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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report:

First Quarter 2020

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EXECUTIVE SUMMARY

None of the radionuclides detected in samples collected during the first quarter of 2020 could be directly linked with INL Site activities. Levels of detected radionuclides were no different than values measured historically or at other locations across the western United States. All detected radionuclide concentrations were well below standards set by the U.S. Department of Energy (DOE) and regulatory standards established by the U.S. Environmental Protection Agency (EPA) for protection of the public.

This report for the first quarter of 2020 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, January 1 through March 31, 2020. All sample types (media) and the sampling schedule followed during 2020 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
- Milk

Table ES-1. Summary of Results for the First Quarter of 2020.

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were no statistically significant differences in monthly and quarterly gross alpha, however, statistically significant differences were determined for gross beta concentrations measured at Distant, Boundary, and INL Site sampling locations for the quarter and the month of January. The differences can be attributed to significantly lower results measured at some Distant locations during January. 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, ^{90}Sr, actinides (americium and plutonium)	No human-made gamma-emitters or ^{90}Sr, ^{241}Am, ^{238}Pu, and $^{239/249}$Pu were measured in any quarterly composited sample.
	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	Two of eight results showed tritium concentrations greater than the 3s uncertainty during the quarter. No sample result exceeded the 99%/95% UTL or the DCS for tritium in air.
Precipitation	Liquid	Tritium	Ten of 22 results were greater than the 3s uncertainty. All results were below the 99%/95% UTL and were consistent with those reported across the region by the Environmental Protection Agency and the INL Oversight Program.
Milk	Liquid	Iodine-131, other gamma-emitting radionuclides	Forty-two milk samples were collected at seven locations (including duplicate samples and the offsite control sample from Colorado). No sample result exceeded 3s.

LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission
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
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
NRTS	National Reactor Testing Station
ORAU	Oak Ridge Associated Universities
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 established 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 established 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 2020, environmental monitoring within the INL Site boundaries is primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors. The ESER Program focuses on surveillance off the INL Site and is managed by Veolia Nuclear Solutions-Federal Services (VNSFS).

This report contains monitoring results from the ESER Program for samples collected during the first quarter of 2020 (January 1- March 31, 2020).

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

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

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

Environmental samples collected include:

- air at 16 locations on and around the INL Site
- atmospheric moisture at one INL Site location and at three locations off the INL Site
- precipitation collected at the same four locations sampled for atmospheric moisture
- drinking water collected from eight locations off the INL Site
- surface water collected from three springs located downgradient of the INL Site and from five locations along the Big Lost River, when it is flowing, on the INL Site
- agricultural products, including milk at six dairies around the INL Site, potatoes from at least seven local producers, alfalfa from three locations off the INL Site, 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 bats, big game (pronghorn, mule deer, and elk) and waterfowl sampled from the INL Site.

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

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

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

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

Once samples have been collected and analyzed, the ESER Program has the responsibility for quality control of the data, entry into the ESER database, and reporting in quarterly reports. The quarterly reports are then consolidated into the INL Site Environmental Report for each calendar year. These annual reports also include 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). 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 2010-2019) 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 multiprogram national laboratories. Battelle Energy Alliance, LLC, is responsible for the management and operations of the INL.

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

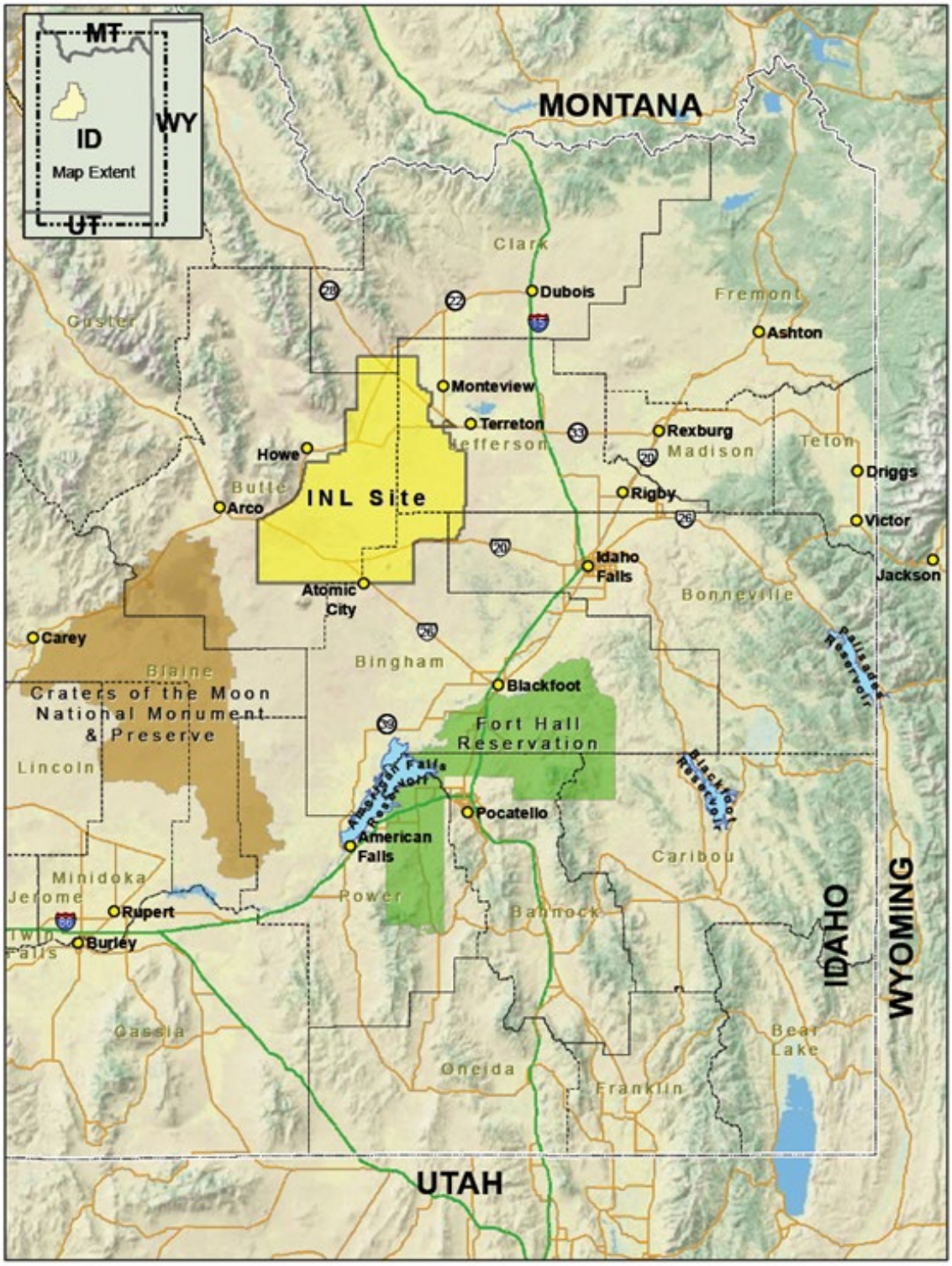

Figure 1. Location of the Idaho National Laboratory Site.

3. AIR SAMPLING

The primary pathway by which radionuclides can move off the INL Site is through the air and for this reason the air pathway is the primary focus of monitoring on and around the INL Site. Samples for particulates and iodine-131 (^{131}I) gas in air were collected weekly for the duration of the quarter at 16 locations using low-volume air samplers. Moisture in the atmosphere was sampled at four locations around the INL Site and analyzed for tritium. Air sampling activities and results for the first quarter of 2020 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 first quarter of 2020 (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 2020, one replicate sampler was moved to Arco (a Boundary location) and one was moved to Mud Lake (also a Boundary location). An average of 20,215 ft^3 (572 m^3) of air was sampled at each location, each week, at an average flow rate of 2.02 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.

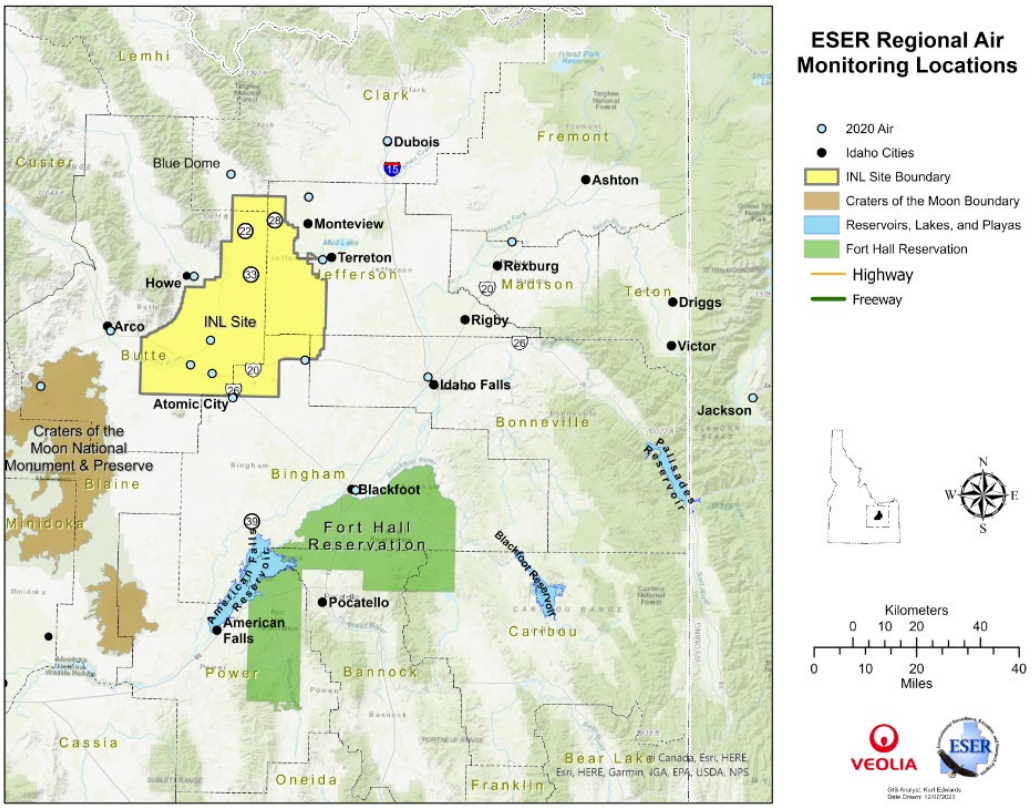

Figure 2. ESER air monitoring locations.

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. Mud Lake had an invalid sample result due to a low total air volume (less than 7,000 ft^3). The sample collected at Mud Lake on February 26, 2020 had a low total air volume due to a tripped circuit breaker. Gross alpha concentrations measured during the quarter in individual samples ranged from a low of $(-3.2 \pm 1.6) \times 10^{-16}$ µCi/ml collected at Blue Dome on February 5, 2020, to a high of $(2.3 \pm 0.24) \times 10^{-15}$ µCi/ml collected at QA-1 (Arco) on January 8, 2020. All results were less than the Derived Concentration Guide (DCG) of 3.4×10^{-14} µCi/ml for ^{239}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. The UTL was determined using ten years of historical data (measured from 2010 through 2019) 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 first 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. No differences were determined (Table D-2).

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 x 10^{-11} µCi/ml for ^{90}Sr. In addition, the results were consistent with historical data, as represented by the 99%/95% UTL for gross beta activity (6.3 x 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.

The Kruskal-Wallis analysis of variance by ranks test determined there were statistically significant differences in the gross beta data for the quarter and for the month of January (Table D-1). The results are statistically different due to the lower concentrations measured at the distant locations during the month of January (Table D-3).

Iodine-131 was not detected in any of the 24 sets of charcoal cartridges measured during the first quarter. Weekly ^{131}I results for each location are listed in Table C-2.

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

ATMOSPHERIC MOISTURE SAMPLING

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

Results were available for eight atmospheric moisture samples collected at the INL Site, Boundary, and Distant locations during the first quarter of 2020. Two of the concentrations exceeded the 3s uncertainty level for tritium, with a maximum reported value of (3.3 ± 0.8) x 10^{-13} µCi/ml$_{air}$ at Howe. Results are similar to those reported during the past ten years (2010-2019) and none exceed the 99%/95% UTL of 1.61 x 10^{-12} µCi/ml$_{air}$. All samples were significantly below the DOE DCS for tritium in air of 1.4 × 10^{-8} µCi/ml$_{air}$ Results are shown in Table C-4.

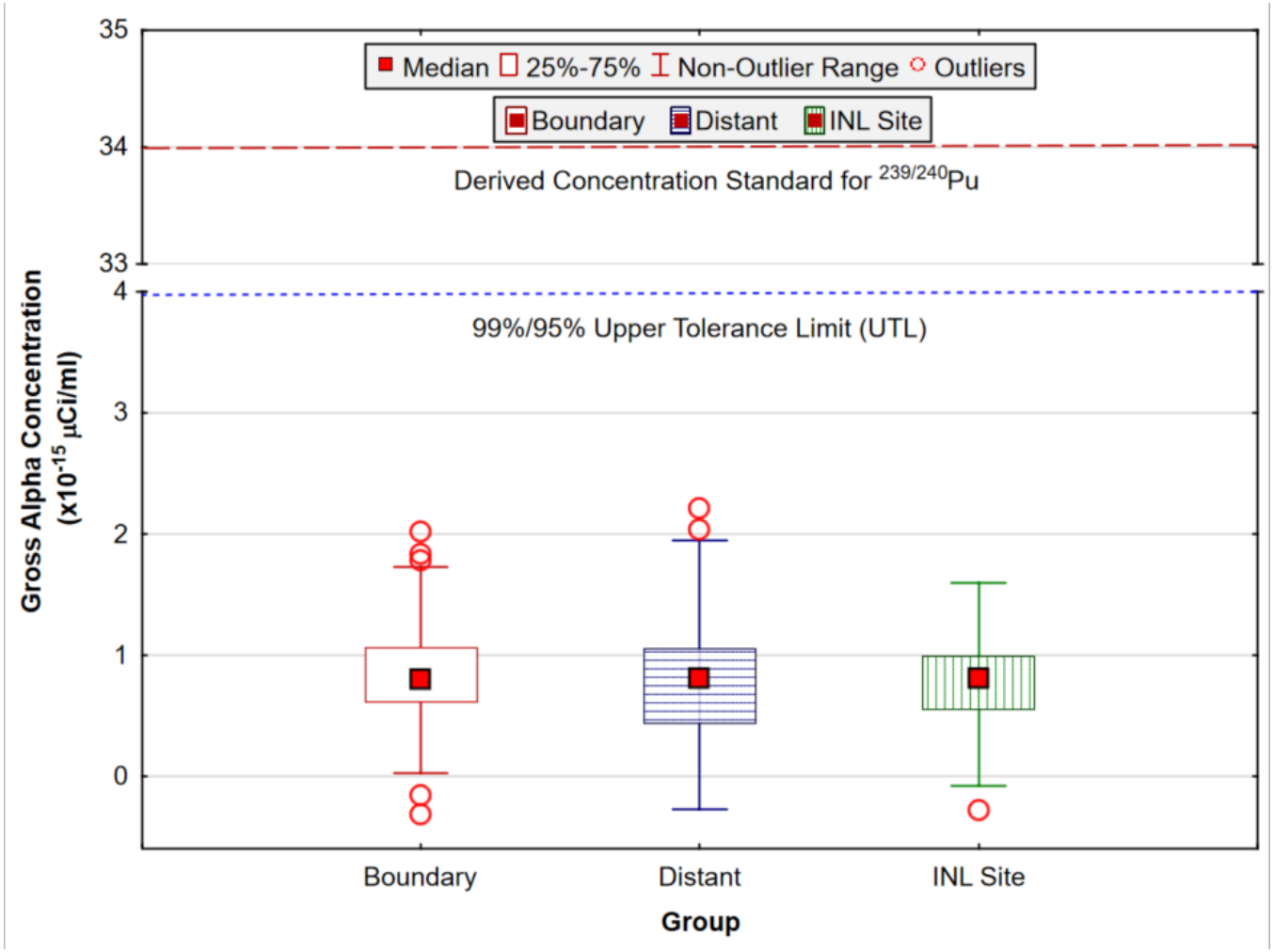

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the first quarter of 2020. The DOE Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

