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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report:

First Quarter 2019

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EXECUTIVE SUMMARY

None of the radionuclides detected in samples collected during the first quarter of 2019 could be directly linked with INL Site activities. Levels of detected radionuclides were no different than values measured at other locations across the western United States. All detected radionuclide concentrations were well below standards set by the U.S. Department of Energy (DOE) and regulatory standards established by the U.S. Environmental Protection Agency (EPA) for protection of the public.

This report for the first 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, January 1 through March 31, 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
- Milk

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

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were no statistically significant differences in monthly and quarterly gross alpha and gross beta concentrations measured at Distant, Boundary, and INL Site sampling locations. Several differences were noted in first quarter gross alpha results categorized by location, with Idaho Falls being statistically higher than Blue Dome, Craters of the Moon and Dubois. 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, ^{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 composite.
	Charcoal Cartridge	Iodine-131	Iodine-131 was not detected in any of the batches of charcoal cartridges counted during the quarter.
Atmospheric Moisture	Liquid	Tritium	Three 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	Five of 33 results were greater than the 3s uncertainty. All results were 99%/95% UTL and were consistent with those reported across the region by the Environmental Protection Agency.
Milk	Liquid	Iodine-131, other gamma-emitting radionuclides	Forty 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 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 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 2019 (January 1- March 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 several potential exposure points within the various exposure pathways, including air, water, agricultural products, wildlife, and soil that could possibly contribute to the radiation dose received by the public.

Environmental samples collected include:

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

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

The ESER Program used two laboratories to perform analyses on routine environmental samples collected during the quarter reported here. The 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.

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.

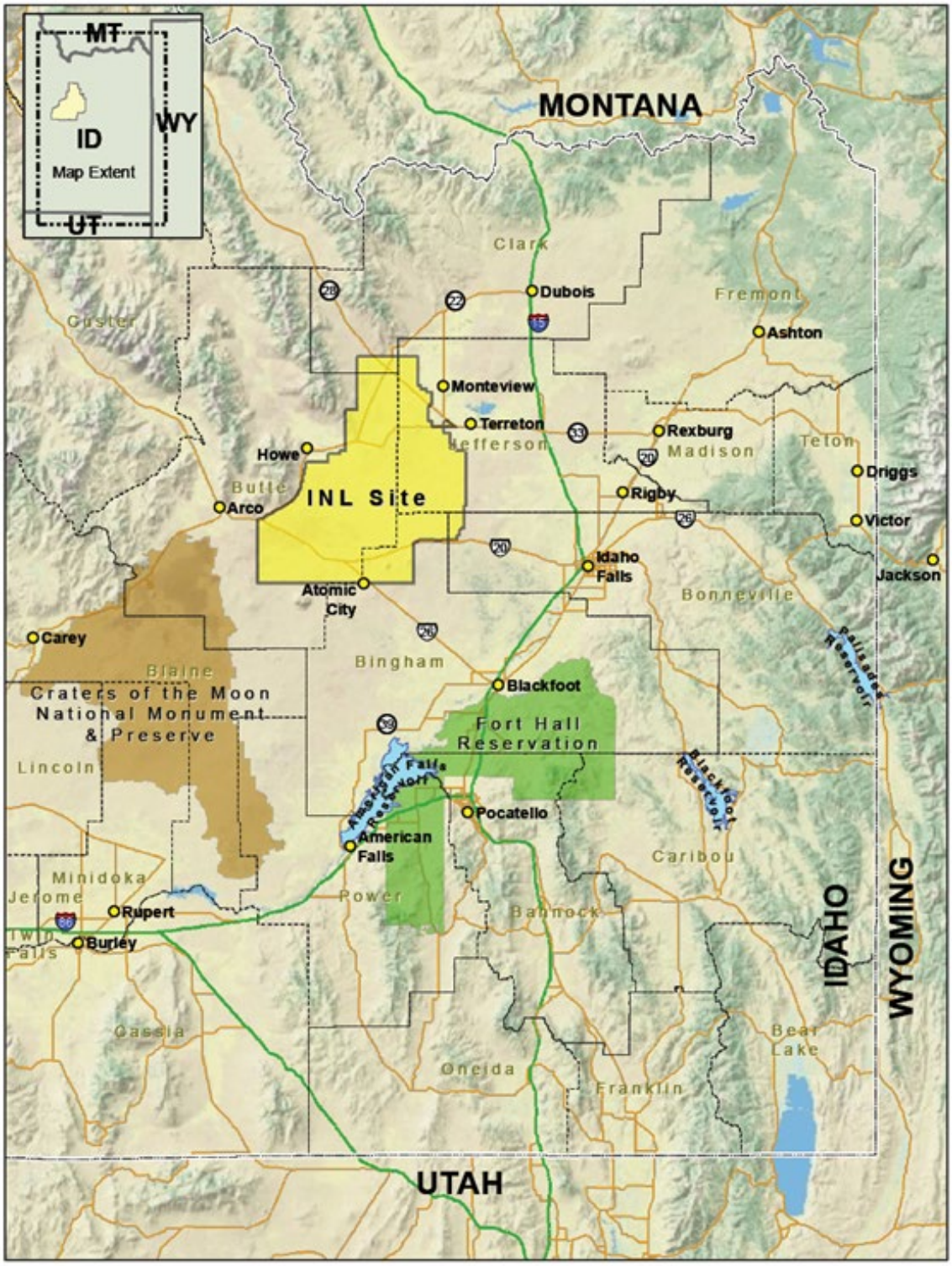

Figure 1. Location of the Idaho National Laboratory Site.

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 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 first 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 20,407 ft^3 (578 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.

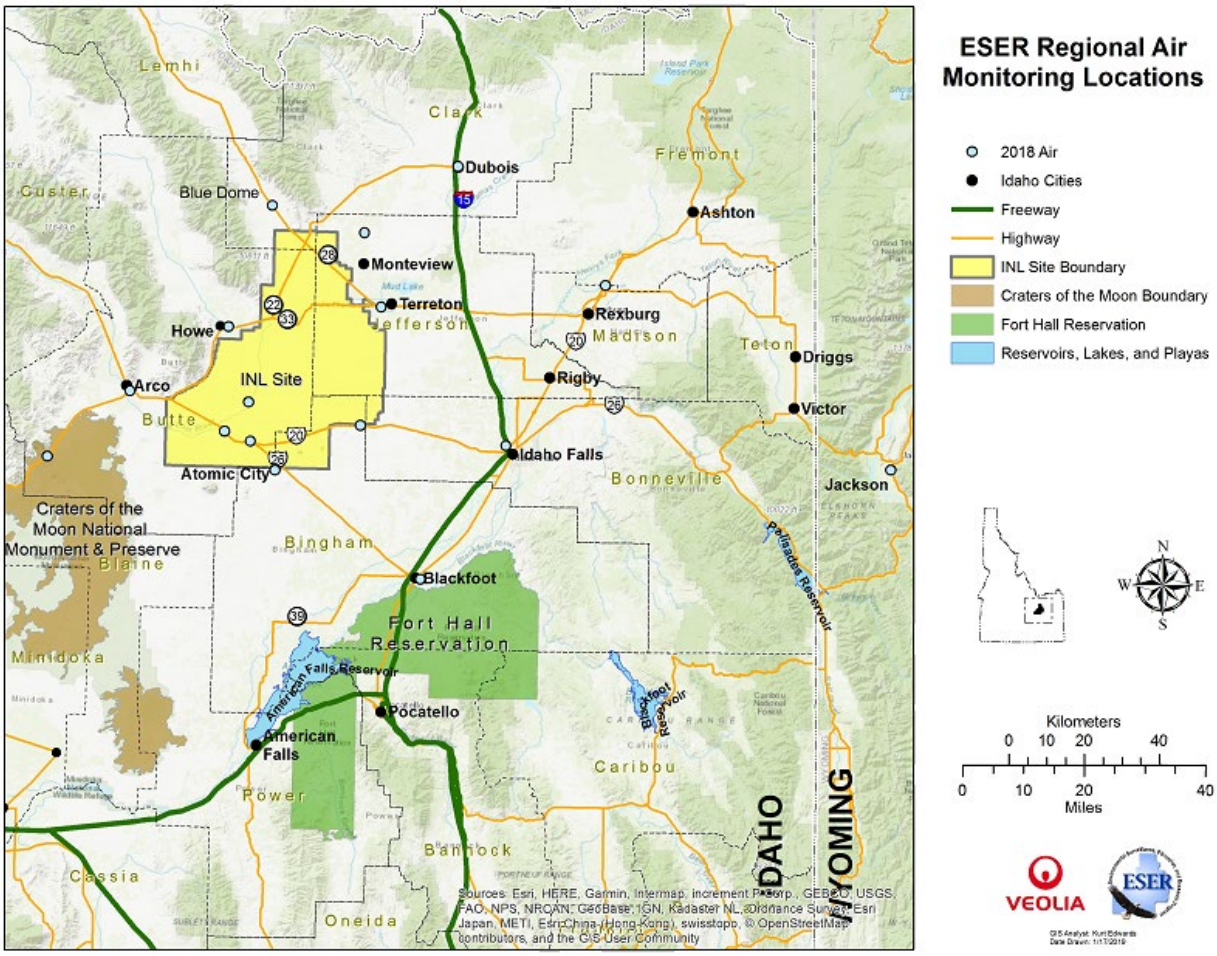

Figure 2. ESER air monitoring locations.

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. Gross alpha concentrations measured in individual samples ranged from a low of $1.0 \pm 1.8 \times 10^{-16}$ µCi/ml collected at Blue Dome on January 30, 2019, to a high of $2.7 \times 10^{-15} \pm 2.3 \times 10^{-16}$ µCi/ml collected at the Idaho Falls on March 27, 2019. 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 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 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-Wallace analysis of variance by ranks test was used again. Results measured at Idaho Falls differed statistically from those measured at Blue Dome, Craters of the Moon, and Dubois during the first quarter (Table D-2), but not during any specific month. The highest mean rank was calculated for Idaho Falls and the lowest mean ranks were calculated for Blue Dome, Craters of the Moon, and Dubois. These differences may be visually observed in Figure D-1, where the Idaho Falls median and upper box values are the highest and those measured at Blue Dome, Craters of the Moon, and Dubois are the lowest. The differences between locations may be due to variations in local meteorology, geology, or other natural factors. The Idaho Falls station is also located in in a disturbed, populated area whereas Blue Dome, Craters of the Moon, and Dubois stations are in more remote, undisturbed areas.

Gross beta results are presented in Table C-1 and displayed in Figures 7 through 10. 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-Wallace 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-Wallace 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 26 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.

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 2019. Three of the concentrations exceeded the 3s uncertainty level for tritium, with a maximum reported value of 3.12×10^{-13} $\mu Ci/ml_{air}$ at Howe. Results are similar to those reported during the past ten years (2009-2018) and none exceed the 99%/95% UTL of 7.0. All samples were significantly below the DOE DCS for tritium in air of 1.4×10^{-8} $\mu Ci/ml_{air}$ Results are shown in Table C-4.

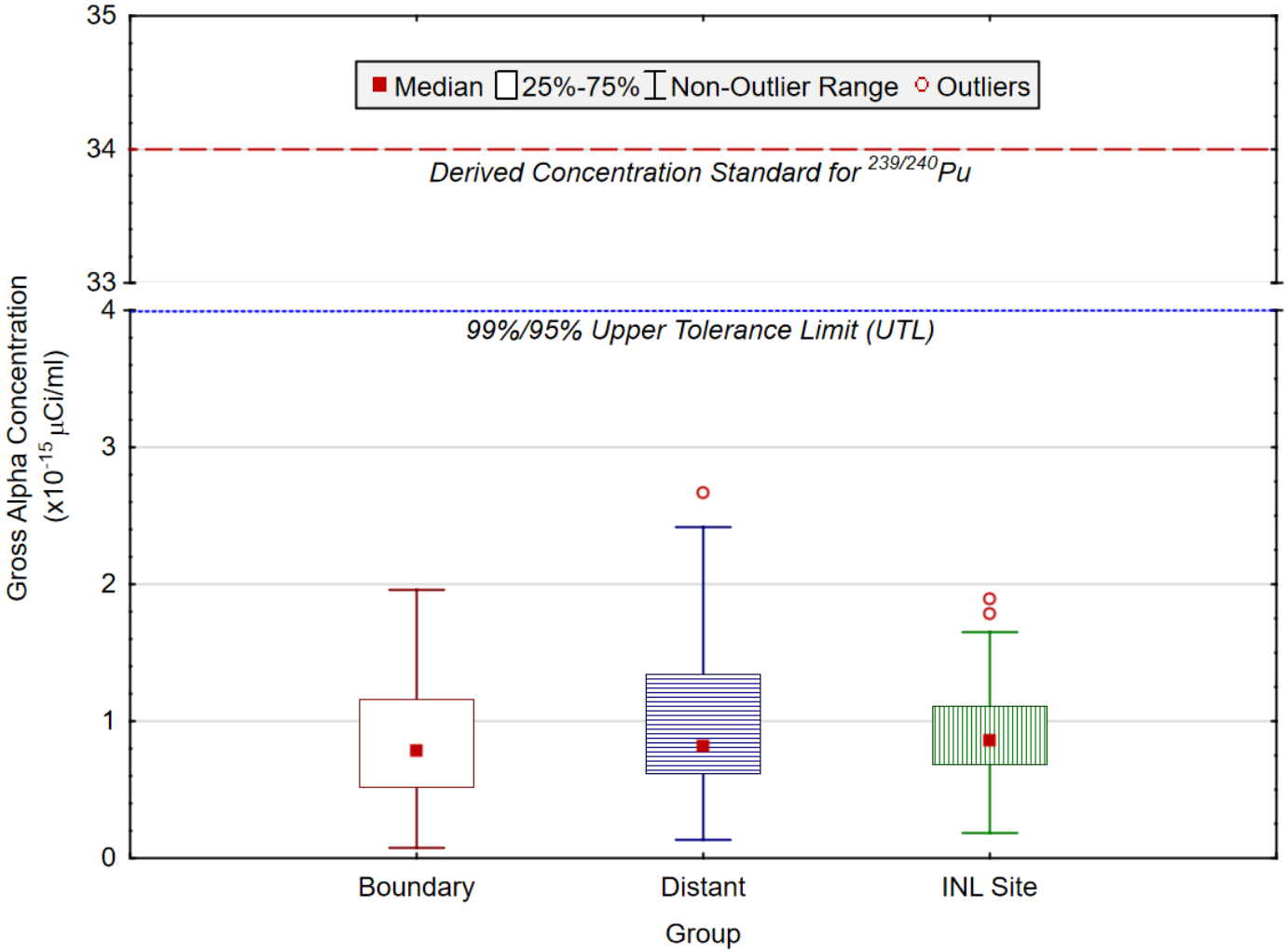

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the first quarter of 2019. The DOE Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr.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

