Veolia Nuclear Solutions- Federal Services
Environmental Surveillance, Education, and Research Program
ISSN NUMBER 1089-5469

Idaho National Laboratory Site Offsite Environmental Surveillance Program Report: First Quarter 2018

December 2018

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Program conducted for the U.S. Department of Energy, Idaho Operations Office
Under Contract DE-NE0008477

By
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EXECUTIVE SUMMARY

None of the radionuclides detected in samples collected during the first quarter of 2018 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 2018 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, 2018. All sample types (media) and the sampling schedule followed during 2018 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
- Large game animals

Table E-1 Summary of Results for the First Quarter of 2018

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were some 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 weekly results but no pattern was discernible. No result exceeded results for the past ten years or the DCS for gross alpha or gross beta activity in air.
	Quarterly Composite	Gamma-emitting radionuclides, ^{90}Sr, actinides (americium and plutonium)	One human-made alpha-emitting radionuclide (^{241}Am) was measured above 3s in the composite sample from Atomic City, but was not detected in the duplicate QA sample collected at the same location. The detected concentration was near the detection level and well below the DCS and historical measurements. No human-made gamma-emitters or ^{90}Sr, ^{238}Pu, and $^{239/249}$Pu were measured in any composite.
	Charcoal Cartridge	Iodine-131	Iodine-131 was not detected in any of the 26 batches counted during the quarter.
Atmospheric Moisture	Liquid	Tritium	All nine results showed tritium concentrations greater than the 3s uncertainty during the quarter. No sample result exceeded results for the past ten years or the DCS for tritium in air.
Precipitation	Liquid	Tritium	A total of twenty-one samples were collected. Twelve of the results were greater than the 3s uncertainty. All results were within the range previously measured in the past ten years and were consistent with those reported across the region by the Environmental Protection Agency.
Milk	Liquid	Iodine-131, other	Forty milk samples were

		gamma-emitting radionuclides	collected at seven locations (including the offsite control sample from Colorado). No sample result exceeded 3s.
Large game animals	Tissue	Gamma-emitting radionuclides	No human-made gamma-emitting radionuclides were found in the muscle tissues or thyroid of an elk sampled in the first quarter.

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 a number of 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 2018, environmental monitoring within the INL Site boundaries was primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors.

At the beginning of the first quarter of 2018, ESER Program responsibilities were assumed by Veolia Nuclear Solutions-Federal Services (VNSFS), in conjunction with team members Idaho State University and Oak Ridge Associated Universities (ORAU). ORAU ceased operations in April 2018 and was replaced in May by GEL Laboratories.

This report contains monitoring results from the ESER Program for samples collected during the first quarter of 2018 (January 1- March 31, 2018).

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 through the use of reports, presentations, newsletter articles and press releases.

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

Environmental samples collected include:

- air at 16 locations on and around the INL Site
- moisture in air at four locations around the INL Site
- precipitation from three locations on and around the INL Site
- drinking water from eight locations and surface water from three locations around the INL Site and five locations along the Big Lost River on the INL Site
- agricultural products, including milk at seven dairies around the INL Site, potatoes from at least six local producers, alfalfa from a local producer, 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 13 locations around the INL Site biennially
- environmental dosimeters from 17 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 three 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 Oak Ridge Associated Universities (ORAU). ORAU closed in April and was replaced by GEL Laboratories who completed the analyses of the remaining 2018 samples (i.e., first quarter air composites).

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

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

Once samples have been collected and analyzed, the ESER Program has the responsibility for quality control of the data, entry into the ESER database, and reporting in quarterly reports. The quarterly reports are then consolidated into the INL Site Environmental Report for each calendar year. 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 have an effect on 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 (i.e., the *a posteriori* measurement) based on calculations derived by Curie (1984). The 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 identify a potentially false positive result. 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 particular 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.

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

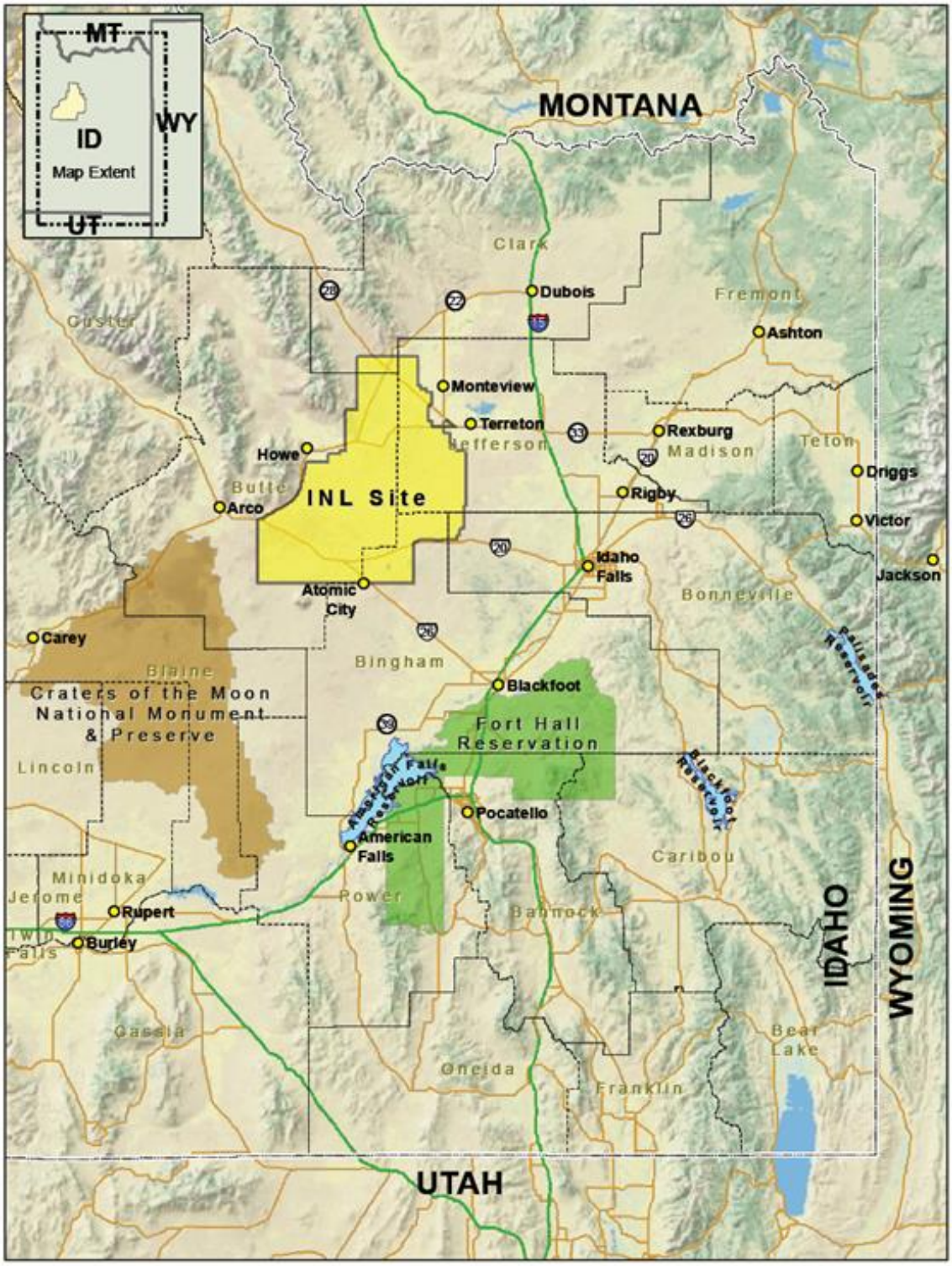

Figure 1. Location of the Idaho National Laboratory Site.

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 2018 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 2018 (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 20,324 ft^3 (576 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.

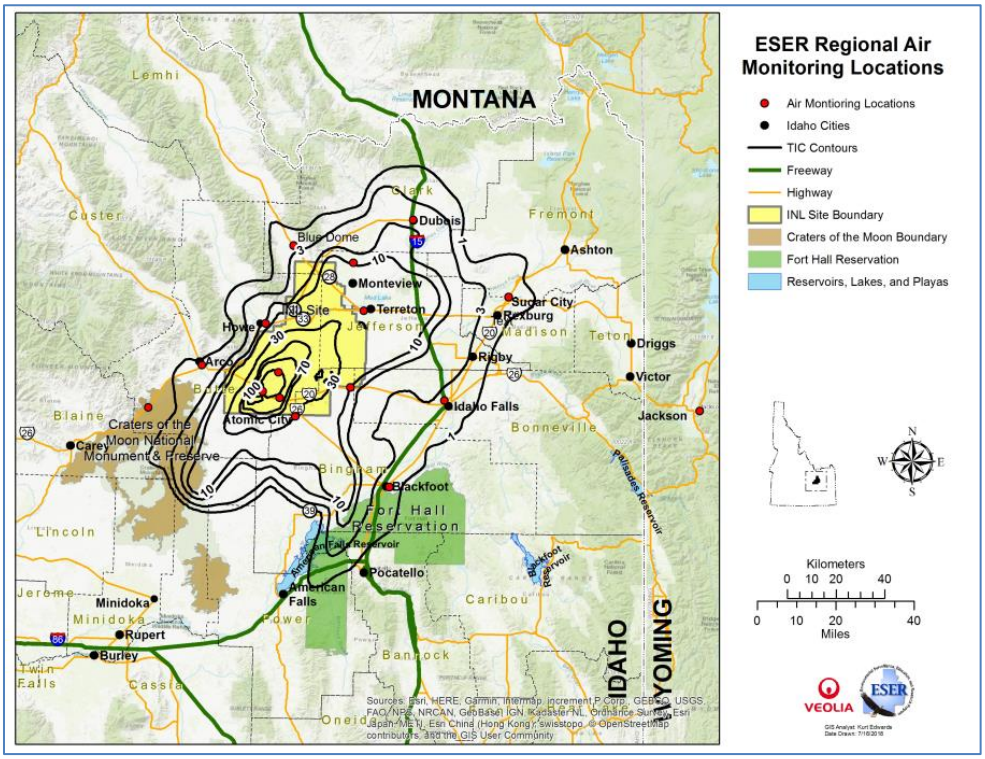

Figure 2. Low-volume air sampler locations. Total Integrated Concentration (TIC) contours were generated by the National Oceanic and Atmospheric Administration Air Resources Laboratory – Field Research Division using the MDIFF air transport and dispersion model and wind data from 35 meteorological stations on and around the INL Site in 2010.

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 data are tested for normality prior to statistical analyses, and generally show no consistent discernible distribution. Because there is no discernible distribution of the data, the nonparametric Kruskal-Wallis test of multiple independent groups was used to test for statistical differences between INL Site, Boundary, and Distant locations. The use of nonparametric tests, such as Kruskal-Wallis, gives less weight to outlier and extreme values thus allowing a more appropriate comparison of data groups. A statistically significant difference exists between data groups if the (p) 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 a statistically significant difference in the data by group by locations for the quarter as a whole and for the months of January and February. In both cases, the boundary group had the highest median concentration and the highest mean rank score. The differences between the groups was small, however, as shown in Figure 3.

As an additional check, comparisons between gross alpha concentrations measured at Boundary and Distant locations were made on a weekly basis. The Mann-Whitney U test was used to compare the Boundary and Distant data because it is the most powerful nonparametric alternative to the t-test for independent samples. INL Site sample results were not included in this analysis because the onsite data, collected at only three locations, are not representative of the entire INL Site and would not aid in determining offsite impacts. There were three weeks where a statistically significant difference existed between the two sample groups (Table D-2). These were the weeks of January 3, January 10, and February 21; the Boundary stations were statistically higher than the Distant and INL Site stations. Nothing unusual was noted in the data, however, and all were well within measurements taken within the last ten years (2008-2017). All results were well below the DCS for $^{239/240}Pu$, the most conservative value for a human-made alpha-emitting radionuclide that might be detected at the INL Site.

Gross beta results are presented in Table C-1 and displayed in Figures 7 through 10. The data are 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 was not a statistically significant difference in the data between groups for the quarter as a whole, using the Kruskal-Wallace ANOVA by ranks test (Table D-1). However results were statistically highest for boundary results during the month of January. Weekly comparisons were also made

January 10, January 24, January 31, and March 14. In all cases, except January 3 and January 24, the INL Site group showed the highest median concentration and the highest mean rank score. The differences between the groups was very small, however, as shown in Figure 7.

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 of Appendix C.

No ^{137}Cs or other human-made gamma-emitting radionuclides were found in quarterly composites. No ^{90}Sr, ^{238}Pu, $^{239/240}Pu$, were detected either. One result for ^{241}Am was detected in Atomic City, but not at the QA-1 Atomic City duplicate location. The result was also below detections observed during the past ten years and below the DCS for ^{241}Am. Results for these analyses are found in Table C-3 of Appendix C.

ATMOSPHERIC MOISTURE SAMPLING

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

Results were available for nine atmospheric moisture samples collected at the INL Site, Boundary, and Distant locations during the first quarter of 2018. All of the results exceeded the 3s uncertainty level for tritium, with similar results to those reported during the past ten years (2008-2017). Results also remain similar between the four sampling locations. All samples were significantly below the DOE DCS for tritium in air of 1.4×10^{-8} $\mu Ci/mL_{air}$ with a maximum reported value of 6.80×10^{-13} $\mu Ci/mL_{air}$ at Idaho Falls. Results are shown in Table C-4, Appendix C.