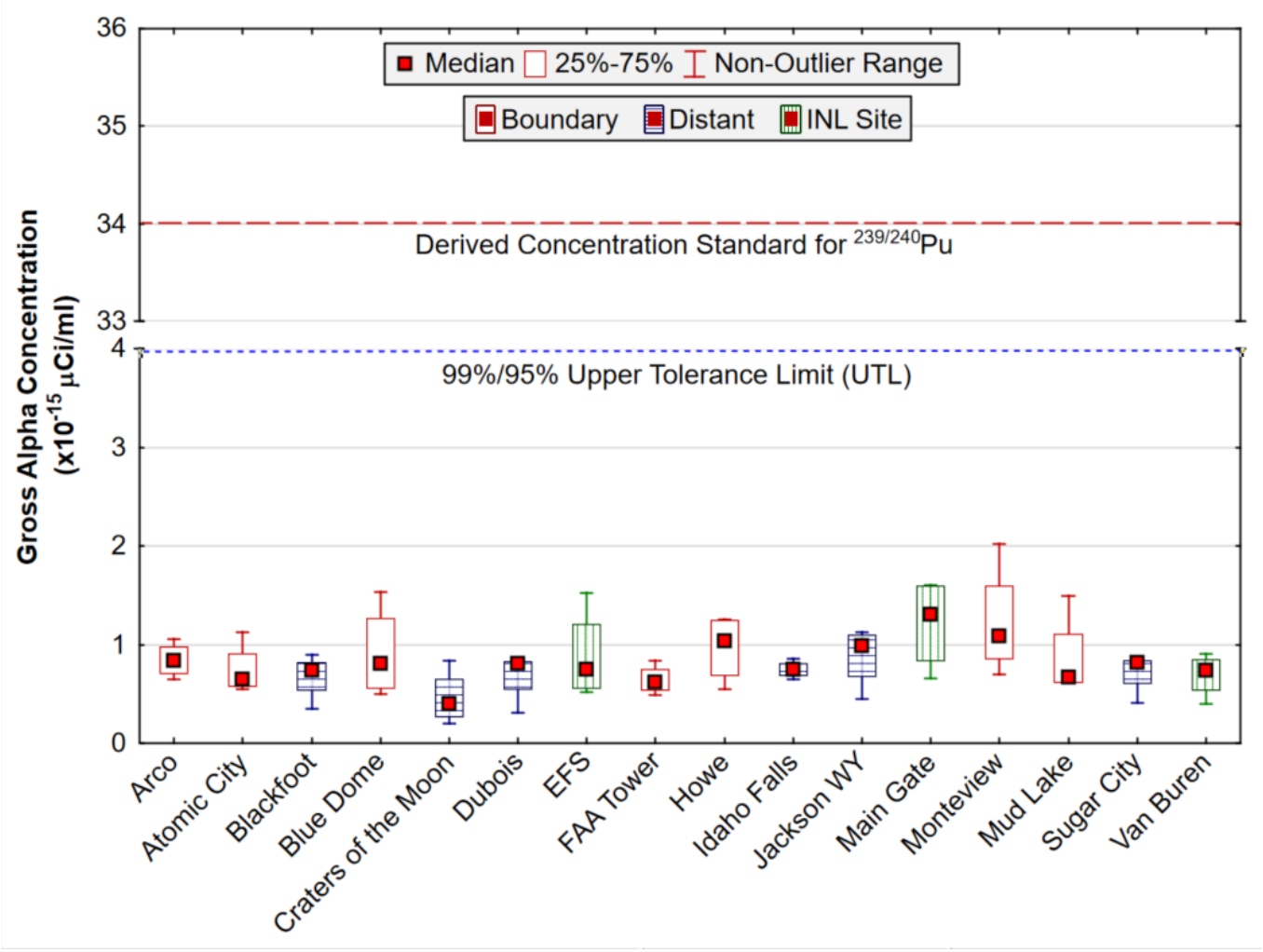

Figure 4. January 2020 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

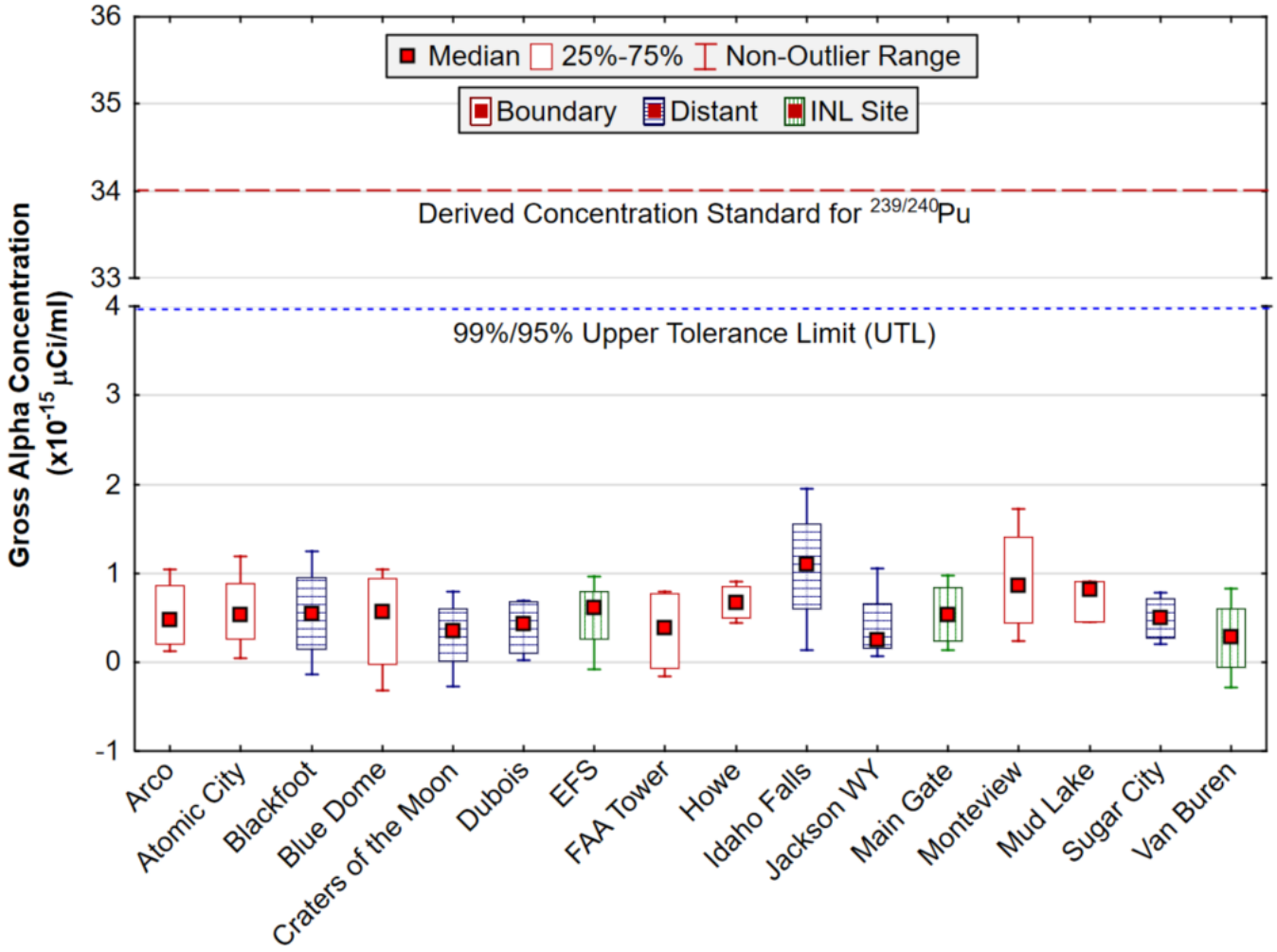

Figure 5. February 2020 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location, except for Mud Lake (N = 3). The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled 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. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

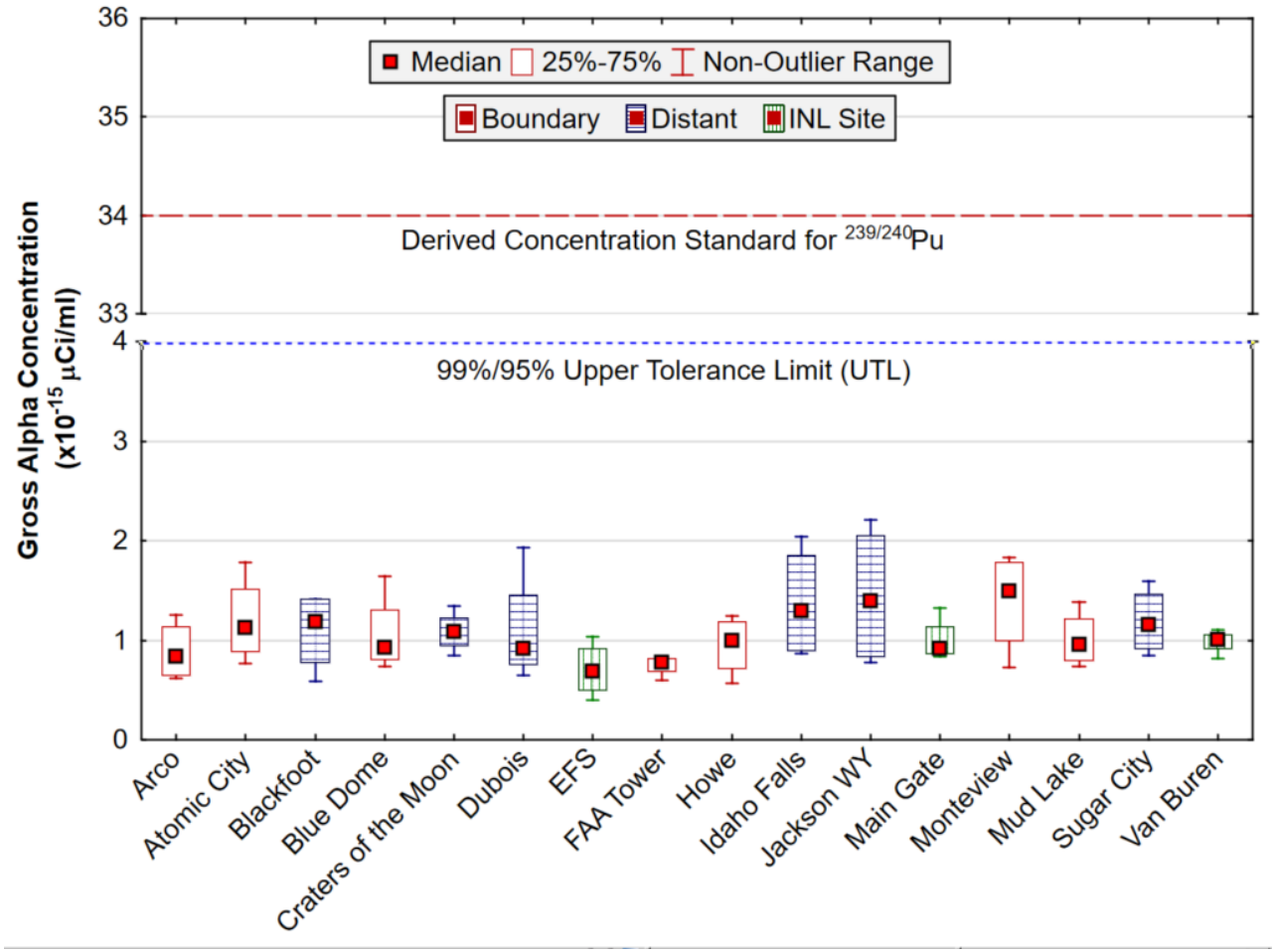

Figure 6. March 2020 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}$Pu is shown because it is the most restrictive human-made alpha emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

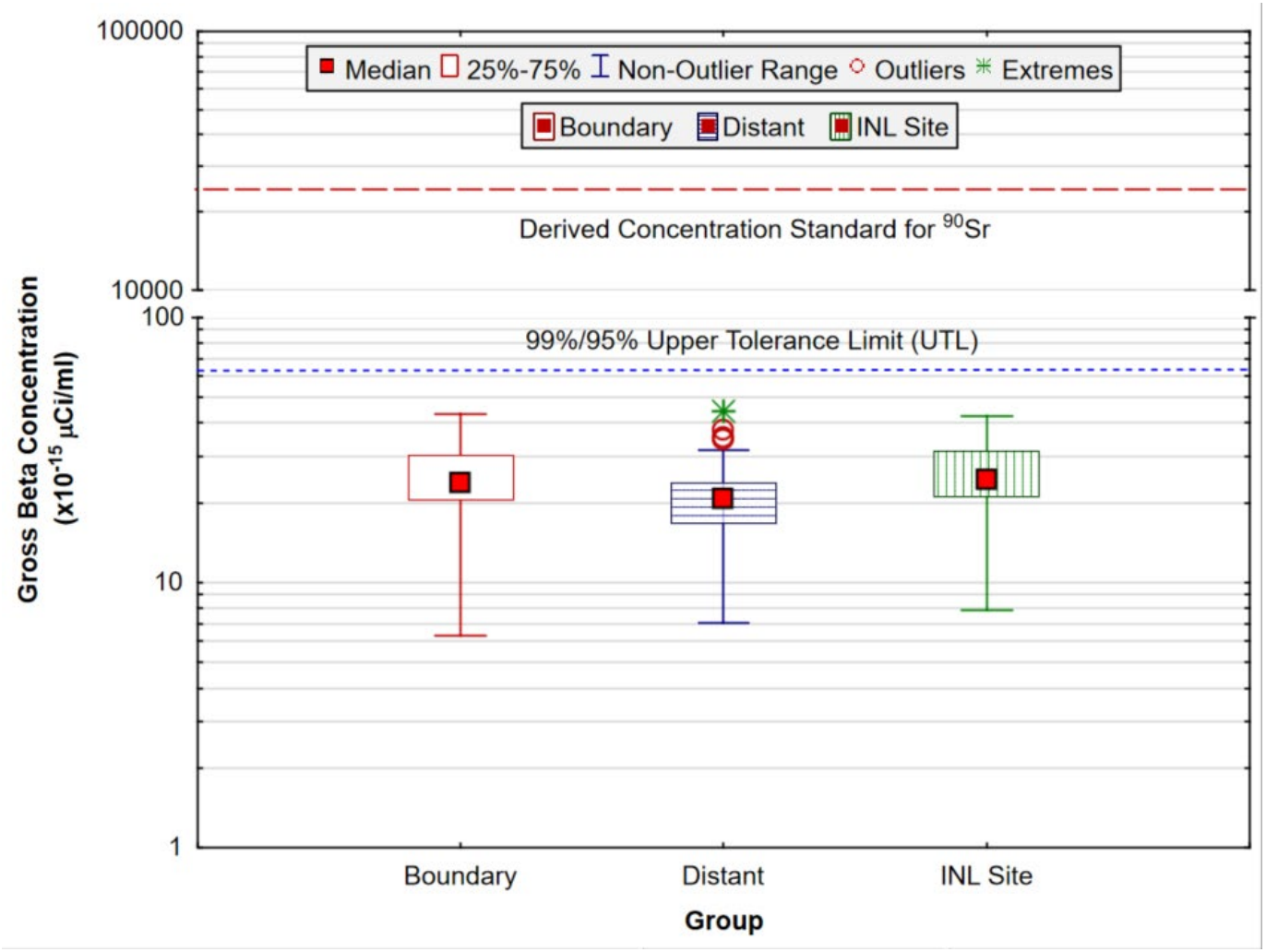

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the first quarter of 2020. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentration. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

