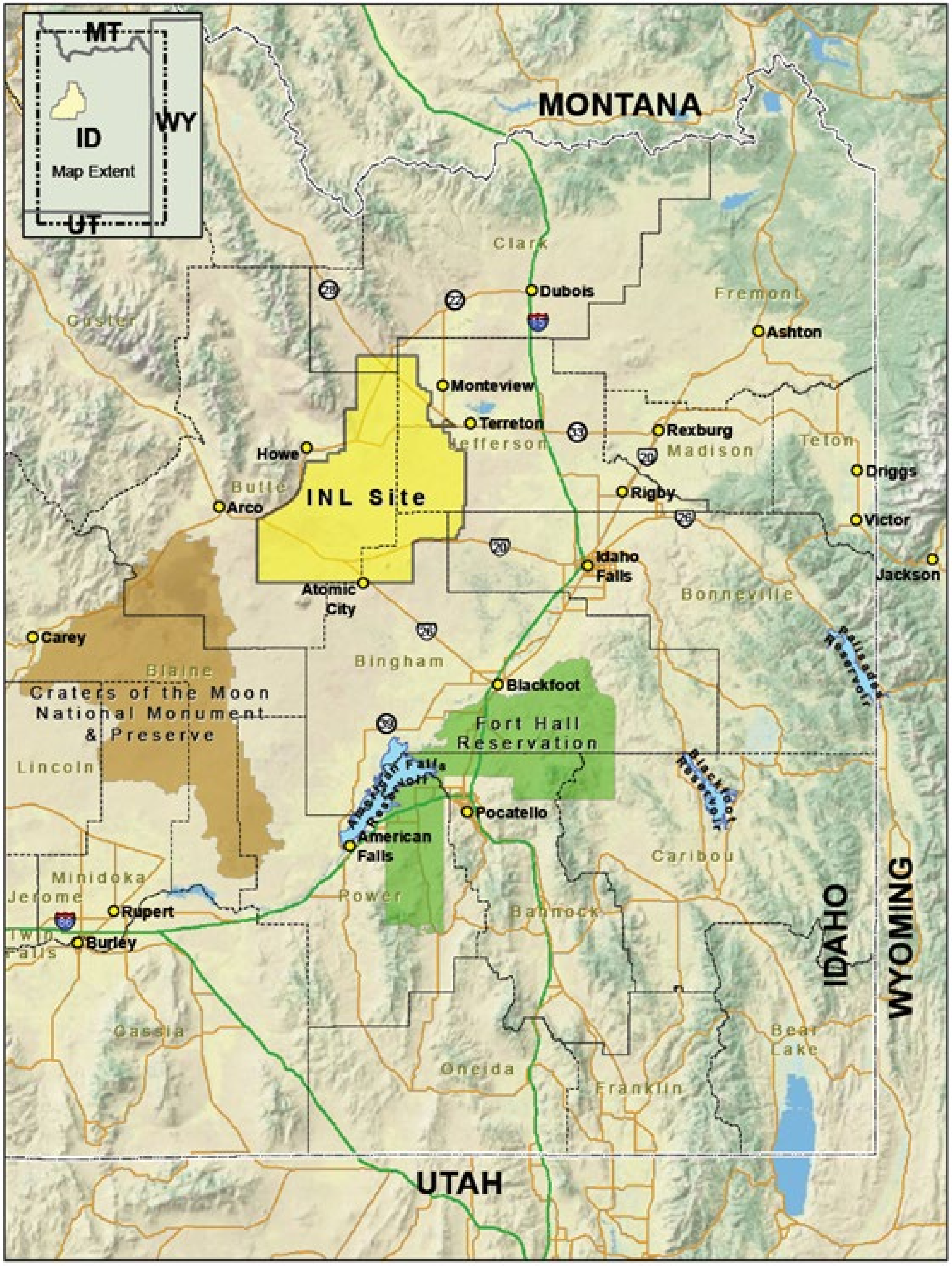

Figure 1. Location of the Idaho National Laboratory Site.

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 fourth quarter of 2019 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 fourth quarter of 2019 (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. At the start of 2018, one replicate sampler was moved to Blue Dome (a Boundary location) and one was moved to Atomic City (also a Boundary location). An average of 20,566 ft^3 (582 m^3) of air was sampled at each location, each week, at an average flow rate of 2.06 ft^3/min (0.06 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.

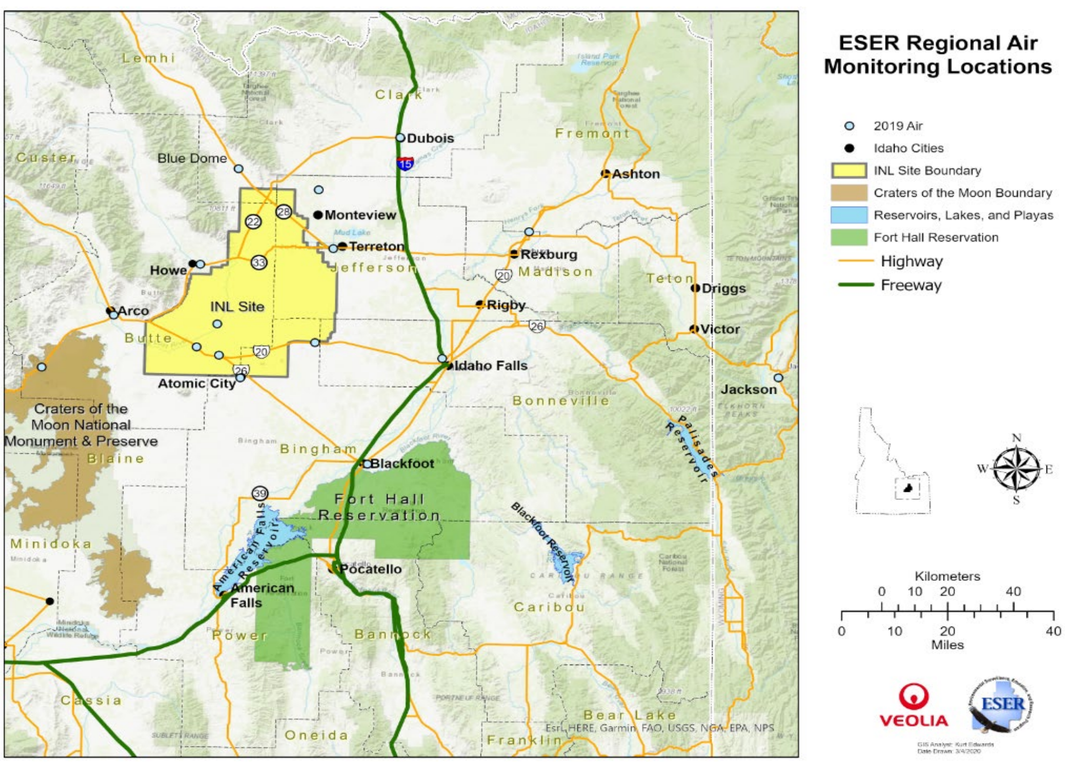

Figure 2. ESER air monitoring locations.

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. Atomic City and Craters of the Moon each had an invalid sample result due to a low total air volume (less than 7,000 ft^3). The sample collected at Atomic City on November 6, 2019 had a low total air volume due to a blown fuse, whereas, the sample for Craters of the Moon was not changed out due to lack of access resulting from weather conditions. Gross alpha concentrations measured in individual samples ranged from a low of $(3.5 \pm 1.8) \times 10^{-16}$ µCi/ml (undetected) collected at Blue Dome on December 18, 2019, to a high of $(3.1 \pm 0.33) \times 10^{-15}$ µCi/ml collected at Mud Lake on November 6, 2019. 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 (4×10^{-15} µCi/ml). The UTL was determined using ten years of historical data (measured from 2009 through 2018) 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 fourth 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 percent 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. Results measured at Jackson, WY differed statistically from those measured at Blue Dome during the fourth quarter (Table D-2). The highest mean rank was calculated for Jackson, WY and the lowest mean rank was calculated for Blue Dome. The difference may be visually observed in Figure D-1, where the Jackson, WY median and upper box values are higher than Blue Dome. The differences between locations may be due to variations in local meteorology, geology, or other natural factors.

Gross beta results are presented in Table C-1 and displayed in Figures 7 through 10. 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). The typical temporal fluctuations in gross beta concentrations in air were observed during the quarter as a result of an inversion. In addition, the results were consistent with historical data, as represented by the 99%/95% upper tolerance limit (UTL) for gross beta activity (6.4×10^{-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.

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. No differences were determined (Table D-3).

Iodine-131 was not detected in any of the 28 sets of charcoal cartridges measured during the fourth 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. Strontium-90, a beta-emitting radionuclide was not detected in any composite sample. Americium-241, Plutonium-238 and Plutonium 239/240 were not detected in any composite sample (Table C-3).

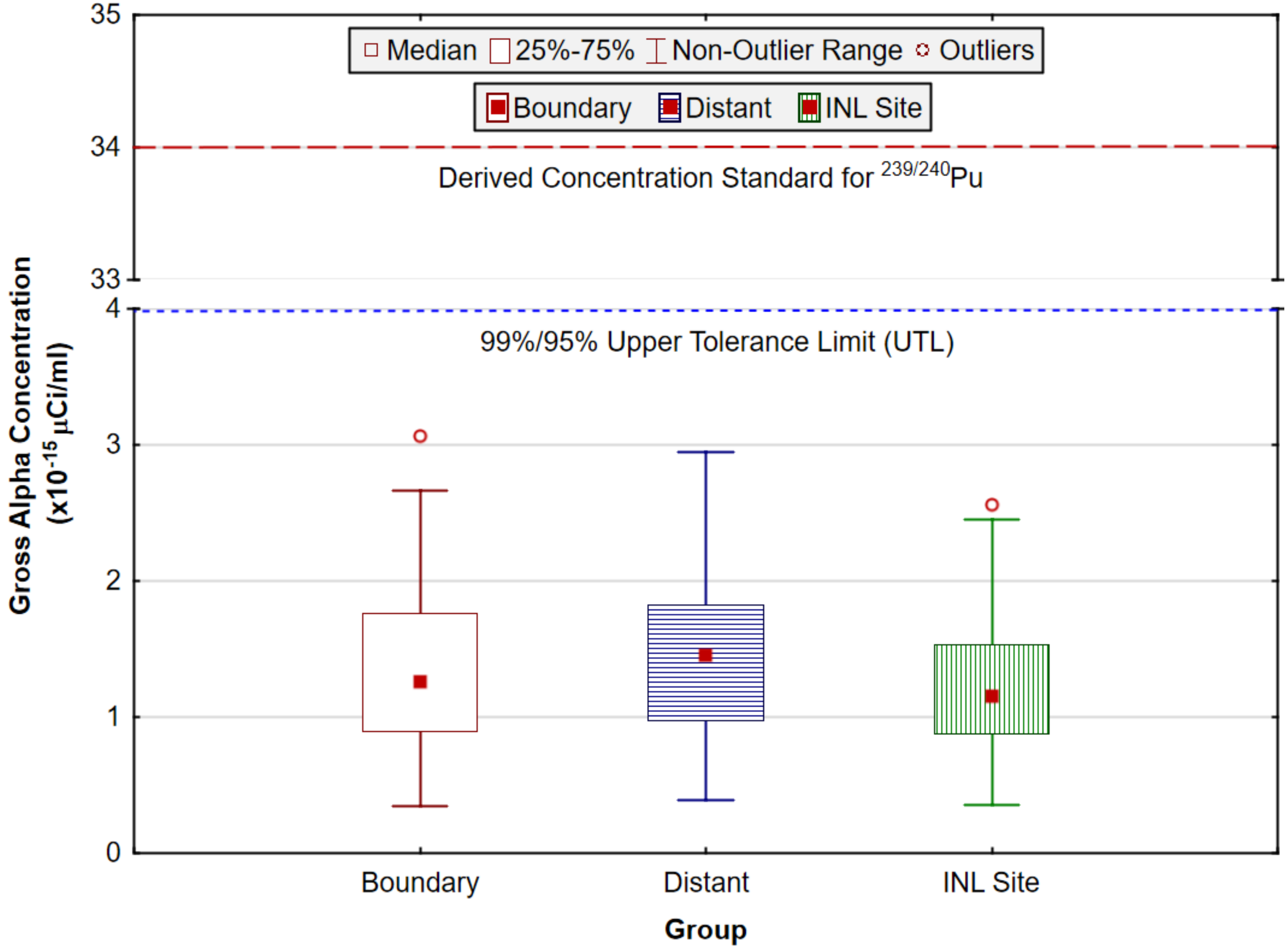

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the fourth quarter of 2019. The DOE Derived Concentration Standard (DCS) is the concentration of plutonium-239 ($^{239/240}Pu$) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. 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.

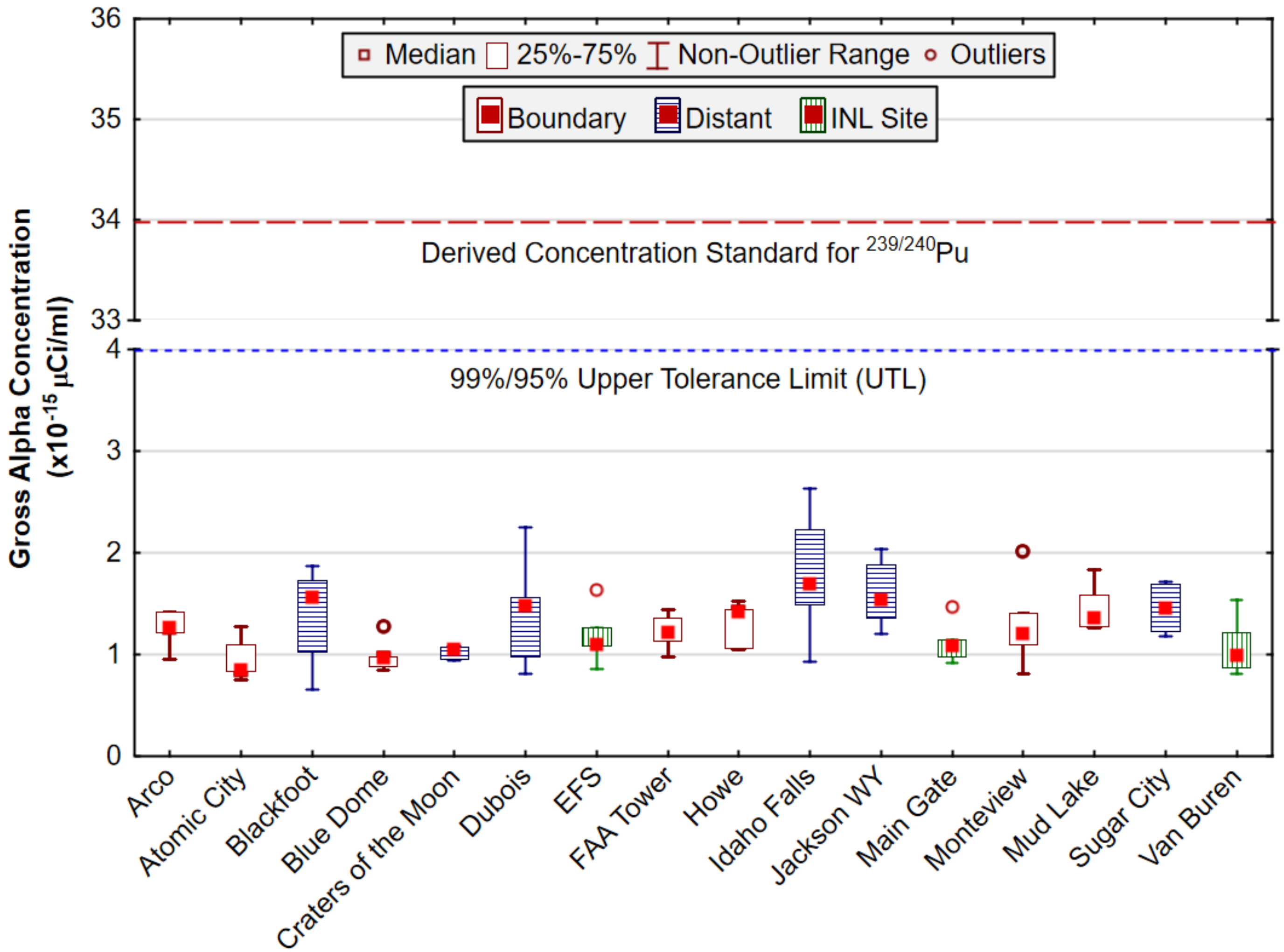

Figure 4. October gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}Pu$) in air which, if inhaled for a year, would result in a 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.

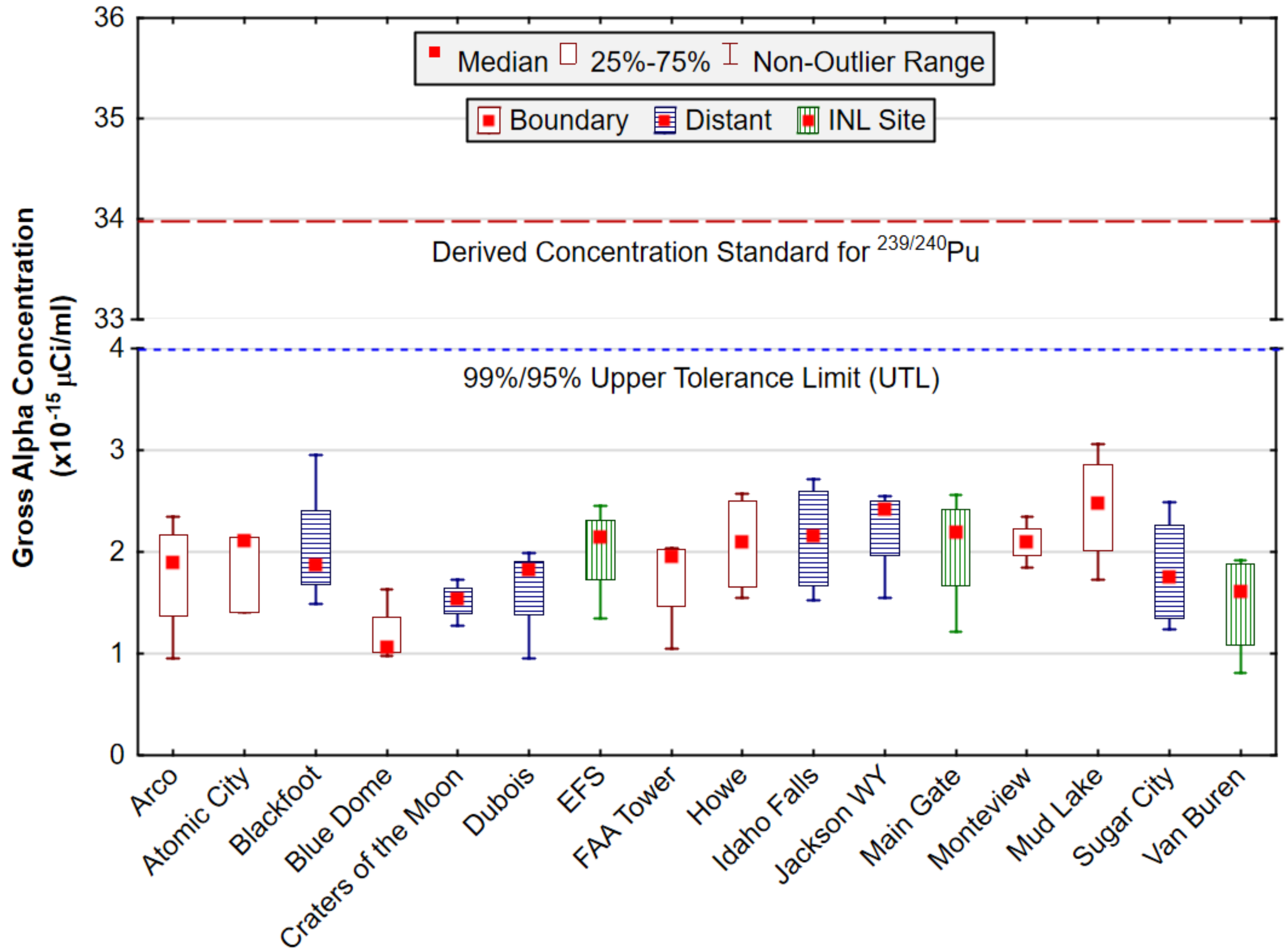

Figure 5. November gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location except Atomic City (N = 3). The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}Pu$) in air which, if inhaled for 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.