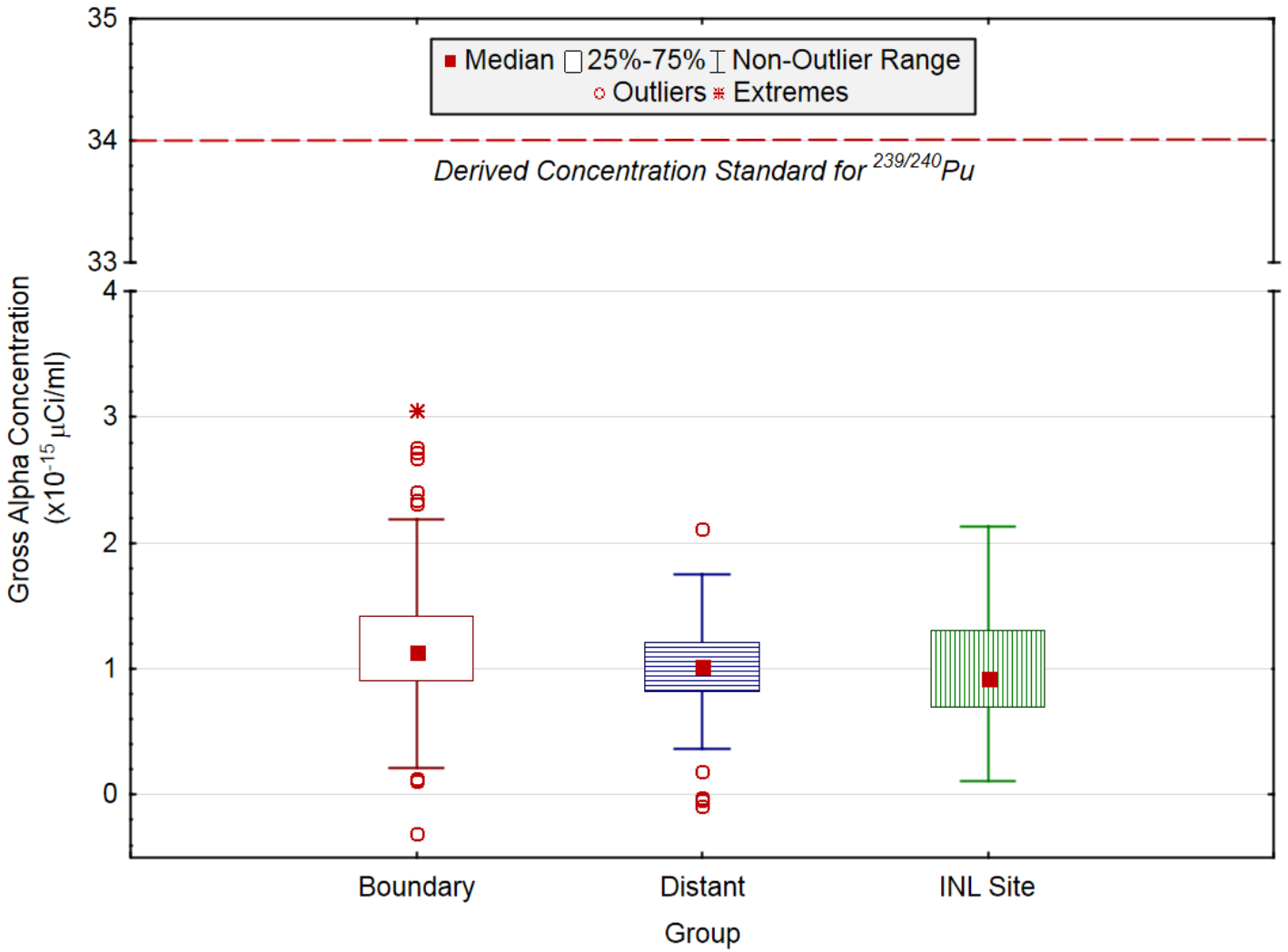

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the first quarter of 2018. The DOE Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. 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.

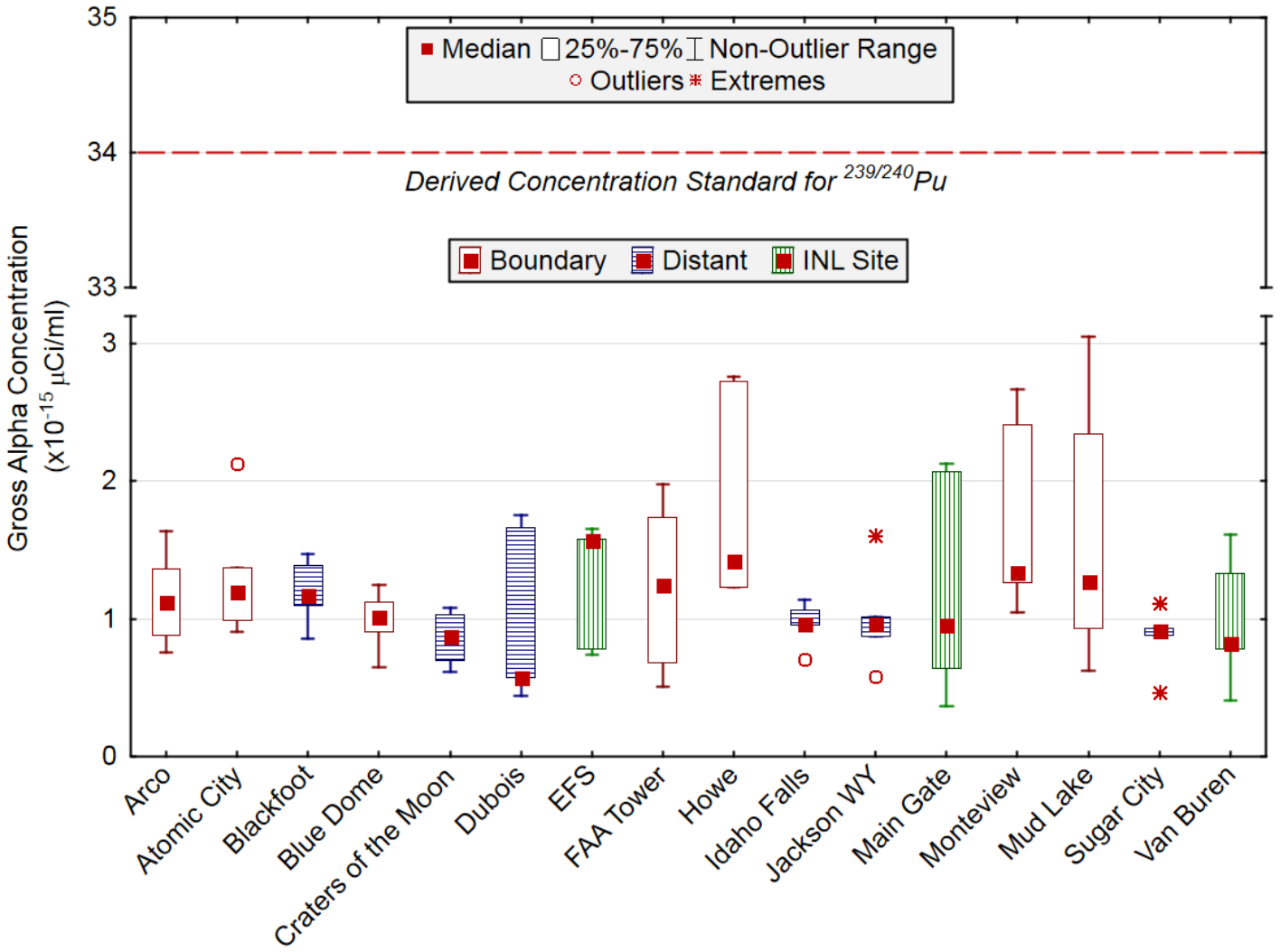

Figure 4. January gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a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

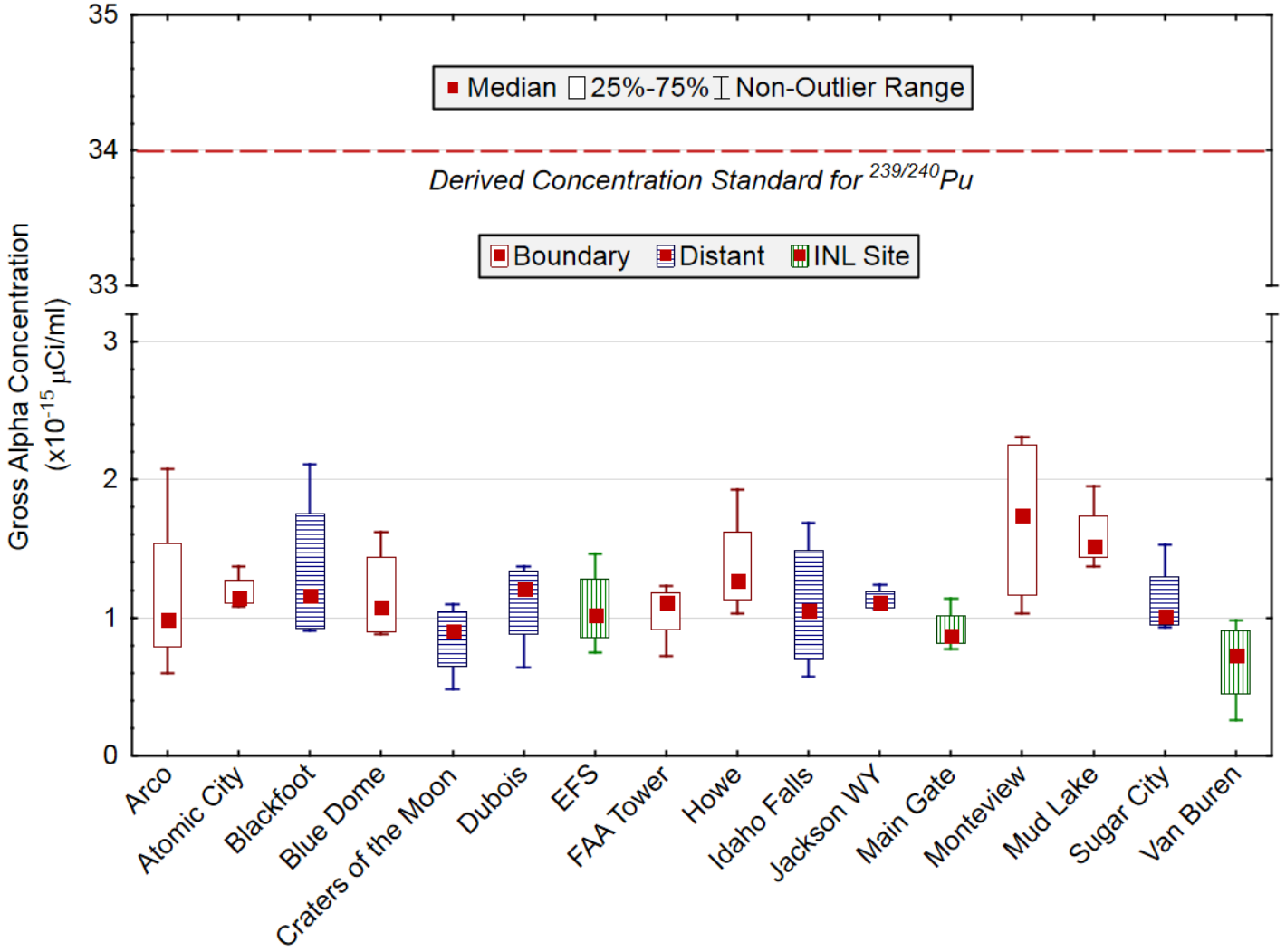

Figure 5. February gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in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

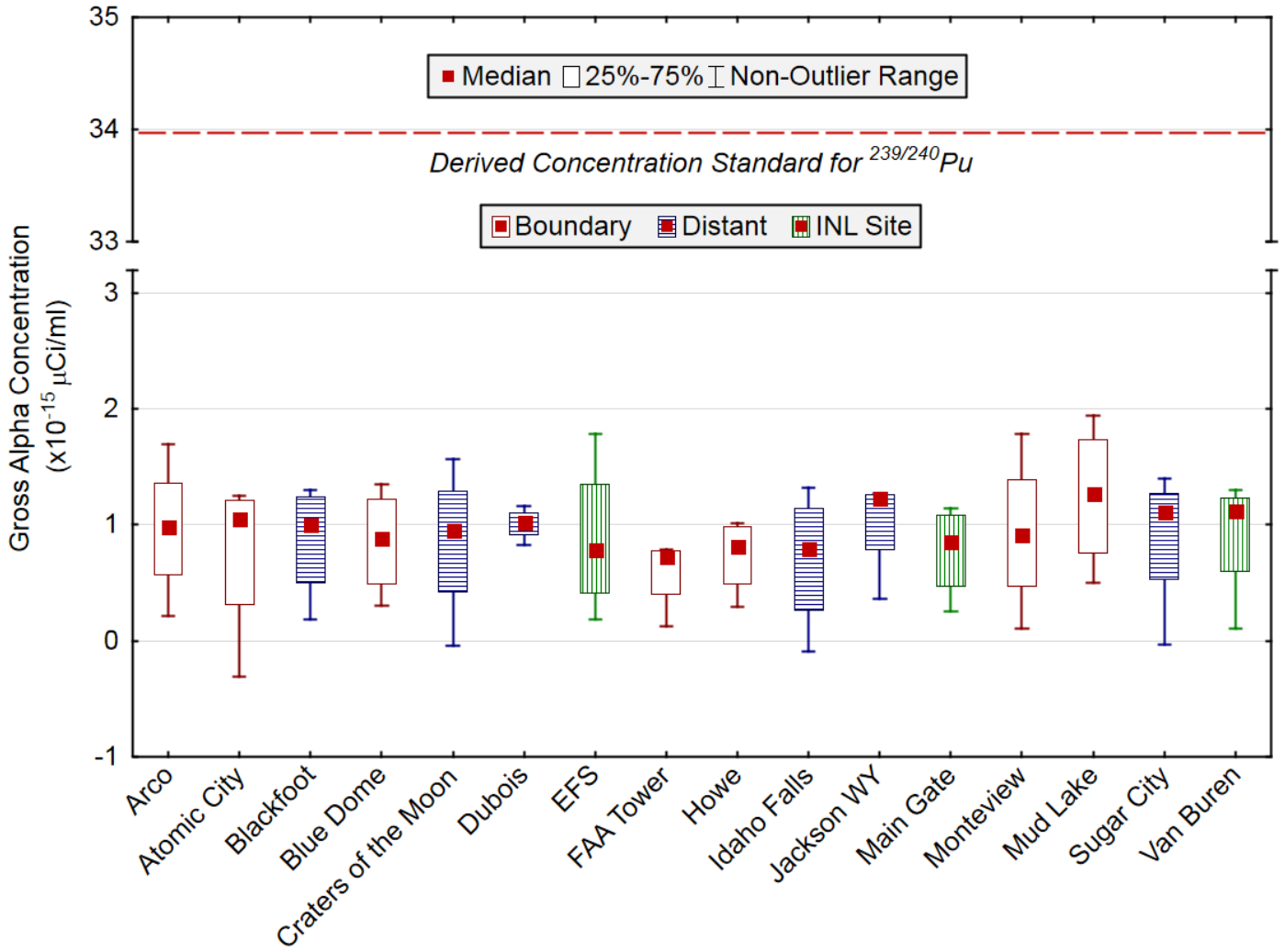

Figure 6. March gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}$Pu) in air which, if inhaled for a year, would result in a dose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