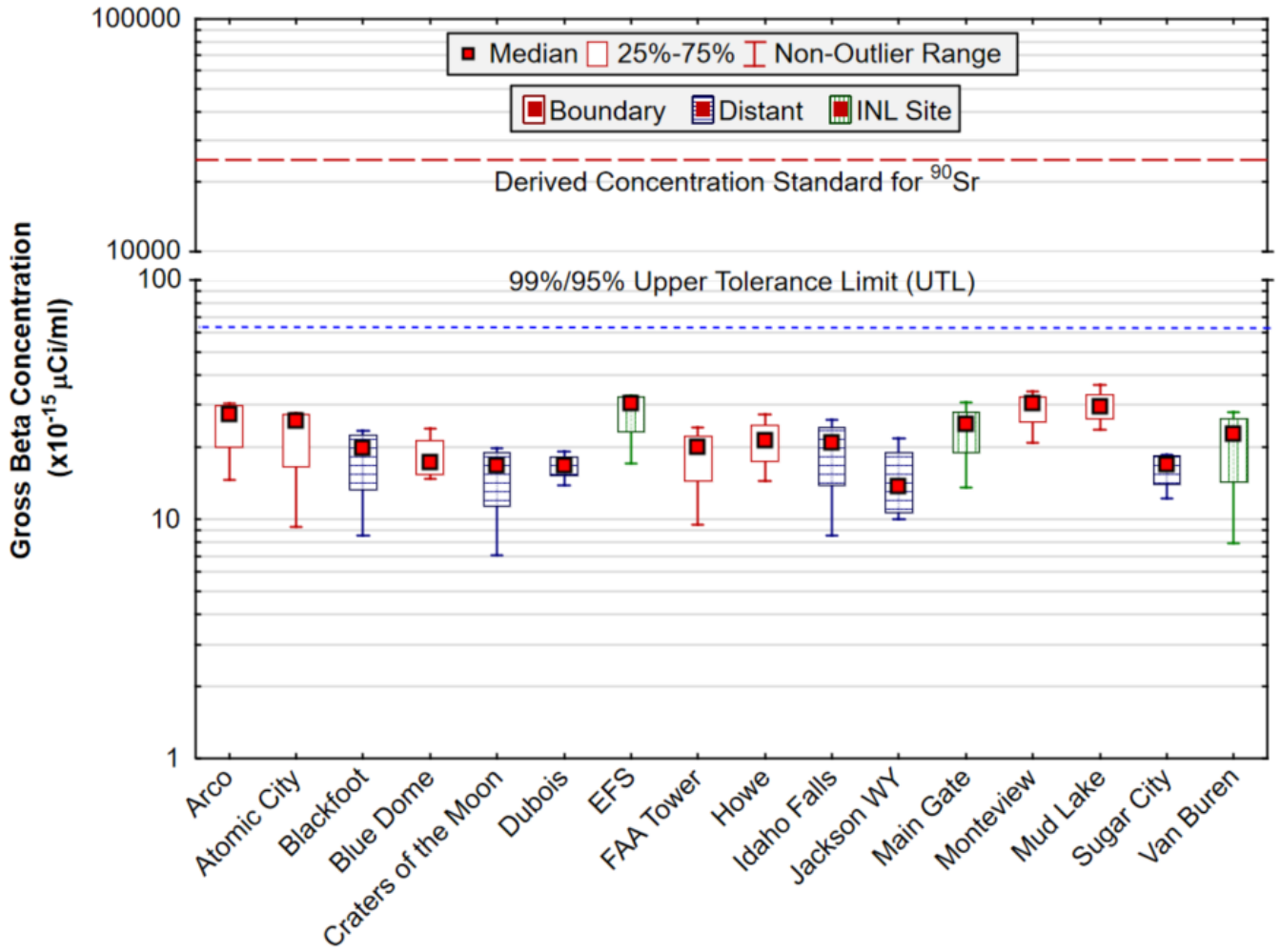

Figure 8. January 2020 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

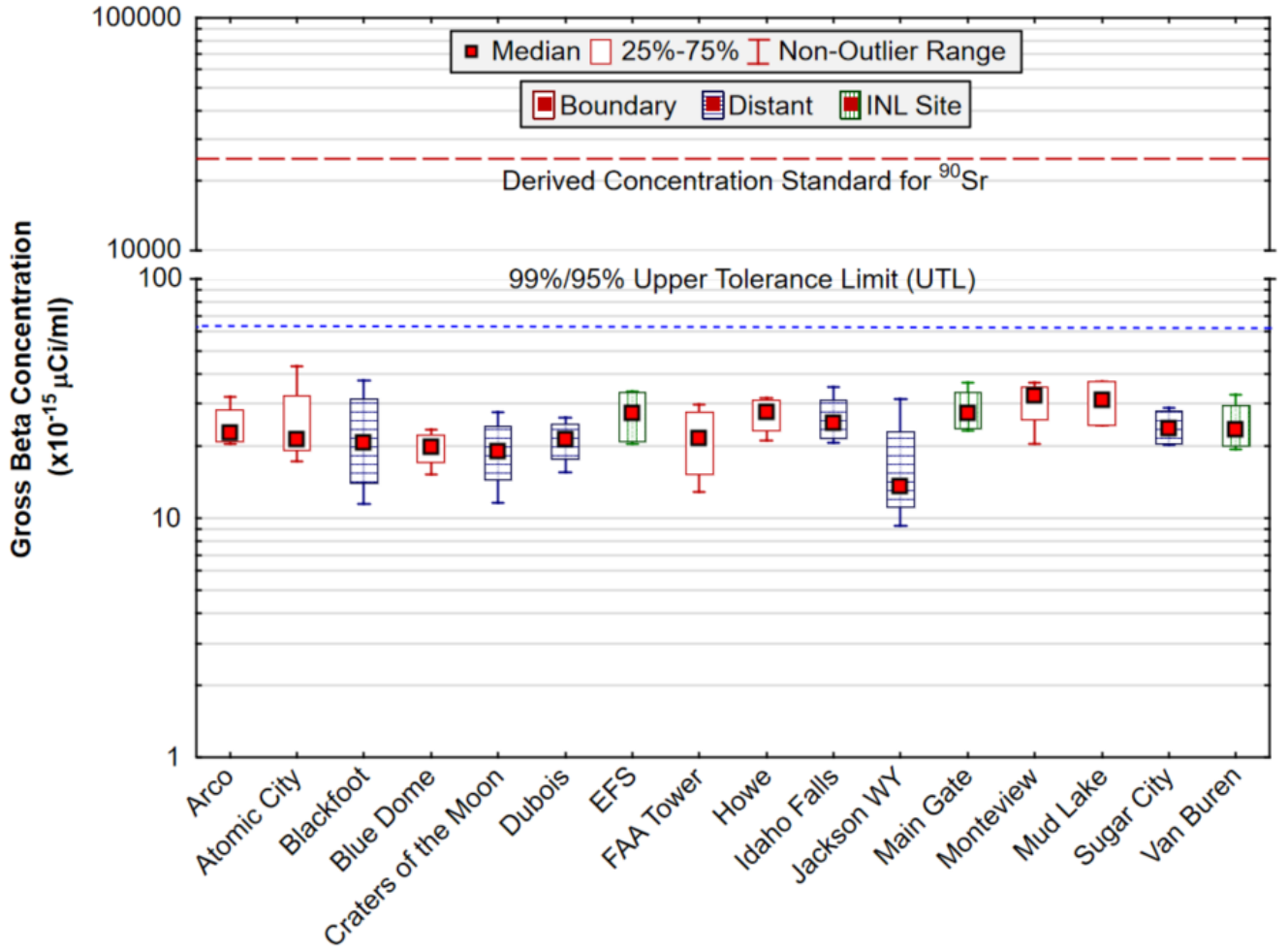

Figure 9. February 2020 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location, except for Mud Lake (N = 3). The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

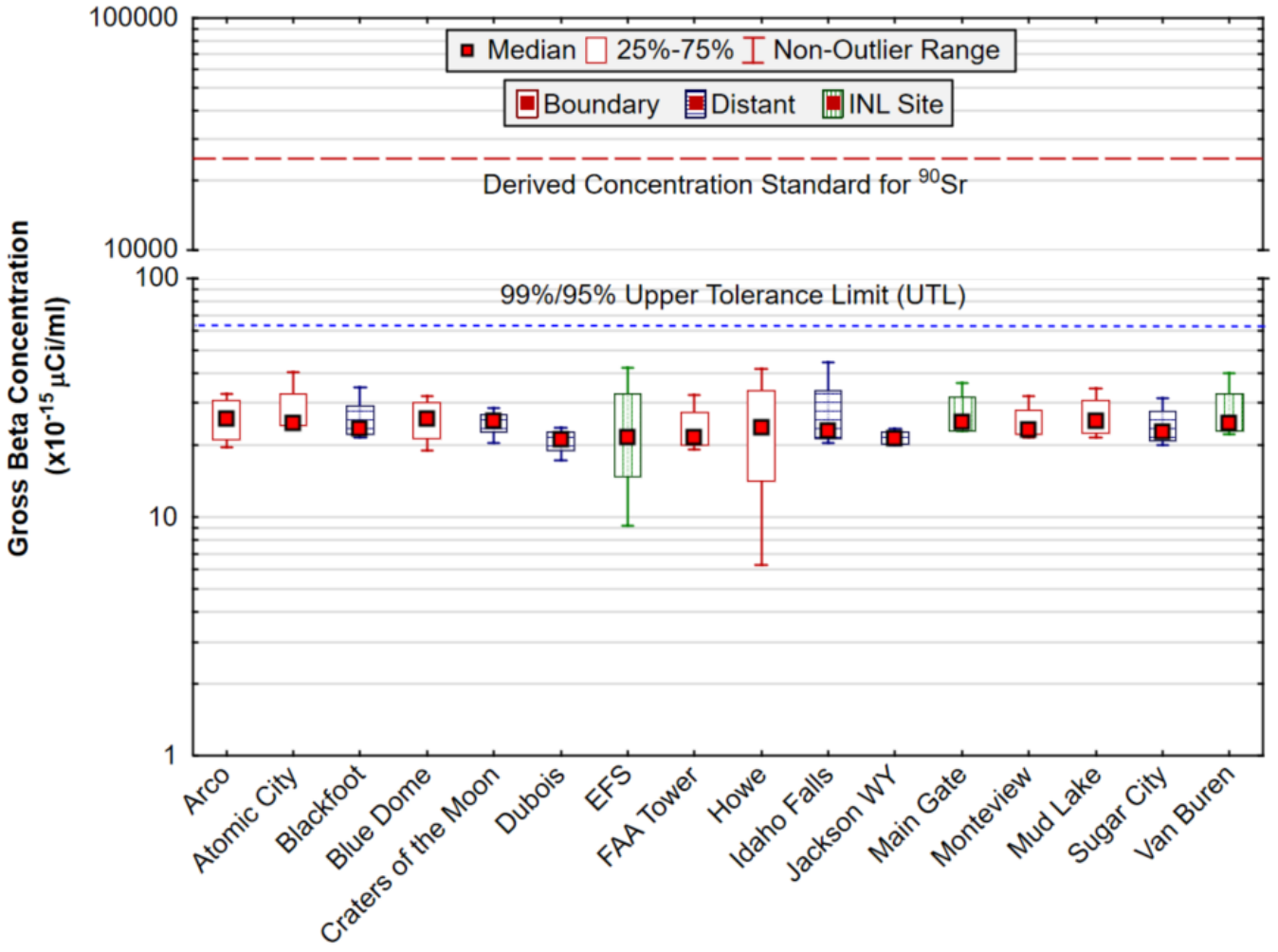

Figure 10. March 2020 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter The UTL represents the value below which 99% of the population are expected to fall with 95% confidence.

4. PRECIPITATION AND WATER SAMPLING

PRECIPITATION SAMPLING

Precipitation samples are gathered when enough precipitation occurs to allow for the collection of the minimum sample volume of approximately 50 ml. Samples are taken of monthly composites from Idaho Falls, and weekly (when available) from the EFS on the INL Site and Atomic City and Howe on the INL Site boundary. These are the same locations that atmospheric moisture samples are collected at. Precipitation samples are analyzed for tritium. Storm events in the first quarter of 2020 produced sufficient precipitation to yield 22 samples.

Tritium was measured above the 3s values in ten of the 22 samples collected during the quarter. These results are listed in Table C-5 (Appendix C). Low levels of tritium always exist in the environment as a result of cosmic ray reactions with water molecules in the upper atmosphere. Long-term data collected around the globe since 1961 by the International Atomic Energy Agency suggest that that tritium levels have steadily decreased since the Nuclear Test Ban Treaty in 1963 and are close to their pre-nuclear test values (Cauquoin et al. 2015) and that there are no longer measurable remnants of fallout from nuclear 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. 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 first quarter was 150 pCi/L in an EFS sample collected in March. The result was below the 99%/95% UTL of 311 pCi/L.

5. AGRICULTURAL PRODUCT, WILDLIFE, AND SOIL SAMPLING

Another potential pathway for contaminants to reach humans is through the food chain. The ESER Program samples multiple agricultural products and game animals from around the INL Site and Southeast Idaho. Specifically, milk, alfalfa, grain, potatoes, lettuce, large game animals, and waterfowl are sampled. Milk is sampled throughout the year and large game animals are sampled whenever large game animals are killed onsite from vehicle collisions. Alfalfa is collected during the second quarter, lettuce and grain are sampled during the third quarter, while potatoes are collected during the fourth quarter. Waterfowl are collected in either the third or fourth quarter. See Table A-1, Appendix A, for more details on agricultural product and wildlife sampling. This section discusses results from milk and wildlife samples available during the first quarter of 2020.