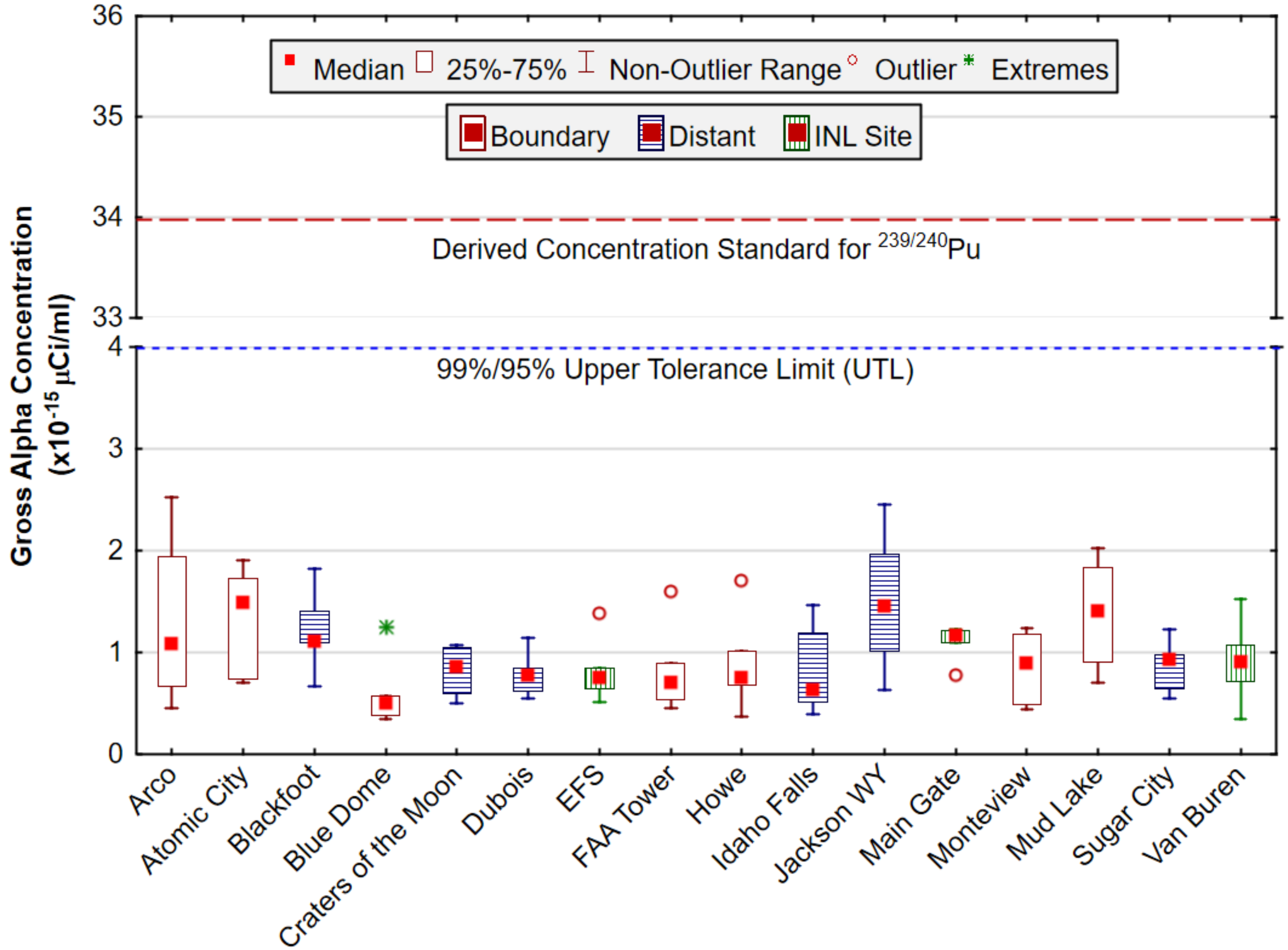

Figure 6. December gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location except for Craters of the Moon (N=4). The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}Pu$) in air which, if 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.

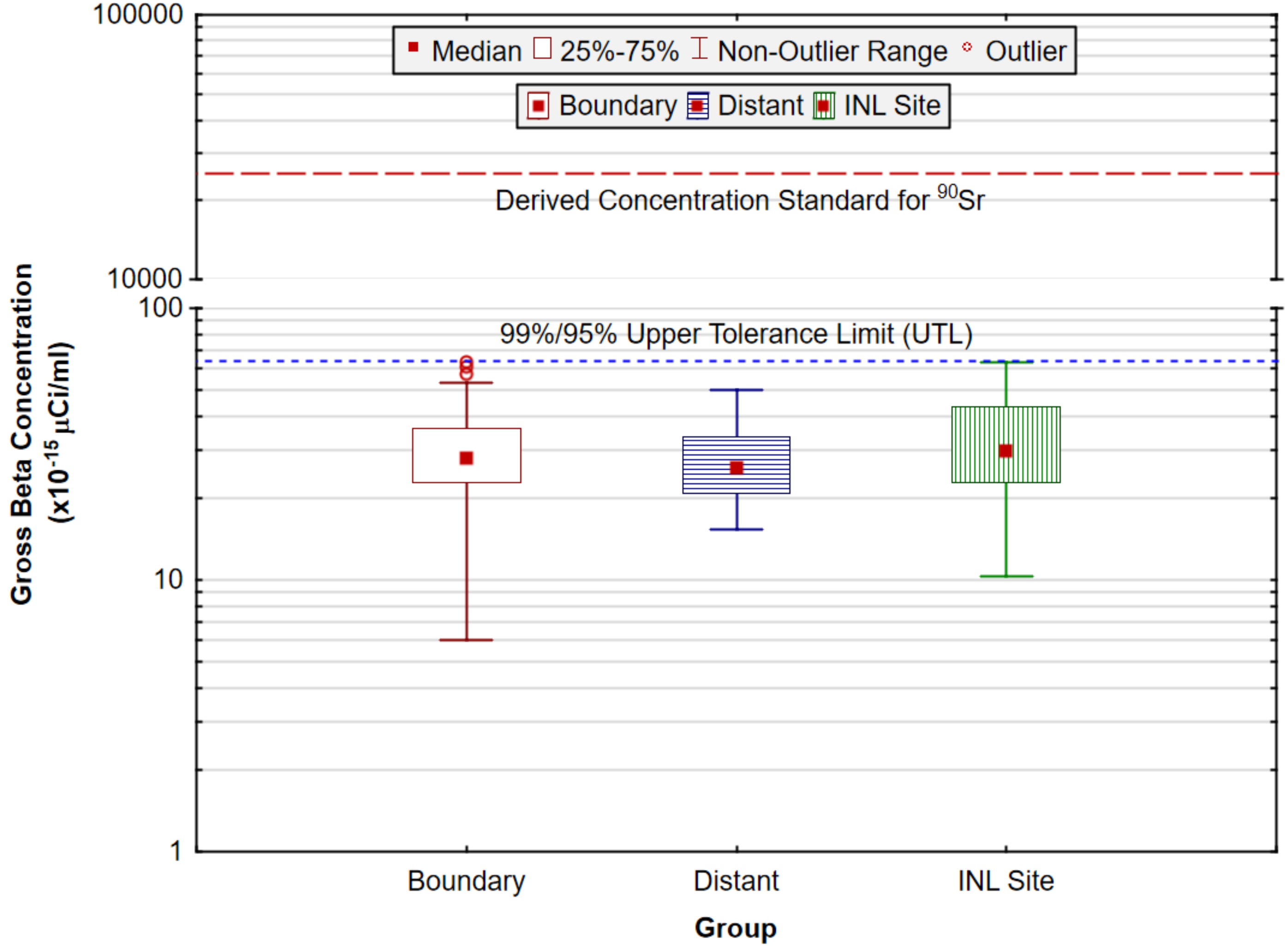

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the fourth quarter of 2019. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the 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.

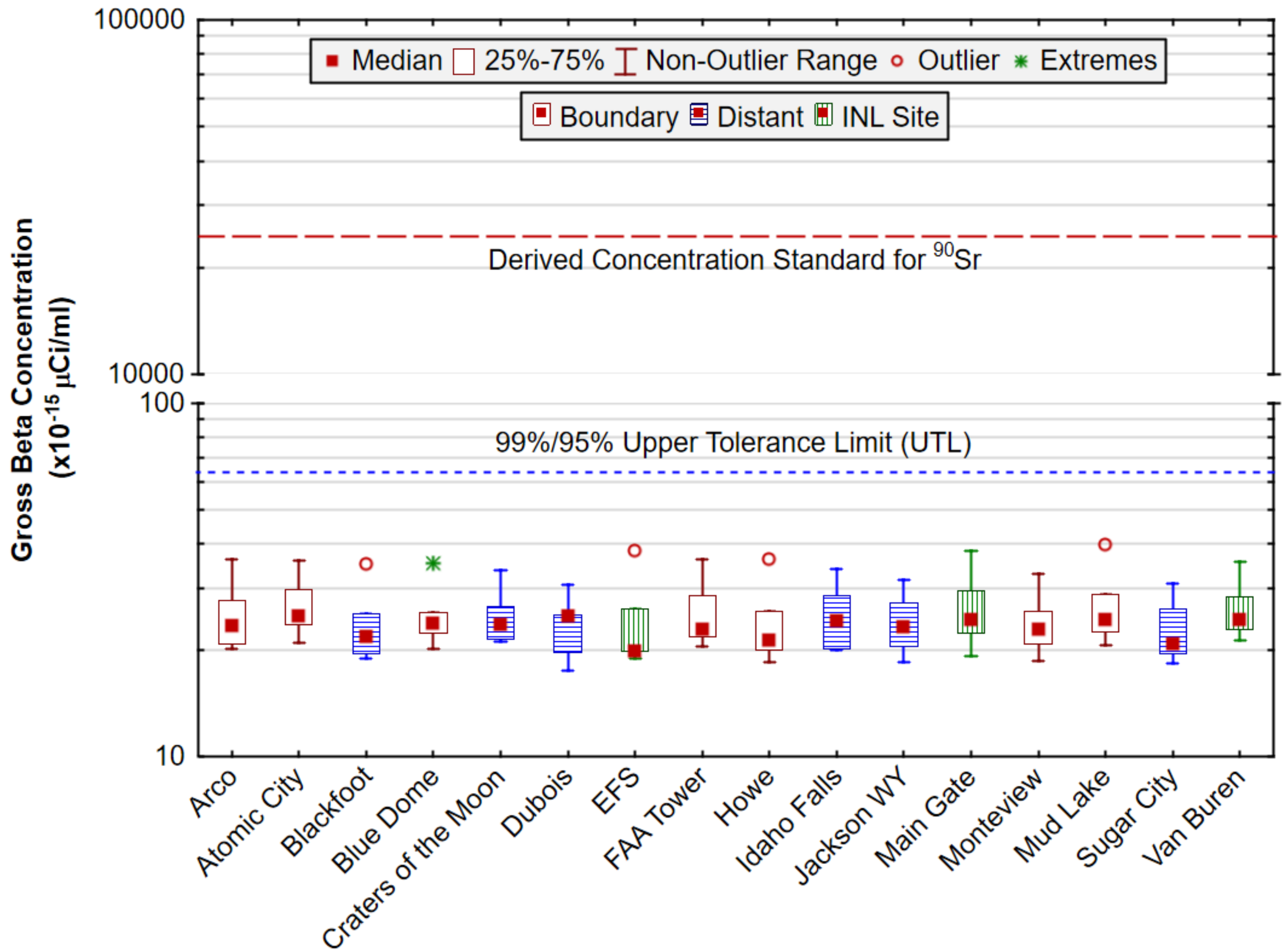

Figure 8. October gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally 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.

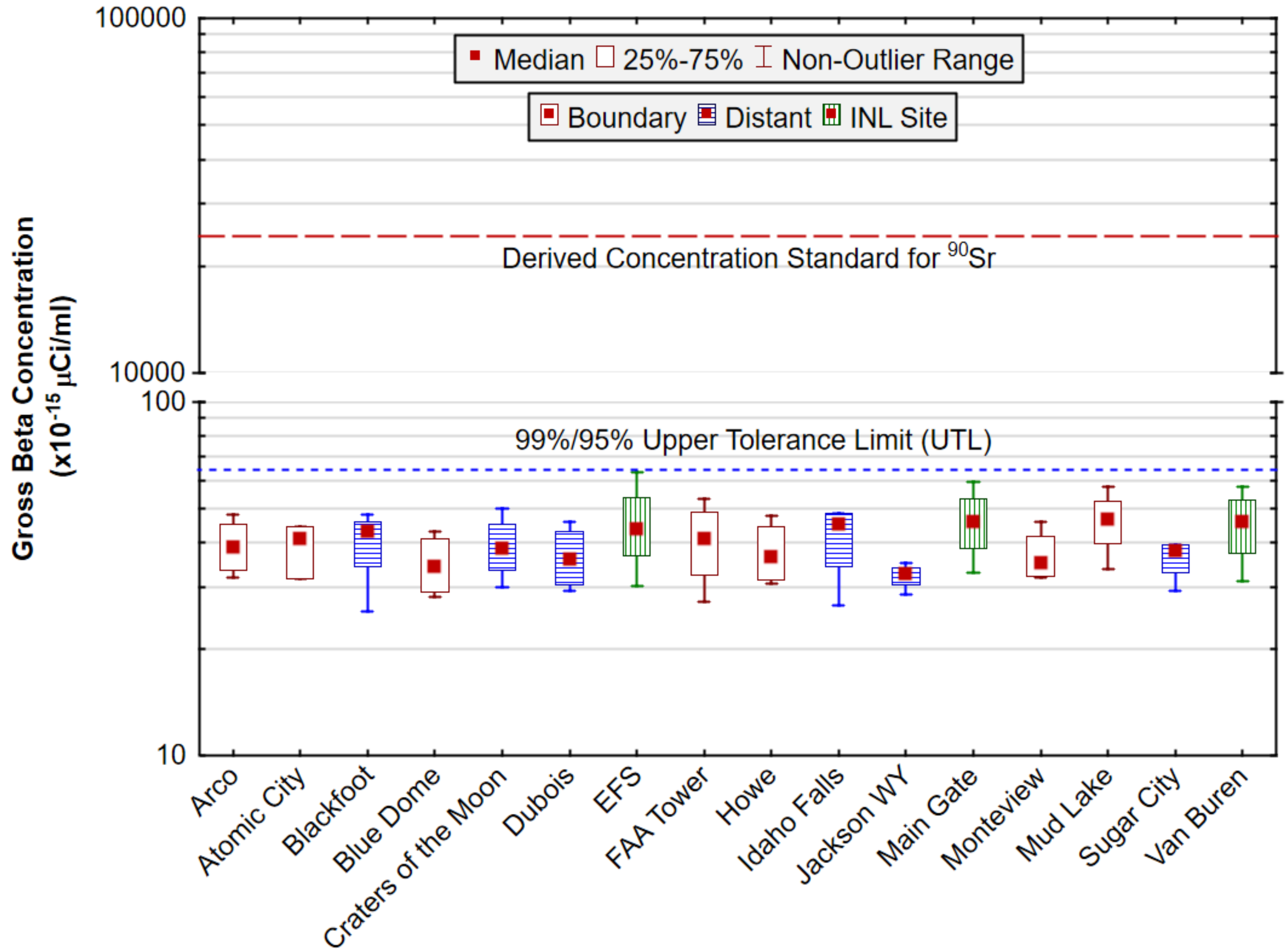

Figure 9. November gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally 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.

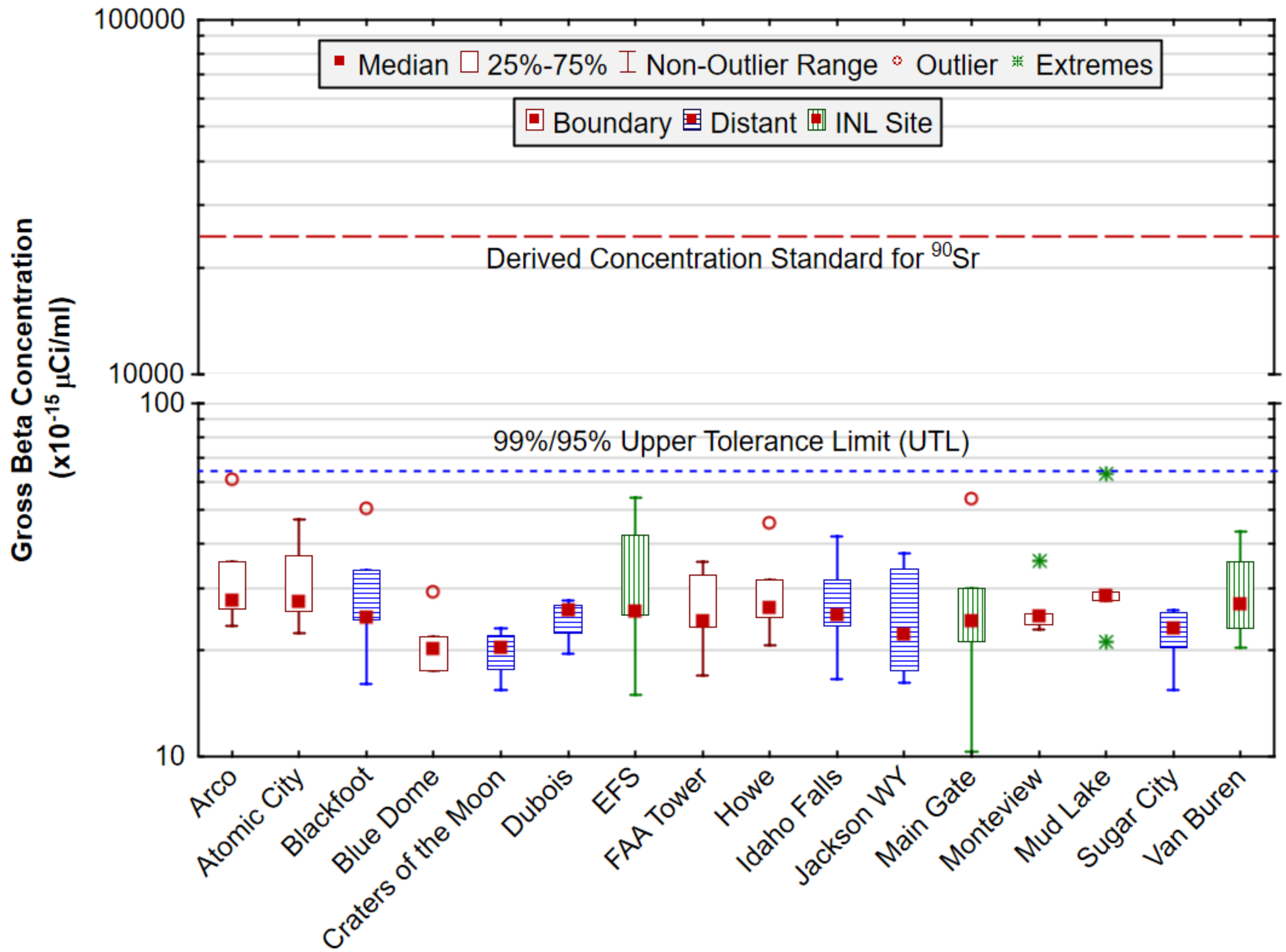

Figure 10. December gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include 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.

