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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report: First Quarter 2009

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EXECUTIVE SUMMARY

None of the radionuclides detected in samples collected during the first quarter of 2009 could be directly linked with INL Site activities. Levels of detected radionuclides were no different than values measured at other locations across the United States or were consistent with levels measured historically at the INL Site. All detected radionuclide concentrations were well below guidelines 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 2009 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, 2009. All sample types (media) and the sampling schedule followed during 2009 are listed in Appendix A. Specifically, this report contains the results for the following:

- Air sampling, including particulate air filters, charcoal cartridges and atmospheric moisture
- Precipitation sampling
- Milk sampling
- Game animal sampling

Table E-1 Summary of results for the First Quarter of 2009.

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were no statistical differences in gross alpha or gross beta quarterly, monthly or weekly data in the first quarter. No result exceeded the DCG for gross alpha or gross beta activity in air.
		Gamma-emitting radionuclides, select actinides (^{241}Am, ^{238}Pu, and ^{239,240} Pu), ^{90}Sr	Strontium-90 was detected on a composite from a boundary location at a concentration within the range of those found previously.
	Charcoal Cartridge	Iodine-131	No detections of ^{131}I were made during the first quarter.
Atmospheric Moisture	Liquid	Tritium	A total of seven samples were collected. Six of these samples had a tritium result greater than the 3s uncertainty. No sample result exceeded the DCG for tritium in air.
Precipitation	Liquid	Tritium	Thirteen samples were collected. Seven of the results were greater than the 3s uncertainty. The concentration was consistent with those reported across the region and with previous results.
Milk	Liquid	Iodine-131, gamma-emitting radionuclides	Thirty-one samples, including two duplicates, were collected. No Iodine-131 or other manmade gamma-emitting radionuclides were detected in any sample.
Large Game Animals	Tissue	Iodine-131, gamma-emitting radionuclides	One animal (a mule deer) was sampled. No Iodine-131 or other manmade gamma-emitting radionuclides were detected in any tissues.

LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission
CFA	Central Facilities Area
CMS	community monitoring station
DCG	Derived Concentration Guide
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

LIST OF UNITS

Bq	becquerel
Ci	curie
g	gram
L	liter
µCi	microcurie
mL	milliliter
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 2003). During calendar year 2008, environmental monitoring within the INL Site boundaries was primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors, while monitoring outside the INL Site boundaries was conducted under the Environmental Surveillance, Education and Research (ESER) Program. The ESER Program is led by the S.M. Stoller Corporation in cooperation with its team members, including the University of Idaho, Idaho State University (ISU), the Wildlife Conservation Society and Teledyne Brown Engineering. This report contains monitoring results from the ESER Program for samples collected during the first quarter of 2009 (January 1-March 31, 2009).

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
- agricultural products, including milk at eight dairies around the INL Site, potatoes from at least five local producers, wheat from approximately 10 local producers, and lettuce from approximately nine home-owned and portable gardens on and around the INL
- soil from 12 locations around the INL Site biennially
- environmental dosimeters from 15 locations semi-annually
- various numbers of wildlife including big game (pronghorn, mule deer, and elk) and waterfowl sampled on and near 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 Teledyne Brown Engineering, Inc. of Knoxville, Tennessee.

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, the EPA may request additional sampling be performed through RadNet [previously known as the Environmental Radiation Ambient Monitoring System (ERAMS) network] (EPA 2008). The EPA established the ERAMS network in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. ERAMS was renamed RadNet in 2005 to reflect a new mission. RadNet is comprised of a nationwide network of sampling stations that provide air, precipitation, drinking water and milk samples. 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 (http://www.epa.gov/narel/radnet/).

Once samples have been collected and analyzed, the ESER Program has the responsibility for quality control of the data and for preparing quarterly reports on results from the environmental surveillance program. 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. The ESER has adopted guidelines developed by the United States Geological Survey (Bartholomay, et al. 2003), based on an extension of a method proposed by Currie (1984), to interpret analytical results and make decisions concerning detection. Most of the following discussion is taken from Bartholomay et al (2003).

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). Instrument signals for the target and blank vary randomly about the true signals and may overlap making it difficult to distinguish between radionuclide activities in blank and in environmental samples (Figure 1). That is, the variability around the sample result may substantially overlap the variability around a net activity of zero for samples with no radioactivity. 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.

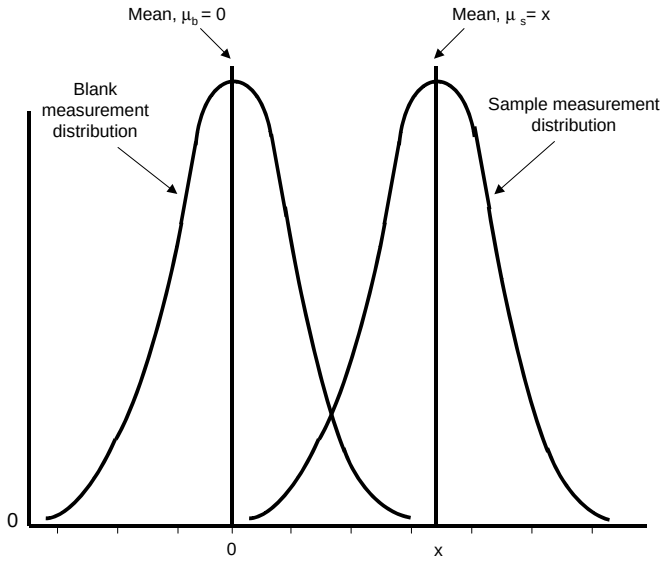

Figure 1. Example of overlap of blank and sample measurement distributions.

In the laboratory, instrument signals must exceed a critical level of 1.6s before the qualitative decision can be made as to whether the radionuclide was detected in a sample. At 1.6s there is about a 95-percent probability that the correct conclusion—not detected—will be made. Given a large number of samples, approximately 5 percent of the samples with measured concentrations greater than or equal to 1.6s, which were concluded as being detected, might not contain the radionuclide. These are referred to as false positives. For purposes of simplicity and consistency with past reporting, the ESER has rounded the 1.6s critical level estimate to 2s.

Once the critical level has been defined, the minimum detectable concentration may be determined. Concentrations that equal 3s represent a measurement at the detection level or minimum detectable concentration. For true concentrations of 3s or greater, there is a 95-percent probability that the radionuclide was detected in the target sample. In a large number of samples, the conclusion—not detected—will be made in 5 percent of the samples with true concentrations at the minimum detectable concentration of 3s. These measurements are known as false negatives. 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 detection may not be reliable.

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 typically 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 little 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 the S.M. Stoller Corporation at (208) 525-9358, or visit the Program's web page (http://www.stoller-eser.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 (2300 km^2) of the upper Snake River Plain in Southeastern Idaho. 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 cleanup operation, the 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 by 2012.

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 2009 are discussed below. A summary of approximate minimum detectable concentrations (MDCs) for radiological analyses and DOE Derived Concentration Guide (DCG) (DOE 1993) 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 2009 (Figure 2). Three of these samplers are located on the INL Site, nine are situated off the INL Site near the boundary and six 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 2008, 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 16,400 ft^3 (464 m^3) of air was sampled at each location, each week, at an average flow rate of 1.63 ft^3/min (0.05 m^3/min). Particulates in air were collected on membrane particulate filters (1.2-µm pore size). Gases passing through the filter were collected with an activated charcoal cartridge.

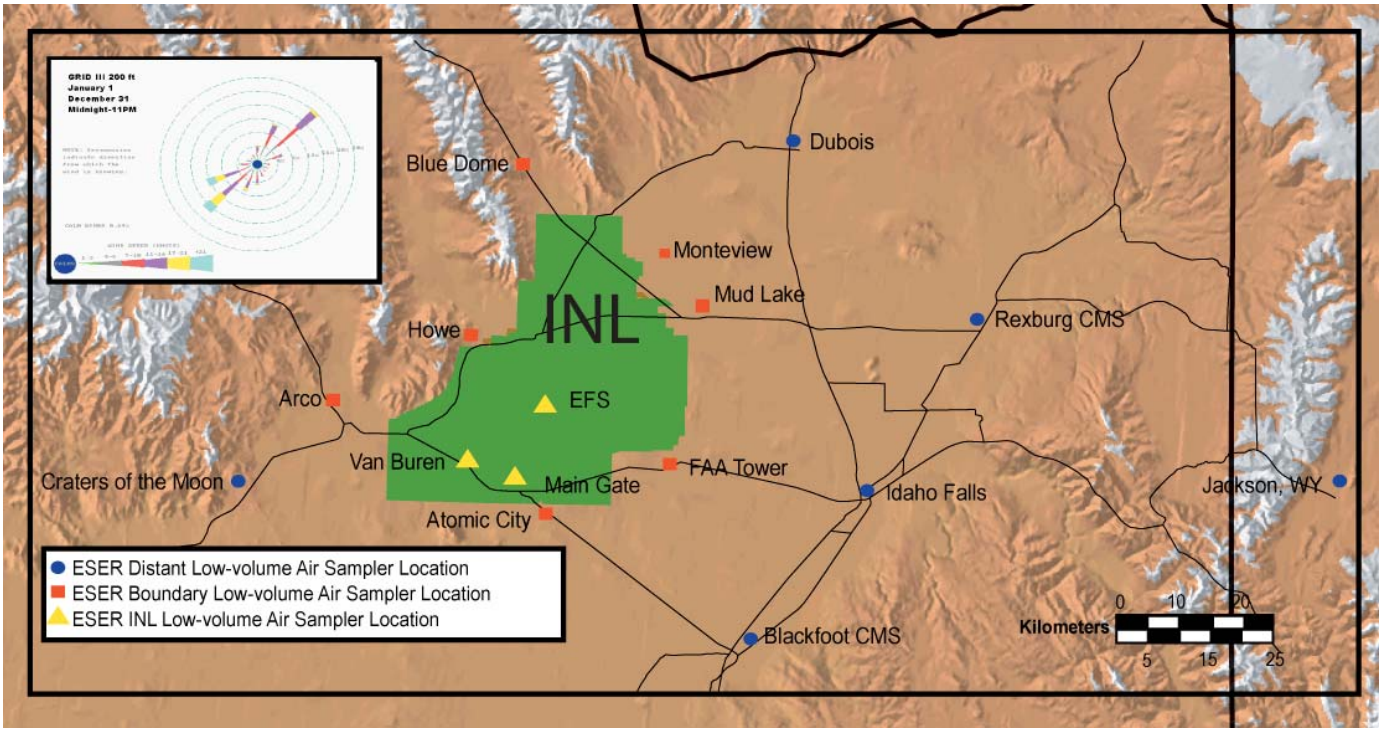

Figure 2. Low-volume air sampler locations.

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. Median gross alpha concentrations in air for INL Site, Boundary, and Distant locations for the first quarter of 2009 are shown in Figure 3. Gross alpha data are tested for normality prior to statistical analyses, and generally show no consistent discernable distribution. Box and whisker plots are commonly used when there is no assumed distribution. Each data group in Figure 3 is presented as a box and whisker plot, with a median (small red square), a box enclosing values between the 25th and 75th percentiles, and whiskers representing the non-outlier range. Outliers and extreme values are identified separately from the box and whiskers. Outliers and extreme values are atypical, infrequent data points that are far from the middle of the data distribution. For this report, outliers are defined as values that are greater than 1.5 times the height of the box, above or below the box. Extreme values are greater than 2 times the height of the box, above or below the box. Outliers and extreme values may reflect inherent variability, may be due to errors associated with transcription or measurement, or may be related to other anomalies. A careful review of the data collected during the first quarter indicates that the outlier values were not due to mistakes in collection, analysis, or reporting procedures, but rather reflect natural variability in the measurements. The outlier values lie within the range of measurements made within the past several years. Thus, rather than dismissing the outliers, they were included in the subsequent statistical analyses.

Because there is no discernable 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. For the quarter, there was no statistical difference noted. Figure 3 graphically shows that the gross alpha measurements made at INL Site, Boundary and Distant locations are similar for the first quarter. If the INL Site were a significant source of offsite contamination, concentrations of contaminants could be statistically greater at Boundary locations than at Distant locations.

Comparisons of gross alpha concentrations were made for each month of the quarter (Figures 4 – 6). Again the Kruskal-Wallis test of multiple independent groups was used to determine if statistical differences exist between INL Site, Boundary and Distant data groups.