MILK SAMPLING

Milk samples were collected weekly at Idaho Falls and Terreton. Monthly samples were collected at four other locations around the INL Site (Figure 11) during the first quarter of 2020. In addition to the local locations, commercially-available organic milk (from Colorado) was purchased as a control sample each month. All samples were analyzed for gamma emitting radionuclides, with particular emphasis on Iodine-131.

Neither ^{131}I nor ^{137}Cs was detected in any weekly or monthly samples during the first 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-6.

LARGE GAME ANIMAL SAMPLING

No big game animals killed by vehicular collisions were available for sampling during the first quarter of 2020.

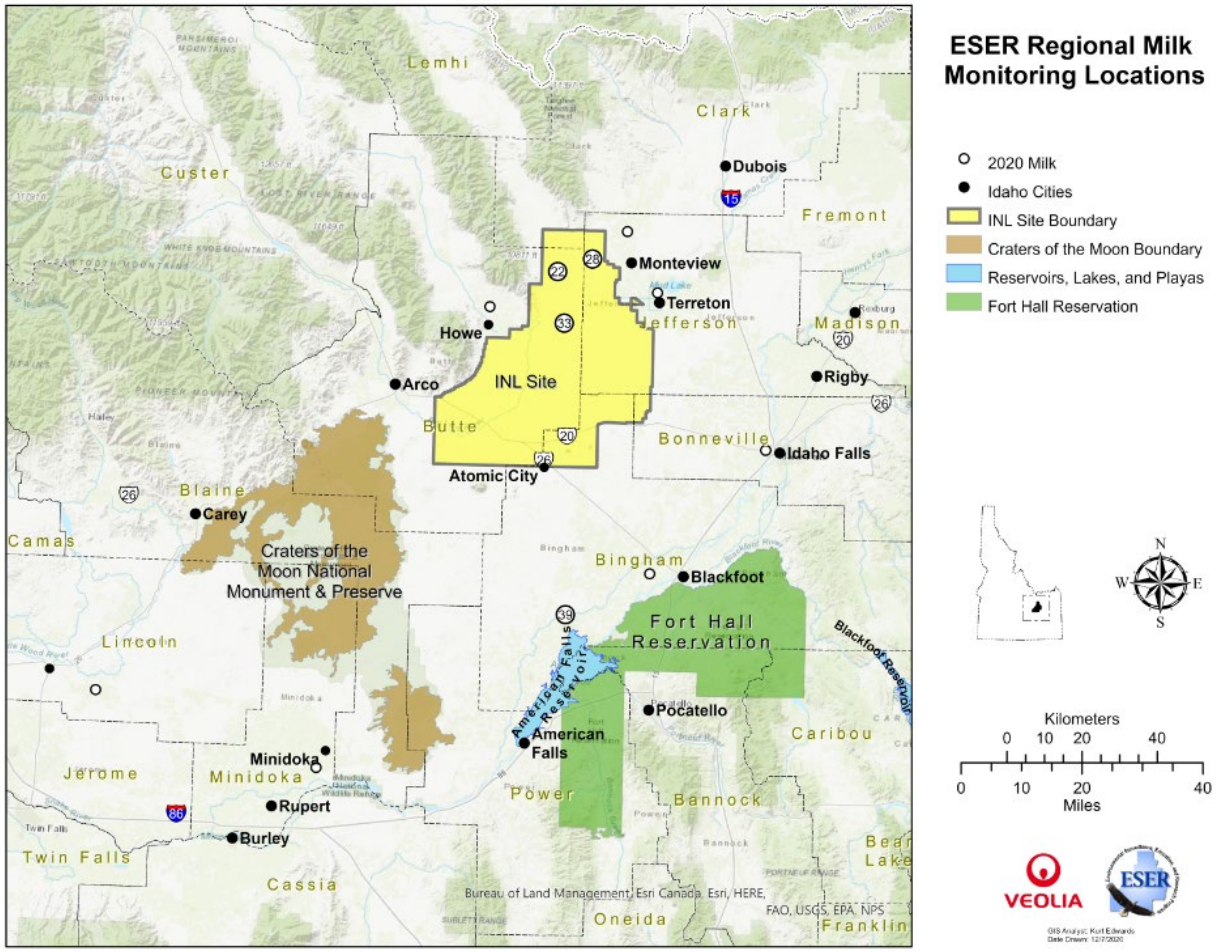

Figure 11. ESER milk sampling locations. Milk is collected at locations identified by blue circles.

6. QUALITY ASSURANCE

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

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

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

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

Assessments of ESER data quality are achieved through analysis of spike, performance evaluation, and duplicate samples; through sample recounts; through analysis of blank samples; and through comparison of sample results to established method quality objectives. These assessments are documented in the ESER Quality Assurance Report for the First Quarter of 2020 (VNSFS 2020).

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APPENDIX A

SUMMARY OF SAMPLING SCHEDULE

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

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

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

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

APPENDIX B

SUMMARY OF MDCs AND DCSs

Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses Performed during First Quarter 2020

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha	5.7×10^{-16} µCi/ml	3.4×10^{-14} µCi/ml[c]
	Gross beta	1.4×10^{-15} µCi/ml	2.5×10^{-11} µCi/ml[d]
	^{137}Cs	9.0×10^{-17} µCi/ml	9.8×10^{-11} µCi/ml
	^{90}Sr	3.2×10^{-17} µCi/ml	2.5×10^{-11} µCi/ml
	^{241}Am	2.7×10^{-18} µCi/ml	4.1×10^{-14} µCi/ml
	^{238}Pu	3.1×10^{-18} µCi/ml	3.7×10^{-14} µCi/ml
	$^{239/240}$Pu	4.3×10^{-18} µCi/ml	3.4×10^{-14} µCi/ml
Air (charcoal cartridge)[e]	^{131}I	4.0×10^{-16} µCi/ml	2.3×10^{-19} µCi/ml
Air (atmospheric moisture)	^{3}H	93.7 pCi/L_{water} 3.0×10^{-13} µCi/ml_{air}	1.9×10^{6} pCi/L_{water} 2.1×10^{-7} µCi/ml_{air}
Air (precipitation)	^{3}H	92.6 pCi/L	1.9×10^{6} pCi/L_{water}
Milk	^{131}I	0.5 pCi/L	1,300 pCi/L[f]
	^{137}Cs	0.9 pCi/L	3,000 pCi/L[f]

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 is based on an average filtered air volume (pressure corrected) of 445 m^3/week.
f. There is no DCS established for radionuclides in milk. However, The DCS shown is for the radionuclide ingested in water.

APPENDIX C

SAMPLE ANALYSIS RESULTS

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
BOUNDARY															
ARCO	1/8/2020	1.06	±	0.20	3.92	±	0.74	**Yes**	29.10	±	0.67	107.67	±	2.47	**Yes**
	1/15/2020	0.90	±	0.23	3.32	±	0.85	**Yes**	14.60	±	0.58	54.02	±	2.16	**Yes**
	1/22/2020	0.77	±	0.21	2.86	±	0.76	**Yes**	25.40	±	0.66	93.98	±	2.45	**Yes**
	1/29/2020	0.65	±	0.15	2.41	±	0.56	**Yes**	30.50	±	0.70	112.85	±	2.59	**Yes**
	2/5/2020	0.28	±	0.15	1.04	±	0.56	No	20.50	±	0.61	75.85	±	2.25	**Yes**
	2/12/2020	0.12	±	0.16	0.46	±	0.60	No	21.00	±	0.62	77.70	±	2.29	**Yes**
	2/19/2020	0.68	±	0.15	2.50	±	0.57	**Yes**	24.40	±	0.62	90.28	±	2.31	**Yes**
	2/26/2020	1.04	±	0.16	3.85	±	0.58	**Yes**	32.00	±	0.68	118.40	±	2.50	**Yes**
	3/4/2020	1.26	±	0.22	4.66	±	0.80	**Yes**	32.60	±	0.69	120.62	±	2.55	**Yes**
	3/11/2020	0.67	±	0.20	2.49	±	0.74	**Yes**	19.60	±	0.60	72.52	±	2.23	**Yes**
	3/18/2020	1.01	±	0.16	3.74	±	0.58	**Yes**	22.60	±	0.60	83.62	±	2.22	**Yes**
	3/25/2020	0.62	±	0.17	2.29	±	0.62	**Yes**	28.80	±	0.71	106.56	±	2.63	**Yes**
QA-1	1/8/2020	2.31	±	0.24	8.55	±	0.88	**Yes**	26.30	±	0.62	97.31	±	2.31	**Yes**
(ARCO)	1/15/2020	0.32	±	0.19	1.19	±	0.70	No	12.40	±	0.53	45.88	±	1.95	**Yes**
	1/22/2020	0.93	±	0.20	3.43	±	0.75	**Yes**	25.80	±	0.64	95.46	±	2.36	**Yes**
	1/29/2020	0.80	±	0.16	2.96	±	0.59	**Yes**	30.30	±	0.70	112.11	±	2.59	**Yes**
	2/5/2020	0.42	±	0.16	1.55	±	0.59	No	22.60	±	0.63	83.62	±	2.33	**Yes**
	2/12/2020	-0.01	±	0.15	-0.04	±	0.56	No	15.20	±	0.55	56.24	±	2.02	**Yes**
	2/19/2020	0.41	±	0.13	1.53	±	0.48	**Yes**	23.60	±	0.58	87.32	±	2.15	**Yes**
	2/26/2020	1.08	±	0.16	4.00	±	0.58	**Yes**	30.50	±	0.66	112.85	±	2.44	**Yes**
	3/4/2020	1.21	±	0.22	4.48	±	0.80	**Yes**	32.90	±	0.70	121.73	±	2.58	**Yes**
	3/11/2020	1.26	±	0.24	4.66	±	0.88	**Yes**	18.00	±	0.61	66.60	±	2.27	**Yes**
	3/18/2020	1.13	±	0.16	4.18	±	0.60	**Yes**	23.50	±	0.61	86.95	±	2.25	**Yes**
	3/25/2020	1.07	±	0.18	3.96	±	0.67	**Yes**	29.10	±	0.69	107.67	±	2.57	**Yes**
ATOMIC CITY	1/8/2020	1.13	±	0.20	4.18	±	0.74	**Yes**	27.40	±	0.65	101.38	±	2.40	**Yes**
	1/15/2020	0.61	±	0.21	2.27	±	0.77	No	9.31	±	0.51	34.45	±	1.87	**Yes**
	1/22/2020	0.55	±	0.21	2.05	±	0.78	No	23.80	±	0.69	88.06	±	2.56	**Yes**
	1/29/2020	0.69	±	0.16	2.54	±	0.58	**Yes**	27.60	±	0.69	102.12	±	2.55	**Yes**
	2/5/2020	0.49	±	0.17	1.81	±	0.62	No	21.60	±	0.64	79.92	±	2.35	**Yes**
	2/12/2020	0.04	±	0.16	0.15	±	0.61	No	20.90	±	0.63	77.33	±	2.34	**Yes**
	2/19/2020	0.59	±	0.16	2.16	±	0.58	**Yes**	17.30	±	0.58	64.01	±	2.15	**Yes**
	2/26/2020	1.19	±	0.20	4.40	±	0.72	**Yes**	43.20	±	0.88	159.84	±	3.26	**Yes**
	3/4/2020	1.78	±	0.25	6.59	±	0.92	**Yes**	40.30	±	0.78	149.11	±	2.90	**Yes**
	3/11/2020	1.00	±	0.23	3.70	±	0.85	**Yes**	25.00	±	0.69	92.50	±	2.56	**Yes**
	3/18/2020	1.25	±	0.18	4.63	±	0.66	**Yes**	23.60	±	0.65	87.32	±	2.42	**Yes**
	3/25/2020	0.77	±	0.17	2.84	±	0.63	**Yes**	24.50	±	0.66	90.65	±	2.44	**Yes**
BLUE DOME	1/8/2020	0.50	±	0.16	1.86	±	0.58	**Yes**	14.80	±	0.50	54.76	±	1.84	**Yes**
	1/15/2020	1.53	±	0.24	5.66	±	0.90	**Yes**	15.90	±	0.57	58.83	±	2.11	**Yes**
	1/22/2020	1.00	±	0.24	3.70	±	0.88	**Yes**	18.50	±	0.65	68.45	±	2.41	**Yes**
	1/29/2020	0.62	±	0.16	2.29	±	0.60	**Yes**	24.00	±	0.69	88.80	±	2.53	**Yes**
	2/5/2020	0.84	±	0.19	3.12	±	0.70	**Yes**	15.20	±	0.58	56.24	±	2.16	**Yes**
	2/12/2020	-0.32	±	0.16	-1.19	±	0.60	No	18.90	±	0.66	69.93	±	2.43	**Yes**
	2/19/2020	0.28	±	0.14	1.05	±	0.53	No	23.50	±	0.65	86.95	±	2.41	**Yes**
	2/26/2020	1.04	±	0.18	3.85	±	0.66	**Yes**	20.80	±	0.67	76.96	±	2.47	**Yes**
	3/4/2020	1.64	±	0.26	6.07	±	0.97	**Yes**	32.20	±	0.77	119.14	±	2.83	**Yes**
	3/11/2020	0.98	±	0.22	3.61	±	0.82	**Yes**	18.90	±	0.62	69.93	±	2.28	**Yes**
	3/18/2020	0.87	±	0.16	3.22	±	0.58	**Yes**	23.50	±	0.64	86.95	±	2.36	**Yes**
	3/25/2020	0.74	±	0.17	2.73	±	0.62	**Yes**	28.00	±	0.69	103.60	±	2.55	**Yes**
FAA TOWER	1/8/2020	0.66	±	0.18	2.42	±	0.66	**Yes**	19.50	±	0.58	72.15	±	2.16	**Yes**
	1/16/2020	0.49	±	0.18	1.81	±	0.66	No	9.50	±	0.46	35.15	±	1.68	**Yes**
	1/22/2020	0.58	±	0.23	2.15	±	0.85	No	20.30	±	0.70	75.11	±	2.60	**Yes**
	1/29/2020	0.84	±	0.17	3.10	±	0.62	**Yes**	24.10	±	0.67	89.17	±	2.48	**Yes**