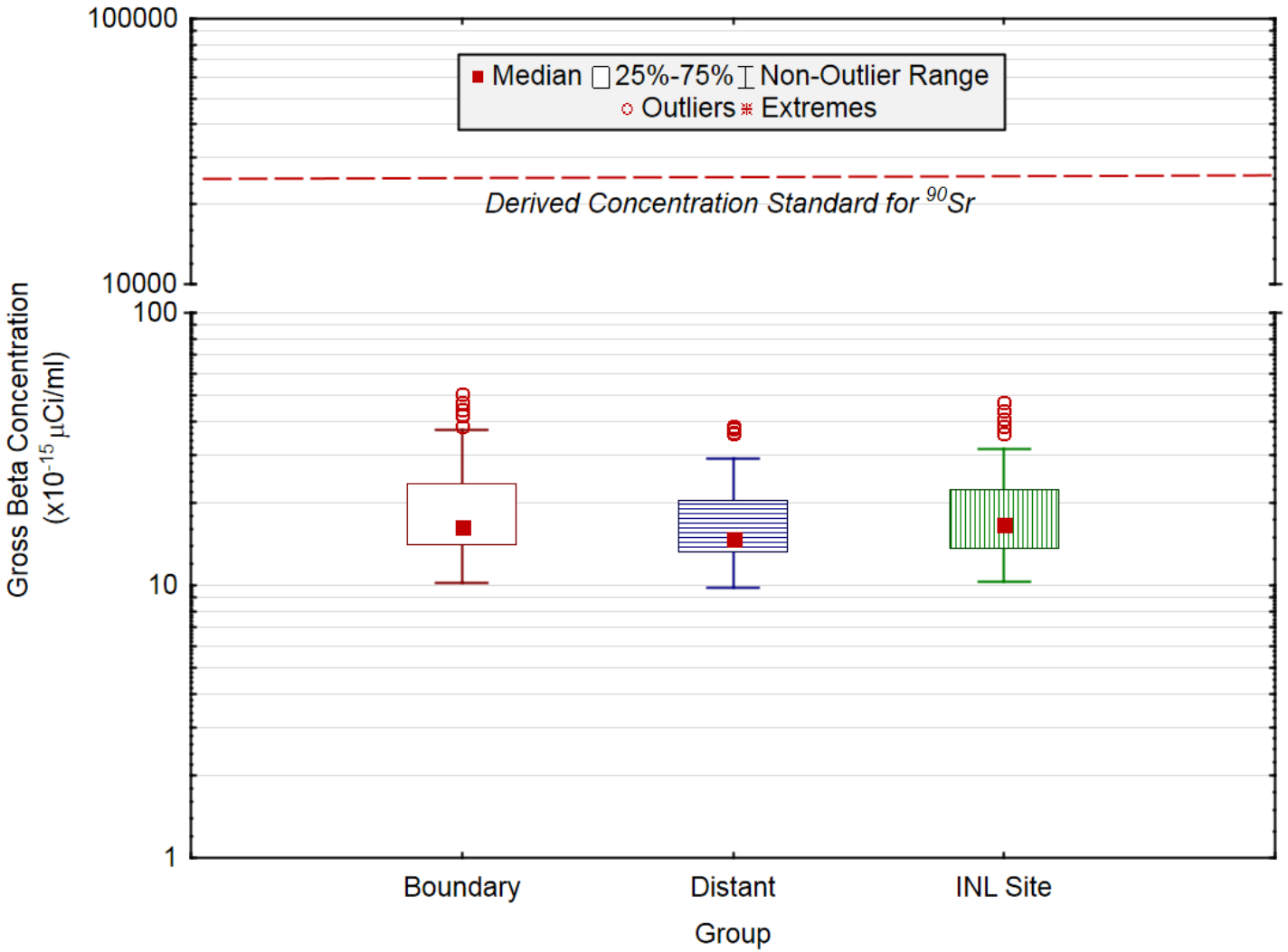

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the first quarter of 2018. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

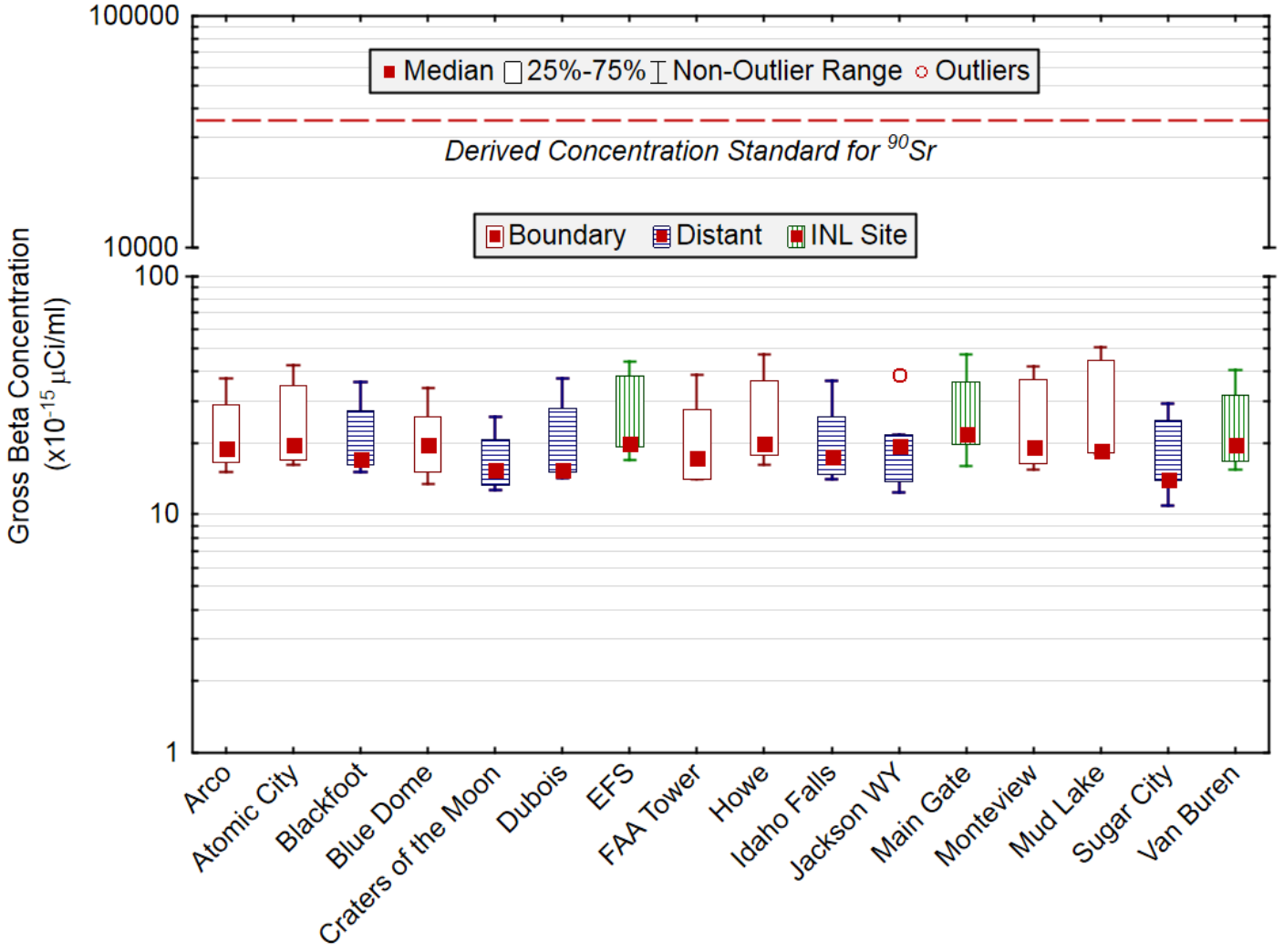

Figure 8. January gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

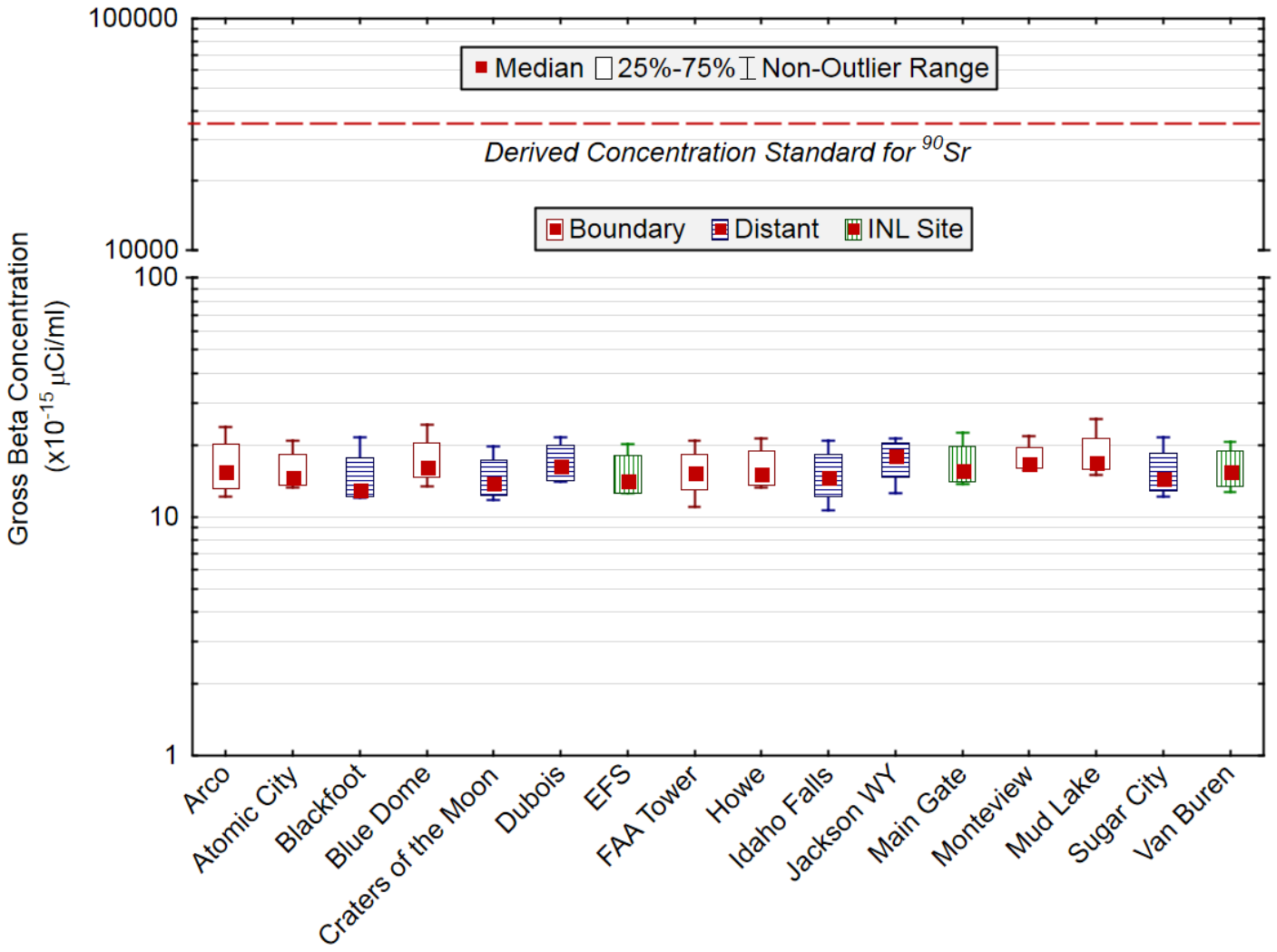

Figure 9. February gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

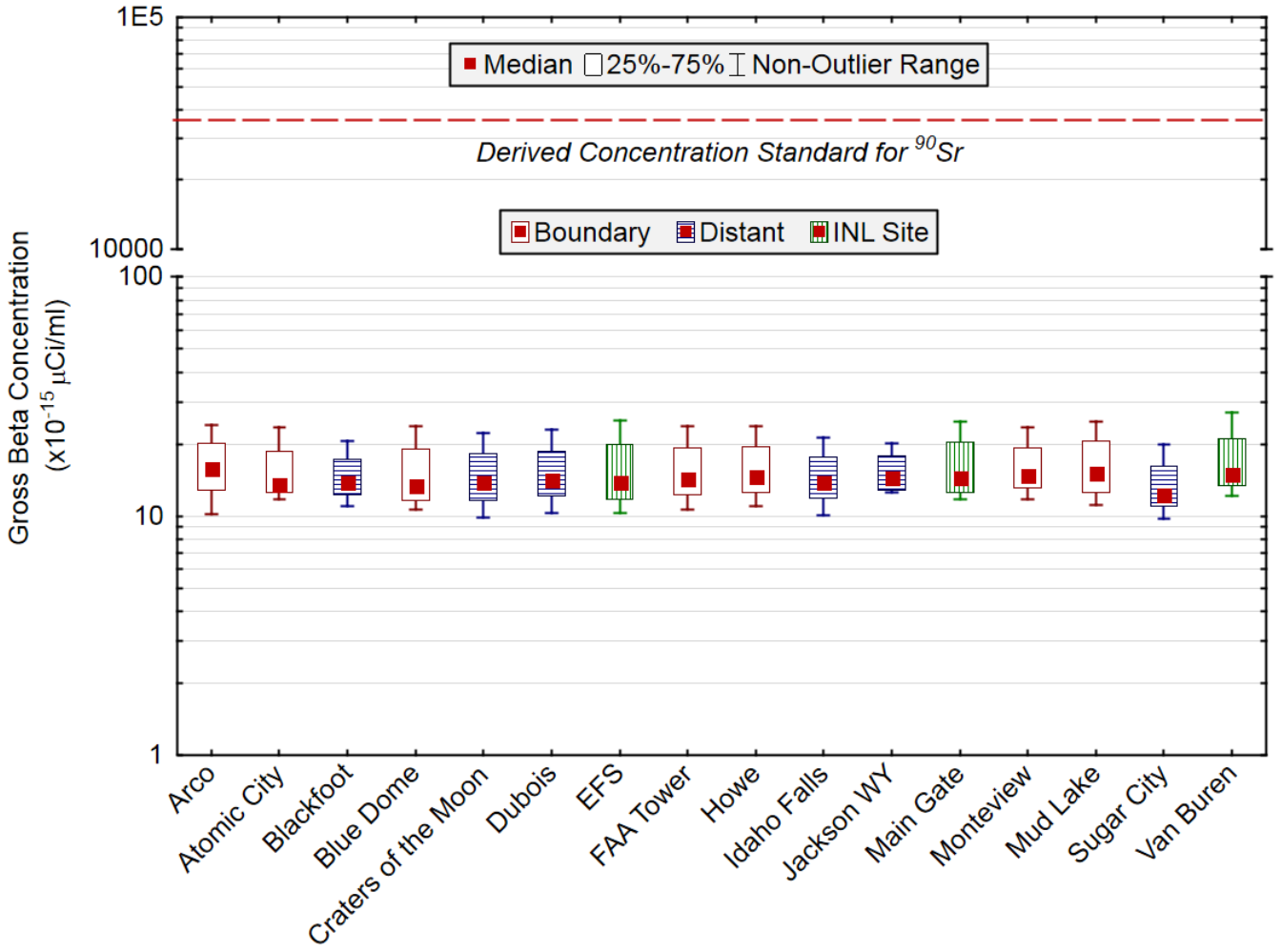

Figure 10. March gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (90Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally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

4. PRECIPITATION AND WATER SAMPLING

PRECIPITATION SAMPLING

Precipitation samples are gathered when sufficient 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 2018 produced sufficient precipitation to yield 21 samples.