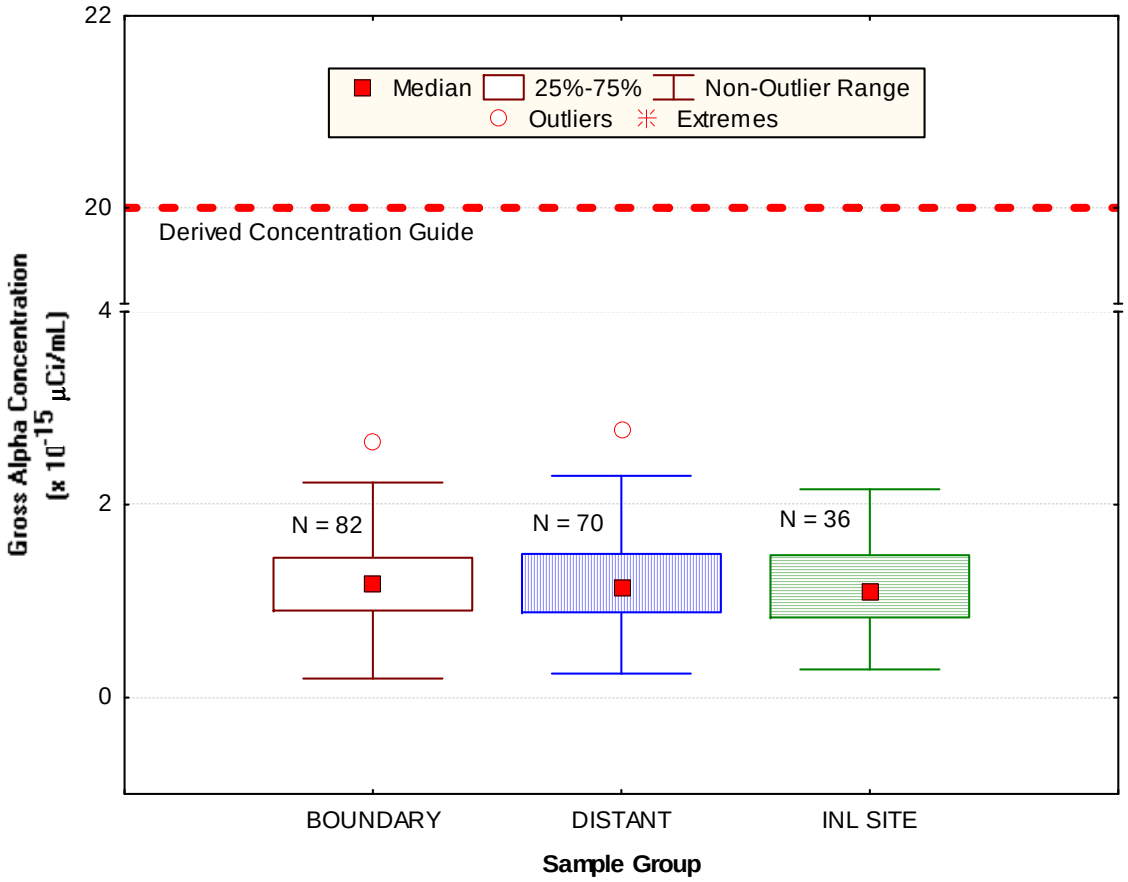

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations for the first quarter of 2009.

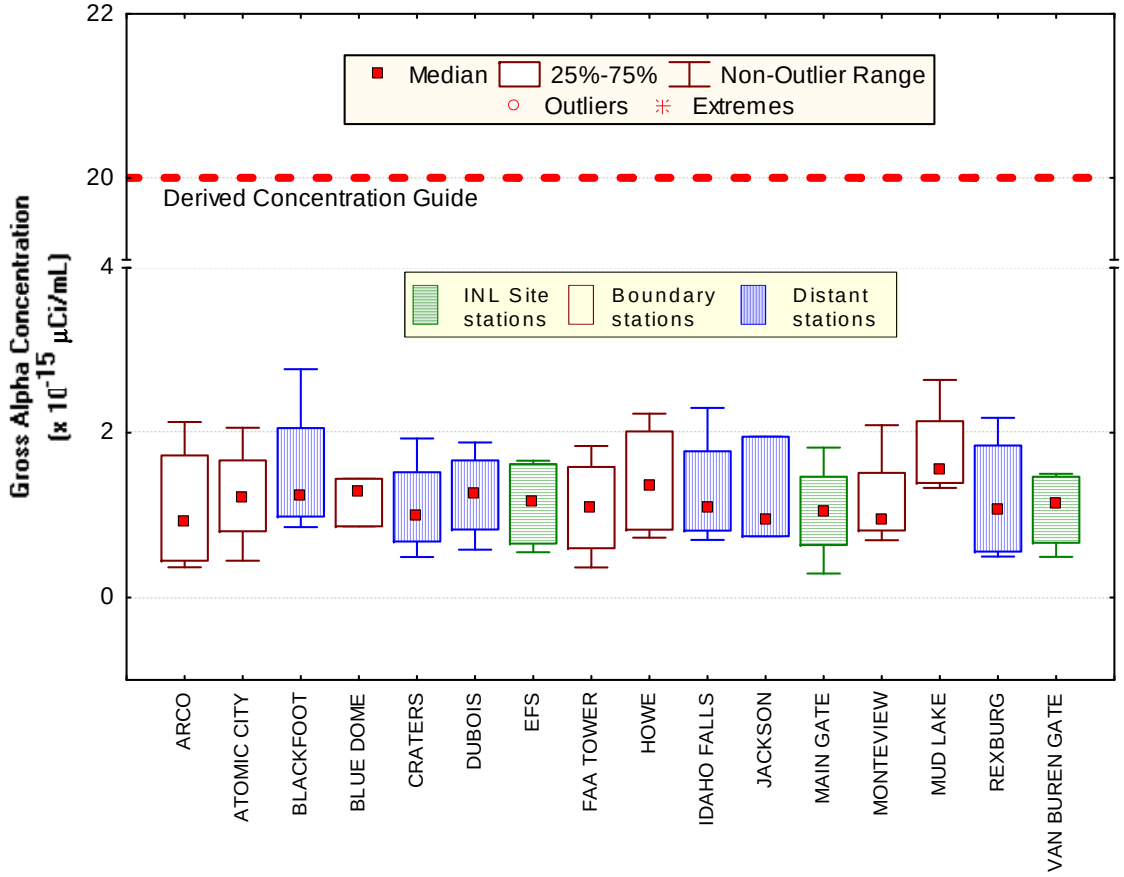

Figure 4. **January gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except Blue Dome and Jackson (N = 3).**

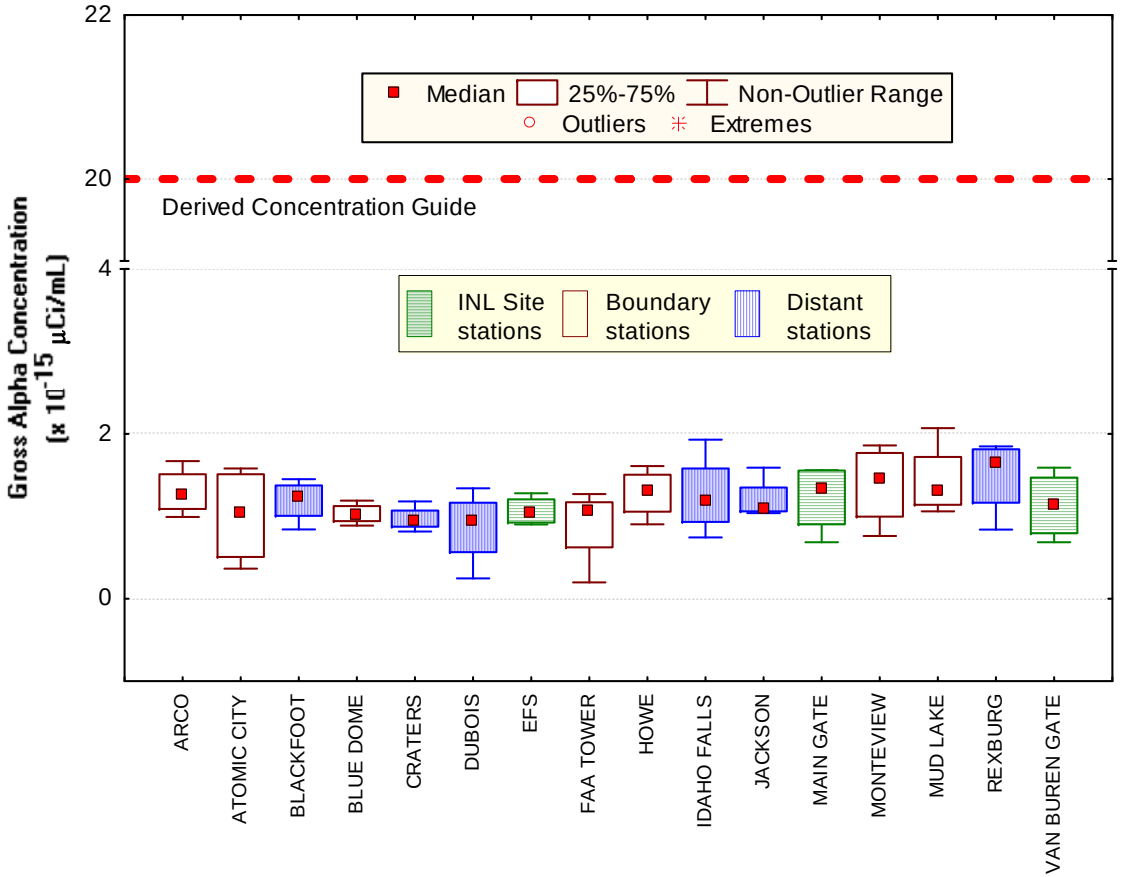

Figure 5. February gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location.

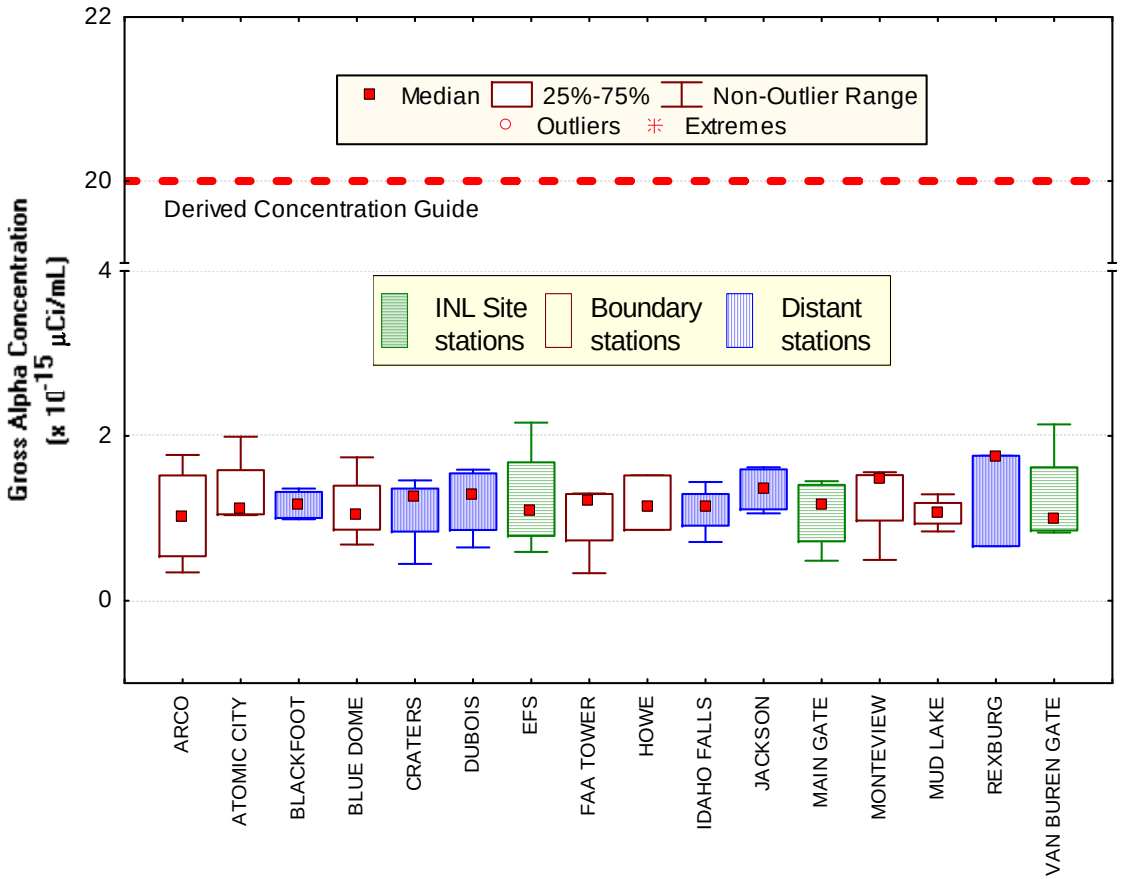

Figure 6. **March gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except Howe and Rexburg (N = 3).**

No statistical differences in gross alpha concentrations between groups were noted during any month of the quarter (Table D-1).

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. In the first quarter, there were no weeks where a statistical difference existed between the two sample groups (Table D-2).

Gross beta results are presented in Table C-1. Gross beta concentrations in air for INL Site, Boundary and Distant locations for the first quarter of 2009 are shown in Figure 7. The data were tested and found to be neither normally nor log-normally distributed. Box and whiskers plots were used for presentation of the data. Outliers and extreme values were retained in subsequent statistical analyses because they are within the range of measurements made in the past five years, and because these values could not be attributed to mistakes in collection, analysis, or reporting procedures. No statistical differences were noted in the quarterly data using the Kruskal-Wallace test (Table D-1).

Monthly median gross beta concentrations in air for each sampling group are shown in Figures 8 – 10. Statistical data are presented in Table D-1. There were no statistical differences in gross beta between groups for any month during the quarter.

Comparison of weekly Boundary and Distant gross beta data sets, using the Mann Whitney U test, showed no statistical differences between Boundary and Distant measurements during any week in the first quarter (Table D-2).

No ^{131}I was detected in any of the charcoal cartridge batches collected during the first quarter of 2009. Weekly ^{131}I results for each location are listed in Table C-2 of Appendix C. Gamma spectrographic analysis is also done with the ^{131}I analysis. Cesium-137 was not detected in any of the 26 measured batches of cartridges this quarter. The analytical laboratory considers occasional detections of this nuclide a result of the materials used in the charcoal filters.

Weekly filters for the first quarter of 2009 were composited by location. All samples were analyzed for gamma-emitting radionuclides, including ^{137}Cs (see Table C-3, Appendix C). No manmade gamma-emitting radionuclides were detected.

Selected composites were also analyzed for ^{90}Sr, ^{238}Pu, $^{239/240}$Pu and ^{241}Am (see Table C-3, Appendix C). Several of the americium and plutonium analyses had extremely low recoveries and were considered by the laboratory to be estimated values only. During the data validation process, these results were invalidated and are not reported. No detections were noted for the samples with acceptable recoveries.

