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Idaho National Engineering and Environmental Laboratory Offsite Environmental Surveillance Program Report: Second Quarter 2000

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EXECUTIVE SUMMARY

This report for the second quarter, 2000, consists of results from the Environmental Surveillance, Education, and Research (ESER) Program's monitoring of the Department of Energy's Idaho National Engineering and Environmental Laboratory's (INEEL) offsite environment. All sample types (media) and the sampling schedule followed during 2000 are listed in Appendix A. Specifically, this report contains the results for the following:

- Air Sampling, including air filters and charcoal cartridges, atmospheric moisture,
- Precipitation,
- Drinking and Surface water,
- Food Stuff sampling, including milk, sheep, large game animal, and marmot collection, and
- Environmental Radiation.

The average gross alpha concentrations in four of the thirteen weeks (those ending April 12, April 19, May 10, and May 31, 2000) at INEEL locations were significantly different from Boundary or Distant averages. In all cases, Distant samples were higher than the INEEL average. There were no statistical differences in weekly gross beta concentration averages at INEEL, Boundary, or Distant locations. No ^{131}I was detected in any of the weekly charcoal cartridges during the second quarter.

Selected quarterly composite filter samples were analyzed for gamma emitting radionuclides. ^{137}Cs was measured in the sample from the Monteview station, while $^{239/240}$Pu was measured in the sample from the Blackfoot Community Monitoring Station. Both $^{239/240}$Pu and ^{137}Cs were deposited around the world from atmospheric nuclear weapons testing so the measurements of ^{137}Cs at Monteview and $^{239/240}$Pu in Blackfoot do not necessarily indicate inputs from the INEEL, though this cannot be ruled out. However, concentrations are within the range of values measured around the World. No specific radionuclides were detected in composite filter samples from other locations including those on the INEEL. Details of both weekly and quarterly analyses can be found in section 3.1.

Only the Idaho Falls atmospheric moisture sample had a tritium result greater than its 2s uncertainty [$(8.2 \pm 6.5) \times 10^{-13}$ µCi/ml of air, or $(3.03 \pm 2.41) \times 10^{-9}$ Bq/ml of air]. This result is just over the 2s-uncertainty value so there is a relatively high probability that this value is a false positive. More details on atmospheric moisture results can be found in section 3.2.

Airborne particulate sampling is discussed in section 3.3. Results for the period were below regulatory levels except for a single 24-hour exceedance at the Blackfoot Community Monitoring Station. The April 5, 2000 value of 164.13 µg/m^3 is above the EPA limit of 150 :g/m^3. This elevated level of particulates can be attributed to agricultural activities (tilling and planting) in the area of the sampler.

One of two precipitation samples collected at the Experimental Field Station (EFS) on the INEEL in April yielded a tritium result greater than 2s-uncertainty $(1.49 \pm 0.73) \times 10^2$ pCi/L, or 5.51 ± 2.7 Bq/L). Reanalysis of this sample produced a result less than its 2s uncertainty [(-1.8 ± 72) pCi/L, or -0.06 ± 2.7 Bq/L]. Averaging the values and propagating the error resulted in a value that does not exceed the 2s value (73.6 ± 102 pCi/L). More details on precipitation results can be found in section 4.1.

The results of the semiannual drinking and surface water sampling are discussed in detail in sections 4.2 and 4.3. None of the drinking or surface water samples collected had measurable levels of tritium above the 2s value. All samples collected had initial analytical results for gross beta above the 2s value. Recounts of selected samples yielded results below the 2s value. One surface water and three drinking water samples yielded analytical results for gross alpha greater than the 2s value. Again recounts were below the 2s value. None of the samples with measurable activity exceeded their respective MDC values. As explained in the *Helpful Information* section these results are considered to be false positives.

All concentrations of radioactivity found in these samples were consistent with concentrations which have been found in samples during recent quarters and which have been attributed in the past to natural background radioactivity, worldwide fallout from past nuclear weapons testing, and nuclear operations around the world. No measured concentrations could be directly attributed to operations at the INEEL. Concentrations in all of the samples collected and analyzed over the second quarter 2000 were below guidelines set by both the DOE and the U.S. Environmental Protection Agency (EPA) for protection of the public.

Of the 42 milk samples collected over the second quarter, 2000, none of the samples contained detectable concentrations of ^{131}I. Six samples had ^{137}Cs results above their 2s uncertainty values, though none exceeded the MDC. Immediate recounts could not support detection for five of the samples (the recount did not exceed the 2s value). Further information on second quarter milk samples can be found in section 5.1.

Section 5.2 presents the results on two big game animals (one mule deer, one pronghorn antelope) that were sampled in the second quarter. Of these two animals only the muscle tissue sample from the antelope yielded a ^{137}Cs level greater than the 2s uncertainty level [(3.2 ± 2.6) x 10^{-9} µCi/g wet weight, or (1.2 ± 0.96) x 10^{-4} Bq/g wet weight].

The second quarter, 2000 also included the annual collection of sheep, and a special sampling of marmots. Of the six sheep sampled, three, one each from the north and south INEEL allotments and control group, had measurable ^{137}Cs in their tissue. Recounts of the samples could not support the initial results (the recounts were less than the 2s value). Details of this sampling are found in section 5.3.

Section 5.4 discusses marmots that were collected from the RWMC and a control population. Three animals were collected from each location. Two RWMC animals had human-made radionuclides above the 2s value. One animal gave a positive result for ^{137}Cs and one for ^{90}Sr.

Finally in section 6 are presented the results of the semi-annual environmental radiation measurements. For the period November 1999 through May 2000, there was no statistical difference between exposure rates at Boundary and Distant locations, with levels of 0.39 mR/day and 0.41 mR/day, respectively.

All concentrations of radioactivity found in samples collected by the ESER program during the first quarter, 2000, were consistent with concentrations which have been found in samples taken during recent years. No measured concentrations could be directly attributed to operations at the INEEL. Radionuclide concentrations in all of the samples collected and analyzed over the second quarter, 2000 were below guidelines set by both the DOE and the EPA for protection of human health.

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LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission	
Bq	becquerel	
CFA	Central Facilities Area	
CMS	community monitoring station	
Ci	curie	
DCG	Derived Concentration Guide	
DOE – ID	U.S. Department of Energy Idaho Operations Office	
EAL	Environmental Assessment Laboratory	
EFS	Experimental Field Station	
EML	Environmental Measurements Laboratory	
EPA	Environmental Protection Agency	
ERAMS	Environmental Radiation Ambient Monitoring System	
ESER Program	Environmental Surveillance, Education, and Research Program	
g	gram	
INEEL	Idaho National Engineering and Environmental Laboratory	
ISU	Idaho State University	
L	liter	
MDA	minimum detectable activity	
MDC	minimum detectable concentration	
mi	mile	
mL	milliliter	(0.001 liters)
mR	milliroentgens	(0.001 roentgens)
mrem	millirem	(0.001 rem)
µCi	microcurie	(10^{-6} curies)
pCi	picocurie	(10^{-12} curies)
PM_{10}	particulate matter less than 10 micrometers in diameter	
R	roentgen	
rem	Unit of doe equivalent (roentgen-equivalent-man)	
s	standard deviation	
SASP	Surface Air Sampling Program	
SI	Systeme International d'Unites	
Sv	seivert	
µSv	microseiverts (10^{-6} seivert)	

HELPFUL INFORMATION

Elements That Make Up Our World

Atoms make up everything in our world. The basic parts of an atom are protons, neutrons, and electrons (Figure 1). Different atoms may have different numbers of each of these parts. An element is a substance that is made up of only atoms with the same number of protons. Elements with different numbers of neutrons are referred to as isotopes of that element. Elements are sometimes expressed with the one- or two-letter chemical symbol for that element. The atomic weight, shown as a superscript number, is equal to the number of protons and neutrons in its nucleus and is used to identify the isotope of that element. Some isotopes of some elements are radioactive, including many naturally occurring elements. Radioactive isotopes, when taken as a whole for more than one element, are collectively referred to as radionuclides. All human-made radionuclides detected during this quarter are listed in this report. A list of common human-made radionuclides, along with their chemical symbol, are listed below.

Symbol		Radionuclide
^{3}H	-	Tritium
^{90}Sr	-	Strontium-90
^{131}I	-	Iodine-131
^{137}Cs	-	Cesium-137
^{238}Pu	-	Plutonium-238
$^{239/240}Pu$	-	Plutonium-239/240
^{241}Am	-	Americium-241

Helium Atom

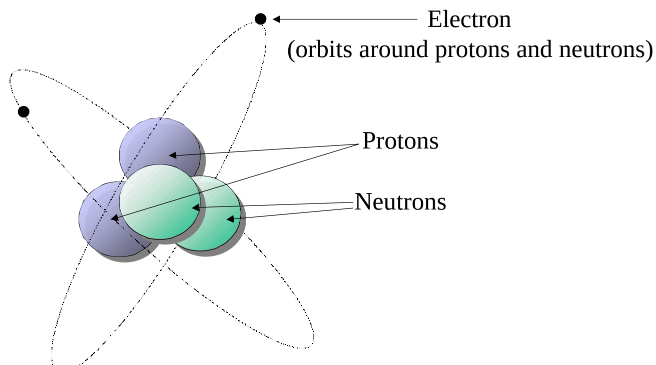

FIGURE 1. An atom of the element Helium. An element is a substance that is made up of only atoms with the same number of protons.

Radiation

Radioactive atoms are unstable and, in an effort to become stable, release energy. This release of energy comes from the release of particles or electromagnetic waves as the radioactive atom “decays,” or “disintegrates.” The three main types of radiation are alpha, beta, and gamma radiation (Figure 2). Alpha and beta are two types of particles emitted from an atom. Alpha particles consist of two protons and two neutrons (equal to the nucleus of a helium atom). Alpha particles do not travel very far (only centimeters in air) and are easily stopped. They will not penetrate paper or the outer layer of your skin so they are not an external hazard to the body. Internally, however, they are of more concern. Beta particles are electrons emitted from the nucleus of an atom. Beta particles can have enough energy to penetrate paper or skin but not materials like wood or plastic. Gamma rays are short-wavelength electromagnetic waves (photons) emitted from the nucleus of an atom following radioactive decay. Gamma ray radiation has a penetration ability greater than alpha or beta radiation. In fact, X-rays are the same as gamma radiation except they are produced from the orbital electrons of atoms rather than the nucleus. The rate at which a given amount of a particular radioactive isotope decays is measured by its half-life. The half-life is the time required for half of the amount present to decay.

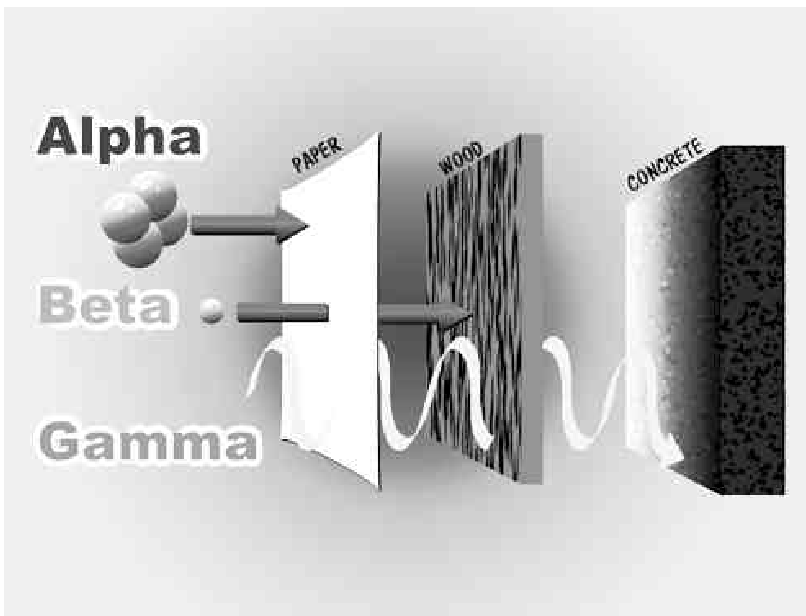

FIGURE 2. Three main types of radiation are alpha, beta, & gamma. Alpha and beta are particles emitted from an atom. Gamma radiation is short-wavelength electromagnetic waves (photons) emitted from atoms.

Units Used to Express the Amount of Radioactivity

Radioactivity is measured by the number of atoms that disintegrate per unit time. The conventional unit for activity is the curie (Ci). A curie is defined as the activity in one gram of naturally occurring Radium-226 and equals 37,000,000,000 disintegrations per second (Figure 3). The Systeme International d'Unites (SI) is the recognized international standard for describing measurable quantities and their units. The standard SI unit for radioactivity is the becquerel (Bq). A becquerel is equal to one disintegration per second (Figure 3).

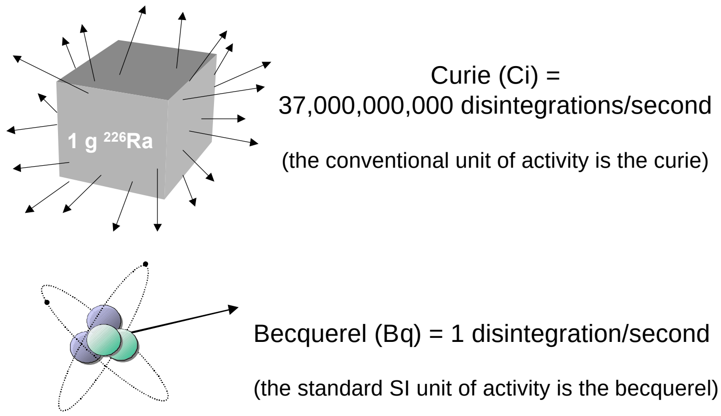

FIGURE 3. Units used to express the amount of radioactivity.

Radiation Exposure and Dose

The primary concern regarding radioactivity is the amount of energy deposited by particles or gamma radiation to the surrounding environment. It is possible that the energy from radiation may damage living tissue. When radiation interacts with the atoms of a given substance, it can alter the number of electrons associated with those atoms (usually removing orbital electrons). This is called ionization.

The term “exposure” is used to express the amount of ionization produced in air by electromagnetic (gamma and X-ray) radiation. The unit of exposure from gamma or X-ray radiation is the roentgen (R). The average exposure rate from natural radioactivity in southeast Idaho is about 0.130 R per year.

Radiation absorbed dose describes the amount of energy from ionizing radiation absorbed by any kind of matter. When absorbed dose is adjusted to account for the amount of biological damage a particular type of radiation causes, it is known as dose equivalent. The unit for dose equivalence is called the rem (“roentgen-equivalent-man”). The SI unit for dose equivalent is called the seivert (Sv). One seivert is equivalent to 100 rem.

Unit Prefixes

The range of numbers experienced in many scientific fields, like that of environmental monitoring for radioactivity, is huge and units for very small and very large numbers are commonly expressed by scientists as a prefix that modifies the unit of measure. One example is the prefix *kilo*, abbreviated k, which means 1,000 of a given unit. A kilometer is therefore equal to 1,000 meters. Prefixes used in this report include:

Prefix	Abbreviation	Meaning
Mega	M	1,000,000 (= 1 x 10^{6})
milli	m	0.001 (= 1 x 10^{-3})
micro	µ	0.000001 (1 x 10^{-6})
pico	p	0.000000000001 (= 1 x 10^{-12})

Scientific Notation

Scientific notation is used to express numbers which are very small or very large. A very small number will be expressed with a negative exponent, e.g., 1.2×10^{-6}. To convert this number to the more commonly used form, the decimal point must be moved left by the number of places equal to the exponent (in this case, six). Thus the number 1.2×10^{-6} is equal to 0.0000012. A large number will be expressed with a positive exponent, e.g. 1.2×10^{6}. To convert this number, the decimal point must be moved right by the number of places equal to the exponent. For example, the number 1.2×10^{6} is equal to 1,200,000.

Concentrations of Radioactivity

The amount of radioactivity in a substance of interest is described by its concentration. The concentration is the amount of radioactivity per unit volume or weight of that substance. Air, milk, and atmospheric moisture samples are expressed as activity per milliliter (mL). Concentrations in surface water, drinking water, and precipitation samples are expressed as activity per liter (L). Radioactivity in foodstuff and soil are expressed as activity per gram (g). Exposure, as measured by environmental dosimeters, is expressed in units of milliroentgens (mR). This is sometimes expressed in terms of dose as millirem (mrem) or microseiverts (:Sv).

Gross versus Specific Analyses

Some analyses are designed to detect specific radionuclides (specific analyses) while other analyses are designed to measure radiation from a large number of sources (gross analyses). Gamma emitting radionuclides are determined by a specific analyses technique called gamma spectroscopy. Analyses for specific alpha and beta emitting radionuclides, on the other hand, require more difficult and expensive radiochemical analyses. Low cost, but very sensitive, gross measurements are often substituted for the more expensive specific analyses as a screening procedure. The gross analyses are generally made first to determine the total amount of radioactivity that is present. The more expensive specific analyses of beta and alpha emitting radionuclides are only made if the gross measurements are above background levels. When gross beta or gross alpha measurements are made, it simply means all beta activity or all alpha activity is measured. There is no distinction between which beta-emitting or alpha-emitting radionuclides are present, just how much beta or alpha activity there is present. Gross measurements are used as a method to screen samples for relative levels of radioactivity.

Detecting Radioactivity

All measurements have uncertainties. Uncertainty arises from variations in detection equipment and analysis procedures, natural background radiation, the random nature of radioactive decay, variances in the distribution of the compound targeted for analysis in the media being analyzed, and other sources. The analysis uncertainty is reported with radioactive analyses. This uncertainty exists because individual radioactive atoms disintegrate in a random way, both in location throughout a substance and direction particles or gamma rays are emitted. That is to say not all of the particles/energy released strike the detector. If the number of radioactive disintegrations from one sample are counted multiple times, each for the same duration, that number will vary around some average value. Background radiation makes this true even for a sample that has no radioactivity. If a sample containing no radioactivity was analyzed multiple times, the net result should vary around an average of zero (Figure 4). Therefore, samples with radioactivity levels very close to zero will have results that are negative values approximately 50% of the time. In order to avoid censoring data, these negative values, rather than "not detectable" or "zero," are reported for radionuclides of interest. This provides more information than merely truncating to the detection limits for results near background activities and allows for improved statistical analyses and measures of trends in the data.

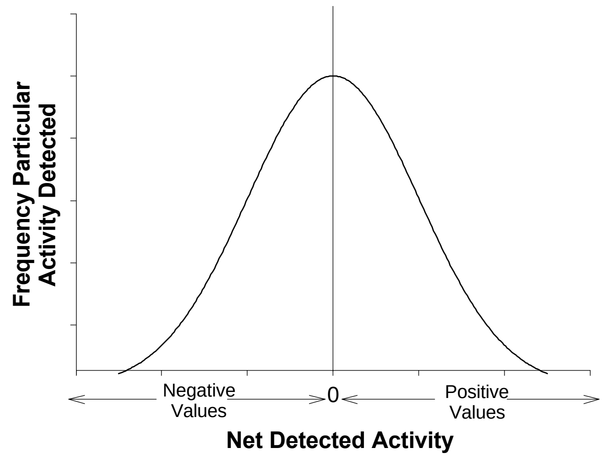

FIGURE 4. Expected frequency distribution for a sample with no radioactivity. If a sample containing no radioactivity was analyzed multiple times, a distribution of net values with an average of zero would result. Samples with radioactivity levels very close to zero are expected to have net results that are negative values approximately 50% of the time after background is subtracted.

Confidence in Detections

There are two main types of errors that may be made when reporting levels of contaminants:

- reporting something as not present when it actually is, and;
- reporting something as present when it actually is not.

It is the goal of the ESER program to minimize the error of saying something is not present when it actually is. To do this, a two standard deviation (2s) reporting level is used. The standard deviation is a measurement of the variation from the mean. In a distribution of results for one sample, the average result, plus or minus (±) two standard deviations (2s) of that average, approximates the 95% confidence interval for that average. When a net sample result is greater than 2s from zero, we have about 95% confidence[1] the value came from a distribution with an average greater than zero (Figure 5). The uncertainty of measurements in this report are denoted by following the result with a "±" 2s uncertainty term and all results that are greater than 2s from zero are reported in the text (all data are reported in Appendix C).

By using a 2s value as a reporting level (i.e. reporting net results that are greater than two times their uncertainty), we are controlling the error rate for saying something is not there when it is, to less than 5% (we have 95% confidence the value is greater than zero). However, there is a relatively high error rate for false detections (reporting something as present when it actually is not) for results near their 2s uncertainty. This is because there is variability around a net activity of zero for samples with no radioactivity which may substantially overlap the variability around the sample result (Figure 5). Variability associated with current analysis techniques

[1] 95% confidence interval is equal to 1.96s.

were used to calculate the level at which we are 95% certain the sample result is greater than the *distribution* of values for a sample with no radioactivity. This level is known as the minimum detectable activity (MDA). When sample net results are greater than the MDA, (Figure 6) we have 95% confidence the results are not false detections. The MDA per sample weight or volume is called the minimum detectable concentration (MDC). All results with measured levels greater than the MDC will be specifically highlighted in this report.