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	2/5/2020	0.03	±	0.14	0.10	±	0.52	No	17.50	±	0.58	64.75	±	2.16	Yes
	2/12/2020	-0.16	±	0.15	-0.58	±	0.57	No	12.90	±	0.55	47.73	±	2.03	Yes
	2/19/2020	0.80	±	0.16	2.95	±	0.60	Yes	25.30	±	0.64	93.61	±	2.38	Yes
	2/26/2020	0.75	±	0.15	2.77	±	0.55	Yes	29.80	±	0.68	110.26	±	2.52	Yes
	3/4/2020	0.83	±	0.21	3.09	±	0.78	Yes	32.40	±	0.73	119.88	±	2.69	Yes
	3/11/2020	0.80	±	0.21	2.96	±	0.77	Yes	19.20	±	0.61	71.04	±	2.25	Yes
	3/18/2020	0.77	±	0.15	2.84	±	0.54	Yes	20.70	±	0.59	76.59	±	2.18	Yes
	3/25/2020	0.60	±	0.16	2.23	±	0.60	Yes	22.50	±	0.64	83.25	±	2.38	Yes
HOWE	1/8/2020	1.26	±	0.20	4.66	±	0.75	Yes	20.50	±	0.59	75.85	±	2.17	Yes
	1/15/2020	0.55	±	0.18	2.02	±	0.65	Yes	14.40	±	0.50	53.28	±	1.85	Yes
	1/22/2020	1.24	±	0.26	4.59	±	0.95	Yes	22.10	±	0.71	81.77	±	2.63	Yes
	1/29/2020	0.84	±	0.18	3.11	±	0.68	Yes	27.30	±	0.75	101.01	±	2.78	Yes
	2/5/2020	0.44	±	0.19	1.64	±	0.69	No	21.00	±	0.69	77.70	±	2.55	Yes
	2/12/2020	0.56	±	0.22	2.06	±	0.81	No	25.10	±	0.76	92.87	±	2.79	Yes
	2/19/2020	0.91	±	0.18	3.36	±	0.67	Yes	31.80	±	0.74	117.66	±	2.73	Yes
	2/26/2020	0.78	±	0.17	2.90	±	0.62	Yes	30.20	±	0.75	111.74	±	2.79	Yes
	3/4/2020	1.25	±	0.26	4.63	±	0.95	Yes	41.90	±	0.88	155.03	±	3.24	Yes
	3/11/2020	0.88	±	0.25	3.24	±	0.92	Yes	25.40	±	0.75	93.98	±	2.79	Yes
	3/18/2020	1.12	±	0.17	4.14	±	0.63	Yes	22.00	±	0.62	81.40	±	2.30	Yes
	3/25/2020	0.57	±	0.32	2.10	±	1.17	No	6.29	±	0.90	23.27	±	3.33	Yes
MONTEVIEW	1/8/2020	2.02	±	0.23	7.47	±	0.86	Yes	30.10	±	0.66	111.37	±	2.46	Yes
	1/15/2020	0.70	±	0.22	2.60	±	0.82	Yes	20.80	±	0.65	76.96	±	2.42	Yes
	1/22/2020	1.16	±	0.25	4.29	±	0.92	Yes	30.70	±	0.78	113.59	±	2.87	Yes
	1/29/2020	1.02	±	0.18	3.77	±	0.68	Yes	34.00	±	0.78	125.80	±	2.89	Yes
	2/5/2020	0.64	±	0.19	2.36	±	0.68	Yes	20.50	±	0.66	75.85	±	2.42	Yes
	2/12/2020	0.23	±	0.20	0.87	±	0.73	No	30.80	±	0.79	113.96	±	2.92	Yes
	2/19/2020	1.08	±	0.18	4.00	±	0.67	Yes	34.10	±	0.74	126.17	±	2.73	Yes
	2/26/2020	1.72	±	0.20	6.36	±	0.73	Yes	36.60	±	0.75	135.42	±	2.78	Yes
	3/4/2020	1.83	±	0.27	6.77	±	0.98	Yes	32.20	±	0.76	119.14	±	2.80	Yes
	3/11/2020	1.27	±	0.26	4.70	±	0.94	Yes	22.80	±	0.70	84.36	±	2.60	Yes
	3/18/2020	1.73	±	0.20	6.40	±	0.73	Yes	21.60	±	0.63	79.92	±	2.32	Yes
	3/25/2020	0.73	±	0.17	2.70	±	0.62	Yes	23.70	±	0.65	87.69	±	2.42	Yes
MUD LAKE	1/8/2020	1.50	±	0.20	5.55	±	0.75	Yes	29.00	±	0.63	107.30	±	2.33	Yes
	1/15/2020	0.63	±	0.22	2.32	±	0.80	No	23.60	±	0.68	87.32	±	2.50	Yes
	1/22/2020	0.62	±	0.22	2.28	±	0.80	No	29.70	±	0.75	109.89	±	2.77	Yes
	1/29/2020	0.71	±	0.17	2.62	±	0.63	Yes	36.20	±	0.80	133.94	±	2.96	Yes
	2/5/2020	0.91	±	0.24	3.36	±	0.89	Yes	24.50	±	0.82	90.65	±	3.04	Yes
	2/12/2020	0.45	±	0.21	1.67	±	0.77	No	30.90	±	0.79	114.33	±	2.92	Yes
	2/19/2020	0.82	±	0.18	3.03	±	0.65	Yes	37.10	±	0.78	137.27	±	2.87	Yes
a	2/26/2020		±			±		No		±			±		No
	3/4/2020	0.73	±	0.18	2.72	±	0.66	Yes	34.60	±	0.66	128.02	±	2.44	Yes
	3/11/2020	0.86	±	0.21	3.17	±	0.77	Yes	23.20	±	0.64	85.84	±	2.35	Yes
	3/18/2020	1.06	±	0.17	3.92	±	0.61	Yes	21.50	±	0.62	79.55	±	2.28	Yes
	3/25/2020	1.38	±	0.21	5.11	±	0.76	Yes	27.10	±	0.72	100.27	±	2.65	Yes
QA-2 (MUD LAKE)	1/8/2020	2.29	±	0.24	8.47	±	0.89	Yes	31.00	±	0.67	114.70	±	2.48	Yes
	1/15/2020	0.65	±	0.21	2.41	±	0.79	Yes	20.60	±	0.64	76.22	±	2.36	Yes
	1/22/2020	0.87	±	0.23	3.23	±	0.83	Yes	28.50	±	0.73	105.45	±	2.69	Yes
	1/29/2020	0.98	±	0.18	3.62	±	0.65	Yes	34.90	±	0.77	129.13	±	2.85	Yes
	2/5/2020	0.45	±	0.17	1.67	±	0.61	No	21.20	±	0.63	78.44	±	2.32	Yes
	2/12/2020	-0.16	±	0.15	-0.60	±	0.54	No	17.20	±	0.58	63.64	±	2.14	Yes
	2/19/2020	0.72	±	0.16	2.68	±	0.60	Yes	28.60	±	0.68	105.82	±	2.52	Yes
	2/26/2020	1.46	±	0.20	5.40	±	0.75	Yes	41.40	±	0.85	153.18	±	3.15	Yes
	3/4/2020	1.42	±	0.26	5.25	±	0.97	Yes	47.60	±	0.91	176.12	±	3.36	Yes

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	3/11/2020	1.69	±	0.28	6.25	±	1.02	Yes	24.80	±	0.74	91.76	±	2.72	Yes
	3/18/2020	0.71	±	0.15	2.62	±	0.55	Yes	22.90	±	0.63	84.73	±	2.33	Yes
	3/25/2020	1.11	±	0.19	4.11	±	0.69	Yes	26.50	±	0.68	98.05	±	2.52	Yes
DISTANT															
BLACKFOOT	1/8/2020	0.75	±	0.18	2.76	±	0.66	Yes	18.00	±	0.56	66.60	±	2.06	Yes
	1/15/2020	0.35	±	0.20	1.31	±	0.72	No	8.54	±	0.49	31.60	±	1.82	Yes
	1/22/2020	0.90	±	0.21	3.31	±	0.77	Yes	23.50	±	0.64	86.95	±	2.38	Yes
	1/29/2020	0.73	±	0.16	2.70	±	0.58	Yes	21.60	±	0.63	79.92	±	2.32	Yes
	2/5/2020	0.43	±	0.16	1.59	±	0.60	No	16.40	±	0.57	60.68	±	2.12	Yes
	2/12/2020	-0.14	±	0.14	-0.52	±	0.52	No	11.50	±	0.50	42.55	±	1.85	Yes
	2/19/2020	0.66	±	0.16	2.44	±	0.58	Yes	24.90	±	0.64	92.13	±	2.38	Yes
	2/26/2020	1.25	±	0.18	4.63	±	0.66	Yes	37.60	±	0.77	139.12	±	2.83	Yes
	3/4/2020	1.41	±	0.24	5.22	±	0.90	Yes	34.70	±	0.76	128.39	±	2.82	Yes
	3/11/2020	1.42	±	0.24	5.25	±	0.90	Yes	21.50	±	0.65	79.55	±	2.40	Yes
	3/18/2020	0.97	±	0.17	3.58	±	0.63	Yes	23.90	±	0.67	88.43	±	2.49	Yes
	3/25/2020	0.59	±	0.16	2.16	±	0.60	Yes	22.80	±	0.65	84.36	±	2.39	Yes
CRATERS OF THE MOON	1/8/2020	0.84	±	0.13	3.12	±	0.49	Yes	18.10	±	0.42	66.97	±	1.55	Yes
	1/15/2020	0.20	±	0.17	0.74	±	0.63	No	7.04	±	0.44	26.05	±	1.61	Yes
	1/22/2020	0.34	±	0.18	1.27	±	0.65	No	15.50	±	0.55	57.35	±	2.04	Yes
	1/29/2020	0.45	±	0.13	1.67	±	0.49	Yes	19.70	±	0.58	72.89	±	2.14	Yes
	2/5/2020	0.29	±	0.15	1.09	±	0.54	No	17.40	±	0.56	64.38	±	2.08	Yes
	2/12/2020	-0.28	±	0.13	-1.02	±	0.49	No	11.60	±	0.50	42.92	±	1.85	Yes
	2/19/2020	0.41	±	0.14	1.50	±	0.50	No	20.30	±	0.57	75.11	±	2.12	Yes
	2/26/2020	0.79	±	0.15	2.93	±	0.54	Yes	27.80	±	0.64	102.86	±	2.38	Yes
	3/4/2020	1.12	±	0.22	4.14	±	0.80	Yes	28.70	±	0.68	106.19	±	2.50	Yes
	3/11/2020	1.05	±	0.25	3.89	±	0.91	Yes	20.40	±	0.68	75.48	±	2.51	Yes
	3/18/2020	1.34	±	0.21	4.96	±	0.76	Yes	24.90	±	0.75	92.13	±	2.76	Yes
	3/25/2020	0.85	±	0.17	3.15	±	0.63	Yes	25.20	±	0.65	93.24	±	2.42	Yes
DUBOIS	1/8/2020	0.81	±	0.17	3.00	±	0.63	Yes	19.10	±	0.53	70.67	±	1.98	Yes
	1/15/2020	0.85	±	0.22	3.13	±	0.81	Yes	13.90	±	0.56	51.43	±	2.08	Yes
	1/22/2020	0.80	±	0.21	2.95	±	0.79	Yes	16.40	±	0.59	60.68	±	2.20	Yes
	1/29/2020	0.31	±	0.13	1.13	±	0.50	No	17.20	±	0.59	63.64	±	2.19	Yes
	2/5/2020	0.19	±	0.15	0.68	±	0.54	No	15.60	±	0.55	57.72	±	2.05	Yes
	2/12/2020	0.03	±	0.17	0.10	±	0.62	No	19.50	±	0.63	72.15	±	2.33	Yes
	2/19/2020	0.69	±	0.16	2.55	±	0.60	Yes	26.30	±	0.67	97.31	±	2.48	Yes
	2/26/2020	0.67	±	0.15	2.46	±	0.55	Yes	22.90	±	0.64	84.73	±	2.38	Yes
	3/4/2020	1.93	±	0.25	7.14	±	0.93	Yes	21.60	±	0.61	79.92	±	2.26	Yes
	3/11/2020	0.98	±	0.22	3.63	±	0.82	Yes	17.30	±	0.60	64.01	±	2.22	Yes
	3/18/2020	0.86	±	0.16	3.19	±	0.58	Yes	20.60	±	0.61	76.22	±	2.26	Yes
	3/25/2020	0.65	±	0.17	2.41	±	0.63	Yes	23.70	±	0.68	87.69	±	2.51	Yes
IDAHO FALLS	1/8/2020	0.72	±	0.16	2.67	±	0.61	Yes	19.20	±	0.53	71.04	±	1.96	Yes
	1/15/2020	0.86	±	0.22	3.17	±	0.81	Yes	8.56	±	0.49	31.67	±	1.81	Yes
	1/22/2020	0.65	±	0.21	2.39	±	0.77	Yes	22.40	±	0.66	82.88	±	2.43	Yes
	1/29/2020	0.77	±	0.16	2.83	±	0.58	Yes	26.10	±	0.66	96.57	±	2.45	Yes
	2/5/2020	0.14	±	0.15	0.51	±	0.56	No	20.60	±	0.63	76.22	±	2.33	Yes
	2/12/2020	1.06	±	0.21	3.92	±	0.78	Yes	22.60	±	0.66	83.62	±	2.45	Yes
	2/19/2020	1.15	±	0.18	4.26	±	0.66	Yes	27.00	±	0.66	99.90	±	2.42	Yes
	2/26/2020	1.95	±	0.20	7.22	±	0.74	Yes	35.20	±	0.72	130.24	±	2.68	Yes
	3/4/2020	0.93	±	0.23	3.44	±	0.86	Yes	44.30	±	0.86	163.91	±	3.19	Yes
	3/11/2020	0.87	±	0.20	3.22	±	0.74	Yes	20.50	±	0.59	75.85	±	2.19	Yes
	3/18/2020	2.04	±	0.21	7.55	±	0.76	Yes	23.60	±	0.63	87.32	±	2.34	Yes
	3/25/2020	1.67	±	0.20	6.18	±	0.75	Yes	22.20	±	0.63	82.14	±	2.31	Yes
JACKSON	1/8/2020	1.13	±	0.19	4.18	±	0.70	Yes	16.00	±	0.52	59.20	±	1.91	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 ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	1/15/2020	0.92	±	0.23	3.39	±	0.86	Yes	10.00	±	0.53	37.00	±	1.96	Yes
	1/22/2020	1.06	±	0.23	3.92	±	0.83	Yes	21.70	±	0.65	80.29	±	2.39	Yes
	1/29/2020	0.45	±	0.15	1.65	±	0.54	Yes	11.30	±	0.54	41.81	±	1.99	Yes
	2/5/2020	0.26	±	0.16	0.97	±	0.60	No	12.80	±	0.56	47.36	±	2.06	Yes
	2/12/2020	0.07	±	0.18	0.25	±	0.66	No	9.27	±	0.54	34.30	±	1.99	Yes
	2/19/2020	0.24	±	0.15	0.89	±	0.55	No	14.30	±	0.59	52.91	±	2.17	Yes
	2/26/2020	1.05	±	0.16	3.89	±	0.60	Yes	31.30	±	0.70	115.81	±	2.57	Yes
	3/4/2020	1.90	±	0.27	7.03	±	0.99	Yes	22.00	±	0.66	81.40	±	2.43	Yes
	3/9/2020	2.21	±	0.39	8.18	±	1.45	Yes	20.70	±	0.90	76.59	±	3.32	Yes
	3/18/2020	0.88	±	0.14	3.27	±	0.52	Yes	19.90	±	0.54	73.63	±	2.00	Yes
	3/25/2020	0.78	±	0.18	2.90	±	0.68	Yes	23.30	±	0.69	86.21	±	2.56	Yes
SUGAR CITY	1/8/2020	0.81	±	0.17	2.99	±	0.63	Yes	18.00	±	0.53	66.60	±	1.95	Yes
	1/15/2020	0.83	±	0.22	3.06	±	0.80	Yes	12.20	±	0.53	45.14	±	1.96	Yes
	1/22/2020	0.86	±	0.21	3.17	±	0.76	Yes	15.80	±	0.56	58.46	±	2.08	Yes
	1/29/2020	0.41	±	0.14	1.52	±	0.53	No	18.60	±	0.62	68.82	±	2.29	Yes
	2/5/2020	0.20	±	0.16	0.74	±	0.58	No	20.10	±	0.63	74.37	±	2.33	Yes
	2/12/2020	0.35	±	0.19	1.30	±	0.71	No	26.90	±	0.73	99.53	±	2.70	Yes
	2/19/2020	0.78	±	0.16	2.89	±	0.59	Yes	20.60	±	0.59	76.22	±	2.18	Yes
	2/26/2020	0.65	±	0.13	2.42	±	0.50	Yes	28.90	±	0.64	106.93	±	2.35	Yes
	3/4/2020	1.59	±	0.25	5.88	±	0.94	Yes	31.50	±	0.74	116.55	±	2.75	Yes
	3/11/2020	1.34	±	0.27	4.96	±	0.98	Yes	19.90	±	0.69	73.63	±	2.56	Yes
	3/18/2020	0.97	±	0.17	3.60	±	0.63	Yes	23.60	±	0.67	87.32	±	2.48	Yes
	3/25/2020	0.85	±	0.17	3.15	±	0.62	Yes	21.70	±	0.62	80.29	±	2.29	Yes
INL SITE															
EFS	1/8/2020	1.52	±	0.23	5.62	±	0.85	Yes	32.10	±	0.73	118.77	±	2.69	Yes
	1/15/2020	0.52	±	0.20	1.91	±	0.74	No	17.10	±	0.59	63.27	±	2.17	Yes
	1/22/2020	0.59	±	0.21	2.20	±	0.78	No	29.00	±	0.73	107.30	±	2.69	Yes
	1/29/2020	0.90	±	0.17	3.33	±	0.62	Yes	32.60	±	0.73	120.62	±	2.70	Yes
	2/6/2020	0.60	±	0.15	2.23	±	0.54	Yes	20.50	±	0.55	75.85	±	2.02	Yes
	2/12/2020	-0.08	±	0.17	-0.30	±	0.62	No	21.30	±	0.66	78.81	±	2.46	Yes
	2/19/2020	0.63	±	0.16	2.32	±	0.60	Yes	33.70	±	0.74	124.69	±	2.72	Yes
	2/26/2020	0.97	±	0.16	3.58	±	0.60	Yes	33.20	±	0.72	122.84	±	2.66	Yes
	3/4/2020	1.04	±	0.22	3.85	±	0.83	Yes	42.30	±	0.81	156.51	±	2.98	Yes
	3/11/2020	0.40	±	0.19	1.48	±	0.71	No	9.17	±	0.49	33.93	±	1.83	Yes
	3/18/2020	0.80	±	0.14	2.95	±	0.53	Yes	20.20	±	0.57	74.74	±	2.09	Yes
	3/25/2020	0.59	±	0.15	2.18	±	0.57	Yes	23.00	±	0.62	85.10	±	2.30	Yes
MAIN GATE	1/8/2020	1.59	±	0.22	5.88	±	0.81	Yes	25.20	±	0.63	93.24	±	2.34	Yes
	1/15/2020	1.60	±	0.25	5.92	±	0.93	Yes	13.50	±	0.55	49.95	±	2.05	Yes
	1/22/2020	0.66	±	0.21	2.45	±	0.76	Yes	24.40	±	0.67	90.28	±	2.47	Yes
	1/29/2020	1.02	±	0.17	3.77	±	0.64	Yes	30.70	±	0.72	113.59	±	2.65	Yes
	2/5/2020	0.35	±	0.16	1.31	±	0.59	No	24.10	±	0.65	89.17	±	2.42	Yes
	2/12/2020	0.14	±	0.16	0.50	±	0.61	No	23.20	±	0.64	85.84	±	2.37	Yes
	2/19/2020	0.71	±	0.16	2.61	±	0.58	Yes	30.50	±	0.68	112.85	±	2.52	Yes
	2/26/2020	0.97	±	0.18	3.59	±	0.67	Yes	36.60	±	0.83	135.42	±	3.06	Yes
	3/4/2020	1.33	±	0.23	4.92	±	0.83	Yes	36.50	±	0.74	135.05	±	2.73	Yes
	3/11/2020	0.90	±	0.22	3.33	±	0.80	Yes	22.90	±	0.65	84.73	±	2.39	Yes
	3/18/2020	0.83	±	0.15	3.09	±	0.54	Yes	23.10	±	0.60	85.47	±	2.23	Yes
	3/25/2020	0.94	±	0.18	3.47	±	0.66	Yes	26.70	±	0.68	98.79	±	2.52	Yes
VAN BUREN GATE	1/8/2020	0.90	±	0.20	3.34	±	0.75	Yes	24.60	±	0.67	91.02	±	2.46	Yes
	1/15/2020	0.40	±	0.19	1.48	±	0.70	No	7.88	±	0.47	29.16	±	1.72	Yes
	1/22/2020	0.80	±	0.21	2.96	±	0.79	Yes	20.80	±	0.64	76.96	±	2.36	Yes
	1/29/2020	0.68	±	0.16	2.52	±	0.58	Yes	27.90	±	0.69	103.23	±	2.56	Yes
	2/5/2020	0.17	±	0.15	0.64	±	0.54	No	20.50	±	0.61	75.85	±	2.26	Yes