Strontium-90 was reported on one composite from FAA Tower. The measured concentration was in the central part of the range detected over the past several years.

ATMOSPHERIC MOISTURE SAMPLING

Seven atmospheric moisture samples were obtained during the first quarter of 2009 from Atomic City, Blackfoot CMS, Idaho Falls and Rexburg CMS. 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.

Six of the seven samples exceeded the 3s uncertainty level for tritium, with similar results reported from all four locations. All samples were significantly below the DOE DCG for tritium in air of 1×10^{-7} $\mu Ci/mL_{air}$ with a maximum reported value of $(6.8 \pm 1.6) \times 10^{-13}$ $\mu Ci/mL_{air}$ at Rexburg. All results are shown in Table C-4, Appendix C.

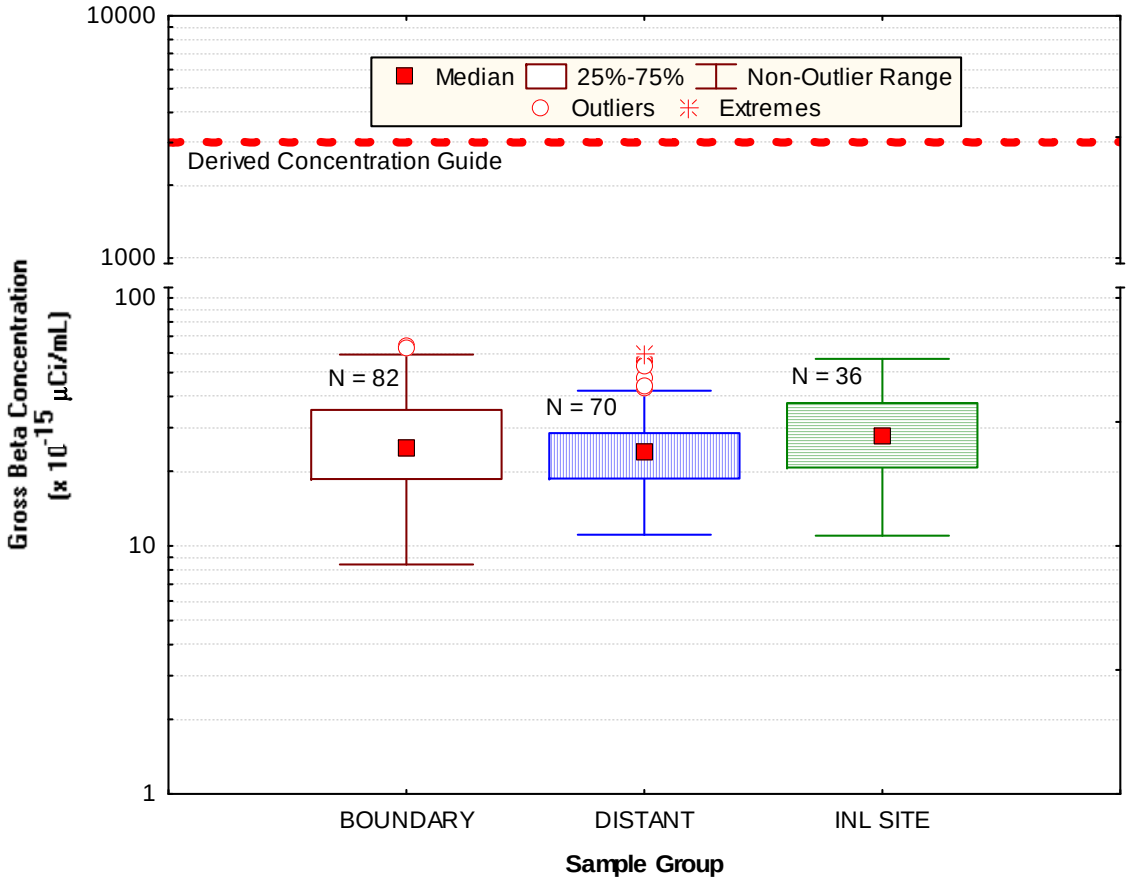

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary and Distant locations for the first quarter of 2009.

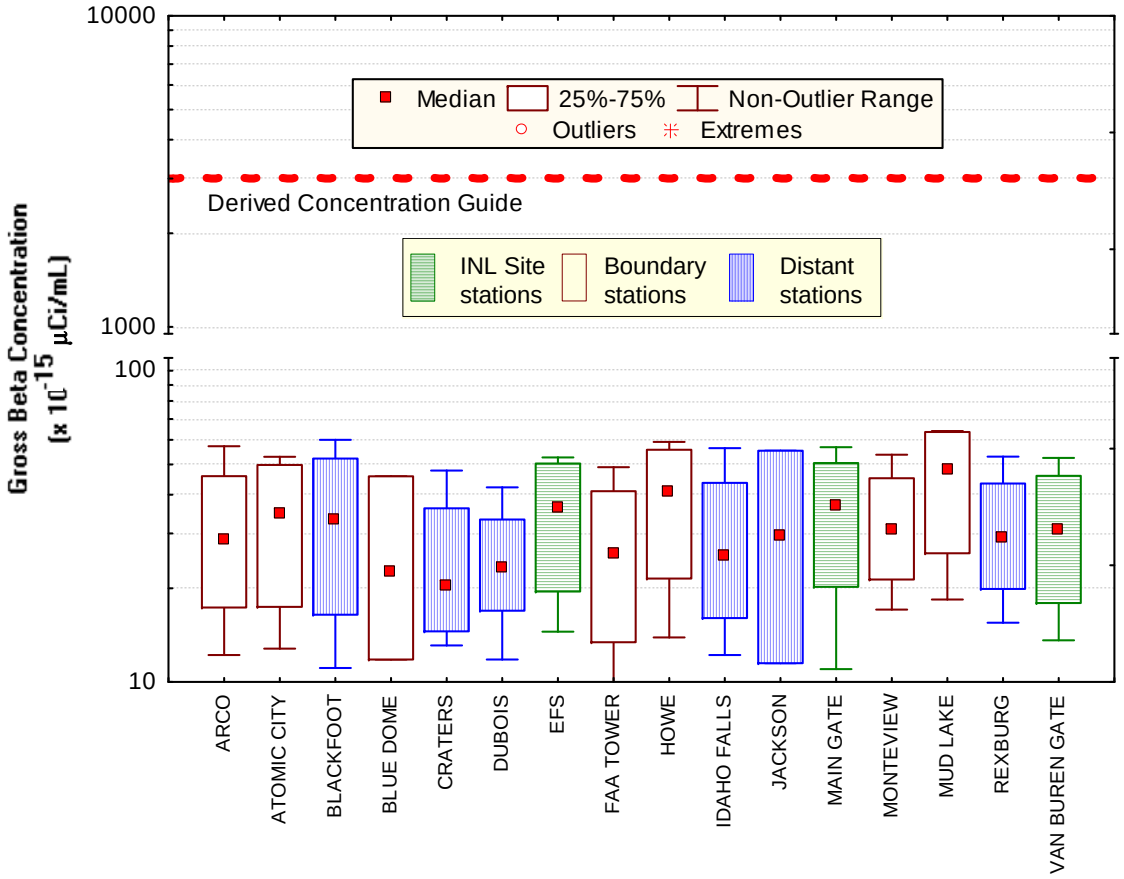

Figure 8. **January gross beta concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except Blue Dome and Jackson (N = 3).**

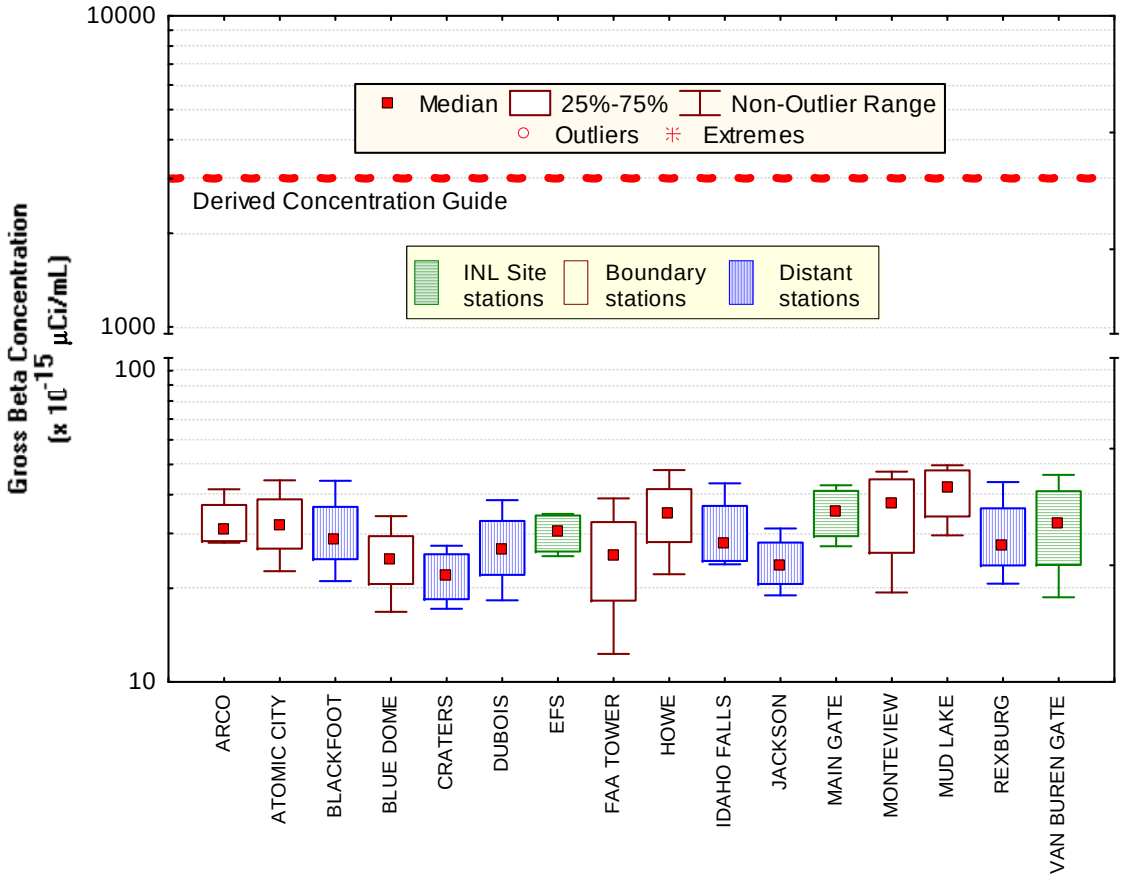

Figure 9. February gross beta concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location.

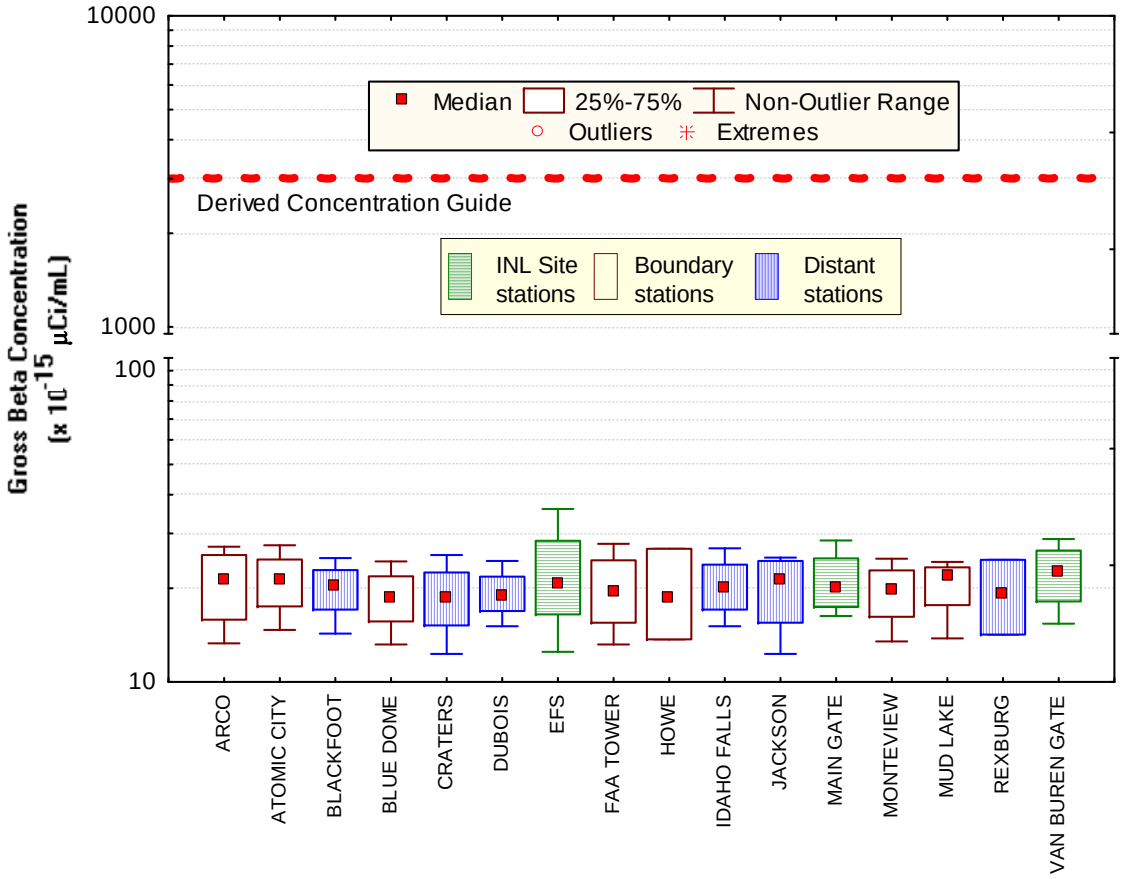

Figure 10. March gross beta concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except Howe and Rexburg (N = 3).