Tritium was measured above the 3s values in 12 of the 21 samples. These results are listed in Table C-5 (Appendix C). Low levels of tritium exist in the environment at all times as a result of cosmic ray reactions with water molecules in the upper atmosphere. Long-term data collected around the globe since 1961 by the International Atomic Energy Agency suggest that 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 (EPA 2018). Most samples have values up to about 150 pCi/L, with occasional values ranging up to about 300-400 pCi/L. The maximum value in the first quarter was 267 pCi/L in a February Atomic City sample.

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 2018.

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 2018. 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

Muscle tissue was collected from one game animal, an elk, during the first quarter. No manmade gamma-emitting radionuclides were detected (Appendix C, Table C-7).

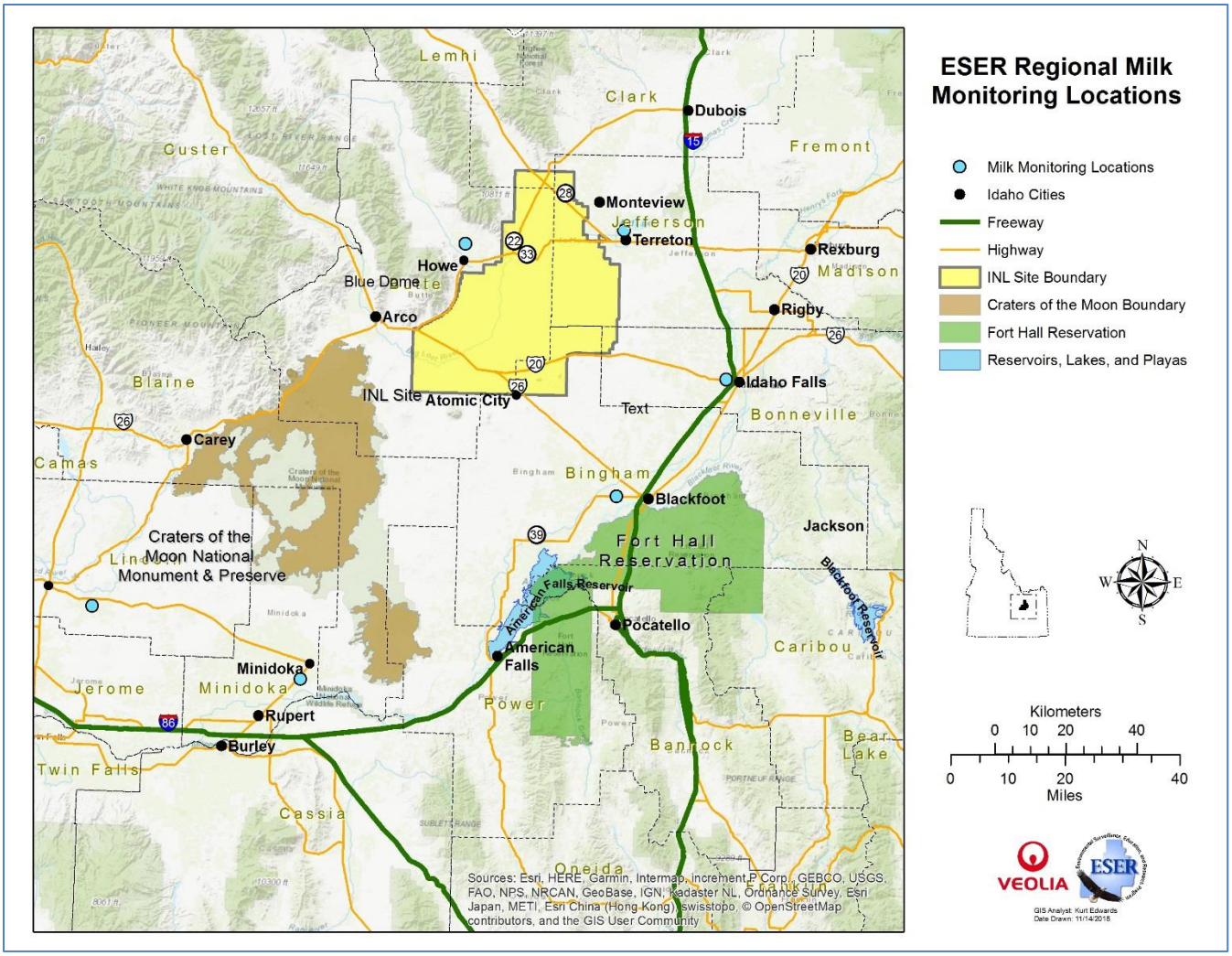

Figure 11. ESER milk sampling locations. Milk is collected at locations identified by blue circles.

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 2018). Criteria established by DOE for Quality Assurance activities include:

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

Assessments of ESER data quality are achieved through analysis of spike, performance evaluation, and duplicate samples; through sample recounts; through analysis of blank samples; and through comparison of sample results to established method quality objectives. These assessments are documented in the ESER Quality Assurance for the First quarter of 2018 (VNSFS 2018).

7. REFERENCES

BEA, 2016, *Data Quality Objectives Supporting the Environmental Soil Monitoring Program for the INL Site*, INL/EXT-15-34909, February 2016.

Cauquoin, A., P. Jean-Baptiste, C. Risia, É. Fourré, B. Stenni, and A. Landais, 2015, "The global distribution of natural tritium in precipitation simulated with an Atmospheric General Circulation Model and comparison with observations", *Earth and Planetary Science Letters* 427 (2015) 160–170. http://www.lmd.jussieu.fr/~acauquoin/Mes_Publications/Cauquoin%20et%20al.%202015%20-%20EPSL.pdf.

Currie, L.A., 1984, Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements, NUREG/CR-4007, U.S. Nuclear Regulatory Commission, Washington, D.C., September 1984.

DOE, 2011a, "Radiation Protection of the Public and the Environment," U.S. Department of Energy O 458.1, Administrative Change 3, February 11, 2011.

DOE, 2011b, "Derived Concentration Technical Standard", Department of Energy Standard 1196-2011, April 2011.

DOE, 2015a, "Environmental Radiological Effluent Monitoring and Environmental Surveillance", DOE-HDBK-1216-2015, March 2015.

DOE, 2015b, Handbook for the Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP), January 2015. Available at: http://www.id.energy.gov/resl/mapep/handbookv15.pdf.

EPA, 2018, RadNet—Tracking Environmental Radiation Nationwide, Web-page: http://www.epa.gov/narel/radnet/

ICRP, 2009, *ICRP Publication 114: Environmental Protection: Transfer Parameters for Reference Animals and Plants*, Annals of the International Commission on Radiological Protection (ICRP), December 2009.

Pinder, J. E. III, K. W. McLeod, D. C. Adriano, J. C. Corey, and L. Boni, 1990, "Atmospheric Deposition, Resuspension and Root Uptake of Pu in Corn and Other Grain-Producing Agroecosystems Near a Nuclear Fuel Facility," *Health Physics*, Vol. 59, pp. 853-867.

VNSFS, 2018, Quality Assurance Project Plan for the INL Site Offsite Environmental Surveillance Program, Environmental Surveillance, Education and Research Program.

VNSFS, 2018, *Environmental Quality Assurance Report for the 1st Quarter 2018,* Environmental Surveillance, Education, and Research Program.

APPENDIX A

SUMMARY OF SAMPLING SCHEDULE

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

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

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

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
FOODSTUFF SAMPLING				
MILK				
Gamma Spec (^{131}I)	weekly	Idaho Falls	Terreton	None
Gamma Spec (^{131}I)	monthly	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka	Howe, Terreton	None
Tritium, ^{90}Sr	Semi-annually	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka	Howe, Terreton	None
POTATOES				
Gamma Spec, ^{90}Sr	annually	Varies among Blackfoot, Idaho Falls, Rupert, Shelley, Hamer, Driggs, occasional samples across the U.S.	Varies among Arco, Monteview, Mud Lake, Terreton	None
ALFALFA				
Gamma Spec, ^{90}Sr	annually	Idaho Falls	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
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 2017

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha[c]	4.1×10^{-16} µCi/mL	3.4×10^{-14} µCi/mL
	Gross beta[d]	9.2×10^{-16} µCi/mL	2.5×10^{-11} µCi/mL
	^{137}Cs	7.8×10^{-17} µCi/mL	9.8×10^{-11} µCi/mL
	^{90}Sr	1.4×10^{-17} µCi/mL	2.5×10^{-11} µCi/mL
	^{241}Am	2.9×10^{-18} µCi/mL	4.1×10^{-14} µCi/mL
	^{238}Pu	4.4×10^{-18} µCi/mL	3.7×10^{-14} µCi/mL
	$^{239/240}$Pu	5.3×10^{-18} µCi/mL	3.4×10^{-14} µCi/mL
Air (charcoal cartridge)[e]	^{131}I	6.8×10^{-16} µCi/mL	2.3×10^{-19} µCi/mL
Air (atmospheric moisture)	^{3}H	87.3 pCi/L_{water} 4.9×10^{-13} µCi/mL_{air}	2.1×10^{-7} µCi/mL_{air}
Air (precipitation)	^{3}H	87.4 pCi/L	1.9×10^{-3} µCi/mL
Milk	^{131}I	0.5 pCi/L	--
	^{137}Cs	1.0 pCi/L	--
Game Animals	^{137}Cs	1.5 pCi/kg	--

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.