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 nine atmospheric moisture samples collected at the INL Site, Boundary, and Distant locations during the fourth quarter of 2019 (Figure 11). Five of the results exceeded the 3s uncertainty level for tritium, with a maximum reported value of $(8.2 \pm 1.6) \times 10^{-13}$ $\mu Ci/mL_{air}$ at EFS. The maximum result exceeded the 99%/95% UTL of 7.0×10^{-13} $\mu Ci/mL_{air}$ prompting a close inspection of the result. The result is valid and is within the range of values observed for the past ten years and thus appears to be consistent with ambient concentrations. Results also remain similar between the four sampling locations. 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, Appendix C.

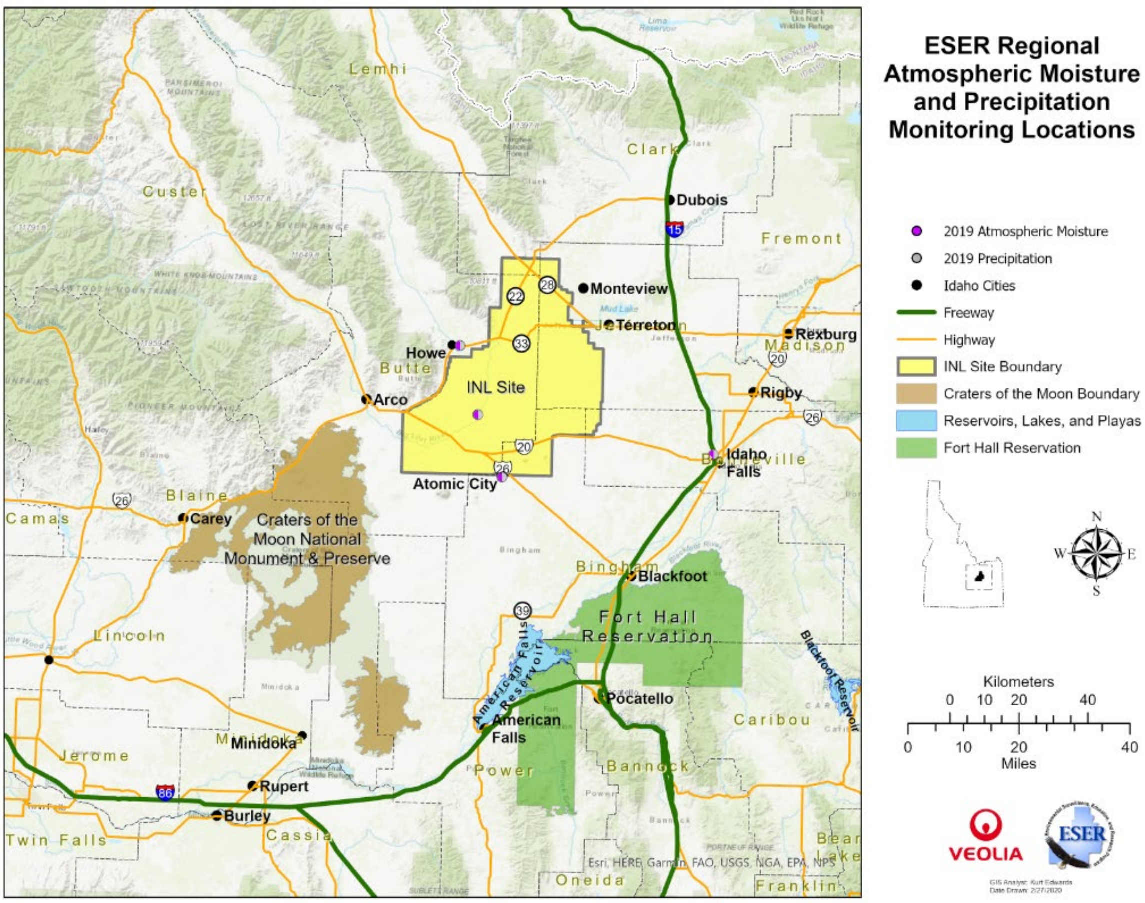

Figure 11. Moisture and precipitation monitoring locations.

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 (Figure 11). These are the same locations where atmospheric moisture samples are collected. Precipitation samples are analyzed for tritium. Storm events in the fourth quarter of 2019 produced sufficient amounts of precipitation to yield twenty-two samples.

Tritium was measured above the 3s values in seven of the twenty-two samples. These results are listed in Table C-5 (Appendix C). Low levels of tritium exist in the environment at all times 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 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 weapons testing. When detected, tritium values have remained well within the historical range and the range measured across the country by the EPA Radnet program and INL Oversight Program. The EPA Radnet database lists tritium results for precipitation collected in Idaho. The last sample for which results are available was collected on December 15, 2011. A search of the RadNet database (https://enviro.epa.gov/enviro/erams_query_v2.simple_query) for tritium in precipitation collected in Idaho from 2007 through 2011 shows a range of -84 to 123 pCi/L. The INL Oversight Program presents tritium precipitation results for 2016 through 2019 (http://www.deq.idaho.gov/inl-oversight/monitoring/reports/) and the results range from -100 to 140 pCi/L. The maximum value in the fourth quarter was (103 ± 26) pCi/L in an Atomic City sample collected on December 11th. The result was below the 99%/95% UTL of 322 pCi/L.

Water Sampling

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

Gross alpha activity was detected in three of the nine drinking water samples (Craters of the Moon, Minidoka and Shoshone samples) and in one of the four surface water samples (Bill Jones, Jr. Trout Farm). The highest reported gross alpha value was (1.9 ± 0.41) pCi/L in the drinking water sample from Shoshone. Gross beta activity was detected in seven of the nine drinking water samples (all except the control and Howe), and in all four 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 (6.4 ± 0.52) 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 two of the nine drinking water samples and none of the surface water samples. The concentrations were similar to those found in atmospheric moisture and precipitation samples and were consistent with previous results. The maximum value was

(101 ± 27) pCi/L in drinking water at Rest Area. The results are well below the DCS of 1.9 x 10^6 pCi/L for tritium in drinking water.

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 fourth quarter, while potatoes are collected during the third or 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, potato, and wildlife samples available during the fourth quarter of 2019.

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 12) during the fourth quarter of 2019. 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 ^{131}I. Semi-annual samples were collected and analyzed for ^{90}Sr and tritium during the fourth quarter.

Neither ^{131}I nor ^{137}Cs was detected in any weekly or monthly samples during the fourth 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 at 0.27 pCi/L in a sample collected at Terreton. The result is consistent with ^{90}Sr concentrations observed in previous years. There is no DCS for ^{90}Sr in milk; however, for comparison the result was well below the drinking water DCS of 1.1 x 10^3 pCi/L.

Tritium was not detected in any of the samples analyzed this quarter.

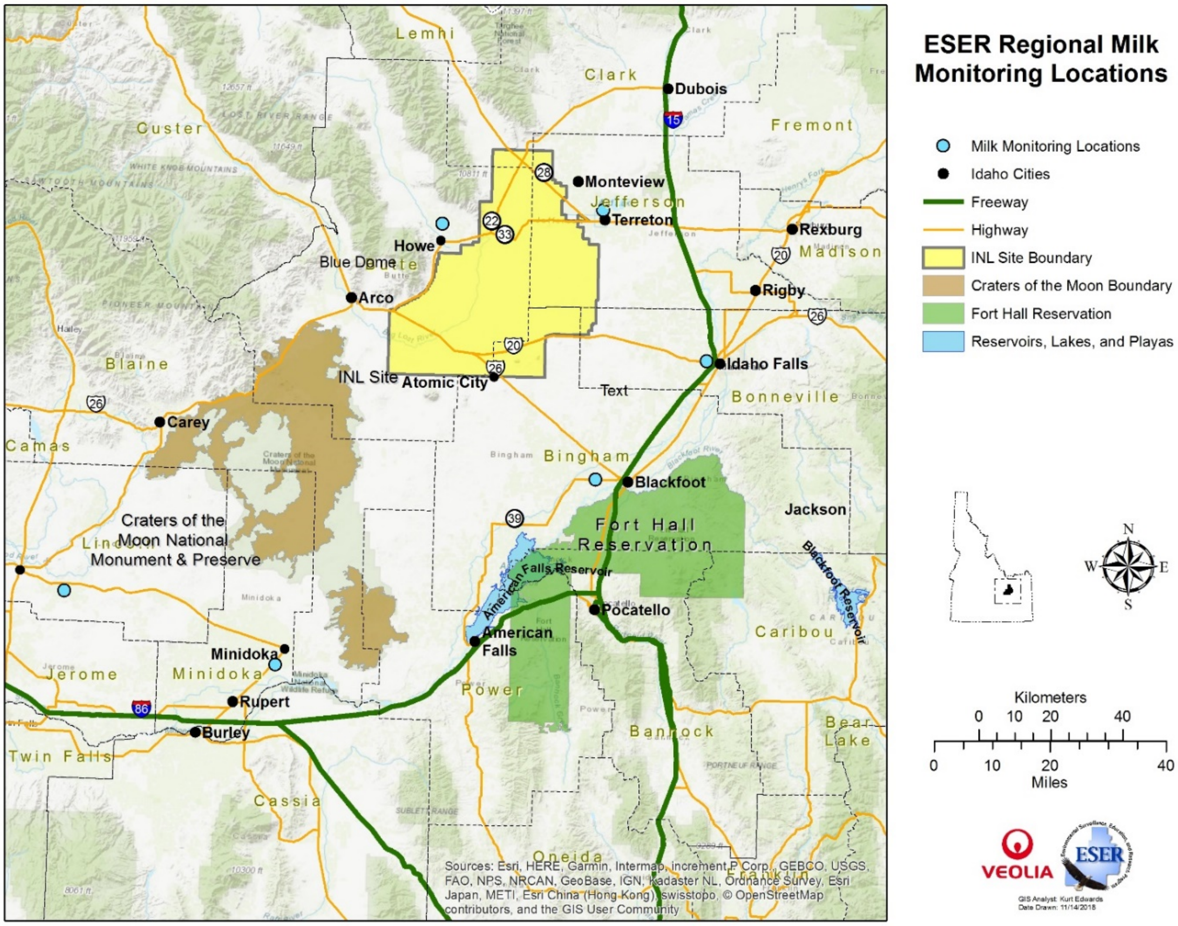

Figure 12. ESER milk monitoring locations.

Potato Sampling

Locally-grown potatoes from seven southeast Idaho locations (Figure 13) and one duplicate from Rexburg were analyzed for gamma-emitting radionuclides like ^{137}Cs and for ^{90}Sr. A control sample from a local grocery store (grown in Washington state) was also analyzed. No human-made gamma-emitters were found in any sample. Strontium-90 was not reported in any sample. Data for potato samples are listed in Appendix C, Table C-9.

Large Game Animal Sampling

No big game animals killed by vehicular collisions were available for sampling during the fourth quarter of 2019.

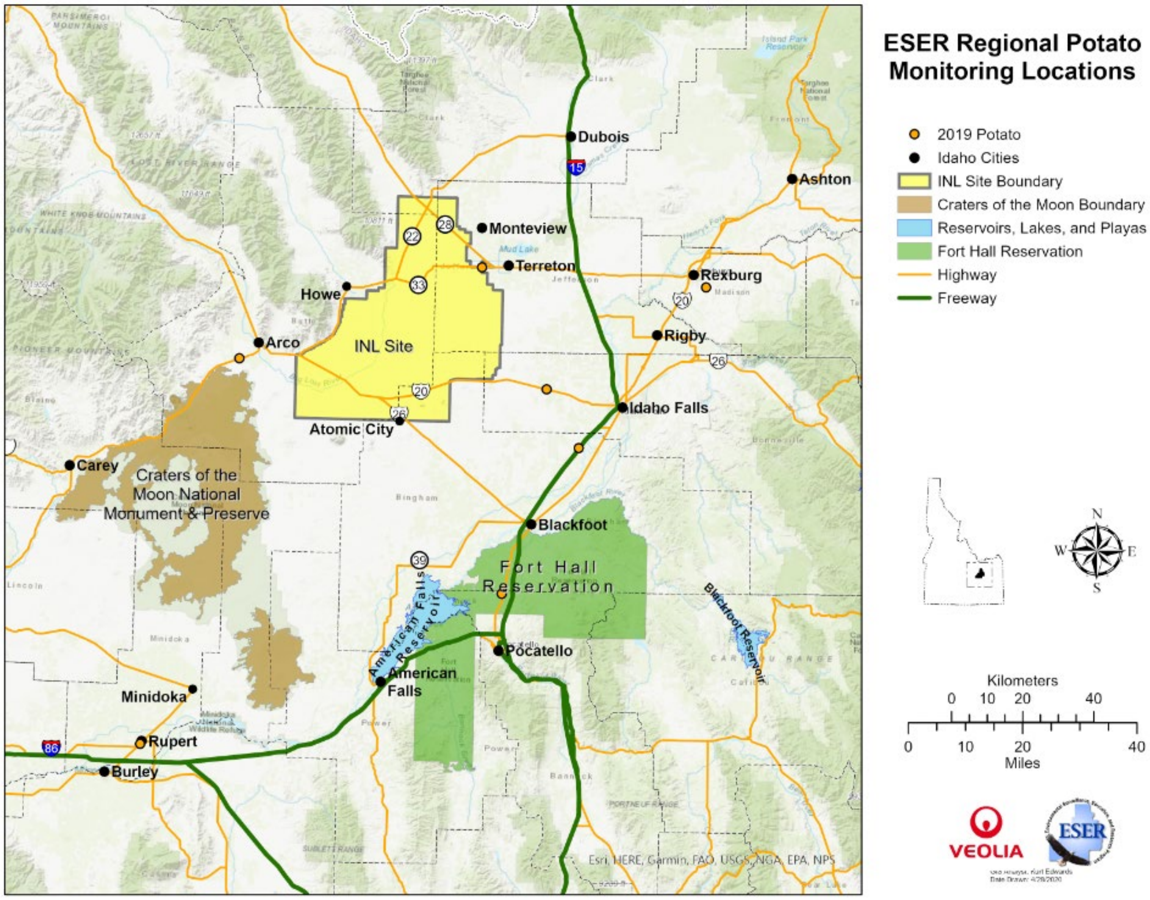

Figure 13. ESER potato monitoring locations.

Waterfowl

Waterfowl are collected each year by the ESER contractor at a wastewater pond on the INL Site and at a location off the INL Site. Four waterfowl were collected from a pond located at the Advanced Test Reactor (ATR) Complex. Two control waterfowl were collected from Menan and Roberts. Each sample was divided into the following three sub-samples: 1) edible tissue (muscle, gizzard, heart, and liver), 2) external portion (feathers, feet, and head), and 3) all remaining tissue. All samples were analyzed for gamma-emitting radionuclides, ^{90}Sr, and actinides (americium-241 [^{241}Am], plutonium-238 [^{238}Pu], and plutonium-239/240 [$^{239/240}$Pu]). These radionuclides were selected because they have historically been measured in liquid effluents from some INL Site facilities.

A total of five human-made radionuclides were detected in edible, exterior, and remainder sub-samples from ducks collected at the ATR Complex ponds (Table 1). These were cobalt-60 (^{60}Co), zinc-65 (^{65}Zn), ^{90}Sr, ^{238}Pu, and ^{137}Cs. Of these five nuclides, all but ^{238}Pu were found in the edible tissues (Appendix C, Table C-10). Two radionuclides (^{241}Am and ^{90}Sr) were detected in the control ducks.

The maximum potential dose from eating 225 g (8 oz) of duck meat collected in 2019 was calculated. Doses from consuming waterfowl are conservatively based on the assumption that ducks are eaten immediately after leaving the pond and no radioactive decay occurs. The maximum potential dose of 0.004 mrem from these waterfowl samples is much lower than the doses estimated for 2018 (0.016 mrem). The Hypalon™ liner was replaced in the west disposal pond in 2016 and associated debris was removed with the liner and is no longer available to waterfowl.

Table 1. Radionuclide Concentrations Detected in Waterfowl Collected in 2019.

Radionuclides Detected in Waterfowl Tissue (pCi/kg dry weight)				
Location	**Species**	**Portion**	**Radionuclide**	**Concentration**
ATR Complex Ponds	Ruddy Duck	Edible	^{60}Co	82 ± 6
			^{65}Zn	51 ± 11
			^{137}Cs	41 ± 8
		Exterior	^{60}Co	23 ± 4
			^{65}Zn	82± 14
			^{137}Cs	12 ± 4
			^{90}Sr	23 ± 4
		Remainder	^{60}Co	81 ± 4
			^{65}Zn	83 ± 9
			^{137}Cs	126 ± 9
			^{238}Pu	14 ± 3
			^{90}Sr	20 ± 4
	Green-winged Teal	Edible	^{60}Co	300 ± 11
			^{65}Zn	276 ± 27
			^{137}Cs	171 ± 17
			^{90}Sr	28 ± 4
		Exterior	^{60}Co	133 ± 12
			^{65}Zn	205 ± 52
			^{137}Cs	78 ± 11
			^{90}Sr	358 ± 10
		Remainder	^{60}Co	285 ± 9
			^{65}Zn	299 ± 27
			^{137}Cs	145 ± 14
			^{90}Sr	123 ± 7
	Northern Shoveler	Edible	^{60}Co	10 ± 3
			^{137}Cs	47 ± 8
		Exterior	^{137}Cs	14 ± 4
			^{90}Sr	19 ± 4
		Remainder	^{60}Co	30 ± 3
			^{65}Zn	26 ± 5
			^{137}Cs	33 ± 4
Control (Roberts)	Northern Pintail	Edible	^{241}Am	5 ± 1
		Exterior	^{90}Sr	26 ± 4
		Remainder	^{90}Sr	10 ± 3
Control (Menan)	Mallard	Edible	^{241}Am	6 ± 2

6. Environmental Radiation

An array of optically stimulated luminescent dosimeters (OSLDs) and thermoluminescent dosimeter (TLD) is distributed throughout the Eastern Snake River Plain to monitor for environmental radiation. Beginning in November 2011, two OSLDs were placed in the same locations (Figure 13) 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 fourth quarter are displayed in Appendix C, Table C-11. Results are presented in dose units of millirem (mrem). Similar to the low-volume air results the environmental dosimeter locations are also divided into Boundary and Distant groupings. The Boundary OSLD values ranged from 60.15 mrem at Blue Dome to 71.75 mrem at Atomic City, with an overall average of 66.35 mrem. This equates to an average dose of 0.37 mrem per day. Distant results varied from 60.85 mrem at Dubois to 82.5 mrem at Sugar City. The Distant average was 69.07 mrem, which also equates to 0.38 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 and fourth quarter are presented in Appendix C, Tables C-12 and C-13 respectively. The results for TLDs are provided in exposure units of milliroentgen (mR). The TLD results from second quarter were still being evaluated at the time the quarterly report was being published. This was the result of ISU reviewing a quality assurance measurement performed to verify the calibration of the internal strontium-90 source for the TLD reader. The review concluded that the measured ^{90}Sr source rate met the criteria of being within ±5% of the current calibration source rate displayed by the TLD reader. The second quarter Boundary group, six-month exposures ranged from 50.6 milliRotengens (mR) at Blue Dome to 64.0 mR at Mud Lake. The overall Boundary exposure was 58.8 mR with an average dose of 0.32 mrem per day. Distant exposures for second quarter ranged from 50.7 mR at Dubois to 72.8 mR for the TLD at Sugar City. The average Distant exposure was 59.4 mR with an average dose of 0.32 mrem per day. The fourth quarter Boundary values ranged from 54.2 mrem at Blue Dome to 70.2 mrem at Atomic City, with an overall average of 63.1 mrem. This results in an average daily dose of 0.35 mrem per day. The Distant results for fourth quarter ranged from 57.5 mrem at Blackfoot to 83.2 mrem at Sugar City. The overall Distant exposure was 68.9 mrem with an average dose of 0.36 mrem per day.