4. PRECIPITATION SAMPLING

Precipitation samples are gathered when sufficient precipitation occurs to allow for the collection of the minimum sample volume of approximately 20 mL. Samples are taken of monthly composites from Idaho Falls and CFA, and weekly from the EFS. Precipitation samples are analyzed for tritium. Storm events in the first quarter of 2009 produced sufficient precipitation to yield 13 samples.

Tritium was measured above the 3s value in seven of the 13 samples collected during the first quarter of 2009. 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. The EPA's RadNet program collects precipitation samples from across the United States. From 1980 to 2008, tritium measured in samples from Region 10 (which includes Idaho) averaged 117 pCi/L (EPA 2009). Data for all first quarter precipitation samples collected by the ESER Program were in the range of this value (averaging 97 pCi/L) and are listed in Table C-5 (Appendix C).

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, wheat, potatoes, garden lettuce, big game, 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. Lettuce and wheat 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 large game animals sampled during the first quarter of 2009.

MILK SAMPLING

Milk samples were collected weekly in Idaho Falls. Monthly samples were collected at seven other locations around the INL Site (Figure 11) during the first quarter of 2009. During the quarter, the dairy at Fort Hall ceased operations. The goat dairy in Blackfoot does not collect milk from November to February so only a March sample was collected. All samples were analyzed for gamma emitting radionuclides. During the second quarter, samples from half of the locations are analyzed for ^{90}Sr and half are analyzed for tritium. In the fourth quarter the analyses are reversed, so that each location receives one analysis for ^{90}Sr and tritium each year.

No Iodine-131 or other gamma-emitting radionuclides were detected in any sample. Data for ^{131}I and ^{137}Cs in milk samples are listed in Appendix C, Table C-6.

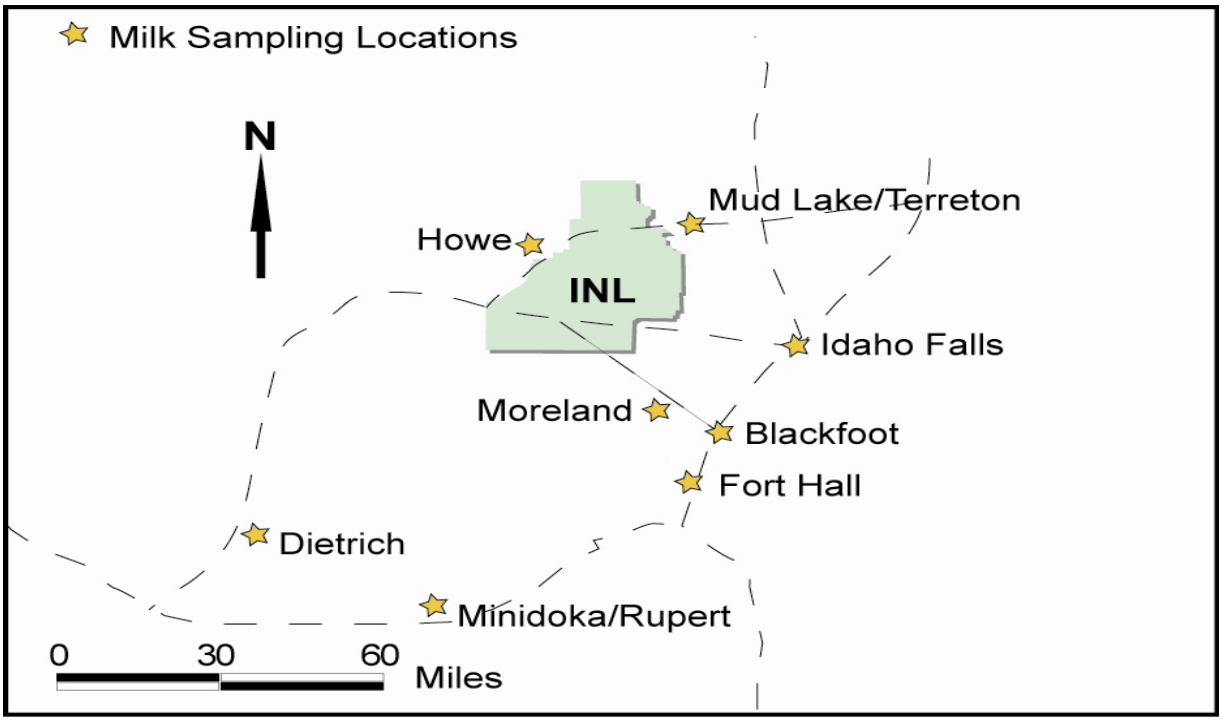

Figure 11. ESER milk sampling locations.

LARGE GAME ANIMAL SAMPLING

One large game animal (a mule deer) was sampled on the INL Site during the first quarter of 2009. No manmade radionuclides were found in the muscle, thyroid and liver samples. The data for ^{137}Cs and ^{131}I are listed in Appendix C, Table C-7.

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 (Stoller 2007). The following table summarizes the results of the quality assurance program for the first quarter of 2009.

QA Sample Type	Number of Sample Results	Number of Results Meeting Criteria	Percentage Meeting Criteria
Spikes/Laboratory Control Samples	239	228	95.4
Field Duplicates	59	55	93.2
Laboratory Splits	24	24	100.0
Recounts	170	170	100.0
Blanks	60	60	97.6
Method Uncertainty	1621	1578	97.3

7. REFERENCES

Bartholomay, R.C., Knobel, L.L., and Rousseau, J.P., 2003, *Field Methods and Quality Plan for Quality-of-Water Activities, U.S. Geological Survey, Idaho National Engineering and Environmental Laboratory, Idaho*, DOE/ID-22182, January 2003.

Code of Federal Regulations (CFR), 2007, 40 CFR 50.6, "National Primary and Secondary Ambient Air Quality Standards for Particulate Matter," Code of Federal Regulations, Office of the Federal Register, July 1, 2007.

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, 2003, "Environmental Management System," U.S. Department of Energy Order 450.1, January 2003.

DOE, 1993, "Radiation Protection of the Public and the Environment," U.S. Department of Energy Order 5400.5, January 1993.

EPA, 2009, RadNet—Tracking Environmental Radiation Nationwide, Web-page: http://www.epa.gov/narel/radnet/

Stoller, 2007, *Quality Assurance Project Plan for the INL Site Offsite Environmental Surveillance Program*, Environmental Surveillance, Education and Research Program, February 2007.

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, Rexburg	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, Rexburg	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	Blackfoot, Idaho Falls, Rexburg	Atomic City	None
PRECIPITATION				
Tritium	monthly	Idaho Falls	None	CFA
Tritium	weekly	None	None	EFS
ENVIRONMENTAL RADIATION SAMPLING				
TLDs				
Gamma Radiation	semiannual	Aberdeen, Blackfoot (2), Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Minidoka, Rexburg, Roberts	Arco, Atomic City, Birch Creek, Blue Dome, Howe, Monteview, Mud Lake	None
SOIL SAMPLING				
SOIL				
Gamma Spec, ^{90}Sr, Transuranics	biennially	Carey, Crystal Ice Caves (Aberdeen), Blackfoot, St. Anthony	Butte City, Monteview, Atomic City, FAA Tower, Howe, Mud Lake (2), Birch Creek	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	None	None
Gamma Spec (^{131}I)	monthly	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka, Moreland	Howe, Terreton	None
Tritium, ^{90}Sr	Semi-annually	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka, Moreland	Howe, Terreton	None
POTATOES				
Gamma Spec, ^{90}Sr	annually	Aberdeen, Blackfoot, Fort Hall, Idaho Falls, Rupert, Taber, occasional samples across the U.S.	Arco, Monteview, Mud Lake, Terreton	None
WHEAT				
Gamma Spec, ^{90}Sr	annually	American Falls, Blackfoot, Dietrich, Idaho Falls, Minidoka, Carey	Arco, Monteview, Mud Lake, Taber, Terreton	None
LETTUCE				
Gamma Spec, ^{90}Sr	annually	Blackfoot, Carey, Idaho Falls, Pocatello	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	Wastewater disposal ponds

APPENDIX B

SUMMARY OF MDCs AND DCGs

Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses Performed During First Quarter 2009

Sample Type	Analysis	Approximate Minimum Detectable Concentration[a] (MDC)	Derived Concentration Guide[b] (DCG)
Air (particulate filter)[e]	Gross alpha[c]	6.04×10^{-16} µCi/mL	2×10^{-14} µCi/mL
	Gross beta[d]	1.88×10^{-15} µCi/mL	3×10^{-12} µCi/mL
	Specific gamma (^{137}Cs)	1.92×10^{-16} µCi/mL	4×10^{-10} µCi/mL
	^{238}Pu	2.57×10^{-17} µCi/mL	3×10^{-14} µCi/mL
	$^{239/240}$Pu	1.10×10^{-17} µCi/mL	2×10^{-14} µCi/mL
	^{241}Am	4.37×10^{-18} µCi/mL	2×10^{-14} µCi/mL
	^{90}Sr	2.62×10^{-16} µCi/mL	9×10^{-12} µCi/mL
Air (charcoal cartridge)[e]	^{131}I	5.56×10^{-16} µCi/mL	4×10^{-10} µCi/mL
Air (atmospheric moisture)	^{3}H	111.0 pCi/L_{water}	1×10^{-7} µCi/mL_{air}
Air (precipitation)	^{3}H	109.7 pCi/L	2×10^{-3} µCi/mL
Milk	^{131}I	0.70 pCi/L	--
	^{137}Cs	1.56 pCi/L	--

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 and precision of plus or minus 100 percent under a specified set of typical laboratory measurement conditions.

b DCGs, 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 The DCG for gross alpha is equivalent to the DCGs for ^{239,240}Pu and ^{241}Am.