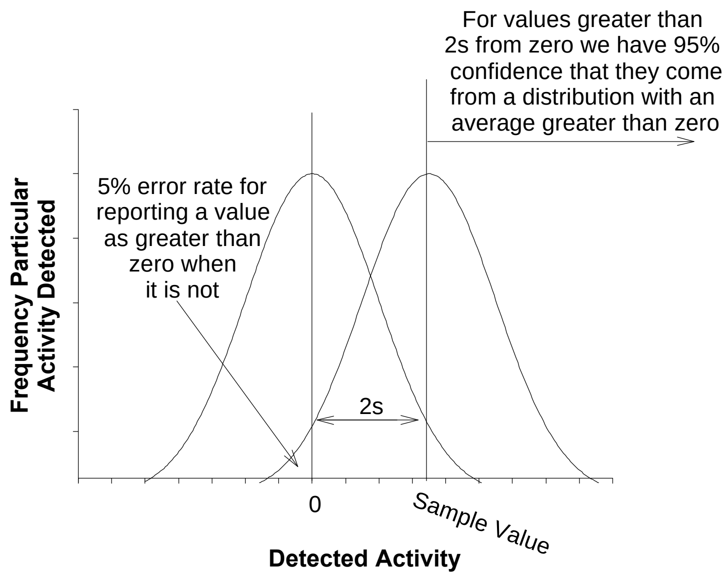

FIGURE 5. Radioactivity is reported when the result is greater than 2s from a net activity of zero. However, because there is variability around a net activity of zero for a sample with no radioactivity and variability around some value for a sample with radioactivity, there is a high rate for false detections for results near 2s.

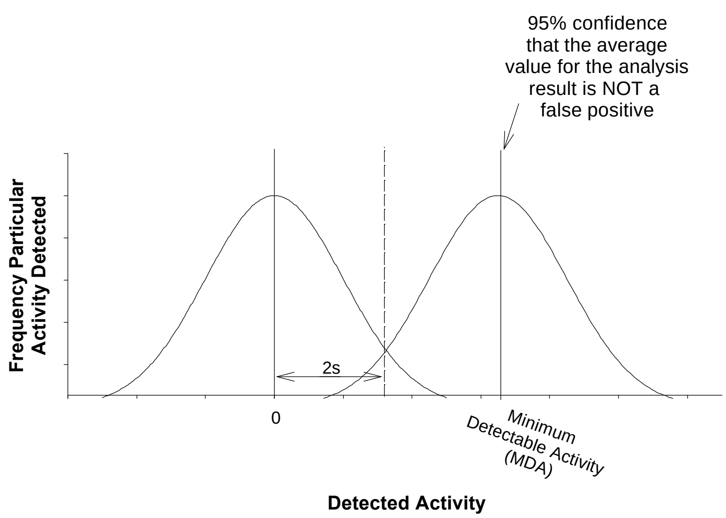

FIGURE 6. 95% confidence level that a sample result is not a false positive (95% confidence the sample result is greater than 2s from zero) is obtained when the sample result is greater than the MDA.

Determining Statistical Differences

When radiological measurements are made, it is often of interest to determine whether concentrations are different between locations or periods of time. For example, if the INEEL were a significant source of offsite contamination, concentrations of contaminants would be higher at INEEL locations compared to Boundary locations which, in turn, would be higher than at Distant locations, this, due to dispersal. To investigate this, statistical tests are used. Specifically, an independent samples t-test is used to test if there are significant differences between the average gross alpha and gross beta concentrations at INEEL, Boundary, and Distant locations. Groups are considered significantly different if the 95% confidence interval for their averages overlap (t-test with $\alpha = 0.05$).

Radioactivity In Our World

Radiation has always been a part of the natural environment in the form of cosmic radiation, cosmogenic radionuclides [carbon-14 (^{14}C), Beryllium-7 (^{7}Be), and tritium (^{3}H)], and naturally occurring radionuclides, such as potassium-40 (^{40}K), and the thorium, uranium, and actinium series radionuclides which have very long half lives. Additionally, human-made radionuclides were distributed throughout the world beginning in the early 1940s. Atmospheric testing of nuclear weapons from 1945 through 1980 and nuclear power plant accidents, such as the Chernobyl accident in the former Soviet Union during 1986, have resulted in fallout of detectable radionuclides around the world. This natural and global fallout radioactivity is referred to as background radiation.

The radionuclides present in our environment can give both internal and external doses (Table 1). Internal dose is received as a result of the intake of radionuclides. The major routes of intake of radionuclides for members of the public are ingestion and inhalation. Ingestion includes the intake of the radionuclides from drinking milk and water, and consumption of food products. Inhalation includes the intake of radionuclides through breathing dust particles containing radioactive materials.

We sample the air at 15 locations on and around the INEEL; surface water at 4 locations on the Snake River; drinking water at 14 locations around the INEEL; foodstuff which includes milk at 9 dairies around the INEEL, potatoes from at least 5 local producers, wheat from 11 local producers, lettuce from 8 home-owned gardens around the INEEL, sheep from 2 operators which graze their sheep on the INEEL, and various numbers of wildlife (game animals) which include big game (pronghorn, mule deer, and elk), waterfowl, and fish sampled on and near the INEEL. Table A-1 in Appendix A lists samples, sampling locations and collection frequency for the ESER Program.

Regulatory Limits

During the last 100 years, research has been conducted in an attempt to understand the effects of radiation on humans and the environment. Much of this research was done using standard epidemiological and toxicological approaches to characterize the response of populations and individuals to high radiation doses. A good understanding of risks associated with high radiation doses was achieved. At low exposures to radiation, however, healing of cells does occur so the risks from these levels are less known. This problem is compounded because scientists are searching for effects from exposure to low levels of radiation in the midst of exposures to much larger amounts of natural radiation. The only measurable increased cancer incidence has occurred following high radiation doses. Mathematical models have been used to predict risks from low radiation doses. Regulatory dose limits are set well below levels where measurable health effects have been observed. The total radiation dose limit for individual members of the public as defined by the Code of Federal Regulations (10 CFR 20.1301) is 1 mSv/y (100 mrem/y), not including the dose contribution from background radiation. Limits on emissions of radionuclides to the air from DOE facilities are set such that they will not result in a dose greater than 0.1 mSv/y (10 mrem/y) to any member of the public (40 CFR 61.92). DOE drinking water criterion have set limits of 0.04 mSv/y (4 mrem/y) for the ingestion of drinking water (DOE Order 5400.5,), and EPA limits on drinking water supplies specify low allowable limits for radioactive constituents (40 CFR Parts 9, 141, and 142). DOE Order 5400.5 lists Derived Concentration Guide (DCG) values which are the concentrations in air and water that a person exposed to continuously (ingested and inhaled given certain assumptions) will result in the dose limit. DCG values are used as a reference to ensure observed concentrations are lower than concentrations that would result in a dose near the limit. ESER Program laboratories analyze for radionuclides at levels ranging from 10 to over one million times lower than those that would result in a dose near the limits (Table B-1, Appendix B).

TABLE 1. Annual estimated average dose received by a member of the population of the United States from natural radiation sources. (data source NCRP 1987)[a].

	Average Annual Effective Dose Equivalent	
SOURCE	**(mSv)[b]**	**(mrem)[c]**
Inhaled (Radon and Decay Products)	2	200
Other Internally Deposited Radionuclides	0.39	39
Terrestrial Radiation	0.28	28
Cosmic Radiation	0.27	27
Cosmogenic Radioactivity	.01	1
Rounded Total From Natural Sources	3	300

[a] Natural radiation doses vary based on local geology and elevation.
[b] milliseiverts
[c] millirem

1. ESER PROGRAM DESCRIPTION

Operations at the Idaho National Engineering and Environmental Laboratory (INEEL) 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 Clean Water Act). The requirements imposed by DOE are specified in the DOE Orders. These requirements include monitoring the effects, of DOE activities onsite and offsite of the INEEL (DOE Order 5400.1). During calendar year 2000, environmental monitoring within the INEEL boundaries was primarily the responsibility of the INEEL Management and Operating (M&O) contractor, while the program for monitoring outside the INEEL boundaries was conducted under the Environmental Surveillance, Education, and Research (ESER) Program by an independent contractor. Samples for the first portion of the year, 2000, were collected by the Environmental Science and Research Foundation (Idaho Falls, ID) that formerly held the ESER contract. This report was prepared by the new ESER Team (assuming responsibilities of the ESER program in November, 2000) lead by the S.M. Stoller Corporation. The team includes North Wind Environmental, Montgomery-Watson Harza for technical support, the University of Idaho and Washington State University for research assistance, and Idaho State University (ISU) for analytical services. This report contains the monitoring results from the ESER Program for the second quarter of 2000.

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, radiological, and biological condition of environmental media on and around the INEEL;
- Assess the potential radiation dose to members of the public from INEEL effluents, and;
- Present program results clearly and concisely through the use of reports, presentations, newsletter articles, and press releases.

The INEEL ESER Program's primary responsibility is to monitor a number of different pathways by which pollutants from the INEEL could reach members of the public. The constituents of primary concern are radioactive isotopes and the surveillance program focuses on these constituents. The goal of the surveillance program is to monitor several different media points within these potential pathways, including air, water, foodstuff, and soil, that could potentially contribute to the dose received by the public. A comprehensive list of the annual sample collection schedule is presented in Appendix A.

Once samples have been collected and analyzed, the ESER Program has the responsibility for quality control of the data and preparing quarterly reports on results from the environmental surveillance program. The quarterly reports are then combined into the *INEEL Annual Site Environmental Report* for each calendar year. Annual reports also include data collected by other INEEL contractors.

The ESER Program used several different laboratories to perform analyses on environmental samples for 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 ^{90}Sr , ^{238}Pu, $^{239/240}$Pu, and ^{241}Am are performed under contract with Severn-Trent, Inc. The Operational Dosimetry unit of the INEEL M&O contractor evaluates environmental dosimeters. Samples collected by the ESER Program on behalf of the EPA are sent to the EPA's Eastern Environmental Radiation Facility.

In the event of non-routine occurrences, such as suspected releases of radioactive material, the ESER Program may increase either the frequency of sampling or the number of sampling locations based on the nature of the release and wind distribution patterns. In the event of any suspected worldwide nuclear incidents, like the Chernobyl accident, the EPA may request additional sampling be performed through the Environmental Radiation Ambient Monitoring System (ERAMS) network of which the ESER Program operates air and precipitation sampling equipment in Idaho Falls. 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 is comprised of a nationwide network of sampling stations that provide air, precipitation, surface water, drinking water, and milk samples. Any data found to be outside historical norms in the ESER Program are thoroughly investigated to determine if an INEEL origin is likely. Investigation may include re-sampling and/or re-analysis of prior samples.

For more information concerning the ESER Program, contact S.M. Stoller Corporation at (208) 525-9358, or visit the Program's web page (http://www.stoller-eser.com).

2. THE INEEL

The Idaho National Engineering and Environmental Laboratory (INEEL) is a nuclear energy 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 2,300 km^2 (890 mi^2) of the upper Snake River Plain in Southeastern Idaho. The history of the INEEL began during World War II when the U.S. Naval Ordnance Station was located in Pocatello, Idaho. This station, one of just two such installations in the U.S., retooled large guns from U.S. Navy ships. The facility tested the retooled guns on the nearby-uninhabited plain, known as the Naval Proving Ground. In the aftermath of 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 electricity. The facility evolved into an assembly of 52 reactors, associated research centers, and waste handling areas. The NRTS was renamed the Idaho National Engineering Laboratory in 1974 and INEEL in January 1997. Only two reactors are operable today with most activities on the INEEL centered on environmental restoration and waste management activities.

3. AIR SAMPLING

Surface water does not flow from the INEEL so the primary pathway by which radionuclides can move off-site is through the air. Consequently, air is a primary focus of monitoring on and around the INEEL. Particulates and ^{131}I in air are measured at 15 locations; three on the INEEL with the rest at Boundary and Distant locations using low-volume air samplers. Moisture in the atmosphere is sampled at four locations around the INEEL and analyzed for tritium. All air and atmospheric moisture samples are analyzed by gamma spectrometry for any gamma emitting radionuclides. Because of its prevalence in the environment primarily due to atmospheric nuclear testing and recent nuclear accidents (i.e., Chernobyl) cesium-137 is the most commonly measured radionuclide in samples. Other radionuclides are reported when they are found (measured). Concentrations of particulates in the air are measured using PM_{10} samplers at three locations. Air sampling activities and results for the second quarter, 2000 are discussed below.

3.1 Low-Volume Air Sampling

Radioactivity associated with airborne particulates was monitored continuously by 17 ESER Program air samplers at 15 locations during the second quarter of 2000 (Figure 7). Three of these samplers were located on the INEEL, seven were located off the INEEL near the boundary, and five were at locations distant the INEEL. Samplers are divided into INEEL, Boundary and Distant groups to determine if there is a gradient of radionuclide concentrations, increasing towards the INEEL. One replicate sampler was placed at FAA Tower (Boundary location) and one at Monteview (Boundary location) during all of 2000. An average of 17,853 ft^3 (506 m^3) of air was sampled at each location, each week, at an average flow rate of 1.8 ft^3/min (0.05 m^3/min). Particulates in air were collected on filters (1.2 µm pore size), while gases were pulled through activated charcoal cartridges.

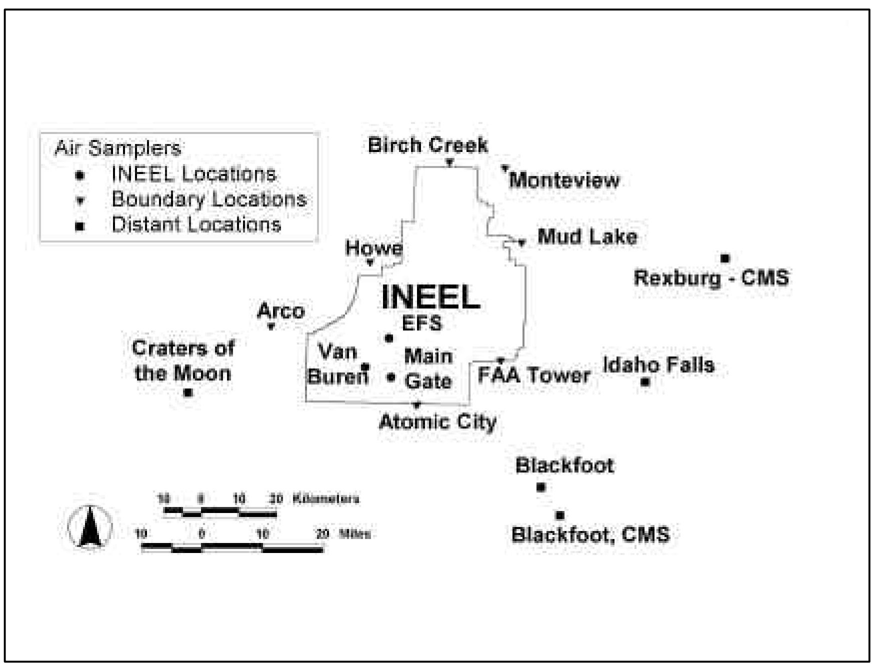

FIGURE 7. Continuous air sampling locations.

Filters and charcoal cartridges were changed weekly at each station. Each filter was screened 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. For more information concerning gross alpha and beta radioactivity, see the *Gross versus Specific Analyses* portion of the *Helpful Information* section of this report. Charcoal cartridges were analyzed for gamma emitting radionuclides, specifically ^{131}I. Iodine-131 is of great interest because it is produced in relatively large quantities by nuclear fission and has a half-life of only eight days. This means any ^{131}I that is detected would be from a recent release of fission products. Finally, a composite of 13 filters, one for each week of the quarter, for each location was analyzed for gamma-emitting radionuclides with a subset analyzed for ^{90}Sr, ^{238}Pu, $^{239/240}$Pu, and ^{241}Am.

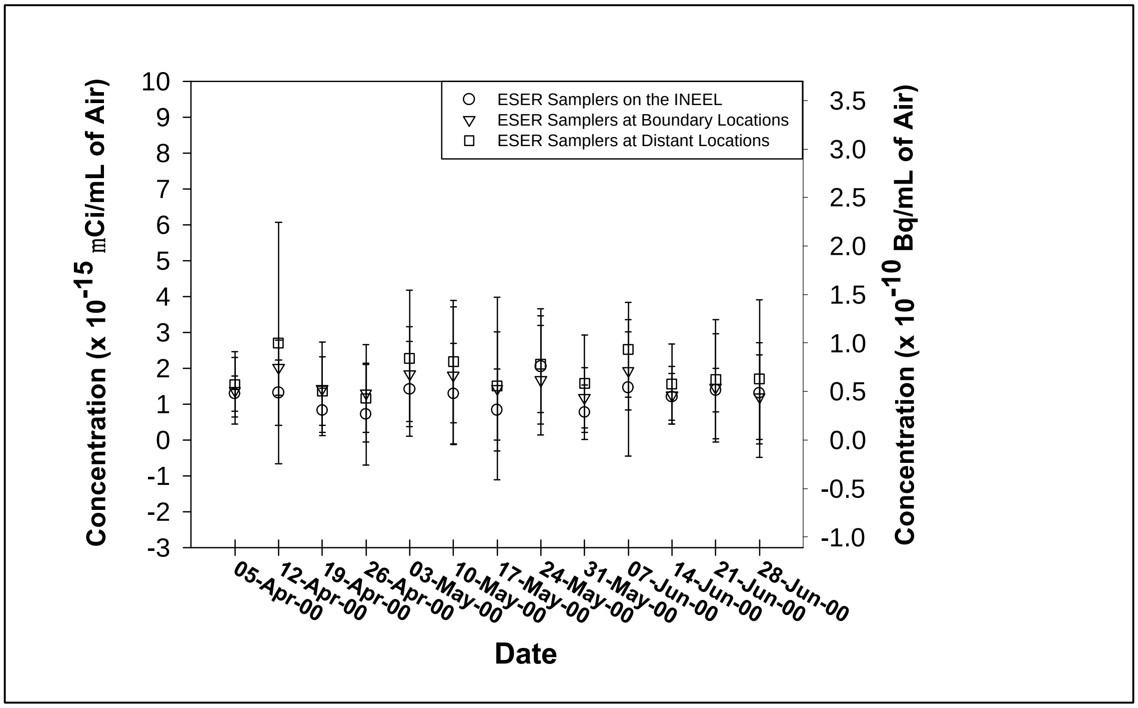

FIGURE 8. Weekly average gross alpha concentrations in air at ESER Program INEEL, Boundary, and Distant locations (error bars equal ± 2 standard deviations).

INEEL, Boundary, and distant location weekly average gross alpha concentrations in air are shown in Figure 8. Weekly average gross beta concentrations are shown in Figure 9. None of the weekly average gross alpha or gross beta concentrations at INEEL locations were significantly higher (using independent samples t-tests and ± = 0.05) than the corresponding averages for Boundary or Distant locations. A summary of approximate minimum detectable concentrations for radiological analyses data is provided in Appendix B, and gross alpha and gross beta results for individual filters are listed in Table C-1 of Appendix C.

Monthly average gross alpha and beta concentrations in air at each sampling location are shown in Figures 10 – 15. No ^{131}I was detected in any of the weekly charcoal cartridges during the second quarter. Weekly ^{131}I results for each location are listed in Table C-2 of Appendix C.

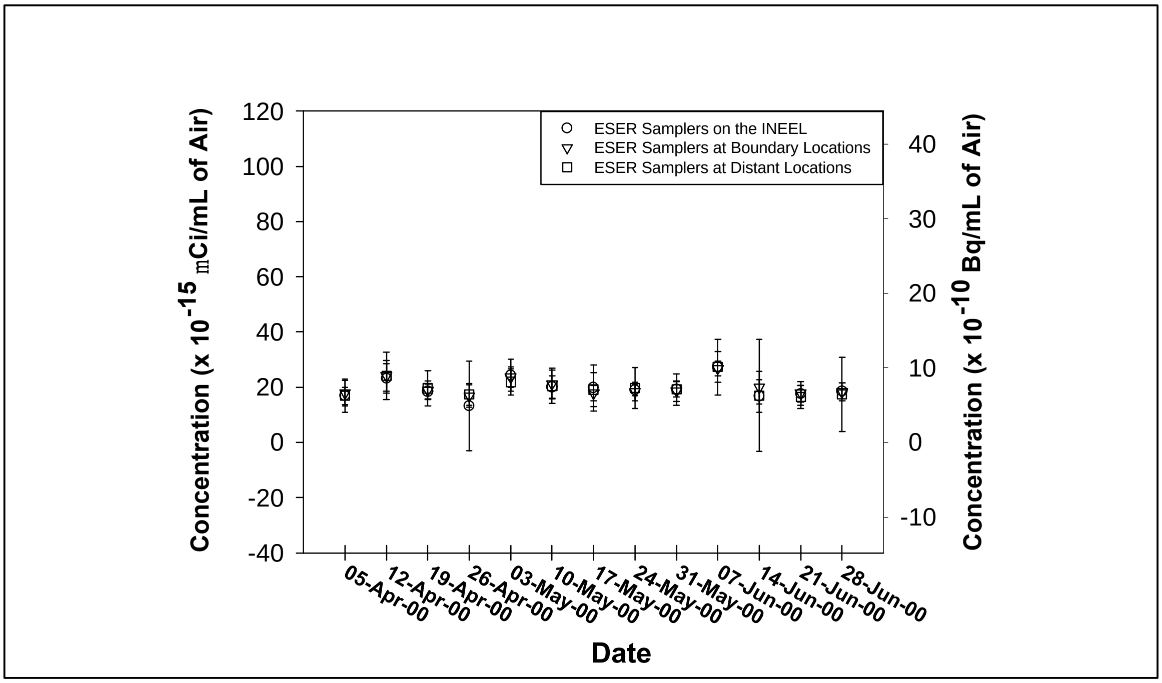

FIGURE 9. Average gross beta concentrations in air at ESER Program INEEL, Boundary, and Distant locations (error bars equal ± 2 standard deviations).