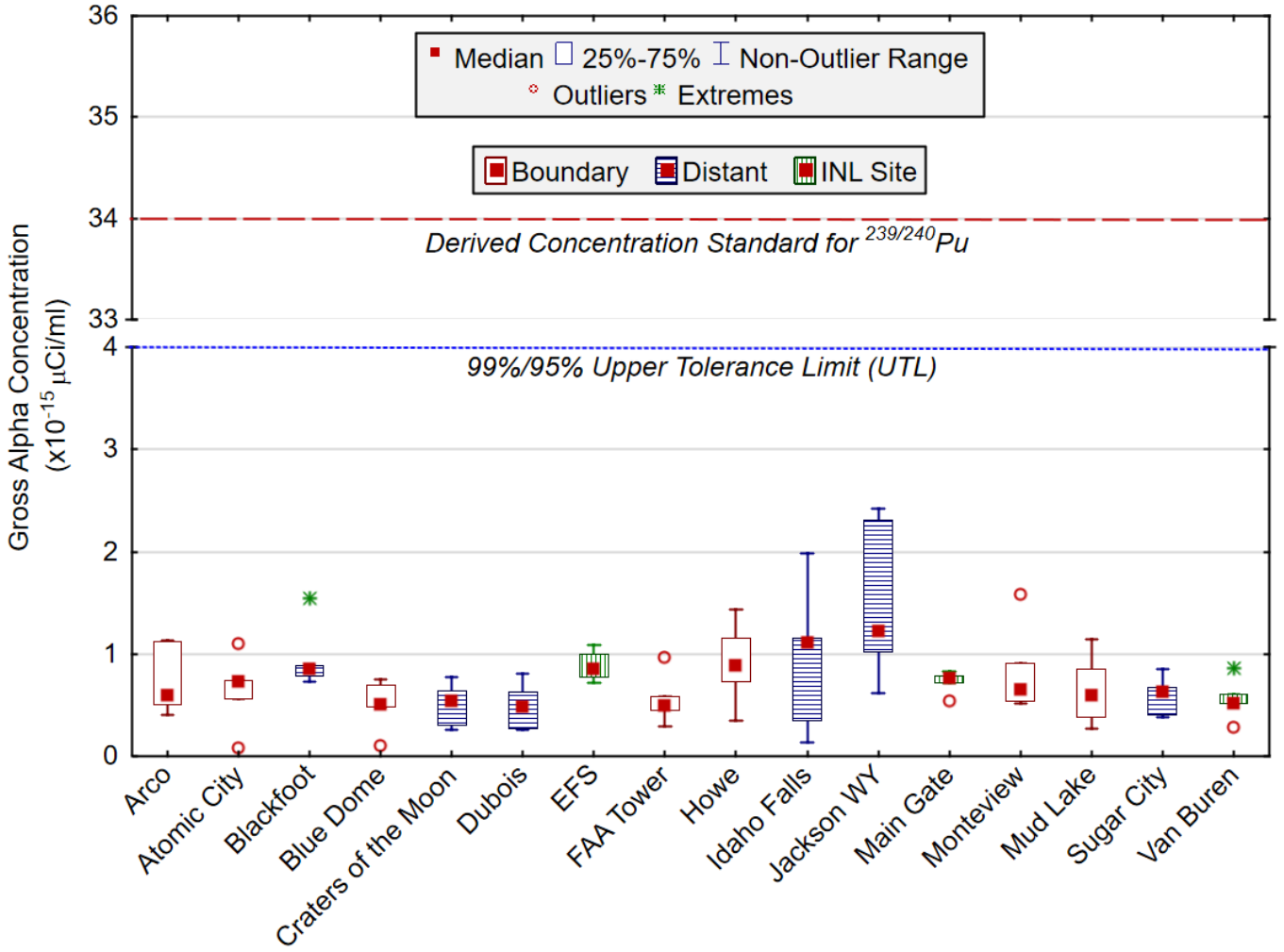

Figure 4. January 2019 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result 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. The UTL represents the value below which 99% of the population values are expected to fall with 95% confidence.

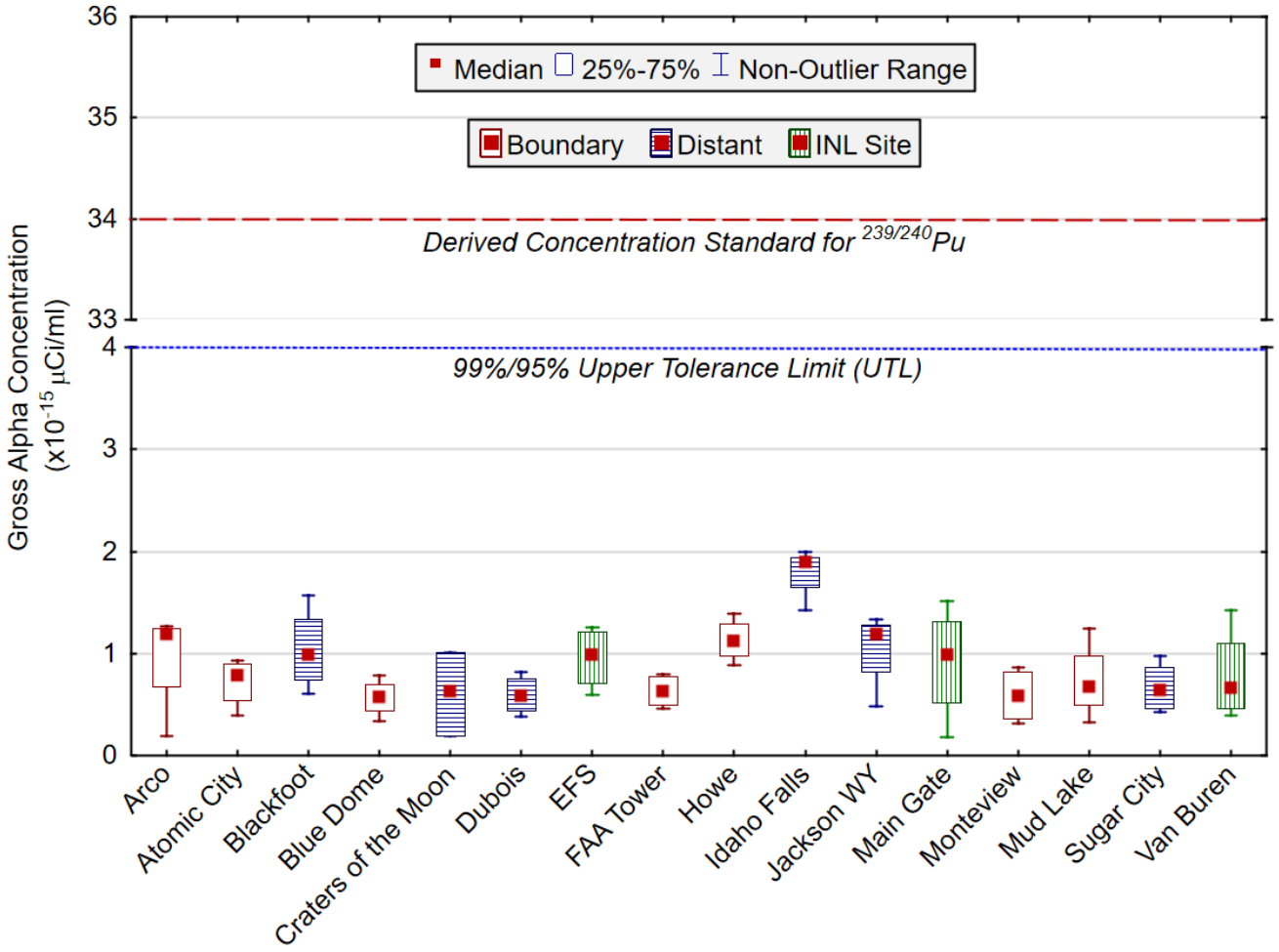

Figure 5. February 2019 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location, except for Craters of the Moon (N = 3). The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, 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.

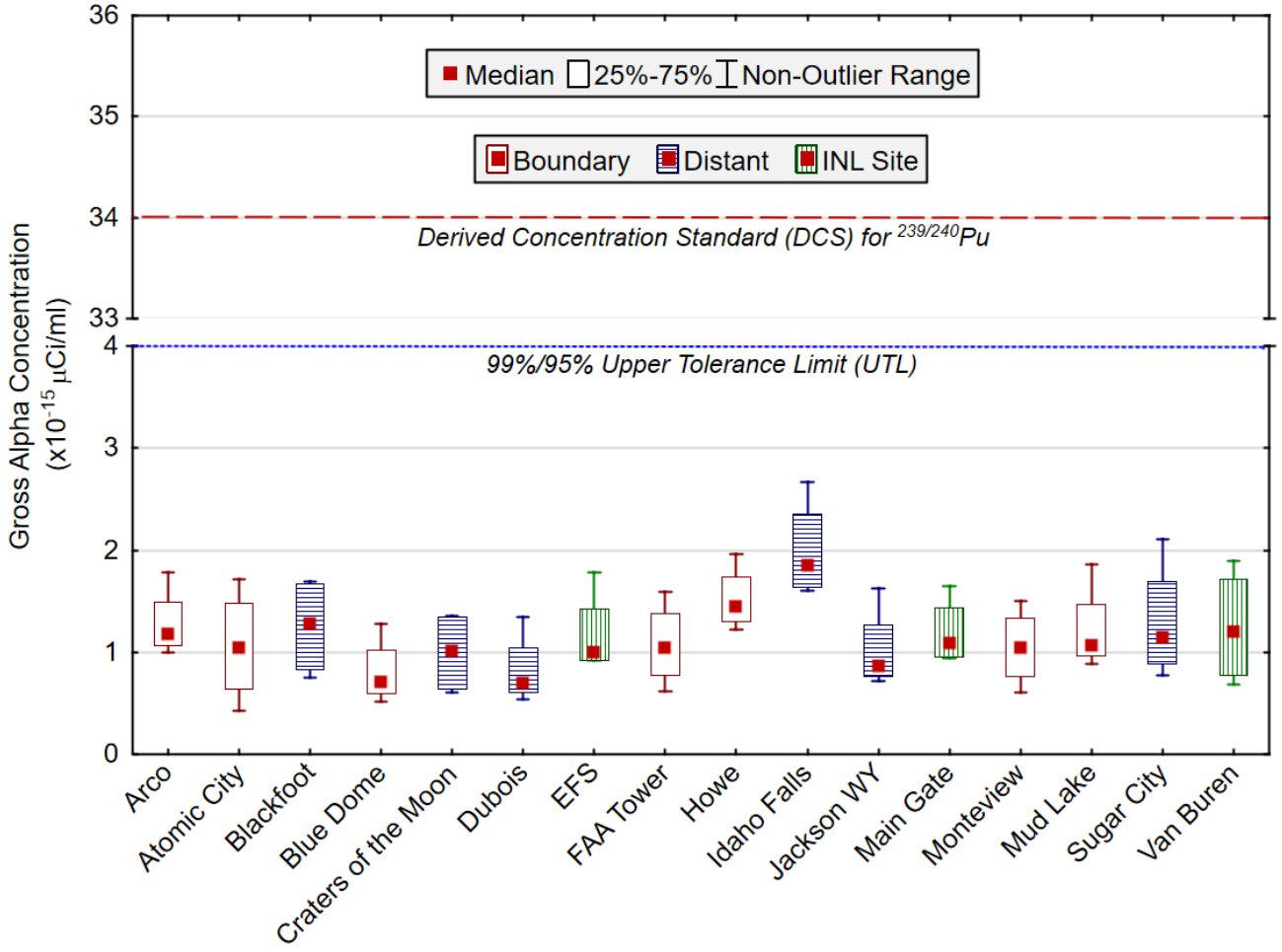

Figure 6. March 2019 gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in 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.

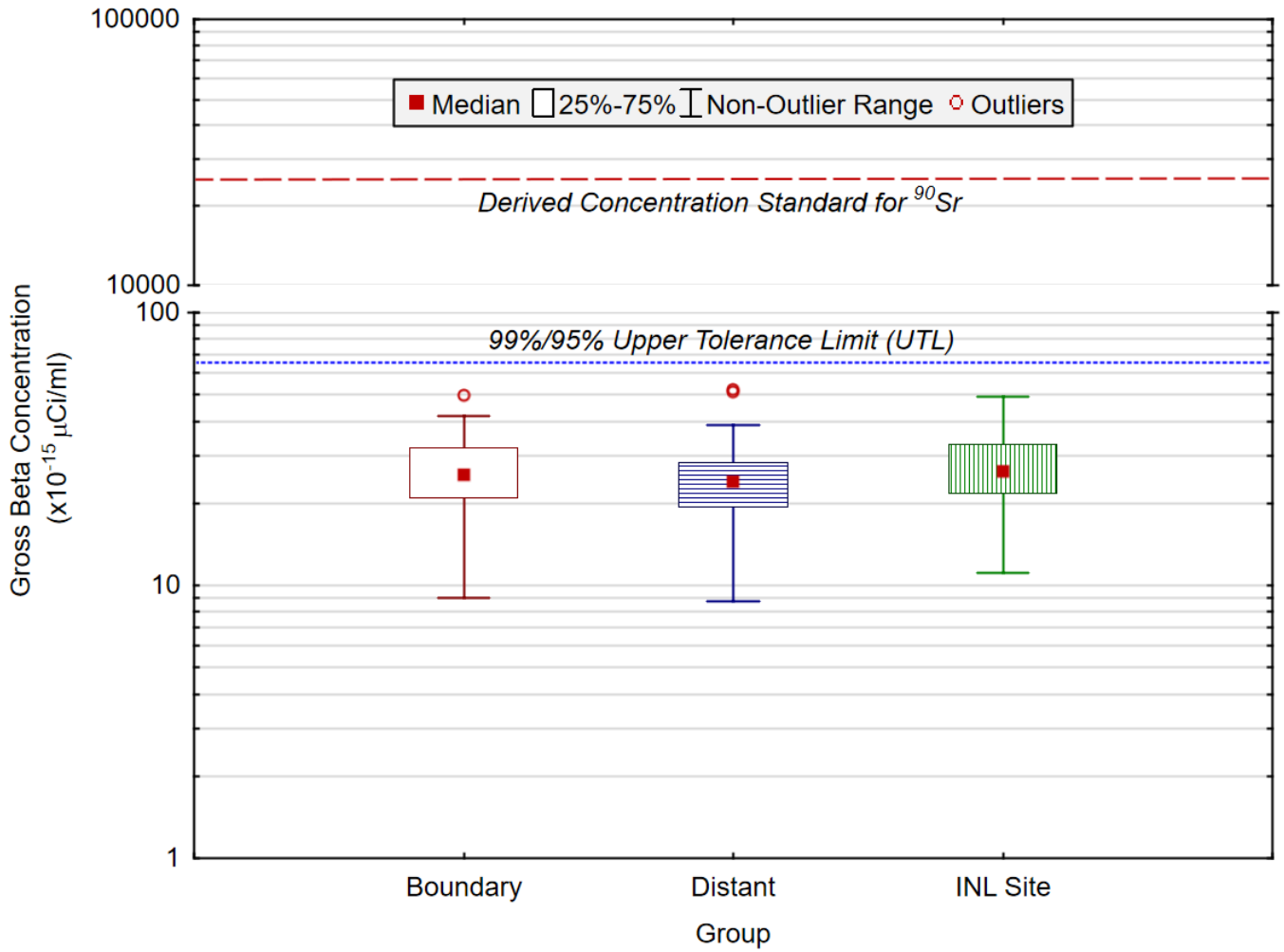

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the first quarter of 2019. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements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

