

Department of Environmental Quality  
INL Oversight Program

**ENVIRONMENTAL SURVEILLANCE PROGRAM  
QUARTERLY DATA REPORT**

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# Table of Acronyms

aCi/L	-	attocuries per liter	RWMC	-	Radioactive Waste Management Complex
BEA	-	Battelle Energy Alliance, LLC	RTC	-	Reactor Technology Complex
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act	SD	-	standard deviation
CFA	-	Central Facilities Area	SMCL	-	secondary maximum contaminant level
CWI	-	CH2M-WG Idaho, LLC	TAN	-	Test Area North
DEQ-INL OP	-	The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program	TCE	-	trichloroethene
DOE	-	U.S. Department of Energy	TDS	-	total dissolved solids
EIC	-	electret ionization chamber	TMI	-	Three Mile Island
EML	-	Environmental Monitoring Laboratory	TSP	-	total suspended particulate
EPA	-	Environmental Protection Agency	TSS	-	total suspended solids
ESER	-	Environmental Surveillance Education and Research Program (SM Stoller)	USGS	-	U.S. Geological Survey
ESP	-	Environmental Surveillance Program	VOC	-	volatile organic compound
ESRPA	-	Eastern Snake River Plain Aquifer	WLAP	-	Wastewater Land Application Permit
HPIC	-	high-pressure ion chamber			
LLD	-	lower limit of detection			
IBL	-	Idaho Bureau of Laboratories			
INL	-	Idaho National Laboratory			
INTEC	-	Idaho Nuclear Technology and Engineering Center			
LSC	-	liquid scintillation counting			
MFC	-	Materials and Fuels Complex			
µg/L	-	micrograms per liter			
mg/L	-	milligrams per liter			
mrem	-	millirem or 1/1000 <sup>th</sup> of a rem			
mR/hr	-	milliRoentgen per hour			
µR/hr	-	microRoentgen per hour			
MCL	-	maximum contaminant level			
MDA	-	minimum detectable activity			
MDC	-	minimum detectable concentration			
NIST	-	National Institute of Standards and Technology			
nCi/L	-	nanocuries per liter			
NOAA	-	National Oceanic and Atmospheric Administration			
NRF	-	Naval Reactors Facility			
pCi/g	-	picocuries per gram			
pCi/L	-	picocuries per liter			
pCi/m <sup>3</sup>	-	picocuries per cubic meter			
PCE	-	perchloroethene			
QAPP	-	Quality Assurance Program Plan			
QA/QC	-	Quality Assurance/Quality Control			
RCRA	-	Resource Conservation and Recovery Act			
RPD	-	relative percent difference			

## Introduction

The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program's (DEQ-INL OP) Environmental Surveillance Program (ESP) is conducted at locations on the INL, on the boundaries of the INL, and at distant locations to the INL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

The primary objective for DEQ-INL OP's ESP is to maintain an independent environmental monitoring and verification program designed to verify and supplement DOE's data and programs. This program is also used to provide the citizens of Idaho with information that has been independently evaluated to enable them to reach informed conclusions about DOE activities in Idaho and potential impacts to public health and the environment.

Results of the ESP are published using two distinct reporting formats: quarterly data reports and an annual ESP report. The annual ESP report is designed for a broad audience and summarizes the results of the ESP for the previous four quarters. The annual report's primary emphasis is to focus on trends, ascertain the impacts of DOE operations on the environment, and confirm the validity of DOE monitoring programs. This quarterly report is designed to provide the mechanism to document the results of the ESP on a quarterly basis and provide detailed data to those who wish to "see the numbers." It is organized according to the media sampled and also provides a quality assurance assessment.

## Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the second quarter, 2009 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter, gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. The Fort Hall station uses identical instrumentation and sampling protocol as the ten stations operated by the ESP. The DEQ-INL OP reports the Fort Hall station data as an additional distant site.

Airborne particulate matter was sampled using high-volume total suspended particulate (TSP) air samplers. Weekly gross alpha and gross beta particulate radioactivity results for filters from the TSP samplers are presented in **Appendix A** and summarized as a range of results in **Table 2**.

Composites of filters collected using TSP samplers during the course of a calendar quarter are analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma spectroscopy results for the second quarter of 2009 for TSP filters are presented in **Table 3**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

Annual composites of filters collected using TSP samplers are also analyzed using radiochemical separation techniques. The samples are analyzed for Strontium-90, Plutonium-238, Plutonium-239/240, and Americium-241. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons. DEQ-INL OP's action levels of 190 for Americium-241, 1900 for Strontium-90, 210 for Plutonium-238, and 200 for Plutonium-239/240

(in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>) are 10 percent of the compliance values listed for the specific radionuclides in 40 CFR 61, Appendix E, Table 2. Field sample concentrations which exceed these amounts require further investigation. Results from the annual composite analysis are typically presented in the following year's first quarter report.