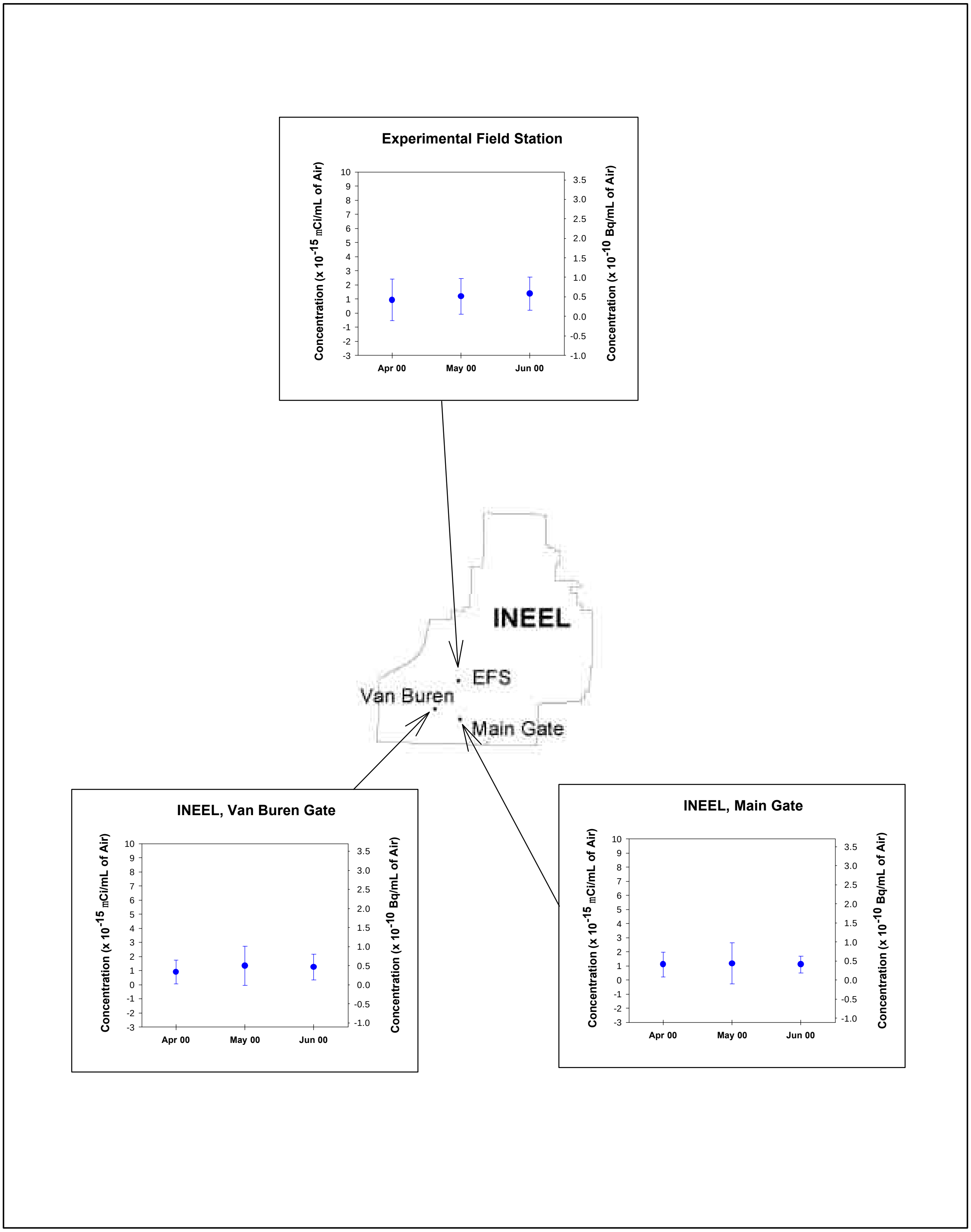

FIGURE 10. Monthly average gross alpha concentrations in air at ESER Program INEEL Locations.

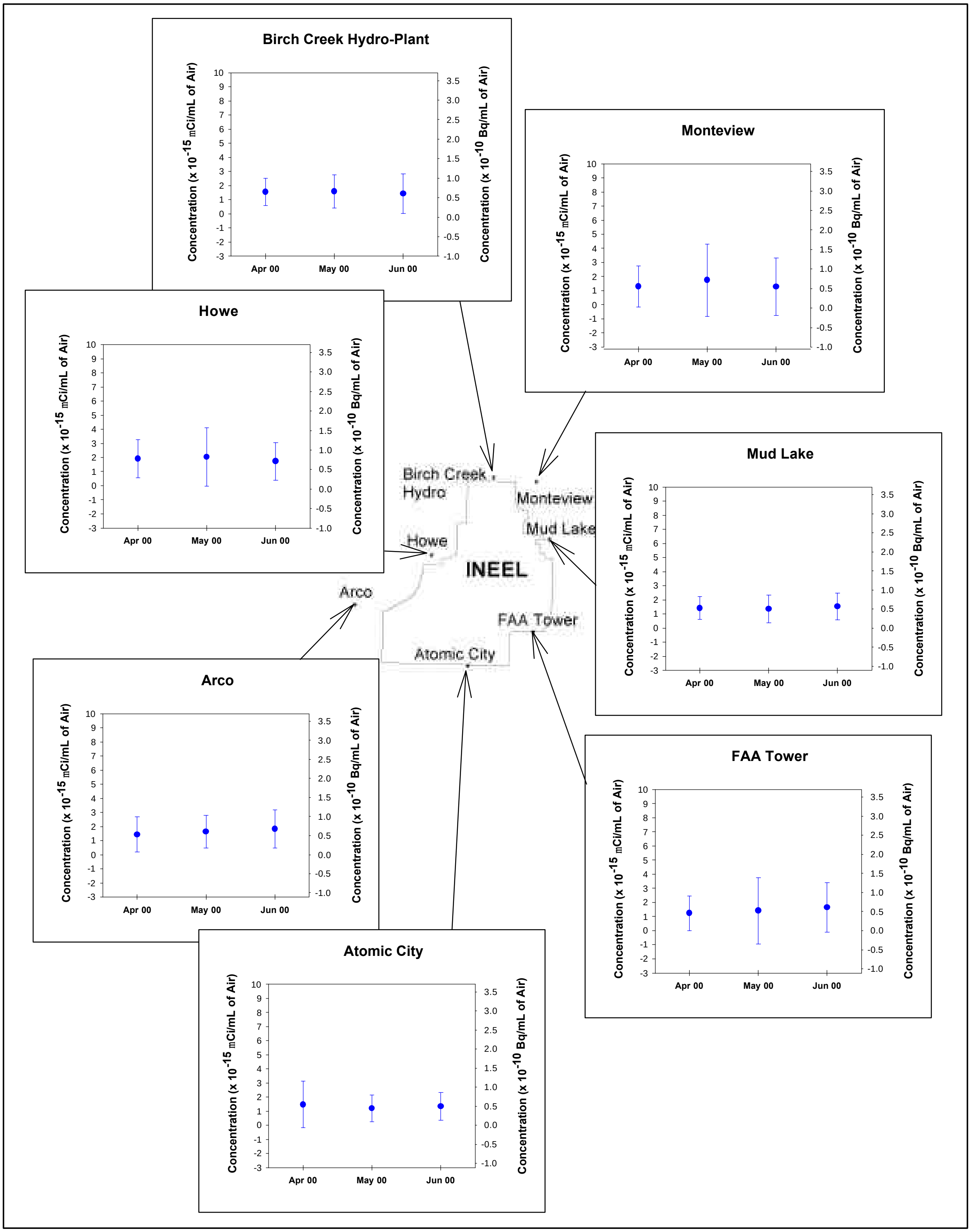

FIGURE 11. Monthly average gross alpha concentrations in air at ESER Program Boundary Locations.

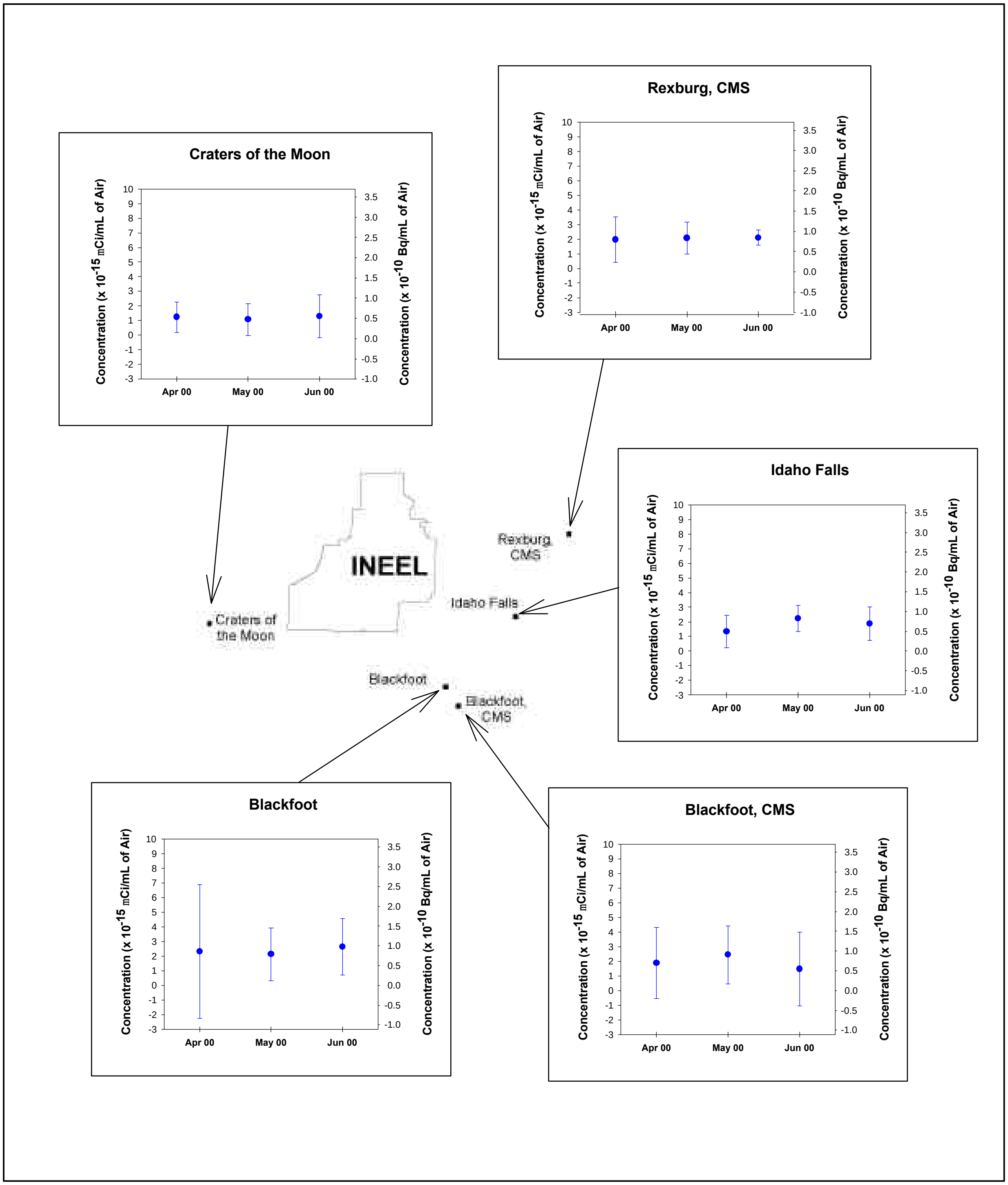

FIGURE 12. Monthly average gross alpha concentrations in air at ESER Program Distant Locations.

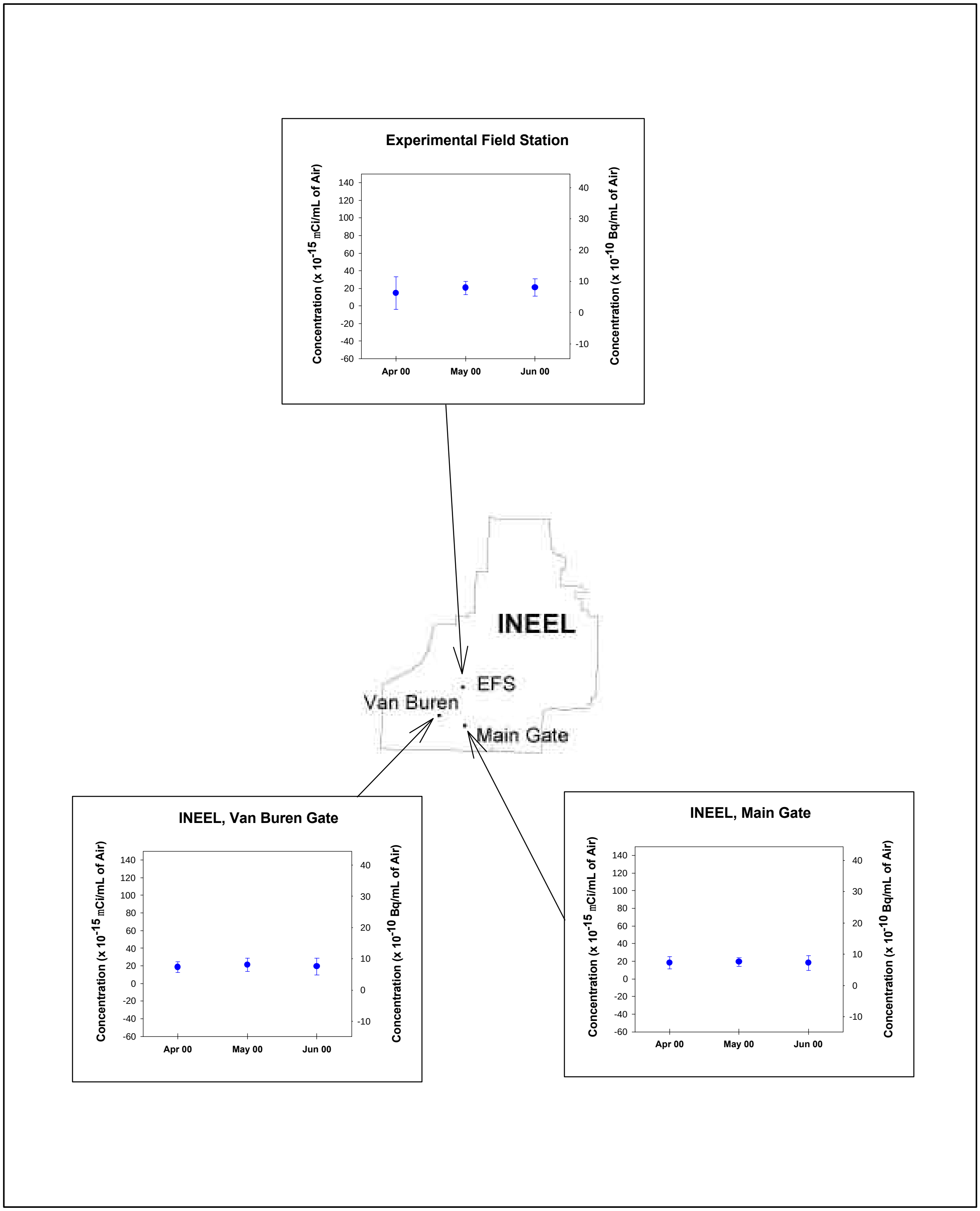

FIGURE 13. Monthly average gross beta concentrations in air at ESER Program INEEL Locations.

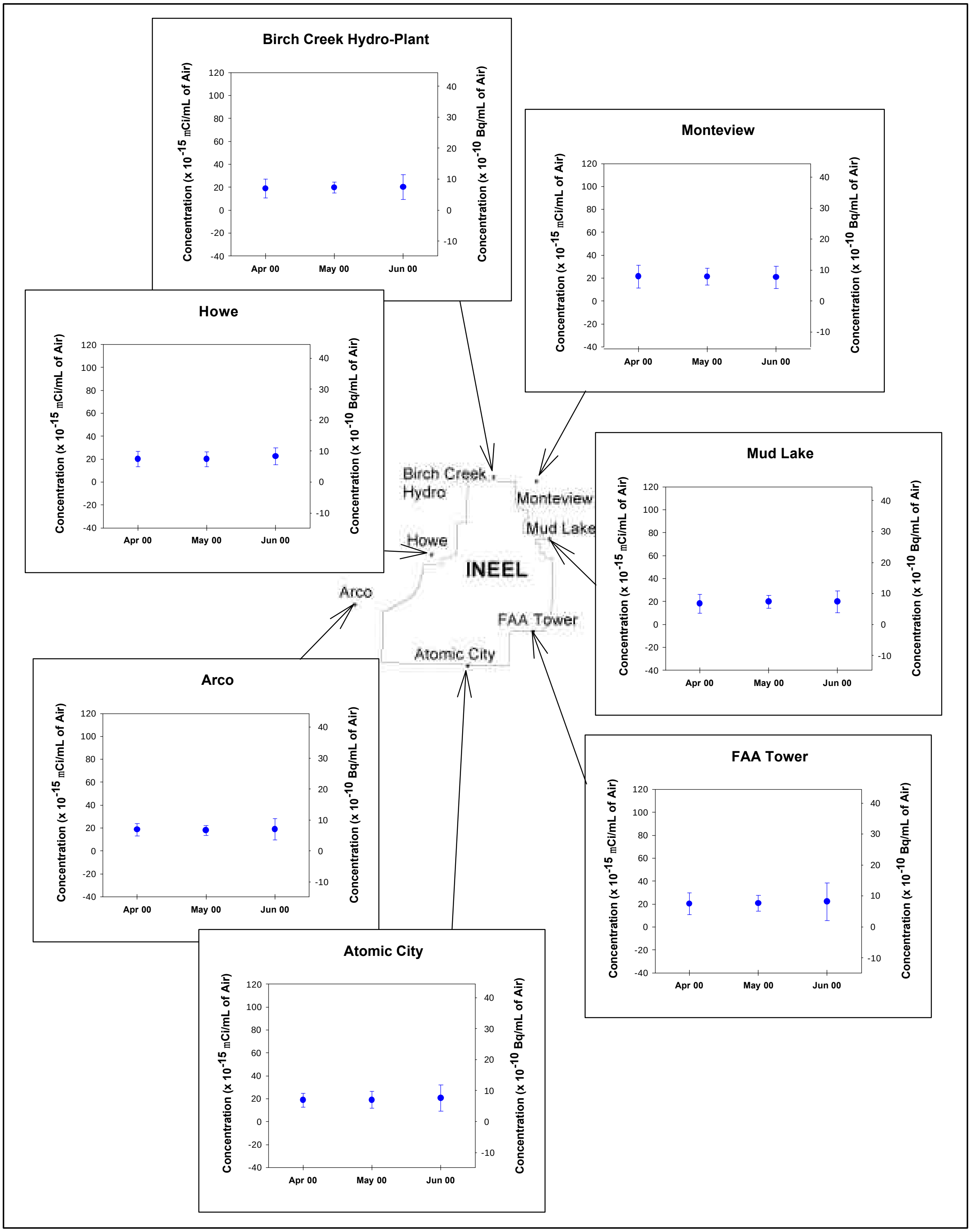

FIGURE 14. Monthly average gross beta concentrations in air at ESER Program Boundary Locations.