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	1/3/2018	1.64	±	0.19	6.07	±	0.71	Yes	28.90	±	0.66	106.93	±	0.66	Yes
	1/10/2018	1.36	±	0.20	5.03	±	0.75	Yes	37.00	±	0.76	136.90	±	0.76	Yes
	1/17/2018	0.88	±	0.25	3.26	±	0.91	Yes	15.00	±	0.59	55.50	±	0.59	Yes
	1/24/2018	1.12	±	0.26	4.14	±	0.97	Yes	19.10	±	0.64	70.67	±	0.64	Yes
	1/31/2018	0.76	±	0.25	2.80	±	0.93	Yes	16.60	±	0.62	61.42	±	0.62	Yes
	2/7/2018	0.99	±	0.25	3.66	±	0.91	Yes	12.10	±	0.56	44.77	±	0.56	Yes
	2/14/2018	2.08	±	0.31	7.70	±	1.15	Yes	23.80	±	0.71	88.06	±	0.71	Yes
	2/21/2018	0.98	±	0.25	3.63	±	0.92	Yes	14.30	±	0.58	52.91	±	0.58	Yes
	2/28/2018	0.60	±	0.22	2.22	±	0.80	No	16.60	±	0.61	61.42	±	0.61	Yes
	3/7/2018	1.03	±	0.25	3.81	±	0.93	Yes	15.40	±	0.61	56.98	±	0.61	Yes
	3/14/2018	1.70	±	0.29	6.29	±	1.08	Yes	24.00	±	0.72	88.80	±	0.72	Yes
	3/21/2018	0.21	±	0.25	0.79	±	0.94	No	10.20	±	0.54	37.74	±	0.54	Yes
	3/28/2018	0.93	±	0.25	3.44	±	0.93	Yes	16.30	±	0.63	60.31	±	0.63	Yes
ATOMIC CITY	1/3/2018	2.13	±	0.23	7.88	±	0.83	Yes	34.80	±	0.75	128.76	±	0.75	Yes
	1/10/2018	1.37	±	0.21	5.07	±	0.77	Yes	42.50	±	0.82	157.25	±	0.82	Yes
	1/17/2018	0.91	±	0.25	3.35	±	0.91	Yes	16.90	±	0.61	62.53	±	0.61	Yes
	1/24/2018	1.20	±	0.27	4.44	±	1.00	Yes	19.60	±	0.65	72.52	±	0.65	Yes
	1/31/2018	0.99	±	0.25	3.67	±	0.94	Yes	16.10	±	0.60	59.57	±	0.60	Yes
	2/7/2018	1.08	±	0.26	4.00	±	0.95	Yes	13.30	±	0.59	49.21	±	0.59	Yes
	2/14/2018	1.17	±	0.27	4.33	±	1.00	Yes	20.90	±	0.67	77.33	±	0.67	Yes
	2/21/2018	1.37	±	0.27	5.07	±	1.00	Yes	13.80	±	0.58	51.06	±	0.58	Yes
	2/28/2018	1.13	±	0.24	4.18	±	0.87	Yes	15.60	±	0.58	57.72	±	0.58	Yes
	3/7/2018	1.25	±	0.25	4.63	±	0.94	Yes	13.80	±	0.58	51.06	±	0.58	Yes
	3/14/2018	1.18	±	0.26	4.37	±	0.96	Yes	23.60	±	0.69	87.32	±	0.69	Yes
	3/21/2018	-0.31	±	0.23	-1.13	±	0.84	No	11.80	±	0.56	43.66	±	0.56	Yes
	3/28/2018	0.93	±	0.25	3.44	±	0.91	Yes	13.40	±	0.58	49.58	±	0.58	Yes
QA-1 (ATOMIC CITY)	1/3/2018	1.18	±	0.17	4.37	±	0.64	Yes	25.50	±	0.63	94.35	±	2.32	Yes
	1/10/2018	1.31	±	0.20	4.85	±	0.75	Yes	39.10	±	0.78	144.67	±	2.89	Yes
	1/17/2018	0.66	±	0.23	2.45	±	0.86	No	15.50	±	0.59	57.35	±	2.19	Yes
	1/24/2018	0.99	±	0.25	3.66	±	0.93	Yes	17.20	±	0.61	63.64	±	2.25	Yes
	1/31/2018	0.61	±	0.24	2.25	±	0.88	No	15.40	±	0.59	56.98	±	2.20	Yes
	2/7/2018	0.84	±	0.24	3.12	±	0.89	Yes	12.20	±	0.56	45.14	±	2.08	Yes
	2/14/2018	1.26	±	0.27	4.66	±	1.01	Yes	22.80	±	0.68	84.36	±	2.52	Yes
	2/21/2018	1.32	±	0.26	4.88	±	0.98	Yes	14.10	±	0.58	52.17	±	2.14	Yes
	2/28/2018	0.65	±	0.23	2.39	±	0.84	No	16.50	±	0.62	61.05	±	2.31	Yes
	3/7/2018	0.94	±	0.24	3.49	±	0.87	Yes	13.30	±	0.56	49.21	±	2.08	Yes
	3/14/2018	1.37	±	0.27	5.07	±	0.99	Yes	22.80	±	0.68	84.36	±	2.50	Yes
	3/21/2018	0.42	±	0.25	1.57	±	0.93	No	9.70	±	0.52	35.89	±	1.91	Yes
	3/28/2018	1.09	±	0.25	4.03	±	0.94	Yes	14.90	±	0.60	55.13	±	2.22	Yes
BLUE DOME	1/3/2018	1.12	±	0.18	4.14	±	0.65	Yes	25.60	±	0.66	94.72	±	2.42	Yes
	1/10/2018	1.25	±	0.20	4.63	±	0.73	Yes	33.90	±	0.73	125.43	±	2.71	Yes
	1/17/2018	0.65	±	0.23	2.41	±	0.86	No	13.40	±	0.57	49.58	±	2.10	Yes
	1/24/2018	1.01	±	0.26	3.74	±	0.97	Yes	19.70	±	0.66	72.89	±	2.43	Yes
	1/31/2018	0.91	±	0.25	3.35	±	0.92	Yes	15.10	±	0.59	55.87	±	2.17	Yes
	2/7/2018	1.26	±	0.27	4.66	±	0.98	Yes	13.40	±	0.59	49.58	±	2.19	Yes
	2/14/2018	1.62	±	0.30	5.99	±	1.10	Yes	24.30	±	0.72	89.91	±	2.66	Yes
	2/21/2018	0.88	±	0.25	3.27	±	0.93	Yes	16.00	±	0.61	59.20	±	2.26	Yes
	2/28/2018	0.90	±	0.23	3.34	±	0.87	Yes	16.40	±	0.61	60.68	±	2.26	Yes
	3/7/2018	0.68	±	0.22	2.53	±	0.81	Yes	12.50	±	0.54	46.25	±	2.01	Yes
	3/14/2018	1.35	±	0.27	5.00	±	0.99	Yes	23.90	±	0.69	88.43	±	2.56	Yes
	3/21/2018	0.30	±	0.25	1.11	±	0.93	No	10.70	±	0.54	39.59	±	1.99	Yes
	3/28/2018	1.09	±	0.26	4.03	±	0.94	Yes	14.20	±	0.60	52.54	±	2.21	Yes
QA-2	1/3/2018	1.29	±	0.18	4.77	±	0.68	Yes	9.76	±	0.68	36.11	±	2.50	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**
(BLUE DOME)	1/10/2018	1.75	±	0.22	6.48	±	0.80	**Yes**	12.30	±	0.73	45.51	±	2.69	**Yes**
	1/17/2018	0.55	±	0.22	2.02	±	0.83	No	39.10	±	0.57	144.67	±	2.11	**Yes**
	1/24/2018	0.31	±	0.22	1.15	±	0.81	No	14.40	±	0.61	53.28	±	2.26	**Yes**
	1/31/2018	0.78	±	0.24	2.87	±	0.88	**Yes**	17.60	±	0.57	65.12	±	2.10	**Yes**
	2/7/2018	0.95	±	0.25	3.51	±	0.93	**Yes**	14.50	±	0.60	53.65	±	2.21	**Yes**
	2/14/2018	1.11	±	0.28	4.11	±	1.03	**Yes**	14.30	±	0.71	52.91	±	2.62	**Yes**
	2/21/2018	1.08	±	0.27	4.00	±	0.98	**Yes**	22.80	±	0.63	84.36	±	2.32	**Yes**
	2/28/2018	0.79	±	0.23	2.91	±	0.84	**Yes**	16.30	±	0.62	60.31	±	2.29	**Yes**
	3/7/2018	0.90	±	0.23	3.34	±	0.84	**Yes**	17.30	±	0.57	64.01	±	2.09	**Yes**
	3/14/2018	0.92	±	0.24	3.39	±	0.89	**Yes**	14.70	±	0.67	54.39	±	2.46	**Yes**
	3/21/2018	0.45	±	0.24	1.68	±	0.90	No	23.40	±	0.52	86.58	±	1.92	**Yes**
	3/28/2018	0.56	±	0.21	2.08	±	0.78	No	10.90	±	0.55	40.33	±	2.04	**Yes**
HOWE	1/3/2018	2.72	±	0.23	10.06	±	0.85	**Yes**	36.20	±	0.72	133.94	±	2.66	**Yes**
	1/10/2018	2.76	±	0.26	10.21	±	0.96	**Yes**	46.70	±	0.85	172.79	±	3.16	**Yes**
	1/17/2018	1.42	±	0.27	5.25	±	1.00	**Yes**	17.70	±	0.63	65.49	±	2.32	**Yes**
	1/24/2018	1.23	±	0.27	4.55	±	1.01	**Yes**	20.00	±	0.67	74.00	±	2.46	**Yes**
	1/31/2018	1.23	±	0.26	4.55	±	0.95	**Yes**	16.10	±	0.59	59.57	±	2.19	**Yes**
	2/7/2018	1.23	±	0.26	4.55	±	0.96	**Yes**	13.90	±	0.59	51.43	±	2.17	**Yes**
	2/14/2018	1.93	±	0.29	7.14	±	1.05	**Yes**	21.20	±	0.64	78.44	±	2.38	**Yes**
	2/21/2018	1.03	±	0.25	3.81	±	0.91	**Yes**	13.30	±	0.56	49.21	±	2.05	**Yes**
	2/28/2018	1.31	±	0.25	4.85	±	0.94	**Yes**	16.50	±	0.62	61.05	±	2.28	**Yes**
	3/7/2018	0.96	±	0.24	3.55	±	0.90	**Yes**	14.10	±	0.58	52.17	±	2.16	**Yes**
	3/14/2018	1.01	±	0.25	3.74	±	0.93	**Yes**	23.80	±	0.69	88.06	±	2.54	**Yes**
	3/21/2018	0.30	±	0.24	1.10	±	0.90	No	11.00	±	0.53	40.70	±	1.96	**Yes**
	3/28/2018	0.68	±	0.23	2.52	±	0.86	No	15.10	±	0.60	55.87	±	2.22	**Yes**
MONTEVIEW	1/3/2018	2.67	±	0.25	9.88	±	0.92	**Yes**	36.60	±	0.78	135.42	±	2.88	**Yes**
	1/10/2018	2.41	±	0.23	8.92	±	0.87	**Yes**	42.00	±	0.78	155.40	±	2.88	**Yes**
	1/17/2018	1.26	±	0.26	4.66	±	0.95	**Yes**	16.40	±	0.60	60.68	±	2.21	**Yes**
	1/24/2018	1.05	±	0.27	3.89	±	0.98	**Yes**	19.30	±	0.65	71.41	±	2.42	**Yes**
	1/31/2018	1.34	±	0.27	4.96	±	0.98	**Yes**	15.40	±	0.59	56.98	±	2.18	**Yes**
	2/7/2018	1.03	±	0.26	3.81	±	0.97	**Yes**	16.30	±	0.63	60.31	±	2.34	**Yes**
	2/14/2018	2.31	±	0.31	8.55	±	1.16	**Yes**	21.70	±	0.68	80.29	±	2.51	**Yes**
	2/21/2018	1.30	±	0.27	4.81	±	1.01	**Yes**	15.60	±	0.62	57.72	±	2.28	**Yes**
	2/28/2018	2.19	±	0.29	8.10	±	1.07	**Yes**	17.30	±	0.63	64.01	±	2.31	**Yes**
	3/7/2018	1.00	±	0.25	3.70	±	0.92	**Yes**	14.50	±	0.60	53.65	±	2.21	**Yes**
	3/14/2018	1.78	±	0.30	6.59	±	1.10	**Yes**	23.40	±	0.71	86.58	±	2.63	**Yes**
	3/21/2018	0.11	±	0.24	0.40	±	0.87	No	11.80	±	0.54	43.66	±	2.00	**Yes**
	3/28/2018	0.83	±	0.24	3.09	±	0.89	**Yes**	15.10	±	0.60	55.87	±	2.22	**Yes**
MUD LAKE	1/3/2018	2.34	±	0.22	8.66	±	0.82	**Yes**	44.10	±	0.79	163.17	±	2.91	**Yes**
	1/10/2018	3.05	±	0.26	11.29	±	0.97	**Yes**	50.50	±	0.86	186.85	±	3.20	**Yes**
	1/17/2018	0.63	±	0.23	2.32	±	0.85	No	18.20	±	0.62	67.34	±	2.28	**Yes**
	1/24/2018	0.93	±	0.25	3.45	±	0.91	**Yes**	18.60	±	0.62	68.82	±	2.29	**Yes**
	1/31/2018	1.27	±	0.26	4.70	±	0.97	**Yes**	17.90	±	0.62	66.23	±	2.28	**Yes**
	2/7/2018	1.53	±	0.28	5.66	±	1.04	**Yes**	16.70	±	0.63	61.79	±	2.34	**Yes**
	2/14/2018	1.95	±	0.30	7.22	±	1.12	**Yes**	25.60	±	0.72	94.72	±	2.66	**Yes**
	2/21/2018	1.37	±	0.27	5.07	±	0.98	**Yes**	14.90	±	0.58	55.13	±	2.16	**Yes**
	2/28/2018	1.51	±	0.25	5.59	±	0.94	**Yes**	17.10	±	0.60	63.27	±	2.23	**Yes**
	3/7/2018	1.01	±	0.24	3.74	±	0.90	**Yes**	14.10	±	0.58	52.17	±	2.14	**Yes**
	3/14/2018	1.94	±	0.29	7.18	±	1.09	**Yes**	25.00	±	0.71	92.50	±	2.62	**Yes**
	3/21/2018	0.50	±	0.25	1.86	±	0.93	No	11.10	±	0.53	41.07	±	1.95	**Yes**
	3/28/2018	1.54	±	0.27	5.70	±	1.01	**Yes**	16.30	±	0.62	60.31	±	2.28	**Yes**
DISTANT															
BLACKFOOT	1/3/2018	1.47	±	0.18	5.44	±	0.67	**Yes**	27.10	±	0.63	100.27	±	2.32	**Yes**
	1/10/2018	1.17	±	0.19	4.33	±	0.69	**Yes**	36.00	±	0.73	133.20	±	2.68	**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
	1/17/2018	1.39	±	0.26	5.14	±	0.98	Yes	16.20	±	0.60	59.94	±	2.21	Yes
	1/24/2018	1.10	±	0.26	4.07	±	0.95	Yes	17.10	±	0.61	63.27	±	2.25	Yes