Radioactive iodine samples are collected weekly. Samples are collected by drawing air through a canister filled with activated charcoal using a low-volume air pump. The activated charcoal contained in the canister traps the radioiodine within its sponge-like pores. Each week, canisters are collected from all eleven air monitoring stations and analyzed together as a composite. If Iodine-131 is detected in this grouping, the canisters are individually analyzed. No radioactive isotopes of iodine, specifically Iodine-131, were detected on the weekly charcoal cartridges used to collect this nuclide during the second quarter.

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the 11 monitoring stations. This moisture was stripped from the hygroscopic media and analyzed to calculate the atmospheric tritium concentration. Reported values are the result of either a single sample or a weighted mean based upon the volume of air sampled when more than one atmospheric moisture sample was collected during the calendar quarter. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the second quarter of 2009. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were generally below minimum detectable concentration in precipitation collected during the second quarter of 2009. Tritium and Cesium-137 analysis results are presented in **Table 5**. Reported values were either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter. There were no analytical results for either radionuclide above the analytical MDC.

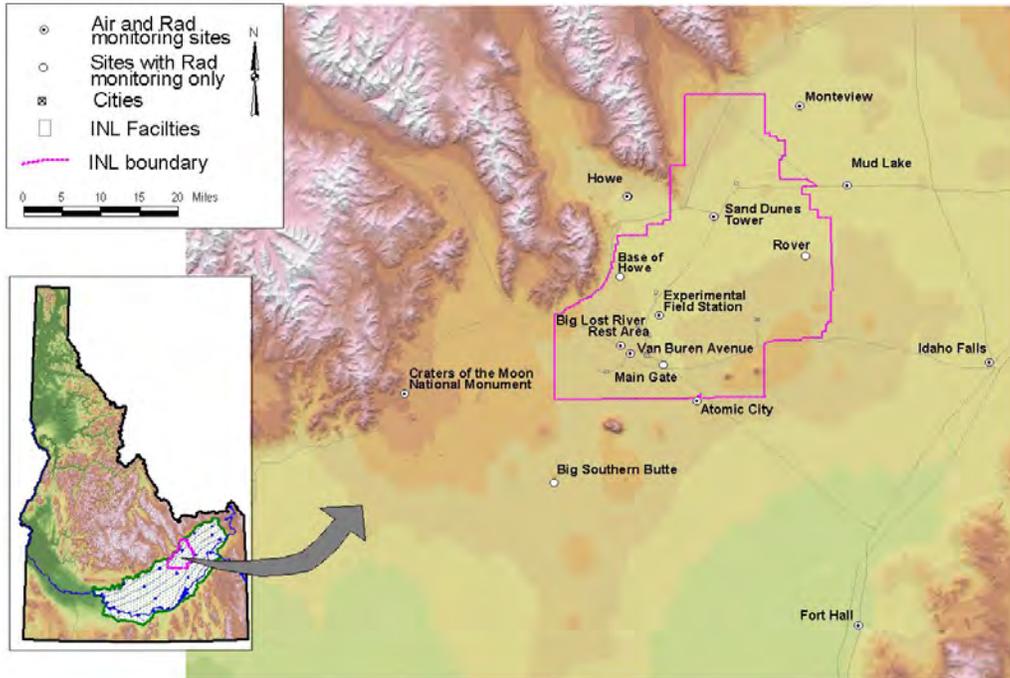


Figure 1. Air and radiation monitoring sites.

**Table 1. Sampling locations and sample type.**

Station Locations	Sample type <sup>1</sup>			
	TSP	Radioiodine	Water Vapor	Precipitation
<b>On-site Locations</b>				
Big Lost River Rest Area	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Experimental Field Station	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Sand Dunes Tower	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Van Buren Avenue	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
<b>Boundary Locations</b>				
Atomic City	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Howe	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Monteview	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Mud Lake	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Distant Locations</b>				
Craters of the Moon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Fort Hall <sup>2</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Idaho Falls	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

<sup>1</sup>  Samples collected weekly;  Samples collected quarterly.