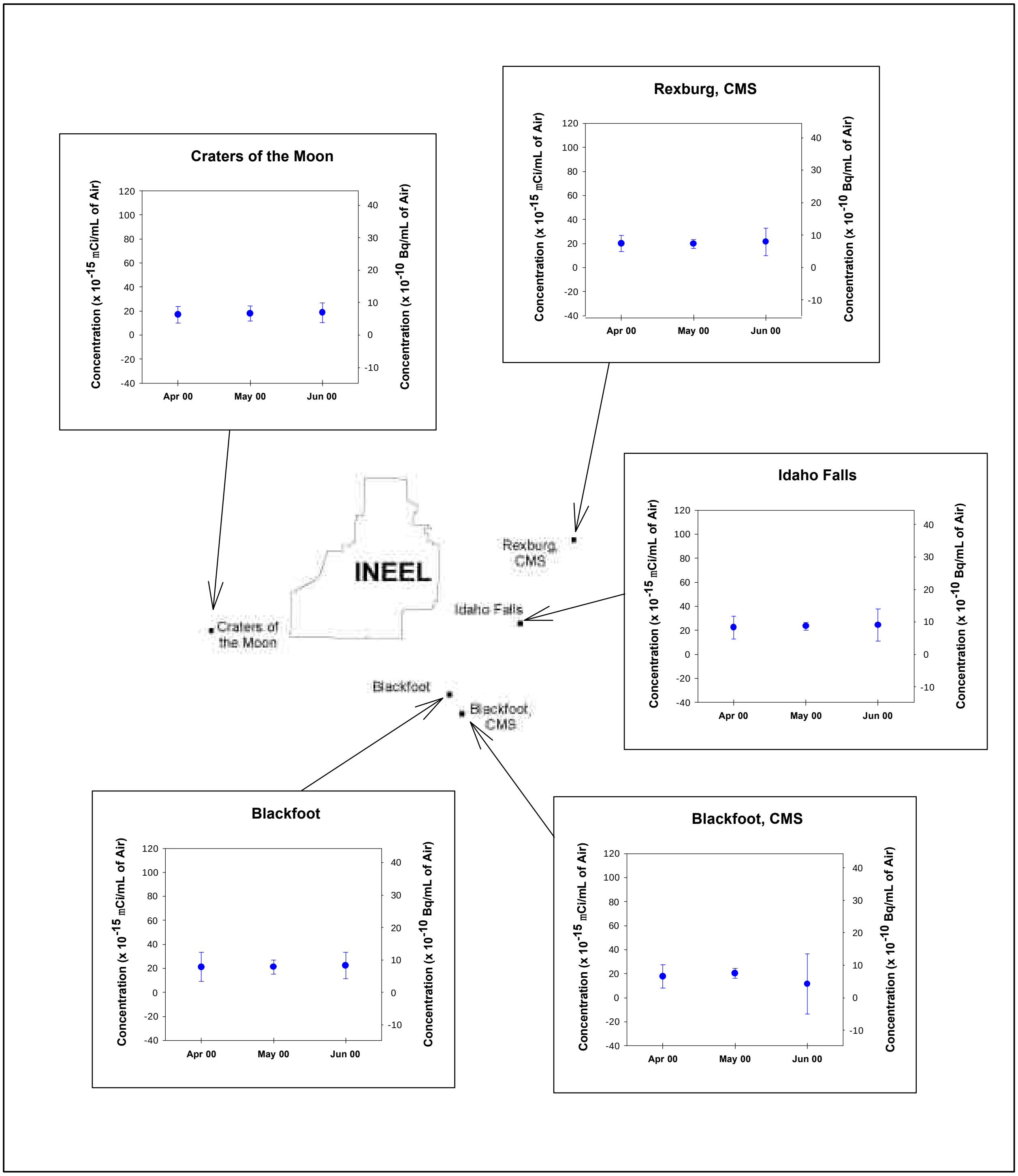

FIGURE 15. Monthly average gross beta concentrations in air at ESER Program Distant Locations.

Selected quarterly composited filters were analyzed for the gamma emitting radionuclides, ^{90}Sr, ^{238}Pu, $^{239/240}Pu$, and ^{241}Am. Two human-made radionuclides were measured on composite filter samples. The first was ^{137}Cs measured on the composite sample from Monteview at a concentration in air of $(2.69 \pm 1.88) \times 10^{-16}$ µCi/mL of air [$(9.95 \pm 6.96) \times 10^{-12}$ Bq/mL of air]. This value is slightly less than the minimum detectable concentration (MDC) of 3.0×10^{-16} :Ci/mL of air (1.11×10^{-11} Bq/mL of air) (see Table B-1, Appendix B). No ^{137}Cs was measured on the composite filter from the replicate sampler at that location or at any other samplers nearby or on the INEEL. Concentrations of ^{137}Cs measured at Monteview were over one million times lower than DCG values set to ensure dose limits are not exceeded (compare sample results with DCG values listed in Table B-1, Appendix B). The second human-made radionuclide, $^{239/240}Pu$, was measured at the Community Monitoring Station (CMS) in Blackfoot at a concentration of $(1.57 \pm 1.40) \times 10^{-18}$ µCi/mL of air [$(5.81 \pm 5.18) \times 10^{-14}$ Bq/mL of air], slightly lower than the MDC of 1.58×10^{-18} (5.85×10^{-14} Bq/mL of air) for $^{239/240}Pu$ on air filters. The concentration of $^{239/240}Pu$ measured in Blackfoot was over twelve thousand times lower than DCG values set to ensure dose limits are not exceeded (Table B-1).

Both $^{239/240}Pu$ and ^{137}Cs were deposited around the world from atmospheric nuclear weapons testing so the measurements of ^{137}Cs at Monteview and $^{239/240}Pu$ in Blackfoot do not necessarily indicate inputs from the INEEL, though this cannot be ruled out. However, concentrations are within the range of values measured around the World. The Department of Energy's Environmental Measurements Laboratory (EML), Surface Air Sampling Program (SASP) has a database available (http://www.eml.doe.gov/databases/SASP/) with information on EML's archived air filter samples. The program was established in 1957 to track the global dispersion of radioactive debris resulting from atmospheric testing of nuclear bombs. Though the most recent data for $^{239/240}Pu$ is 1985, concentrations measured around the INEEL are within the range seen throughout the world. Results for composite filter samples from the second quarter, 2000, are shown in Table C-3 of Appendix C.

3.2 Atmospheric Moisture Sampling

Four atmospheric moisture samples were obtained during the second quarter of 2000; one each from Rexburg, Blackfoot, Idaho Falls, and Atomic City. Atmospheric moisture is collected by pulling air through a column of silica gel that absorbs water vapor. The water is then extracted from the silica gel by heat distillation. The resulting atmospheric moisture samples were then analyzed for tritium using liquid scintillation.

Only the Idaho Falls sample, April 5 through July 5, had a tritium result greater than its 2s uncertainty [$(8.2 \pm 6.5) \times 10^{-14}$ µCi/mL of air, or $(3.03 \pm 2.41) \times 10^{-10}$ Bq/mL of air]. While this result is over the 2s-uncertainty value, it is well below the MDC value. The analytical result is also well below the DOE Derived Concentration Guide (DCG) for tritium in air of 1.7×10^{-7} :Ci/mL of air. Because the result does not exceed its MDC, there is a relatively high probability that this is a false positive (see *Confidence in Detections* in the *Helpful Information* section of this report). Tritium results for all atmospheric moisture samples are listed in Table C-4 of Appendix C.

3.3 PM_{10} Air Sampling

The EPA began using a standard for concentrations of airborne particulate matter in 1987. The standard refers only to "particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers" (40 CFR 50.6). Particles of this size are capable of reaching the deeper regions of the lungs, and are considered to be responsible for most of the adverse health effects associated with airborne particulate pollution. The air quality standards for fine particulates, generally referred to as PM_{10}, are an annual average of 50 µg/m^3, with a maximum 24-hour concentration of 150 µg/m^3.

The ESER Program operates three PM_{10} samplers, one each at Rexburg, Blackfoot, and Atomic City. Samples are collected by running the sampler for twenty-four hours every sixth day. This yielded a total of 15 samples collected at each location during the second quarter of 2000. All but a single PM_{10} concentration was below the air quality standards for fine particulates. The Rexburg sampler did not have a sample collected on May 5 due to an equipment failure. In addition the filter weight from June 28 was in error due to an error in weighing the filter before being placed in the field. The maximum 24-hour concentration was recorded at Blackfoot of 164.13 µg/m^3 on April 5, 2000. This exceeds the maximum 24-hour concentration of 150 µg/m^3. Since PM_{10} is a measure of particulates in the air, this exceedance is probably due to agricultural activities in the area of the sampler (e.g., dust from planting nearby fields). Table 3 lists average, maximum, and minimum values for each station. Results for all PM_{10} samples are listed in Table C-5, Appendix C.

TABLE 2. PM_{10} values (µg/m^3) in for each station.

	Atomic City	Blackfoot	Rexburg
Average	16.4	27.4	13.8
Maximum	55.5	164.1	30.9
Minimum	3.7	6.0	5.5

4. WATER SAMPLING

Water that is sampled by the ESER program includes precipitation and surface and drinking water. Monthly composite precipitation samples are collected from Idaho Falls and the Central Facilities Area (CFA) at the INEEL. Weekly precipitation samples are collected from the Experimental Field Station (EFS) on the INEEL. Surface and/or drinking water are sampled twice each year at 18 locations around the INEEL (Figure 16). This occurs during the second and fourth quarters. All water samples are analyzed by gamma spectrometry for any gamma emitting radionuclides. Because of its prevalence in the environment primarily due to atmospheric nuclear testing and recent nuclear accidents (i.e., Chernobyl) cesium-137 is the most commonly measured radionuclide in samples. Other radionuclides are reported when they are found.

4.1 Precipitation Sampling

Monthly composite precipitation samples were collected from Idaho Falls and the Central Facilities Area (CFA) on the INEEL. Enough precipitation occurred during the quarter for each station to yield one sample per month for a total of six samples. Weekly precipitation samples are collected from the Experimental Field Station (EFS). The EFS station had two samples collected in April (April 11 and April 25), and one each in May and June.

Of all the precipitation samples collected, only the EFS sample from April 11, yielded a tritium result greater than the 2s uncertainty [$(1.49 \pm 0.73) \times 10^2$ pCi/L, or (5.51 ± 2.7) Bq/L]. This sample did not exceed the MDC of 1.61×10^3 pCi/L (5.96×10^1 Bq/L). While there is not a DCG for precipitation, the closest equivalent is for tritium in drinking water of 2×10^6 pCi/L (7.40×10^4 Bq/L). The measured value did not exceed this DCG, and in fact is over 13,000 times smaller. No tritium was measured above the 2s level in the CFA, the Idaho Falls, or the remaining EFS samples.

Immediate re-analysis of the EFS sample gave a result less than its 2s uncertainty [(-1.8 ± 72) pCi/L, or $(–6.6 \pm 266.4) \times 10^{-2}$ Bq/L]. The average of the two results, propagating the uncertainty, was 73.6 pCi/L (5.5 Bq/L). This value is less than both the 2s value (1.0×10^2 pCi/L) and the MDC of 1.61×10^3. Data for all precipitation samples are listed in Appendix C, Table C-6.

Low levels of tritium exist in the environment at all times. For example, during 1997, the U.S. Environmental Protection Agency (EPA), as part of its Environmental Radiation Ambient Monitoring System (ERAMS), measured tritium from –86 to 293 pCi/L (-3.19 to 10.85 Bq/L) in precipitation from across the United States (EPA, 1997).

4.2 Drinking Water

Drinking water samples are collected from selected taps throughout southeast Idaho (Figure 16). Samples are analyzed for gross alpha, gross beta, and tritium (^3H). None of the drinking water samples exceeded their respective 2s values for tritium (Appendix C, Table C-8). However, all drinking water samples, including one QA/QC duplicate, had gross beta results above their respective 2s values. In addition, four samples also had gross alpha results above their 2s values (Table C-7). Such levels are not unusual for naturally occurring radionuclides given the basaltic terrain. All values are similar to those recorded in 1999.

Recounts of representative samples confirmed all gross beta at levels greater than 2s. Only one of the gross alpha sample recounts exceeded the 2s value. In general these gross alpha results are consistent with past values.

None of the results exceeded the respective MDC's of 2 pCi/L for gross alpha and 8 pCi/L for gross beta. All samples were also below the levels of health or regulatory concern detailed in 40 CFR 141 (Safe Drinking Water Act [SDWA]) of 15 pCi/L gross alpha, and 50 pCi/L gross beta.

The gross beta results for Atomic City, Mud Lake, and Minidoka are slightly above their 1999 levels. The Arco result is significantly above its 1999 levels, but consistent with past second quarter values. Values remain at least three orders of magnitude below any limits of health or regulatory concern, but will be watched closely over the next sample period. Reasons for the continuing increase in values is still under investigation, but is most likely linked to a natural cause since this sample location is upgradient to groundwater flow from the INEEL. All drinking water sample results may be found in Appendix C, Tables C-7 and C-8.

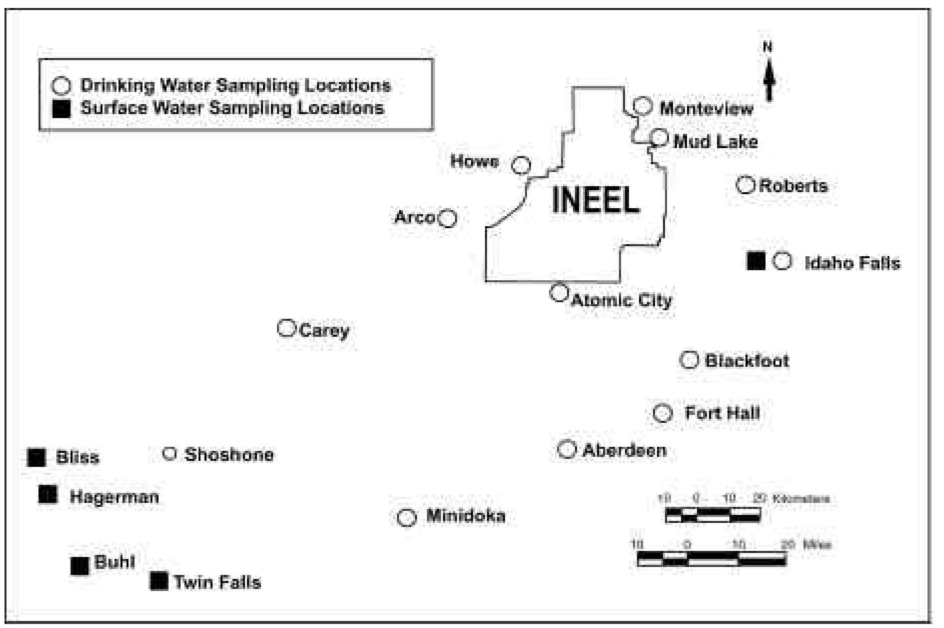

FIGURE 16. Drinking and Surface Water Sampling Locations.

4.3 Surface Water

All six surface water samples (Table 4) had gross beta analytical results above their 2s values. This included one QA/QC duplicate. In addition the sample from the Hagerman area had an analytical result exceeding the 2s value for gross alpha (Table 4). Levels of gross alpha and gross beta in all samples are similar to results from recent years (1998 and 1999). None of the gross beta results exceeded their respective MDC of 8 pCi/L gross beta or 2 pCi/L gross alpha. All samples were also at least six times lower than health standards (see Table 4). The presence of gross alpha and gross beta in surface water (particularly the springs) is related to dissolution of naturally occurring radionuclides (i.e., uranium and radium) by groundwater as it flows through the surrounding basalts. All gross alpha and gross beta results can be found in Appendix A, Table C-7. Tritium results are in Table C-8 of Appendix C.

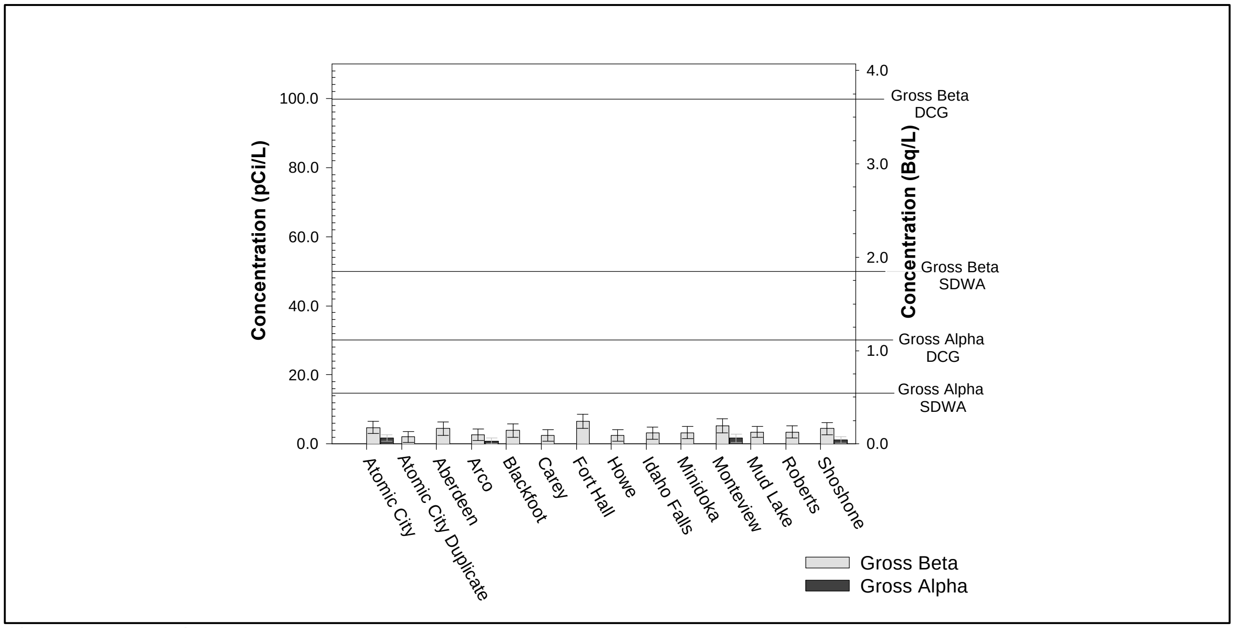

FIGURE 17. Gross alpha and beta results that were greater than their associated 2s (error bars = 2s). The DCG values are set to ensure dose limits are not exceeded. The most limiting alpha and beta emitting radionuclide DCG value was used to compare against observed gross alpha and beta concentrations.

TABLE 3. Surface water results > 2s, Second Quarter, 2000.

Location	**Sample Results** 10^2 **pCi/L " 2s**	**MDC**	**SDWA**	**DCG**
		Gross Alpha		
Hagerman	1.07 ± 0.82	2.0 pCi/L	15 pCi/L	30 pCi/
		Gross Beta		
Bliss	7.12 ± 1.96			
Buhl	4.84 ± 1.83			
Hagerman	3.48 ± 1.70	8.0 pCi/L	50 pCi/L	100 pCi/L
Hagerman (Duplicate)	2.28 ± 1.62			
Twin Falls	7.53 ± 2.04			

NOTE: To convert pCi/L to Bq/L multiply the above pCi/L values by 0.037.

5. FOODSTUFF SAMPLING

Another potential pathway for contaminants to reach humans is through the food chain. The ESER Program samples multiple agricultural products, and game animals around the INEEL and Southeast Idaho. Specifically, milk, wheat, potatoes, garden lettuce, sheep, big game, waterfowl, marmots, and fish are sampled. Milk is sampled throughout the year. Sheep are sampled during the second quarter. Lettuce and wheat are sampled during the third quarter, while potatoes and waterfowl are collected during the fourth quarter. During 2000, marmots (a.k.a. rockchucks), a food source for Native Americans, were sampled during the second quarter. Big game and fish are sampled as they come available. See Table B-1, Appendix B, for more details on foodstuff sampling. All samples are analyzed by gamma spectrometry for any gamma emitting radionuclides. Because of its prevalence in the environment primarily due to atmospheric nuclear testing and recent nuclear accidents (i.e., Chernobyl) ^{137}Cs is the most commonly measured radionuclide in samples. Other radionuclides are reported when they are measured.

5.1 Milk Sampling

Milk samples were collected weekly in Idaho Falls and monthly at eight other locations around the INEEL (Figure 18). All samples were analyzed for gamma emitting radionuclides. A total of 29 monthly and 13 weekly milk samples were collected during the second quarter of 2000. Six samples had a ^{137}Cs concentration greater than their 2s uncertainty. All five samples submitted for ^{90}Sr analysis also contained concentrations of ^{90}Sr greater than the 2s level. Almost all samples had detectable levels of the naturally occurring radionuclide ^{40}K. Cesium-137 and ^{131}I data for all milk samples are listed in Appendix C, Table C-9, while the ^{90}Sr results can be found in Table C-10.

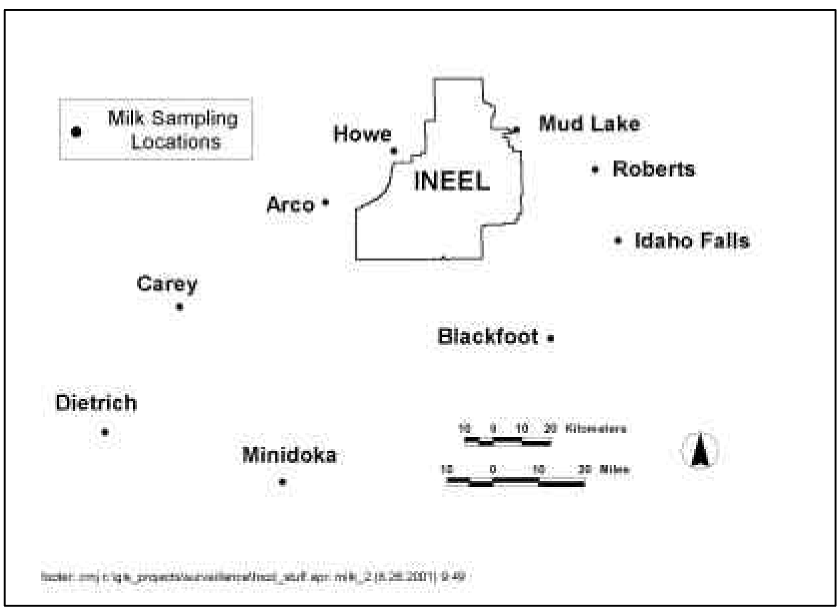

FIGURE 18. ESER Program milk sampling locations.