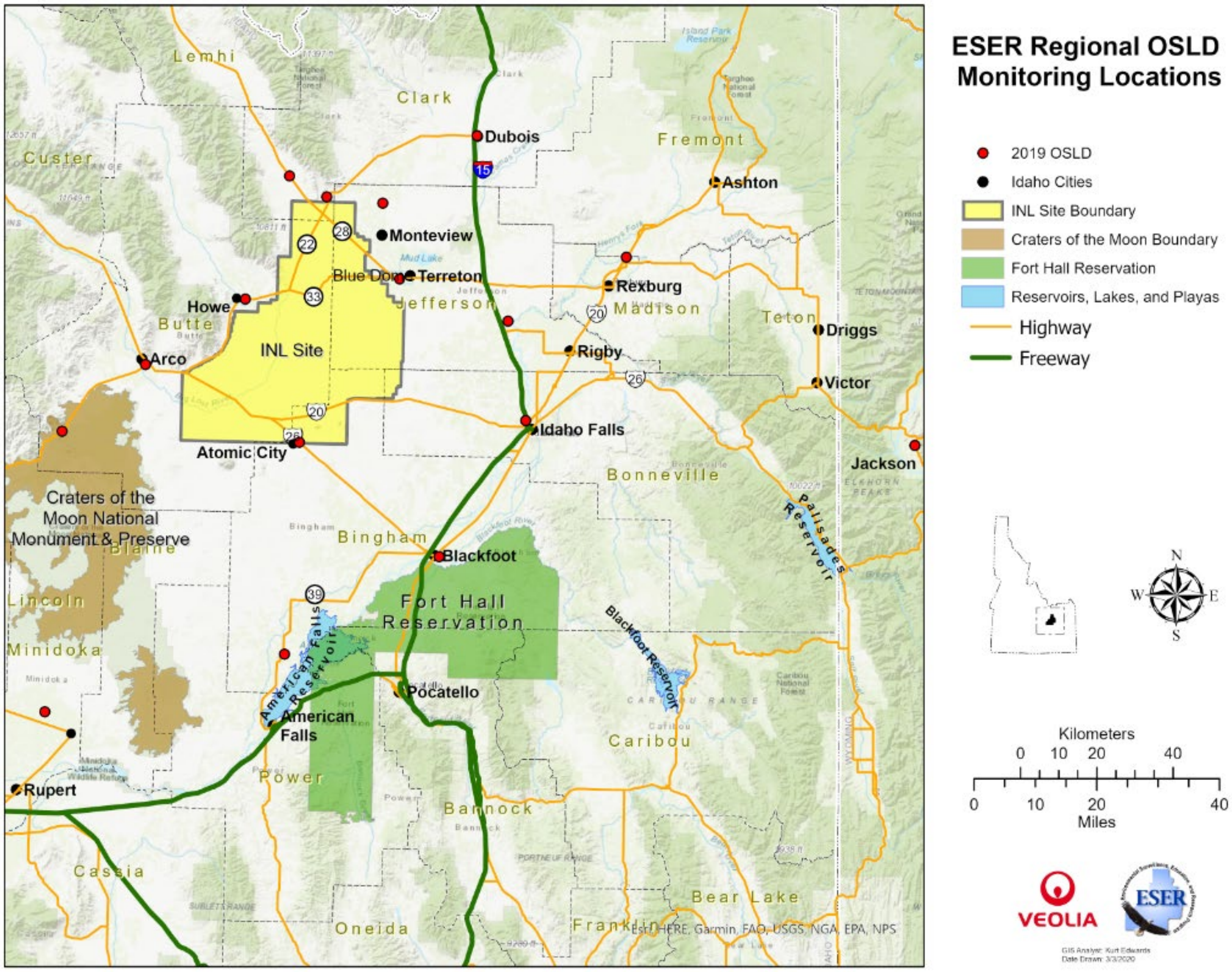

Figure 13. ESER optically stimulated luminescent dosimeter (OSLD) locations.

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 2018). 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 for the Fourth Quarter of 2019 (VNSFS 2019).

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VNSFS, 2019, Environmental Quality Assurance Report for the 3rd Quarter 2019, Environmental Surveillance, Education, and Research Program.

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 (2), 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
FOODSTUFF 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

APPENDIX B

SUMMARY OF MDCs AND DCSs

Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses Performed during Fourth Quarter 2019

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha	7.4×10^{-16} µCi/mL	3.4×10^{-14} µCi/ml[c]
	Gross beta	1.5×10^{-15} µCi/mL	2.5×10^{-11} µCi/ml[d]
	^{137}Cs	7.4×10^{-17} µCi/mL	9.8×10^{-11} µCi/ml
	^{90}Sr	2.7×10^{-17} µCi/mL	2.5×10^{-11} µCi/ml
	^{241}Am	2.9×10^{-18} µCi/mL	4.1×10^{-14} µCi/ml
	^{238}Pu	2.1×10^{-18} µCi/mL	3.7×10^{-14} µCi/ml
	$^{239/240}Pu$	2.4×10^{-18} µCi/mL	3.4×10^{-14} µCi/ml
Air (charcoal cartridge)[e]	^{131}I	3.3×10^{-16} µCi/mL	4.1×10^{-10} µCi/ml
Air (atmospheric moisture)	^{3}H	92.1 pCi/L_{water} 4.4×10^{-13} $µCi/mL_{air}$	1.9×10^{6} pCi/L_{water} 2.1×10^{-7} $µCi/ml_{air}$
Air (precipitation)	^{3}H	93.4 pCi/L	1.9×10^{-6} pCi/L
Milk	^{131}I	0.5 pCi/L	1,300 pCi/L[f]
	^{137}Cs	0.9 pCi/L	3,000 pCi/L[f]
	^{90}Sr	0.2 pCi/L	1,100 pCi/L[f]
	^{3}H	92.2 pCi/L	1.9×10^{6} pCi/L[f]
Drinking Water/Surface Water	Gross alpha	1.0 pCi/L	140 pCi/L[c]
	Gross beta	1.3 pCi/L	1,100 pCi/L[d]
	^{3}H	94.7 pCi/L	1.9×10^{6} pCi/L
Waterfowl	^{137}Cs	4.2 pCi/kg	--[g]
	^{90}Sr	9.2 pCi/kg	--
	^{241}Am	6.6 pCi/kg	--
	^{238}Pu	8.5 pCi/kg	--
	$^{239/240}Pu$	9.3 pCi/kg	--

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)

a. The MDC is an estimate of the concentration of radioactivity in a given sample type that can be identified with a 95 percent 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 for air is based on an average filtered air volume (pressure corrected) of 445 m^3/week. The MDCs for lettuce, potatoes, grain and soil are per dry weight.
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

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 (x 10^{-15} µCi/mL)**			**Result ± 1s Uncertainty (x 10^{-11} Bq/mL)**			**Result > 3s**	**Result ± 1s Uncertainty (x 10^{-15} µCi/mL)**			**Result ± 1s Uncertainty (x 10^{-11} Bq/mL)**			**Result > 3s**
BOUNDARY															
ARCO	10/2/2019	1.42	±	0.25	5.25	±	0.93	Yes	20.80	±	0.65	76.96	±	2.41	Yes
	10/9/2019	1.42	±	0.25	5.25	±	0.93	Yes	27.60	±	0.71	102.12	±	2.64	Yes
	10/16/2019	1.21	±	0.24	4.48	±	0.88	Yes	36.00	±	0.76	133.20	±	2.82	Yes
	10/23/2019	1.26	±	0.22	4.66	±	0.80	Yes	20.20	±	0.59	74.74	±	2.16	Yes
	10/30/2019	0.95	±	0.23	3.52	±	0.84	Yes	23.40	±	0.64	86.58	±	2.38	Yes
	11/6/2019	2.34	±	0.30	8.66	±	1.11	Yes	47.90	±	0.90	177.23	±	3.34	Yes
	11/13/2019	2.00	±	0.27	7.40	±	1.00	Yes	42.30	±	0.82	156.51	±	3.04	Yes
	11/20/2019	1.79	±	0.26	6.62	±	0.95	Yes	35.00	±	0.76	129.50	±	2.83	Yes
	11/27/2019	0.96	±	0.22	3.55	±	0.83	Yes	31.90	±	0.72	118.03	±	2.67	Yes
	12/4/2019	1.08	±	0.22	4.00	±	0.82	Yes	27.70	±	0.68	102.49	±	2.52	Yes
	12/11/2019	0.46	±	0.20	1.69	±	0.73	No	26.10	±	0.67	96.57	±	2.46	Yes
	12/18/2019	0.67	±	0.20	2.48	±	0.74	Yes	23.40	±	0.64	86.58	±	2.37	Yes
	12/24/2019	1.94	±	0.30	7.18	±	1.10	Yes	35.50	±	0.86	131.35	±	3.17	Yes
	12/31/2019	2.53	±	0.38	9.36	±	1.41	Yes	60.90	±	1.21	225.33	±	4.48	Yes
ATOMIC CITY	10/2/2019	0.84	±	0.23	3.12	±	0.83	Yes	23.50	±	0.67	86.95	±	2.48	Yes
	10/9/2019	0.75	±	0.22	2.79	±	0.80	Yes	29.60	±	0.71	109.52	±	2.62	Yes
	10/16/2019	1.10	±	0.23	4.07	±	0.85	Yes	35.90	±	0.75	132.83	±	2.79	Yes
	10/23/2019	1.27	±	0.22	4.70	±	0.82	Yes	25.00	±	0.65	92.50	±	2.39	Yes
	10/30/2019	0.83	±	0.22	3.08	±	0.83	Yes	20.90	±	0.62	77.33	±	2.30	Yes
a	11/6/2019		±			±		No		±			±		No
	11/13/2019	2.11	±	0.25	7.81	±	0.94	Yes	44.40	±	0.78	164.28	±	2.88	Yes
	11/20/2019	2.14	±	0.28	7.92	±	1.03	Yes	41.00	±	0.83	151.70	±	3.07	Yes
	11/27/2019	1.41	±	0.26	5.22	±	0.94	Yes	31.70	±	0.75	117.29	±	2.79	Yes
	12/4/2019	0.71	±	0.21	2.61	±	0.76	Yes	25.80	±	0.67	95.46	±	2.47	Yes
	12/11/2019	1.91	±	0.26	7.07	±	0.97	Yes	27.50	±	0.70	101.75	±	2.58	Yes
	12/18/2019	0.73	±	0.21	2.72	±	0.78	Yes	22.40	±	0.65	82.88	±	2.41	Yes
	12/24/2019	1.73	±	0.29	6.40	±	1.09	Yes	46.70	±	0.96	172.79	±	3.56	Yes
	12/31/2019	1.49	±	0.25	5.51	±	0.92	Yes	37.10	±	0.79	137.27	±	2.93	Yes
QA-1 (ATOMIC CITY)	10/2/2019	1.03	±	0.23	3.81	±	0.84	Yes	21.70	±	0.64	80.29	±	2.36	Yes
	10/9/2019	1.37	±	0.24	5.07	±	0.88	Yes	26.50	±	0.68	98.05	±	2.50	Yes
	10/16/2019	1.09	±	0.23	4.03	±	0.84	Yes	33.90	±	0.73	125.43	±	2.71	Yes
	10/23/2019	1.25	±	0.22	4.63	±	0.81	Yes	21.40	±	0.61	79.18	±	2.26	Yes
	10/30/2019	1.15	±	0.23	4.26	±	0.86	Yes	19.50	±	0.60	72.15	±	2.22	Yes
	11/6/2019	2.29	±	0.30	8.47	±	1.11	Yes	56.10	±	0.96	207.57	±	3.56	Yes
	11/13/2019	1.62	±	0.25	5.99	±	0.93	Yes	41.60	±	0.80	153.92	±	2.96	Yes
	11/20/2019	1.81	±	0.27	6.70	±	1.01	Yes	40.80	±	0.84	150.96	±	3.11	Yes
	11/27/2019	1.25	±	0.24	4.63	±	0.89	Yes	29.30	±	0.71	108.41	±	2.63	Yes
	12/4/2019	0.98	±	0.21	3.62	±	0.79	Yes	24.10	±	0.64	89.17	±	2.37	Yes
	12/11/2019	1.35	±	0.24	5.00	±	0.87	Yes	24.20	±	0.65	89.54	±	2.41	Yes
	12/18/2019	0.34	±	0.19	1.24	±	0.69	No	20.00	±	0.61	74.00	±	2.26	Yes
	12/24/2019	1.48	±	0.27	5.48	±	1.01	Yes	42.50	±	0.90	157.25	±	3.31	Yes
	12/31/2019	1.30	±	0.24	4.81	±	0.87	Yes	23.70	±	0.67	87.69	±	2.47	Yes
BLUE DOME	10/2/2019	0.88	±	0.22	3.27	±	0.82	Yes	20.10	±	0.63	74.37	±	2.31	Yes
	10/9/2019	0.85	±	0.22	3.15	±	0.83	Yes	25.50	±	0.68	94.35	±	2.53	Yes
	10/16/2019	0.98	±	0.23	3.63	±	0.84	Yes	35.30	±	0.75	130.61	±	2.79	Yes
	10/23/2019	1.27	±	0.23	4.70	±	0.86	Yes	23.80	±	0.66	88.06	±	2.45	Yes
	10/30/2019	0.96	±	0.22	3.56	±	0.83	Yes	22.30	±	0.62	82.51	±	2.31	Yes
	11/6/2019	1.04	±	0.26	3.85	±	0.95	Yes	43.10	±	0.88	159.47	±	3.25	Yes
	11/13/2019	1.63	±	0.26	6.03	±	0.95	Yes	38.60	±	0.79	142.82	±	2.92	Yes
	11/20/2019	1.08	±	0.23	4.00	±	0.86	Yes	29.80	±	0.73	110.26	±	2.69	Yes
	11/27/2019	0.98	±	0.23	3.62	±	0.85	Yes	28.10	±	0.70	103.97	±	2.59	Yes
	12/4/2019	0.38	±	0.19	1.41	±	0.68	No	21.80	±	0.62	80.66	±	2.28	Yes