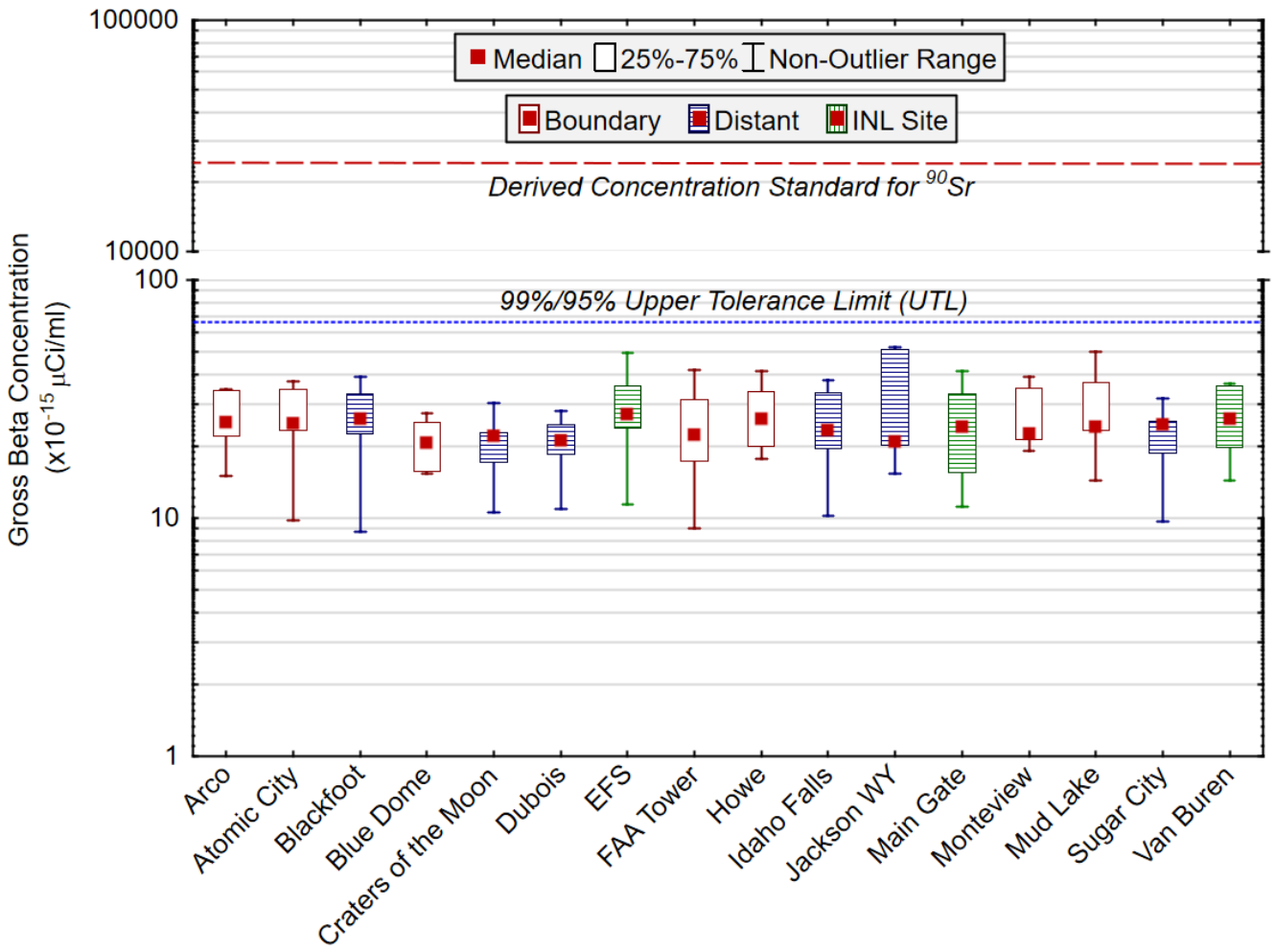

Figure 8. January 2019 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 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.

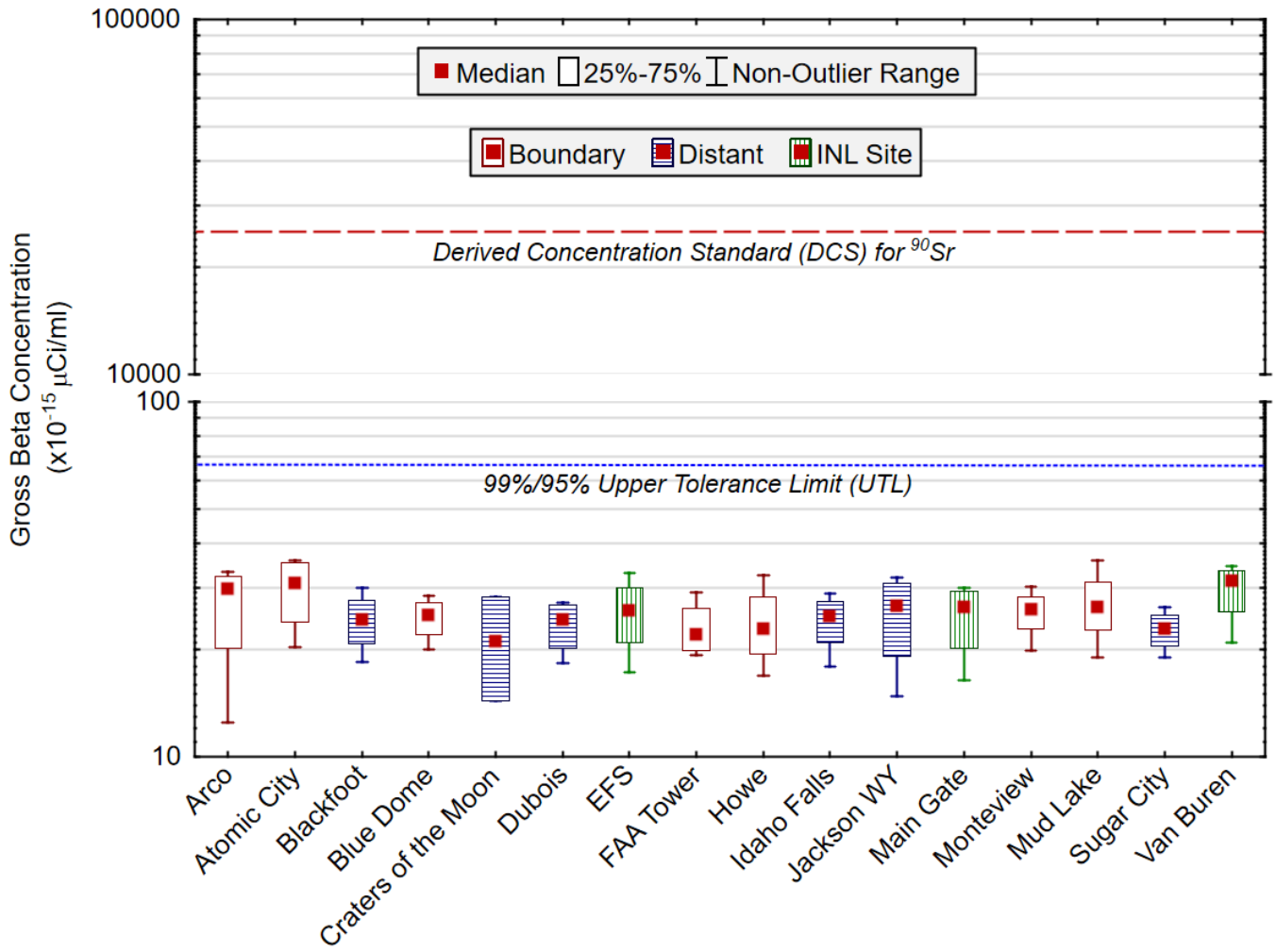

Figure 9. February 2019 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location, except for Craters of the Moon (N = 3). The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled 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.

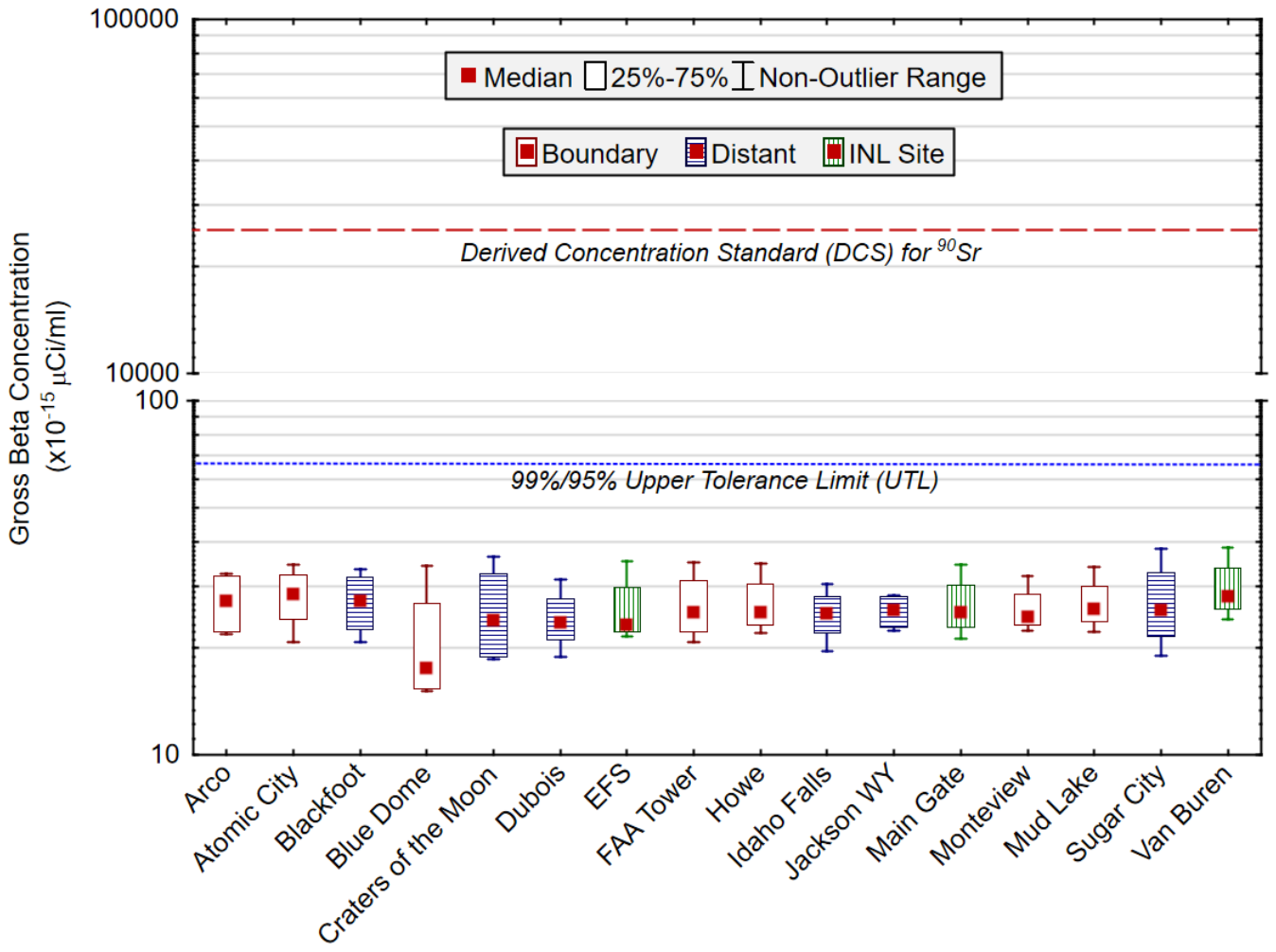

Figure 10. March 2019 gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 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 2019 produced sufficient precipitation to yield 33 samples.

Tritium was measured above the 3s values in five of the 33 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 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 for the last ten years of published data (2006 through 2015) yields an average tritium concentration of 11.3 pCi/ml with a range of -84 to 123.0 pCi/ml. The maximum value in the first quarter was 144 pCi/L in an Atomic City sample collected in February. The result is below the 99%/95% UTL of 322 pCi/ml.

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 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 11) during the first 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 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 2019.

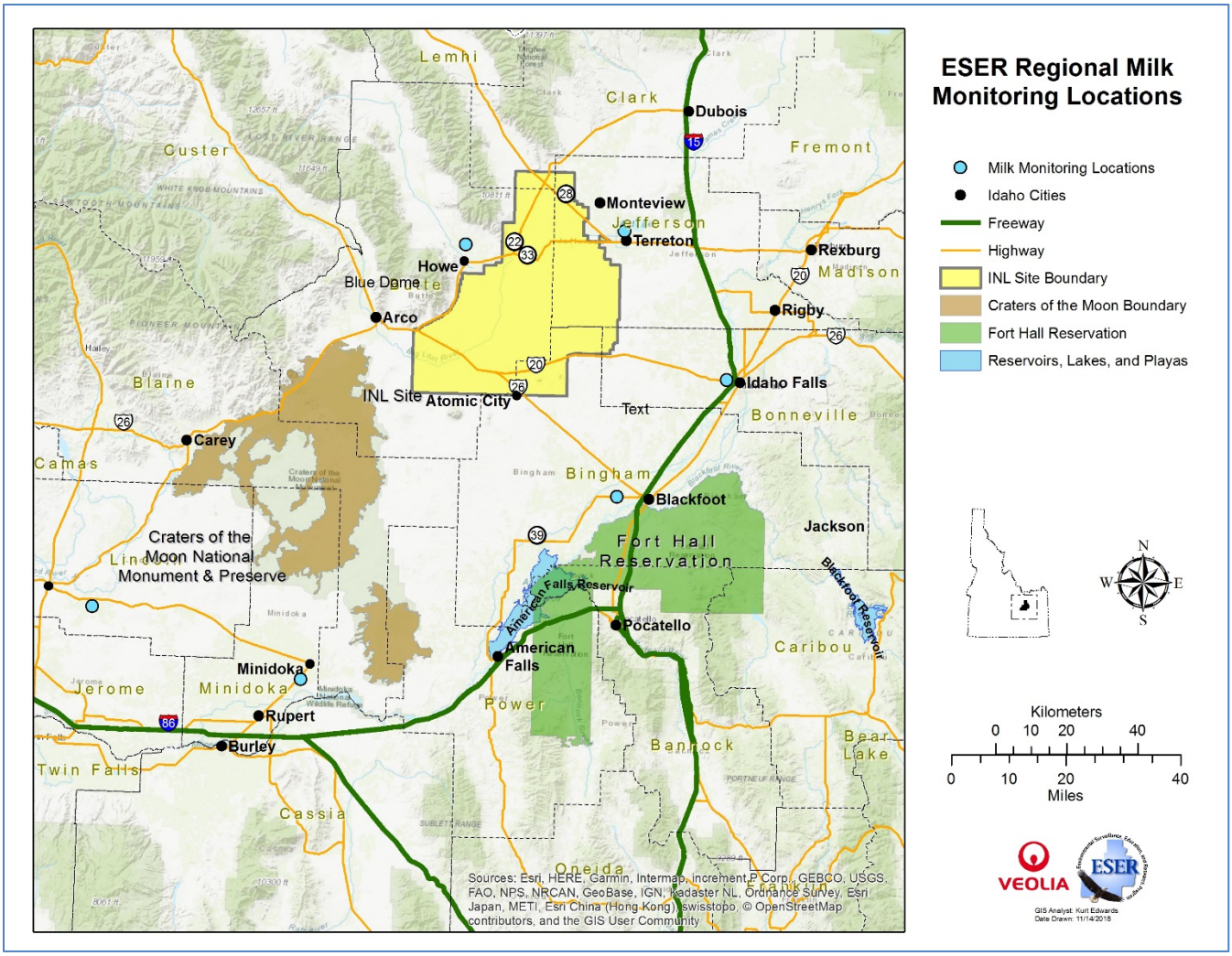

Figure 11. ESER milk sampling locations. Milk is collected at locations identified by blue circles.