d The DCG for gross beta is equivalent to the DCGs for ^{228}Ra

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

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	1/7/2009	0.53 ± 0.20	1.95 ± 0.74		22.50 ± 0.81	83.25 ± 3.00	Y
	1/14/2009	0.37 ± 0.19	1.36 ± 0.71		12.20 ± 0.70	45.14 ± 2.59	Y
	1/21/2009	1.32 ± 0.26	4.88 ± 0.96	Y	34.50 ± 1.02	127.65 ± 3.77	Y
	1/28/2009	2.13 ± 0.31	7.88 ± 1.13	Y	57.20 ± 1.20	211.64 ± 4.44	Y
	2/4/2009	1.67 ± 0.29	6.18 ± 1.08	Y	41.60 ± 1.08	153.92 ± 4.00	Y
	2/11/2009	1.19 ± 0.24	4.39 ± 0.91	Y	28.71 ± 0.93	106.23 ± 3.45	Y
	2/18/2009	0.99 ± 0.25	3.67 ± 0.91	Y	28.00 ± 0.94	103.60 ± 3.47	Y
	2/25/2009	1.35 ± 0.25	5.00 ± 0.91	Y	32.50 ± 0.95	120.25 ± 3.53	Y
	3/4/2009	1.27 ± 0.23	4.70 ± 0.84	Y	24.00 ± 0.86	88.80 ± 3.17	Y
	3/11/2009	0.34 ± 0.18	1.27 ± 0.65		13.30 ± 0.70	49.21 ± 2.59	Y
	3/18/2009	1.77 ± 0.27	6.55 ± 1.01	Y	27.20 ± 0.89	100.64 ± 3.30	Y
	3/25/2009	0.74 ± 0.21	2.73 ± 0.77	Y	18.40 ± 0.77	68.08 ± 2.86	Y
ATOMIC CITY	1/7/2009	1.16 ± 0.23	4.29 ± 0.86	Y	22.10 ± 0.81	81.77 ± 2.99	Y
	1/14/2009	0.45 ± 0.20	1.66 ± 0.73		12.80 ± 0.70	47.36 ± 2.60	Y
	1/21/2009	1.27 ± 0.24	4.70 ± 0.90	Y	46.80 ± 1.07	173.16 ± 3.96	Y
	1/28/2009	2.06 ± 0.32	7.62 ± 1.17	Y	52.90 ± 1.21	195.73 ± 4.48	Y
	2/4/2009	1.44 ± 0.29	5.33 ± 1.07	Y	44.50 ± 1.13	164.65 ± 4.18	Y
	2/11/2009	0.65 ± 0.25	2.40 ± 0.91		30.94 ± 1.07	114.48 ± 3.96	Y
	2/18/2009	0.37 ± 0.19	1.35 ± 0.71		22.70 ± 0.82	83.99 ± 3.04	Y
	2/25/2009	1.58 ± 0.28	5.85 ± 1.02	Y	32.80 ± 1.02	121.36 ± 3.77	Y
	3/4/2009	1.04 ± 0.23	3.85 ± 0.84	Y	22.00 ± 0.88	81.40 ± 3.24	Y
	3/11/2009	1.06 ± 0.23	3.92 ± 0.86	Y	14.70 ± 0.77	54.39 ± 2.83	Y
	3/18/2009	1.99 ± 0.29	7.36 ± 1.09	Y	27.50 ± 0.93	101.75 ± 3.44	Y
	3/25/2009	1.18 ± 0.27	4.37 ± 0.98	Y	20.30 ± 0.90	75.11 ± 3.34	Y
QA-1 (ATOMIC CITY)	1/7/2009	0.28 ± 0.18	1.05 ± 0.66		21.80 ± 0.78	80.66 ± 2.90	Y
	1/14/2009	1.08 ± 0.23	4.00 ± 0.84	Y	12.40 ± 0.69	45.88 ± 2.54	Y
	1/21/2009	1.49 ± 0.26	5.51 ± 0.96	Y	44.20 ± 1.07	163.54 ± 3.96	Y
	1/28/2009	2.12 ± 0.30	7.84 ± 1.11	Y	54.50 ± 1.16	201.65 ± 4.29	Y
	2/4/2009	1.49 ± 0.26	5.51 ± 0.94	Y	38.70 ± 0.96	143.19 ± 3.56	Y
	2/11/2009	1.20 ± 0.26	4.44 ± 0.97	Y	31.48 ± 1.01	116.47 ± 3.76	Y
	2/18/2009	1.42 ± 0.25	5.25 ± 0.94	Y	23.00 ± 0.85	85.10 ± 3.14	Y
	2/25/2009	1.32 ± 0.24	4.88 ± 0.90	Y	29.20 ± 0.92	108.04 ± 3.40	Y
	3/4/2009	1.33 ± 0.23	4.92 ± 0.84	Y	21.70 ± 0.82	80.29 ± 3.03	Y
	3/11/2009	1.01 ± 0.22	3.74 ± 0.80	Y	14.60 ± 0.72	54.02 ± 2.66	Y
	3/18/2009	1.31 ± 0.25	4.85 ± 0.92	Y	24.90 ± 0.86	92.13 ± 3.17	Y
	3/25/2009	0.95 ± 0.25	3.52 ± 0.91	Y	19.90 ± 0.88	73.63 ± 3.24	Y
BLUE DOME [a]	1/7/2009	0.09 ± 39.00	0.34 ± 144.30		643.00 ± 134.00	2379.10 ± 495.80	Y
	1/14/2009	0.86 ± 0.22	3.20 ± 0.82	Y	11.80 ± 0.69	43.66 ± 2.57	Y
	1/21/2009	1.28 ± 0.21	4.74 ± 0.77	Y	22.60 ± 0.74	83.62 ± 2.73	Y
	1/28/2009	1.44 ± 0.25	5.33 ± 0.91	Y	45.80 ± 1.00	169.46 ± 3.68	Y
	2/4/2009	0.99 ± 0.22	3.67 ± 0.81	Y	34.10 ± 0.88	126.17 ± 3.24	Y
	2/11/2009	1.19 ± 0.24	4.40 ± 0.90	Y	24.80 ± 0.89	91.76 ± 3.27	Y
	2/18/2009	0.89 ± 0.21	3.29 ± 0.79	Y	16.80 ± 0.74	62.16 ± 2.72	Y
	2/25/2009	1.06 ± 0.22	3.92 ± 0.81	Y	24.50 ± 0.83	90.65 ± 3.07	Y
	3/4/2009	1.04 ± 0.21	3.85 ± 0.78	Y	18.10 ± 0.78	66.97 ± 2.87	Y
	3/11/2009	0.68 ± 0.23	2.52 ± 0.85		13.20 ± 0.82	48.84 ± 3.02	Y
	3/18/2009	1.05 ± 0.22	3.89 ± 0.80	Y	24.40 ± 0.79	90.28 ± 2.91	Y
	3/25/2009	1.74 ± 0.35	6.44 ± 1.30	Y	19.30 ± 1.07	71.41 ± 3.96	Y
QA-2	1/7/2009	0.80 ± 0.21	2.96 ± 0.78	Y	21.60 ± 0.79	79.92 ± 2.94	Y
(BLUE DOME)	1/14/2009	0.88 ± 0.20	3.27 ± 0.73	Y	11.10 ± 0.61	41.07 ± 2.24	Y
	1/21/2009	0.95 ± 0.24	3.53 ± 0.87	Y	26.00 ± 0.93	96.20 ± 3.44	Y
	1/28/2009	1.56 ± 0.25	5.77 ± 0.93	Y	44.30 ± 1.00	163.91 ± 3.68	Y
	2/4/2009	1.04 ± 0.27	3.85 ± 0.99	Y	40.10 ± 1.09	148.37 ± 4.03	Y
	2/11/2009	1.19 ± 0.24	4.40 ± 0.90	Y	26.00 ± 0.90	96.20 ± 3.32	Y

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
	2/18/2009	0.51 ± 0.20	1.89 ± 0.73		19.10 ± 0.78	70.67 ± 2.87	Y
	2/25/2009	0.95 ± 0.22	3.52 ± 0.80	Y	23.30 ± 0.82	86.21 ± 3.05	Y
	3/4/2009	1.18 ± 0.22	4.37 ± 0.80	Y	19.40 ± 0.78	71.78 ± 2.88	Y
	3/11/2009	0.36 ± 0.17	1.33 ± 0.64		14.40 ± 0.70	53.28 ± 2.57	Y
	3/18/2009	1.23 ± 0.24	4.55 ± 0.87	Y	25.30 ± 0.83	93.61 ± 3.09	Y
	3/25/2009	0.93 ± 0.21	3.44 ± 0.78	Y	16.20 ± 0.72	59.94 ± 2.68	Y
FAA TOWER	1/7/2009	0.83 ± 0.22	3.07 ± 0.83	Y	18.40 ± 0.79	68.08 ± 2.93	Y
	1/14/2009	0.37 ± 0.20	1.35 ± 0.72		8.42 ± 0.66	31.15 ± 2.43	Y
	1/21/2009	1.33 ± 0.26	4.92 ± 0.97	Y	33.10 ± 1.01	122.47 ± 3.74	Y
	1/28/2009	1.84 ± 0.26	6.81 ± 0.95	Y	49.00 ± 1.01	181.30 ± 3.74	Y
	2/4/2009	1.05 ± 0.24	3.89 ± 0.89	Y	38.90 ± 0.98	143.93 ± 3.61	Y
	2/11/2009	1.07 ± 0.24	3.96 ± 0.88	Y	26.40 ± 0.91	97.68 ± 3.37	Y
	2/18/2009	0.20 ± 0.19	0.73 ± 0.70		12.30 ± 0.74	45.51 ± 2.73	Y
	2/25/2009	1.27 ± 0.24	4.70 ± 0.90	Y	24.20 ± 0.87	89.54 ± 3.23	Y
	3/4/2009	1.29 ± 0.26	4.77 ± 0.95	Y	21.40 ± 0.93	79.18 ± 3.44	Y
	3/11/2009	0.33 ± 0.19	1.24 ± 0.70		13.20 ± 0.74	48.84 ± 2.75	Y
	3/18/2009	1.13 ± 0.33	4.18 ± 1.23	Y	27.80 ± 1.20	102.86 ± 4.44	Y
	3/25/2009	1.30 ± 0.23	4.81 ± 0.85	Y	17.80 ± 0.74	65.86 ± 2.72	Y
HOWE	1/7/2009	0.92 ± 0.20	3.40 ± 0.73	Y	29.10 ± 0.79	107.67 ± 2.92	Y
	1/14/2009	0.73 ± 0.18	2.69 ± 0.68	Y	13.90 ± 0.63	51.43 ± 2.32	Y
	1/21/2009	2.23 ± 0.30	8.25 ± 1.10	Y	52.50 ± 1.16	194.25 ± 4.29	Y
	1/28/2009	1.80 ± 0.30	6.66 ± 1.11	Y	59.10 ± 1.23	218.67 ± 4.55	Y
	2/4/2009	1.21 ± 0.24	4.48 ± 0.90	Y	48.00 ± 1.04	177.60 ± 3.85	Y
	2/11/2009	1.40 ± 0.25	5.18 ± 0.92	Y	35.40 ± 0.97	130.98 ± 3.57	Y
	2/18/2009	0.90 ± 0.22	3.34 ± 0.83	Y	22.20 ± 0.82	82.14 ± 3.05	Y
	2/25/2009	1.61 ± 0.27	5.96 ± 0.99	Y	34.10 ± 1.00	126.17 ± 3.69	Y
a	3/5/2009	0.81 ± 0.98	3.01 ± 3.62		18.50 ± 3.87	68.45 ± 14.32	Y
	3/11/2009	0.86 ± 0.23	3.18 ± 0.85	Y	13.70 ± 0.78	50.69 ± 2.88	Y
	3/18/2009	1.52 ± 0.24	5.62 ± 0.89	Y	26.80 ± 0.82	99.16 ± 3.04	Y
	3/25/2009	1.13 ± 0.25	4.18 ± 0.94	Y	18.60 ± 0.85	68.82 ± 3.15	Y
MONTEVIEW	1/7/2009	0.93 ± 0.19	3.45 ± 0.68	Y	25.60 ± 0.72	94.72 ± 2.65	Y
	1/14/2009	0.70 ± 0.20	2.58 ± 0.73	Y	17.10 ± 0.71	63.27 ± 2.63	Y
	1/21/2009	0.93 ± 0.26	3.44 ± 0.98	Y	36.50 ± 1.13	135.05 ± 4.18	Y
	1/28/2009	2.09 ± 0.28	7.73 ± 1.02	Y	53.80 ± 1.07	199.06 ± 3.96	Y
	2/4/2009	1.86 ± 0.24	6.88 ± 0.90	Y	47.40 ± 0.94	175.38 ± 3.46	Y
	2/11/2009	1.68 ± 0.28	6.22 ± 1.04	Y	42.20 ± 1.10	156.14 ± 4.07	Y
	2/18/2009	0.76 ± 0.24	2.82 ± 0.87	Y	19.40 ± 0.86	71.78 ± 3.18	Y
	2/25/2009	1.23 ± 0.22	4.55 ± 0.81	Y	32.60 ± 0.87	120.62 ± 3.23	Y
	3/4/2009	1.45 ± 0.27	5.37 ± 1.00	Y	20.80 ± 0.95	76.96 ± 3.52	Y
	3/11/2009	0.50 ± 0.17	1.83 ± 0.64		13.50 ± 0.66	49.95 ± 2.43	Y
	3/18/2009	1.49 ± 0.22	5.51 ± 0.81	Y	24.90 ± 0.74	92.13 ± 2.73	Y
	3/25/2009	1.56 ± 0.24	5.77 ± 0.88	Y	18.90 ± 0.74	69.93 ± 2.73	Y
MUD LAKE	1/7/2009	1.33 ± 0.23	4.92 ± 0.87	Y	33.40 ± 0.89	123.58 ± 3.29	Y
	1/14/2009	1.45 ± 0.24	5.37 ± 0.90	Y	18.40 ± 0.76	68.08 ± 2.80	Y
	1/21/2009	1.64 ± 0.26	6.07 ± 0.95	Y	64.00 ± 1.17	236.80 ± 4.33	Y
	1/28/2009	2.64 ± 0.31	9.77 ± 1.15	Y	63.20 ± 1.19	233.84 ± 4.40	Y
	2/4/2009	1.22 ± 0.24	4.51 ± 0.90	Y	46.00 ± 1.01	170.20 ± 3.74	Y
	2/11/2009	2.07 ± 0.31	7.66 ± 1.14	Y	49.70 ± 1.19	183.89 ± 4.40	Y
	2/18/2009	1.06 ± 0.27	3.92 ± 0.98	Y	29.60 ± 1.01	109.52 ± 3.74	Y
	2/25/2009	1.37 ± 0.26	5.07 ± 0.95	Y	38.50 ± 1.03	142.45 ± 3.81	Y
	3/4/2009	1.29 ± 0.23	4.77 ± 0.83	Y	22.40 ± 0.82	82.88 ± 3.04	Y
	3/11/2009	0.84 ± 0.23	3.12 ± 0.83	Y	13.80 ± 0.77	51.06 ± 2.85	Y
	3/18/2009	1.03 ± 0.23	3.81 ± 0.87	Y	24.30 ± 0.85	89.91 ± 3.14	Y
	3/25/2009	1.08 ± 0.24	4.00 ± 0.89	Y	21.50 ± 0.85	79.55 ± 3.15	Y
DISTANT							
BLACKFOOT CMS	1/7/2009	0.86 ± 0.20	3.16 ± 0.73	Y	21.80 ± 0.74	80.66 ± 2.73	Y