Of the six samples with ^{137}Cs results above their 2s uncertainty values, none exceeded the MDC. Immediate recounts could not support detection for the samples from Carey, Howe, Rupert, or the two from Idaho Falls. Immediate recounts and reanalysis (counting a second aliquot) of the Dietrich sample resulted in the reanalysis exceeding the 2s value. Averaging recount and analytical results for this sample and propagating the error yields a value of 4.8 ± 4.2 x 10^{-9} µCi/ml [(1.8 ± 1.6) x 10^{-4} Bq/ml]. This is well below both the MDC and the DCG for cesium in water. Sample results were similar to levels reported by EPA of ^{137}Cs in pasteurized milk during 1997 that ranged from below detection limits to (8.6 ± 2.0) x 10^{-9} µCi/ml [(3.2 ± 0.7) x 10^{-4} Bq/ml] for locations around the United States and its territories (EPA, 1997).

Of the five samples containing ^{90}Sr at greater than the 2s levels, the Rupert sample was below the MDA and was flagged as “undetected” by the laboratory. A recount on one of the other four samples also exceeded the MDA level. Therefore, these four samples (Blackfoot, Carey, Idaho Falls, Terreton) are all considered statistically valid detections for ^{90}Sr.

There are no specific regulatory limits on radionuclides in milk. As a comparison the DCG for ^{137}Cs and ^{90}Sr in water can be used. None of the samples exceeded the DCG of 3.0 x 10^{-6} µCi/ml for ^{137}Cs or the DCG for ^{90}Sr of 1.0 x 10^{-6} µCi/ml.

As discussed in the *Helpful Information* section cesium, and strontium exist as remnants of atmospheric testing of nuclear weapons and nuclear accidents. Because of this fact detections of cesium and strontium cannot automatically be attributed to the INEEL. Similar levels occur in areas outside the region (EPA, 1997).

5.2 Large Game Animal Sampling

Two game animals were sampled during the second quarter of 2000, both involved in vehicular collisions. A male pronghorn collected from along Highway 22/33 on the north end of the site on May 31 and a male mule deer collected near CFA on June 6 were the two animals sampled. Thyroid, muscle, and liver tissue were collected from each animal and analyzed for gamma emitting radionuclides. Not surprisingly, liver and muscle tissue of both animals gave valid (> MDC) results for ^{40}K. The pronghorn muscle had a greater than 2s result [(3.2 ± 2.6) x 10^{-9} µCi/g wet weight, or (1.2 ± 0.96) x 10^{-4} Bq/g wet weight] of ^{137}Cs. Recount of the sample could not support the validity of the initial result (the recount was much less than 2s). Data for all big game samples are listed in Appendix C, Table C-11.

The presence of ^{137}Cs in big game tissue is not an immediate concern in that similar levels are commonly detected in wild game tissues throughout the Northern Hemisphere. For example, big game animals sampled in Colorado, Idaho (distant to the INEEL), Montana, Oregon, Utah, and Wyoming during 1998 – 1999, had average ^{137}Cs concentrations in muscle tissue of 20 x 10^{-9} µCi/g wet weight [range: (-10 to 152) x 10^{-9} µCi/g wet weight]. Cesium-137 is an analog of potassium and is readily incorporated in muscle and organ tissues. Cesium-137 is also available throughout the world from the fallout from historic nuclear weapons tests.

5.3 Sheep Sampling

Certain areas of the INEEL are open to grazing under lease agreements managed by the Bureau of Land Management (BLM). Every year the ESER Program collects samples from sheep using these areas, either just before or shortly after they leave the INEEL. This occurs during the second quarter of the year. For the calendar year 2000, sheep were collected from the selected allotments before they were moved. Three flocks were sampled, a control flock in

Blackfoot, a flock from a southern allotment, and a flock from a northern allotment. Two sheep were taken from each flock and sampled. Thyroid, muscle, and liver tissue were analyzed for gamma emitting radionuclides. Levels of ^{131}I are of particular interest in thyroids because of this organ's ability to concentrate iodine. No ^{131}I was found in any of the samples. The naturally occurring radionuclide ^{40}K was found above the MDC in both on-site and control animals at equivalent levels. Three animals showed greater than 2s results of ^{137}Cs, one in muscle from the control flock, and one each in the liver from both the northern and southern flock. Reanalysis of each sample could not support the result (recount was less than 2s). Data for all sheep samples are listed in Appendix C, Table C-12.

5.4 Marmot Sampling

Marmots, otherwise known as rockchucks, are a large member of the squirrel family and are hunted and consumed by Native American people in the area. A population of yellow-bellied marmots exists within the boundaries of the Radioactive Waste Management Complex (RWMC). During the second quarter of 2000, three marmots were collected from the Subsurface Disposal Area of the RWMC. Three marmots were also collected, as controls, from the Idaho Falls area. Each marmot was dissected into two samples, the edible portion (muscle tissue), and the skin, fur, viscera, and bones. All samples were analyzed for gamma-emitting radionuclides with a subset analyzed for ^{90}Sr, ^{238}Pu, $^{239/240}$Pu, and ^{241}Am. Two samples had results greater than their associated 2s uncertainty. One was ^{137}Cs in the fur, skin, viscera, and bone sample from a marmot sampled from the RWMC at $(11.5 \pm 7.2) \times 10^{-3}$ pCi/g [$(42.55 \pm 26.64) \times 10^{-5}$ Bq/g]. A different marmot from the RWMC had ^{90}Sr in its fur, skin, viscera, and bone sample at $(90.4 \pm 56.0) \times 10^{-3}$ pCi/g [$(334.48 \pm 207.20) \times 10^{-5}$ Bq/g]. No human-made radionuclides were detected in the edible portion of any marmots sampled during 2000. Results for all marmot samples are listed in Table C-13, Appendix C.

6. ENVIRONMENTAL RADIATION

The ESER and its predecessors have placed an array of thermoluminescent dosimeters (TLDs) distributed throughout the Eastern Snake River Plain to monitor for environmental radiation. The TLDs are changed out in May and again in November. The results of the May sampling (the period November 1999 through May 2000) are discussed below.

Dosimeter locations are divided into Boundary and Distant groupings. Boundary average exposure rates ranged from a low of 0.32 mR/day at Birch Creek to a high of 0.42 mR/day at Mud Lake. The overall average was 0.39 mR/day. The Distant set had a high of 0.45 mR/day at Roberts and a low of 0.38 mR/day at Craters of the Moon, Minidoka, and the Blackfoot CMS. The overall average Distant value was 0.41 mR/day. There was no statistical difference between Boundary and Distant locations. Furthermore, all values are in line with past readings. Table 5 lists the range and average for both groups.

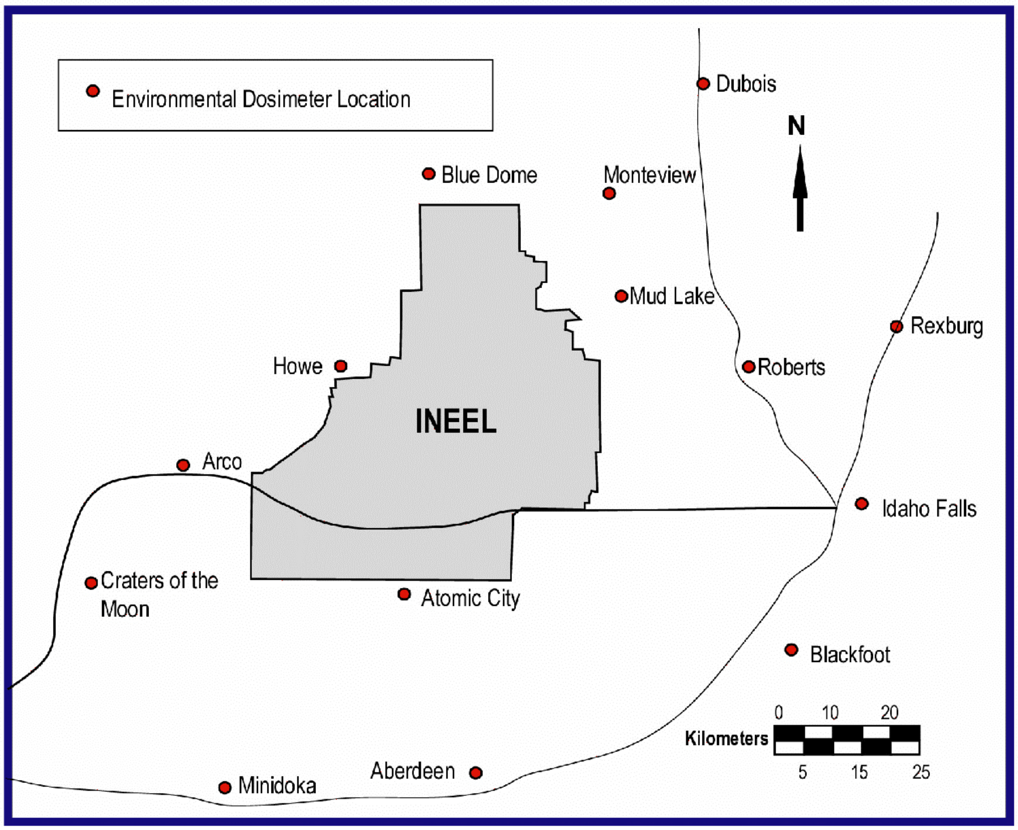

FIGURE 19. TLD Sampling Locations.

TABLE 4. TLD Exposures from November 1999 to May 2000.

	Exposure (mR)	
Location	**Boundary**	**Distant**
AVERAGE	71.4	74.0
MAXIMUM	76.9	80.9
MINIMUM	58.6	68.5
CONTROL	---	24.9

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APPENDIX A

ESER PROGRAM SAMPLING MEDIA & SCHEDULE

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

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INEEL
AIR SAMPLING				
LOW-VOLUME AIR				
Gross Alpha Gross Beta ^{131}I	weekly	Blackfoot, Craters of the Moon, Idaho Falls, Rexburg	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Reno Ranch	Main Gate, EFS, Van Buren
Gamma Spec	quarterly	Blackfoot, Craters of the Moon, Idaho Falls, Rexburg	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Reno Ranch	Main Gate, EFS, Van Buren
^{90}Sr Transuranics	quarterly	Rotating schedule	Rotating schedule	Rotating schedule
ATMOSPHERIC MOISTURE				
Tritium	4 to 13 weeks	Idaho Falls	Atomic City	None
PRECIPITATION				
Tritium	monthly	Idaho Falls	None	CFA
Tritium	weekly	None	None	EFS
PM-10				
Particulate Mass	every 6th day	Rexburg, Blackfoot	Atomic City	None
WATER SAMPLING				
SURFACE WATER				
Gross Alpha, Gross Beta, ^{3}H	semi-annually	Twin Falls, Buhl, Hagerman Idaho Falls, Bliss	None	None
DRINKING WATER				
Gross Alpha Gross Beta, ^{3}H	semi-annually	Aberdeen, Blackfoot, Carey, Idaho Falls, Fort Hall, Minidoka, Roberts, Shoshone	Arco, Atomic City, Howe, Monteview, Mud Lake, Reno Ranch	None
ENVIRONMENTAL RADIATION SAMPLING				
TLDs				
Gamma Radiation	semiannual	Aberdeen, Blackfoot, Craters of the Moon, Idaho Falls, Minidoka, Rexburg, Roberts	Arco, Atomic City, Howe, Monteview, Mud Lake, Reno Ranch	None
SOIL SAMPLING				
SOIL				
Gamma Spec ^{90}Sr Transuranics	biennially	Carey, Crystal Ice Caves, Blackfoot, St. Anthony	Butte City, Monteview, Atomic City, FAA Tower, Howe, Mud Lake (2), Reno Ranch	None

TABLE A-1 cont.

Sample Type Analysis	Collection Frequency	LOCATIONS Distant	Boundary	INEEL
FOODSTUFF SAMPLING				
MILK				
Gamma Spec (^{131}I)	weekly	Idaho Falls	None	None
Gamma Spec (^{131}I)	monthly	Blackfoot, Carey, Dietrich, Minidoka, Roberts, Moreland	Howe, Terreton, Arco	None
Tritium ^{90}Sr	Semi-annually	Blackfoot, Carey, Dietrich, Idaho Falls, Minidoka, Roberts, Moreland	Howe, Terreton, Arco	None
POTATOES				
Gamma Spec ^{90}Sr	annually	Blackfoot, Idaho Falls, Rupert, occasional samples across the U.S.	Arco, Mud Lake	None
WHEAT				
Gamma Spec ^{90}Sr	annually	Am. Falls, Blackfoot, Dietrich, Idaho Falls, Minidoka, Carey	Arco, Monteview, Mud Lake, Tabor, Terreton	None
LETTUCE				
Gamma Spec ^{90}Sr	annually	Blackfoot, Carey, Idaho Falls, Pocatello	Arco, Atomic City, Howe, Mud Lake	None
BIG GAME				
Gamma Spec	varies	Occasional samples across the U.S.	varies	INEEL roads
SHEEP				
Gamma Spec	annually	Blackfoot or Dubois, N. INEEL, S. INEEL	None	INEEL
WATERFOWL				
Gamma Spec ^{90}Sr Transuranics	annually	Fort Hall	None	Waste disposal ponds
FISH				
Gamma Spec	annually or as available	None	None	Big Lost River

APPENDIX B

MINIMUM DETECTABLE CONCENTRATIONS

TABLE B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses

Sample Type	Analysis	Approx. Minimum Detectable Concentration[a] (MDC)	Derived Concentration Guide [b]	Drinking Water Detection Limits [c]
Air (particulate filter) [d]	Gross alpha	1×10^{-15} µCi/mL	2×10^{-14} µCi/mL	--
	Gross beta	3×10^{-15} µCi/mL	3×10^{-12} µCi/mL	--
	Specific gamma (^{137}Cs)	3×10^{-16} µCi/mL	4×10^{-10} µCi/mL	--
	^{238}Pu	2×10^{-18} µCi/mL	3×10^{-14} µCi/mL	--
	$^{239/240}$Pu	3×10^{-18} µCi/mL	2×10^{-14} µCi/mL	--
	^{241}Am	2×10^{-18} µCi/mL	2×10^{-14} µCi/mL	--
	^{90}Sr	6×10^{-17} µCi/mL	9×10^{-12} µCi/mL	--
Air (charcoal cartridge) [d]	^{131}I	4×10^{-15} µCi/mL	4×10^{-10} µCi/mL	--
Air (atmospheric moisture) [e]	^{3}H	3.7×10^{-12} µCi/mL	1×10^{-7} µCi/mL	--
Air (precipitation)	^{3}H	1×10^{-7} µCi/mL	2×10^{-3} µCi/mL	--
Water (drinking & surface)	Gross alpha	3 pCi/L	30 pCi/L	3 pCi/L
	Gross beta	2 pCi/L	100 pCi/L	4 pCi/L
	^{3}H	100 pCi/L	2×10^{6} pCi/L	1000 pCi/L
Milk	^{131}I	3 x 10-9 µCi/mL	--	--
Wheat	Specific gamma (^{137}Cs)	4×10^{-9} µCi/g	--	--
	^{90}Sr	5×10^{-9} µCi/g	--	--
Lettuce	Specific gamma (^{137}Cs)	1×10^{-7} µCi/g	--	--
	^{90}Sr	2×10^{-7} µCi/g	--	--

[a] The MDC is an estimate of the concentration of radioactivity in a given sample type that can be identified with a 95% level of confidence and precision of plus or minus 100% 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] These limits are required by the National Primary Drinking Water Regulations (40 CFR 141). The "detection limit" is the terminology used by the EPA and means the same as the MDC defined above.
[d] The approximate MDC is based on an average filtered air volume (pressure corrected) of 570 m^3/week.
[e] The approximate MDC is expressed for tritium (as tritiated water) in air, and is based on an average filtered air volume of 39 m^3, assuming an average sampling period of eight weeks.

APPENDIX C

2ND QUARTER 2000 SAMPLE ANALYSIS RESULTS

Table C-1: Weekly Gross Alpha & Gross Beta Concentrations in Air

Sample Group & Location	Sampling Date	GROSS ALPHA Concentration +/- 2s[a] 10^{-15} µCi[b] /mL			GROSS ALPHA Concentration +/- 2s 10^{-10} Bq[c] /mL			GROSS BETA Concentration +/- 2s 10^{-15} µCi/mL			GROSS BETA Concentration +/- 2s 10^{-10} Bq/mL		
BOUNDARY													
ARCO													
	4/5/00	1.2	±	0.7	0.4	±	0.2	17.1	±	1.9	6.3	±	0.7
	4/12/00	2.0	±	0.6	0.7	±	0.2	20.3	±	1.6	7.5	±	0.6
	4/19/00	1.6	±	0.7	0.6	±	0.3	20.9	±	1.8	7.7	±	0.7
	4/26/00	0.9	±	0.5	0.3	±	0.2	16.4	±	1.5	6.1	±	0.6
	5/3/00	2.0	±	0.7	0.7	±	0.3	20.7	±	1.8	7.7	±	0.7
	5/10/00	1.9	±	0.8	0.7	±	0.3	18.5	±	1.8	6.8	±	0.7
	5/17/00	1.6	±	0.9	0.6	±	0.3	18.1	±	2.0	6.7	±	0.7
	5/24/00	1.8	±	0.7	0.7	±	0.3	16.2	±	1.7	6.0	±	0.6
	5/31/00	0.9	±	0.6	0.3	±	0.2	16.5	±	1.8	6.1	±	0.7
	6/7/00	2.5	±	0.7	0.9	±	0.3	25.0	±	1.9	9.3	±	0.7
	6/14/00	1.5	±	0.7	0.6	±	0.2	17.3	±	1.7	6.4	±	0.6
	6/21/00	1.9	±	0.7	0.7	±	0.2	15.5	±	1.7	5.7	±	0.6
	6/28/00	1.4	±	0.8	0.5	±	0.3	18.1	±	2.1	6.7	±	0.8
ATOMIC CITY													
	4/5/00	1.8	±	0.8	0.7	±	0.3	18.7	±	2.0	6.9	±	0.8
	4/12/00	2.1	±	0.8	0.8	±	0.3	22.4	±	2.2	8.3	±	0.8
	4/19/00	1.3	±	0.7	0.5	±	0.3	16.8	±	1.9	6.2	±	0.7
	4/26/00	0.6	±	0.5	0.2	±	0.2	17.2	±	1.6	6.4	±	0.6
	5/3/00	1.6	±	0.7	0.6	±	0.3	24.3	±	2.0	9.0	±	0.7
	5/10/00	0.7	±	0.7	0.3	±	0.3	19.5	±	1.9	7.2	±	0.7
	5/17/00	1.1	±	0.7	0.4	±	0.3	16.6	±	1.8	6.1	±	0.7
	5/24/00	1.2	±	0.6	0.5	±	0.2	17.6	±	1.7	6.5	±	0.6
	5/31/00	1.2	±	0.8	0.5	±	0.3	16.5	±	2.0	6.1	±	0.8
	6/7/00	1.8	±	0.7	0.7	±	0.2	28.0	±	2.0	10.4	±	0.7
	6/14/00	1.2	±	0.7	0.4	±	0.3	20.3	±	2.0	7.5	±	0.7
	6/21/00	1.1	±	0.6	0.4	±	0.2	16.6	±	1.9	6.1	±	0.7
	6/28/00	1.3	±	0.8	0.5	±	0.3	17.2	±	2.1	6.4	±	0.8
BIRCH CREEK													
	4/5/00	1.6	±	0.7	0.6	±	0.2	15.8	±	1.7	5.8	±	0.6
	4/12/00	2.0	±	0.7	0.7	±	0.3	24.0	±	2.0	8.9	±	0.8
	4/19/00	1.3	±	0.7	0.5	±	0.3	18.6	±	1.9	6.9	±	0.7
	4/26/00	1.3	±	0.7	0.5	±	0.2	17.1	±	1.8	6.3	±	0.7
	5/3/00	1.1	±	0.6	0.4	±	0.2	22.8	±	2.0	8.4	±	0.7
	5/10/00	2.2	±	0.9	0.8	±	0.4	19.9	±	2.1	7.4	±	0.8
	5/17/00	1.4	±	0.8	0.5	±	0.3	19.1	±	2.0	7.1	±	0.7
	5/24/00	1.6	±	0.7	0.6	±	0.3	18.4	±	1.9	6.8	±	0.7
	5/31/00	1.6	±	0.7	0.6	±	0.3	18.3	±	1.9	6.8	±	0.7
	6/7/00	2.1	±	0.8	0.8	±	0.3	26.9	±	2.2	10.0	±	0.8
	6/14/00	1.5	±	0.7	0.5	±	0.3	20.0	±	2.0	7.4	±	0.7
	6/21/00	0.8	±	0.5	0.3	±	0.2	15.6	±	1.7	5.8	±	0.6
	6/28/00	1.4	±	0.8	0.5	±	0.3	18.3	±	2.0	6.8	±	0.7
FAA TOWER													
	4/5/00	1.3	±	0.7	0.5	±	0.3	16.4	±	1.9	6.1	±	0.7
	4/12/00	1.6	±	0.7	0.6	±	0.2	26.3	±	2.0	9.7	±	0.7
	4/19/00	0.6	±	0.6	0.2	±	0.2	19.7	±	1.9	7.3	±	0.7
	4/26/00	1.5	±	0.7	0.5	±	0.3	18.2	±	1.8	6.7	±	0.7
	5/3/00	1.1	±	0.7	0.4	±	0.3	22.2	±	2.3	8.2	±	0.8