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 2019 (VNSFS 2019).

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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	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 2019

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha	5.1×10^{-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	8.4×10^{-17} µCi/ml	9.8×10^{-11} µCi/ml
	^{90}Sr	3.4×10^{-17} µCi/ml	2.5×10^{-11} µCi/ml
	^{241}Am	5.0×10^{-18} µCi/ml	4.1×10^{-14} µCi/ml
	^{238}Pu	7.9×10^{-18} µCi/ml	3.7×10^{-14} µCi/ml
	$^{239/240}$Pu	7.2×10^{-18} µCi/ml	3.4×10^{-14} µCi/ml
Air (charcoal cartridge)[e]	^{131}I	7.3×10^{-16} µCi/ml	2.3×10^{-19} µCi/ml
Air (atmospheric moisture)	^{3}H	90.9 pCi/L_{water} 3.3×10^{-13} µCi/ml_{air}	1.9×10^{6} pCi/L_{water} 2.1×10^{-7} µCi/ml_{air}
Air (precipitation)	^{3}H	92.0 pCi/L	1.9×10^{6} pCi/L_{water}
Milk	^{131}I	0.5 pCi/L	1.3×10^{3} pCi/L[f]
	^{137}Cs	1.0 pCi/L	3.0×10^{3} 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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS BETA Result > 3s
BOUNDARY							
ARCO	1/2/2019	0.50 ± 0.15	1.86 ± 0.54	**Yes**	25.30 ± 0.64	93.61 ± 0.66	**Yes**
	1/9/2019	1.12 ± 0.17	4.14 ± 0.63	**Yes**	34.30 ± 0.74	126.91 ± 0.76	**Yes**
	1/16/2019	1.13 ± 0.24	4.18 ± 0.89	**Yes**	34.50 ± 0.78	127.65 ± 0.59	**Yes**
	1/23/2019	0.60 ± 0.22	2.20 ± 0.80	No	15.00 ± 0.57	55.50 ± 0.64	**Yes**
	1/30/2019	0.41 ± 0.20	1.51 ± 0.72	No	22.10 ± 0.62	81.77 ± 0.62	**Yes**
	2/6/2019	1.16 ± 0.19	4.29 ± 0.71	**Yes**	33.30 ± 0.75	123.21 ± 0.56	**Yes**
	2/13/2019	1.22 ± 0.21	4.51 ± 0.77	**Yes**	31.40 ± 0.78	116.18 ± 0.71	**Yes**
	2/20/2019	0.19 ± 0.09	0.71 ± 0.35	No	12.50 ± 0.40	46.25 ± 0.58	**Yes**
	2/27/2019	1.27 ± 0.18	4.70 ± 0.66	**Yes**	27.90 ± 0.70	103.23 ± 0.61	**Yes**
	3/6/2019	1.21 ± 0.16	4.48 ± 0.60	**Yes**	22.60 ± 0.62	83.62 ± 0.61	**Yes**
	3/13/2019	1.00 ± 0.16	3.70 ± 0.60	**Yes**	22.00 ± 0.63	81.40 ± 0.72	**Yes**
	3/20/2019	1.14 ± 0.16	4.22 ± 0.60	**Yes**	32.60 ± 0.72	120.62 ± 0.54	**Yes**
	3/27/2019	1.78 ± 0.20	6.59 ± 0.73	**Yes**	31.60 ± 0.73	116.92 ± 0.63	**Yes**
ATOMIC CITY	1/2/2019	0.56 ± 0.15	2.06 ± 0.56	**Yes**	24.80 ± 0.64	91.76 ± 0.75	**Yes**
	1/9/2019	0.74 ± 0.15	2.75 ± 0.55	**Yes**	34.70 ± 0.74	128.39 ± 0.82	**Yes**
	1/16/2019	1.10 ± 0.23	4.07 ± 0.84	**Yes**	37.50 ± 0.77	138.75 ± 0.61	**Yes**
	1/23/2019	0.08 ± 0.19	0.29 ± 0.70	No	9.71 ± 0.50	35.93 ± 0.65	**Yes**
	1/30/2019	0.73 ± 0.21	2.68 ± 0.78	**Yes**	23.20 ± 0.64	85.84 ± 0.60	**Yes**
	2/6/2019	0.88 ± 0.18	3.25 ± 0.65	**Yes**	35.90 ± 0.76	132.83 ± 0.59	**Yes**
	2/13/2019	0.69 ± 0.17	2.55 ± 0.63	**Yes**	27.40 ± 0.70	101.38 ± 0.67	**Yes**
	2/20/2019	0.40 ± 0.14	1.47 ± 0.51	No	20.40 ± 0.58	75.48 ± 0.58	**Yes**
	2/27/2019	0.93 ± 0.17	3.43 ± 0.63	**Yes**	34.40 ± 0.79	127.28 ± 0.58	**Yes**
	3/6/2019	0.85 ± 0.15	3.14 ± 0.56	**Yes**	27.30 ± 0.69	101.01 ± 0.58	**Yes**
	3/13/2019	0.43 ± 0.14	1.59 ± 0.50	**Yes**	20.90 ± 0.64	77.33 ± 0.69	**Yes**
	3/20/2019	1.24 ± 0.17	4.59 ± 0.63	**Yes**	29.70 ± 0.70	109.89 ± 0.56	**Yes**
	3/27/2019	1.72 ± 0.19	6.36 ± 0.71	**Yes**	34.60 ± 0.76	128.02 ± 0.58	**Yes**
QA-1	1/2/2019	0.46 ± 0.17	1.71 ± 0.63	No	29.20 ± 0.76	108.04 ± 2.80	**Yes**
(ATOMIC CITY)	1/9/2019	1.04 ± 0.17	3.85 ± 0.61	**Yes**	38.20 ± 0.77	141.34 ± 2.86	**Yes**
	1/16/2019	1.25 ± 0.25	4.63 ± 0.91	**Yes**	38.70 ± 0.80	143.19 ± 2.97	**Yes**
	1/23/2019	0.78 ± 0.23	2.90 ± 0.85	**Yes**	11.70 ± 0.54	43.29 ± 2.01	**Yes**
	1/30/2019	0.64 ± 0.23	2.36 ± 0.86	No	25.80 ± 0.72	95.46 ± 2.66	**Yes**
	2/6/2019	1.14 ± 0.18	4.22 ± 0.67	**Yes**	32.00 ± 0.71	118.40 ± 2.62	**Yes**
	2/13/2019	0.91 ± 0.20	3.37 ± 0.75	**Yes**	31.40 ± 0.81	116.18 ± 3.00	**Yes**
	2/20/2019	0.26 ± 0.13	0.97 ± 0.50	No	1.22 ± 0.17	4.51 ± 0.64	**Yes**
	2/27/2019	1.22 ± 0.17	4.51 ± 0.64	**Yes**	30.40 ± 0.71	112.48 ± 2.63	**Yes**
	3/6/2019	0.88 ± 0.17	3.25 ± 0.62	**Yes**	27.40 ± 0.75	101.38 ± 2.76	**Yes**
	3/13/2019	0.92 ± 0.17	3.40 ± 0.62	**Yes**	21.70 ± 0.67	80.29 ± 2.47	**Yes**
	3/20/2019	0.95 ± 0.15	3.52 ± 0.56	**Yes**	27.10 ± 0.66	100.27 ± 2.44	**Yes**
	3/27/2019	1.48 ± 0.18	5.48 ± 0.67	**Yes**	34.50 ± 0.75	127.65 ± 2.77	**Yes**
BLUE DOME	1/2/2019	0.51 ± 0.15	1.88 ± 0.56	**Yes**	20.70 ± 0.60	76.59 ± 2.23	**Yes**
	1/9/2019	0.75 ± 0.15	2.78 ± 0.56	**Yes**	27.40 ± 0.68	101.38 ± 2.51	**Yes**
	1/16/2019	0.70 ± 0.22	2.57 ± 0.81	**Yes**	25.30 ± 0.69	93.61 ± 2.54	**Yes**
	1/23/2019	0.49 ± 0.22	1.79 ± 0.80	No	15.70 ± 0.59	58.09 ± 2.16	**Yes**
	1/30/2019	0.10 ± 0.18	0.36 ± 0.68	No	15.30 ± 0.56	56.61 ± 2.08	**Yes**
	2/6/2019	0.53 ± 0.14	1.94 ± 0.52	**Yes**	24.30 ± 0.60	89.91 ± 2.22	**Yes**
	2/13/2019	0.61 ± 0.23	2.25 ± 0.86	No	28.50 ± 0.93	105.45 ± 3.44	**Yes**
	2/20/2019	0.34 ± 0.15	1.27 ± 0.54	No	20.00 ± 0.61	74.00 ± 2.25	**Yes**

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS BETA Result > 3s
	2/27/2019	0.79 ± 0.15	2.91 ± 0.55	Yes	26.00 ± 0.67	96.20 ± 2.47	Yes
	3/6/2019	0.52 ± 0.10	1.92 ± 0.37	Yes	15.60 ± 0.44	57.72 ± 1.61	Yes
	3/13/2019	0.67 ± 0.14	2.49 ± 0.50	Yes	15.20 ± 0.53	56.24 ± 1.95	Yes
	3/20/2019	0.75 ± 0.15	2.78 ± 0.54	Yes	19.50 ± 0.62	72.15 ± 2.28	Yes
	3/27/2019	1.28 ± 0.22	4.74 ± 0.80	Yes	34.20 ± 0.94	126.54 ± 3.46	Yes
QA-2	1/2/2019	0.33 ± 0.15	1.24 ± 0.56	No	22.60 ± 0.66	83.62 ± 2.44	Yes
(BLUE DOME)	1/9/2019	0.78 ± 0.15	2.87 ± 0.57	Yes	26.20 ± 0.68	96.94 ± 2.52	Yes
	1/16/2019	1.02 ± 0.23	3.77 ± 0.86	Yes	27.30 ± 0.70	101.01 ± 2.60	Yes
	1/23/2019	0.93 ± 0.23	3.44 ± 0.87	Yes	15.10 ± 0.58	55.87 ± 2.13	Yes
	1/30/2019	0.46 ± 0.21	1.71 ± 0.76	No	17.20 ± 0.59	63.64 ± 2.19	Yes
	2/6/2019	0.66 ± 0.17	2.45 ± 0.61	Yes	24.10 ± 0.66	89.17 ± 2.43	Yes
	2/13/2019	0.72 ± 0.18	2.68 ± 0.66	Yes	25.40 ± 0.71	93.98 ± 2.62	Yes
	2/20/2019	0.34 ± 0.16	1.27 ± 0.58	No	17.60 ± 0.62	65.12 ± 2.29	Yes
	2/27/2019	0.68 ± 0.16	2.51 ± 0.59	Yes	28.70 ± 0.76	106.19 ± 2.79	Yes
	3/6/2019	0.96 ± 0.15	3.56 ± 0.56	Yes	23.20 ± 0.63	85.84 ± 2.32	Yes
	3/13/2019	0.75 ± 0.15	2.76 ± 0.54	Yes	21.20 ± 0.62	78.44 ± 2.28	Yes
	3/20/2019	1.03 ± 0.16	3.81 ± 0.60	Yes	24.80 ± 0.68	91.76 ± 2.51	Yes
	3/27/2019	1.30 ± 0.18	4.81 ± 0.68	Yes	32.20 ± 0.78	119.14 ± 2.87	Yes
FAA TOWER	1/2/2019	0.45 ± 0.15	1.66 ± 0.56	No	22.20 ± 0.63	82.14 ± 2.33	Yes
	1/9/2019	0.59 ± 0.15	2.18 ± 0.55	Yes	31.40 ± 0.74	116.18 ± 2.73	Yes
	1/16/2019	0.96 ± 0.26	3.56 ± 0.98	Yes	41.80 ± 0.91	154.66 ± 3.37	Yes
	1/23/2019	0.50 ± 0.20	1.84 ± 0.75	No	9.00 ± 0.48	33.30 ± 1.76	Yes
	1/30/2019	0.30 ± 0.18	1.09 ± 0.68	No	17.40 ± 0.56	64.38 ± 2.07	Yes
	2/6/2019	0.75 ± 0.18	2.78 ± 0.66	Yes	29.00 ± 0.73	107.30 ± 2.69	Yes
	2/13/2019	0.46 ± 0.14	1.71 ± 0.53	Yes	20.60 ± 0.59	76.22 ± 2.19	Yes
	2/20/2019	0.52 ± 0.16	1.92 ± 0.59	Yes	19.30 ± 0.62	71.41 ± 2.29	Yes
	2/27/2019	0.80 ± 0.14	2.95 ± 0.53	Yes	23.60 ± 0.62	87.32 ± 2.30	Yes
	3/6/2019	1.17 ± 0.16	4.33 ± 0.59	Yes	23.50 ± 0.62	86.95 ± 2.29	Yes
	3/13/2019	0.62 ± 0.14	2.28 ± 0.53	Yes	20.90 ± 0.63	77.33 ± 2.34	Yes
	3/20/2019	0.93 ± 0.15	3.43 ± 0.55	Yes	27.10 ± 0.66	100.27 ± 2.45	Yes
	3/27/2019	1.59 ± 0.19	5.88 ± 0.72	Yes	35.10 ± 0.79	129.87 ± 2.91	Yes
HOWE	1/2/2019	0.88 ± 0.17	3.26 ± 0.63	Yes	25.90 ± 0.66	95.83 ± 2.45	Yes
	1/9/2019	1.16 ± 0.17	4.29 ± 0.64	Yes	33.70 ± 0.74	124.69 ± 2.75	Yes
	1/16/2019	1.44 ± 0.25	5.33 ± 0.93	Yes	41.10 ± 0.82	152.07 ± 3.05	Yes
	1/23/2019	0.73 ± 0.23	2.72 ± 0.86	Yes	17.70 ± 0.62	65.49 ± 2.30	Yes
	1/30/2019	0.35 ± 0.20	1.28 ± 0.74	No	19.90 ± 0.62	73.63 ± 2.28	Yes
	2/6/2019	1.18 ± 0.19	4.37 ± 0.71	Yes	32.40 ± 0.74	119.88 ± 2.75	Yes
	2/13/2019	1.06 ± 0.18	3.92 ± 0.67	Yes	22.10 ± 0.64	81.77 ± 2.35	Yes
	2/20/2019	0.89 ± 0.17	3.30 ± 0.64	Yes	16.90 ± 0.58	62.53 ± 2.16	Yes
	2/27/2019	1.39 ± 0.17	5.14 ± 0.64	Yes	23.90 ± 0.64	88.43 ± 2.35	Yes
	3/6/2019	1.22 ± 0.17	4.51 ± 0.62	Yes	24.60 ± 0.66	91.02 ± 2.42	Yes
	3/13/2019	1.38 ± 0.18	5.11 ± 0.66	Yes	22.10 ± 0.63	81.77 ± 2.32	Yes
	3/20/2019	1.52 ± 0.18	5.62 ± 0.68	Yes	25.90 ± 0.67	95.83 ± 2.49	Yes
	3/27/2019	1.96 ± 0.21	7.25 ± 0.76	Yes	34.80 ± 0.77	128.76 ± 2.86	Yes
MONTEVIEW	1/2/2019	0.52 ± 0.16	1.91 ± 0.57	Yes	22.60 ± 0.64	83.62 ± 2.36	Yes
	1/9/2019	1.58 ± 0.20	5.85 ± 0.72	Yes	39.30 ± 0.80	145.41 ± 2.96	Yes
	1/16/2019	0.65 ± 0.22	2.40 ± 0.80	No	34.90 ± 0.77	129.13 ± 2.84	Yes
	1/23/2019	0.54 ± 0.22	2.01 ± 0.83	No	19.10 ± 0.63	70.67 ± 2.34	Yes