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)	Result ± 1s Uncertainty (x 10^{-11} Bq/mL)	Result > 3s	GROSS BETA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)	Result ± 1s Uncertainty (x 10^{-11} Bq/mL)	Result > 3s
	12/11/2019	0.58 ± 0.20	2.13 ± 0.75	No	20.20 ± 0.62	74.74 ± 2.28	Yes
	12/18/2019	0.35 ± 0.18	1.28 ± 0.66	No	17.50 ± 0.57	64.75 ± 2.11	Yes
	12/24/2019	1.25 ± 0.28	4.63 ± 1.05	Yes	29.20 ± 0.84	108.04 ± 3.12	Yes
	12/31/2019	0.50 ± 0.18	1.85 ± 0.65	No	6.04 ± 0.41	22.35 ± 1.52	Yes
QA-2	10/2/2019	1.05 ± 0.23	3.89 ± 0.83	Yes	21.40 ± 0.63	79.18 ± 2.33	Yes
(BLUE DOME)	10/9/2019	1.91 ± 0.44	7.07 ± 1.62	Yes	30.60 ± 1.12	113.22 ± 4.14	Yes
	10/16/2019	1.05 ± 0.24	3.89 ± 0.87	Yes	35.70 ± 0.77	132.09 ± 2.85	Yes
	10/23/2019	1.30 ± 0.23	4.81 ± 0.87	Yes	22.40 ± 0.65	82.88 ± 2.41	Yes
	10/30/2019	0.99 ± 0.22	3.67 ± 0.83	Yes	21.90 ± 0.62	81.03 ± 2.30	Yes
	11/6/2019	1.30 ± 0.26	4.81 ± 0.97	Yes	41.80 ± 0.85	154.66 ± 3.16	Yes
	11/13/2019	1.99 ± 0.27	7.36 ± 1.00	Yes	38.40 ± 0.79	142.08 ± 2.93	Yes
	11/20/2019	1.67 ± 0.26	6.18 ± 0.95	Yes	31.80 ± 0.75	117.66 ± 2.76	Yes
	11/27/2019	0.96 ± 0.23	3.57 ± 0.84	Yes	27.40 ± 0.69	101.38 ± 2.56	Yes
	12/4/2019	0.76 ± 0.20	2.80 ± 0.74	Yes	23.20 ± 0.63	85.84 ± 2.32	Yes
	12/11/2019	0.64 ± 0.21	2.38 ± 0.77	Yes	20.60 ± 0.62	76.22 ± 2.30	Yes
	12/18/2019	0.90 ± 0.21	3.32 ± 0.77	Yes	20.00 ± 0.60	74.00 ± 2.23	Yes
	12/24/2019	0.95 ± 0.26	3.50 ± 0.97	Yes	31.10 ± 0.84	115.07 ± 3.10	Yes
	12/31/2019	0.69 ± 0.19	2.56 ± 0.70	Yes	11.10 ± 0.49	41.07 ± 1.80	Yes
FAA Tower	10/2/2019	1.13 ± 0.24	4.18 ± 0.87	Yes	21.80 ± 0.65	80.66 ± 2.40	Yes
	10/9/2019	1.44 ± 0.24	5.33 ± 0.90	Yes	28.50 ± 0.70	105.45 ± 2.58	Yes
	10/16/2019	0.98 ± 0.23	3.62 ± 0.85	Yes	36.00 ± 0.76	133.20 ± 2.82	Yes
	10/23/2019	1.22 ± 0.23	4.51 ± 0.84	Yes	22.90 ± 0.64	84.73 ± 2.37	Yes
	10/30/2019	1.36 ± 0.24	5.03 ± 0.89	Yes	20.50 ± 0.61	75.85 ± 2.26	Yes
	11/6/2019	2.02 ± 0.31	7.47 ± 1.14	Yes	53.00 ± 0.99	196.10 ± 3.66	Yes
	11/13/2019	2.04 ± 0.28	7.55 ± 1.03	Yes	44.50 ± 0.85	164.65 ± 3.14	Yes
	11/20/2019	1.88 ± 0.26	6.96 ± 0.97	Yes	37.60 ± 0.78	139.12 ± 2.89	Yes
	11/27/2019	1.05 ± 0.23	3.89 ± 0.85	Yes	27.30 ± 0.69	101.01 ± 2.56	Yes
	12/4/2019	0.53 ± 0.20	1.97 ± 0.74	No	24.10 ± 0.66	89.17 ± 2.42	Yes
	12/11/2019	0.89 ± 0.23	3.29 ± 0.84	Yes	23.20 ± 0.67	85.84 ± 2.47	Yes
	12/18/2019	0.45 ± 0.19	1.66 ± 0.72	No	17.00 ± 0.59	62.90 ± 2.18	Yes
	12/24/2019	1.59 ± 0.30	5.88 ± 1.10	Yes	35.60 ± 0.90	131.72 ± 3.32	Yes
	12/31/2019	0.70 ± 0.21	2.60 ± 0.79	Yes	32.70 ± 0.75	120.99 ± 2.78	Yes
HOWE	10/2/2019	1.06 ± 0.23	3.92 ± 0.85	Yes	21.30 ± 0.64	78.81 ± 2.36	Yes
	10/9/2019	1.52 ± 0.27	5.62 ± 0.98	Yes	25.80 ± 0.72	95.46 ± 2.66	Yes
	10/16/2019	1.42 ± 0.26	5.25 ± 0.96	Yes	36.20 ± 0.80	133.94 ± 2.95	Yes
	10/23/2019	1.05 ± 0.22	3.89 ± 0.81	Yes	20.00 ± 0.61	74.00 ± 2.26	Yes
	10/30/2019	1.44 ± 0.23	5.33 ± 0.85	Yes	18.50 ± 0.56	68.45 ± 2.09	Yes
	11/6/2019	2.43 ± 0.31	8.99 ± 1.16	Yes	47.60 ± 0.93	176.12 ± 3.43	Yes
	11/13/2019	2.57 ± 0.30	9.51 ± 1.11	Yes	41.20 ± 0.83	152.44 ± 3.08	Yes
	11/20/2019	1.76 ± 0.26	6.51 ± 0.97	Yes	31.80 ± 0.75	117.66 ± 2.78	Yes
	11/27/2019	1.55 ± 0.25	5.74 ± 0.91	Yes	30.70 ± 0.71	113.59 ± 2.63	Yes
	12/4/2019	0.68 ± 0.20	2.50 ± 0.75	Yes	26.30 ± 0.67	97.31 ± 2.48	Yes
	12/11/2019	0.38 ± 0.21	1.39 ± 0.76	No	24.80 ± 0.68	91.76 ± 2.53	Yes
	12/18/2019	1.01 ± 0.22	3.74 ± 0.80	Yes	20.70 ± 0.62	76.59 ± 2.28	Yes
	12/24/2019	1.70 ± 0.31	6.29 ± 1.16	Yes	45.80 ± 1.01	169.46 ± 3.74	Yes
	12/31/2019	0.76 ± 0.20	2.80 ± 0.74	Yes	31.60 ± 0.70	116.92 ± 2.59	Yes
MONTEVIEW	10/2/2019	0.82 ± 0.22	3.02 ± 0.83	Yes	18.60 ± 0.62	68.82 ± 2.29	Yes
	10/9/2019	1.40 ± 0.24	5.18 ± 0.90	Yes	25.80 ± 0.68	95.46 ± 2.52	Yes
	10/16/2019	1.20 ± 0.24	4.44 ± 0.88	Yes	32.90 ± 0.74	121.73 ± 2.73	Yes
	10/23/2019	2.01 ± 0.26	7.44 ± 0.95	Yes	22.90 ± 0.65	84.73 ± 2.39	Yes
	10/30/2019	1.10 ± 0.23	4.07 ± 0.85	Yes	20.80 ± 0.61	76.96 ± 2.26	Yes
	11/6/2019	2.34 ± 0.29	8.66 ± 1.05	Yes	45.70 ± 0.85	169.09 ± 3.15	Yes
	11/13/2019	2.08 ± 0.27	7.70 ± 1.01	Yes	37.60 ± 0.79	139.12 ± 2.91	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 (x 10^{-15} µCi/mL)**			**Result ± 1s Uncertainty (x 10^{-11} Bq/mL)**			**Result > 3s**	**Result ± 1s Uncertainty (x 10^{-15} µCi/mL)**			**Result ± 1s Uncertainty (x 10^{-11} Bq/mL)**			**Result > 3s**
	11/20/2019	2.11	±	0.27	7.81	±	1.00	Yes	32.30	±	0.74	119.51	±	2.75	Yes
	11/27/2019	1.85	±	0.27	6.85	±	0.98	Yes	31.90	±	0.74	118.03	±	2.74	Yes
	12/4/2019	0.89	±	0.21	3.31	±	0.78	Yes	25.40	±	0.65	93.98	±	2.42	Yes
	12/11/2019	0.44	±	0.21	1.62	±	0.76	No	25.00	±	0.68	92.50	±	2.51	Yes
	12/18/2019	1.18	±	0.22	4.37	±	0.83	Yes	22.90	±	0.64	84.73	±	2.35	Yes
	12/24/2019	1.24	±	0.27	4.59	±	1.01	Yes	35.70	±	0.88	132.09	±	3.24	Yes
	12/31/2019	0.49	±	0.19	1.83	±	0.71	No	23.50	±	0.64	86.95	±	2.38	Yes
MUD LAKE	10/2/2019	1.28	±	0.22	4.74	±	0.82	Yes	20.70	±	0.59	76.59	±	2.19	Yes
	10/9/2019	1.36	±	0.25	5.03	±	0.92	Yes	28.80	±	0.72	106.56	±	2.67	Yes
	10/16/2019	1.83	±	0.26	6.77	±	0.94	Yes	39.80	±	0.78	147.26	±	2.87	Yes
	10/23/2019	1.58	±	0.25	5.85	±	0.91	Yes	24.30	±	0.67	89.91	±	2.46	Yes
	10/30/2019	1.26	±	0.22	4.66	±	0.83	Yes	22.50	±	0.60	83.25	±	2.21	Yes
	11/6/2019	3.06	±	0.33	11.32	±	1.21	Yes	57.30	±	0.97	212.01	±	3.60	Yes
	11/13/2019	2.66	±	0.30	9.84	±	1.09	Yes	47.20	±	0.86	174.64	±	3.18	Yes
	11/20/2019	2.30	±	0.29	8.51	±	1.05	Yes	45.90	±	0.87	169.83	±	3.20	Yes
	11/27/2019	1.73	±	0.25	6.40	±	0.93	Yes	33.70	±	0.73	124.69	±	2.70	Yes
	12/4/2019	0.70	±	0.20	2.60	±	0.74	Yes	28.60	±	0.68	105.82	±	2.51	Yes
	12/11/2019	0.90	±	0.23	3.34	±	0.84	Yes	29.30	±	0.72	108.41	±	2.66	Yes
	12/18/2019	1.84	±	0.26	6.81	±	0.94	Yes	21.10	±	0.64	78.07	±	2.35	Yes
	12/24/2019	2.02	±	0.33	7.47	±	1.22	Yes	63.00	±	1.14	233.10	±	4.22	Yes
	12/31/2019	1.41	±	0.24	5.22	±	0.87	Yes	27.60	±	0.69	102.12	±	2.55	Yes
DISTANT															
BLACKFOOT	10/2/2019	0.65	±	0.21	2.42	±	0.77	Yes	19.60	±	0.61	72.52	±	2.26	Yes
	10/9/2019	1.87	±	0.26	6.92	±	0.95	Yes	25.40	±	0.67	93.98	±	2.47	Yes
	10/16/2019	1.56	±	0.25	5.77	±	0.94	Yes	34.90	±	0.76	129.13	±	2.81	Yes
	10/23/2019	1.02	±	0.21	3.77	±	0.79	Yes	21.80	±	0.62	80.66	±	2.30	Yes
	10/30/2019	1.73	±	0.25	6.40	±	0.93	Yes	19.00	±	0.59	70.30	±	2.19	Yes
	11/6/2019	1.87	±	0.28	6.92	±	1.04	Yes	48.10	±	0.90	177.97	±	3.33	Yes
	11/13/2019	1.86	±	0.26	6.88	±	0.95	Yes	43.30	±	0.80	160.21	±	2.97	Yes
	11/20/2019	2.95	±	0.31	10.92	±	1.14	Yes	42.70	±	0.85	157.99	±	3.14	Yes
	11/27/2019	1.49	±	0.24	5.51	±	0.90	Yes	25.50	±	0.66	94.35	±	2.45	Yes
	12/4/2019	1.11	±	0.21	4.11	±	0.79	Yes	24.30	±	0.63	89.91	±	2.33	Yes
	12/11/2019	1.09	±	0.22	4.03	±	0.83	Yes	24.80	±	0.65	91.76	±	2.42	Yes
	12/18/2019	0.66	±	0.21	2.45	±	0.76	Yes	16.00	±	0.58	59.20	±	2.14	Yes
	12/24/2019	1.82	±	0.37	6.73	±	1.35	Yes	50.10	±	1.17	185.37	±	4.33	Yes
	12/31/2019	1.41	±	0.24	5.22	±	0.90	Yes	33.60	±	0.75	124.32	±	2.79	Yes
CRATERS OF THE MOON	10/2/2019	0.96	±	0.23	3.54	±	0.84	Yes	21.40	±	0.65	79.18	±	2.39	Yes
	10/9/2019	1.08	±	0.23	4.00	±	0.85	Yes	26.50	±	0.68	98.05	±	2.53	Yes
	10/16/2019	0.94	±	0.22	3.47	±	0.83	Yes	33.70	±	0.74	124.69	±	2.73	Yes
	10/23/2019	1.07	±	0.22	3.96	±	0.82	Yes	23.50	±	0.65	86.95	±	2.41	Yes
	10/30/2019	1.05	±	0.23	3.89	±	0.85	Yes	21.10	±	0.62	78.07	±	2.30	Yes
	11/6/2019	1.27	±	0.27	4.70	±	0.98	Yes	49.80	±	0.92	184.26	±	3.42	Yes
	11/13/2019	1.55	±	0.26	5.74	±	0.97	Yes	40.20	±	0.83	148.74	±	3.05	Yes
	11/20/2019	1.73	±	0.26	6.40	±	0.96	Yes	36.80	±	0.79	136.16	±	2.92	Yes
	11/27/2019	1.52	±	0.25	5.62	±	0.94	Yes	29.80	±	0.72	110.26	±	2.67	Yes
	12/4/2019	0.69	±	0.20	2.54	±	0.74	Yes	20.90	±	0.61	77.33	±	2.24	Yes
	12/11/2019	1.07	±	0.23	3.96	±	0.83	Yes	19.90	±	0.61	73.63	±	2.27	Yes
	12/18/2019	0.50	±	0.20	1.85	±	0.75	No	15.40	±	0.59	56.98	±	2.18	Yes
	12/24/2019	1.02	±	0.27	3.77	±	1.01	Yes	23.10	±	0.78	85.47	±	2.89	Yes
a	12/31/2019		±			±		No		±			±		No
DUBOIS	10/2/2019	0.98	±	0.23	3.63	±	0.83	Yes	19.70	±	0.62	72.89	±	2.29	Yes
	10/9/2019	1.56	±	0.25	5.77	±	0.94	Yes	25.20	±	0.68	93.24	±	2.52	Yes
	10/16/2019	1.48	±	0.25	5.48	±	0.91	Yes	30.50	±	0.72	112.85	±	2.66	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 (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	10/23/2019	2.25	±	0.27	8.33	±	1.01	Yes	24.90	±	0.68	92.13	±	2.53	Yes
	10/30/2019	0.82	±	0.21	3.02	±	0.77	Yes	17.50	±	0.56	64.75	±	2.06	Yes
	11/6/2019	1.82	±	0.28	6.73	±	1.03	Yes	45.70	±	0.88	169.09	±	3.25	Yes
	11/13/2019	1.99	±	0.28	7.36	±	1.05	Yes	40.20	±	0.84	148.74	±	3.10	Yes
	11/20/2019	1.83	±	0.27	6.77	±	1.01	Yes	31.40	±	0.77	116.18	±	2.85	Yes
	11/27/2019	0.95	±	0.24	3.53	±	0.89	Yes	29.10	±	0.74	107.67	±	2.73	Yes
	12/4/2019	0.62	±	0.21	2.29	±	0.78	No	27.70	±	0.71	102.49	±	2.62	Yes
	12/11/2019	0.78	±	0.22	2.87	±	0.82	Yes	22.40	±	0.66	82.88	±	2.43	Yes
	12/18/2019	0.84	±	0.21	3.12	±	0.78	Yes	19.60	±	0.61	72.52	±	2.26	Yes
	12/24/2019	1.14	±	0.27	4.22	±	1.00	Yes	25.90	±	0.79	95.83	±	2.92	Yes
	12/31/2019	0.54	±	0.20	2.01	±	0.75	No	26.70	±	0.69	98.79	±	2.57	Yes
IDAHO FALLS	10/2/2019	0.93	±	0.22	3.44	±	0.82	Yes	20.00	±	0.62	74.00	±	2.30	Yes
	10/9/2019	1.49	±	0.27	5.51	±	1.01	Yes	28.60	±	0.77	105.82	±	2.83	Yes
	10/16/2019	2.23	±	0.29	8.25	±	1.08	Yes	34.00	±	0.79	125.80	±	2.92	Yes
	10/23/2019	2.63	±	0.29	9.73	±	1.08	Yes	24.10	±	0.69	89.17	±	2.55	Yes
	10/30/2019	1.69	±	0.26	6.25	±	0.97	Yes	20.20	±	0.63	74.74	±	2.31	Yes
	11/6/2019	1.82	±	0.35	6.73	±	1.30	Yes	48.30	±	1.08	178.71	±	4.00	Yes
	11/13/2019	2.71	±	0.32	10.03	±	1.20	Yes	48.00	±	0.94	177.60	±	3.46	Yes
	11/20/2019	2.48	±	0.28	9.18	±	1.03	Yes	41.70	±	0.81	154.29	±	2.99	Yes
	11/27/2019	1.52	±	0.24	5.62	±	0.88	Yes	26.60	±	0.66	98.42	±	2.45	Yes
	12/4/2019	0.63	±	0.19	2.32	±	0.71	Yes	23.40	±	0.62	86.58	±	2.29	Yes
	12/11/2019	0.52	±	0.21	1.91	±	0.76	No	25.10	±	0.67	92.87	±	2.49	Yes
	12/18/2019	0.39	±	0.18	1.46	±	0.67	No	16.60	±	0.56	61.42	±	2.07	Yes
	12/24/2019	1.47	±	0.27	5.44	±	1.01	Yes	41.90	±	0.89	155.03	±	3.30	Yes
	12/31/2019	1.19	±	0.23	4.40	±	0.86	Yes	31.50	±	0.74	116.55	±	2.72	Yes
JACKSON	10/2/2019	1.20	±	0.26	4.44	±	0.95	Yes	20.50	±	0.68	75.85	±	2.52	Yes
	10/9/2019	1.36	±	0.26	5.03	±	0.97	Yes	27.10	±	0.74	100.27	±	2.73	Yes
	10/16/2019	2.04	±	0.29	7.55	±	1.06	Yes	31.60	±	0.77	116.92	±	2.85	Yes
	10/23/2019	1.88	±	0.27	6.96	±	1.01	Yes	23.30	±	0.70	86.21	±	2.58	Yes
	10/30/2019	1.54	±	0.26	5.70	±	0.94	Yes	18.50	±	0.61	68.45	±	2.25	Yes
	11/6/2019	2.39	±	0.29	8.84	±	1.08	Yes	32.30	±	0.76	119.51	±	2.82	Yes
	11/13/2019	2.45	±	0.30	9.07	±	1.09	Yes	35.10	±	0.79	129.87	±	2.92	Yes
	11/20/2019	1.55	±	0.27	5.74	±	0.99	Yes	32.90	±	0.79	121.73	±	2.93	Yes
	11/27/2019	2.55	±	0.33	9.44	±	1.22	Yes	28.60	±	0.80	105.82	±	2.97	Yes
	12/4/2019	1.97	±	0.25	7.29	±	0.91	Yes	22.10	±	0.61	81.77	±	2.26	Yes
	12/11/2019	1.01	±	0.25	3.74	±	0.91	Yes	17.50	±	0.65	64.75	±	2.39	Yes
	12/18/2019	0.64	±	0.21	2.35	±	0.77	Yes	16.20	±	0.59	59.94	±	2.18	Yes
	12/24/2019	2.45	±	0.31	9.07	±	1.15	Yes	37.70	±	0.87	139.49	±	3.22	Yes
	12/31/2019	1.45	±	0.25	5.37	±	0.93	Yes	33.80	±	0.78	125.06	±	2.87	Yes
SUGAR CITY	10/2/2019	1.23	±	0.23	4.55	±	0.84	Yes	19.50	±	0.60	72.15	±	2.22	Yes
	10/9/2019	1.45	±	0.25	5.37	±	0.91	Yes	26.20	±	0.69	96.94	±	2.54	Yes
	10/16/2019	1.18	±	0.23	4.37	±	0.85	Yes	30.90	±	0.70	114.33	±	2.60	Yes
	10/23/2019	1.72	±	0.24	6.36	±	0.89	Yes	20.80	±	0.61	76.96	±	2.26	Yes
	10/30/2019	1.69	±	0.25	6.25	±	0.91	Yes	18.40	±	0.58	68.08	±	2.13	Yes
	11/6/2019	1.46	±	0.27	5.40	±	1.01	Yes	39.50	±	0.85	146.15	±	3.15	Yes
	11/13/2019	2.03	±	0.27	7.51	±	0.98	Yes	39.40	±	0.78	145.78	±	2.90	Yes
	11/20/2019	2.49	±	0.28	9.21	±	1.04	Yes	36.50	±	0.78	135.05	±	2.87	Yes
	11/27/2019	1.24	±	0.23	4.59	±	0.85	Yes	29.10	±	0.69	107.67	±	2.54	Yes
	12/4/2019	0.65	±	0.21	2.39	±	0.76	Yes	23.10	±	0.65	85.47	±	2.39	Yes
	12/11/2019	0.93	±	0.23	3.43	±	0.83	Yes	20.30	±	0.63	75.11	±	2.33	Yes
	12/18/2019	0.97	±	0.22	3.60	±	0.81	Yes	15.40	±	0.57	56.98	±	2.11	Yes
	12/24/2019	1.23	±	0.27	4.55	±	1.01	Yes	25.90	±	0.79	95.83	±	2.90	Yes
	12/31/2019	0.55	±	0.19	2.04	±	0.71	No	25.60	±	0.65	94.72	±	2.41	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 (x 10^{-15} µCi/mL)	Result ± 1s Uncertainty (x 10^{-11} Bq/mL)	Result > 3s	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)	Result ± 1s Uncertainty (x 10^{-11} Bq/mL)	Result > 3s
INL SITE							
EFS	10/2/2019	0.86 ± 0.21	3.16 ± 0.76	Yes	19.80 ± 0.59	73.26 ± 2.16	Yes
	10/9/2019	1.09 ± 0.23	4.03 ± 0.86	Yes	26.10 ± 0.69	96.57 ± 2.54	Yes
	10/16/2019	1.26 ± 0.24	4.66 ± 0.90	Yes	38.20 ± 0.79	141.34 ± 2.93	Yes
	10/23/2019	1.63 ± 0.26	6.03 ± 0.95	Yes	19.80 ± 0.65	73.26 ± 2.39	Yes
	10/30/2019	1.08 ± 0.23	4.00 ± 0.84	Yes	18.90 ± 0.59	69.93 ± 2.19	Yes
	11/6/2019	2.45 ± 0.35	9.07 ± 1.28	Yes	63.00 ± 1.12	233.10 ± 4.14	Yes
	11/13/2019	2.11 ± 0.28	7.81 ± 1.02	Yes	44.40 ± 0.84	164.28 ± 3.11	Yes
	11/20/2019	2.18 ± 0.28	8.07 ± 1.03	Yes	43.10 ± 0.84	159.47 ± 3.11	Yes
	11/27/2019	1.35 ± 0.24	5.00 ± 0.89	Yes	30.20 ± 0.71	111.74 ± 2.63	Yes
	12/4/2019	0.75 ± 0.21	2.78 ± 0.78	Yes	25.80 ± 0.67	95.46 ± 2.48	Yes
	12/11/2019	0.65 ± 0.21	2.40 ± 0.79	Yes	25.20 ± 0.68	93.24 ± 2.52	Yes
	12/18/2019	0.51 ± 0.20	1.89 ± 0.74	No	14.90 ± 0.57	55.13 ± 2.12	Yes
	12/24/2019	1.38 ± 0.29	5.11 ± 1.07	Yes	54.10 ± 1.04	200.17 ± 3.85	Yes
	12/31/2019	0.84 ± 0.22	3.12 ± 0.83	Yes	42.20 ± 0.83	156.14 ± 3.07	Yes
MAIN GATE	10/2/2019	0.98 ± 0.22	3.61 ± 0.81	Yes	22.30 ± 0.63	82.51 ± 2.34	Yes
	10/9/2019	1.14 ± 0.23	4.22 ± 0.84	Yes	29.50 ± 0.70	109.15 ± 2.59	Yes
	10/16/2019	0.91 ± 0.22	3.38 ± 0.81	Yes	38.20 ± 0.76	141.34 ± 2.80	Yes
	10/23/2019	1.08 ± 0.22	4.00 ± 0.81	Yes	24.40 ± 0.65	90.28 ± 2.42	Yes
	10/30/2019	1.46 ± 0.24	5.40 ± 0.87	Yes	19.20 ± 0.58	71.04 ± 2.15	Yes
	11/6/2019	2.28 ± 0.32	8.44 ± 1.19	Yes	59.10 ± 1.04	218.67 ± 3.85	Yes
	11/13/2019	2.56 ± 0.29	9.47 ± 1.09	Yes	47.10 ± 0.86	174.27 ± 3.20	Yes
	11/20/2019	2.11 ± 0.28	7.81 ± 1.04	Yes	44.30 ± 0.86	163.91 ± 3.19	Yes
	11/27/2019	1.22 ± 0.22	4.51 ± 0.81	Yes	32.90 ± 0.69	121.73 ± 2.56	Yes
	12/4/2019	1.17 ± 0.24	4.33 ± 0.88	Yes	29.90 ± 0.74	110.63 ± 2.72	Yes
	12/11/2019	1.23 ± 0.22	4.55 ± 0.80	Yes	21.10 ± 0.59	78.07 ± 2.18	Yes
	12/18/2019	0.77 ± 0.22	2.85 ± 0.83	Yes	24.10 ± 0.69	89.17 ± 2.56	Yes
	12/24/2019	1.10 ± 0.25	4.07 ± 0.91	Yes	53.50 ± 0.94	197.95 ± 3.47	Yes
	12/31/2019	1.21 ± 0.21	4.48 ± 0.78	Yes	10.30 ± 0.48	38.11 ± 1.76	Yes
VAN BUREN GATE	10/2/2019	0.87 ± 0.23	3.23 ± 0.84	Yes	22.80 ± 0.66	84.36 ± 2.45	Yes
	10/9/2019	0.99 ± 0.23	3.68 ± 0.84	Yes	28.40 ± 0.70	105.08 ± 2.60	Yes
	10/16/2019	1.54 ± 0.25	5.70 ± 0.91	Yes	35.40 ± 0.75	130.98 ± 2.76	Yes
	10/23/2019	1.21 ± 0.23	4.48 ± 0.85	Yes	24.40 ± 0.67	90.28 ± 2.46	Yes
	10/30/2019	0.81 ± 0.22	2.99 ± 0.80	Yes	21.30 ± 0.61	78.81 ± 2.26	Yes
	11/6/2019	1.85 ± 0.30	6.85 ± 1.11	Yes	57.40 ± 1.01	212.38 ± 3.74	Yes
	11/13/2019	1.92 ± 0.28	7.10 ± 1.03	Yes	48.30 ± 0.89	178.71 ± 3.29	Yes
	11/20/2019	1.37 ± 0.24	5.07 ± 0.90	Yes	43.20 ± 0.83	159.84 ± 3.07	Yes
	11/27/2019	0.81 ± 0.23	2.98 ± 0.83	Yes	31.10 ± 0.74	115.07 ± 2.72	Yes
	12/4/2019	0.35 ± 0.19	1.30 ± 0.72	No	26.90 ± 0.69	99.53 ± 2.55	Yes
	12/11/2019	0.91 ± 0.23	3.36 ± 0.84	Yes	23.10 ± 0.67	85.47 ± 2.46	Yes
	12/18/2019	0.72 ± 0.21	2.65 ± 0.77	Yes	20.40 ± 0.63	75.48 ± 2.32	Yes
	12/24/2019	1.53 ± 0.30	5.66 ± 1.11	Yes	43.30 ± 0.97	160.21 ± 3.59	Yes
	12/31/2019	1.07 ± 0.24	3.96 ± 0.88	Yes	35.40 ± 0.79	130.98 ± 2.93	Yes