[a] *2s = 2 Standard Deviations*
[b] *µCi = Standard Units (see "Helpful Information")*
[c] *Bq = Systeme International d'Unites (see "Helpful Information")*

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air

Sample Group & Location	Sampling Date	GROSS ALPHA Concentration +/- 2s[a] 10^{-15} µCi[b] /mL			GROSS ALPHA Concentration +/- 2s 10^{-10} Bq[c] /mL			GROSS BETA Concentration +/- 2s 10^{-15} µCi/mL			GROSS BETA Concentration +/- 2s 10^{-10} Bq/mL		
	5/10/00	2.0	±	1.1	0.7	±	0.4	17.8	±	2.3	6.6	±	0.9
	5/17/00	0.5	±	0.9	0.2	±	0.3	25.0	±	2.5	9.3	±	0.9
	5/24/00	2.9	±	1.0	1.1	±	0.4	19.5	±	2.3	7.2	±	0.8
	5/31/00	0.7	±	0.6	0.3	±	0.2	18.9	±	2.0	7.0	±	0.8
	6/7/00	2.6	±	0.9	1.0	±	0.3	33.4	±	2.5	12.4	±	0.9
	6/14/00	1.1	±	0.7	0.4	±	0.3	18.2	±	2.0	6.7	±	0.7
	6/21/00	1.4	±	0.7	0.5	±	0.2	16.4	±	1.9	6.1	±	0.7
	6/28/00	1.5	±	1.0	0.6	±	0.4	19.9	±	2.5	7.4	±	0.9
FAA TOWER (Q/A-1)													
	4/5/00	1.2	±	0.6	0.5	±	0.2	15.5	±	1.6	5.7	±	0.6
	4/12/00	1.4	±	0.6	0.5	±	0.2	24.9	±	1.8	9.2	±	0.7
	4/19/00	0.7	±	0.5	0.3	±	0.2	18.9	±	1.7	7.0	±	0.6
	4/26/00	1.1	±	0.6	0.4	±	0.2	17.4	±	1.7	6.4	±	0.6
	5/3/00	1.8	±	0.8	0.7	±	0.3	22.2	±	2.1	8.2	±	0.8
	5/10/00	1.0	±	0.9	0.4	±	0.3	19.7	±	2.2	7.3	±	0.8
	5/17/00	0.7	±	0.8	0.3	±	0.3	16.8	±	2.1	6.2	±	0.8
	5/24/00	1.5	±	0.7	0.6	±	0.2	16.9	±	1.8	6.3	±	0.7
	5/31/00	1.4	±	0.7	0.5	±	0.2	17.8	±	1.8	6.6	±	0.7
	6/7/00	1.5	±	0.6	0.5	±	0.2	25.7	±	2.1	9.5	±	0.8
	6/14/00	1.2	±	0.6	0.5	±	0.2	18.2	±	1.8	6.7	±	0.7
	6/21/00	1.4	±	0.6	0.5	±	0.2	17.1	±	1.7	6.3	±	0.6
	6/28/00	1.0	±	0.7	0.4	±	0.3	17.9	±	2.0	6.6	±	0.7
HOWE													
	4/5/00	1.2	±	0.7	0.5	±	0.3	20.2	±	2.2	7.5	±	0.8
	4/12/00	2.1	±	0.8	0.8	±	0.3	23.4	±	2.2	8.7	±	0.8
	4/19/00	2.3	±	0.9	0.8	±	0.3	19.8	±	2.1	7.3	±	0.8
	4/26/00	2.0	±	0.9	0.7	±	0.3	16.4	±	2.0	6.1	±	0.7
	5/3/00	2.2	±	1.0	0.8	±	0.4	21.9	±	2.4	8.1	±	0.9
	5/10/00	2.3	±	1.2	0.8	±	0.4	23.1	±	2.7	8.5	±	1.0
	5/17/00	3.1	±	1.3	1.2	±	0.5	17.8	±	2.5	6.6	±	0.9
	5/24/00	1.6	±	0.8	0.6	±	0.3	16.8	±	2.0	6.2	±	0.7
	5/31/00	1.0	±	0.7	0.4	±	0.3	20.2	±	2.1	7.5	±	0.8
	6/7/00	2.4	±	0.8	0.9	±	0.3	26.1	±	2.3	9.7	±	0.8
	6/14/00	1.4	±	0.8	0.5	±	0.3	23.8	±	2.3	8.8	±	0.8
	6/21/00	1.7	±	0.7	0.6	±	0.3	19.8	±	2.0	7.3	±	0.7
	6/28/00	1.4	±	0.9	0.5	±	0.3	20.0	±	2.4	7.4	±	0.9
MONTEVIEW													
	4/5/00	1.0	±	0.5	0.4	±	0.2	18.5	±	1.6	6.8	±	0.6
	4/12/00	2.2	±	0.7	0.8	±	0.3	28.1	±	2.1	10.4	±	0.8
	4/19/00	1.1	±	0.6	0.4	±	0.2	20.0	±	1.8	7.4	±	0.7
	4/26/00	1.0	±	0.6	0.4	±	0.2	19.0	±	1.8	7.0	±	0.7
	5/3/00	2.3	±	1.0	0.9	±	0.4	25.5	±	2.5	9.4	±	0.9
	5/10/00	2.4	±	1.2	0.9	±	0.4	23.7	±	2.7	8.8	±	1.0
	5/17/00	0.2	±	0.9	0.1	±	0.3	17.5	±	2.4	6.5	±	0.9
	5/24/00	2.7	±	0.9	1.0	±	0.3	20.1	±	2.2	7.4	±	0.8
	5/31/00	1.1	±	0.7	0.4	±	0.3	19.6	±	2.1	7.3	±	0.8
	6/7/00	1.4	±	0.7	0.5	±	0.3	27.2	±	2.3	10.1	±	0.9
	6/14/00	0.9	±	0.7	0.3	±	0.2	18.2	±	2.0	6.7	±	0.7
	6/21/00	2.4	±	0.8	0.9	±	0.3	18.7	±	2.1	6.9	±	0.8
	6/28/00	0.5	±	0.8	0.2	±	0.3	18.8	±	2.2	7.0	±	0.8

[a] *2s = 2 Standard Deviations*
[b] *µCi = Standard Units (see "Helpful Information")*
[c] *Bq = Systeme International d'Unites (see "Helpful Information")*

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air

Sample Group & Location	Sampling Date	GROSS ALPHA Concentration +/- 2s[a] 10^{-15} µCi[b] /mL	GROSS ALPHA Concentration +/- 2s 10^{-10} Bq[c] /mL	GROSS BETA Concentration +/- 2s 10^{-15} µCi/mL	GROSS BETA Concentration +/- 2s 10^{-10} Bq/mL
MONTEVIEW (Q/A-2)					
	4/5/00	1.2 ± 0.6	0.4 ± 0.2	16.0 ± 1.7	5.9 ± 0.6
	4/12/00	1.9 ± 0.7	0.7 ± 0.3	24.3 ± 1.9	9.0 ± 0.7
	4/19/00	0.8 ± 0.6	0.3 ± 0.2	19.4 ± 1.9	7.2 ± 0.7
	4/26/00	0.7 ± 0.5	0.3 ± 0.2	19.9 ± 1.8	7.4 ± 0.7
	5/3/00	1.6 ± 0.7	0.6 ± 0.3	21.3 ± 2.0	7.9 ± 0.7
	5/10/00	0.9 ± 0.8	0.3 ± 0.3	19.4 ± 2.1	7.2 ± 0.8
	5/17/00	1.5 ± 0.9	0.5 ± 0.3	16.3 ± 1.9	6.0 ± 0.7
	5/24/00	1.8 ± 0.7	0.7 ± 0.3	19.2 ± 1.9	7.1 ± 0.7
	5/31/00	0.8 ± 0.6	0.3 ± 0.2	17.9 ± 1.8	6.6 ± 0.7
	6/7/00	1.3 ± 0.6	0.5 ± 0.2	22.6 ± 2.0	8.4 ± 0.7
	6/14/00	1.3 ± 0.7	0.5 ± 0.2	14.5 ± 1.7	5.4 ± 0.6
	6/21/00	1.4 ± 0.6	0.5 ± 0.2	17.3 ± 1.8	6.4 ± 0.7
	6/28/00	1.7 ± 0.8	0.6 ± 0.3	17.4 ± 2.0	6.4 ± 0.7
MUD LAKE					
	4/5/00	1.3 ± 0.5	0.5 ± 0.2	15.8 ± 1.4	5.8 ± 0.5
	4/12/00	1.7 ± 0.7	0.6 ± 0.3	22.8 ± 1.9	8.4 ± 0.7
	4/19/00	1.1 ± 0.6	0.4 ± 0.2	19.1 ± 1.8	7.1 ± 0.7
	4/26/00	1.6 ± 0.7	0.6 ± 0.2	14.5 ± 1.6	5.4 ± 0.6
	5/3/00	1.9 ± 0.6	0.7 ± 0.2	23.7 ± 1.7	8.8 ± 0.6
	5/10/00	1.3 ± 0.8	0.5 ± 0.3	19.8 ± 1.9	7.3 ± 0.7
	5/17/00	1.3 ± 0.7	0.5 ± 0.3	18.1 ± 1.7	6.7 ± 0.6
	5/24/00	1.3 ± 0.6	0.5 ± 0.2	19.0 ± 1.7	7.0 ± 0.6
	5/31/00	1.0 ± 0.6	0.4 ± 0.2	18.2 ± 1.7	6.7 ± 0.6
	6/7/00	2.0 ± 0.7	0.7 ± 0.3	26.0 ± 2.0	9.6 ± 0.7
	6/14/00	1.3 ± 0.6	0.5 ± 0.2	17.2 ± 1.7	6.4 ± 0.6
	6/21/00	1.4 ± 0.6	0.5 ± 0.2	18.5 ± 1.7	6.8 ± 0.6
	6/28/00	1.5 ± 0.7	0.5 ± 0.3	17.3 ± 1.8	6.4 ± 0.7
DISTANT					
BLACKFOOT					
	4/5/00	1.9 ± 0.8	0.7 ± 0.3	18.8 ± 2.2	7.0 ± 0.8
	4/12/00	4.9 ± 3.8	1.8 ± 1.4	28.4 ± 8.5	10.5 ± 3.1
	4/19/00	1.7 ± 0.9	0.6 ± 0.3	19.7 ± 2.2	7.3 ± 0.8
	4/26/00	0.8 ± 0.6	0.3 ± 0.2	17.7 ± 1.9	6.5 ± 0.7
	5/3/00	3.3 ± 1.0	1.2 ± 0.4	25.2 ± 2.3	9.3 ± 0.9
	5/10/00	2.0 ± 1.0	0.7 ± 0.4	21.5 ± 2.4	8.0 ± 0.9
	5/17/00	1.8 ± 1.1	0.7 ± 0.4	19.1 ± 2.3	7.1 ± 0.9
	5/24/00	2.2 ± 0.8	0.8 ± 0.3	20.8 ± 2.2	7.7 ± 0.8
	5/31/00	1.5 ± 0.8	0.5 ± 0.3	19.7 ± 2.2	7.3 ± 0.8
	6/7/00	3.3 ± 1.0	1.2 ± 0.4	28.8 ± 2.4	10.7 ± 0.9
	6/14/00	1.7 ± 0.9	0.6 ± 0.3	19.7 ± 2.2	7.3 ± 0.8
	6/21/00	2.5 ± 0.8	0.9 ± 0.3	17.9 ± 2.0	6.6 ± 0.7
	6/28/00	3.0 ± 1.7	1.1 ± 0.6	23.5 ± 3.7	8.7 ± 1.4
BLACKFOOT, CMS					
	4/5/00	1.3 ± 0.5	0.5 ± 0.2	12.2 ± 1.3	4.5 ± 0.5
	4/12/00	3.4 ± 1.0	1.3 ± 0.4	22.0 ± 2.2	8.1 ± 0.8
	4/19/00	1.5 ± 0.8	0.6 ± 0.3	20.4 ± 2.1	7.5 ± 0.8
	4/26/00	1.3 ± 0.7	0.5 ± 0.3	16.4 ± 1.9	6.1 ± 0.7
	5/3/00	2.7 ± 0.9	1.0 ± 0.3	19.9 ± 2.1	7.4 ± 0.8

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air

Sample Group & Location	Sampling Date	GROSS ALPHA Concentration +/- 2s[a] 10^{-15} µCi[b] /mL	GROSS ALPHA Concentration +/- 2s 10^{-10} Bq[c] /mL	GROSS BETA Concentration +/- 2s 10^{-15} µCi/mL	GROSS BETA Concentration +/- 2s 10^{-10} Bq/mL
	5/10/00	3.4 ± 1.2	1.3 ± 0.4	18.4 ± 2.2	6.8 ± 0.8
	5/17/00	1.3 ± 0.9	0.5 ± 0.3	20.8 ± 2.3	7.7 ± 0.8
	5/24/00	2.7 ± 0.9	1.0 ± 0.3	22.5 ± 2.2	8.3 ± 0.8
	5/31/00	2.1 ± 0.8	0.8 ± 0.3	19.2 ± 2.1	7.1 ± 0.8
	6/7/00	2.9 ± 0.9	1.1 ± 0.3	27.3 ± 2.3	10.1 ± 0.9
	6/14/00	1.7 ± 0.8	0.6 ± 0.3	-1.0 ± 1.0	-0.4 ± 0.4
	6/21/00	0.8 ± 0.6	0.3 ± 0.2	13.6 ± 1.8	5.0 ± 0.7
	6/28/00	0.5 ± 0.5	0.2 ± 0.2	6.0 ± 1.2	2.2 ± 0.4
CRATERS OF THE MOON					
	4/5/00	1.8 ± 0.6	0.7 ± 0.2	15.9 ± 1.5	5.9 ± 0.5
	4/12/00	1.3 ± 0.6	0.5 ± 0.2	21.6 ± 1.7	8.0 ± 0.6
	4/19/00	1.0 ± 0.5	0.4 ± 0.2	15.1 ± 1.4	5.6 ± 0.5
	4/26/00	1.0 ± 0.6	0.4 ± 0.2	15.5 ± 1.6	5.7 ± 0.6
	5/3/00	1.0 ± 0.6	0.4 ± 0.2	22.3 ± 1.8	8.3 ± 0.7
	5/10/00	1.6 ± 0.8	0.6 ± 0.3	18.3 ± 1.9	6.8 ± 0.7
	5/17/00	0.5 ± 0.6	0.2 ± 0.2	15.5 ± 1.7	5.7 ± 0.6
	5/24/00	1.3 ± 0.6	0.5 ± 0.2	15.5 ± 1.6	5.7 ± 0.6
	5/31/00	1.1 ± 0.6	0.4 ± 0.2	17.7 ± 1.7	6.5 ± 0.6
	6/7/00	2.1 ± 0.7	0.8 ± 0.3	24.1 ± 1.9	8.9 ± 0.7
	6/14/00	0.8 ± 0.5	0.3 ± 0.2	18.1 ± 1.7	6.7 ± 0.6
	6/21/00	1.0 ± 0.5	0.4 ± 0.2	17.1 ± 1.7	6.3 ± 0.6
	6/28/00	1.3 ± 0.7	0.5 ± 0.3	15.8 ± 1.8	5.8 ± 0.7
IDAHO FALLS					
	4/5/00	1.3 ± 0.8	0.5 ± 0.3	19.0 ± 2.4	7.0 ± 0.9
	4/12/00	1.8 ± 1.0	0.7 ± 0.4	28.0 ± 2.9	10.4 ± 1.1
	4/19/00	0.9 ± 0.7	0.4 ± 0.3	23.4 ± 2.3	8.7 ± 0.9
	4/26/00	1.3 ± 0.7	0.5 ± 0.3	19.6 ± 2.1	7.3 ± 0.8
	5/3/00	2.2 ± 0.9	0.8 ± 0.3	22.7 ± 2.3	8.4 ± 0.9
	5/10/00	2.2 ± 1.4	0.8 ± 0.5	25.2 ± 3.2	9.3 ± 1.2
	5/17/00	2.1 ± 1.4	0.8 ± 0.5	23.0 ± 3.1	8.5 ± 1.1
	5/24/00	2.5 ± 1.1	0.9 ± 0.4	23.5 ± 2.8	8.7 ± 1.0
	5/31/00	2.2 ± 1.1	0.8 ± 0.4	23.5 ± 2.8	8.7 ± 1.0
	6/7/00	2.2 ± 1.0	0.8 ± 0.4	29.8 ± 3.0	11.0 ± 1.1
	6/14/00	1.6 ± 1.0	0.6 ± 0.4	28.8 ± 2.9	10.7 ± 1.1
	6/21/00	1.8 ± 1.1	0.7 ± 0.4	17.8 ± 2.8	6.6 ± 1.1
	6/28/00	1.9 ± 1.6	0.7 ± 0.6	21.1 ± 3.8	7.8 ± 1.4
REXBURG, CMS					
	4/5/00	1.8 ± 0.7	0.7 ± 0.2	18.6 ± 1.7	6.9 ± 0.6
	4/12/00	2.9 ± 0.8	1.1 ± 0.3	24.2 ± 1.9	9.0 ± 0.7
	4/19/00	1.5 ± 0.6	0.6 ± 0.2	18.0 ± 1.7	6.7 ± 0.6
	4/26/00	1.7 ± 0.6	0.6 ± 0.2	19.0 ± 1.7	7.0 ± 0.6
	5/3/00	2.6 ± 0.8	1.0 ± 0.3	20.7 ± 1.8	7.7 ± 0.6
	5/10/00	2.1 ± 0.9	0.8 ± 0.3	21.1 ± 2.0	7.8 ± 0.8
	5/17/00	1.8 ± 0.8	0.7 ± 0.3	17.9 ± 1.8	6.6 ± 0.7
	5/24/00	2.2 ± 0.7	0.8 ± 0.3	20.3 ± 1.8	7.5 ± 0.7
	5/31/00	1.7 ± 0.6	0.6 ± 0.2	18.4 ± 1.7	6.8 ± 0.6
	6/7/00	2.1 ± 0.7	0.8 ± 0.3	29.0 ± 2.0	10.7 ± 0.7
	6/14/00	2.0 ± 0.7	0.7 ± 0.3	19.2 ± 1.7	7.1 ± 0.6
	6/21/00	2.2 ± 0.7	0.8 ± 0.3	17.2 ± 1.7	6.4 ± 0.6
	6/28/00	2.2 ± 0.9	0.8 ± 0.3	20.2 ± 2.0	7.5 ± 0.7

[a] *2s = 2 Standard Deviations*
[b] *µCi = Standard Units (see "Helpful Information")*
[c] *Bq = Systeme International d'Unites (see "Helpful Information")*

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air

Sample Group & Location	Sampling Date	GROSS ALPHA Concentration +/- 2s[a] 10^{-15} µCi[b] /mL			GROSS ALPHA Concentration +/- 2s 10^{-10} Bq[c] /mL			GROSS BETA Concentration +/- 2s 10^{-15} µCi/mL			GROSS BETA Concentration +/- 2s 10^{-10} Bq/mL		
INEEL													
EFS													
	4/5/00	1.4	±	0.6	0.5	±	0.2	17.4	±	1.8	6.4	±	0.7
	4/12/00	1.3	±	0.6	0.5	±	0.2	21.5	±	1.8	8.0	±	0.7
	4/19/00	0.9	±	0.6	0.3	±	0.2	17.8	±	1.7	6.6	±	0.6
	4/26/00	0.8	±	0.6	0.3	±	0.2	17.6	±	1.7	6.5	±	0.6
	5/3/00	1.7	±	0.8	0.6	±	0.3	26.3	±	2.3	9.7	±	0.9
	5/10/00	1.0	±	0.9	0.4	±	0.3	20.7	±	2.4	7.7	±	0.9
	5/17/00	0.6	±	0.8	0.2	±	0.3	18.5	±	2.2	6.8	±	0.8
	5/24/00	1.6	±	0.7	0.6	±	0.3	19.3	±	2.0	7.1	±	0.7
	5/31/00	1.1	±	0.7	0.4	±	0.2	18.4	±	1.9	6.8	±	0.7
	6/7/00	0.9	±	0.6	0.3	±	0.2	27.5	±	2.3	10.2	±	0.8
	6/14/00	1.2	±	0.7	0.4	±	0.3	19.3	±	2.0	7.1	±	0.7
	6/21/00	1.5	±	0.7	0.5	±	0.3	19.0	±	2.0	7.0	±	0.7
	6/28/00	1.9	±	0.9	0.7	±	0.3	18.0	±	2.2	6.7	±	0.8
MAIN GATE													
	4/5/00	1.3	±	0.6	0.5	±	0.2	15.7	±	1.6	5.8	±	0.6
	4/12/00	1.4	±	0.6	0.5	±	0.2	22.4	±	1.7	8.3	±	0.6
	4/19/00	1.0	±	0.5	0.4	±	0.2	17.8	±	1.6	6.6	±	0.6
	4/26/00	0.7	±	0.5	0.3	±	0.2	16.9	±	1.6	6.3	±	0.6
	5/3/00	1.0	±	0.6	0.4	±	0.2	22.2	±	1.8	8.2	±	0.7
	5/10/00	1.0	±	0.8	0.4	±	0.3	20.0	±	2.2	7.4	±	0.8
	5/17/00	1.0	±	0.8	0.4	±	0.3	16.7	±	1.9	6.2	±	0.7
	5/24/00	2.2	±	0.7	0.8	±	0.3	18.4	±	1.8	6.8	±	0.7
	5/31/00	0.8	±	0.6	0.3	±	0.2	19.1	±	1.9	7.1	±	0.7
	6/7/00	1.2	±	0.6	0.4	±	0.2	22.8	±	1.9	8.4	±	0.7
	6/14/00	1.1	±	0.6	0.4	±	0.2	13.8	±	1.6	5.1	±	0.6
	6/21/00	1.2	±	0.6	0.4	±	0.2	17.4	±	1.7	6.4	±	0.6
	6/28/00	0.9	±	0.7	0.3	±	0.3	18.4	±	2.0	6.8	±	0.7
VAN BUREN													
	4/5/00	1.2	±	0.7	0.5	±	0.3	18.2	±	2.0	6.7	±	0.7
	4/12/00	0.9	±	0.7	0.3	±	0.2	22.1	±	2.2	8.2	±	0.8
	4/19/00	0.9	±	0.6	0.3	±	0.2	18.2	±	1.9	6.7	±	0.7
	4/26/00	0.6	±	0.6	0.2	±	0.2	16.1	±	1.9	6.0	±	0.7
	5/3/00	2.0	±	0.8	0.7	±	0.3	26.4	±	2.3	9.8	±	0.9
	5/10/00	1.2	±	0.9	0.5	±	0.3	21.3	±	2.4	7.9	±	0.9
	5/17/00	1.3	±	0.9	0.5	±	0.3	18.9	±	2.2	7.0	±	0.8
	5/24/00	1.6	±	0.7	0.6	±	0.3	18.8	±	2.1	7.0	±	0.8
	5/31/00	0.6	±	0.6	0.2	±	0.2	20.5	±	2.1	7.6	±	0.8
	6/7/00	1.1	±	0.7	0.4	±	0.2	25.5	±	2.3	9.4	±	0.8
	6/14/00	1.4	±	0.8	0.5	±	0.3	15.9	±	1.9	5.9	±	0.7
	6/21/00	1.5	±	0.7	0.6	±	0.3	17.5	±	2.0	6.5	±	0.7
	6/28/00	1.0	±	1.1	0.4	±	0.4	18.1	±	2.7	6.7	±	1.0

[a] *2s = 2 Standard Deviations*
[b] *µCi = Standard Units (see "Helpful Information")*
[c] *Bq = Systeme International d'Unites (see "Helpful Information")*

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-2: Weekly Iodine- 131 Concentrations in Air

Sample Group & Location	Sampling Date	Concentration +/- 2s[a] 10^{-6} µCi[b] /mL			Concentration +/- 2s 10^{-2} Bq[c] /mL		
BOUNDARY							
ARCO							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
ATOMIC CITY							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
BIRCH CREEK							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
FAA TOWER							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE 1: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

NOTE 2: Up to 9 charcoal cartridges are screened simultaneously on a gamma spectrometer, hence like results for certain locations by sample date.