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS BETA Result > 3s
	1/30/2019	0.91 ± 0.22	3.36 ± 0.83	**Yes**	21.40 ± 0.63	79.18 ± 2.33	**Yes**
	2/6/2019	0.77 ± 0.17	2.83 ± 0.63	**Yes**	30.20 ± 0.71	111.74 ± 2.62	**Yes**
	2/13/2019	0.41 ± 0.15	1.52 ± 0.56	No	26.20 ± 0.67	96.94 ± 2.49	**Yes**
	2/20/2019	0.31 ± 0.16	1.16 ± 0.58	No	19.90 ± 0.65	73.63 ± 2.41	**Yes**
	2/27/2019	0.87 ± 0.15	3.20 ± 0.54	**Yes**	25.90 ± 0.63	95.83 ± 2.35	**Yes**
	3/6/2019	1.16 ± 0.16	4.29 ± 0.60	**Yes**	25.00 ± 0.65	92.50 ± 2.41	**Yes**
	3/13/2019	0.61 ± 0.14	2.25 ± 0.52	**Yes**	22.40 ± 0.64	82.88 ± 2.35	**Yes**
	3/20/2019	0.93 ± 0.15	3.42 ± 0.55	**Yes**	24.00 ± 0.63	88.80 ± 2.33	**Yes**
	3/27/2019	1.50 ± 0.18	5.55 ± 0.67	**Yes**	32.00 ± 0.72	118.40 ± 2.68	**Yes**
MUD LAKE	1/2/2019	0.38 ± 0.14	1.40 ± 0.53	No	24.10 ± 0.63	89.17 ± 2.34	**Yes**
	1/9/2019	0.59 ± 0.14	2.19 ± 0.51	**Yes**	36.90 ± 0.73	136.53 ± 2.72	**Yes**
	1/16/2019	1.15 ± 0.24	4.26 ± 0.90	**Yes**	49.80 ± 0.89	184.26 ± 3.28	**Yes**
	1/23/2019	0.27 ± 0.19	1.00 ± 0.72	No	14.40 ± 0.55	53.28 ± 2.02	**Yes**
	1/30/2019	0.85 ± 0.22	3.16 ± 0.83	**Yes**	23.40 ± 0.65	86.58 ± 2.42	**Yes**
	2/6/2019	0.65 ± 0.16	2.42 ± 0.60	**Yes**	35.80 ± 0.74	132.46 ± 2.75	**Yes**
	2/13/2019	0.71 ± 0.17	2.61 ± 0.61	**Yes**	26.40 ± 0.68	97.68 ± 2.50	**Yes**
	2/20/2019	0.33 ± 0.14	1.22 ± 0.53	No	19.10 ± 0.60	70.67 ± 2.20	**Yes**
	2/27/2019	1.24 ± 0.17	4.59 ± 0.63	**Yes**	26.50 ± 0.67	98.05 ± 2.48	**Yes**
	3/6/2019	1.05 ± 0.15	3.89 ± 0.56	**Yes**	26.10 ± 0.64	96.57 ± 2.35	**Yes**
	3/13/2019	0.88 ± 0.16	3.26 ± 0.58	**Yes**	22.30 ± 0.64	82.51 ± 2.35	**Yes**
	3/20/2019	1.09 ± 0.15	4.03 ± 0.57	**Yes**	25.40 ± 0.63	93.98 ± 2.34	**Yes**
	3/27/2019	1.86 ± 0.20	6.88 ± 0.73	**Yes**	34.00 ± 0.75	125.80 ± 2.76	**Yes**
DISTANT							
BLACKFOOT	1/2/2019	0.88 ± 0.16	3.26 ± 0.59	**Yes**	26.10 ± 0.63	96.57 ± 2.33	**Yes**
	1/9/2019	0.86 ± 0.15	3.17 ± 0.56	**Yes**	33.00 ± 0.71	122.10 ± 2.62	**Yes**
	1/16/2019	0.79 ± 0.22	2.93 ± 0.83	**Yes**	38.90 ± 0.77	143.93 ± 2.83	**Yes**
	1/23/2019	1.55 ± 0.24	5.74 ± 0.89	**Yes**	8.78 ± 0.49	32.49 ± 1.82	**Yes**
	1/30/2019	0.73 ± 0.23	2.70 ± 0.84	**Yes**	22.60 ± 0.66	83.62 ± 2.45	**Yes**
	2/6/2019	1.57 ± 0.20	5.81 ± 0.74	**Yes**	29.90 ± 0.70	110.63 ± 2.58	**Yes**
	2/13/2019	0.88 ± 0.16	3.27 ± 0.60	**Yes**	23.20 ± 0.61	85.84 ± 2.26	**Yes**
	2/20/2019	0.61 ± 0.16	2.25 ± 0.59	**Yes**	18.50 ± 0.59	68.45 ± 2.20	**Yes**
	2/27/2019	1.09 ± 0.16	4.03 ± 0.58	**Yes**	25.50 ± 0.63	94.35 ± 2.33	**Yes**
	3/6/2019	0.76 ± 0.14	2.80 ± 0.51	**Yes**	24.30 ± 0.63	89.91 ± 2.32	**Yes**
	3/13/2019	0.90 ± 0.16	3.33 ± 0.60	**Yes**	20.90 ± 0.64	77.33 ± 2.37	**Yes**
	3/20/2019	1.66 ± 0.19	6.14 ± 0.68	**Yes**	30.10 ± 0.70	111.37 ± 2.58	**Yes**
	3/27/2019	1.69 ± 0.19	6.25 ± 0.71	**Yes**	33.40 ± 0.75	123.58 ± 2.78	**Yes**
CRATERS OF THE MOON	1/2/2019	0.30 ± 0.13	1.11 ± 0.50	No	22.70 ± 0.61	83.99 ± 2.25	**Yes**
	1/9/2019	0.64 ± 0.15	2.36 ± 0.55	**Yes**	30.40 ± 0.73	112.48 ± 2.69	**Yes**
	1/16/2019	0.25 ± 0.21	0.94 ± 0.78	No	22.00 ± 0.69	81.40 ± 2.55	**Yes**
	1/23/2019	0.54 ± 0.21	2.01 ± 0.76	No	10.50 ± 0.50	38.85 ± 1.85	**Yes**
	1/30/2019	0.77 ± 0.21	2.85 ± 0.76	**Yes**	17.20 ± 0.56	63.64 ± 2.07	**Yes**
	2/6/2019	1.01 ± 0.18	3.74 ± 0.67	**Yes**	28.20 ± 0.69	104.34 ± 2.55	**Yes**
	2/13/2019	0.63 ± 0.16	2.33 ± 0.58	**Yes**	21.10 ± 0.61	78.07 ± 2.25	**Yes**
	2/20/2019	0.19 ± 0.13	0.71 ± 0.48	No	14.40 ± 0.53	53.28 ± 1.97	**Yes**
	3/6/2019[a]	0.61 ± 0.09	2.26 ± 0.33	**Yes**	18.70 ± 0.40	69.19 ± 1.49	**Yes**
	3/13/2019	0.68 ± 0.14	2.50 ± 0.51	**Yes**	19.10 ± 0.58	70.67 ± 2.15	**Yes**
	3/20/2019	1.36 ± 0.17	5.03 ± 0.63	**Yes**	28.80 ± 0.67	106.56 ± 2.49	**Yes**
	3/27/2019	1.34 ± 0.18	4.96 ± 0.67	**Yes**	36.40 ± 0.79	134.68 ± 2.92	**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
DUBOIS	1/2/2019	0.26	±	0.13	0.95	±	0.48	No	21.00	±	0.58	77.70	±	2.15	**Yes**
	1/9/2019	0.63	±	0.15	2.33	±	0.54	**Yes**	24.50	±	0.66	90.65	±	2.45	**Yes**
	1/16/2019	0.81	±	0.22	2.98	±	0.81	**Yes**	28.10	±	0.70	103.97	±	2.59	**Yes**
	1/23/2019	0.27	±	0.19	0.98	±	0.70	No	10.90	±	0.50	40.33	±	1.84	**Yes**
	1/30/2019	0.49	±	0.20	1.80	±	0.75	No	18.40	±	0.59	68.08	±	2.20	**Yes**
	2/6/2019	0.49	±	0.15	1.80	±	0.56	**Yes**	21.90	±	0.62	81.03	±	2.28	**Yes**
	2/13/2019	0.69	±	0.17	2.55	±	0.63	**Yes**	26.60	±	0.69	98.42	±	2.56	**Yes**
	2/20/2019	0.39	±	0.14	1.42	±	0.53	No	18.40	±	0.58	68.08	±	2.14	**Yes**
	2/27/2019	0.82	±	0.15	3.02	±	0.56	**Yes**	27.10	±	0.68	100.27	±	2.52	**Yes**
	3/6/2019	0.54	±	0.13	2.01	±	0.50	**Yes**	23.30	±	0.65	86.21	±	2.40	**Yes**
	3/13/2019	0.68	±	0.14	2.50	±	0.51	**Yes**	18.90	±	0.57	69.93	±	2.12	**Yes**
	3/20/2019	0.73	±	0.14	2.69	±	0.52	**Yes**	24.00	±	0.64	88.80	±	2.38	**Yes**
	3/27/2019	1.35	±	0.19	5.00	±	0.68	**Yes**	31.30	±	0.76	115.81	±	2.82	**Yes**
IDAHO FALLS	1/2/2019	1.11	±	0.18	4.11	±	0.66	**Yes**	23.40	±	0.64	86.58	±	2.35	**Yes**
	1/9/2019	1.98	±	0.21	7.33	±	0.76	**Yes**	33.30	±	0.74	123.21	±	2.73	**Yes**
	1/16/2019	1.16	±	0.26	4.29	±	0.95	**Yes**	37.90	±	0.84	140.23	±	3.10	**Yes**
	1/23/2019	0.14	±	0.20	0.51	±	0.73	No	10.20	±	0.52	37.74	±	1.91	**Yes**
	1/30/2019	0.35	±	0.21	1.29	±	0.76	No	19.50	±	0.63	72.15	±	2.32	**Yes**
	2/6/2019	1.88	±	0.23	6.96	±	0.84	**Yes**	28.90	±	0.73	106.93	±	2.71	**Yes**
	2/13/2019	1.99	±	0.22	7.36	±	0.81	**Yes**	24.00	±	0.66	88.80	±	2.44	**Yes**
	2/20/2019	1.42	±	0.19	5.25	±	0.72	**Yes**	17.90	±	0.59	66.23	±	2.18	**Yes**
	2/27/2019	1.90	±	0.20	7.03	±	0.73	**Yes**	25.90	±	0.66	95.83	±	2.43	**Yes**
	3/6/2019	1.67	±	0.19	6.18	±	0.71	**Yes**	24.50	±	0.67	90.65	±	2.49	**Yes**
	3/13/2019	1.60	±	0.19	5.92	±	0.70	**Yes**	19.60	±	0.60	72.52	±	2.23	**Yes**
	3/20/2019	2.04	±	0.20	7.55	±	0.75	**Yes**	25.70	±	0.67	95.09	±	2.49	**Yes**
	3/27/2019	2.67	±	0.23	9.88	±	0.84	**Yes**	30.40	±	0.72	112.48	±	2.65	**Yes**
JACKSON	1/2/2019	0.62	±	0.12	2.28	±	0.46	**Yes**	20.90	±	0.50	77.33	±	1.86	**Yes**
	1/9/2019	2.42	±	0.22	8.95	±	0.81	**Yes**	52.10	±	0.86	192.77	±	3.18	**Yes**
	1/16/2019	2.31	±	0.29	8.55	±	1.07	**Yes**	51.00	±	0.91	188.70	±	3.36	**Yes**
	1/23/2019	1.22	±	0.25	4.51	±	0.91	**Yes**	20.20	±	0.63	74.74	±	2.35	**Yes**
	1/30/2019	1.02	±	0.22	3.77	±	0.83	**Yes**	15.30	±	0.56	56.61	±	2.05	**Yes**
	2/6/2019	1.15	±	0.18	4.26	±	0.67	**Yes**	32.00	±	0.70	118.40	±	2.60	**Yes**
	2/13/2019	1.22	±	0.18	4.51	±	0.68	**Yes**	29.50	±	0.69	109.15	±	2.55	**Yes**
	2/20/2019	0.49	±	0.14	1.80	±	0.53	**Yes**	14.80	±	0.53	54.76	±	1.95	**Yes**
	2/27/2019	1.33	±	0.16	4.92	±	0.60	**Yes**	23.70	±	0.60	87.69	±	2.22	**Yes**
	3/6/2019	0.82	±	0.14	3.03	±	0.52	**Yes**	23.30	±	0.62	86.21	±	2.28	**Yes**
	3/13/2019	0.72	±	0.14	2.66	±	0.53	**Yes**	22.50	±	0.62	83.25	±	2.28	**Yes**
	3/20/2019	0.90	±	0.14	3.34	±	0.53	**Yes**	28.20	±	0.64	104.34	±	2.38	**Yes**
	3/27/2019	1.63	±	0.18	6.03	±	0.67	**Yes**	27.80	±	0.66	102.86	±	2.46	**Yes**
SUGAR CITY	1/2/2019	0.38	±	0.14	1.42	±	0.53	No	24.70	±	0.64	91.39	±	2.35	**Yes**
	1/9/2019	0.63	±	0.14	2.32	±	0.52	**Yes**	25.40	±	0.65	93.98	±	2.41	**Yes**
	1/16/2019	0.86	±	0.22	3.17	±	0.81	**Yes**	31.60	±	0.72	116.92	±	2.68	**Yes**
	1/23/2019	0.40	±	0.20	1.49	±	0.74	No	9.70	±	0.49	35.89	±	1.82	**Yes**
	1/30/2019	0.68	±	0.21	2.50	±	0.78	**Yes**	18.60	±	0.60	68.82	±	2.20	**Yes**
	2/6/2019	0.42	±	0.13	1.56	±	0.49	**Yes**	19.00	±	0.54	70.30	±	2.00	**Yes**
	2/13/2019	0.77	±	0.17	2.83	±	0.61	**Yes**	23.80	±	0.64	88.06	±	2.37	**Yes**
	2/20/2019	0.51	±	0.16	1.89	±	0.60	**Yes**	22.10	±	0.66	81.77	±	2.43	**Yes**
	2/27/2019	0.97	±	0.18	3.60	±	0.65	**Yes**	26.50	±	0.74	98.05	±	2.75	**Yes**