	1/31/2018	0.85	±	0.25	3.16	±	0.92	Yes	15.00	±	0.59	55.50	±	2.18	Yes
	2/7/2018	0.93	±	0.24	3.44	±	0.89	Yes	12.20	±	0.55	45.14	±	2.05	Yes
	2/14/2018	2.11	±	0.31	7.81	±	1.14	Yes	21.50	±	0.68	79.55	±	2.52	Yes
	2/21/2018	0.91	±	0.24	3.36	±	0.88	Yes	13.70	±	0.56	50.69	±	2.06	Yes
	2/28/2018	1.39	±	0.26	5.14	±	0.96	Yes	12.00	±	0.57	44.40	±	2.10	Yes
	3/7/2018	0.81	±	0.24	3.01	±	0.87	Yes	13.50	±	0.57	49.95	±	2.12	Yes
	3/14/2018	1.19	±	0.25	4.40	±	0.94	Yes	20.50	±	0.64	75.85	±	2.38	Yes
	3/21/2018	0.19	±	0.25	0.68	±	0.92	No	11.00	±	0.55	40.70	±	2.02	Yes
	3/28/2018	1.30	±	0.26	4.81	±	0.95	Yes	14.20	±	0.58	52.54	±	2.15	Yes
CRATERS OF	1/3/2018	0.87	±	0.16	3.23	±	0.58	Yes	20.50	±	0.58	75.85	±	2.13	Yes
THE MOON	1/10/2018	1.03	±	0.18	3.81	±	0.68	Yes	25.60	±	0.65	94.72	±	2.40	Yes
	1/17/2018	0.70	±	0.23	2.58	±	0.87	No	13.30	±	0.56	49.21	±	2.09	Yes
	1/24/2018	1.08	±	0.26	4.00	±	0.95	Yes	15.40	±	0.59	56.98	±	2.19	Yes
	1/31/2018	0.61	±	0.24	2.27	±	0.88	No	12.70	±	0.57	46.99	±	2.09	Yes
	2/7/2018	0.81	±	0.24	2.99	±	0.90	Yes	11.80	±	0.56	43.66	±	2.08	Yes
	2/14/2018	1.10	±	0.27	4.07	±	0.98	Yes	19.80	±	0.66	73.26	±	2.42	Yes
	2/21/2018	0.48	±	0.23	1.78	±	0.84	No	12.70	±	0.56	46.99	±	2.08	Yes
	2/28/2018	1.00	±	0.24	3.70	±	0.87	Yes	14.90	±	0.59	55.13	±	2.17	Yes
	3/7/2018	0.89	±	0.24	3.28	±	0.87	Yes	13.30	±	0.56	49.21	±	2.09	Yes
	3/14/2018	1.57	±	0.27	5.81	±	1.01	Yes	22.20	±	0.67	82.14	±	2.46	Yes
	3/21/2018	-0.05	±	0.23	-0.17	±	0.84	No	9.87	±	0.51	36.52	±	1.89	Yes
	3/28/2018	1.02	±	0.24	3.77	±	0.90	Yes	14.50	±	0.58	53.65	±	2.13	Yes
DUBOIS	1/3/2018	1.75	±	0.20	6.48	±	0.73	Yes	27.80	±	0.66	102.86	±	2.42	Yes
	1/10/2018	1.66	±	0.22	6.14	±	0.83	Yes	37.40	±	0.79	138.38	±	2.92	Yes
	1/17/2018	0.44	±	0.21	1.62	±	0.79	No	15.40	±	0.57	56.98	±	2.12	Yes
	1/24/2018	0.58	±	0.25	2.13	±	0.91	No	14.20	±	0.60	52.54	±	2.21	Yes
	1/31/2018	0.57	±	0.25	2.12	±	0.94	No	15.10	±	0.62	55.87	±	2.31	Yes
	2/7/2018	1.37	±	0.28	5.07	±	1.03	Yes	14.00	±	0.61	51.80	±	2.26	Yes
	2/14/2018	1.30	±	0.29	4.81	±	1.05	Yes	21.60	±	0.69	79.92	±	2.57	Yes
	2/21/2018	0.64	±	0.24	2.36	±	0.87	No	14.50	±	0.59	53.65	±	2.16	Yes
	2/28/2018	1.13	±	0.26	4.18	±	0.94	Yes	18.40	±	0.66	68.08	±	2.43	Yes
	3/7/2018	1.05	±	0.25	3.89	±	0.93	Yes	14.40	±	0.60	53.28	±	2.21	Yes
	3/14/2018	1.00	±	0.26	3.70	±	0.97	Yes	23.00	±	0.70	85.10	±	2.59	Yes
	3/21/2018	0.83	±	0.27	3.06	±	1.01	Yes	10.30	±	0.54	38.11	±	1.98	Yes
	3/28/2018	1.16	±	0.25	4.29	±	0.93	Yes	14.10	±	0.58	52.17	±	2.14	Yes
IDAHO FALLS	1/3/2018	1.06	±	0.17	3.92	±	0.62	Yes	25.60	±	0.63	94.72	±	2.33	Yes
	1/10/2018	1.14	±	0.20	4.22	±	0.73	Yes	36.30	±	0.77	134.31	±	2.84	Yes
	1/17/2018	0.96	±	0.25	3.56	±	0.92	Yes	14.70	±	0.59	54.39	±	2.17	Yes
	1/24/2018	0.96	±	0.26	3.55	±	0.96	Yes	17.50	±	0.63	64.75	±	2.34	Yes
	1/31/2018	0.71	±	0.24	2.62	±	0.90	No	14.10	±	0.58	52.17	±	2.15	Yes
	2/7/2018	0.58	±	0.25	2.13	±	0.91	No	10.70	±	0.58	39.59	±	2.14	Yes
	2/14/2018	1.69	±	0.30	6.25	±	1.11	Yes	20.90	±	0.69	77.33	±	2.53	Yes
	2/21/2018	0.82	±	0.25	3.03	±	0.92	Yes	13.70	±	0.59	50.69	±	2.16	Yes
	2/28/2018	1.29	±	0.25	4.77	±	0.93	Yes	15.50	±	0.60	57.35	±	2.21	Yes
	3/7/2018	0.62	±	0.23	2.28	±	0.86	No	14.00	±	0.59	51.80	±	2.19	Yes
	3/14/2018	1.32	±	0.27	4.88	±	1.00	Yes	21.20	±	0.68	78.44	±	2.50	Yes
	3/21/2018	-0.09	±	0.22	-0.35	±	0.82	No	10.10	±	0.51	37.37	±	1.89	Yes
	3/28/2018	0.97	±	0.23	3.58	±	0.86	Yes	13.80	±	0.55	51.06	±	2.05	Yes
JACKSON	1/3/2018	0.96	±	0.16	3.56	±	0.59	Yes	21.60	±	0.59	79.92	±	2.17	Yes
	1/10/2018	1.60	±	0.21	5.92	±	0.77	Yes	38.50	±	0.76	142.45	±	2.79	Yes
	1/17/2018	0.58	±	0.21	2.14	±	0.77	No	12.40	±	0.51	45.88	±	1.90	Yes
	1/24/2018	1.01	±	0.25	3.74	±	0.92	Yes	19.50	±	0.63	72.15	±	2.32	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
	1/31/2018	0.87	±	0.23	3.23	±	0.87	Yes	13.80	±	0.55	51.06	±	2.02	Yes
	2/7/2018	1.13	±	0.24	4.18	±	0.89	Yes	12.60	±	0.54	46.62	±	2.00	Yes
	2/14/2018	1.24	±	0.26	4.59	±	0.97	Yes	21.30	±	0.65	78.81	±	2.39	Yes
	2/21/2018	1.09	±	0.24	4.03	±	0.87	Yes	16.60	±	0.57	61.42	±	2.09	Yes
	2/28/2018	1.06	±	0.24	3.92	±	0.88	Yes	19.40	±	0.64	71.78	±	2.36	Yes
	3/7/2018	1.21	±	0.24	4.48	±	0.88	Yes	12.60	±	0.53	46.62	±	1.97	Yes
	3/14/2018	1.26	±	0.25	4.66	±	0.93	Yes	20.10	±	0.63	74.37	±	2.33	Yes
	3/21/2018	0.36	±	0.24	1.34	±	0.87	No	13.20	±	0.54	48.84	±	2.00	Yes
	3/28/2018	1.27	±	0.25	4.70	±	0.94	Yes	15.70	±	0.59	58.09	±	2.19	Yes
SUGAR CITY	1/3/2018	1.11	±	0.18	4.11	±	0.65	Yes	24.70	±	0.64	91.39	±	2.38	Yes
	1/10/2018	0.93	±	0.18	3.45	±	0.65	Yes	29.10	±	0.67	107.67	±	2.48	Yes
	1/17/2018	0.88	±	0.25	3.25	±	0.93	Yes	13.90	±	0.59	51.43	±	2.18	Yes
	1/24/2018	0.91	±	0.26	3.38	±	0.94	Yes	14.10	±	0.59	52.17	±	2.17	Yes
	1/31/2018	0.47	±	0.23	1.73	±	0.85	No	10.90	±	0.54	40.33	±	1.98	Yes
	2/7/2018	0.97	±	0.25	3.59	±	0.93	Yes	12.10	±	0.57	44.77	±	2.11	Yes
	2/14/2018	1.53	±	0.29	5.66	±	1.09	Yes	21.60	±	0.70	79.92	±	2.57	Yes
	2/21/2018	0.93	±	0.25	3.44	±	0.93	Yes	13.60	±	0.58	50.32	±	2.13	Yes
	2/28/2018	1.06	±	0.24	3.92	±	0.90	Yes	15.40	±	0.60	56.98	±	2.22	Yes
	3/7/2018	1.08	±	0.25	4.00	±	0.92	Yes	12.20	±	0.56	45.14	±	2.08	Yes
	3/14/2018	1.40	±	0.27	5.18	±	0.99	Yes	20.00	±	0.65	74.00	±	2.40	Yes
	3/21/2018	-0.03	±	0.22	-0.11	±	0.81	No	9.76	±	0.50	36.11	±	1.84	Yes
	3/28/2018	1.14	±	0.24	4.22	±	0.90	Yes	12.30	±	0.54	45.51	±	2.01	Yes
INL SITE															
EFS	1/3/2018	1.65	±	0.20	6.11	±	0.75	Yes	38.20	±	0.77	141.34	±	2.85	Yes
	1/10/2018	1.58	±	0.26	5.85	±	0.96	Yes	43.90	±	0.97	162.43	±	3.58	Yes
	1/17/2018	0.78	±	0.24	2.88	±	0.88	Yes	16.90	±	0.61	62.53	±	2.24	Yes
	1/24/2018	1.57	±	0.27	5.81	±	1.01	Yes	19.90	±	0.67	73.63	±	2.48	Yes
	1/31/2018	0.74	±	0.25	2.72	±	0.93	No	19.30	±	0.65	71.41	±	2.40	Yes
	2/7/2018	0.75	±	0.25	2.78	±	0.91	Yes	12.60	±	0.59	46.62	±	2.17	Yes
	2/14/2018	1.46	±	0.28	5.40	±	1.04	Yes	20.20	±	0.66	74.74	±	2.43	Yes
	2/21/2018	0.95	±	0.25	3.52	±	0.93	Yes	12.50	±	0.56	46.25	±	2.07	Yes
	2/28/2018	1.10	±	0.24	4.07	±	0.90	Yes	15.90	±	0.60	58.83	±	2.23	Yes
	3/7/2018	0.65	±	0.23	2.40	±	0.85	No	13.10	±	0.58	48.47	±	2.14	Yes
	3/14/2018	1.78	±	0.30	6.59	±	1.10	Yes	25.10	±	0.73	92.87	±	2.70	Yes
	3/21/2018	0.18	±	0.24	0.67	±	0.88	No	10.30	±	0.52	38.11	±	1.92	Yes
	3/28/2018	0.92	±	0.24	3.42	±	0.89	Yes	14.80	±	0.59	54.76	±	2.17	Yes
MAIN GATE	1/3/2018	2.07	±	0.21	7.66	±	0.79	Yes	36.00	±	0.73	133.20	±	2.71	Yes
	1/10/2018	2.13	±	0.23	7.88	±	0.86	Yes	46.70	±	0.83	172.79	±	3.07	Yes
	1/17/2018	0.64	±	0.24	2.37	±	0.88	No	16.00	±	0.61	59.20	±	2.25	Yes
	1/24/2018	0.96	±	0.26	3.53	±	0.96	Yes	21.90	±	0.68	81.03	±	2.51	Yes
	1/31/2018	0.37	±	0.24	1.36	±	0.88	No	19.60	±	0.66	72.52	±	2.44	Yes
	2/7/2018	0.77	±	0.24	2.85	±	0.88	Yes	13.70	±	0.58	50.69	±	2.15	Yes
	2/14/2018	0.88	±	0.27	3.26	±	0.98	Yes	22.50	±	0.70	83.25	±	2.58	Yes
	2/21/2018	0.86	±	0.24	3.20	±	0.88	Yes	14.30	±	0.57	52.91	±	2.11	Yes
	2/28/2018	1.14	±	0.25	4.22	±	0.91	Yes	16.90	±	0.62	62.53	±	2.29	Yes
	3/7/2018	0.69	±	0.23	2.56	±	0.84	Yes	13.30	±	0.56	49.21	±	2.09	Yes
	3/14/2018	1.14	±	0.27	4.22	±	1.00	Yes	25.00	±	0.73	92.50	±	2.70	Yes
	3/21/2018	0.26	±	0.25	0.95	±	0.93	No	11.80	±	0.56	43.66	±	2.05	Yes
	3/28/2018	1.02	±	0.25	3.77	±	0.93	Yes	15.80	±	0.61	58.46	±	2.27	Yes
VAN BUREN GATE	1/3/2018	1.61	±	0.20	5.96	±	0.73	Yes	31.60	±	0.70	116.92	±	2.58	Yes
	1/10/2018	1.33	±	0.21	4.92	±	0.76	Yes	40.60	±	0.80	150.22	±	2.96	Yes
	1/17/2018	0.78	±	0.24	2.88	±	0.90	Yes	16.80	±	0.61	62.16	±	2.26	Yes
	1/24/2018	0.83	±	0.25	3.05	±	0.94	Yes	19.60	±	0.65	72.52	±	2.41	Yes
	1/31/2018	0.40	±	0.23	1.49	±	0.84	No	15.40	±	0.59	56.98	±	2.19	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
	2/7/2018	0.26	±	0.22	0.97	±	0.80	No	12.70	±	0.57	46.99	±	2.11	**Yes**
	2/14/2018	0.82	±	0.26	3.05	±	0.95	**Yes**	20.70	±	0.67	76.59	±	2.48	**Yes**
	2/21/2018	0.98	±	0.25	3.63	±	0.92	**Yes**	14.10	±	0.57	52.17	±	2.12	**Yes**
	2/28/2018	0.64	±	0.22	2.36	±	0.81	No	16.90	±	0.61	62.53	±	2.26	**Yes**
	3/7/2018	1.09	±	0.25	4.03	±	0.93	**Yes**	15.20	±	0.60	56.24	±	2.21	**Yes**
	3/14/2018	1.30	±	0.28	4.81	±	1.05	**Yes**	27.10	±	0.76	100.27	±	2.80	**Yes**
	3/21/2018	0.11	±	0.24	0.40	±	0.89	No	12.20	±	0.55	45.14	±	2.05	**Yes**
	3/28/2018	1.16	±	0.25	4.29	±	0.94	**Yes**	14.70	±	0.59	54.39	±	2.19	**Yes**