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
		1/14/2009	1.11	±	0.21	4.11	±	0.77	Y	11.10	±	0.61	41.07	±	2.25	Y
		1/21/2009	1.34	±	0.22	4.96	±	0.82	Y	44.50	±	0.95	164.65	±	3.51	Y
		1/28/2009	2.77	±	0.31	10.25	±	1.15	Y	60.00	±	1.15	222.00	±	4.26	Y
		2/4/2009	1.30	±	0.24	4.81	±	0.90	Y	44.30	±	0.99	163.91	±	3.66	Y
		2/11/2009	1.17	±	0.22	4.33	±	0.80	Y	28.48	±	0.84	105.37	±	3.09	Y
		2/18/2009	0.84	±	0.20	3.12	±	0.75	Y	21.10	±	0.75	78.07	±	2.79	Y
		2/25/2009	1.45	±	0.23	5.37	±	0.84	Y	28.80	±	0.83	106.56	±	3.06	Y
		3/4/2009	0.99	±	0.19	3.66	±	0.69	Y	20.80	±	0.72	76.96	±	2.68	Y
		3/11/2009	1.02	±	0.19	3.77	±	0.69	Y	14.30	±	0.61	52.91	±	2.27	Y
		3/18/2009	1.28	±	0.22	4.74	±	0.81	Y	25.00	±	0.77	92.50	±	2.83	Y
		3/25/2009	1.36	±	0.22	5.03	±	0.81	Y	19.90	±	0.72	73.63	±	2.66	Y
CRATERS OF		1/7/2009	0.49	±	0.19	1.82	±	0.69		16.00	±	0.71	59.20	±	2.62	Y
THE MOON		1/14/2009	0.87	±	0.21	3.22	±	0.79	Y	13.10	±	0.69	48.47	±	2.54	Y
		1/21/2009	1.11	±	0.25	4.11	±	0.92	Y	24.50	±	0.93	90.65	±	3.44	Y
		1/28/2009	1.93	±	0.28	7.14	±	1.02	Y	47.80	±	1.05	176.86	±	3.89	Y
		2/4/2009	1.18	±	0.24	4.37	±	0.89	Y	27.40	±	0.86	101.38	±	3.18	Y
		2/11/2009	0.82	±	0.23	3.02	±	0.84	Y	19.71	±	0.85	72.94	±	3.14	Y
		2/18/2009	0.93	±	0.23	3.45	±	0.85	Y	17.20	±	0.79	63.64	±	2.93	Y
		2/25/2009	0.96	±	0.22	3.54	±	0.80	Y	24.10	±	0.84	89.17	±	3.11	Y
		3/4/2009	1.26	±	0.24	4.66	±	0.87	Y	19.40	±	0.84	71.78	±	3.10	Y
		3/11/2009	0.45	±	0.20	1.65	±	0.72		12.30	±	0.73	45.51	±	2.71	Y
		3/18/2009	1.46	±	0.25	5.40	±	0.93	Y	25.60	±	0.85	94.72	±	3.13	Y
		3/25/2009	1.23	±	0.23	4.55	±	0.84	Y	18.10	±	0.75	66.97	±	2.77	Y
DUBOIS		1/7/2009	0.58	±	0.19	2.15	±	0.72		22.10	±	0.78	81.77	±	2.89	Y
		1/14/2009	1.45	±	0.27	5.37	±	0.99	Y	11.80	±	0.75	43.66	±	2.77	Y
		1/21/2009	1.07	±	0.21	3.96	±	0.76	Y	24.40	±	0.78	90.28	±	2.89	Y
		1/28/2009	1.88	±	0.27	6.96	±	1.01	Y	42.20	±	1.00	156.14	±	3.70	Y
		2/4/2009	1.34	±	0.24	4.96	±	0.88	Y	38.40	±	0.92	142.08	±	3.40	Y
		2/11/2009	0.88	±	0.25	3.27	±	0.93	Y	25.90	±	0.98	95.83	±	3.64	Y
		2/18/2009	0.25	±	0.18	0.92	±	0.67		18.30	±	0.77	67.71	±	2.83	Y
		2/25/2009	0.99	±	0.27	3.67	±	0.99	Y	27.40	±	1.05	101.38	±	3.89	Y
		3/4/2009	1.50	±	0.25	5.55	±	0.93	Y	19.10	±	0.85	70.67	±	3.13	Y
		3/11/2009	0.65	±	0.21	2.39	±	0.77	Y	15.10	±	0.77	55.87	±	2.85	Y
		3/18/2009	1.59	±	0.24	5.88	±	0.88	Y	24.50	±	0.78	90.65	±	2.87	Y
		3/25/2009	1.07	±	0.25	3.96	±	0.94	Y	18.70	±	0.86	69.19	±	3.19	Y
IDAHO FALLS		1/7/2009	0.92	±	0.22	3.42	±	0.81	Y	19.90	±	0.78	73.63	±	2.89	Y
		1/14/2009	0.70	±	0.22	2.59	±	0.81	Y	12.20	±	0.72	45.14	±	2.66	Y
		1/21/2009	1.25	±	0.23	4.63	±	0.84	Y	30.90	±	0.88	114.33	±	3.25	Y
		1/28/2009	2.30	±	0.33	8.51	±	1.21	Y	56.40	±	1.24	208.68	±	4.59	Y
		2/4/2009	1.23	±	0.26	4.55	±	0.96	Y	43.50	±	1.05	160.95	±	3.89	Y
		2/11/2009	1.93	±	0.34	7.14	±	1.26	Y	30.10	±	1.16	111.37	±	4.29	Y
		2/18/2009	1.12	±	0.26	4.14	±	0.94	Y	23.90	±	0.91	88.43	±	3.37	Y
		2/25/2009	0.74	±	0.21	2.75	±	0.79	Y	25.10	±	0.88	92.87	±	3.25	Y
		3/4/2009	1.11	±	0.21	4.11	±	0.79	Y	19.10	±	0.78	70.67	±	2.89	Y
		3/11/2009	0.71	±	0.21	2.64	±	0.78	Y	15.10	±	0.76	55.87	±	2.83	Y
		3/18/2009	1.44	±	0.26	5.33	±	0.95	Y	26.90	±	0.88	99.53	±	3.27	Y
		3/25/2009	1.15	±	0.25	4.26	±	0.93	Y	20.80	±	0.86	76.96	±	3.19	Y
JACKSON	a	1/7/2009		±			±				±			±		
		1/14/2009	0.74	±	0.22	2.75	±	0.81	Y	11.50	±	0.70	42.55	±	2.59	Y
		1/21/2009	0.94	±	0.21	3.46	±	0.77	Y	29.50	±	0.86	109.15	±	3.19	Y
		1/28/2009	1.95	±	0.31	7.22	±	1.13	Y	55.40	±	1.21	204.98	±	4.48	Y
		2/4/2009	1.04	±	0.25	3.85	±	0.93	Y	25.00	±	0.89	92.50	±	3.29	Y
		2/11/2009	1.08	±	0.24	4.00	±	0.90	Y	31.15	±	0.97	115.27	±	3.58	Y
		2/18/2009	1.11	±	0.24	4.11	±	0.88	Y	19.00	±	0.80	70.30	±	2.97	Y
		2/25/2009	1.59	±	0.25	5.88	±	0.92	Y	22.30	±	0.83	82.51	±	3.05	Y
		3/4/2009	1.57	±	0.24	5.81	±	0.89	Y	23.90	±	0.84	88.43	±	3.12	Y

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
	3/11/2009	1.06 ± 0.21	3.92 ± 0.79	Y	12.30 ± 0.67	45.51 ± 2.48	Y
	3/18/2009	1.16 ± 0.24	4.29 ± 0.88	Y	25.10 ± 0.85	92.87 ± 3.15	Y
	3/25/2009	1.62 ± 0.26	5.99 ± 0.94	Y	18.70 ± 0.78	69.19 ± 2.89	Y
REXBURG CMS	1/7/2009	0.50 ± 0.20	1.84 ± 0.75		24.30 ± 0.81	89.91 ± 3.01	Y
	1/14/2009	0.62 ± 0.22	2.28 ± 0.81		15.50 ± 0.78	57.35 ± 2.89	Y
	1/21/2009	1.51 ± 0.29	5.59 ± 1.05	Y	33.80 ± 1.07	125.06 ± 3.96	Y
	1/28/2009	2.18 ± 0.31	8.07 ± 1.14	Y	53.00 ± 1.16	196.10 ± 4.29	Y
	2/4/2009	1.78 ± 0.31	6.59 ± 1.15	Y	43.90 ± 1.16	162.43 ± 4.29	Y
	2/11/2009	1.49 ± 0.28	5.51 ± 1.02	Y	28.40 ± 0.99	105.08 ± 3.66	Y
	2/18/2009	0.84 ± 0.24	3.10 ± 0.90	Y	20.70 ± 0.88	76.59 ± 3.27	Y
	2/25/2009	1.85 ± 0.28	6.85 ± 1.04	Y	26.70 ± 0.94	98.79 ± 3.47	Y
a	3/4/2009	1.86 ± 1.74	6.88 ± 6.44		18.80 ± 6.52	69.56 ± 24.12	
	3/11/2009	0.66 ± 0.22	2.45 ± 0.80	Y	14.20 ± 0.78	52.54 ± 2.89	Y
	3/18/2009	1.76 ± 0.26	6.51 ± 0.94	Y	24.70 ± 0.81	91.39 ± 3.00	Y
	3/25/2009	1.75 ± 0.25	6.48 ± 0.93	Y	19.10 ± 0.75	70.67 ± 2.78	Y
INL SITE							
EFS	1/7/2009	0.76 ± 0.21	2.79 ± 0.77	Y	24.60 ± 0.82	91.02 ± 3.03	Y
	1/14/2009	0.55 ± 0.20	2.04 ± 0.75		14.50 ± 0.73	53.65 ± 2.70	Y
	1/21/2009	1.66 ± 0.26	6.14 ± 0.97	Y	48.00 ± 1.08	177.60 ± 4.00	Y
	1/28/2009	1.58 ± 0.27	5.85 ± 1.00	Y	52.70 ± 1.12	194.99 ± 4.14	Y
	2/4/2009	1.13 ± 0.24	4.18 ± 0.89	Y	27.10 ± 0.86	100.27 ± 3.19	Y
	2/11/2009	0.95 ± 0.23	3.51 ± 0.85	Y	33.86 ± 0.97	125.26 ± 3.58	Y
	2/18/2009	0.90 ± 0.23	3.33 ± 0.84	Y	25.40 ± 0.86	93.98 ± 3.19	Y
	2/25/2009	1.28 ± 0.24	4.74 ± 0.90	Y	34.70 ± 0.97	128.39 ± 3.58	Y
	3/4/2009	1.20 ± 0.22	4.44 ± 0.83	Y	20.50 ± 0.82	75.85 ± 3.02	Y
	3/11/2009	0.59 ± 0.22	2.19 ± 0.82		12.50 ± 0.80	46.25 ± 2.95	Y
	3/18/2009	2.16 ± 0.40	7.99 ± 1.49	Y	36.00 ± 1.34	133.20 ± 4.96	Y
	3/25/2009	0.98 ± 0.27	3.63 ± 1.00	Y	20.90 ± 0.96	77.33 ± 3.56	Y
MAIN GATE	1/7/2009	1.11 ± 0.41	4.11 ± 1.53		29.40 ± 1.50	108.78 ± 5.55	Y
	1/14/2009	0.29 ± 0.17	1.08 ± 0.64		11.00 ± 0.64	40.70 ± 2.35	Y
	1/21/2009	0.98 ± 0.22	3.63 ± 0.81	Y	44.30 ± 1.01	163.91 ± 3.74	Y
	1/28/2009	1.82 ± 0.28	6.73 ± 1.05	Y	56.80 ± 1.16	210.16 ± 4.29	Y
	2/4/2009	1.56 ± 0.27	5.77 ± 1.00	Y	39.40 ± 1.01	145.78 ± 3.74	Y
	2/11/2009	1.12 ± 0.28	4.14 ± 1.02	Y	31.52 ± 1.08	116.63 ± 4.01	Y
	2/18/2009	0.69 ± 0.28	2.54 ± 1.03		27.30 ± 1.10	101.01 ± 4.07	Y
	2/25/2009	1.55 ± 0.43	5.74 ± 1.58	Y	42.90 ± 1.67	158.73 ± 6.18	Y
	3/4/2009	1.36 ± 0.23	5.03 ± 0.85	Y	21.40 ± 0.82	79.18 ± 3.02	Y
	3/11/2009	0.49 ± 0.35	1.79 ± 1.28		16.30 ± 1.30	60.31 ± 4.81	Y
	3/18/2009	1.45 ± 0.25	5.37 ± 0.92	Y	28.50 ± 0.87	105.45 ± 3.22	Y
	3/25/2009	0.95 ± 0.24	3.53 ± 0.90	Y	18.50 ± 0.85	68.45 ± 3.16	Y
VAN BUREN GATE	1/7/2009	0.83 ± 0.25	3.09 ± 0.91	Y	22.30 ± 0.91	82.51 ± 3.37	Y
	1/14/2009	0.49 ± 0.23	1.83 ± 0.85		13.60 ± 0.82	50.32 ± 3.02	Y
	1/21/2009	1.43 ± 0.28	5.29 ± 1.04	Y	39.50 ± 1.13	146.15 ± 4.18	Y
	1/28/2009	1.50 ± 0.29	5.55 ± 1.05	Y	52.50 ± 1.18	194.25 ± 4.37	Y
	2/4/2009	0.91 ± 0.26	3.35 ± 0.95	Y	46.30 ± 1.12	171.31 ± 4.14	Y
	2/11/2009	1.35 ± 0.26	5.00 ± 0.98	Y	28.83 ± 0.97	106.65 ± 3.60	Y
	2/18/2009	0.69 ± 0.22	2.53 ± 0.81	Y	18.70 ± 0.81	69.19 ± 3.00	Y
	2/25/2009	1.59 ± 0.26	5.88 ± 0.96	Y	35.80 ± 0.98	132.46 ± 3.64	Y
	3/4/2009	1.10 ± 0.22	4.07 ± 0.80	Y	24.10 ± 0.85	89.17 ± 3.14	Y
	3/11/2009	0.83 ± 0.24	3.07 ± 0.87	Y	15.40 ± 0.83	56.98 ± 3.06	Y
	3/18/2009	2.14 ± 0.32	7.92 ± 1.17	Y	28.80 ± 0.99	106.56 ± 3.66	Y
	3/25/2009	0.88 ± 0.25	3.25 ± 0.93	Y	20.90 ± 0.92	77.33 ± 3.40	Y