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS BETA Result > 3s
	3/6/2019	1.01 ± 0.15	3.74 ± 0.54	Yes	24.20 ± 0.61	89.54 ± 2.25	Yes
	3/13/2019	0.77 ± 0.14	2.85 ± 0.51	Yes	19.00 ± 0.56	70.30 ± 2.07	Yes
	3/20/2019	1.28 ± 0.17	4.74 ± 0.61	Yes	27.20 ± 0.66	100.64 ± 2.43	Yes
	3/27/2019	2.11 ± 0.23	7.81 ± 0.86	Yes	38.20 ± 0.88	141.34 ± 3.24	Yes
INL SITE							
EFS	1/2/2019	0.71 ± 0.16	2.64 ± 0.58	Yes	27.30 ± 0.66	101.01 ± 2.43	Yes
	1/9/2019	0.77 ± 0.16	2.86 ± 0.58	Yes	35.70 ± 0.78	132.09 ± 2.87	Yes
	1/16/2019	1.09 ± 0.25	4.03 ± 0.91	Yes	49.40 ± 0.90	182.78 ± 3.32	Yes
	1/23/2019	1.00 ± 0.24	3.70 ± 0.87	Yes	11.40 ± 0.53	42.18 ± 1.96	Yes
	1/30/2019	0.86 ± 0.21	3.17 ± 0.77	Yes	23.70 ± 0.62	87.69 ± 2.29	Yes
	2/6/2019	1.16 ± 0.19	4.29 ± 0.70	Yes	33.00 ± 0.74	122.10 ± 2.73	Yes
	2/13/2019	0.82 ± 0.17	3.04 ± 0.61	Yes	24.80 ± 0.65	91.76 ± 2.39	Yes
	2/20/2019	0.59 ± 0.16	2.18 ± 0.58	Yes	17.30 ± 0.58	64.01 ± 2.16	Yes
	2/27/2019	1.26 ± 0.17	4.66 ± 0.62	Yes	27.00 ± 0.66	99.90 ± 2.44	Yes
	3/6/2019	0.94 ± 0.15	3.46 ± 0.57	Yes	22.70 ± 0.63	83.99 ± 2.35	Yes
	3/13/2019	0.92 ± 0.16	3.39 ± 0.61	Yes	21.70 ± 0.65	80.29 ± 2.41	Yes
	3/20/2019	1.06 ± 0.16	3.92 ± 0.59	Yes	24.00 ± 0.65	88.80 ± 2.41	Yes
	3/27/2019	1.78 ± 0.20	6.59 ± 0.74	Yes	35.30 ± 0.78	130.61 ± 2.90	Yes
MAIN GATE	1/2/2019	0.54 ± 0.15	1.98 ± 0.56	Yes	24.00 ± 0.64	88.80 ± 2.35	Yes
	1/9/2019	0.78 ± 0.16	2.90 ± 0.58	Yes	33.00 ± 0.75	122.10 ± 2.78	Yes
	1/16/2019	0.72 ± 0.24	2.65 ± 0.88	Yes	41.20 ± 0.86	152.44 ± 3.19	Yes
	1/23/2019	0.76 ± 0.22	2.83 ± 0.83	Yes	11.10 ± 0.52	41.07 ± 1.94	Yes
	1/30/2019	0.83 ± 0.22	3.08 ± 0.82	Yes	15.50 ± 0.57	57.35 ± 2.11	Yes
	2/6/2019	1.11 ± 0.19	4.11 ± 0.70	Yes	29.90 ± 0.72	110.63 ± 2.65	Yes
	2/13/2019	0.86 ± 0.17	3.18 ± 0.63	Yes	24.10 ± 0.65	89.17 ± 2.41	Yes
	2/20/2019	0.18 ± 0.13	0.67 ± 0.50	No	16.50 ± 0.57	61.05 ± 2.09	Yes
	2/27/2019	1.51 ± 0.18	5.59 ± 0.68	Yes	28.70 ± 0.70	106.19 ± 2.57	Yes
	3/6/2019	1.23 ± 0.17	4.55 ± 0.61	Yes	24.70 ± 0.65	91.39 ± 2.39	Yes
	3/13/2019	0.94 ± 0.17	3.49 ± 0.62	Yes	21.30 ± 0.66	78.81 ± 2.43	Yes
	3/20/2019	0.96 ± 0.15	3.54 ± 0.54	Yes	26.00 ± 0.63	96.20 ± 2.34	Yes
	3/27/2019	1.65 ± 0.20	6.11 ± 0.73	Yes	34.50 ± 0.79	127.65 ± 2.92	Yes
VAN BUREN GATE	1/2/2019	0.52 ± 0.16	1.91 ± 0.58	Yes	26.10 ± 0.67	96.57 ± 2.49	Yes
	1/9/2019	0.87 ± 0.19	3.21 ± 0.69	Yes	35.90 ± 0.88	132.83 ± 3.24	Yes
	1/16/2019	0.52 ± 0.20	1.92 ± 0.75	No	36.70 ± 0.76	135.79 ± 2.80	Yes
	1/23/2019	0.60 ± 0.24	2.23 ± 0.90	No	14.30 ± 0.62	52.91 ± 2.28	Yes
	1/30/2019	0.28 ± 0.19	1.05 ± 0.70	No	19.80 ± 0.60	73.26 ± 2.21	Yes
	2/6/2019	0.78 ± 0.16	2.90 ± 0.60	Yes	32.10 ± 0.69	118.77 ± 2.55	Yes
	2/13/2019	0.53 ± 0.18	1.97 ± 0.65	Yes	30.30 ± 0.77	112.11 ± 2.85	Yes
	2/20/2019	0.40 ± 0.15	1.46 ± 0.55	No	21.00 ± 0.62	77.70 ± 2.29	Yes
	2/27/2019	1.42 ± 0.19	5.25 ± 0.71	Yes	34.60 ± 0.79	128.02 ± 2.94	Yes
	3/6/2019	0.69 ± 0.16	2.54 ± 0.59	Yes	27.40 ± 0.76	101.38 ± 2.81	Yes
	3/13/2019	0.86 ± 0.16	3.17 ± 0.58	Yes	24.10 ± 0.66	89.17 ± 2.43	Yes
	3/20/2019	1.54 ± 0.17	5.70 ± 0.64	Yes	28.80 ± 0.65	106.56 ± 2.42	Yes
	3/27/2019	1.89 ± 0.22	6.99 ± 0.81	Yes	38.40 ± 0.86	142.08 ± 3.19	Yes

a. A two-week sample was collected. The sampler could not be accessed for one week due to snow closure of road.

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	01/02/19	1.53	±	1.16	5.66	±	4.29	No
	01/09/19	0.26	±	1.10	0.98	±	4.07	No
	01/16/19	-2.15	±	1.56	-7.96	±	5.77	No
	01/23/19	0.85	±	1.50	3.16	±	5.55	No
	01/30/19	-0.90	±	1.08	-3.34	±	4.00	No
	02/06/19	-0.89	±	1.07	-3.30	±	3.96	No
	02/13/19	-2.42	±	1.83	-8.95	±	6.77	No
	02/20/19	0.24	±	1.11	0.87	±	4.11	No
	02/27/19	-2.41	±	1.50	-8.92	±	5.55	No
	03/06/19	-2.00	±	0.92	-7.40	±	3.40	No
	03/13/19	-0.54	±	1.39	-2.00	±	5.14	No
	03/20/19	-0.74	±	0.92	-2.74	±	3.42	No
	03/27/19	-1.27	±	1.59	-4.70	±	5.88	No
ATOMIC CITY	01/02/19	1.54	±	1.16	5.70	±	4.29	No
	01/09/19	0.26	±	1.09	0.96	±	4.03	No
	01/16/19	-1.99	±	1.45	-7.36	±	5.37	No
	01/23/19	0.87	±	1.52	3.20	±	5.62	No
	01/30/19	-0.91	±	1.09	-3.36	±	4.03	No
	02/06/19	-0.87	±	1.04	-3.20	±	3.85	No
	02/13/19	-2.22	±	1.67	-8.21	±	6.18	No
	02/20/19	0.32	±	1.53	1.20	±	5.66	No
	02/27/19	-2.56	±	1.59	-9.47	±	5.88	No
	03/06/19	-2.10	±	0.97	-7.77	±	3.57	No
	03/13/19	-0.57	±	1.46	-2.11	±	5.40	No
	03/20/19	-0.76	±	0.94	-2.80	±	3.49	No
	03/27/19	-1.26	±	1.58	-4.66	±	5.85	No
QA-1	01/02/19	1.85	±	1.40	6.85	±	5.18	No
(ATOMIC CITY)	01/09/19	0.26	±	1.10	0.97	±	4.07	No
	01/16/19	-2.11	±	1.53	-7.81	±	5.66	No
	01/23/19	0.89	±	1.56	3.29	±	5.77	No
	01/30/19	-1.03	±	1.24	-3.81	±	4.59	No
	02/06/19	-0.84	±	1.01	-3.10	±	3.74	No
	02/13/19	-2.57	±	1.94	-9.51	±	7.18	No
	02/20/19	0.33	±	1.56	1.22	±	5.77	No
	02/27/19	-2.31	±	1.44	-8.55	±	5.33	No
	03/06/19	-2.41	±	1.11	-8.92	±	4.11	No
	03/13/19	-0.59	±	1.52	-2.19	±	5.62	No
	03/20/19	-0.73	±	0.90	-2.68	±	3.34	No
	03/27/19	-1.23	±	1.55	-4.55	±	5.74	No
BLUE DOME	01/02/19	0.43	±	1.09	1.60	±	4.03	No
	01/09/19	-1.51	±	1.05	-5.59	±	3.89	No
	01/16/19	-0.31	±	0.97	-1.15	±	3.58	No
	01/23/19	-1.04	±	0.96	-3.85	±	3.53	No
	01/30/19	0.59	±	1.82	2.20	±	6.73	No
	02/06/19	0.38	±	0.85	1.40	±	3.13	No
	02/13/19	0.74	±	1.32	2.73	±	4.88	No
	02/20/19	2.10	±	1.00	7.77	±	3.69	No
	02/27/19	0.13	±	0.82	0.49	±	3.02	No
	03/06/19	0.03	±	0.99	0.13	±	3.65	No
	03/13/19	-0.19	±	1.34	-0.70	±	4.96	No
	03/20/19	-0.91	±	1.64	-3.37	±	6.07	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
	03/27/19	0.10	±	1.21	0.36	±	4.48	No
QA-2	01/02/19	0.47	±	1.19	1.75	±	4.40	No
(BLUE DOME)	01/09/19	-1.56	±	1.09	-5.77	±	4.03	No
	01/16/19	-0.31	±	0.96	-1.14	±	3.54	No
	01/23/19	-1.03	±	0.95	-3.81	±	3.51	No
	01/30/19	0.60	±	1.84	2.22	±	6.81	No
	02/06/19	0.44	±	0.99	1.64	±	3.66	No
	02/13/19	0.51	±	0.92	1.89	±	3.39	No
	02/20/19	2.32	±	1.10	8.58	±	4.07	No
	02/27/19	0.15	±	0.94	0.56	±	3.47	No
	03/06/19	0.05	±	1.39	0.18	±	5.14	No
	03/13/19	-0.20	±	1.41	-0.73	±	5.22	No
	03/20/19	-0.91	±	1.64	-3.36	±	6.07	No
	03/27/19	0.07	±	0.92	0.27	±	3.40	No
FAA TOWER	01/02/19	0.44	±	1.12	1.64	±	4.14	No
	01/09/19	-1.58	±	1.11	-5.85	±	4.11	No
	01/16/19	-0.36	±	1.11	-1.32	±	4.11	No
	01/23/19	-0.98	±	0.90	-3.63	±	3.33	No
	01/30/19	0.55	±	1.69	2.04	±	6.25	No
	02/06/19	0.47	±	1.04	1.72	±	3.85	No
	02/13/19	0.44	±	0.78	1.61	±	2.89	No
	02/20/19	2.20	±	1.04	8.14	±	3.85	No
	02/27/19	0.13	±	0.77	0.46	±	2.86	No
	03/06/19	0.05	±	1.34	0.17	±	4.96	No
	03/13/19	-0.21	±	1.49	-0.77	±	5.51	No
	03/20/19	-0.82	±	1.48	-3.04	±	5.48	No
	03/27/19	0.07	±	0.88	0.26	±	3.27	No
HOWE	01/02/19	0.44	±	1.10	1.62	±	4.07	No
	01/09/19	-1.52	±	1.06	-5.62	±	3.92	No
	01/16/19	-0.30	±	0.95	-1.12	±	3.50	No
	01/23/19	-1.07	±	0.98	-3.96	±	3.64	No
	01/30/19	0.59	±	1.82	2.19	±	6.73	No
	02/06/19	0.45	±	1.00	1.65	±	3.68	No
	02/13/19	0.47	±	0.84	1.73	±	3.09	No
	02/20/19	2.16	±	1.02	7.99	±	3.77	No
	02/27/19	0.13	±	0.79	0.47	±	2.92	No
	03/06/19	0.05	±	1.43	0.18	±	5.29	No
	03/13/19	-0.20	±	1.41	-0.73	±	5.22	No
	03/20/19	-0.87	±	1.57	-3.22	±	5.81	No
	03/27/19	0.07	±	0.86	0.26	±	3.19	No
MONTEVIEW	01/02/19	0.45	±	1.12	1.65	±	4.14	No
	01/09/19	-1.53	±	1.07	-5.66	±	3.96	No
	01/16/19	-0.30	±	0.94	-1.12	±	3.49	No
	01/23/19	-1.06	±	0.97	-3.92	±	3.60	No
	01/30/19	0.58	±	1.79	2.16	±	6.62	No
	02/06/19	0.43	±	0.96	1.60	±	3.57	No
	02/13/19	0.46	±	0.83	1.71	±	3.06	No
	02/20/19	2.35	±	1.11	8.70	±	4.11	No
	02/27/19	0.12	±	0.75	0.45	±	2.77	No
	03/06/19	0.05	±	1.40	0.18	±	5.18	No
	03/13/19	-0.20	±	1.43	-0.75	±	5.29	No
	03/20/19	-0.83	±	1.49	-3.05	±	5.51	No
	03/27/19	0.07	±	0.82	0.24	±	3.02	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
MUD LAKE	01/02/19	0.43	±	1.07	1.57	±	3.96	No
	01/09/19	-1.39	±	0.97	-5.14	±	3.60	No
	01/16/19	-0.30	±	0.93	-1.11	±	3.46	No
	01/23/19	-0.98	±	0.90	-3.64	±	3.33	No
	01/30/19	0.59	±	1.80	2.18	±	6.66	No
	02/06/19	0.42	±	0.93	1.54	±	3.43	No
	02/13/19	0.46	±	0.83	1.71	±	3.06	No
	02/20/19	2.09	±	0.99	7.73	±	3.66	No
	02/27/19	0.13	±	0.81	0.48	±	2.98	No
	03/06/19	0.05	±	1.31	0.17	±	4.85	No
	03/13/19	-0.20	±	1.43	-0.75	±	5.29	No
	03/20/19	-0.79	±	1.43	-2.93	±	5.29	No
	03/27/19	0.07	±	0.83	0.25	±	3.06	No
DISTANT								
BLACKFOOT	01/02/19	1.46	±	1.11	5.40	±	4.11	No
	01/09/19	0.25	±	1.05	0.93	±	3.89	No
	01/16/19	-1.92	±	1.40	-7.10	±	5.18	No
	01/23/19	0.87	±	1.52	3.20	±	5.62	No
	01/30/19	-0.99	±	1.18	-3.65	±	4.37	No
	02/06/19	-0.86	±	1.03	-3.17	±	3.81	No
	02/13/19	-1.95	±	1.47	-7.22	±	5.44	No
	02/20/19	0.36	±	1.68	1.31	±	6.22	No
	02/27/19	-2.13	±	1.33	-7.88	±	4.92	No
	03/06/19	-1.96	±	0.90	-7.25	±	3.34	No
	03/13/19	-0.57	±	1.46	-2.10	±	5.40	No
	03/20/19	-0.74	±	0.92	-2.73	±	3.41	No
	03/27/19	-1.27	±	1.60	-4.70	±	5.92	No
CRATERS OF THE MOON	01/02/19	1.52	±	1.15	5.62	±	4.26	No
	01/09/19	0.28	±	1.17	1.04	±	4.33	No
	01/16/19	-2.35	±	1.71	-8.70	±	6.33	No
	01/23/19	0.83	±	1.46	3.07	±	5.40	No
	01/30/19	-0.88	±	1.05	-3.24	±	3.89	No
	02/06/19	-0.87	±	1.05	-3.23	±	3.89	No
	02/13/19	-2.07	±	1.56	-7.66	±	5.77	No
	02/20/19	0.34	±	1.63	1.27	±	6.03	No
	3/6/2019[a]	-1.10	±	0.51	-4.07	±	1.88	No
	03/13/19	-0.51	±	1.32	-1.90	±	4.88	No
	03/20/19	-0.72	±	0.89	-2.65	±	3.30	No
	03/27/19	-1.30	±	1.63	-4.81	±	6.03	No
DUBOIS	01/02/19	0.40	±	1.02	1.49	±	3.77	No
	01/09/19	-1.56	±	1.09	-5.77	±	4.03	No
	01/16/19	-0.30	±	0.94	-1.11	±	3.46	No
	01/23/19	-0.97	±	0.89	-3.60	±	3.30	No
	01/30/19	0.58	±	1.78	2.15	±	6.59	No
	02/06/19	0.42	±	0.94	1.56	±	3.49	No
	02/13/19	0.48	±	0.86	1.78	±	3.18	No
	02/20/19	2.04	±	0.97	7.55	±	3.58	No
	02/27/19	0.13	±	0.82	0.49	±	3.04	No
	03/06/19	0.05	±	1.46	0.19	±	5.40	No
	03/13/19	-0.19	±	1.34	-0.70	±	4.96	No
	03/20/19	-0.86	±	1.55	-3.17	±	5.74	No
	03/27/19	0.07	±	0.91	0.27	±	3.36	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
IDAHO FALLS	01/02/19	0.43	±	1.09	1.60	±	4.03	No
	01/09/19	-1.50	±	1.05	-5.55	±	3.89	No
	01/16/19	-0.33	±	1.03	-1.22	±	3.81	No
	01/23/19	-1.05	±	0.96	-3.89	±	3.55	No
	01/30/19	0.61	±	1.88	2.27	±	6.96	No
	02/06/19	0.47	±	1.05	1.74	±	3.89	No
	02/13/19	0.47	±	0.84	1.74	±	3.11	No
	02/20/19	2.11	±	1.00	7.81	±	3.70	No
	02/27/19	0.13	±	0.79	0.47	±	2.93	No
	03/06/19	0.05	±	1.50	0.19	±	5.55	No
	03/13/19	-0.20	±	1.43	-0.74	±	5.29	No
	03/20/19	-0.87	±	1.57	-3.22	±	5.81	No
	03/27/19	0.07	±	0.83	0.25	±	3.07	No
JACKSON	01/02/19	1.17	±	0.89	4.33	±	3.28	No
	01/09/19	0.25	±	1.04	0.92	±	3.85	No
	01/16/19	-2.12	±	1.54	-7.84	±	5.70	No
	01/23/19	0.86	±	1.51	3.18	±	5.59	No
	01/30/19	-0.92	±	1.11	-3.42	±	4.11	No
	02/06/19	-0.83	±	0.99	-3.06	±	3.68	No
	02/13/19	-2.03	±	1.53	-7.51	±	5.66	No
	02/20/19	0.33	±	1.58	1.24	±	5.85	No
	02/27/19	-2.05	±	1.28	-7.59	±	4.74	No
	03/06/19	-1.95	±	0.90	-7.22	±	3.32	No
	03/13/19	-0.51	±	1.31	-1.89	±	4.85	No
	03/20/19	-0.68	±	0.84	-2.50	±	3.11	No
	03/27/19	-1.17	±	1.47	-4.33	±	5.44	No
SUGAR CITY	01/02/19	0.42	±	1.06	1.56	±	3.92	No
	01/09/19	-1.48	±	1.04	-5.48	±	3.85	No
	01/16/19	-0.29	±	0.91	-1.08	±	3.38	No
	01/23/19	-1.00	±	0.92	-3.70	±	3.39	No
	01/30/19	0.58	±	1.78	2.14	±	6.59	No
	02/06/19	0.38	±	0.84	1.39	±	3.10	No
	02/13/19	0.45	±	0.81	1.67	±	2.99	No
	02/20/19	2.25	±	1.06	8.33	±	3.92	No
	02/27/19	0.16	±	0.96	0.57	±	3.54	No
	03/06/19	0.04	±	1.28	0.16	±	4.74	No
	03/13/19	-0.18	±	1.29	-0.67	±	4.77	No
	03/20/19	-0.81	±	1.46	-2.99	±	5.40	No
	03/27/19	0.08	±	1.00	0.30	±	3.70	No
INL SITE								
EFS	01/02/19	1.53	±	1.16	5.66	±	4.29	No
	01/09/19	0.28	±	1.16	1.03	±	4.29	No
	01/16/19	-2.14	±	1.55	-7.92	±	5.74	No
	01/23/19	0.87	±	1.52	3.20	±	5.62	No
	01/30/19	-0.85	±	1.02	-3.16	±	3.77	No
	02/06/19	-0.88	±	1.06	-3.27	±	3.92	No
	02/13/19	-2.06	±	1.55	-7.62	±	5.74	No
	02/20/19	0.36	±	1.69	1.32	±	6.25	No
	02/27/19	-2.21	±	1.37	-8.18	±	5.07	No
	03/06/19	-2.08	±	0.96	-7.70	±	3.54	No
	03/13/19	-0.57	±	1.47	-2.11	±	5.44	No
	03/20/19	-0.77	±	0.96	-2.84	±	3.54	No
	03/27/19	-1.31	±	1.65	-4.85	±	6.11	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
MAIN GATE	01/02/19	1.57	±	1.19	5.81	±	4.40	No
	01/09/19	0.28	±	1.17	1.04	±	4.33	No
	01/16/19	-2.28	±	1.66	-8.44	±	6.14	No
	01/23/19	0.86	±	1.52	3.19	±	5.62	No
	01/30/19	-0.95	±	1.14	-3.53	±	4.22	No
	02/06/19	-0.90	±	1.08	-3.32	±	4.00	No
	02/13/19	-2.12	±	1.60	-7.84	±	5.92	No
	02/20/19	0.35	±	1.67	1.30	±	6.18	No
	02/27/19	-2.31	±	1.44	-8.55	±	5.33	No
	03/06/19	-2.03	±	0.94	-7.51	±	3.46	No
	03/13/19	-0.58	±	1.50	-2.16	±	5.55	No
	03/20/19	-0.70	±	0.87	-2.58	±	3.21	No
	03/27/19	-1.35	±	1.70	-5.00	±	6.29	No
VAN BUREN GATE	01/02/19	1.63	±	1.24	6.03	±	4.59	No
	01/09/19	0.34	±	1.43	1.26	±	5.29	No
	01/16/19	-1.98	±	1.44	-7.33	±	5.33	No
	01/23/19	0.98	±	1.73	3.63	±	6.40	No
	01/30/19	-0.91	±	1.09	-3.35	±	4.03	No
	02/06/19	-0.80	±	0.97	-2.97	±	3.57	No
	02/13/19	-2.42	±	1.82	-8.95	±	6.73	No
	02/20/19	0.35	±	1.67	1.30	±	6.18	No
	02/27/19	-2.55	±	1.58	-9.44	±	5.85	No
	03/06/19	-2.48	±	1.14	-9.18	±	4.22	No
	03/13/19	-0.54	±	1.39	-2.00	±	5.14	No
	03/20/19	-0.68	±	0.85	-2.52	±	3.15	No
	03/27/19	-1.45	±	1.82	-5.37	±	6.73	No