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	01/03/18	0.75	±	1.60	2.77	±	5.92	No
	01/10/18	0.61	±	0.94	2.26	±	3.47	No
	01/17/18	1.86	±	1.03	6.88	±	3.81	No
	01/24/18	2.06	±	0.99	7.62	±	3.67	No
	01/31/18	-1.99	±	1.58	-7.36	±	5.85	No
	02/07/18	-1.10	±	0.99	-4.07	±	3.65	No
	02/14/18	2.58	±	1.61	9.55	±	5.96	No
	02/21/18	-1.10	±	0.96	-4.07	±	3.54	No
	02/28/18	-0.31	±	0.92	-1.15	±	3.39	No
	03/07/18	0.28	±	1.04	1.03	±	3.85	No
	03/14/18	2.00	±	1.69	7.40	±	6.25	No
	03/21/18	-1.20	±	0.97	-4.44	±	3.60	No
	03/28/18	-1.13	±	0.95	-4.18	±	3.53	No
ATOMIC CITY	01/03/18	0.82	±	1.75	3.02	±	6.48	No
	01/10/18	0.63	±	0.96	2.31	±	3.55	No
	01/17/18	1.86	±	1.03	6.88	±	3.81	No
	01/24/18	2.09	±	1.01	7.73	±	3.74	No
	01/31/18	-1.92	±	1.53	-7.10	±	5.66	No
	02/07/18	-1.14	±	1.03	-4.22	±	3.81	No
	02/14/18	2.51	±	1.57	9.29	±	5.81	No
	02/21/18	-1.12	±	0.98	-4.14	±	3.61	No
	02/28/18	-0.30	±	0.88	-1.11	±	3.25	No
	03/07/18	0.27	±	1.01	1.00	±	3.74	No
	03/14/18	1.90	±	1.60	7.03	±	5.92	No
	03/21/18	-1.18	±	0.96	-4.37	±	3.55	No
	03/28/18	-1.12	±	0.94	-4.14	±	3.48	No
QA-1	01/03/18	0.75	±	1.60	2.77	±	5.92	No
(ATOMIC CITY)	01/10/18	1.84	±	1.02	6.81	±	3.77	No
	01/17/18	2.03	±	0.98	7.51	±	3.62	No
	01/24/18	-1.95	±	1.55	-7.22	±	5.74	No
	01/31/18	-1.11	±	1.00	-4.11	±	3.69	No
	02/07/18	2.47	±	1.55	9.14	±	5.74	No
	02/14/18	-1.10	±	0.96	-4.07	±	3.55	No
	02/21/18	-0.33	±	0.96	-1.20	±	3.54	No
	02/28/18	0.27	±	0.99	0.98	±	3.65	No
	03/07/18	1.90	±	1.60	7.03	±	5.92	No
	03/14/18	-1.14	±	0.93	-4.22	±	3.42	No
	03/21/18	-1.11	±	0.94	-4.11	±	3.46	No
	03/28/18	0.61	±	0.94	2.27	±	3.48	No
BLUE DOME	01/03/18	3.28	±	1.72	12.14	±	6.36	No
	01/10/18	-0.71	±	1.40	-2.64	±	5.18	No
	01/17/18	0.43	±	1.43	1.60	±	5.29	No
	01/24/18	-0.90	±	1.41	-3.33	±	5.22	No
	01/31/18	0.98	±	0.91	3.61	±	3.37	No
	02/07/18	-0.88	±	0.92	-3.27	±	3.39	No
	02/14/18	0.72	±	0.95	2.65	±	3.53	No
	02/21/18	-1.96	±	1.47	-7.25	±	5.44	No
	02/28/18	3.44	±	1.53	12.73	±	5.66	No
	03/07/18	-0.82	±	0.88	-3.02	±	3.27	No
	03/14/18	-0.63	±	0.92	-2.34	±	3.40	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	03/21/18	0.65	±	1.40	2.41	±	5.18	No
	03/28/18	-1.09	±	1.39	-4.03	±	5.14	No
QA-2	01/03/18	3.20	±	1.68	11.84	±	6.22	No
(BLUE DOME)	01/10/18	-0.71	±	1.38	-2.61	±	5.11	No
	01/17/18	0.42	±	1.40	1.57	±	5.18	No
	01/24/18	-0.86	±	1.35	-3.19	±	5.00	No
	01/31/18	0.95	±	0.88	3.51	±	3.27	No
	02/07/18	-0.87	±	0.90	-3.22	±	3.34	No
	02/14/18	0.73	±	0.97	2.69	±	3.59	No
	02/21/18	-2.02	±	1.52	-7.47	±	5.62	No
	02/28/18	3.41	±	1.52	12.62	±	5.62	No
	03/07/18	-0.80	±	0.86	-2.95	±	3.19	No
	03/14/18	-0.60	±	0.87	-2.22	±	3.23	No
	03/21/18	0.61	±	1.31	2.26	±	4.85	No
	03/28/18	-0.98	±	1.25	-3.63	±	4.63	No
HOWE	01/03/18	0.11	±	0.87	0.42	±	3.21	No
	01/10/18	2.05	±	1.02	7.59	±	3.77	No
	01/17/18	0.73	±	0.86	2.70	±	3.19	No
	01/24/18	2.98	±	1.98	11.03	±	7.33	No
	01/31/18	-0.03	±	2.00	-0.12	±	7.40	No
	02/07/18	-0.26	±	1.34	-0.95	±	4.96	No
	02/14/18	-0.75	±	1.47	-2.78	±	5.44	No
	02/21/18	-1.42	±	1.75	-5.25	±	6.48	No
	02/28/18	1.94	±	1.38	7.18	±	5.11	No
	03/07/18	-1.38	±	1.46	-5.11	±	5.40	No
	03/14/18	2.22	±	1.51	8.21	±	5.59	No
	03/21/18	-0.81	±	1.57	-2.98	±	5.81	No
	03/28/18	0.81	±	1.28	2.98	±	4.74	No
MONTEVIEW	01/03/18	0.12	±	0.89	0.43	±	3.31	No
	01/10/18	1.91	±	0.94	7.07	±	3.49	No
	01/17/18	0.76	±	0.90	2.82	±	3.33	No
	01/24/18	3.07	±	2.05	11.36	±	7.59	No
	01/31/18	-0.03	±	2.04	-0.12	±	7.55	No
	02/07/18	-0.28	±	1.48	-1.05	±	5.48	No
	02/14/18	-0.79	±	1.53	-2.91	±	5.66	No
	02/21/18	-1.49	±	1.83	-5.51	±	6.77	No
	02/28/18	2.00	±	1.42	7.40	±	5.25	No
	03/07/18	-1.43	±	1.51	-5.29	±	5.59	No
	03/14/18	2.31	±	1.57	8.55	±	5.81	No
	03/21/18	-0.83	±	1.61	-3.06	±	5.96	No
	03/28/18	0.79	±	1.25	2.91	±	4.63	No
MUD LAKE	01/03/18	0.11	±	0.83	0.40	±	3.06	No
	01/10/18	1.93	±	0.95	7.14	±	3.53	No
	01/17/18	0.73	±	0.86	2.70	±	3.19	No
	01/24/18	3.05	±	2.03	11.29	±	7.51	No
	01/31/18	-0.03	±	1.98	-0.12	±	7.33	No
	02/07/18	-0.28	±	1.46	-1.04	±	5.40	No
	02/14/18	-0.74	±	1.45	-2.75	±	5.37	No
	02/21/18	-1.46	±	1.79	-5.40	±	6.62	No
	02/28/18	1.91	±	1.35	7.07	±	5.00	No
	03/07/18	-1.35	±	1.42	-5.00	±	5.25	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
	03/14/18	2.28	±	1.55	8.44	±	5.74	No
	03/21/18	-0.86	±	1.67	-3.17	±	6.18	No
	03/28/18	0.76	±	1.21	2.83	±	4.48	No
DISTANT								
BLACKFOOT	01/03/18	0.72	±	1.53	2.65	±	5.66	No
	01/10/18	0.57	±	0.88	2.12	±	3.25	No
	01/17/18	1.82	±	1.01	6.73	±	3.74	No
	01/24/18	2.04	±	0.98	7.55	±	3.62	No
	01/31/18	-1.94	±	1.54	-7.18	±	5.70	No
	02/07/18	-1.09	±	0.98	-4.03	±	3.62	No
	02/14/18	2.54	±	1.59	9.40	±	5.88	No
	02/21/18	-1.06	±	0.93	-3.92	±	3.42	No
	02/28/18	-0.33	±	0.96	-1.21	±	3.56	No
	03/07/18	0.27	±	1.01	1.01	±	3.74	No
	03/14/18	1.86	±	1.57	6.88	±	5.81	No
	03/21/18	-1.17	±	0.95	-4.33	±	3.51	No
	03/28/18	-1.09	±	0.92	-4.03	±	3.39	No
CRATERS	01/03/18	0.75	±	1.61	2.79	±	5.96	No
	01/10/18	0.60	±	0.92	2.22	±	3.41	No
	01/17/18	1.86	±	1.03	6.88	±	3.81	No
	01/24/18	2.07	±	1.00	7.66	±	3.69	No
	01/31/18	-1.98	±	1.57	-7.33	±	5.81	No
	02/07/18	-1.13	±	1.02	-4.18	±	3.77	No
	02/14/18	2.52	±	1.58	9.32	±	5.85	No
	02/21/18	-1.12	±	0.98	-4.14	±	3.61	No
	02/28/18	-0.31	±	0.91	-1.15	±	3.37	No
	03/07/18	0.27	±	1.00	0.99	±	3.68	No
	03/14/18	1.87	±	1.58	6.92	±	5.85	No
	03/21/18	-1.12	±	0.91	-4.14	±	3.36	No
	03/28/18	-1.06	±	0.90	-3.92	±	3.32	No
DUBOIS	01/03/18	3.09	±	1.62	11.43	±	5.99	No
	01/10/18	-0.76	±	1.48	-2.80	±	5.48	No
	01/17/18	0.41	±	1.36	1.52	±	5.03	No
	01/24/18	-0.93	±	1.46	-3.44	±	5.40	No
	01/31/18	1.07	±	1.00	3.96	±	3.70	No
	02/07/18	-0.91	±	0.95	-3.38	±	3.50	No
	02/14/18	0.73	±	0.97	2.70	±	3.59	No
	02/21/18	-1.94	±	1.46	-7.18	±	5.40	No
	02/28/18	3.60	±	1.60	13.32	±	5.92	No
	03/07/18	-0.87	±	0.94	-3.23	±	3.49	No
	03/14/18	-0.66	±	0.96	-2.45	±	3.55	No
	03/21/18	0.65	±	1.40	2.41	±	5.18	No
	03/28/18	-1.04	±	1.33	-3.85	±	4.92	No
IDAHO FALLS	01/03/18	3.07	±	1.60	11.36	±	5.92	No
	01/10/18	-0.74	±	1.44	-2.73	±	5.33	No
	01/17/18	0.44	±	1.44	1.61	±	5.33	No
	01/24/18	-0.91	±	1.42	-3.36	±	5.25	No
	01/31/18	1.00	±	0.93	3.69	±	3.44	No
	02/07/18	-0.95	±	0.99	-3.52	±	3.65	No
	02/14/18	0.73	±	0.97	2.69	±	3.57	No
	02/21/18	-1.99	±	1.50	-7.36	±	5.55	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
	02/28/18	3.42	±	1.52	12.65	±	5.62	No
	03/07/18	-0.88	±	0.96	-3.27	±	3.53	No
	03/14/18	-0.65	±	0.95	-2.42	±	3.52	No
	03/21/18	0.62	±	1.34	2.29	±	4.96	No
	03/28/18	-0.99	±	1.26	-3.67	±	4.66	No
JACKSON	01/03/18	0.75	±	1.60	2.77	±	5.92	No
	01/10/18	0.58	±	0.90	2.16	±	3.31	No
	01/17/18	1.67	±	0.92	6.18	±	3.41	No
	01/24/18	1.98	±	0.95	7.33	±	3.52	No
	01/31/18	-1.80	±	1.43	-6.66	±	5.29	No
	02/07/18	-1.03	±	0.93	-3.81	±	3.44	No
	02/14/18	2.36	±	1.48	8.73	±	5.48	No
	02/21/18	-0.98	±	0.85	-3.62	±	3.16	No
	02/28/18	-0.31	±	0.90	-1.13	±	3.32	No
	03/07/18	0.25	±	0.93	0.93	±	3.45	No
	03/14/18	1.81	±	1.53	6.70	±	5.66	No
	03/21/18	-1.06	±	0.86	-3.92	±	3.17	No
	03/28/18	-1.06	±	0.90	-3.92	±	3.31	No
SUGAR CITY	01/03/18	3.27	±	1.71	12.10	±	6.33	No
	01/10/18	-0.68	±	1.33	-2.52	±	4.92	No
	01/17/18	0.45	±	1.48	1.66	±	5.48	No
	01/24/18	-0.91	±	1.42	-3.35	±	5.25	No
	01/31/18	1.00	±	0.93	3.69	±	3.44	No
	02/07/18	-0.88	±	0.92	-3.27	±	3.39	No
	02/14/18	0.73	±	0.97	2.70	±	3.59	No
	02/21/18	-1.95	±	1.47	-7.22	±	5.44	No
	02/28/18	3.46	±	1.54	12.80	±	5.70	No
	03/07/18	-0.87	±	0.94	-3.20	±	3.46	No
	03/14/18	-0.63	±	0.92	-2.35	±	3.41	No
	03/21/18	0.61	±	1.30	2.24	±	4.81	No
	03/28/18	-1.01	±	1.29	-3.74	±	4.77	No
INL SITE								
EFS	01/03/18	0.80	±	1.70	2.95	±	6.29	No
	01/10/18	0.81	±	1.25	3.01	±	4.63	No
	01/17/18	1.83	±	1.01	6.77	±	3.74	No
	01/24/18	2.18	±	1.05	8.07	±	3.89	No
	01/31/18	-1.97	±	1.57	-7.29	±	5.81	No
	02/07/18	-1.16	±	1.05	-4.29	±	3.89	No
	02/14/18	2.49	±	1.56	9.21	±	5.77	No
	02/21/18	-1.12	±	0.97	-4.14	±	3.60	No
	02/28/18	-0.31	±	0.92	-1.15	±	3.40	No
	03/07/18	0.28	±	1.04	1.03	±	3.85	No
	03/14/18	2.02	±	1.70	7.47	±	6.29	No
	03/21/18	-1.12	±	0.91	-4.14	±	3.36	No
	03/28/18	-1.08	±	0.91	-4.00	±	3.36	No
MAIN GATE	01/03/18	0.76	±	1.63	2.81	±	6.03	No
	01/10/18	0.60	±	0.91	2.20	±	3.38	No
	01/17/18	1.90	±	1.05	7.03	±	3.89	No
	01/24/18	2.10	±	1.01	7.77	±	3.74	No
	01/31/18	-2.01	±	1.59	-7.44	±	5.88	No
	02/07/18	-1.11	±	1.00	-4.11	±	3.70	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
	02/14/18	2.59	±	1.62	9.58	±	5.99	No
	02/21/18	-1.07	±	0.93	-3.96	±	3.45	No
	02/28/18	-0.32	±	0.93	-1.17	±	3.44	No
	03/07/18	0.27	±	1.00	0.99	±	3.69	No
	03/14/18	2.02	±	1.70	7.47	±	6.29	No
	03/21/18	-1.16	±	0.94	-4.29	±	3.49	No
	03/28/18	-1.12	±	0.94	-4.14	±	3.49	No
VAN BUREN GATE	01/03/18	0.77	±	1.64	2.84	±	6.07	No
	01/10/18	0.62	±	0.95	2.30	±	3.53	No
	01/17/18	1.86	±	1.03	6.88	±	3.81	No
	01/24/18	2.10	±	1.01	7.77	±	3.74	No
	01/31/18	-1.93	±	1.54	-7.14	±	5.70	No
	02/07/18	-1.12	±	1.01	-4.14	±	3.74	No
	02/14/18	2.54	±	1.59	9.40	±	5.88	No
	02/21/18	-1.09	±	0.95	-4.03	±	3.53	No
	02/28/18	-0.31	±	0.91	-1.15	±	3.38	No
	03/07/18	0.27	±	1.02	1.01	±	3.77	No
	03/14/18	2.04	±	1.72	7.55	±	6.36	No
	03/21/18	-1.14	±	0.93	-4.22	±	3.43	No
	03/28/18	-1.09	±	0.92	-4.03	±	3.41	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
BOUNDARY									
ARCO	03/28/18	CESIUM-137	2.97	±	103	10.99	±	381.10	No
	03/28/18	STRONTIUM-90	10.30	±	10.60	38.11	±	39.22	No
ATOMIC CITY	03/28/18	AMERICIUM-241	9.92	±	1.75	36.70	±	6.48	**Yes**
	03/28/18	CESIUM-137	-116.00	±	88.20	-429.20	±	326.34	No
	03/28/18	PLUTONIUM-238	-10.70	±	4.64	-39.59	±	17.17	No
	03/28/18	PLUTONIUM-239/240	-6.41	±	4.30	-23.72	±	15.91	No
QA-1 (ATOMIC CITY)	03/28/18	AMERICIUM-241	3.30	±	4.33	12.21	±	16.02	No
	03/28/18	CESIUM-137	128.00	±	113.00	473.60	±	418.10	No
	03/28/18	PLUTONIUM-238	9.55	±	3.60	35.34	±	13.32	No
	03/28/18	PLUTONIUM-239/240	4.39	±	4.33	16.24	±	16.02	No
BLUE DOME	03/28/18	CESIUM-137	-4.35	±	81.40	-16.10	±	301.18	No
	03/28/18	STRONTIUM-90	8.46	±	10.60	31.30	±	39.22	No
(QA-2) BLUE DOME	03/28/18	CESIUM-137	111.00	±	102.00	410.70	±	377.40	No
	03/28/18	STRONTIUM-90	10.20	±	10.60	37.74	±	39.22	No
FAA TOWER	03/28/18	AMERICIUM-241	-2.71	±	1.91	-10.03	±	7.07	No
	03/28/18	CESIUM-137	-71.20	±	86.10	-263.44	±	318.57	No
	03/28/18	PLUTONIUM-238	0.00	±	3.23	0.00	±	11.95	No
	03/28/18	PLUTONIUM-239/240	-8.06	±	5.41	-29.82	±	20.02	No
HOWE	03/28/18	CESIUM-137	-1.11	±	62.80	-4.11	±	232.36	No
MONTEVIEW	03/28/18	CESIUM-137	-31.30	±	106.00	-115.81	±	392.20	No
	03/28/18	STRONTIUM-90	-13.10	±	9.39	-48.47	±	34.74	No
MUD LAKE	03/28/18	CESIUM-137	60.10	±	119.00	222.37	±	440.30	No
DISTANT									
BLACKFOOT	03/28/18	CESIUM-137	-21.10	±	62.90	-78.07	±	232.73	No
CRATERS OF THE MOON	03/28/18	AMERICIUM-241	-3.48	±	3.13	-12.88	±	11.58	No
	03/28/18	CESIUM-137	257.00	±	114.00	950.90	±	421.80	No
	03/28/18	PLUTONIUM-238	1.17	±	3.83	-12.88	±	11.58	No
	03/28/18	PLUTONIUM-239/240	-5.23	±	3.58	-12.88	±	11.58	No
DUBOIS	03/28/18	CESIUM-137	64.60	±	107.00	239.02	±	395.90	No
IDAHO FALLS	03/28/18	CESIUM-137	109.00	±	84.90	403.30	±	314.13	No
JACKSON	03/28/18	AMERICIUM-241	2.52	±	1.72	9.32	±	6.36	No
	03/28/18	CESIUM-137	-161.00	±	111.00	-595.70	±	410.70	No
	03/28/18	PLUTONIUM-238	2.89	±	4.15	10.69	±	15.36	No