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	**Sampling Date**	**Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)**			**Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)**			**Result > 3s**	**Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)**			**Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)**			**Result > 3s**
	2/12/2020	-0.29	±	0.14	-1.06	±	0.50	No	19.40	±	0.59	71.78	±	2.17	**Yes**
	2/19/2020	0.39	±	0.14	1.42	±	0.51	No	26.10	±	0.63	96.57	±	2.35	**Yes**
	2/26/2020	0.83	±	0.15	3.06	±	0.56	**Yes**	32.60	±	0.69	120.62	±	2.57	**Yes**
	3/4/2020	1.01	±	0.22	3.74	±	0.83	**Yes**	39.80	±	0.79	147.26	±	2.93	**Yes**
	3/11/2020	1.01	±	0.22	3.74	±	0.81	**Yes**	22.10	±	0.64	81.77	±	2.35	**Yes**
	3/18/2020	1.11	±	0.17	4.11	±	0.61	**Yes**	23.70	±	0.63	87.69	±	2.33	**Yes**
	3/25/2020	0.82	±	0.17	3.03	±	0.63	**Yes**	25.50	±	0.66	94.35	±	2.45	**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 ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
BOUNDARY								
ARCO	01/08/20	-0.02	±	1.03	-0.07	±	3.81	No
	01/15/20	-0.22	±	1.17	-0.81	±	4.33	No
	01/22/20	-1.40	±	1.08	-5.18	±	4.00	No
	01/29/20	1.07	±	1.05	3.96	±	3.89	No
	02/05/20	0.75	±	1.13	2.78	±	4.18	No
	02/12/20	0.70	±	1.14	2.60	±	4.22	No
	02/19/20	0.64	±	1.15	2.38	±	4.26	No
	02/26/20	-0.25	±	1.03	-0.91	±	3.81	No
	03/04/20	-0.09	±	0.95	-0.34	±	3.50	No
	03/11/20	0.91	±	1.18	3.37	±	4.37	No
	03/18/20	-0.06	±	1.05	-0.21	±	3.89	No
	03/25/20	0.67	±	1.19	2.49	±	4.40	No
QA-1 (ARCO)	01/08/20	-0.02	±	0.97	-0.07	±	3.59	No
	01/15/20	-0.20	±	1.09	-0.75	±	4.03	No
	01/22/20	-1.31	±	1.01	-4.85	±	3.74	No
	01/29/20	1.07	±	1.06	3.96	±	3.92	No
	02/05/20	0.75	±	1.13	2.78	±	4.18	No
	02/12/20	0.69	±	1.12	2.55	±	4.14	No
	02/19/20	0.59	±	1.04	2.17	±	3.85	No
	02/26/20	-0.24	±	1.02	-0.90	±	3.77	No
	03/04/20	-0.09	±	0.96	-0.34	±	3.56	No
	03/11/20	0.98	±	1.27	3.63	±	4.70	No
	03/18/20	-0.06	±	1.04	-0.20	±	3.85	No
	03/25/20	0.64	±	1.13	2.37	±	4.18	No
ATOMIC CITY	01/08/20	-0.02	±	1.02	-0.07	±	3.77	No
	01/15/20	-0.21	±	1.15	-0.79	±	4.26	No
	01/22/20	-1.57	±	1.21	-5.81	±	4.48	No
	01/29/20	1.11	±	1.10	4.11	±	4.07	No
	02/05/20	0.78	±	1.17	2.89	±	4.33	No
	02/12/20	0.73	±	1.18	2.70	±	4.37	No
	02/19/20	0.71	±	1.26	2.62	±	4.66	No
	02/26/20	-0.31	±	1.31	-1.15	±	4.85	No
	03/04/20	-0.10	±	1.01	-0.36	±	3.74	No
	03/11/20	0.98	±	1.27	3.63	±	4.70	No
	03/18/20	-0.06	±	1.17	-0.23	±	4.33	No
	03/25/20	0.66	±	1.16	2.44	±	4.29	No
BLUE DOME	01/08/20	0.83	±	1.01	3.08	±	3.74	No
	01/15/20	1.13	±	1.07	4.18	±	3.96	No
	01/22/20	-1.16	±	2.10	-4.29	±	7.77	No
	01/29/20	-1.23	±	2.15	-4.55	±	7.96	No
	02/05/20	-1.12	±	1.16	-4.14	±	4.29	No
	02/12/20	0.92	±	2.40	3.40	±	8.88	No
	02/19/20	2.16	±	2.83	7.99	±	10.47	No
	02/26/20	0.98	±	2.50	3.61	±	9.25	No
	03/04/20	0.31	±	1.13	1.15	±	4.18	No
	03/11/20	1.77	±	1.81	6.55	±	6.70	No
	03/18/20	-0.85	±	1.74	-3.15	±	6.44	No
	03/25/20	-2.18	±	1.72	-8.07	±	6.36	No
FAA TOWER	01/08/20	0.91	±	1.11	3.38	±	4.11	No
	01/16/20	1.04	±	0.98	3.85	±	3.63	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	01/22/20	-1.25	±	2.26	-4.63	±	8.36	No
	01/29/20	-1.18	±	2.05	-4.37	±	7.59	No
	02/05/20	-1.05	±	1.08	-3.89	±	4.00	No
	02/12/20	0.84	±	2.19	3.10	±	8.10	No
	02/19/20	2.00	±	2.63	7.40	±	9.73	No
	02/26/20	0.80	±	2.05	2.96	±	7.59	No
	03/04/20	0.28	±	1.03	1.05	±	3.81	No
	03/11/20	1.72	±	1.76	6.36	±	6.51	No
	03/18/20	-0.81	±	1.66	-2.99	±	6.14	No
	03/25/20	-2.24	±	1.76	-8.29	±	6.51	No
HOWE	01/08/20	0.89	±	1.08	3.28	±	4.00	No
	01/15/20	0.98	±	0.93	3.63	±	3.42	No
	01/22/20	-1.21	±	2.19	-4.48	±	8.10	No
	01/29/20	-1.32	±	2.30	-4.88	±	8.51	No
	02/05/20	-1.23	±	1.26	-4.55	±	4.66	No
	02/12/20	0.98	±	2.55	3.61	±	9.44	No
	02/19/20	2.17	±	2.85	8.03	±	10.55	No
	02/26/20	0.94	±	2.41	3.49	±	8.92	No
	03/04/20	0.32	±	1.18	1.20	±	4.37	No
	03/11/20	2.05	±	2.10	7.59	±	7.77	No
	03/18/20	-0.85	±	1.74	-3.14	±	6.44	No
	03/25/20	-5.38	±	4.24	-19.91	±	15.69	No
MONTEVIEW	01/08/20	0.85	±	1.03	3.13	±	3.81	No
	01/15/20	1.22	±	1.15	4.51	±	4.26	No
	01/22/20	-1.15	±	2.08	-4.26	±	7.70	No
	01/29/20	-1.21	±	2.11	-4.48	±	7.81	No
	02/05/20	-1.15	±	1.18	-4.26	±	4.37	No
	02/12/20	0.93	±	2.43	3.44	±	8.99	No
	02/19/20	2.06	±	2.71	7.62	±	10.03	No
	02/26/20	0.82	±	2.08	3.02	±	7.70	No
	03/04/20	0.30	±	1.10	1.12	±	4.07	No
	03/11/20	1.95	±	1.99	7.22	±	7.36	No
	03/18/20	-0.87	±	1.78	-3.21	±	6.59	No
	03/25/20	-2.22	±	1.75	-8.21	±	6.48	No
MUD LAKE	01/08/20	0.80	±	0.97	2.95	±	3.59	No
	01/15/20	1.19	±	1.13	4.40	±	4.18	No
	01/22/20	-1.10	±	2.00	-4.07	±	7.40	No
	01/29/20	-1.21	±	2.12	-4.48	±	7.84	No
	02/05/20	-1.48	±	1.52	-5.48	±	5.62	No
	02/12/20	0.93	±	2.44	3.45	±	9.03	No
	02/19/20	2.13	±	2.79	7.88	±	10.32	No
a	02/26/20		±			±		No
	03/04/20	0.23	±	0.83	0.84	±	3.06	No
	03/11/20	1.64	±	1.68	6.07	±	6.22	No
	03/18/20	-0.85	±	1.74	-3.15	±	6.44	No
	03/25/20	-2.37	±	1.87	-8.77	±	6.92	No
QA-2 (MUD LAKE)	01/08/20	0.84	±	1.03	3.11	±	3.81	No
	01/15/20	1.18	±	1.11	4.37	±	4.11	No
	01/22/20	-1.08	±	1.96	-4.00	±	7.25	No
	01/29/20	-1.16	±	2.03	-4.29	±	7.51	No
	02/05/20	-1.06	±	1.09	-3.92	±	4.03	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	02/12/20	0.80	±	2.08	2.95	±	7.70	No
	02/19/20	2.04	±	2.68	7.55	±	9.92	No
	02/26/20	0.93	±	2.38	3.44	±	8.81	No
	03/04/20	0.31	±	1.14	1.16	±	4.22	No
	03/11/20	1.98	±	2.03	7.33	±	7.51	No
	03/18/20	-0.85	±	1.73	-3.13	±	6.40	No
	03/25/20	-2.21	±	1.74	-8.18	±	6.44	No
DISTANT								
BLACKFOOT	01/08/20	-0.02	±	1.03	-0.07	±	3.81	No
	01/15/20	-0.21	±	1.15	-0.79	±	4.26	No
	01/22/20	-1.41	±	1.08	-5.22	±	4.00	No
	01/29/20	1.12	±	1.11	4.14	±	4.11	No
	02/05/20	0.77	±	1.16	2.85	±	4.29	No
	02/12/20	0.69	±	1.11	2.53	±	4.11	No
	02/19/20	0.67	±	1.19	2.48	±	4.40	No
	02/26/20	-0.27	±	1.13	-1.00	±	4.18	No
	03/04/20	-0.10	±	1.08	-0.38	±	4.00	No
	03/11/20	0.97	±	1.25	3.59	±	4.63	No
	03/18/20	-0.06	±	1.22	-0.24	±	4.51	No
	03/25/20	0.67	±	1.18	2.47	±	4.37	No
CRATERS	01/08/20	-0.01	±	0.65	-0.04	±	2.39	No
OF THE MOON	01/15/20	-0.19	±	1.04	-0.72	±	3.85	No
	01/22/20	-1.40	±	1.08	-5.18	±	4.00	No
	01/29/20	1.04	±	1.03	3.85	±	3.81	No
	02/05/20	0.73	±	1.09	2.69	±	4.03	No
	02/12/20	0.68	±	1.11	2.53	±	4.11	No
	02/19/20	0.63	±	1.13	2.34	±	4.18	No
	02/26/20	-0.25	±	1.04	-0.92	±	3.85	No
	03/04/20	-0.10	±	1.01	-0.36	±	3.74	No
	03/11/20	1.07	±	1.39	3.96	±	5.14	No
	03/18/20	-0.07	±	1.40	-0.28	±	5.18	No
	03/25/20	0.64	±	1.12	2.36	±	4.14	No
DUBOIS	01/08/20	0.80	±	0.97	2.95	±	3.60	No
	01/15/20	1.19	±	1.12	4.40	±	4.14	No
	01/22/20	-1.07	±	1.95	-3.96	±	7.22	No
	01/29/20	-1.18	±	2.06	-4.37	±	7.62	No
	02/05/20	-1.03	±	1.06	-3.81	±	3.92	No
	02/12/20	0.84	±	2.21	3.12	±	8.18	No
	02/19/20	2.09	±	2.75	7.73	±	10.18	No
	02/26/20	0.87	±	2.22	3.21	±	8.21	No
	03/04/20	0.28	±	1.01	1.03	±	3.74	No
	03/11/20	1.77	±	1.82	6.55	±	6.73	No
	03/18/20	-0.86	±	1.76	-3.19	±	6.51	No
	03/25/20	-2.36	±	1.86	-8.73	±	6.88	No
IDAHO FALLS	01/08/20	0.79	±	0.96	2.92	±	3.56	No
	01/15/20	1.19	±	1.13	4.40	±	4.18	No
	01/22/20	-1.06	±	1.92	-3.92	±	7.10	No
	01/29/20	-1.10	±	1.92	-4.07	±	7.10	No
	02/05/20	-1.08	±	1.11	-4.00	±	4.11	No
	02/12/20	0.84	±	2.20	3.12	±	8.14	No
	02/19/20	1.98	±	2.60	7.33	±	9.62	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	02/26/20	0.79	±	2.02	2.92	±	7.47	No
	03/04/20	0.30	±	1.10	1.12	±	4.07	No
	03/11/20	1.59	±	1.63	5.88	±	6.03	No
	03/18/20	-0.83	±	1.69	-3.06	±	6.25	No
	03/25/20	-2.14	±	1.69	-7.92	±	6.25	No
JACKSON	01/08/20	-0.02	±	0.97	-0.07	±	3.59	No
	01/15/20	-0.22	±	1.20	-0.83	±	4.44	No
	01/22/20	-1.49	±	1.14	-5.51	±	4.22	No
	01/29/20	1.24	±	1.23	4.59	±	4.55	No
	02/05/20	0.84	±	1.26	3.09	±	4.66	No
	02/12/20	0.82	±	1.33	3.03	±	4.92	No
	02/19/20	0.79	±	1.41	2.93	±	5.22	No
	02/26/20	-0.26	±	1.09	-0.97	±	4.03	No
	03/04/20	-0.11	±	1.15	-0.41	±	4.26	No
	03/09/20	1.61	±	2.08	5.96	±	7.70	No
	03/18/20	-0.05	±	0.96	-0.19	±	3.53	No
	03/25/20	0.73	±	1.29	2.71	±	4.77	No
SUGAR CITY	01/08/20	0.81	±	0.99	2.99	±	3.65	No
	01/15/20	1.16	±	1.10	4.29	±	4.07	No
	01/22/20	-1.01	±	1.83	-3.74	±	6.77	No
	01/29/20	-1.21	±	2.12	-4.48	±	7.84	No
	02/05/20	-1.10	±	1.13	-4.07	±	4.18	No
	02/12/20	0.89	±	2.32	3.29	±	8.58	No
	02/19/20	1.98	±	2.60	7.33	±	9.62	No
	02/26/20	0.73	±	1.87	2.70	±	6.92	No
	03/04/20	0.30	±	1.09	1.11	±	4.03	No
	03/11/20	2.05	±	2.10	7.59	±	7.77	No
	03/18/20	-0.92	±	1.88	-3.40	±	6.96	No
	03/25/20	-2.14	±	1.69	-7.92	±	6.25	No
INL SITE								
EFS	01/08/20	-0.02	±	1.11	-0.07	±	4.11	No
	01/15/20	-0.20	±	1.09	-0.75	±	4.03	No
	01/22/20	-1.51	±	1.16	-5.59	±	4.29	No
	01/29/20	1.10	±	1.08	4.07	±	4.00	No
	02/06/20	0.63	±	0.95	2.33	±	3.50	No
	02/12/20	0.78	±	1.27	2.89	±	4.70	No
	02/19/20	0.68	±	1.22	2.52	±	4.51	No
	02/26/20	-0.27	±	1.11	-0.98	±	4.11	No
	03/04/20	-0.10	±	1.02	-0.37	±	3.77	No
	03/11/20	0.98	±	1.27	3.64	±	4.70	No
	03/18/20	-0.05	±	1.02	-0.20	±	3.77	No
	03/25/20	0.62	±	1.10	2.30	±	4.07	No
MAIN GATE	01/08/20	-0.02	±	1.02	-0.07	±	3.77	No
	01/15/20	-0.21	±	1.12	-0.77	±	4.14	No
	01/22/20	-1.47	±	1.13	-5.44	±	4.18	No
	01/29/20	1.10	±	1.09	4.07	±	4.03	No
	02/05/20	0.76	±	1.15	2.82	±	4.26	No
	02/12/20	0.70	±	1.14	2.60	±	4.22	No
	02/19/20	0.64	±	1.14	2.37	±	4.22	No
	02/26/20	-0.32	±	1.32	-1.17	±	4.88	No
	03/04/20	-0.09	±	0.98	-0.35	±	3.63	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	03/11/20	0.93	±	1.20	3.43	±	4.44	No
	03/18/20	-0.06	±	1.04	-0.20	±	3.85	No
	03/25/20	0.66	±	1.16	2.43	±	4.29	No
VAN BUREN GATE	01/08/20	-0.02	±	1.14	-0.08	±	4.22	No
	01/15/20	-0.21	±	1.10	-0.76	±	4.07	No
	01/22/20	-1.49	±	1.15	-5.51	±	4.26	No
	01/29/20	1.11	±	1.10	4.11	±	4.07	No
	02/05/20	0.75	±	1.14	2.79	±	4.22	No
	02/12/20	0.68	±	1.11	2.52	±	4.11	No
	02/19/20	0.64	±	1.13	2.35	±	4.18	No
	02/26/20	-0.25	±	1.06	-0.94	±	3.92	No
	03/04/20	-0.10	±	1.04	-0.37	±	3.85	No
	03/11/20	0.93	±	1.20	3.43	±	4.44	No
	03/18/20	-0.06	±	1.09	-0.21	±	4.03	No
	03/25/20	0.65	±	1.14	2.39	±	4.22	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 ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-14}$ Bq/mL)			Result > 3s
BOUNDARY									
ARCO	3/25/2020	AMERICIUM-241	0.42	±	0.99	1.55	±	3.65	No
		CESIUM-137	-17.60	±	118.00	-65.12	±	436.60	No
		PLUTONIUM-238	0.43	±	0.78	1.60	±	2.89	No
		PLUTONIUM-239/240	-4.95	±	1.75	-18.32	±	6.48	No
QA-1 (ARCO)	3/25/2020	AMERICIUM-241	1.24	±	0.81	4.59	±	3.00	No
		CESIUM-137	2.48	±	93.00	9.18	±	344.10	No
		PLUTONIUM-238	0.90	±	0.81	3.32	±	2.98	No
		PLUTONIUM-239/240	-0.60	±	1.11	-2.21	±	4.11	No
ATOMIC CITY	3/25/2020	CESIUM-137	80.50	±	81.40	297.85	±	301.18	No
BLUE DOME	3/25/2020	CESIUM-137	221.00	±	132.00	817.70	±	488.40	No
FAA TOWER	3/25/2020	CESIUM-137	12.10	±	80.40	44.77	±	297.48	No
		STRONTIUM-90	0.14	±	7.23	0.53	±	26.75	No
HOWE	3/25/2020	CESIUM-137	50.80	±	93.40	187.96	±	345.58	No
		STRONTIUM-90	24.90	±	11.00	92.13	±	40.70	No
MONTEVIEW	3/25/2020	CESIUM-137	-64.60	±	108.00	-239.02	±	399.60	No
		STRONTIUM-90	-7.34	±	10.10	-27.16	±	37.37	No
MUD LAKE	3/25/2020	AMERICIUM-241	2.43	±	0.95	8.99	±	3.51	No
		CESIUM-137	94.30	±	88.00	348.91	±	325.60	No
		PLUTONIUM-238	0.90	±	0.72	3.33	±	2.66	No
		PLUTONIUM-239/240	0.36	±	0.78	1.32	±	2.89	No
QA-2 (MUD LAKE)	3/25/2020	AMERICIUM-241	0.62	±	0.94	2.28	±	3.47	No
		CESIUM-137	78.60	±	108.00	290.82	±	399.60	No
		PLUTONIUM-238	2.32	±	1.61	8.58	±	5.96	No
		PLUTONIUM-239/240	-1.26	±	1.53	-4.66	±	5.66	No
DISTANT									
BLACKFOOT	3/25/2020	CESIUM-137	211.00	±	143.00	780.70	±	529.10	No
CRATERS	3/25/2020	CESIUM-137	-73.20	±	74.50	-270.84	±	275.65	No
		STRONTIUM-90	-7.40	±	10.80	-27.38	±	39.96	No