a. Invalid sample result shown in red

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
BOUNDARY								
ARCO	10/02/19	-1.20	±	1.10	-4.44	±	4.07	No
	10/09/19	-0.98	±	1.07	-3.63	±	3.96	No
	10/16/19	-0.82	±	1.04	-3.02	±	3.85	No
	10/23/19	1.51	±	0.90	5.59	±	3.32	No
	10/30/19	1.22	±	1.18	4.51	±	4.37	No
	11/06/19	1.30	±	1.18	4.81	±	4.37	No
	11/13/19	-0.05	±	1.18	-0.18	±	4.37	No
	11/20/19	0.69	±	1.06	2.56	±	3.92	No
	11/27/19	2.73	±	1.98	10.10	±	7.33	No
	12/04/19	-0.30	±	1.06	-1.09	±	3.92	No
	12/11/19	-0.51	±	0.94	-1.88	±	3.49	No
	12/18/19	2.94	±	2.34	10.88	±	8.66	No
	12/24/19	3.93	±	2.50	14.54	±	9.25	No
	12/31/19	0.76	±	3.36	2.82	±	12.43	No
ATOMIC CITY	10/02/19	-1.18	±	1.08	-4.37	±	4.00	No
	10/09/19	-0.93	±	1.02	-3.44	±	3.77	No
	10/16/19	-0.80	±	1.02	-2.97	±	3.77	No
	10/23/19	1.55	±	0.92	5.74	±	3.42	No
	10/30/19	1.24	±	1.20	4.59	±	4.44	No
a	11/06/19		±			±		No
	11/13/19	-0.04	±	1.04	-0.16	±	3.85	No
	11/20/19	0.71	±	1.09	2.64	±	4.03	No
	11/27/19	2.95	±	2.14	10.92	±	7.92	No
	12/04/19	-0.30	±	1.07	-1.11	±	3.96	No
	12/11/19	-0.52	±	0.97	-1.94	±	3.59	No
	12/18/19	3.10	±	2.47	11.47	±	9.14	No
	12/24/19	3.96	±	2.52	14.65	±	9.32	No
	12/31/19	0.52	±	2.31	1.94	±	8.55	No
QA-1	10/02/19	-1.15	±	1.05	-4.26	±	3.89	No
(ATOMIC CITY)	10/09/19	-0.93	±	1.01	-3.43	±	3.74	No
	10/16/19	-0.80	±	1.02	-2.95	±	3.77	No
	10/23/19	1.56	±	0.93	5.77	±	3.44	No
	10/30/19	1.21	±	1.18	4.48	±	4.37	No
	11/06/19	1.29	±	1.17	4.77	±	4.33	No
	11/13/19	-0.05	±	1.14	-0.18	±	4.22	No
	11/20/19	0.73	±	1.12	2.71	±	4.14	No
	11/27/19	2.83	±	2.05	10.47	±	7.59	No
	12/04/19	-0.29	±	1.04	-1.08	±	3.85	No
	12/11/19	-0.51	±	0.94	-1.88	±	3.49	No
	12/18/19	3.01	±	2.40	11.14	±	8.88	No
	12/24/19	3.75	±	2.39	13.88	±	8.84	No
	12/31/19	0.53	±	2.33	1.96	±	8.62	No
BLUE DOME	10/02/19	-1.15	±	1.01	-4.26	±	3.74	No
	10/09/19	-1.38	±	1.02	-5.11	±	3.77	No
	10/16/19	0.15	±	3.31	0.55	±	12.25	No
	10/23/19	1.20	±	1.82	4.44	±	6.73	No
	10/30/19	-0.42	±	1.82	-1.54	±	6.73	No
	11/06/19	-2.66	±	1.20	-9.84	±	4.44	No
	11/13/19	1.90	±	1.97	7.03	±	7.29	No
	11/20/19	4.25	±	1.98	15.73	±	7.33	No
	11/27/19	3.67	±	1.90	13.58	±	7.03	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	12/04/19	-1.02	±	0.97	-3.77	±	3.60	No
	12/11/19	-1.77	±	1.90	-6.55	±	7.03	No
	12/18/19	-0.65	±	1.20	-2.41	±	4.44	No
	12/24/19	-0.91	±	2.37	-3.36	±	8.77	No
	12/31/19	0.87	±	1.88	3.20	±	6.96	No
QA-2	10/02/19	-1.12	±	0.98	-4.14	±	3.64	No
(BLUE DOME)	10/09/19	-2.69	±	1.99	-9.95	±	7.36	No
	10/16/19	0.15	±	3.39	0.56	±	12.54	No
	10/23/19	1.21	±	1.84	4.48	±	6.81	No
	10/30/19	-0.42	±	1.83	-1.55	±	6.77	No
	11/06/19	-2.59	±	1.17	-9.58	±	4.33	No
	11/13/19	1.92	±	1.99	7.10	±	7.36	No
	11/20/19	4.22	±	1.96	15.61	±	7.25	No
	11/27/19	3.66	±	1.89	13.54	±	6.99	No
	12/04/19	-1.01	±	0.96	-3.74	±	3.54	No
	12/11/19	-1.77	±	1.90	-6.55	±	7.03	No
	12/18/19	-0.66	±	1.21	-2.43	±	4.48	No
	12/24/19	-0.87	±	2.27	-3.22	±	8.40	No
	12/31/19	0.87	±	1.88	3.20	±	6.96	No
FAA TOWER	10/02/19	-1.16	±	1.02	-4.29	±	3.77	No
	10/09/19	-1.32	±	0.97	-4.88	±	3.60	No
	10/16/19	0.15	±	3.33	0.55	±	12.32	No
	10/23/19	1.17	±	1.77	4.33	±	6.55	No
	10/30/19	-0.42	±	1.85	-1.57	±	6.85	No
	11/06/19	-2.80	±	1.27	-10.36	±	4.70	No
	11/13/19	1.94	±	2.01	7.18	±	7.44	No
	11/20/19	4.07	±	1.90	15.06	±	7.03	No
	11/27/19	3.67	±	1.90	13.58	±	7.03	No
	12/04/19	-1.06	±	1.01	-3.92	±	3.74	No
	12/11/19	-1.84	±	1.98	-6.81	±	7.33	No
	12/18/19	-0.69	±	1.28	-2.56	±	4.74	No
	12/24/19	-0.89	±	2.33	-3.29	±	8.62	No
	12/31/19	0.93	±	2.02	3.45	±	7.47	No
HOWE	10/02/19	-1.15	±	1.00	-4.26	±	3.70	No
	10/09/19	-1.48	±	1.09	-5.48	±	4.03	No
	10/16/19	0.16	±	3.57	0.59	±	13.21	No
	10/23/19	1.18	±	1.78	4.37	±	6.59	No
	10/30/19	-0.40	±	1.73	-1.46	±	6.40	No
	11/06/19	-2.70	±	1.22	-9.99	±	4.51	No
	11/13/19	1.99	±	2.06	7.36	±	7.62	No
	11/20/19	4.28	±	1.99	15.84	±	7.36	No
	11/27/19	3.56	±	1.84	13.17	±	6.81	No
	12/04/19	-1.04	±	0.99	-3.85	±	3.66	No
	12/11/19	-1.85	±	1.98	-6.85	±	7.33	No
	12/18/19	-0.66	±	1.22	-2.46	±	4.51	No
	12/24/19	-0.92	±	2.39	-3.39	±	8.84	No
	12/31/19	0.85	±	1.84	3.13	±	6.81	No
MONTEVIEW	10/02/19	-1.18	±	1.03	-4.37	±	3.81	No
	10/09/19	-1.35	±	1.00	-5.00	±	3.68	No
	10/16/19	0.15	±	3.35	0.56	±	12.40	No
	10/23/19	1.18	±	1.79	4.37	±	6.62	No
	10/30/19	-0.42	±	1.84	-1.55	±	6.81	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	11/06/19	-2.39	±	1.09	-8.84	±	4.03	No
	11/13/19	1.92	±	1.99	7.10	±	7.36	No
	11/20/19	4.15	±	1.93	15.36	±	7.14	No
	11/27/19	3.69	±	1.91	13.65	±	7.07	No
	12/04/19	-1.02	±	0.97	-3.77	±	3.60	No
	12/11/19	-1.82	±	1.95	-6.73	±	7.22	No
	12/18/19	-0.66	±	1.21	-2.43	±	4.48	No
	12/24/19	-0.85	±	2.22	-3.15	±	8.21	No
	12/31/19	0.90	±	1.95	3.32	±	7.22	No
MUD LAKE	10/02/19	-1.03	±	0.90	-3.81	±	3.34	No
	10/09/19	-1.39	±	1.02	-5.14	±	3.77	No
	10/16/19	0.14	±	3.18	0.53	±	11.77	No
	10/23/19	1.20	±	1.82	4.44	±	6.73	No
	10/30/19	-0.39	±	1.69	-1.43	±	6.25	No
	11/06/19	-2.55	±	1.16	-9.44	±	4.29	No
	11/13/19	1.90	±	1.96	7.03	±	7.25	No
	11/20/19	4.20	±	1.96	15.54	±	7.25	No
	11/27/19	3.48	±	1.80	12.88	±	6.66	No
	12/04/19	-1.00	±	0.95	-3.70	±	3.53	No
	12/11/19	-1.80	±	1.94	-6.66	±	7.18	No
	12/18/19	-0.69	±	1.26	-2.54	±	4.66	No
	12/24/19	-0.89	±	2.34	-3.31	±	8.66	No
	12/31/19	0.90	±	1.94	3.32	±	7.18	No
DISTANT								
BLACKFOOT	10/02/19	-1.13	±	1.03	-4.18	±	3.81	No
	10/09/19	-0.92	±	1.01	-3.42	±	3.74	No
	10/16/19	-0.83	±	1.06	-3.07	±	3.92	No
	10/23/19	1.59	±	0.95	5.88	±	3.50	No
	10/30/19	1.20	±	1.16	4.44	±	4.29	No
	11/06/19	1.29	±	1.17	4.77	±	4.33	No
	11/13/19	-0.05	±	1.11	-0.17	±	4.11	No
	11/20/19	0.71	±	1.09	2.64	±	4.03	No
	11/27/19	2.74	±	1.98	10.14	±	7.33	No
	12/04/19	-0.28	±	1.01	-1.04	±	3.74	No
	12/11/19	-0.51	±	0.94	-1.87	±	3.46	No
	12/18/19	3.11	±	2.48	11.51	±	9.18	No
	12/24/19	5.25	±	3.34	19.43	±	12.36	No
	12/31/19	0.52	±	2.28	1.91	±	8.44	No
CRATERS OF THE MOON	10/02/19	-1.17	±	1.07	-4.33	±	3.96	No
	10/09/19	-0.94	±	1.03	-3.49	±	3.81	No
	10/16/19	-0.81	±	1.04	-3.01	±	3.85	No
	10/23/19	1.64	±	0.97	6.07	±	3.60	No
	10/30/19	1.23	±	1.19	4.55	±	4.40	No
	11/06/19	1.32	±	1.20	4.88	±	4.44	No
	11/13/19	-0.05	±	1.24	-0.19	±	4.59	No
	11/20/19	0.71	±	1.08	2.61	±	4.00	No
	11/27/19	2.87	±	2.08	10.62	±	7.70	No
	12/04/19	-0.29	±	1.04	-1.08	±	3.85	No
	12/11/19	-0.52	±	0.97	-1.93	±	3.58	No
	12/18/19	3.24	±	2.58	11.99	±	9.55	No
	12/24/19	4.39	±	2.80	16.24	±	10.36	No
a	12/31/19		±			±		No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
DUBOIS	10/02/19	-1.15	±	1.00	-4.26	±	3.70	No
	10/09/19	-1.37	±	1.01	-5.07	±	3.74	No
	10/16/19	0.15	±	3.36	0.56	±	12.43	No
	10/23/19	1.23	±	1.86	4.55	±	6.88	No
	10/30/19	-0.40	±	1.75	-1.48	±	6.48	No
	11/06/19	-2.54	±	1.15	-9.40	±	4.26	No
	11/13/19	2.05	±	2.12	7.59	±	7.84	No
	11/20/19	4.49	±	2.09	16.61	±	7.73	No
	11/27/19	3.92	±	2.03	14.50	±	7.51	No
	12/04/19	-1.10	±	1.05	-4.07	±	3.89	No
	12/11/19	-1.84	±	1.97	-6.81	±	7.29	No
	12/18/19	-0.68	±	1.25	-2.51	±	4.63	No
	12/24/19	-0.87	±	2.29	-3.23	±	8.47	No
	12/31/19	0.93	±	2.02	3.45	±	7.47	No
IDAHO FALLS	10/02/19	-1.14	±	1.00	-4.22	±	3.69	No
	10/09/19	-1.54	±	1.13	-5.70	±	4.18	No
	10/16/19	0.16	±	3.64	0.60	±	13.47	No
	10/23/19	1.26	±	1.91	4.66	±	7.07	No
	10/30/19	-0.44	±	1.93	-1.63	±	7.14	No
	11/06/19	-3.48	±	1.58	-12.88	±	5.85	No
	11/13/19	2.17	±	2.25	8.03	±	8.33	No
	11/20/19	3.98	±	1.85	14.73	±	6.85	No
	11/27/19	3.46	±	1.79	12.80	±	6.62	No
	12/04/19	-0.99	±	0.94	-3.66	±	3.48	No
	12/11/19	-1.78	±	1.91	-6.59	±	7.07	No
	12/18/19	-0.65	±	1.20	-2.40	±	4.44	No
	12/24/19	-0.79	±	2.06	-2.92	±	7.62	No
	12/31/19	0.92	±	2.00	3.41	±	7.40	No
JACKSON	10/02/19	-1.30	±	1.19	-4.81	±	4.40	No
	10/09/19	-1.05	±	1.15	-3.89	±	4.26	No
	10/16/19	-0.91	±	1.16	-3.36	±	4.29	No
	10/23/19	1.82	±	1.08	6.73	±	4.00	No
	10/30/19	1.27	±	1.24	4.70	±	4.59	No
	11/06/19	1.28	±	1.17	4.74	±	4.33	No
	11/13/19	-0.05	±	1.25	-0.20	±	4.63	No
	11/20/19	0.77	±	1.17	2.84	±	4.33	No
	11/27/19	3.48	±	2.52	12.88	±	9.32	No
	12/04/19	-0.28	±	1.01	-1.04	±	3.74	No
	12/11/19	-0.60	±	1.11	-2.22	±	4.11	No
	12/18/19	3.17	±	2.52	11.73	±	9.32	No
	12/24/19	3.85	±	2.46	14.25	±	9.10	No
	12/31/19	0.54	±	2.39	2.00	±	8.84	No
SUGAR CITY	10/02/19	-1.09	±	0.95	-4.03	±	3.53	No
	10/09/19	-1.36	±	1.00	-5.03	±	3.70	No
	10/16/19	0.14	±	3.23	0.53	±	11.95	No
	10/23/19	1.14	±	1.73	4.22	±	6.40	No
	10/30/19	-0.41	±	1.79	-1.51	±	6.62	No
	11/06/19	-2.68	±	1.21	-9.92	±	4.48	No
	11/13/19	1.84	±	1.91	6.81	±	7.07	No
	11/20/19	4.08	±	1.90	15.10	±	7.03	No
	11/27/19	3.48	±	1.80	12.88	±	6.66	No
	12/04/19	-1.07	±	1.01	-3.96	±	3.74	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	12/11/19	-1.82	±	1.95	-6.73	±	7.22	No
	12/18/19	-0.69	±	1.27	-2.56	±	4.70	No
	12/24/19	-0.87	±	2.27	-3.22	±	8.40	No
	12/31/19	0.87	±	1.88	3.21	±	6.96	No
INL SITE								
EFS	10/02/19	-1.05	±	0.96	-3.89	±	3.56	No
	10/09/19	-0.96	±	1.05	-3.55	±	3.89	No
	10/16/19	-0.84	±	1.06	-3.09	±	3.92	No
	10/23/19	1.78	±	1.06	6.59	±	3.92	No
	10/30/19	1.21	±	1.18	4.48	±	4.37	No
	11/06/19	1.54	±	1.40	5.70	±	5.18	No
	11/13/19	-0.05	±	1.18	-0.19	±	4.37	No
	11/20/19	0.70	±	1.07	2.60	±	3.96	No
	11/27/19	2.76	±	2.00	10.21	±	7.40	No
	12/04/19	-0.30	±	1.08	-1.11	±	4.00	No
	12/11/19	-0.54	±	0.99	-1.98	±	3.68	No
	12/18/19	3.17	±	2.52	11.73	±	9.32	No
	12/24/19	4.05	±	2.58	14.99	±	9.55	No
	12/31/19	0.52	±	2.29	1.92	±	8.47	No
MAIN GATE	10/02/19	-1.11	±	1.01	-4.11	±	3.74	No
	10/09/19	-0.91	±	1.00	-3.37	±	3.69	No
	10/16/19	-0.78	±	0.99	-2.88	±	3.67	No
	10/23/19	1.61	±	0.96	5.96	±	3.55	No
	10/30/19	1.16	±	1.13	4.29	±	4.18	No
	11/06/19	1.42	±	1.30	5.25	±	4.81	No
	11/13/19	-0.05	±	1.19	-0.19	±	4.40	No
	11/20/19	0.72	±	1.10	2.66	±	4.07	No
	11/27/19	2.50	±	1.81	9.25	±	6.70	No
	12/04/19	-0.32	±	1.14	-1.18	±	4.22	No
	12/11/19	-0.47	±	0.87	-1.74	±	3.23	No
	12/18/19	3.28	±	2.61	12.14	±	9.66	No
	12/24/19	3.45	±	2.20	12.77	±	8.14	No
	12/31/19	0.49	±	2.15	1.80	±	7.96	No
VAN BUREN GATE	10/02/19	-1.18	±	1.08	-4.37	±	4.00	No
	10/09/19	-0.94	±	1.03	-3.49	±	3.81	No
	10/16/19	-0.80	±	1.02	-2.95	±	3.77	No
	10/23/19	1.66	±	0.99	6.14	±	3.65	No
	10/30/19	1.19	±	1.16	4.40	±	4.29	No
	11/06/19	1.38	±	1.26	5.11	±	4.66	No
	11/13/19	-0.05	±	1.23	-0.19	±	4.55	No
	11/20/19	0.69	±	1.05	2.54	±	3.89	No
	11/27/19	2.87	±	2.09	10.62	±	7.73	No
	12/04/19	-0.31	±	1.10	-1.14	±	4.07	No
	12/11/19	-0.55	±	1.01	-2.02	±	3.74	No
	12/18/19	3.09	±	2.46	11.43	±	9.10	No
	12/24/19	4.23	±	2.69	15.65	±	9.95	No
	12/31/19	0.54	±	2.39	2.01	±	8.84	No