Table C-2 (cont.): Weekly Iodine- 131 Concentrations in Air

Sample Group & Location	Sampling Date	Concentration +/- 2s[a] 10^{-6} µCi[b] /mL			Concentration +/- 2s 10^{-2} Bq[c] /mL		
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
FAA TOWER (Q/A-1)							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
HOWE							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
MONTEVIEW							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE 1: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis
NOTE 2: Up to 9 charcoal cartridges are screened simultaneously on a gamma spectrometer, hence like results for certain locations by sample date.

Table C-2 (cont.): Weekly Iodine- 131 Concentrations in Air

Sample Group & Location	Sampling Date	Concentration +/- 2s[a] 10^{-6} µCi[b] /mL			Concentration +/- 2s 10^{-2} Bq[c] /mL		
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
MONTEVIEW (Q/A-2)							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
MUD LAKE							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
DISTANT							
BLACKFOOT							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
BLACKFOOT, CMS							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE 1: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

NOTE 2: Up to 9 charcoal cartridges are screened simultaneously on a gamma spectrometer, hence like results for certain locations by sample date.

Table C-2 (cont.): Weekly Iodine- 131 Concentrations in Air

Sample Group & Location	Sampling Date	Concentration +/- 2s[a] 10^-6 µCi[b] /mL			Concentration +/- 2s 10^-2 Bq[c] /mL		
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
CRATERS OF THE MOON							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
IDAHO FALLS							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
REXBURG, CMS							
	4/5/00	0.5	±	1.6	1.8	±	6.1
	4/12/00	-0.8	±	1.7	-3.0	±	6.4
	4/19/00	0.5	±	1.7	1.9	±	6.1
	4/26/00	0.5	±	1.7	1.8	±	6.2
	5/3/00	0.1	±	1.7	0.4	±	6.4
	5/10/00	-0.2	±	1.6	-0.8	±	6.1
	5/17/00	-0.8	±	2.0	-3.1	±	7.2
	5/24/00	1.6	±	1.7	5.9	±	6.1
	5/31/00	0.4	±	1.9	1.4	±	6.8
	6/7/00	1.6	±	2.0	5.8	±	7.2
	6/14/00	2.3	±	1.7	8.5	±	6.2

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE 1: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

NOTE 2: Up to 9 charcoal cartridges are screened simultaneously on a gamma spectrometer, hence like results for certain locations by sample date.

Table C-2 (cont.): Weekly Iodine- 131 Concentrations in Air

Sample Group & Location	Sampling Date	Concentration +/- 2s[a] 10^{-6} µCi[b] /mL			Concentration +/- 2s 10^{-2} Bq[c] /mL		
	6/21/00	0.4	±	2.2	1.4	±	8.3
	6/28/00	-1.7	±	2.1	-6.3	±	7.6
INEEL							
EFS							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
MAIN GATE							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2
VAN BUREN							
	4/5/00	-1.4	±	2.0	-5.0	±	7.5
	4/12/00	0.9	±	2.3	3.2	±	8.7
	4/19/00	1.1	±	2.1	4.0	±	7.6
	4/26/00	0.8	±	2.1	2.9	±	7.8
	5/3/00	0.9	±	2.2	3.2	±	8.3
	5/10/00	0.8	±	2.0	2.9	±	7.5
	5/17/00	0.6	±	1.6	2.2	±	6.0
	5/24/00	-1.9	±	2.0	-6.8	±	7.5
	5/31/00	0.7	±	2.2	2.6	±	8.3
	6/7/00	-2.3	±	2.5	-8.6	±	9.2
	6/14/00	1.6	±	2.1	5.9	±	7.9
	6/21/00	2.3	±	2.2	8.6	±	8.0
	6/28/00	0.7	±	1.7	2.7	±	6.2

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE 1: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

NOTE 2: Up to 9 charcoal cartridges are screened simultaneously on a gamma spectrometer, hence like results for certain locations by sample date.

Table C-3: Quarterly Cesium-137, Americium-241, Plutonium-238, Plutonium-239/240 & Strontium-90 Concentrations in Composited Air Filters

Sample Group & Location	Sampling Date	Analyte	Concentration +/- 2s[a] 10^{-16} µCi[b] /mL			Concentration +/- 2s 10^{-12} Bq[c] /mL		
BOUNDARY								
ARCO								
	6/28/00	CESIUM-137	1.510	±	2.260	5.587	±	8.362
	6/28/00	STRONTIUM-90	0.215	±	0.280	0.796	±	1.036
ATOMIC CITY								
	6/28/00	AMERICIUM-241	0.002	±	0.006	0.007	±	0.024
	6/28/00	CESIUM-137	-0.003	±	2.440	-0.012	±	9.028
	6/28/00	PLUTONIUM-238	0.000	±	0.009	0.000	±	0.032
	6/28/00	PLUTONIUM-239/240	0.009	±	0.012	0.033	±	0.046
BIRCH CREEK								
	6/28/00	CESIUM-137	-3.070	±	8.640	-11.359	±	31.968
FAA TOWER								
	6/28/00	AMERICIUM-241	0.001	±	0.008	0.003	±	0.030
	6/28/00	CESIUM-137	-0.863	±	2.280	-3.193	±	8.436
	6/28/00	PLUTONIUM-238	-0.003	±	0.007	-0.012	±	0.024
	6/28/00	PLUTONIUM-239/240	0.016	±	0.024	0.061	±	0.089
FAA TOWER (Q/A-1)								
	6/20/00	AMERICIUM-241	0.003	±	0.005	0.010	±	0.019
	6/20/00	PLUTONIUM-238	0.000	±	0.013	0.000	±	0.048
	6/20/00	PLUTONIUM-239/240	0.010	±	0.014	0.037	±	0.052
	6/28/00	CESIUM-137	-3.930	±	5.580	-14.541	±	20.646
HOWE								
	6/28/00	CESIUM-137	-6.520	±	10.500	-24.124	±	38.850
MONTEVIEW								
	6/28/00	CESIUM-137	2.690	±	1.880	9.953	±	6.956
	6/28/00	STRONTIUM-90	0.132	±	0.360	0.488	±	1.332
MONTEVIEW (Q/A-2)								
	6/28/00	CESIUM-137	-4.630	±	8.400	-17.131	±	31.080
	6/28/00	STRONTIUM-90	-0.082	±	0.280	-0.305	±	1.036
MUD LAKE								
	6/15/00	CESIUM-137	-0.145	±	1.730	-0.537	±	6.401
	6/28/00	AMERICIUM-241	0.001	±	0.006	0.002	±	0.022
	6/28/00	CESIUM-137	1.600	±	1.780	5.920	±	6.586
	6/28/00	PLUTONIUM-238	-0.004	±	0.005	-0.015	±	0.017
	6/28/00	PLUTONIUM-239/240	0.005	±	0.010	0.019	±	0.036

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-3(cont.): Quarterly Cesium-137, Americium-241, Plutonium-238, Plutonium-239/240 & Strontium-90 Concentrations in Composited Air Filters

Sample Group & Location	Sampling Date	Analyte	Concentration +/- 2s[a] 10^{-16} µCi[b] /mL			Concentration +/- 2s 10^{-12} Bq[c] /mL		
DISTANT								
BLACKFOOT								
	6/28/00	CESIUM-137	0.436	±	3.200	1.613	±	11.840
	6/28/00	STRONTIUM-90	0.336	±	0.400	1.243	±	1.480
BLACKFOOT, CMS								
	6/28/00	AMERICIUM-241	0.006	±	0.013	0.023	±	0.048
	6/28/00	CESIUM-137	0.108	±	2.000	0.400	±	7.400
	6/28/00	PLUTONIUM-238	-0.001	±	0.002	-0.004	±	0.008
	6/28/00	PLUTONIUM-239/240	0.016	±	0.014	0.058	±	0.052
CRATERS OF THE MOON								
	6/28/00	AMERICIUM-241	0.003	±	0.005	0.009	±	0.019
	6/28/00	CESIUM-137	-0.780	±	2.100	-2.886	±	7.770
	6/28/00	PLUTONIUM-238	0.000	±	0.005	0.000	±	0.020
	6/28/00	PLUTONIUM-239/240	0.007	±	0.009	0.026	±	0.035
IDAHO FALLS								
	6/28/00	AMERICIUM-241	0.009	±	0.013	0.033	±	0.047
	6/28/00	CESIUM-137	2.590	±	3.080	9.583	±	11.396
	6/28/00	PLUTONIUM-238	0.006	±	0.036	0.023	±	0.133
	6/28/00	PLUTONIUM-239/240	0.023	±	0.038	0.085	±	0.141
REXBURG, CMS								
	6/28/00	CESIUM-137	-1.900	±	7.540	-7.030	±	27.898
	6/28/00	STRONTIUM-90	0.098	±	0.260	0.361	±	0.962
INEEL								
EFS								
	6/28/00	AMERICIUM-241	0.009	±	0.011	0.035	±	0.041
	6/28/00	CESIUM-137	-7.090	±	5.920	-26.233	±	21.904
	6/28/00	PLUTONIUM-238	-0.001	±	0.002	-0.004	±	0.009
	6/28/00	PLUTONIUM-239/240	0.008	±	0.012	0.030	±	0.046
MAIN GATE								
	6/28/00	CESIUM-137	-6.390	±	7.920	-23.643	±	29.304
	6/28/00	STRONTIUM-90	0.092	±	0.280	0.339	±	1.036
VAN BUREN								
	6/28/00	CESIUM-137	-0.664	±	2.740	-2.457	±	10.138

a 2s = 2 Standard Deviations
b µCi = Standard Units (see "Helpful Information")
c Bq = Systeme International d'Unites (see "Helpful Information")

NOTE: Q/A-1 and Q/A-2 are replicate samplers placed at the location in parenthesis

Table C-4: Tritium Concentrations in Atmospheric Moisture

Location	Start Date	End Date	Concentration +/- 2s[a] 10^{-14} µCi[b] /ml Air			Concentration +/- 2s 10^{-9} Bq[c] /ml Air		
ATOMIC CITY								
	4/4/00	6/27/00	12.9	±	13.9	4.8	±	5.1
BLACKFOOT, CMS								
	4/5/00	6/22/00	11.3	±	18.0	4.2	±	6.7
IDAHO FALLS								
	3/1/00	6/15/00	7.3	±	5.7	2.7	±	2.1
REXBURG, CMS								
	4/5/00	6/28/00	-6.2	±	9.3	-2.3	±	3.4

a 2s = 2 Standard Deviations
b µCi = Standard Units (see "Helpful Information")
c Bq = Systeme International d'Unites (see "Helpful Information")

Table C-5: PM_{10} Sampler Concentrations at Atomic City, Blackfoot CMS, & Rexburg CMS

Location	Sampling Date	Concentration µg /m³	Comments
ATOMIC CITY			
	4/5/00	14.5	
	4/11/00	16.7	
	4/17/00	13.2	
	4/23/00	3.7	
	4/29/00	13.0	
	5/5/00	19.1	
	5/11/00	5.0	
	5/17/00	6.9	
	5/23/00	13.6	
	5/29/00	14.2	
	6/4/00	20.0	
	6/10/00	31.6	
	6/16/00	11.5	
	6/22/00	55.5	
	6/28/00	8.1	
BLACKFOOT, CMS			
	4/5/00	164.2	Weight Difference is large
	4/11/00	22.9	
	4/17/00	15.1	
	4/23/00	6.0	
	4/29/00	13.9	
	5/5/00	16.2	
	5/11/00	8.8	
	5/17/00	11.8	
	5/23/00	30.6	
	5/29/00	16.6	
	6/4/00	31.2	
	6/10/00	12.6	
	6/16/00	15.0	
	6/22/00	22.7	
	6/28/00	22.7	

Table C-5(cont.): PM_{10} Sampler Concentrations at Atomic City, Blackfoot CMS, & Rexburg CMS

Location	Sampling Date	Concentration µg /m³	Comments
REXBURG, CMS			
	4/5/00	30.9	
	4/11/00	18.5	
	4/17/00	21.8	
	4/23/00	5.5	
	4/29/00	18.5	
	5/5/00		Invalid Sample - Motor not Running
	5/11/00	6.7	
	5/17/00	10.4	
	5/23/00	22.4	
	5/29/00	14.8	
	6/4/00	20.3	
	6/10/00	10.0	
	6/16/00	16.1	
	6/22/00	16.4	
	6/28/00		Filter Problem

Table C-6: Weekly & Monthly Tritium Concentrations in Precipitatior

Location	Sampling Date	Concentration +/- 2s[a] pCi[b]/L			Concentration +/- 2s Bq[c]/L		
CFA							
	4/3/00	-73.2	±	71.0	-2.71	±	2.63
	5/1/00	-0.6	±	70.0	-0.02	±	2.59
	6/5/00	-45.6	±	69.6	-1.69	±	2.58
EFS							
	4/11/00	149.0	±	73.8	5.51	±	2.73
	4/25/00	27.6	±	70.4	1.02	±	2.60
	5/9/00	0.7	±	70.0	0.03	±	2.59
	6/20/00	-240.0	±	67.0	-8.88	±	2.48
IDAHO FALLS							
	4/6/00	-85.1	±	69.0	-3.15	±	2.55
	5/1/00	34.2	±	70.6	1.27	±	2.61
	6/5/00	-65.4	±	69.2	-2.42	±	2.56

a 2s = 2 Standard Deviations
b pCi = Standard Units (see "Helpful Information")
c Bq = Systeme International d'Unites (see "Helpful Information")

Table C-7: Weekly Gross Alpha, Gross Beta & Tritium Concentration in Drinking & Surface Water

Sample Type & Location	Sampling Date	Analyte	Concentration +/- 2s[a] pCi[b] /L			Concentration +/- 2s Bq[c] /L		
DRINKING WATER								
ABERDEEN								
	5/14/00	*GROSS ALPHA*	0.28	±	1.00	0.01	±	0.04
	5/14/00	*GROSS BETA*	4.46	±	1.94	0.17	±	0.07
	5/14/00	*TRITIUM*	13.10	±	82.80	0.48	±	3.06
ARCO								
	5/3/00	*GROSS ALPHA*	0.89	±	0.82	0.03	±	0.03
	5/3/00	*GROSS BETA*	2.66	±	1.67	0.10	±	0.06
	5/3/00	*TRITIUM*	-221.00	±	79.20	-8.18	±	2.93
ATOMIC CITY								
	5/3/00	*GROSS ALPHA*	1.72	±	0.96	0.06	±	0.04
	5/3/00	*GROSS ALPHA*	0.10	±	0.48	0.00	±	0.02
	5/3/00	*GROSS BETA*	4.72	±	1.79	0.17	±	0.07
	5/3/00	*GROSS BETA*	2.06	±	1.54	0.08	±	0.06
	5/3/00	*TRITIUM*	-50.40	±	82.00	-1.86	±	3.03
	5/3/00	*TRITIUM*	-116.00	±	81.00	-4.29	±	3.00
CAREY								
	5/3/00	*GROSS ALPHA*	-0.16	±	0.71	-0.01	±	0.03
	5/3/00	*GROSS BETA*	2.51	±	1.71	0.09	±	0.06
	5/3/00	*TRITIUM*	-67.60	±	81.60	-2.50	±	3.02
FORT HALL								
	5/11/00	*GROSS ALPHA*	0.44	±	1.05	0.02	±	0.04
	5/11/00	*GROSS BETA*	6.50	±	2.06	0.24	±	0.08
	5/11/00	*TRITIUM*	-128.00	±	80.80	-4.74	±	2.99
HOWE								
	5/3/00	*GROSS ALPHA*	0.57	±	0.75	0.02	±	0.03
	5/3/00	*GROSS BETA*	2.45	±	1.66	0.09	±	0.06
	5/3/00	*TRITIUM*	-62.30	±	81.80	-2.31	±	3.03
IDAHO FALLS								
	5/11/00	*GROSS ALPHA*	0.12	±	0.69	0.00	±	0.03
	5/11/00	*GROSS BETA*	3.17	±	1.73	0.12	±	0.06
	5/11/00	*TRITIUM*	-41.00	±	82.20	-1.52	±	3.04

a 2s = 2 Standard Deviations
b μCi = Standard Units (see "Helpful Information")
c Bq = Systeme International d'Unites (see "Helpful Information")

Table C-7(cont): Weekly Gross Alpha, Gross Beta & Tritium Concentrations in Drinking & Surface Water

Sample Type & Location	Sampling Date	Analyte	Concentration +/- 2s[a] pCi[b] /L			Concentration +/- 2s Bq[c] /L		
MINIDOKA								
	5/9/00	GROSS ALPHA	0.29	±	0.79	0.01	±	0.03
	5/9/00	GROSS BETA	3.26	±	1.75	0.12	±	0.06
	5/9/00	TRITIUM	-81.80	±	81.40	-3.03	±	3.01
MONTEVIEW								
	5/3/00	GROSS ALPHA	1.65	±	1.19	0.06	±	0.04
	5/3/00	GROSS BETA	5.23	±	2.02	0.19	±	0.07
	5/3/00	TRITIUM	-89.90	±	81.40	-3.33	±	3.01
MUD LAKE								
	5/3/00	GROSS ALPHA	-0.13	±	0.43	0.00	±	0.02
	5/3/00	GROSS BETA	3.48	±	1.63	0.13	±	0.06
	5/3/00	TRITIUM	-112.00	±	81.00	-4.14	±	3.00
ROBERTS								
	5/8/00	GROSS ALPHA	-0.17	±	0.71	-0.01	±	0.03
	5/8/00	GROSS BETA	3.47	±	1.78	0.13	±	0.07
	5/8/00	TRITIUM	-36.60	±	82.20	-1.35	±	3.04
SHOSHONE								
	5/9/00	GROSS ALPHA	1.14	±	0.89	0.04	±	0.03
	5/9/00	GROSS BETA	4.48	±	1.79	0.17	±	0.07
	5/9/00	TRITIUM	-52.10	±	81.80	-1.93	±	3.03
TABOR								
	5/3/00	GROSS ALPHA	0.39	±	1.00	0.01	±	0.04
	5/3/00	GROSS BETA	3.86	±	1.89	0.14	±	0.07
	5/3/00	TRITIUM	-13.90	±	82.40	-0.51	±	3.05
SURFACE WATER								
BLISS								
	5/18/00	GROSS ALPHA	0.76	±	0.86	0.03	±	0.03
	5/18/00	GROSS BETA	7.12	±	1.96	0.26	±	0.07
	5/18/00	TRITIUM	-10.40	±	82.60	-0.38	±	3.06
BUHL								
	5/9/00	GROSS ALPHA	0.53	±	0.79	0.02	±	0.03
	5/9/00	GROSS BETA	4.84	±	1.83	0.18	±	0.07
	5/9/00	TRITIUM	-69.40	±	81.60	-2.57	±	3.02