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

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-14}$ Bq/mL)			Result > 3s
DUBOIS	3/25/2020	CESIUM-137	86.30	±	140.00	319.31	±	518.00	No
IDAHO FALLS	3/25/2020	AMERICIUM-241	1.54	±	0.69	5.70	±	2.56	No
		CESIUM-137	60.90	±	77.80	225.33	±	287.86	No
		PLUTONIUM-238	-1.28	±	1.00	-4.74	±	3.70	No
		PLUTONIUM-239/240	-0.48	±	0.71	-1.77	±	2.64	No
JACKSON	3/25/2020	AMERICIUM-241	1.10	±	1.01	4.07	±	3.74	No
		CESIUM-137	-44.10	±	89.40	-163.17	±	330.78	No
		PLUTONIUM-238	1.56	±	0.85	5.77	±	3.14	No
		PLUTONIUM-239/240	0.00	±	0.80	0.00	±	2.96	No
SUGAR CITY	3/25/2020	CESIUM-137	159.00	±	147.00	588.30	±	543.90	No
INL SITE									
EFS	3/25/2020	CESIUM-137	140.00	±	149.00	518.00	±	551.30	No
		STRONTIUM-90	-16.90	±	6.35	-62.53	±	23.50	No
MAIN GATE	3/25/2020	CESIUM-137	51.60	±	80.80	190.92	±	298.96	No
		STRONTIUM-90	-18.70	±	10.50	-69.19	±	38.85	No
VAN BUREN GATE	3/25/2020	AMERICIUM-241	0.12	±	0.64	0.43	±	2.37	No
		CESIUM-137	-13.80	±	102.00	-51.06	±	377.40	No
		PLUTONIUM-238	-1.18	±	0.99	-4.37	±	3.64	No
		PLUTONIUM-239/240	0.34	±	1.38	1.24	±	5.11	No

Table C-4. Tritium Concentrations in Atmospheric Moisture

Sampling Group and Location	Start Date	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-13}$ µCi/mL$_{air}$)			Result ± 1s Uncertainty ($\times 10^{-9}$ Bq/mL$_{air}$)			Result > 3s
BOUNDARY									
ATOMIC CITY	12/04/19	01/22/20	1.76	±	0.84	6.51	±	3.12	No
ATOMIC CITY	01/22/20	03/11/20	0.35	±	0.78	1.28	±	2.88	No
HOWE	11/27/19	01/08/20	3.30	±	0.78	12.21	±	2.87	**Yes**
HOWE	01/08/20	03/04/20	1.73	±	0.67	6.40	±	2.49	No
DISTANT									
IDAHO FALLS	12/18/19	02/05/20	2.01	±	0.88	7.44	±	3.27	No
IDAHO FALLS	02/05/20	03/18/20	2.38	±	0.96	8.81	±	3.54	No
INL SITE									
EFS	12/04/19	01/15/20	0.87	±	0.73	3.23	±	2.71	No
EFS	01/15/20	03/04/20	2.72	±	0.68	10.06	±	2.52	**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	12/31/19	01/08/20	26.70	±	25.60	0.99	±	0.95	No
ATOMIC CITY	01/08/20	01/15/20	39.70	±	25.80	1.47	±	0.95	No
ATOMIC CITY	01/15/20	01/22/20	76.10	±	26.20	2.82	±	0.97	No
ATOMIC CITY	01/22/20	01/29/20	100.00	±	25.40	3.70	±	0.94	**Yes**
ATOMIC CITY	02/26/20	03/04/20	88.60	±	25.20	3.28	±	0.93	**Yes**
ATOMIC CITY	03/11/20	03/18/20	60.10	±	24.80	2.22	±	0.92	No
HOWE	12/31/19	01/08/20	72.20	±	25.50	2.67	±	0.94	No
HOWE	01/08/20	01/15/20	40.80	±	25.10	1.51	±	0.93	No
HOWE	01/22/20	01/29/20	82.00	±	25.60	3.03	±	0.95	**Yes**
HOWE	01/29/20	02/05/20	143.00	±	25.40	5.29	±	0.94	**Yes**
HOWE	02/19/20	02/26/20	85.20	±	26.20	3.15	±	0.97	**Yes**
HOWE	03/11/20	03/18/20	89.00	±	25.40	3.29	±	0.94	**Yes**
DISTANT									
IDAHO FALLS	12/31/19	01/31/20	9.65	±	24.10	0.36	±	0.89	No
IDAHO FALLS	01/31/20	02/29/20	89.80	±	24.70	3.32	±	0.91	**Yes**
IDAHO FALLS	02/29/20	03/31/20	98.30	±	24.80	3.64	±	0.92	**Yes**
INL SITE									
EFS	12/31/19	01/08/20	86.10	±	25.60	3.19	±	0.95	**Yes**
EFS	01/08/20	01/15/20	72.90	±	25.40	2.70	±	0.94	No
EFS	01/15/20	01/22/20	62.90	±	25.30	2.33	±	0.94	No
EFS	01/22/20	01/29/20	-3.10	±	24.00	-0.11	±	0.89	No
EFS	02/05/20	02/12/20	74.40	±	25.90	2.75	±	0.96	No
EFS	02/19/20	02/26/20	63.50	±	25.80	2.35	±	0.95	No
EFS	03/11/20	03/18/20	150.00	±	25.50	5.55	±	0.94	**Yes**