a. Invalid sample result shown in red

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 (x 10^{-18} µCi/mL)			Result ± 1s Uncertainty (x 10^{-14} Bq/mL)			Result > 3s
BOUNDARY									
ARCO	12/31/2019	CESIUM-137	-100.00	±	72.70	-370.00	±	268.99	No
		STRONTIUM-90	-7.77	±	8.72	-28.75	±	32.26	No
ATOMIC CITY	12/31/2019	AMERICIUM-241	1.19	±	0.84	4.40	±	3.11	No
		CESIUM-137	25.80	±	100.00	95.46	±	370.00	No
		PLUTONIUM-238	-0.46	±	1.04	-1.68	±	3.85	No
		PLUTONIUM-239/240	0.45	±	0.99	1.68	±	3.66	No
QA-1 (ATOMIC CITY)	12/31/2019	AMERICIUM-241	0.74	±	1.28	2.73	±	4.74	No
		CESIUM-137	-25.00	±	91.10	-92.50	±	337.07	No
		PLUTONIUM-238	-0.11	±	0.66	-0.42	±	2.45	No
		PLUTONIUM-239/240	-0.23	±	0.71	-0.84	±	2.62	No
BLUE DOME	12/31/2019	CESIUM-137	-94.10	±	91.80	-348.17	±	339.66	No
		STRONTIUM-90	-9.32	±	5.33	-34.48	±	19.72	No
QA-2 (BLUE DOME)	12/31/2019	CESIUM-137	-4.13	±	99.00	-15.28	±	366.30	No
		STRONTIUM-90	-3.71	±	6.90	-13.73	±	25.53	No
FAA TOWER	12/31/2019	AMERICIUM-241	0.57	±	0.63	2.09	±	2.31	No
		CESIUM-137	21.80	±	90.50	80.66	±	334.85	No
		PLUTONIUM-238	0.61	±	0.59	2.26	±	2.19	No
		PLUTONIUM-239/240	1.22	±	0.85	4.51	±	3.14	No
HOWE	12/31/2019	CESIUM-137	18.30	±	69.70	67.71	±	257.89	No
MONTEVIEW	12/31/2019	CESIUM-137	-169.00	±	91.80	-625.30	±	339.66	No
		STRONTIUM-90	26.90	±	10.60	99.53	±	39.22	No
MUD LAKE	12/31/2019	CESIUM-137	-37.70	±	89.40	-139.49	±	330.78	No
DISTANT									
BLACKFOOT	12/31/2019	CESIUM-137	-1.47	±	88.50	-5.44	±	327.45	No
CRATERS	12/31/2019	AMERICIUM-241	1.40	±	0.93	5.18	±	3.45	No
		CESIUM-137	-36.80	±	81.70	-136.16	±	302.29	No
		PLUTONIUM-238	0.31	±	0.76	1.13	±	2.82	No
		PLUTONIUM-239/240	-0.61	±	0.92	-2.25	±	3.42	No
DUBOIS	12/31/2019	CESIUM-137	-190.00	±	105.00	-703.00	±	388.50	No
IDAHO FALLS	12/31/2019	CESIUM-137	-11.30	±	73.40	-41.81	±	271.58	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 ($x 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($x 10^{-14}$ Bq/mL)			Result > 3s
JACKSON	12/31/2019	AMERICIUM-241	0.18	±	0.48	0.68	±	1.79	No
		CESIUM-137	5.72	±	104.00	21.16	±	384.80	No
		PLUTONIUM-238	-0.12	±	0.77	-0.45	±	2.84	No
		PLUTONIUM-239/240	0.73	±	0.65	2.69	±	2.41	No
SUGAR CITY	12/31/2019	CESIUM-137	-116.00	±	70.90	-429.20	±	262.33	No
		STRONTIUM-90	1.47	±	7.48	5.44	±	27.68	No
INL SITE									
EFS	12/31/2019	CESIUM-137	-162.00	±	75.50	-599.40	±	279.35	No
		STRONTIUM-90	-18.50	±	8.58	-68.45	±	31.75	No
MAIN GATE	12/31/2019	AMERICIUM-241	0.92	±	0.61	3.40	±	2.26	No
		CESIUM-137	-27.20	±	87.30	-100.64	±	323.01	No
		PLUTONIUM-238	-0.13	±	0.78	-0.49	±	2.87	No
		PLUTONIUM-239/240	0.53	±	0.76	1.96	±	2.82	No
VAN BUREN GATE	12/31/2019	CESIUM-137	-8.56	±	89.10	-31.67	±	329.67	No
		STRONTIUM-90	11.30	±	9.16	41.81	±	33.89	No

Table C-4. Tritium Concentrations in Atmospheric Moisture

Sampling Group and Location	Start Date	Sampling Date	Result ± 1s Uncertainty ($x 10^{-13}$ µCi/mL_{air})			Result ± 1s Uncertainty ($x 10^{-9}$ Bq/mL_{air})			Result > 3s
BOUNDARY									
ATOMIC CITY	09/18/19	10/16/19	-0.87	±	1.41	-3.22	±	5.22	No
ATOMIC CITY	10/16/19	12/04/19	2.64	±	0.82	9.77	±	3.04	**Yes**
HOWE	09/18/19	10/16/19	2.75	±	1.44	10.18	±	5.33	No
HOWE	10/16/19	11/27/19	2.57	±	0.84	9.51	±	3.09	**Yes**
DISTANT									
IDAHO FALLS	09/11/19	10/02/19	1.94	±	1.85	7.18	±	6.85	No
IDAHO FALLS	10/02/19	11/13/19	2.88	±	1.02	10.66	±	3.77	No
IDAHO FALLS	11/13/19	12/18/19	3.89	±	1.08	14.39	±	4.00	**Yes**
INL SITE									
EFS	09/18/19	10/09/19	8.24	±	1.59	30.49	±	5.88	**Yes**
EFS	10/09/19	12/04/19	4.85	±	0.72	17.95	±	2.65	**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	09/25/19	10/02/19	102.00	±	25.80	3.77	±	0.95	Yes
ATOMIC CITY	11/20/19	11/27/19	38.80	±	24.60	1.44	±	0.91	No
ATOMIC CITY	11/27/19	12/04/19	44.20	±	25.30	1.64	±	0.94	No
ATOMIC CITY	12/04/19	12/11/19	103.00	±	26.00	3.81	±	0.96	Yes
ATOMIC CITY	12/11/19	12/18/19	78.30	±	24.10	2.90	±	0.89	Yes
ATOMIC CITY	12/18/19	12/24/19	75.00	±	24.10	2.78	±	0.89	Yes
ATOMIC CITY	12/24/19	12/31/19	68.80	±	24.20	2.55	±	0.90	No
HOWE	09/25/19	10/02/19	11.60	±	24.80	0.43	±	0.92	No
HOWE	10/16/19	10/23/19	5.81	±	24.80	0.21	±	0.92	No
HOWE	11/20/19	11/27/19	60.10	±	25.30	2.22	±	0.94	No
HOWE	11/27/19	12/04/19	81.10	±	24.80	3.00	±	0.92	Yes
HOWE	12/04/19	12/11/19	41.50	±	24.30	1.54	±	0.90	No
HOWE	12/18/19	12/24/19	29.70	±	24.10	1.10	±	0.89	No
DISTANT									
IDAHO FALLS	09/30/19	10/31/19	-2.58	±	24.70	-0.10	±	0.91	No
IDAHO FALLS	11/30/19	12/31/19	44.10	±	24.40	1.63	±	0.90	No
INL SITE									
EFS	9/25/2019	10/2/2019	33.60	±	25.40	1.24	±	0.94	No
EFS	10/16/2019	10/23/2019	84.40	±	26.00	3.12	±	0.96	Yes
EFS	11/20/2019	11/27/2019	92.70	±	25.70	3.43	±	0.95	Yes
EFS	11/27/2019	12/4/2019	40.70	±	24.40	1.51	±	0.90	No
EFS	12/4/2019	12/11/2019	44.40	±	24.40	1.64	±	0.90	No
EFS	12/18/2019	12/24/2019	13.90	±	24.10	0.51	±	0.89	No
EFS	12/24/2019	12/31/2019	2.34	±	23.90	0.09	±	0.88	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	11/5/2019	GROSS ALPHA	0.39	±	0.47	0.01	±	0.02	No
		GROSS BETA	6.41	±	0.52	0.24	±	0.02	**Yes**
		TRITIUM	9.11	±	24.10	0.34	±	0.89	No
Alpheus Spring (Duplicate)	11/05/19	GROSS ALPHA	0.93	±	0.36	0.03	±	0.01	No
		GROSS BETA	4.23	±	0.45	0.16	±	0.02	**Yes**
		TRITIUM	-19.70	±	24.50	-0.73	±	0.91	No
Bill Jones, Jr. Trout Farm	11/5/2019	GROSS ALPHA	1.24	±	0.38	0.05	±	0.01	**Yes**
		GROSS BETA	3.80	±	0.45	0.14	±	0.02	**Yes**
		TRITIUM	69.90	±	24.80	2.59	±	0.92	No
Clear Springs	11/5/2019	GROSS ALPHA	0.63	±	0.39	0.02	±	0.01	No
		GROSS BETA	4.24	±	0.46	0.16	±	0.02	**Yes**
		TRITIUM	-0.50	±	23.80	-0.02	±	0.88	No
DRINKING WATER									
Atomic City	11/06/19	GROSS ALPHA	0.60	±	0.34	0.02	±	0.01	No
		GROSS BETA	3.60	±	0.44	0.13	±	0.02	**Yes**
		TRITIUM	50.80	±	25.40	1.88	±	0.94	No
Control	11/07/19	GROSS ALPHA	0.26	±	0.18	0.01	±	0.01	No
		GROSS BETA	0.82	±	0.35	0.03	±	0.01	No
		TRITIUM	7.45	±	23.90	0.28	±	0.89	No
Craters of the Moon	11/06/19	GROSS ALPHA	1.08	±	0.33	0.04	±	0.01	**Yes**
		GROSS BETA	2.38	±	0.41	0.09	±	0.02	**Yes**
		TRITIUM	28.70	±	25.00	1.06	±	0.93	No
Howe	11/06/19	GROSS ALPHA	0.71	±	0.28	0.03	±	0.01	No
		GROSS BETA	1.08	±	0.38	0.04	±	0.01	No
		TRITIUM	36.70	±	25.10	1.36	±	0.93	No
Idaho Falls	11/11/19	GROSS ALPHA	0.63	±	0.42	0.02	±	0.02	No
		GROSS BETA	3.42	±	0.45	0.13	±	0.02	**Yes**
		TRITIUM	1.62	±	24.60	0.06	±	0.91	No
Minidoka	11/05/19	GROSS ALPHA	1.86	±	0.43	0.07	±	0.02	**Yes**
		GROSS BETA	3.01	±	0.45	0.11	±	0.02	**Yes**
		TRITIUM	33.90	±	25.00	1.26	±	0.93	No
Mud Lake	11/04/19	GROSS ALPHA	0.46	±	0.26	0.02	±	0.01	No
		GROSS BETA	3.91	±	0.41	0.14	±	0.02	**Yes**
		TRITIUM	88.80	±	26.00	3.29	±	0.96	**Yes**
Rest Area	11/06/19	GROSS ALPHA	0.99	±	0.35	0.04	±	0.01	No
		GROSS BETA	3.05	±	0.41	0.11	±	0.02	**Yes**
		TRITIUM	101.00	±	27.00	3.74	±	1.00	**Yes**
Shoshone	11/05/19	GROSS ALPHA	1.90	±	0.41	0.07	±	0.02	**Yes**
		GROSS BETA	3.34	±	0.44	0.12	±	0.02	**Yes**
		TRITIUM	26.00	±	24.20	0.96	±	0.90	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	10/07/19	0.17	±	2.39	0.01	±	0.09	No	-0.45	±	1.90	-0.02	±	0.07	No
CONTROL	10/01/19	-0.05	±	2.34	0.00	±	0.09	No	-0.47	±	1.83	-0.02	±	0.07	No
	11/04/19	0.99	±	2.36	0.04	±	0.09	No	0.88	±	1.92	0.03	±	0.07	No
	12/04/19	2.46	±	2.19	0.09	±	0.08	No	0.29	±	1.84	0.01	±	0.07	No
DIETRICH	10/01/19	-0.58	±	1.17	-0.02	±	0.04	No	0.49	±	0.99	0.02	±	0.04	No
	11/05/19	0.77	±	1.25	0.03	±	0.05	No	0.00	±	0.93	0.00	±	0.03	No
	12/03/19	0.55	±	1.24	0.02	±	0.05	No	-0.04	±	1.01	0.00	±	0.04	No
Duplicate	12/07/19	-0.65	±	2.51	-0.02	±	0.09	No	-3.42	±	1.99	-0.13	±	0.07	No
HOWE	10/01/19	-1.79	±	1.27	-0.07	±	0.05	No	0.73	±	1.01	0.03	±	0.04	No
	11/04/19	0.33	±	1.77	0.01	±	0.07	No	-2.52	±	1.48	-0.09	±	0.05	No
	12/03/19	1.52	±	2.21	0.06	±	0.08	No	-0.87	±	1.90	-0.03	±	0.07	No
IDAHO FALLS	10/01/19	2.68	±	1.72	0.10	±	0.06	No	-1.03	±	1.49	-0.04	±	0.06	No
	10/08/19	0.85	±	0.87	0.03	±	0.03	No	1.32	±	0.90	0.05	±	0.03	No
	10/15/19	-0.44	±	1.58	-0.02	±	0.06	No	-2.48	±	1.58	-0.09	±	0.06	No
	10/22/19	2.00	±	1.57	0.07	±	0.06	No	1.12	±	1.46	0.04	±	0.05	No
	10/29/19	-3.72	±	1.78	-0.14	±	0.07	No	-0.82	±	1.47	-0.03	±	0.05	No
	11/05/19	-0.01	±	0.83	0.00	±	0.03	No	0.46	±	0.88	0.02	±	0.03	No
	11/12/19	1.66	±	1.63	0.06	±	0.06	No	1.37	±	1.49	0.05	±	0.06	No
	11/20/19	2.93	±	1.50	0.11	±	0.06	No	-0.45	±	1.40	-0.02	±	0.05	No
	11/26/19	0.84	±	1.60	0.03	±	0.06	No	-0.54	±	1.44	-0.02	±	0.05	No
	12/04/19	0.95	±	0.81	0.04	±	0.03	No	-0.22	±	0.88	-0.01	±	0.03	No
	12/10/19	1.39	±	1.53	0.05	±	0.06	No	-0.37	±	1.45	-0.01	±	0.05	No
	12/17/19	3.50	±	1.65	0.13	±	0.06	No	0.29	±	1.43	0.01	±	0.05	No
	12/26/19	-3.91	±	2.44	-0.14	±	0.09	No	0.09	±	1.50	0.00	±	0.06	No
	12/31/19	1.19	±	1.10	0.04	±	0.04	No	0.29	±	1.01	0.01	±	0.04	No
MINIDOKA	10/01/19	-0.16	±	0.89	-0.01	±	0.03	No	2.58	±	0.92	0.10	±	0.03	No
	11/05/19	0.89	±	0.90	0.03	±	0.03	No	-0.46	±	0.86	-0.02	±	0.03	No
	12/03/19	1.85	±	1.73	0.07	±	0.06	No	0.53	±	1.38	0.02	±	0.05	No
TERRETON	10/01/19	0.84	±	0.90	0.03	±	0.03	No	0.02	±	0.86	0.00	±	0.03	No
Duplicate	10/01/19	1.02	±	1.41	0.04	±	0.05	No	-0.68	±	0.99	-0.03	±	0.04	No
	10/09/19	1.93	±	1.54	0.07	±	0.06	No	-3.99	±	1.67	-0.15	±	0.06	No
	10/16/19	1.47	±	1.98	0.05	±	0.07	No	-0.25	±	1.87	-0.01	±	0.07	No
	10/23/19	2.49	±	1.14	0.09	±	0.04	No	1.18	±	1.01	0.04	±	0.04	No
	10/30/19	0.77	±	1.05	0.03	±	0.04	No	-0.19	±	0.96	-0.01	±	0.04	No
	11/06/19	-1.73	±	1.64	-0.06	±	0.06	No	2.29	±	1.42	0.08	±	0.05	No
	11/13/19	-1.79	±	1.99	-0.07	±	0.07	No	-1.69	±	1.95	-0.06	±	0.07	No
	11/21/19	0.12	±	0.98	0.00	±	0.04	No	0.79	±	1.00	0.03	±	0.04	No
	11/27/19	0.40	±	0.95	0.01	±	0.04	No	0.67	±	1.02	0.02	±	0.04	No
	12/03/19	-0.31	±	1.59	-0.01	±	0.06	No	0.25	±	1.48	0.01	±	0.05	No
	12/11/19	-1.74	±	1.10	-0.06	±	0.04	No	0.55	±	0.98	0.02	±	0.04	No
	12/18/19	5.87	±	2.19	0.22	±	0.08	No	-1.81	±	1.96	-0.07	±	0.07	No
	12/24/19	-0.23	±	1.49	-0.01	±	0.06	No	-0.22	±	1.50	-0.01	±	0.06	No
	12/31/19	1.41	±	1.96	0.05	±	0.07	No	-3.63	±	2.00	-0.13	±	0.07	No