a. Invalid Sample Result

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		01/07/2009	-0.39	±	1.30	-1.43	±	4.81	
		01/14/2009	-0.83	±	2.07	-3.08	±	7.64	
		01/21/2009	-0.68	±	1.96	-2.51	±	7.25	
		01/28/2009	1.81	±	1.55	6.70	±	5.74	
		02/04/2009	-0.89	±	1.55	-3.29	±	5.75	
		02/11/2009	3.74	±	1.40	13.83	±	5.17	
		02/18/2009	-0.74	±	1.42	-2.75	±	5.25	
		02/25/2009	2.81	±	1.37	10.42	±	5.08	
		03/04/2009	1.63	±	1.41	6.02	±	5.21	
		03/11/2009	-4.11	±	1.32	-15.22	±	4.90	
		03/18/2009	-0.59	±	1.35	-2.18	±	5.00	
		03/25/2009	-1.41	±	1.32	-5.23	±	4.89	
ATOMIC CITY		01/07/2009	-0.39	±	1.30	-1.43	±	4.81	
		01/14/2009	-0.82	±	2.04	-3.04	±	7.55	
		01/21/2009	-0.61	±	1.77	-2.27	±	6.54	
		01/28/2009	1.95	±	1.67	7.22	±	6.18	
		02/04/2009	-0.91	±	1.59	-3.37	±	5.89	
		02/11/2009	4.42	±	1.65	16.36	±	6.12	
		02/18/2009	-0.68	±	1.29	-2.50	±	4.78	
		02/25/2009	3.12	±	1.52	11.54	±	5.63	
		03/04/2009	1.76	±	1.52	6.50	±	5.62	
		03/11/2009	-4.46	±	1.43	-16.48	±	5.30	
		03/18/2009	-0.63	±	1.43	-2.31	±	5.30	
		03/25/2009	-1.69	±	1.58	-6.25	±	5.86	
QA-1		01/07/2009	-0.37	±	1.25	-1.38	±	4.63	
		01/14/2009	-0.80	±	2.00	-2.97	±	7.39	
		01/21/2009	-0.64	±	1.84	-2.36	±	6.80	
		01/28/2009	1.78	±	1.53	6.60	±	5.65	
		02/04/2009	-0.77	±	1.34	-2.84	±	4.97	
		02/11/2009	4.05	±	1.51	14.98	±	5.60	
		02/18/2009	-0.70	±	1.34	-2.60	±	4.97	
		02/25/2009	2.82	±	1.38	10.43	±	5.09	
		03/04/2009	1.59	±	1.38	5.90	±	5.10	
		03/11/2009	-4.10	±	1.32	-15.17	±	4.88	
		03/18/2009	-0.58	±	1.33	-2.15	±	4.93	
		03/25/2009	-1.64	±	1.53	-6.06	±	5.68	
BLUE DOME	a	01/07/2009	-18.29	±	327.32	-67.67	±	1211.08	
		01/14/2009	0.71	±	1.20	2.61	±	4.43	
		01/21/2009	0.45	±	1.19	1.67	±	4.40	
		01/28/2009	1.70	±	1.23	6.30	±	4.54	
		02/04/2009	1.03	±	1.19	3.83	±	4.41	
		02/11/2009	-0.77	±	1.27	-2.83	±	4.70	
		02/18/2009	1.28	±	1.13	4.73	±	4.18	
		02/25/2009	-0.15	±	1.75	-0.55	±	6.49	
		03/04/2009	-1.21	±	1.23	-4.49	±	4.55	
		03/11/2009	-0.25	±	1.51	-0.91	±	5.59	
		03/18/2009	-0.39	±	1.09	-1.44	±	4.02	
		03/25/2009	-2.26	±	1.85	-8.36	±	6.86	

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								
QA-2	01/07/2009	-0.07	±	1.25	-0.26	±	4.64	
	01/14/2009	0.60	±	1.02	2.22	±	3.77	
	01/21/2009	0.60	±	1.57	2.20	±	5.81	
	01/28/2009	1.74	±	1.25	6.43	±	4.63	
	02/04/2009	1.32	±	1.52	4.88	±	5.62	
	02/11/2009	-0.76	±	1.26	-2.82	±	4.68	
	02/18/2009	1.31	±	1.16	4.84	±	4.28	
	02/25/2009	-0.15	±	1.78	-0.56	±	6.58	
	03/04/2009	-1.18	±	1.20	-4.37	±	4.42	
	03/11/2009	-0.19	±	1.18	-0.71	±	4.37	
	03/18/2009	-0.42	±	1.17	-1.55	±	4.31	
	03/25/2009	-1.41	±	1.16	-5.20	±	4.27	
FAA TOWER	01/07/2009	-0.08	±	1.34	-0.28	±	4.97	
	01/14/2009	0.73	±	1.23	2.69	±	4.56	
	01/21/2009	0.60	±	1.58	2.22	±	5.85	
	01/28/2009	1.65	±	1.19	6.12	±	4.41	
	02/04/2009	1.13	±	1.31	4.19	±	4.83	
	02/11/2009	-0.78	±	1.29	-2.88	±	4.77	
	02/18/2009	1.43	±	1.26	5.29	±	4.67	
	02/25/2009	-0.16	±	1.90	-0.59	±	7.04	
	03/04/2009	-1.46	±	1.48	-5.42	±	5.48	
	03/11/2009	-0.22	±	1.34	-0.80	±	4.95	
	03/18/2009	-0.68	±	1.90	-2.53	±	7.03	
	03/25/2009	-1.38	±	1.13	-5.10	±	4.19	
HOWE	01/07/2009	-0.06	±	1.06	-0.22	±	3.91	
	01/14/2009	0.58	±	0.99	2.15	±	3.64	
	01/21/2009	0.56	±	1.48	2.08	±	5.48	
	01/28/2009	2.05	±	1.48	7.60	±	5.47	
	02/04/2009	1.09	±	1.26	4.04	±	4.65	
	02/11/2009	-0.73	±	1.20	-2.68	±	4.45	
	02/18/2009	1.33	±	1.18	4.92	±	4.35	
	02/25/2009	-0.16	±	1.95	-0.61	±	7.21	
a	03/05/2009	-8.70	±	8.81	-32.20	±	32.60	
	03/11/2009	-0.23	±	1.40	-0.84	±	5.18	
	03/18/2009	-0.40	±	1.10	-1.46	±	4.07	
	03/25/2009	-1.67	±	1.37	-6.17	±	5.06	
MONTEVIEW	01/07/2009	-0.05	±	0.98	-0.20	±	3.61	
	01/14/2009	0.64	±	1.08	2.36	±	4.00	
	01/21/2009	0.68	±	1.79	2.50	±	6.61	
	01/28/2009	1.73	±	1.25	6.40	±	4.61	
	02/04/2009	0.92	±	1.06	3.42	±	3.94	
	02/11/2009	-0.80	±	1.33	-2.98	±	4.94	
	02/18/2009	1.50	±	1.32	5.54	±	4.90	
	02/25/2009	-0.14	±	1.62	-0.51	±	6.00	
	03/04/2009	-1.52	±	1.54	-5.64	±	5.70	
	03/11/2009	-0.18	±	1.12	-0.68	±	4.16	
	03/18/2009	-0.35	±	0.97	-1.29	±	3.60	
	03/25/2009	-1.35	±	1.11	-5.00	±	4.11	

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								
MUD LAKE	01/07/2009	-0.07	±	1.18	-0.24	±	4.35	
	01/14/2009	0.67	±	1.14	2.49	±	4.22	
	01/21/2009	0.50	±	1.33	1.86	±	4.91	
	01/28/2009	1.83	±	1.32	6.77	±	4.88	
	02/04/2009	1.08	±	1.24	4.00	±	4.60	
	02/11/2009	-0.82	±	1.36	-3.04	±	5.04	
	02/18/2009	1.57	±	1.39	5.82	±	5.15	
	02/25/2009	-0.16	±	1.93	-0.60	±	7.13	
	03/04/2009	-1.20	±	1.21	-4.43	±	4.48	
	03/11/2009	-0.22	±	1.38	-0.83	±	5.09	
	03/18/2009	-0.44	±	1.22	-1.63	±	4.53	
	03/25/2009	-1.57	±	1.29	-5.81	±	4.77	
DISTANT								
BLACKFOOT CMS	01/07/2009	-0.34	±	1.14	-1.26	±	4.23	
	01/14/2009	-0.71	±	1.76	-2.62	±	6.51	
	01/21/2009	-0.52	±	1.50	-1.92	±	5.53	
	01/28/2009	1.65	±	1.41	6.10	±	5.22	
	02/04/2009	-0.74	±	1.29	-2.73	±	4.77	
	02/11/2009	3.17	±	1.18	11.71	±	4.38	
	02/18/2009	-0.61	±	1.18	-2.27	±	4.35	
	02/25/2009	2.41	±	1.18	8.91	±	4.35	
	03/04/2009	1.36	±	1.17	5.03	±	4.35	
	03/11/2009	-3.31	±	1.06	-12.24	±	3.94	
	03/18/2009	-0.49	±	1.12	-1.81	±	4.14	
	03/25/2009	-1.22	±	1.15	-4.53	±	4.24	
CRATERS	01/07/2009	-0.37	±	1.24	-1.37	±	4.60	
	01/14/2009	-0.79	±	1.95	-2.91	±	7.23	
	01/21/2009	-0.70	±	2.03	-2.60	±	7.51	
	01/28/2009	1.66	±	1.42	6.14	±	5.25	
	02/04/2009	-0.78	±	1.37	-2.90	±	5.07	
	02/11/2009	3.87	±	1.45	14.31	±	5.35	
	02/18/2009	-0.72	±	1.37	-2.65	±	5.07	
	02/25/2009	2.71	±	1.32	10.02	±	4.89	
	03/04/2009	1.74	±	1.50	6.43	±	5.56	
	03/11/2009	-4.48	±	1.44	-16.58	±	5.34	
	03/18/2009	-0.56	±	1.29	-2.08	±	4.77	
	03/25/2009	-1.36	±	1.27	-5.02	±	4.70	
DUBOIS	01/07/2009	-0.07	±	1.21	-0.25	±	4.46	
	01/14/2009	0.78	±	1.32	2.87	±	4.88	
	01/21/2009	0.47	±	1.25	1.75	±	4.62	
	01/28/2009	1.81	±	1.30	6.69	±	4.82	
	02/04/2009	1.03	±	1.19	3.83	±	4.41	
	02/11/2009	-0.88	±	1.45	-3.25	±	5.38	
	02/18/2009	1.31	±	1.15	4.83	±	4.27	
	02/25/2009	-0.20	±	2.36	-0.74	±	8.71	
	03/04/2009	-1.34	±	1.36	-4.96	±	5.02	
	03/11/2009	-0.22	±	1.33	-0.80	±	4.94	
	03/18/2009	-0.38	±	1.06	-1.41	±	3.93	

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								
	03/25/2009	-1.70	±	1.39	-6.27	±	5.15	
IDAHO FALLS	01/07/2009	-0.07	±	1.27	-0.26	±	4.70	
	01/14/2009	0.73	±	1.24	2.71	±	4.60	
	01/21/2009	0.50	±	1.32	1.85	±	4.88	
	01/28/2009	2.15	±	1.55	7.95	±	5.72	
	02/04/2009	1.20	±	1.38	4.43	±	5.11	
	02/11/2009	-1.03	±	1.71	-3.83	±	6.35	
	02/18/2009	1.49	±	1.32	5.51	±	4.87	
	02/25/2009	-0.16	±	1.89	-0.59	±	7.00	
	03/04/2009	-1.20	±	1.21	-4.43	±	4.48	
	03/11/2009	-0.21	±	1.32	-0.79	±	4.88	
	03/18/2009	-0.44	±	1.23	-1.64	±	4.55	
	03/25/2009	-1.62	±	1.33	-5.99	±	4.92	
JACKSON	01/07/2009	-0.34	±	1.14	-1.26	±	4.23	
	01/14/2009	-0.85	±	2.10	-3.13	±	7.78	
	01/21/2009	-0.57	±	1.65	-2.11	±	6.09	
	01/28/2009	1.88	±	1.61	6.96	±	5.96	
	02/04/2009	-0.87	±	1.52	-3.21	±	5.61	
	02/11/2009	3.79	±	1.42	14.02	±	5.24	
	02/18/2009	-0.70	±	1.34	-2.60	±	4.97	
	02/25/2009	2.74	±	1.34	10.13	±	4.95	
	03/04/2009	1.59	±	1.38	5.89	±	5.09	
	03/11/2009	-3.97	±	1.19	-14.68	±	4.40	
	03/18/2009	-0.57	±	1.31	-2.12	±	4.85	
	03/25/2009	-1.42	±	1.33	-5.26	±	4.93	
REXBURG CMS	01/07/2009	-0.07	±	1.20	-0.25	±	4.43	
	01/14/2009	0.75	±	1.28	2.79	±	4.73	
	01/21/2009	0.65	±	1.71	2.40	±	6.32	
	01/28/2009	2.00	±	1.44	7.39	±	5.33	
	02/04/2009	1.38	±	1.59	5.10	±	5.88	
	02/11/2009	-0.85	±	1.40	-3.13	±	5.19	
	02/18/2009	1.52	±	1.34	5.61	±	4.96	
	02/25/2009	-0.17	±	2.02	-0.63	±	7.46	
a	03/04/2009	-15.23	±	15.42	-56.36	±	57.05	
	03/11/2009	-0.23	±	1.39	-0.84	±	5.15	
	03/18/2009	-0.41	±	1.13	-1.50	±	4.18	
	03/25/2009	-1.38	±	1.13	-5.10	±	4.19	
INL SITE								
EFS	01/07/2009	-0.37	±	1.26	-1.39	±	4.66	
	01/14/2009	-0.82	±	2.05	-3.05	±	7.58	
	01/21/2009	-0.62	±	1.77	-2.28	±	6.57	
	01/28/2009	1.72	±	1.47	6.37	±	5.45	
	02/04/2009	-0.79	±	1.39	-2.93	±	5.13	
	02/11/2009	3.62	±	1.35	13.39	±	5.01	
	02/18/2009	-0.69	±	1.31	-2.54	±	4.86	
	02/25/2009	2.77	±	1.35	10.26	±	5.01	
	03/04/2009	1.63	±	1.41	6.03	±	5.21	
	03/11/2009	-4.97	±	1.60	-18.39	±	5.92	