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

SUGAR CITY	03/28/18	CESIUM-137	129.00	±	84.30	477.30	±	311.91	No
	03/28/18	STRONTIUM-90	16.60	±	11.10	61.42	±	41.07	No
INL SITE									
EFS	03/28/18	CESIUM-137	-63.20	±	124.00	-233.84	±	458.80	No
	03/28/18	STRONTIUM-90	19.20	±	11.20	71.04	±	41.44	No
MAIN GATE	03/28/18	AMERICIUM-241	-2.95	±	3.78	-10.92	±	13.99	No
	03/28/18	CESIUM-137	44.00	±	65.20	162.80	±	241.24	No
	03/28/18	PLUTONIUM-238	5.19	±	2.98	19.20	±	11.03	No
	03/28/18	PLUTONIUM-239/240	1.88	±	3.15	6.96	±	11.66	No
VAN BUREN GATE	03/28/18	CESIUM-137	-59.10	±	81.80	-218.67	±	302.66	No
	03/28/18	STRONTIUM-90	2.06	±	8.30	7.62	±	30.71	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	11/29/17	01/10/18	6.21	±	1.05	22.98	±	3.89	**Yes**
ATOMIC CITY	01/10/18	02/21/18	5.62	±	1.25	20.79	±	4.63	**Yes**
HOWE	12/27/17	02/07/18	5.11	±	1.07	18.91	±	3.96	**Yes**
HOWE	02/07/18	03/28/18	5.54	±	1.16	20.50	±	4.29	**Yes**
DISTANT									
IDAHO FALLS	12/06/17	01/17/18	3.89	±	1.01	14.39	±	3.74	**Yes**
IDAHO FALLS	01/17/18	02/14/18	6.80	±	1.38	25.16	±	5.11	**Yes**
IDAHO FALLS	02/14/18	03/21/18	4.67	±	1.16	17.28	±	4.29	**Yes**
INL SITE									
EFS	12/19/17	01/31/18	4.61	±	1.03	17.06	±	3.81	**Yes**
EFS	01/31/18	03/14/18	4.62	±	1.10	17.09	±	4.07	**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	01/03/18	01/10/18	66.80	±	23.20	2.47	±	0.86	No
ATOMIC CITY	01/17/18	01/24/18	85.20	±	23.40	3.15	±	0.87	**Yes**
ATOMIC CITY	02/14/18	02/21/18	267.00	±	25.50	9.88	±	0.94	**Yes**
ATOMIC CITY	02/28/18	03/07/18	54.20	±	24.60	2.01	±	0.91	No
ATOMIC CITY	03/14/18	03/21/18	90.60	±	22.80	3.35	±	0.84	**Yes**
ATOMIC CITY	03/21/18	03/28/18	72.80	±	23.40	2.69	±	0.87	**Yes**
HOWE	01/03/18	01/10/18	61.90	±	23.50	2.29	±	0.87	No
HOWE	02/14/18	02/21/18	184.00	±	24.50	6.81	±	0.91	**Yes**
HOWE	02/28/18	03/07/18	81.90	±	23.90	3.03	±	0.88	**Yes**
HOWE	03/07/18	03/14/18	37.20	±	23.30	1.38	±	0.86	No
HOWE	03/14/18	03/21/18	221.00	±	25.70	8.18	±	0.95	**Yes**
HOWE	03/21/18	03/28/18	55.90	±	24.60	2.07	±	0.91	No
DISTANT									
IDAHO FALLS	01/07/18	01/31/18	76.80	±	23.70	2.84	±	0.88	No
IDAHO FALLS	01/31/18	02/28/18	77.70	±	23.20	2.87	±	0.86	No
IDAHO FALLS	02/28/18	03/31/18	69.90	±	23.20	2.59	±	0.86	**Yes**
INL SITE									
EFS	01/03/18	01/10/18	83.60	±	23.80	3.09	±	0.88	**Yes**
EFS	01/17/18	01/24/18	69.30	±	23.60	2.56	±	0.87	No
EFS	02/14/18	02/21/18	214.00	±	24.90	7.92	±	0.92	**Yes**
EFS	02/28/18	03/07/18	174.00	±	24.50	6.44	±	0.91	**Yes**
EFS	03/14/18	03/21/18	53.80	±	23.00	1.99	±	0.85	No
EFS	03/21/18	03/28/18	98.00	±	23.60	3.63	±	0.87	**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
BLACKFOOT	03/11/18	1.66	±	2.16	0.06	±	0.08	No	-2.04	±	1.41	-0.08	±	0.05	No
CONTROL	01/02/18	-1.35	±	1.47	-0.05	±	0.05	No	-0.46	±	1.03	-0.02	±	0.04	No
	02/06/18	0.70	±	1.23	0.03	±	0.05	No	0.48	±	0.95	0.02	±	0.04	No
	03/05/18	3.62	±	2.35	0.13	±	0.09	No	-0.91	±	1.36	-0.03	±	0.05	No
DIETRICH	01/02/18	-1.09	±	1.76	-0.04	±	0.07	No	-0.16	±	1.35	-0.01	±	0.05	No
	02/05/18	-1.78	±	1.87	-0.07	±	0.07	No	1.54	±	1.36	0.06	±	0.05	No
	03/05/18	0.95	±	1.16	0.04	±	0.04	No	-0.32	±	0.97	-0.01	±	0.04	No
HOWE	01/02/18	-3.01	±	2.09	-0.11	±	0.08	No	-2.17	±	1.40	-0.08	±	0.05	No
	02/06/18	-2.55	±	2.09	-0.09	±	0.08	No	0.28	±	1.34	0.01	±	0.05	No
	03/05/18	0.64	±	1.26	0.02	±	0.05	No	0.81	±	0.92	0.03	±	0.03	No
IDAHO FALLS	01/02/18	1.07	±	1.63	0.04	±	0.06	No	-0.42	±	1.43	-0.02	±	0.05	No
	01/09/18	0.60	±	1.60	0.02	±	0.06	No	0.12	±	1.39	0.00	±	0.05	No
	01/17/18	-1.47	±	1.52	-0.05	±	0.06	No	2.58	±	1.46	0.10	±	0.05	No
	01/23/18	2.64	±	1.67	0.10	±	0.06	No	0.41	±	1.51	0.02	±	0.06	No
	01/30/18	0.37	±	0.98	0.01	±	0.04	No	0.82	±	0.83	0.03	±	0.03	No
	02/06/18	-0.12	±	0.97	0.00	±	0.04	No	-0.46	±	0.80	-0.02	±	0.03	No
Duplicate	02/06/18	0.58	±	1.32	0.02	±	0.05	No	1.75	±	1.11	0.06	±	0.04	No
	02/13/18	-1.83	±	1.64	-0.07	±	0.06	No	1.52	±	1.38	0.06	±	0.05	No
	02/21/18	-0.85	±	1.54	-0.03	±	0.06	No	-0.23	±	1.43	-0.01	±	0.05	No
	02/27/18	-0.28	±	1.08	-0.01	±	0.04	No	-1.16	±	0.97	-0.04	±	0.04	No
	03/06/18	-1.28	±	1.11	-0.05	±	0.04	No	1.02	±	0.84	0.04	±	0.03	No
	03/13/18	-0.64	±	0.97	-0.02	±	0.04	No	-0.10	±	0.78	0.00	±	0.03	No
	03/20/18	1.22	±	1.61	0.05	±	0.06	No	1.33	±	1.46	0.05	±	0.05	No
	03/27/18	-1.60	±	1.65	-0.06	±	0.06	No	-1.59	±	1.49	-0.06	±	0.06	No
MINIDOKA	02/05/18	3.23	±	2.09	0.12	±	0.08	No	-0.55	±	0.92	-0.02	±	0.03	No
	02/05/18	1.36	±	1.34	0.05	±	0.05	No	0.73	±	1.31	0.03	±	0.05	No
	03/05/18	-3.81	±	2.15	-0.14	±	0.08	No	0.13	±	1.32	0.00	±	0.05	No
TERRETON	01/03/18	0.33	±	1.67	0.01	±	0.06	No	0.86	±	1.34	1.48	±	0.05	No
	01/10/18	0.56	±	1.13	0.02	±	0.04	No	-0.54	±	1.07	0.86	±	0.04	No
	01/17/18	0.84	±	1.14	0.03	±	0.04	No	0.25	±	1.06	-0.54	±	0.04	No
	01/24/18	-0.51	±	1.10	-0.02	±	0.04	No	0.63	±	1.06	0.25	±	0.04	No
	01/31/18	0.27	±	1.07	0.01	±	0.04	No	0.35	±	1.06	0.63	±	0.04	No
	02/06/18	0.89	±	1.71	0.03	±	0.06	No	1.07	±	1.53	0.35	±	0.06	No
	02/14/18	-0.33	±	1.04	-0.01	±	0.04	No	0.46	±	0.90	1.07	±	0.03	No
	02/21/18	-2.50	±	1.08	-0.09	±	0.04	No	-0.93	±	0.97	0.46	±	0.04	No
	02/28/18	-0.25	±	1.57	-0.01	±	0.06	No	1.48	±	1.43	-0.93	±	0.05	No
	03/05/18	0.31	±	1.06	0.01	±	0.04	No	-0.56	±	0.83	1.48	±	0.03	No
	03/14/18	-1.01	±	1.49	-0.04	±	0.06	No	1.58	±	1.48	-0.56	±	0.05	No
	03/21/18	-0.79	±	0.99	-0.03	±	0.04	No	0.28	±	0.94	1.58	±	0.03	No
	03/28/18	1.40	±	0.99	0.05	±	0.04	No	0.90	±	0.94	0.28	±	0.03	No

Table C-7. Gamma-emitting Radionuclides in Large Game Animals

Species	Collection Date	Tissue	Analyte	Result ± 1s Uncertainty (pCi/kg wet weight)			Result ± 1s Uncertainty (x 10^{-2} Bq/kg wet weight)			Result > 3s
ELK	10/6/2017	Muscle	^{131}I	0.56	±	0.88	2.08	±	3.27	No
			^{137}Cs	-1.36	±	1.30	-5.03	±	4.81	No
ELK	10/6/2017	Thyroid	^{131}I	-130.00	±	208.00	-481.00	±	769.60	No
			^{137}Cs	41.40	±	195.00	153.18	±	721.50	No

APPENDIX D

STATISTICAL ANALYSIS RESULTS

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

Parameter	P[a]
Gross Alpha	
Quarter	0.0188
January	0.0179
February	0.0048
March	0.7733
Gross Beta	
Quarter	0.0540
January	0.0314
February	0.4187
March	0.4116

a. A 'p' value greater than 0.05 signifies no statistical difference between data groups. Any values below 0.05 are indicated in red.

Table D-2. Statistical difference in weekly gross alpha and gross beta concentrations measured at Boundary and Distant locations.

		Mann-Whitney U test
Parameter	**Week**	**P[a]**
Gross Alpha		
	January 3	0.014
	January 10	0.035
	January 17	0.628
	January 24	0.073
	January 31	0.052
	February 7	0.295
	February 14	0.445
	February 21	0.022
	February 28	0.731
	March 7	0.945
	March 14	0.731
	March 21	0.836
	March 28	0.073
Gross Beta		
	January 3	0.008
	January 10	0.035
	January 17	0.101
	January 24	0.022
	January 31	0.008
	February 7	0.180
	February 14	0.295
	February 21	0.295
	February 28	0.366
	March 7	0.137
	March 14	0.001
	March 21	0.184
	March 28	0.138

a. A 'p' value greater than 0.05 signifies no statistical difference between data groups (i.e., Boundary and Distant locations). Any values below 0.05 are indicated in red.