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

Location	Sampling Date	Strontium-90						
		Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty ($x10^{-2}$ Bq/L)			Result > 3s
CONTROL	11/04/19	0.104	±	0.041	0.39	±	0.15	No
DIETRICH	11/05/19	0.098	±	0.033	0.36	±	0.12	No
HOWE	11/04/19	0.027	±	0.040	0.10	±	0.15	No
IDAHO FALLS	11/05/19	-0.013	±	0.082	-0.05	±	0.30	No
MINIDOKA	11/05/19	0.053	±	0.036	0.20	±	0.13	No
TERRETON	11/06/19	0.268	±	0.088	0.99	±	0.33	**Yes**
		Tritium						
		Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
CONTROL	11/04/19	0.67	±	23.80	0.02	±	0.88	No
DIETRICH	11/05/19	22.50	±	24.30	0.83	±	0.90	No
HOWE	11/04/19	55.60	±	24.40	2.06	±	0.90	No
IDAHO FALLS	11/05/19	16.60	±	24.30	0.61	±	0.90	No
MINIDOKA	11/05/19	69.20	±	24.90	2.56	±	0.92	No
TERRETON	11/06/19	55.70	±	24.70	2.06	±	0.91	No

Table C-9. Cesium-137 and Strontium-90 Concentrations in Potatoes

Location	Sampling Date	Cesium-137 Result ± 1s Uncertainty pCi/kg			Result ± 1s Uncertainty ($x 10^{-2}$ Bq/kg)			Result > 3s
ARCO	10/2/2019	-0.10	±	1.09	-0.37	±	4.03	No
CONTROL	10/29/2019	0.29	±	1.69	1.08	±	6.27	No
IDAHO FALLS	9/26/2019	-1.13	±	1.17	-4.20	±	4.33	No
MUD LAKE	10/2/2019	0.30	±	1.08	1.11	±	4.02	No
FORT HALL	10/5/2019	1.57	±	1.64	5.81	±	6.07	No
REXBURG	10/8/2019	0.40	±	1.60	1.50	±	5.93	No
REXBURG (DUPLICATE)	10/8/2019	-2.68	±	1.10	-9.93	±	4.08	No
RUPERT	10/1/2019	-0.39	±	1.64	-1.45	±	6.09	No
SHELLEY	9/23/2019	-0.33	±	1.01	-1.22	±	3.75	No
		Strontium-90						
		Result ± 1s Uncertainty pCi/kg			**Result ± 1s Uncertainty ($x 10^{-2}$ Bq/kg)**			**Result > 3s**
ARCO	10/2/2019	30.80	±	13.10	114.07	±	48.52	No
CONTROL	10/29/2019	-9.47	±	10.90	-35.07	±	40.37	No
IDAHO FALLS	9/26/2019	17.20	±	17.00	63.70	±	62.96	No
MUD LAKE	10/2/2019	-22.30	±	10.40	-82.59	±	38.52	No
FORT HALL	10/5/2019	-24.70	±	10.40	-91.48	±	38.52	No
REXBURG	10/8/2019	26.30	±	10.50	97.41	±	38.89	No
REXBURG (DUPLICATE)	10/8/2019	2.24	±	16.90	8.30	±	62.59	No
RUPERT	10/1/2019	-0.48	±	9.70	-1.77	±	35.93	No
SHELLEY	9/23/2019	-45.90	±	16.60	-170.00	±	61.48	No

Table C-10. Actinide, Gamma-emitting Radionuclide, and Strontium-90 Concentrations in Edible Tissues of Waterfowl

Location	Sampling Date	Analyte	Result pCi/kg	±	Uncertainty(1s) pCi/kg	Result ($x 10^{-2}$) Bq/kg	±	Uncertainty(1s) ($x 10^{-2}$) Bq/kg	Result > 3s
ATR Complex	10/4/2019								
		AMERICIUM-241	2.09	±	1.84	7.74	±	6.81	No
		CESIUM-137	41.30	±	8.20	152.96	±	30.37	Yes
		CHROMIUM-51	4.06	±	112.00	15.04	±	414.81	No
		COBALT-60	81.60	±	6.07	302.22	±	22.48	Yes
		PLUTONIUM-238	-0.36	±	2.12	-1.35	±	7.85	No
		PLUTONIUM-239/240	1.45	±	1.66	5.37	±	6.15	No
		STRONTIUM-90	-1.34	±	2.94	-4.96	±	10.89	No
		ZINC-65	50.90	±	11.40	188.52	±	42.22	Yes
ATR Complex	10/4/2019								
		AMERICIUM-241	-2.35	±	2.55	-8.70	±	9.44	No
		CESIUM-137	171.00	±	17.20	633.33	±	63.70	Yes
		CHROMIUM-51	21.00	±	157.00	77.78	±	581.48	No
		COBALT-60	300.00	±	10.50	1111.11	±	38.89	Yes
		PLUTONIUM-238	3.51	±	1.74	13.00	±	6.44	No
		PLUTONIUM-239/240	2.72	±	1.65	10.07	±	6.11	No
		STRONTIUM-90	28.00	±	4.24	103.70	±	15.70	Yes
		ZINC-65	276.00	±	27.40	1022.22	±	101.48	Yes
ATR Complex	10/12/2019								
		AMERICIUM-241	1.14	±	1.49	4.22	±	5.52	No
		CESIUM-137	46.80	±	7.95	173.33	±	29.44	Yes
		CHROMIUM-51	-130.00	±	87.20	-481.48	±	322.96	No
		COBALT-60	9.93	±	2.97	36.78	±	11.00	Yes
		PLUTONIUM-238	4.43	±	3.63	16.41	±	13.44	No
		PLUTONIUM-239/240	-1.65	±	4.54	-6.11	±	16.81	No
		STRONTIUM-90	3.53	±	1.57	13.07	±	5.81	No
		ZINC-65	17.50	±	9.89	64.81	±	36.63	No
ATR Complex	10/12/2019								
		AMERICIUM-241	7.68	±	3.13	28.44	±	11.59	No
		CESIUM-137	3.49	±	3.47	12.93	±	12.85	No
		CHROMIUM-51	-140.00	±	81.50	-518.52	±	301.85	No
		COBALT-60	2.42	±	2.28	8.96	±	8.44	No
		PLUTONIUM-238	3.74	±	2.93	13.85	±	10.85	No
		PLUTONIUM-239/240	0.53	±	3.19	1.97	±	11.81	No
		STRONTIUM-90	-1.99	±	1.66	-7.37	±	6.15	No
		ZINC-65	-10.70	±	8.04	-39.63	±	29.78	No
Control	10/20/2019			±		0.00	±	0.00	No
		AMERICIUM-241	4.63	±	1.38	17.15	±	5.11	Yes
		CESIUM-137	0.95	±	4.24	3.51	±	15.70	No
		CHROMIUM-51	134.00	±	116.00	496.30	±	429.63	No
		COBALT-60	2.63	±	2.94	9.74	±	10.89	No
		PLUTONIUM-238	0.69	±	1.73	2.56	±	6.41	No
		PLUTONIUM-239/240	-3.78	±	2.23	-14.00	±	8.26	No
		STRONTIUM-90	4.13	±	1.78	15.30	±	6.59	No
		ZINC-65	-9.85	±	9.93	-36.48	±	36.78	No
Control	11/29/2019								
		AMERICIUM-241	6.33	±	2.05	23.44	±	7.59	Yes
		CESIUM-137	5.35	±	3.36	19.81	±	12.44	No
		CHROMIUM-51	-118.00	±	78.60	-437.04	±	291.11	No
		COBALT-60	-4.36	±	2.05	-16.15	±	7.59	No
		PLUTONIUM-238	1.88	±	1.82	6.96	±	6.74	No
		PLUTONIUM-239/240	-0.93	±	2.68	-3.46	±	9.93	No
		STRONTIUM-90	7.97	±	2.95	29.52	±	10.93	No
		ZINC-65	-7.52	±	6.74	-27.85	±	24.96	No

Table C-11. Environmental Radiation Measurements Using OSLDs

Location	Start Date	End Date	Radiation Measurement ± 2s Uncertainty mrem			Dose mrem/day
BOUNDARY						
ARCO	05/08/19	11/06/19	69.00	±	3.45	0.38
ATOMIC CITY	05/08/19	11/06/19	71.75	±	3.59	0.39
BIRCH CREEK	05/08/19	11/06/19	61.40	±	3.08	0.34
BLUE DOME	05/08/19	11/06/19	60.15	±	3.01	0.33
HOWE	05/08/19	11/06/19	64.60	±	3.23	0.36
MONTEVIEW	05/08/19	11/06/19	68.05	±	3.41	0.37
MUD LAKE	05/08/19	11/04/19	69.50	±	3.48	0.39
Boundary Average			**66.35**			**0.37**
DISTANT						
ABERDEEN	05/07/19	11/08/19	73.30	±	3.67	0.40
BLACKFOOT	05/16/19	11/06/19	62.05	±	3.10	0.36
CRATERS	05/08/19	11/06/19	68.65	±	3.44	0.38
DUBOIS	05/08/19	11/06/19	60.85	±	3.05	0.33
IDAHO FALLS	05/08/19	11/06/19	73.25	±	3.66	0.40
JACKSON	05/10/19	11/12/19	63.10	±	3.16	0.34
MINIDOKA	05/07/19	11/08/19	63.10	±	3.16	0.34
ROBERTS	05/07/19	11/04/19	74.85	±	3.75	0.41
SUGAR CITY	05/08/19	11/06/19	82.50	±	4.13	0.45
Distant Average			**69.07**			**0.38**

Table C-12. Environmental Radiation Measurements Using TLDs (Second Quarter 2019)

Location	Start Date	End Date	Radiation Measurement ± 2s Uncertainty mR			Exposure mR/day
BOUNDARY						
ARCO	11/07/18	05/08/19	59.10	±	11.60	0.32
ATOMIC CITY	11/07/18	05/08/19	61.90	±	12.10	0.34
BIRCH CREEK	11/07/18	05/08/19	55.10	±	10.80	0.30
BLUE DOME	11/07/18	05/08/19	50.60	±	9.92	0.28
HOWE	11/07/18	05/08/19	59.60	±	11.70	0.33
MONTEVIEW	11/07/18	05/08/19	61.30	±	12.00	0.34
MUD LAKE	11/07/18	05/08/19	64.00	±	12.50	0.35
Boundary Average			**58.80**			**0.32**
DISTANT						
ABERDEEN	11/08/18	05/07/19	61.70	±	12.10	0.34
BLACKFOOT	11/07/18	05/16/19	58.30	±	11.40	0.30
CRATERS	11/07/18	05/08/19	54.70	±	10.70	0.28
DUBOIS	11/07/18	05/08/19	50.70	±	9.95	0.34
IDAHO FALLS	11/07/18	05/08/19	61.40	±	12.00	0.30
JACKSON	11/09/18	05/10/19	53.90	±	10.60	0.31
MINIDOKA	11/06/18	05/07/19	56.40	±	11.00	0.31
ROBERTS	11/05/18	05/07/19	64.30	±	12.60	0.35
SUGAR CITY	11/07/18	05/08/19	72.80	±	14.30	0.40
Distant Average			**59.36**			**0.32**

Table C-13. Environmental Radiation Measurements Using TLDs (Fourth Quarter 2019)

Location	Start Date	End Date	Radiation Measurement ± 2s Uncertainty mR			Exposure mR/day
BOUNDARY						
ARCO	05/08/19	11/06/19	62.80	±	12.30	0.34
ATOMIC CITY	05/08/19	11/06/19	70.20	±	13.80	0.39
BIRCH CREEK	05/08/19	11/06/19	57.90	±	11.40	0.32
BLUE DOME	05/08/19	11/06/19	54.20	±	10.60	0.30
HOWE	05/08/19	11/06/19	62.90	±	12.30	0.35
MONTEVIEW	05/08/19	11/06/19	64.40	±	12.60	0.35
MUD LAKE	05/08/19	11/04/19	69.30	±	13.60	0.39
Boundary Average			**63.10**			**0.35**
DISTANT						
ABERDEEN	05/07/19	11/08/19	65.30	±	12.80	0.35
BLACKFOOT	05/16/19	11/06/19	57.50	±	11.30	0.36
CRATERS	05/08/19	11/06/19	65.50	±	12.80	0.32
DUBOIS	05/08/19	11/06/19	58.10	±	11.40	0.36
IDAHO FALLS	05/08/19	11/06/19	65.70	±	12.90	0.35
JACKSON	05/10/19	11/12/19	64.40	±	12.60	0.35
MINIDOKA	05/07/19	11/08/19	65.30	±	12.80	0.33
ROBERTS	05/07/19	11/04/19	68.30	±	13.40	0.38
SUGAR CITY	05/08/19	11/06/19	83.20	±	16.30	0.46
Distant Average			**65.92**			**0.36**

APPENDIX D

STATISTICAL ANALYSIS RESULTS

Table D-1. Results of the Kruskal-Wallis statistical test between INL Site, Boundary, and Distant sample groups by quarter and by month.

Gross Alpha					
Quarter	Valid N	Sum of ranks	Mean rank	H[a]	*p*[b]
Boundary	97	10613.00	109.4124		
Distant	83	9859.00	118.7831	2.102463	0.3495
INL Site	42	4281.00	101.9286		
October	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	35	1311.500	37.47143		
Distant	30	1456.500	48.55000	6.463379	0.0395
INL Site	12	472.000	31.46667		
November	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	27	875.0000	32.40741		
Distant	24	756.0000	31.50000	0.0314580	0.9844
INL Site	12	385.0000	32.08333		
December	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	35	1382.000	39.48571		
Distant	29	1170.500	40.36207	0.0319175	0.9842
INL Site	15	607.500	40.50000		
Gross Beta					
Quarter	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	97	11220.00	115.6701		
Distant	83	8385.00	101.0241	3.864905	0.1448
INL Site	42	5148.00	122.5714		
October	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	35	1501.000	42.88571		
Distant	30	1108.000	36.93333	1.144051	0.5644
INL Site	12	631.000	42.06667		
November	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	27	843.5000	31.24074		
Distant	24	669.5000	27.89583	4.762890	0.0924
INL Site	12	503.0000	41.91667		
December	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	35	1535.000	43.85714		
Distant	29	972.500	33.53448	3.640017	0.1620
INL Site	15	652.500	43.50000		

a. H = 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 fourth 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 (4th -Qtr-19-LVf in 4th-Qtr-2019-Trial3)
Independent (grouping) variable: GeographicName
Kruskal-Wallis test: H (15, N= 222) =25.83930 p =.0398
Include condition: v8='gross alpha'

Depend.: Coded Result	**Arco R:119.54**	Atomic City R:107.85	Blue Dome R:61.964	FAA Tower R:101.00	Howe R:114.43	Monteview R:113.61	Mud Lake R:147.39	Blackfoot R:129.43	Craters of the Moon R:86.462	Dubois R:99.929	Idaho Falls R:128.46	Jackson WY R:153.43	Sugar City R:112.68	EFS R:103.71	Main Gate R:113.43	Van Buren R:88.643
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
Blue Dome	1.000000	1.000000		1.000000	1.000000	1.000000	0.051990	0.654369	1.000000	1.000000	0.738944	0.019781	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
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	0.051990	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	0.654369	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	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	0.814910	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	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Idaho Falls	1.000000	1.000000	0.738944	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000
Jackson WY	1.000000	1.000000	0.019781	1.000000	1.000000	1.000000	1.000000	1.000000	0.814910	1.000000	1.000000		1.000000	1.000000	1.000000	0.913909
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
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
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
Van Buren	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.913909	1.000000	1.000000	1.000000	

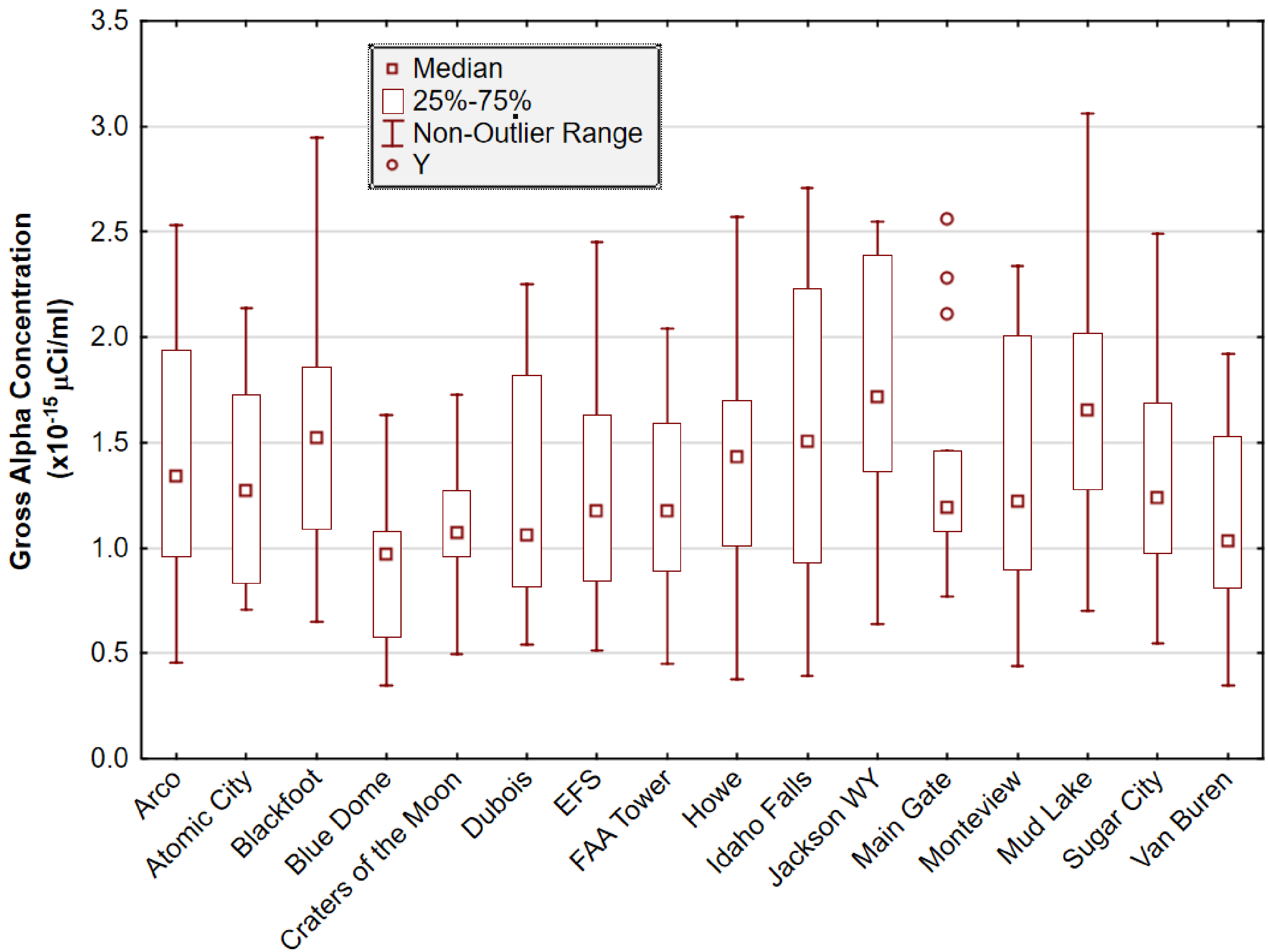

Figure D-1. Fourth quarter gross alpha concentrations in air at all sampling locations. Number of samples (N) = 13 at each location.

Table D-3. Results of multiple comparisons of gross beta results between locations during the fourth 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.

All Groups
Multiple Comparisons p values (2-tailed); Coded Result (4th -Qtr-19-LVf in 4th-Qtr-2019-Trial3)
Independent (grouping) variable: GeographicName
Kruskal-Wallis test: H (15, N= 222) =10.37089 p =.7958
Include condition: v8='gross beta'

Depend.: Coded Result	**Arco R:127.25**	Atomic City R:127.04	Blue Dome R:88.643	FAA Tower R:113.39	Howe R:113.18	Monteview R:106.89	Mud Lake R:134.11	Blackfoot R:110.86	Craters of the Moon R:96.423	Dubois R:98.571	Idaho Falls R:114.79	Jackson WY R:95.500	Sugar City R:89.679	EFS R:119.61	Main Gate R:120.89	Van Buren R:127.21
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
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
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
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
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
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	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Idaho Falls	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
Jackson WY	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
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
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
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	