a. A two-week sample was collected. The sampler could not be accessed for one week due to snow closure of road.

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	03/27/19	AMERICIUM-241	3.03	±	1.58	11.21	±	5.85	No
	03/27/19	CESIUM-137	102.00	±	110	377.40	±	407.00	No
	03/27/19	PLUTONIUM-238	1.98	±	2.51	7.33	±	9.29	No
	03/27/19	PLUTONIUM-239/240	1.19	±	1.96	4.40	±	7.25	No
ATOMIC CITY	03/27/19	CESIUM-137	-28.40	±	80.80	-105.08	±	298.96	No
	03/27/19	STRONTIUM-90	1.59	±	9.26	5.88	±	34.26	No
QA-1 (ATOMIC CITY)	03/27/19	CESIUM-137	-66.70	±	107.00	-246.79	±	395.90	No
	03/27/19	STRONTIUM-90	8.86	±	9.92	32.78	±	36.70	No
BLUE DOME	03/27/19	AMERICIUM-241	1.57	±	1.26	5.81	±	4.66	No
	03/27/19	CESIUM-137	37.30	±	84.60	138.01	±	313.02	No
	03/27/19	PLUTONIUM-238	2.81	±	1.70	10.40	±	6.29	No
	03/27/19	PLUTONIUM-239/240	0.00	±	1.92	0.00	±	7.10	No
(QA-2) BLUE DOME	03/27/19	AMERICIUM-241	1.39	±	2.01	5.14	±	7.44	No
	03/27/19	CESIUM-137	12.10	±	80.00	44.77	±	296.00	No
	03/27/19	PLUTONIUM-238	-8.93	±	3.43	-33.04	±	12.69	No
	03/27/19	PLUTONIUM-239/240	-3.87	±	3.31	-14.32	±	12.25	No
FAA TOWER	03/27/19	CESIUM-137	64.10	±	85.70	237.17	±	317.09	No
	03/27/19	STRONTIUM-90	-11.90	±	8.43	-44.03	±	31.19	No
HOWE	03/27/19	CESIUM-137	131.00	±	87.70	484.70	±	324.49	No
MONTEVIEW	03/27/19	AMERICIUM-241	2.58	±	2.26	9.55	±	8.36	No
	03/27/19	CESIUM-137	18.60	±	74.80	68.82	±	276.76	No
	03/27/19	PLUTONIUM-238	0.63	±	1.38	2.33	±	5.11	No
	03/27/19	PLUTONIUM-239/240	-0.95	±	1.80	-3.52	±	6.66	No
MUD LAKE	03/27/19	CESIUM-137	-224.00	±	112.00	-828.80	±	414.40	No
DISTANT									
BLACKFOOT	03/27/19	CESIUM-137	21.20	±	77.60	78.44	±	287.12	No
CRATERS OF THE	03/27/19	CESIUM-137	63.70	±	76.50	235.69	±	283.05	No
MOON	03/27/19	STRONTIUM-90	1.03	±	10.30	3.81	±	38.11	No
DUBOIS	03/27/19	CESIUM-137	69.30	±	99.50	256.41	±	368.15	No
IDAHO FALLS	03/27/19	CESIUM-137	-136.00	±	103.00	-503.20	±	381.10	No
JACKSON WY	03/27/19	AMERICIUM-241	0.27	±	1.31	0.99	±	4.85	No
	03/27/19	CESIUM-137	97.50	±	74.40	360.75	±	275.28	No

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

	03/27/19	PLUTONIUM-238	3.97	±	2.10	14.69	±	7.77	No
	03/27/19	PLUTONIUM-239/240	-10.10	±	4.68	-37.37	±	17.32	No
SUGAR CITY	03/27/19	AMERICIUM-241	0.70	±	1.75	2.60	±	6.48	No
	03/27/19	CESIUM-137	66.80	±	96.00	247.16	±	355.20	No
	03/27/19	PLUTONIUM-238	3.03	±	1.74	11.21	±	6.44	No
	03/27/19	PLUTONIUM-239/240	4.23	±	1.98	15.65	±	7.33	No
INL SITE									
EFS	03/27/19	CESIUM-137	187.00	±	104.00	691.90	±	384.80	No
	03/27/19	STRONTIUM-90	-11.10	±	8.76	-41.07	±	32.41	No
MAIN GATE	03/27/19	CESIUM-137	-37.40	±	109.00	-138.38	±	403.30	No
	03/27/19	CESIUM-137	-8.20	±	9.00	-30.34	±	33.30	No
VAN BUREN GATE	03/27/19	AMERICIUM-241	2.26	±	1.55	8.36	±	5.74	No
	03/27/19	CESIUM-137	-112.00	±	109	-414.40	±	403.30	No
	03/27/19	PLUTONIUM-238	3.27	±	5.59	12.10	±	20.68	No
	03/27/19	PLUTONIUM-239/240	4.08	±	2.74	15.10	±	10.14	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	12/26/18	02/13/19	0.25	±	0.84	0.94	±	3.12	No
ATOMIC CITY	02/13/19	03/27/19	1.63	±	0.89	6.03	±	3.30	No
HOWE	11/28/18	01/16/19	3.12	±	0.90	11.54	±	3.31	**Yes**
HOWE	01/16/19	02/27/19	1.86	±	0.73	6.88	±	2.69	No
DISTANT									
IDAHO FALLS	12/13/18	02/06/19	2.61	±	0.54	9.66	±	1.98	**Yes**
IDAHO FALLS	02/06/19	03/13/19	2.42	±	0.89	8.95	±	3.29	No
INL SITE									
EFS	12/26/18	02/06/19	2.31	±	0.65	8.55	±	2.39	**Yes**
EFS	02/06/19	03/13/19	1.56	±	0.74	5.77	±	2.72	No