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								
	03/18/2009	-0.94	±	2.16	-3.49	±	8.00	
	03/25/2009	-1.83	±	1.71	-6.76	±	6.33	
MAIN GATE	01/07/2009	-0.83	±	2.78	-3.06	±	10.29	
	01/14/2009	-0.76	±	1.88	-2.79	±	6.94	
	01/21/2009	-0.58	±	1.67	-2.14	±	6.17	
	01/28/2009	1.72	±	1.47	6.36	±	5.45	
	02/04/2009	-0.82	±	1.43	-3.03	±	5.30	
	02/11/2009	4.46	±	1.67	16.51	±	6.17	
	02/18/2009	-0.95	±	1.82	-3.52	±	6.72	
	02/25/2009	5.67	±	2.77	21.00	±	10.25	
	03/04/2009	1.60	±	1.38	5.91	±	5.11	
	03/11/2009	-8.61	±	2.77	-31.84	±	10.24	
	03/18/2009	-0.55	±	1.27	-2.05	±	4.69	
	03/25/2009	-1.62	±	1.52	-6.01	±	5.63	
VAN BUREN GATE	01/07/2009	-0.46	±	1.54	-1.70	±	5.71	
	01/14/2009	-0.98	±	2.43	-3.62	±	8.99	
	01/21/2009	-0.74	±	2.14	-2.74	±	7.91	
	01/28/2009	1.88	±	1.61	6.96	±	5.96	
	02/04/2009	-0.88	±	1.54	-3.26	±	5.71	
	02/11/2009	3.96	±	1.48	14.67	±	5.49	
	02/18/2009	-0.72	±	1.38	-2.67	±	5.10	
	02/25/2009	2.79	±	1.36	10.34	±	5.05	
	03/04/2009	1.60	±	1.39	5.93	±	5.12	
	03/11/2009	-4.87	±	1.57	-18.03	±	5.80	
	03/18/2009	-0.67	±	1.53	-2.48	±	5.68	
	03/25/2009	-1.71	±	1.61	-6.34	±	5.94	

a. Invalid Sample Result

TABLE C-3. Quarterly Americium-241, Cesium-137, Plutonium-238, Plutonium-239/240, and Strontium-90 Concentrations in Composite Air Filters.

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-13}$ Bq/mL)			Result > 3s
BOUNDARY									
ARCO	3/30/2009	CESIUM-137	-163.00	±	121.00	-603.10	±	447.70	
ATOMIC CITY	3/30/2009	CESIUM-137	-38.40	±	164.00	-142.08	±	606.80	
ATOMIC CITY (QA-1)	3/30/2009	AMERICIUM-241	1.80	±	1.68	6.65	±	6.22	
		CESIUM-137	-28.50	±	87.60	-105.45	±	324.12	
		PLUTONIUM-238	2.29	±	0.94	8.45	±	3.46	
		PLUTONIUM-239/40	1.14	±	1.57	4.23	±	5.81	
BLUE DOME	3/30/2009	CESIUM-137	-267.00	±	154.00	-987.90	±	569.80	
		STRONTIUM-90	25.20	±	125.00	93.24	±	462.50	
BLUE DOME (QA-2)	3/30/2009	CESIUM-137	14.40	±	150.00	53.28	±	555.00	
		STRONTIUM-90	-15.70	±	87.50	-58.09	±	323.75	
FAA TOWER	3/30/2009	CESIUM-137	-342.00	±	163.00	-1265.40	±	603.10	
		STRONTIUM-90	81.80	±	15.70	302.66	±	58.09	Y
HOWE	3/30/2009	CESIUM-137	166.00	±	156.00	614.20	±	577.20	
MONTEVIEW	3/30/2009	AMERICIUM-241	0.86	±	0.95	3.19	±	3.52	
		CESIUM-137	64.50	±	122.00	238.65	±	451.40	
MUD LAKE	3/30/2009	CESIUM-137	-151.00	±	89.70	-558.70	±	331.89	

TABLE C-3. Quarterly Americium-241, Cesium-137, Plutonium-238, Plutonium-239/240, and Strontium-90 Concentrations in Composite Air Filters.

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-13}$ Bq/mL)			Result > 3s
DISTANT									
BLACKFOOT	3/30/2009	CESIUM-137	76.10	±	101.00	281.57	±	373.70	
CRATERS	3/30/2009	CESIUM-137	-34.70	±	132.00	-128.39	±	488.40	
DUBOIS	3/30/2009	CESIUM-137	215.00	±	130.00	795.50	±	481.00	
IDAHO FALLS	3/30/2009	CESIUM-137	-78.80	±	94.60	-291.56	±	350.02	
		STRONTIUM-90	221.00	±	93.50	817.70	±	345.95	
JACKSON	3/30/2009	CESIUM-137	148.00	±	143.00	547.60	±	529.10	
REXBURG CMS	3/30/2009	AMERICIUM-241	-0.49	±	2.01	-1.80	±	7.43	
		CESIUM-137	-67.20	±	103.00	-248.64	±	381.10	
INL SITE									
EFS	3/30/2009	AMERICIUM-241	0.37	±	1.32	1.36	±	4.90	
		CESIUM-137	118.00	±	125.00	436.60	±	462.50	
MAIN GATE	3/30/2009	CESIUM-137	153.00	±	173.00	566.10	±	640.10	
		STRONTIUM-90	-19.80	±	112.00	-73.26	±	414.40	
VAN BUREN GATE	3/30/2009	CESIUM-137	-84.20	±	125.00	-311.54	±	462.50	
		STRONTIUM-90	159.00	±	117.00	588.30	±	432.90	

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$_{air}$)			Collection Medium	Result > 3s
BOUNDARY										
ATOMIC CITY	12/31/2008	02/11/2009	5.79	±	1.43	21.42	±	5.28	Molecular Sieve	Y
ATOMIC CITY	02/11/2009	03/18/2009	4.34	±	1.22	16.06	±	4.52	Molecular Sieve	Y
DISTANT										
BLACKFOOT	12/10/2008	01/21/2009	3.53	±	1.05	13.07	±	3.89	Molecular Sieve	Y
BLACKFOOT	01/21/2009	03/04/2009	3.66	±	0.98	13.54	±	3.63	Molecular Sieve	Y
IDAHO FALLS	12/04/2008	01/28/2009	3.35	±	0.73	12.38	±	2.71	Molecular Sieve	Y
IDAHO FALLS	01/28/2009	03/25/2009	1.47	±	0.63	5.44	±	2.34	Molecular Sieve	
REXBURG CMS	12/31/2008	03/11/2009	6.85	±	1.61	25.34	±	5.96	Molecular Sieve	Y

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
IDAHO FALLS	12/1/2008	1/2/2009	40.10	±	32.40	1.48	±	1.20	
	1/2/2009	2/2/2009	53.80	±	33.30	1.99	±	1.23	
	2/2/2009	3/2/2009	164.00	±	34.10	6.07	±	1.26	Y
CFA	1/2/2009	2/2/2009	110.00	±	34.00	4.07	±	1.26	Y
	2/2/2009	3/2/2009	138.00	±	33.60	5.11	±	1.24	Y
EFS	12/31/2009	1/7/2009	128.00	±	34.10	4.74	±	1.26	Y
	1/14/2009	1/21/2009	19.00	±	32.60	0.70	±	1.21	
	1/21/2009	1/28/2009	71.50	±	33.70	2.65	±	1.25	
	2/11/2009	2/18/2009	105.00	±	33.90	3.89	±	1.25	Y
	2/18/2009	2/25/2009	122.00	±	34.20	4.51	±	1.27	Y
	2/25/2009	3/4/2009	82.00	±	32.40	3.03	±	1.20	
	3/11/2009	3/18/2009	140.00	±	33.70	5.18	±	1.25	Y
	3/18/2009	3/25/2009	93.30	±	33.10	3.45	±	1.22	

Table C-6. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk

Location	Sampling Date	Iodine-131 Result ± 1s Uncertainty (pCi[†]/L)			Iodine-131 Result ± 1s Uncertainty (Bq[‡]/L)			Result > 3s	Cesium-137 Result ± 1s Uncertainty (pCi/L)			Cesium-137 Result ± 1s Uncertainty (Bq/L)			Result > 3s
BLACKFOOT															
	3/3/2009	0.07	±	2.75	0.003	±	0.102		1.24	±	1.31	0.046	±	0.049	
DIETRICH															
	01/06/2009	1.24	±	2.21	0.046	±	0.082		1.19	±	2.70	0.044	±	0.100	
	02/03/2009	1.86	±	2.25	0.069	±	0.083		-1.33	±	2.64	-0.049	±	0.098	
	03/03/2009	0.10	±	0.89	0.004	±	0.033		0.19	±	0.77	0.007	±	0.029	
FORT HALL															
	01/06/2009	1.23	±	1.20	0.046	±	0.044		-1.02	±	0.89	-0.038	±	0.033	
HOWE															
	01/06/2009	0.47	±	1.16	0.017	±	0.043		1.11	±	0.90	0.041	±	0.033	
	02/03/2009	0.57	±	1.19	0.021	±	0.044		-1.07	±	0.97	-0.040	±	0.036	
	03/03/2009	-1.73	±	0.96	-0.064	±	0.036		0.19	±	0.78	0.007	±	0.029	
Duplicate	03/03/2009	0.96	±	1.86	0.036	±	0.069		1.81	±	1.36	0.067	±	0.050	
IDAHO FALLS															
	01/06/2009	-0.02	±	0.73	-0.001	±	0.027		1.27	±	0.81	0.047	±	0.030	
	01/13/2009	0.92	±	0.74	0.034	±	0.028		1.03	±	0.81	0.038	±	0.030	
	01/20/2009	0.82	±	0.75	0.030	±	0.028		-0.04	±	0.81	-0.002	±	0.030	
	01/27/2009	0.07	±	1.18	0.003	±	0.044		0.83	±	0.93	0.031	±	0.034	
	02/03/2009	0.40	±	0.76	0.015	±	0.028		-1.45	±	0.82	-0.054	±	0.031	
	02/10/2009	-0.34	±	1.52	-0.013	±	0.056		-0.31	±	1.39	-0.011	±	0.051	
	02/17/2009	-0.41	±	0.74	-0.015	±	0.028		0.69	±	0.82	0.025	±	0.030	
	02/24/2009	-0.31	±	0.84	-0.012	±	0.031		-1.49	±	0.75	-0.055	±	0.028	
	03/03/2009	-0.79	±	0.83	-0.029	±	0.031		0.14	±	0.77	0.005	±	0.028	
	03/10/2009	-1.27	±	0.77	-0.047	±	0.028		-0.66	±	0.75	-0.024	±	0.028	
	03/17/2009	-1.49	±	0.90	-0.055	±	0.033		-0.12	±	0.77	-0.004	±	0.028	
	03/24/2009	-0.77	±	1.52	-0.029	±	0.056		-0.70	±	1.28	-0.026	±	0.047	
	03/31/2009	0.23	±	0.80	0.009	±	0.030		0.57	±	0.77	0.021	±	0.029	
MORELAND															
	01/06/2009	-0.50	±	1.12	-0.019	±	0.041		1.70	±	0.91	0.063	±	0.034	
	02/03/2009	-0.65	±	1.10	-0.024	±	0.041		1.73	±	0.91	0.064	±	0.034	
	03/03/2009	1.33	±	1.50	0.049	±	0.056		-0.40	±	1.43	-0.015	±	0.053	
Duplicate	03/03/2009	0.44	±	1.10	0.016	±	0.041		-0.53	±	0.95	-0.020	±	0.035	

Table C-6. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk

RUPERT												
	01/06/2009	0.03	±	0.82	0.001	±	0.030	1.18	±	0.81	0.044	± 0.030
	02/03/2009	-1.77	±	1.71	-0.066	±	0.063	-1.05	±	1.40	-0.039	± 0.052
	03/03/2009	-1.44	±	1.23	-0.053	±	0.046	-1.74	±	0.92	-0.064	± 0.034
TERRETON												
	01/06/2009	-3.74	±	2.33	-0.139	±	0.086	2.55	±	2.65	0.094	± 0.098
	02/03/2009	-0.17	±	2.36	-0.006	±	0.087	-0.18	±	2.65	-0.007	± 0.098
	03/03/2009	0.15	±	1.09	0.006	±	0.040	-1.16	±	0.79	-0.043	± 0.029

Table C-9. Cesium-137 and Iodine-131 Concentrations 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
MULE DEER	3/11/2009	Muscle	^{131}I	-0.29	±	4.82	-1.07	±	17.83	
			^{137}Cs	5.68	±	2.51	21.02	±	9.29	
MULE DEER	3/11/2009	Liver	^{131}I	-0.72	±	2.00	-2.65	±	7.40	
			^{137}Cs	2.35	±	0.94	8.70	±	3.49	
MULE DEER	3/11/2009	Thyroid	^{131}I	383.00	±	274.00	1417.10	±	1013.80	
			^{137}Cs	73.80	±	254.00	273.06	±	939.80	

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	0.71
January	0.74
February	0.81
March	0.66
Gross Beta	
Quarter	0.17
January	0.63
February	0.06
March	0.62

a. A 'p' value greater than 0.05 signifies no statistical difference between data groups.

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 7	0.10
	January 14	0.17
	January 21	0.32
	January 28	0.32
	February 4	1.00
	February 11	0.57
	February 18	0.48
	February 25	0.67
	March 4	0.86
	March 11	0.62
	March 18	0.89
	March 25	0.48
Gross Beta		
	January 7	0.12
	January 14	0.39
	January 21	0.12
	January 28	0.67
	February 4	0.12
	February 11	0.20
	February 18	0.57
	February 25	0.06
	March 4	0.32
	March 11	0.48
	March 18	0.57
	March 25	0.89

a. A 'p' value greater than 0.05 signifies no statistical difference between data groups.