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

Table C-7(cont): Weekly Gross Alpha, Gross Beta & Tritium Concentrations in Drinking & Surface Water

Sample Type & Location	Sampling Date	Analyte	Concentration +/- 2s[a] pCi[b] /L			Concentration +/- 2s Bq[c] /L		
HAGERMAN								
	5/9/00	GROSS ALPHA	0.37	±	0.66	0.01	±	0.02
	5/9/00	GROSS ALPHA	1.07	±	0.82	0.04	±	0.03
	5/9/00	GROSS BETA	3.48	±	1.70	0.13	±	0.06
	5/9/00	GROSS BETA	2.28	±	1.62	0.08	±	0.06
	5/9/00	TRITIUM	-16.20	±	82.40	-0.60	±	3.05
	5/9/00	TRITIUM	-103.00	±	81.20	-3.81	±	3.00
IDAHO FALLS								
	5/1/00	GROSS ALPHA	0.45	±	0.64	0.02	±	0.02
	5/1/00	GROSS BETA	1.24	±	1.54	0.05	±	0.06
	5/1/00	TRITIUM	-41.90	±	82.00	-1.55	±	3.03
TWIN FALLS								
	5/9/00	GROSS ALPHA	0.22	±	0.80	0.01	±	0.03
	5/9/00	GROSS BETA	7.53	±	2.04	0.28	±	0.08
	5/9/00	TRITIUM	-51.20	±	82.00	-1.89	±	3.03

a 2s = 2 Standard Deviations
b µCi = Standard Units (see "Helpful Information")
c Bq = Systeme International d'Unites (see "Helpful Information")

Table C-8: Weekly Iodine-131 & Cesium-137 Concentrations in Milk

Sample Group & Location	Sampling Date	Analyte	Concentration +/- 2s[a] pCi[b]/L			Concentration +/- 2s Bq[c]/L		
BLACKFOOT								
	4/10/00	CESIUM-137	1.0	±	2.6	0.04	±	0.10
	4/10/00	IODINE-131	0.3	±	2.8	0.01	±	0.11
	5/9/00	CESIUM-137	-0.5	±	2.2	-0.02	±	0.08
	5/9/00	IODINE-131	-1.6	±	1.8	-0.06	±	0.07
	6/5/00	CESIUM-137	-1.0	±	2.2	-0.04	±	0.08
	6/5/00	IODINE-131	1.4	±	2.1	0.05	±	0.08
CAREY								
	4/11/00	CESIUM-137	1.2	±	2.3	0.04	±	0.08
	4/11/00	IODINE-131	-1.1	±	1.8	-0.04	±	0.07
	5/9/00	CESIUM-137	8.1	±	4.7	0.30	±	0.17
	5/9/00	IODINE-131	3.1	±	5.0	0.11	±	0.18
	6/6/00	CESIUM-137	1.5	±	7.7	0.06	±	0.28
	6/6/00	IODINE-131	-3.1	±	7.2	-0.12	±	0.27
DIETRICH								
	4/11/00	CESIUM-137	7.8	±	4.6	0.29	±	0.17
	4/11/00	IODINE-131	-1.4	±	5.0	-0.05	±	0.19
	5/9/00	CESIUM-137	-1.0	±	7.9	-0.04	±	0.29
	5/9/00	IODINE-131	-0.6	±	6.4	-0.02	±	0.24
	6/6/00	CESIUM-137	-0.3	±	2.2	-0.01	±	0.08
	6/6/00	IODINE-131	2.6	±	2.6	0.10	±	0.10
HOWE								
	4/10/00	CESIUM-137	-1.0	±	7.6	-0.04	±	0.28
	4/10/00	IODINE-131	0.8	±	6.8	0.03	±	0.25
	5/8/00	CESIUM-137	0.6	±	2.3	0.02	±	0.08
	5/8/00	IODINE-131	0.5	±	1.8	0.02	±	0.07
	6/5/00	CESIUM-137	4.6	±	4.6	0.17	±	0.17
	6/5/00	IODINE-131	-0.3	±	5.3	-0.01	±	0.19
IDAHO FALLS								
	4/6/00	CESIUM-137	-14.8	±	5.9	-0.55	±	0.22
	4/6/00	IODINE-131	-1.8	±	3.4	-0.06	±	0.13
	4/10/00	CESIUM-137	0.7	±	2.6	0.03	±	0.10
	4/10/00	IODINE-131	-0.9	±	2.8	-0.03	±	0.10
	4/20/00	CESIUM-137	-2.9	±	7.5	-0.11	±	0.28
	4/20/00	IODINE-131	1.1	±	5.4	0.04	±	0.20
	4/27/00	CESIUM-137	-3.9	±	7.7	-0.14	±	0.28
	4/27/00	IODINE-131	2.4	±	5.5	0.09	±	0.20
	5/4/00	CESIUM-137	-3.1	±	7.8	-0.11	±	0.29
	5/4/00	IODINE-131	0.0	±	5.7	0.00	±	0.21
	5/8/00	CESIUM-137	3.6	±	4.6	0.13	±	0.17
	5/8/00	IODINE-131	-1.1	±	4.7	-0.04	±	0.17
	5/18/00	CESIUM-137	-7.5	±	7.1	-0.28	±	0.26
	5/18/00	IODINE-131	0.1	±	4.6	0.00	±	0.17
	5/25/00	CESIUM-137	-3.2	±	7.8	-0.12	±	0.29

[a] 2s = 2 Standard Deviations
[b] pCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

NOTE: The same sampling date for a given location is the same sample analysed for both Cesium-137 and Iodine-131

Table C-8(cont): Weekly Iodine-131 & Cesium-137 Concentrations in Milk

Location	Sampling Date	Analyte	Concentration +/- 2s[a] pCi[b]/L			Concentration +/- 2s Bq[c]/L		
	5/25/00	IODINE-131	-2.8	±	5.7	-0.10	±	0.21
	6/1/00	CESIUM-137	-6.7	±	8.2	-0.25	±	0.30
	6/1/00	IODINE-131	-6.7	±	5.5	-0.25	±	0.20
	6/5/00	CESIUM-137	-6.1	±	7.9	-0.22	±	0.29
	6/5/00	IODINE-131	-7.2	±	6.7	-0.26	±	0.25
	6/15/00	CESIUM-137	4.0	±	4.7	0.15	±	0.18
	6/15/00	IODINE-131	-1.2	±	4.1	-0.05	±	0.15
	6/22/00	CESIUM-137	5.7	±	4.4	0.21	±	0.16
	6/22/00	IODINE-131	3.4	±	4.1	0.13	±	0.15
	6/29/00	CESIUM-137	7.7	±	4.3	0.28	±	0.16
	6/29/00	IODINE-131	1.8	±	3.9	0.06	±	0.15
MINIDOKA								
	4/11/00	CESIUM-137	-2.2	±	7.8	-0.08	±	0.29
	4/11/00	IODINE-131	-0.2	±	6.6	-0.01	±	0.24
	5/9/00	CESIUM-137	6.0	±	4.6	0.22	±	0.17
	5/9/00	IODINE-131	1.3	±	4.6	0.05	±	0.17
	6/6/00	CESIUM-137	0.7	±	2.7	0.02	±	0.10
	6/6/00	IODINE-131	-0.9	±	3.3	-0.03	±	0.12
ROBERTS								
	4/10/00	CESIUM-137	0.7	±	7.9	0.03	±	0.29
	4/10/00	IODINE-131	-3.6	±	6.0	-0.13	±	0.22
	5/8/00	CESIUM-137	-1.5	±	2.7	-0.05	±	0.10
	5/8/00	IODINE-131	1.8	±	2.8	0.07	±	0.10
	6/6/00	CESIUM-137	3.2	±	4.7	0.12	±	0.17
	6/6/00	IODINE-131	-4.7	±	4.9	-0.17	±	0.18
TERRETON								
	4/10/00	CESIUM-137	-0.2	±	2.3	-0.01	±	0.08
	4/10/00	IODINE-131	0.8	±	1.8	0.03	±	0.07
	5/8/00	CESIUM-137	-0.6	±	7.7	-0.02	±	0.28
	5/8/00	IODINE-131	-4.9	±	6.1	-0.18	±	0.23
	6/5/00	CESIUM-137	-0.2	±	2.3	-0.01	±	0.08
	6/5/00	IODINE-131	0.5	±	2.0	0.02	±	0.07

[a] *2s = 2 Standard Deviations*

[b] *µCi = Standard Units (see "Helpful Information")*

[c] *Bq = Systeme International d'Unites (see "Helpful Information")*

NOTE: The same sampling date for a given location is the same sample analysed for both Cesium-137 and Iodine-131

Table C-9: Bi-annual Strontium-90 Concentrations in Milk

Location	Sampling Date	Concentration +/- 2s[a] pCi[b]/L			Concentration +/- 2s Bq[c]/L		
TERRETON	*5/2/00*	0.7	±	0.3	0.03	±	0.01
BLACKFOOT	*5/2/00*	0.7	±	0.3	0.02	±	0.01
IDAHO FALLS	*5/2/00*	0.8	±	0.3	0.03	±	0.01
MINIDOKA	*5/2/00*	0.5	±	0.4	0.02	±	0.02
CAREY	*5/2/00*	1.5	±	0.6	0.05	±	0.02

[a] 2s = 2 Standard Deviations
[b] µCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

Table C-10: Cesium-137 & Iodine-131 Concentrations in Game Animals

Species & Media	Sampling Date	Analyte	Concentration +/- 2s[a] pCi[b] /kg			Concentration +/- 2s Bq[c] /kg		
PRONGHORN								
LIVER								
	5/31/00	CESIUM-137	-0.2	±	10.2	0.0	±	0.4
	5/31/00	IODINE-131	0.3	±	12.6	0.0	±	0.5
MUSCLE								
	5/31/00	CESIUM-137	3.2	±	2.6	0.1	±	0.1
	5/31/00	IODINE-131	0.1	±	5.3	0.0	±	0.2
THYROID								
	5/31/00	CESIUM-137	-344.0	±	704.0	-12.7	±	26.0
	5/31/00	IODINE-131	-34.3	±	354.0	-1.3	±	13.1
MULE DEER								
LIVER								
	6/5/00	CESIUM-137	1.5	±	1.9	0.1	±	0.1
	6/5/00	IODINE-131	-2.0	±	3.6	-0.1	±	0.1
MUSCLE								
	6/5/00	CESIUM-137	1.9	±	2.5	0.1	±	0.1
	6/5/00	IODINE-131	-1.4	±	3.9	-0.1	±	0.1
THYROID								
	6/5/00	CESIUM-137	274.0	±	592.0	10.1	±	21.9
	6/5/00	IODINE-131	417.0	±	628.0	15.4	±	23.2

[a] 2s = 2 Standard Deviations
[b] pCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

Table C-12: Cesium-137 & Iodine-131 Concentrations in Shee

Location & Media	Sampling Date	Analyte	Concentration +/- 2s[a] pCi [b]/kg			Concentration +/- 2s Bq [c] /kg		
BYRON EGBERT								
LIVER								
Sample #1	*5/15/00*	*CESIUM-137*	-3.8	±	11.0	-0.1	±	0.4
Sample #1	*5/15/00*	*IODINE-131*	-17.9	±	31.0	-0.7	±	1.1
Sample #2	*5/15/00*	*CESIUM-137*	6.3	±	2.9	0.2	±	0.1
Sample #2	*5/15/00*	*IODINE-131*	8.0	±	14.3	0.3	±	0.5
MUSCLE								
Sample #1	*5/15/00*	*CESIUM-137*	-2.9	±	10.1	-0.1	±	0.4
Sample #1	*5/15/00*	*IODINE-131*	-7.0	±	32.8	-0.3	±	1.2
Sample #2	*5/15/00*	*CESIUM-137*	-0.8	±	10.1	0.0	±	0.4
Sample #2	*5/15/00*	*IODINE-131*	9.7	±	35.8	0.4	±	1.3
THYROID								
Sample #1	*5/15/00*	*CESIUM-137*	-0.5	±	97.0	0.0	±	3.6
Sample #1	*5/15/00*	*IODINE-131*	6.8	±	122.0	0.2	±	4.5
Sample #2	*5/15/00*	*CESIUM-137*	-29.7	±	119.0	-1.1	±	4.4
Sample #2	*5/15/00*	*IODINE-131*	-135.0	±	172.0	-5.0	±	6.4
KEN WIXSOM								
LIVER								
Sample #1	*5/15/00*	*CESIUM-137*	0.1	±	11.2	0.0	±	0.4
Sample #1	*5/15/00*	*IODINE-131*	38.4	±	48.2	1.4	±	1.8
Sample #2	*5/15/00*	*CESIUM-137*	-10.2	±	9.3	-0.4	±	0.3
Sample #2	*5/15/00*	*IODINE-131*	-15.0	±	49.6	-0.6	±	1.8
MUSCLE								
Sample #1	*5/15/00*	*CESIUM-137*	-7.0	±	10.3	-0.3	±	0.4
Sample #1	*5/15/00*	*IODINE-131*	-43.9	±	60.8	-1.6	±	2.2
Sample #2	*5/15/00*	*CESIUM-137*	2.4	±	2.2	0.1	±	0.1
Sample #2	*5/15/00*	*IODINE-131*	-3.9	±	21.4	-0.1	±	0.8

[a] *2s = 2 Standard Deviations*
[b] *pCi = Standard Units (see "Helpful Information")*
[c] *Bq = Systeme International d'Unites (see "Helpful Information")*

Table C-12(cont): Cesium-137 & Iodine-131 Concentrations in Shee

Location & Media	Sampling Date	Analyte	Concentration +/- 2s[a] pCi [b]/kg			Concentration +/- 2s Bq [c] /kg		
THYROID								
Sample #1	5/15/00	CESIUM-137	-158.0	±	464.0	-5.8	±	17.2
Sample #1	5/15/00	IODINE-131	-34.1	±	330.0	-1.3	±	12.2
Sample #2	5/15/00	CESIUM-137	32.9	±	111.0	1.2	±	4.1
Sample #2	5/15/00	IODINE-131	-64.0	±	149.0	-2.4	±	5.5
ROBERT BALL								
LIVER								
Sample #1	5/15/00	CESIUM-137	-4.7	±	12.4	-0.2	±	0.5
Sample #1	5/15/00	IODINE-131	-2.1	±	31.4	-0.1	±	1.2
Sample #2	5/15/00	CESIUM-137	3.6	±	2.1	0.1	±	0.1
Sample #2	5/15/00	IODINE-131	3.0	±	11.8	0.1	±	0.4
MUSCLE								
Sample #1	5/15/00	CESIUM-137	-1.2	±	10.0	0.0	±	0.4
Sample #1	5/15/00	IODINE-131	8.1	±	23.0	0.3	±	0.9
Sample #2	5/15/00	CESIUM-137	-5.3	±	10.1	-0.2	±	0.4
Sample #2	5/15/00	IODINE-131	-3.0	±	30.0	-0.1	±	1.1
THYROID								
Sample #1	5/15/00	CESIUM-137	-482.0	±	554.0	-17.8	±	20.5
Sample #1	5/15/00	IODINE-131	-58.4	±	286.0	-2.2	±	10.6
Sample #2	5/15/00	CESIUM-137	-155.0	±	572.0	-5.7	±	21.2
Sample #2	5/15/00	IODINE-131	-133.0	±	256.0	-4.9	±	9.5

[a] 2s = 2 Standard Deviations
[b] pCi = Standard Units (see "Helpful Information")
[c] Bq = Systeme International d'Unites (see "Helpful Information")

TABLE C-13: Cesium-137, Strontium-90, Plutonium-238, Plutonium-239/240, and Americium-241 Concentrations in Marmot Samples

Location	*Media*	*Cesium-137 Concentration ± 2s* * *10^{-3} pCi /g wet weight*			*Cesium-137 Concentration ± 2s* *10^{-5} Bq† /g wet weight*		
Marmot 1 (Control Location)	MUSCLE	0.07	±	5.40	0.25	±	19.98
Marmot 2 (Control Location)	MUSCLE	-2.64	±	7.60	-9.77	±	28.12
Marmot 3 (Control Location)	MUSCLE	3.81	±	6.60	14.10	±	24.42
RWMC Marmot 1	MUSCLE	3.37	±	7.00	12.47	±	25.90
	FUR, SKIN, VISCERA, BONE	2.44	±	6.80	9.03	±	25.16
RWMC Marmot 2	MUSCLE	1.65	±	8.60	6.11	±	31.82
	FUR, SKIN, VISCERA, BONE	4.74	±	7.20	17.54	±	26.64
RWMC Marmot 3	MUSCLE	-0.51	±	9.20	-1.89	±	34.04
	FUR, SKIN, VISCERA, BONE	11.50	±	7.20	42.55	±	26.64

Location	*Media*	*Strontium-90 Concentration ± 2s* * *10^{-3} pCi /g wet weight*			*Strontium-90 Concentration ± 2s* *10^{-5} Bq† /g wet weight*		
Marmot 2 (Control Location)	MUSCLE	13.30	±	30.00	49.21	±	111.00
Marmot 3 (Control Location)	MUSCLE	-9.96	±	40.00	-36.85	±	148.00
RWMC Marmot 1	MUSCLE	23.30	±	38.00	86.21	±	140.60
	FUR, SKIN, VISCERA, BONE	90.40	±	56.00	334.48	±	207.20
RWMC Marmot 2	MUSCLE	1.00	±	38.00	3.70	±	140.60
	FUR, SKIN, VISCERA, BONE	24.70	±	52.00	91.39	±	192.40

Location	*Media*	*Plutonium-238 Concentration ± 2s* * *10^{-3} pCi /g wet weight*			*Plutonium-238 Concentration ± 2s* *10^{-5} Bq† /g wet weight*		
Marmot 2 (Control Location)	MUSCLE	-0.54	±	2.40	-2.00	±	8.88
Marmot 3 (Control Location)	MUSCLE	-0.81	±	0.94	-3.00	±	3.48
RWMC Marmot 1	MUSCLE	0.10	±	2.00	0.37	±	7.40
	FUR, SKIN, VISCERA, BONE	0.39	±	0.78	1.43	±	2.89
RWMC Marmot 2	MUSCLE	0.00	±	1.56	0.00	±	5.77
	FUR, SKIN, VISCERA, BONE	-1.53	±	2.40	-5.66	±	8.88

Location	*Media*	*Plutonium-239/240 Concentration ± 2s* * *10^{-8} µCi /g wet weight*			*Plutonium-239/240 Concentration ± 2s* *10^{-5} Bq† /g wet weight*		
Marmot 2 (Control Location)	MUSCLE	0.54	±	1.94	1.99	±	7.18
Marmot 3 (Control Location)	MUSCLE	0.00	±	1.66	0.00	±	6.14
RWMC Marmot 1	MUSCLE	1.30	±	1.78	4.81	±	6.59
	FUR, SKIN, VISCERA, BONE	1.00	±	1.38	3.70	±	5.11
RWMC Marmot 2	MUSCLE	-0.26	±	0.52	-0.94	±	1.92
	FUR, SKIN, VISCERA, BONE	1.36	±	2.60	5.03	±	9.62

Location	*Media*	*Americium-241 Concentration ± 2s* * *10^{-8} µCi /g wet weight*			*Americium-241 Concentration ± 2s* *10^{-5} Bq† /g wet weight*		
Marmot 2 (Control Location)	MUSCLE	0.00	±	0.82	0.00	±	3.03
Marmot 3 (Control Location)	MUSCLE	0.68	±	0.96	2.51	±	3.55
RWMC Marmot 1	MUSCLE	-0.34	±	0.48	-1.25	±	1.78
	FUR, SKIN, VISCERA, BONE	-0.35	±	0.50	-1.31	±	1.85
RWMC Marmot 2	MUSCLE	0.00	±	0.90	0.00	±	3.33
	FUR, SKIN, VISCERA, BONE	0.68	±	0.96	2.52	±	3.55

* s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

Table C-14: Environmental Radiation Results

Sample Group & Location	*Sampling Date*	*Radiation Measurement (mR)*	*Radiation Measurement +/- 1s [a] (mR)*
BOUNDARY			
MUD LAKE	*5/3/00*	76.9	0.0
MONTEVIEW	*5/3/00*	72.3	0.0
HOWE	*5/3/00*	69.8	0.0
BIRCH CREEK	*5/3/00*	58.6	0.0
ATOMIC CITY	*5/3/00*	76.0	0.0
ARCO	*5/3/00*	74.5	0.0
DISTANT			
REXBURG, CMS	*5/3/00*	78.8	0.0
IDAHO FALLS	*5/3/00*	72.2	0.0
CRATERS OF THE MOON	*5/3/00*	68.5	0.0
BLACKFOOT, CMS	*5/3/00*	69.6	0.0
BLACKFOOT	*5/3/00*	75.4	0.0
ROBERTS	*5/8/00*	80.9	0.0
MINIDOKA	*5/9/00*	68.8	0.0
ABERDEEN	*5/14/00*	77.6	0.0

[a] ***1s = 1 Standard Deviation***