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	12/26/18	01/02/19	29.3	±	24.7	1.08	±	0.91	No
ATOMIC CITY	01/02/19	01/09/19	48.3	±	25.1	1.79	±	0.93	No
ATOMIC CITY	01/09/19	01/16/19	6.41	±	24.6	0.24	±	0.91	No
ATOMIC CITY	01/16/19	01/23/19	45	±	25.1	1.67	±	0.93	No
ATOMIC CITY	01/30/19	02/06/19	39.5	±	23.8	1.46	±	0.88	No
ATOMIC CITY	02/06/19	02/13/19	144	±	25.1	5.33	±	0.93	**Yes**
ATOMIC CITY	02/13/19	02/20/19	85.5	±	24.4	3.16	±	0.90	**Yes**
ATOMIC CITY	02/20/19	02/27/19	-13	±	23.9	-0.48	±	0.88	No
ATOMIC CITY	02/27/19	03/06/19	44	±	23.9	1.63	±	0.88	No
ATOMIC CITY	03/06/19	03/13/19	70.3	±	24.7	2.60	±	0.91	No
ATOMIC CITY	03/20/19	03/27/19	26.7	±	24.1	0.99	±	0.89	No
HOWE	12/26/18	01/02/19	88.5	±	25.7	3.27	±	0.95	**Yes**
HOWE	01/02/19	01/09/19	67.5	±	24.4	2.50	±	0.90	No
HOWE	01/09/19	01/16/19	66.9	±	25.1	2.48	±	0.93	No
HOWE	01/16/19	01/23/19	68.9	±	25.1	2.55	±	0.93	No
HOWE	01/30/19	02/06/19	40.00	±	24.10	1.48	±	0.89	No
HOWE	02/06/19	02/13/19	50.90	±	24.30	1.88	±	0.90	No
HOWE	02/13/19	02/20/19	29.60	±	24.00	1.10	±	0.89	No
HOWE	02/20/19	02/27/19	51.50	±	24.40	1.91	±	0.90	No
HOWE	02/27/19	03/06/19	69.10	±	24.30	2.56	±	0.90	No
DISTANT									
IDAHO FALLS	12/31/18	01/31/19	22.40	±	23.80	0.83	±	0.88	No
IDAHO FALLS	01/31/19	02/28/19	31.00	±	23.80	1.15	±	0.88	No
IDAHO FALLS	02/28/19	03/31/19	112.00	±	24.80	4.14	±	0.92	**Yes**
INL SITE									
EFS	12/26/18	01/02/19	9.44	±	24.60	0.35	±	0.91	No
EFS	01/02/19	01/09/19	-5.49	±	24.40	-0.20	±	0.90	No
EFS	01/09/19	01/16/19	30.00	±	24.80	1.11	±	0.92	No
EFS	01/16/19	01/23/19	-3.69	±	24.40	-0.14	±	0.90	No
EFS	01/30/19	02/06/19	56.60	±	26.20	2.09	±	0.97	No
EFS	02/06/19	02/13/19	49.70	±	24.30	1.84	±	0.90	No
EFS	02/13/19	02/20/19	56.60	±	24.10	2.09	±	0.89	No
EFS	02/20/19	02/27/19	37.80	±	23.90	1.40	±	0.88	No
EFS	02/27/19	03/06/19	33.40	±	24.60	1.24	±	0.91	No
EFS	03/06/19	03/13/19	97.30	±	24.60	3.60	±	0.91	**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	01/08/19	0.14	±	1.12	0.01	±	0.04	No	-1.75	±	0.99	-0.06	±	0.04	No
	02/05/19	-2.34	±	2.41	-0.09	±	0.09	No	-2.64	±	1.96	-0.10	±	0.07	No
	03/05/19	-2.67	±	1.94	-0.10	±	0.07	No	1.03	±	1.50	0.04	±	0.06	No
DIETRICH	01/08/19	0.04	±	1.86	0.00	±	0.07	No	1.10	±	1.35	0.04	±	0.05	No
	02/05/19	0.74	±	0.94	0.03	±	0.03	No	2.17	±	0.96	0.08	±	0.04	No
	03/05/19	-1.29	±	0.95	-0.05	±	0.04	No	1.60	±	0.90	0.06	±	0.03	No
HOWE	01/08/19	-2.91	±	2.12	-0.11	±	0.08	No	1.36	±	1.39	0.05	±	0.05	No
	02/05/19	0.50	±	1.31	0.02	±	0.05	No	-0.33	±	0.99	-0.01	±	0.04	No
	03/05/19	-3.91	±	2.49	-0.14	±	0.09	No	-0.99	±	1.88	-0.04	±	0.07	No
IDAHO FALLS	01/02/19	0.77	±	0.95	0.03	±	0.04	No	-1.37	±	0.89	-0.05	±	0.03	No
	01/09/19	0.71	±	0.92	0.03	±	0.03	No	0.73	±	0.87	0.03	±	0.03	No
	01/15/19	-1.25	±	1.54	-0.05	±	0.06	No	0.01	±	1.37	0.00	±	0.05	No
	01/22/19	2.07	±	1.63	0.08	±	0.06	No	1.51	±	1.40	0.06	±	0.05	No
	01/29/19	-2.24	±	1.75	-0.08	±	0.06	No	1.32	±	1.47	0.05	±	0.05	No
	02/05/19	-0.90	±	1.62	-0.03	±	0.06	No	0.03	±	1.49	0.00	±	0.06	No
Duplicate	02/05/19	0.57	±	1.40	0.02	±	0.05	No	0.10		0.98	0.00	±	0.04	No
	02/12/19	-1.03	±	1.73	-0.04	±	0.06	No	-0.09	±	1.41	0.00	±	0.05	No
	02/19/19	-0.08	±	1.64	0.00	±	0.06	No	-2.74	±	1.60	-0.10	±	0.06	No
	02/26/19	0.78	±	1.65	0.03	±	0.06	No	-0.66	±	1.57	-0.02	±	0.06	No
	03/05/19	-0.64	±	1.63	-0.02	±	0.06	No	0.94	±	1.52	0.03	±	0.06	No
	03/12/19	-0.96	±	1.63	-0.04	±	0.06	No	-0.72	±	1.42	-0.03	±	0.05	No
	03/19/19	-0.93	±	1.60	-0.03	±	0.06	No	-1.17	±	1.51	-0.04	±	0.06	No
	03/26/19	-0.42	±	1.61	-0.02	±	0.06	No	-0.69	±	1.38	-0.03	±	0.05	No
MINIDOKA	01/08/19	-0.01	±	1.07	0.00	±	0.04	No	1.33	±	0.88	0.05	±	0.03	No
Duplicate	01/08/19	0.31	±	2.18	0.01	±	0.08	No	0.01	±	1.34	0.00	±	0.05	No
	02/05/19	-2.41	±	1.80	-0.09	±	0.07	No	1.48	±	1.43	0.05	±	0.05	No
	03/05/19	2.10	±	1.81	0.08	±	0.07	No	0.06	±	1.46	0.00	±	0.05	No
TERRETON	01/02/19	-2.80	±	1.80	-0.10	±	0.07	No	-2.84	±	1.39	-0.11	±	0.05	No
	01/08/19	-1.60	±	1.12	-0.06	±	0.04	No	0.34	±	0.93	0.01	±	0.03	No
	01/16/19	0.18	±	1.69	0.01	±	0.06	No	2.01	±	1.40	0.07	±	0.05	No
	01/23/19	2.85	±	2.05	0.11	±	0.08	No	-0.49	±	1.85	-0.02	±	0.07	No
	01/30/19	0.81	±	0.97	0.03	±	0.04	No	-1.18	±	0.98	-0.04	±	0.04	No
	02/05/19	-3.79	±	2.31	-0.14	±	0.09	No	0.18	±	1.83	0.01	±	0.07	No
	02/13/19	1.78	±	1.10	0.07	±	0.04	No	-0.85	±	0.99	-0.03	±	0.04	No
	02/20/19	2.69	±	2.01	0.10	±	0.07	No	-0.90	±	1.88	-0.03	±	0.07	No
	02/27/19	0.53	±	1.95	0.02	±	0.07	No	0.27	±	1.82	0.01	±	0.07	No
	03/05/19	0.60	±	2.14	0.02	±	0.08	No	0.91	±	1.89	0.03	±	0.07	No
	03/13/19	1.19	±	2.00	0.04	±	0.07	No	-0.40	±	1.89	-0.01	±	0.07	No
	03/20/19	1.30	±	2.02	0.05	±	0.07	No	0.43	±	1.85	0.02	±	0.07	No
	03/27/19	-2.18	±	2.02	-0.08	±	0.07	No	-0.55	±	1.82	-0.02	±	0.07	No

APPENDIX D

STATISTICAL ANALYSIS RESULTS

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

Gross Alpha					
Quarter	Valid N	Sum of ranks	Mean rank	H[a]	*p*[b]
Boundary	91	8882.000	97.6044		
Distant	77	8413.000	109.2597	1.8550	0.3955
INL Site	39	4233.000	108.5385		
January	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	35	1331.500	38.04286		
Distant	30	1261.000	42.03333	0.7195	0.6978
INL Site	15	647.500	43.16667		
February	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	798.0000	28.50000		
Distant	23	811.0000	35.26087	1.8800	0.3906
INL Site	12	407.0000	33.91667		
March	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	881.0000	31.46429		
Distant	24	784.5000	32.68750	0.2334	0.8899
INL Site	12	414.5000	34.54167		
Gross Beta					
Quarter	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	91	9723.500	106.8516		
Distant	77	7277.500	94.5130	3.7234	0.1554
INL Site	39	4527.000	116.0769		
January	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	35	1467.500	41.92857		
Distant	30	1111.500	37.05000	1.1470	0.5635
INL Site	15	661.000	44.06667		
February	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	945.5000	33.76786		
Distant	23	621.0000	27.00000	3.0361	0.02191
INL Site	12	449.5000	37.45833		
March	Valid N	Sum of ranks	Mean rank	H	*p*
Boundary	28	902.0000	32.21429		
Distant	24	742.5000	30.93750	0.6734	0.7141
INL Site	12	435.5000	36.29167		

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-19-LVf in 1st-Qtr-19-LVf - Copy) Independent (grouping) variable: GeographicName Kruskal-Wallis test: H (15, N= 207) =45.22547 p =.0001 Include condition: v8="Gross Alpha"															
Depend.: Coded Result	**Arco R:117.50**	Atomic City R:91.115	Blue Dome R:62.423	FAA Tower R:80.000	Howe R:142.54	Monteview R:93.538	Mud Lake R:96.115	Blackfoot R:128.88	Craters of the Moon R:75.042	Dubois R:62.500	EFS R:123.81	Idaho Falls R:160.15	Jackson WY R:136.19	Main Gate R:112.38	Sugar City R:90.154	Van Buren R:89.423
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	0.395801	1.000000	1.000000	1.000000	1.000000
Blue Dome	1.000000	1.000000		1.000000	0.077973	1.000000	1.000000	0.560691	1.000000	1.000000	1.000000	0.003824	0.202857	1.000000	1.000000	1.000000
FAA Tower	1.000000	1.000000	1.000000		0.932651	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.077507	1.000000	1.000000	1.000000	1.000000
Howe	1.000000	1.000000	0.077973	0.932651		1.000000	1.000000	1.000000	0.585671	0.078915	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	0.549325	1.000000	1.000000	1.000000	1.000000
Mud Lake	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000		1.000000	1.000000	1.000000	1.000000	0.770082	1.000000	1.000000	1.000000	1.000000
Blackfoot	1.000000	1.000000	0.560691	1.000000	1.000000	1.000000	1.000000		1.000000	0.566453	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Craters of the Moon	1.000000	1.000000	1.000000	1.000000	0.585671	1.000000	1.000000	1.000000		1.000000	1.000000	0.046329	1.000000	1.000000	1.000000	1.000000
Dubois	1.000000	1.000000	1.000000	1.000000	0.078915	1.000000	1.000000	0.566453	1.000000		1.000000	0.003879	0.205136	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
Idaho Falls	1.000000	0.395801	0.003824	0.077507	1.000000	0.549325	0.770082	1.000000	0.046329	0.003879	1.000000		1.000000	1.000000	0.346579	0.312980
Jackson WY	1.000000	1.000000	0.202857	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.205136	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
Sugar City	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0.346579	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	0.312980	1.000000	1.000000	1.000000	

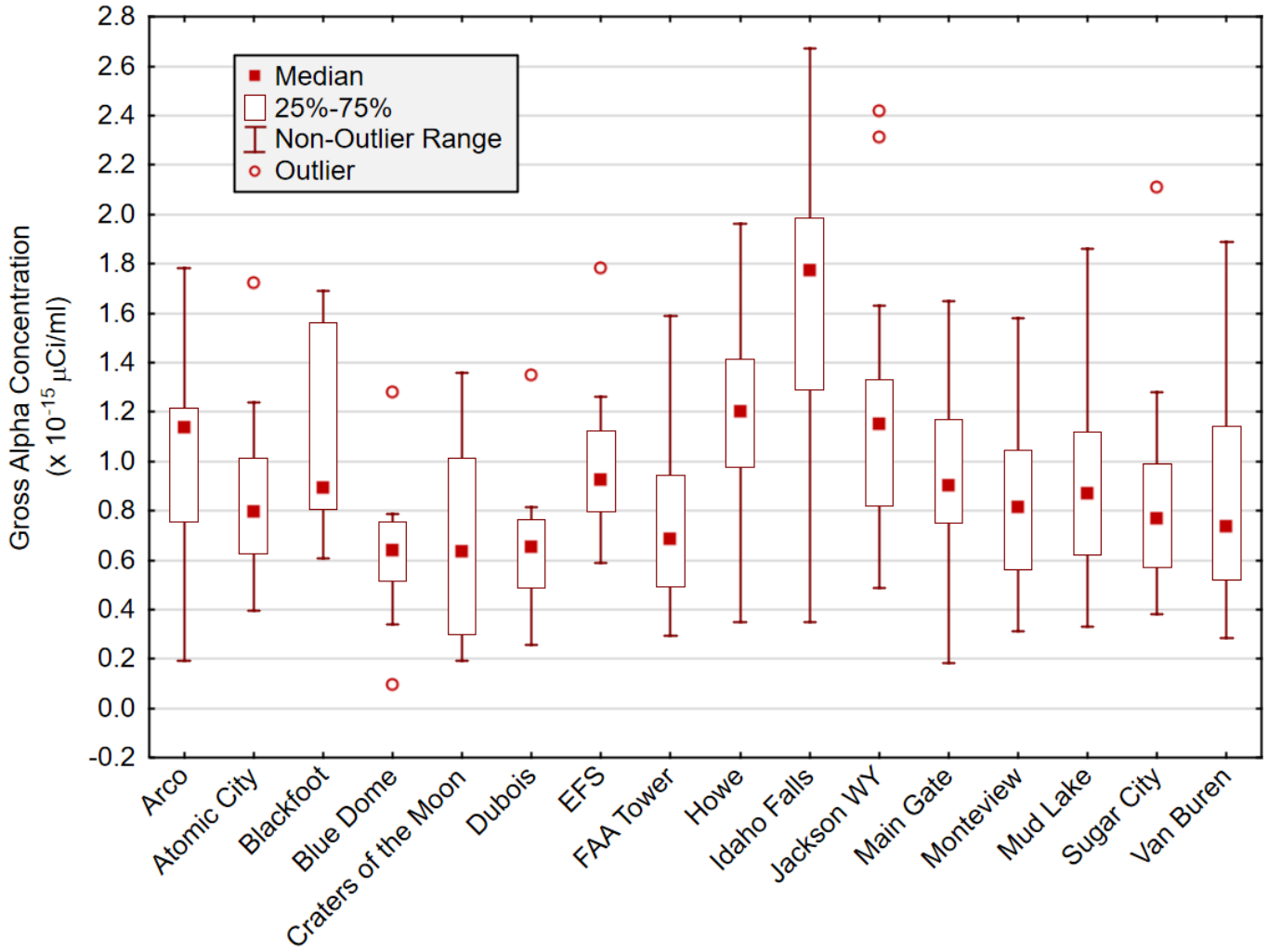

Figure D-1. First quarter gross alpha concentrations in air at all sampling locations. Number of samples (N) = 13 at each location, except for Craters of the Moon (N = 12).

Table D-3. Results of multiple comparisons of gross beta 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.

All Groups
Multiple Comparisons p values (2-tailed); Coded Result (1st-Qtr-19-LVf in 1st-Qtr-19-LVf_REV1)
Independent (grouping) variable: GeographicName
Kruskal-Wallis test: H (15, N= 207) =13.73877 p =.5454
Include condition: v8="Gross Beta"

Depend.: Coded Result	**Arco R:114.88**	Atomic City R:126.08	Blue Dome R:76.731	FAA Tower R:95.115	Howe R:106.04	Monteview R:110.12	Mud Lake R:119.00	Blackfoot R:109.08	Craters of the Moon R:78.917	Dubois R:80.692	EFS R:112.85	Idaho Falls R:99.615	Jackson WY R:105.92	Main Gate R:105.08	Sugar City R:91.654	Van Buren R:130.31
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
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
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
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	