Table C-6. 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
CONTROL	01/07/20	1.01	±	1.86	0.04	±	0.07	No	0.66	±	1.45	0.02	±	0.05	No
	02/04/20	0.48	±	0.98	0.02	±	0.04	No	-1.46	±	0.93	-0.05	±	0.03	No
	03/03/20	2.26	±	1.99	0.08	±	0.07	No	-1.78	±	1.57	-0.07	±	0.06	No
DIETRICH	01/07/20	-0.57	±	1.73	-0.02	±	0.06	No	0.58	±	1.32	0.02	±	0.05	No
	02/04/20	0.63	±	0.92	0.02	±	0.03	No	1.26	±	0.88	0.05	±	0.03	No
	03/03/20	-0.95	±	2.16	-0.04	±	0.08	No	-0.42	±	1.89	-0.02	±	0.07	No
HOWE	01/07/20	1.79	±	2.34	0.07	±	0.09	No	0.09	±	1.83	0.00	±	0.07	No
	02/04/20	0.72	±	2.37	0.03	±	0.09	No	-1.17	±	1.85	-0.04	±	0.07	No
	03/03/20	2.30	±	1.78	0.09	±	0.07	No	-0.51	±	1.46	-0.02	±	0.05	No
IDAHO FALLS	01/07/20	-0.32	±	0.92	-0.01	±	0.03	No	-0.88	±	0.99	-0.03	±	0.04	No
	01/14/20	-0.47	±	0.85	-0.02	±	0.03	No	1.27	±	0.93	0.05	±	0.03	No
	01/21/20	-0.75	±	1.65	-0.03	±	0.06	No	0.48	±	1.44	0.02	±	0.05	No
	01/28/20	-1.04	±	1.58	-0.04	±	0.06	No	1.00	±	1.46	0.04	±	0.05	No
	02/04/20	-0.19	±	0.86	-0.01	±	0.03	No	-0.99	±	0.91	-0.04	±	0.03	No
Duplicate	02/04/20	-1.39	±	1.38	-0.05	±	0.05	No	0.80	±	0.99	0.03	±	0.04	No
	02/11/20	-0.87	±	2.12	-0.03	±	0.08	No	-3.77	±	2.05	-0.14	±	0.08	No
	02/18/20	0.27	±	1.66	0.01	±	0.06	No	1.18	±	1.47	0.04	±	0.05	No
	02/25/20	-2.90	±	1.71	-0.11	±	0.06	No	0.25	±	1.40	0.01	±	0.05	No
	03/03/20	1.23	±	0.90	0.05	±	0.03	No	-0.22	±	0.89	-0.01	±	0.03	No
	03/10/20	0.86	±	1.06	0.03	±	0.04	No	-0.21	±	1.32	-0.01	±	0.05	No
	03/18/20	-1.53	±	1.03	-0.06	±	0.04	No	-0.12	±	1.52	0.00	±	0.06	No
	03/24/20	-1.28	±	1.68	-0.05	±	0.06	No	3.25	±	1.38	0.12	±	0.05	No
MINIDOKA	01/07/20	1.43	±	0.99	0.05	±	0.04	No	1.50	±	0.93	0.06	±	0.03	No
Duplicate	01/07/20	2.34	±	2.60	0.09	±	0.10	No	1.57	±	1.89	0.06	±	0.07	No
	02/04/20	-0.16	±	1.27	-0.01	±	0.05	No	1.37	±	1.01	0.05	±	0.04	No
	03/03/20	-0.35	±	0.93	-0.01	±	0.03	No	1.14	±	0.89	0.04	±	0.03	No
MONTEVIEW	01/02/20	1.32	±	3.39	0.05	±	0.13	No	-2.52	±	1.96	-0.09	±	0.07	No
	01/30/20	0.65	±	2.19	0.02	±	0.08	No	-0.72	±	1.87	-0.03	±	0.07	No
	03/02/20	0.83	±	2.49	0.03	±	0.09	No	-1.15	±	1.89	-0.04	±	0.07	No
TERRETON	01/07/20	-0.37	±	1.17	-0.01	±	0.04	No	-0.74	±	0.97	-0.03	±	0.04	No
	01/15/20	1.64	±	1.13	0.06	±	0.04	No	-0.49	±	1.00	-0.02	±	0.04	No
	01/22/20	0.45	±	1.06	0.02	±	0.04	No	0.58	±	0.96	0.02	±	0.04	No
	01/29/20	0.30	±	1.96	0.01	±	0.07	No	1.19	±	1.91	0.04	±	0.07	No
	02/04/20	-2.98	±	1.78	-0.11	±	0.07	No	-1.18	±	1.52	-0.04	±	0.06	No
	02/12/20	-1.14	±	1.12	-0.04	±	0.04	No	-0.93	±	1.00	-0.03	±	0.04	No
	02/19/20	-0.73	±	1.07	-0.03	±	0.04	No	-0.68	±	1.00	-0.03	±	0.04	No
	02/26/20	0.73	±	1.14	0.03	±	0.04	No	-0.36	±	1.03	-0.01	±	0.04	No
	03/03/20	2.02	±	1.06	0.07	±	0.04	No	-3.27	±	1.63	-0.12	±	0.06	No
Duplicate	03/03/20	4.73	±	2.70	0.18	±	0.10	No	0.45	±	1.84	0.02	±	0.07	No
	03/11/20	-0.60	±	1.58	-0.02	±	0.06	No	2.95	±	1.15	0.11	±	0.04	No
	03/18/20	-0.33	±	1.10	-0.01	±	0.04	No	2.18	±	1.08	0.08	±	0.04	No
	03/24/20	-0.33	±	1.13	-0.01	±	0.04	No	2.13	±	1.04	0.08	±	0.04	No

APPENDIX D

STATISTICAL ANALYSIS RESULTS

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

Gross Alpha					
Quarter	Valid N	Sum of ranks	Mean rank	H[a]	*p*[b]
Boundary	83	8204.500	98.84940		
Distant	72	6843.000	95.04167	0.4971859	0.7799
INL Site	36	3288.500	91.34722		
January	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	964.500	34.44643		
Distant	24	675.000	28.12500	2.244368	0.3256
INL Site	12	440.500	36.70833		
February	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	27	932.5000	34.53704		
Distant	24	739.5000	30.81250	1.014823	0.6021
INL Site	12	344.0000	28.66667		
March	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	844.0000	30.14286		
Distant	24	918.5000	38.27083	4.018764	0.1341
INL Site	12	317.5000	26.45833		
Gross Beta					
Quarter	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	83	8876.000	106.9398		
Distant	72	5350.500	74.3125	18.21538	0.0001
INL Site	36	4109.500	114.1528		
January	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	1083.500	38.69643		
Distant	24	508.000	21.16667	14.32708	0.0008
INL Site	12	488.500	40.70833		
February	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	27	935.5000	34.64815		
Distant	24	621.0000	25.87500	4.658413	0.0974
INL Site	12	459.5000	38.29167		
March	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	970.5000	34.66071		
Distant	24	676.5000	28.18750	2.109812	0.3482
INL Site	12	433.0000	36.08333		

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 first 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 (1st-Qtr-20-LVf in 1st-Qtr-20-LVf)
Independent (grouping) variable: GeographicName
Kruskal-Wallis test: H (17, N= 215) =18.82514 p =.3387
Include condition: v8='gross alpha'

Depend.: Coded Result	Arco R:100.25	Atomic City R:106.71	Blackfoot R:101.63	Blue Dome R:110.00	Craters of the Moon R:84.000	Dubois R:90.750	EFS R:87.917	FAA Tower R:72.042	Howe R:115.63	Idaho Falls R:134.25	Jackson WY R:114.83	Main Gate R:122.71	Monteview R:147.08	Mud Lake R:114.00	Sugar City R:103.83	Van Buren R:91.375
Arco		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Atomic City	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Blackfoot	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Blue Dome	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Craters of the Moon	1.000000	1.000000	1.000000	1.000000		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
EFS	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
FAA Tower	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	0.478752	1.000000	1.000000	1.000000
Howe	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Idaho Falls	1.000000	1.000000	1.000000	1.000000	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
Main Gate	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000
Monteview	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.478752	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
QA-1 (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	1.000000
QA-2 (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	1.000000
Sugar City	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000
Van Buren	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	

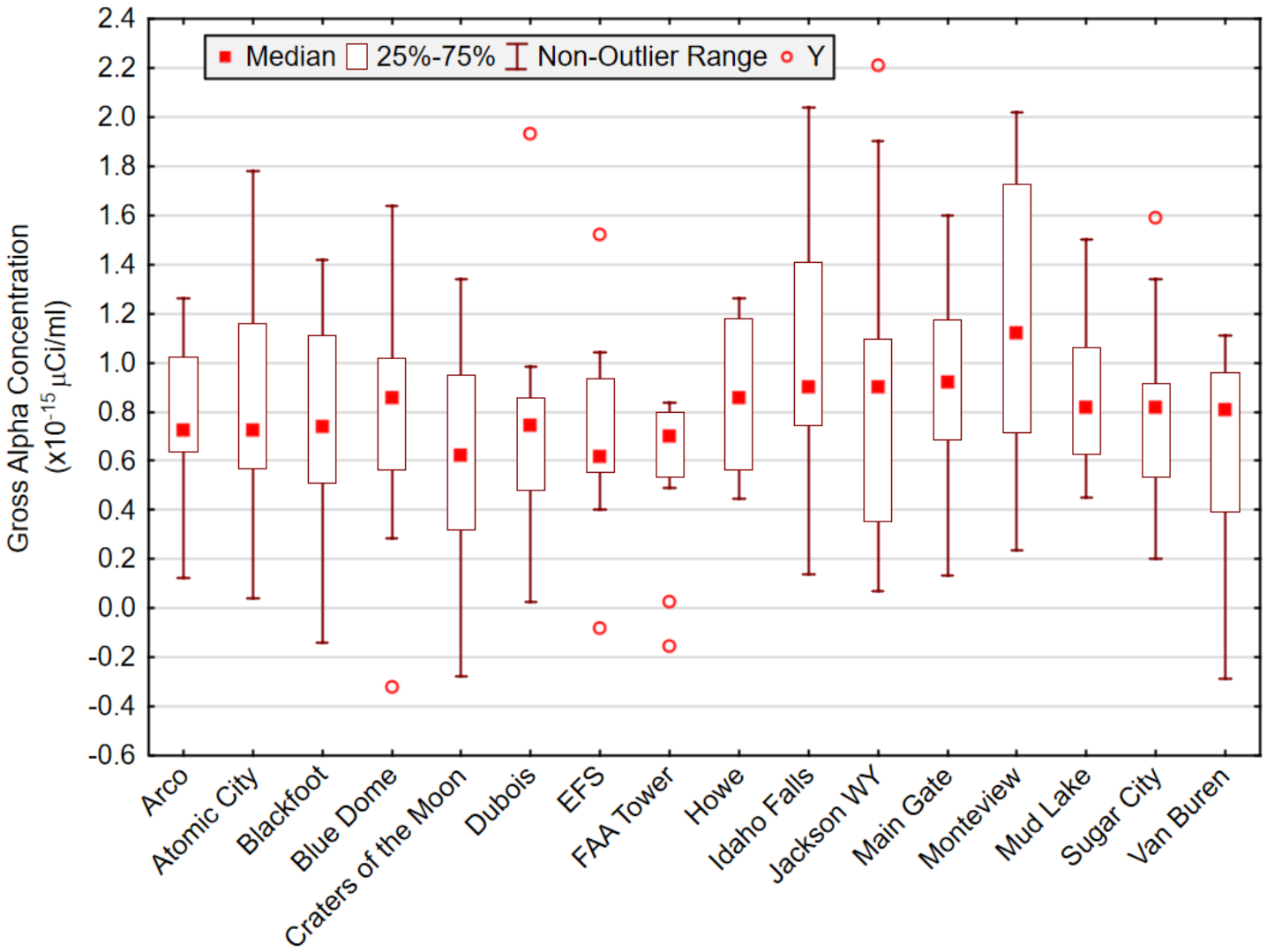

Figure D-1. First quarter gross alpha concentrations in air at all sampling locations. Number of samples (N) = 12 at each location, except for Mud Lake (N = 11).

Table D-3. Basic statistics for gross beta results for month of January.

January								
	All Groups Descriptive Statistics (1st-Qtr-20-LVf in 1st-Qtr-20-LVf) Include condition: v8='Gross Beta',v7=1							
	Valid N	**Mean**	**Median**	**Minimum**	**Maximum**	**Lower**	**Upper**	**Std.Dev.**
ALL	72	21.48236	21.20000	7.040000	36.20000	15.95000	27.50000	7.328168
Boundary	28	23.31107	23.90000	9.310000	36.20000	19.00000	29.05000	7.013444
Distant	24	16.60167	17.60000	7.040000	26.10000	13.05000	19.45000	5.009594
INL Site	12	23.81500	24.90000	7.880000	32.60000	18.95000	29.85000	7.711701
February								
	All Groups Descriptive Statistics (1st-Qtr-20-LVf in 1st-Qtr-20-LVf) Include condition: v8='Gross Beta',v7=1							
	Valid N	**Mean**	**Median**	**Minimum**	**Maximum**	**Lower**	**Upper**	**Std.Dev.**
ALL	71	24.37704	23.20000	9.270000	43.20000	20.10000	30.50000	7.462448
Boundary	27	25.45926	24.40000	12.90000	43.20000	20.50000	30.90000	7.389611
Distant	24	21.72375	20.60000	9.270000	37.60000	16.00000	26.95000	7.504003
INL Site	12	26.80833	25.10000	19.40000	36.60000	20.90000	32.90000	6.157546
March								
	All Groups Descriptive Statistics (1st-Qtr-20-LVf in 1st-Qtr-20-LVf) Include condition: v8='Gross Beta',v7=1							
	Valid N	**Mean**	**Median**	**Minimum**	**Maximum**	**Lower**	**Upper**	**Std.Dev.**
ALL	72	25.49250	23.55000	6.290000	47.60000	21.60000	28.35000	7.260591
Boundary	28	25.59607	23.65000	6.290000	41.90000	21.80000	30.50000	7.132959
Distant	24	24.10417	22.50000	17.30000	44.30000	20.65000	24.40000	5.748231
INL Site	12	26.24750	23.40000	9.170000	42.30000	22.50000	31.60000	9.198784