<sup>2</sup> TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

**Table 2. Range of gross alpha and gross beta concentrations for TSP filters, second quarter, 2009. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.**

Station Location	Concentration			
	Gross Alpha		Gross Beta	
<b>On-Site Locations</b>				
Big Lost River Rest Area	0.5	- 1.4	15.5	- 40.8
Experimental Field Station	0.3	- 1.6	15.9	- 36.6
Sand Dunes Tower	0.3	- 1.4	13.8	- 34.9
Van Buren Avenue	0.3	- 1.6	15.2	- 45.0
<b>Boundary Locations</b>				
Atomic City	0.5	- 1.8	17.6	- 43.4
Howe	0.3	- 1.6	14.2	- 33.7
Monteview	0.2	- 0.5	9.0	- 47.6
Mud Lake	0.3	- 1.6	14.0	- 37.5
<b>Distant Locations</b>				
Craters of the Moon	0.3	- 1.5	14.0	- 28.1
Fort Hall <sup>1</sup>	0.6	- 1.9	14.0	- 28.1
Idaho Falls	0.8	- 2.2	22.2	- 52.1

<sup>1</sup> Operated by Shoshone-Bannock Tribes.

**Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, second quarter, 2009. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.**

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	$\pm 2$ SD	
<b>On-site Locations</b>			
Big Lost River Rest Area	78.9	4.1	<MDC <sup>2</sup>
Experimental Field Station	106.8	5.7	<MDC
Sand Dunes Tower	105.5	5.7	<MDC
Van Buren Avenue	112.0	5.8	<MDC
<b>Boundary Locations</b>			
Atomic City	114.4	6.1	<MDC
Howe	112.5	5.8	<MDC
Monteview	89.5	4.7	<MDC
Mud Lake	101.5	7.1	<MDC
<b>Distant Locations</b>			
Craters of the Moon	95.1	5.2	<MDC
Fort Hall <sup>1</sup>	93.7	4.9	<MDC
Idaho Falls	159.6	8.2	<MDC

<sup>1</sup>Operated by Shoshone-Bannock Tribes.

<sup>2</sup>MDC for Cs-137 typically  $(5-10) \times 10^{-5}$  pCi/m<sup>3</sup>.

**Table 4. Tritium concentrations in air from atmospheric moisture, second quarter, 2009. Concentrations are reported in pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).**

Station Location	Tritium		
	Concentration	$\pm 2$ SD	MDC
<b>On-site Locations</b>			
Big Lost River Rest Area	0.38	0.32	0.52
Experimental Field Station	0.31	0.31	0.53
Sand Dunes Tower	0.12	0.29	0.48
Van Buren Avenue	0.38	0.41	0.68
<b>Boundary Locations</b>			
Atomic City	0.17	0.37	0.62
Howe	0.35	0.39	0.49
Mud Lake	0.22	0.40	0.68
Monteview	0.20	0.40	0.67
<b>Distant Locations</b>			
Craters of the Moon	0.12	0.33	0.55
Fort Hall <sup>1</sup>	0.16	0.40	0.55
Idaho Falls	0.35	0.39	0.65

<sup>1</sup>Operated by Shoshone-Bannock Tribes.

**Table 5. Tritium and Cesium-137 concentrations from precipitation, second quarter, 2009.**  
**Concentrations are reported in pCi/L with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).**

Station Location	Tritium			Cesium-137		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
<b>On-site Locations</b>						
Big Lost River Rest Area	30	80	130	0.7	1.4	2.4
<b>Boundary Locations</b>						
Atomic City	60	80	130	0.1	1.5	2.7
Howe	10	70	130	0.0	2.2	3.7
Monteview	20	80	130	0.4	1.6	2.7
Mud Lake	10	70	130	0.3	1.6	2.7
<b>Distant Locations</b>						
Idaho Falls	0	70	130	0.0	1.6	2.9

## Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the second quarter of 2009 (**Figure 1**). To detect gamma radiation, each station is instrumented with an electret ionization chamber (EIC), and 10 of the stations also have high-pressure ion chambers (HPIC) (**Table 7**). The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall equipped with an EIC and HPIC both of which belong to the DEQ-INL OP. The DEQ-INL OP reports these results.

HPICs are instruments capable of real-time measurements, and are sensitive enough to detect small changes in gamma radiation levels. The real-time gamma radiation measurements collected by the HPICs at each location are radioed to DEQ-INL OP and presented graphically via the worldwide web at [http://www.deq.idaho.gov/inl\\_oversight/monitoring/piconline.cfm](http://www.deq.idaho.gov/inl_oversight/monitoring/piconline.cfm)

EICs are a passive-integrating system that provides a cumulative measure of environmental gamma radiation exposure in the field. EICs are deployed, collected, and analyzed quarterly. EICs offer an inexpensive methodology to measure gamma radiation over a wide area, particularly in regions which do not have a power source. EICs can also provide valuable gamma radiation data in the event of an emergency. For this reason EICs are deployed at an additional 41 locations by DEQ-INL OP in a widespread network around the INL measuring external radiation. This information is tabulated in **Appendix B**.

These two systems are used by DEQ-INL OP to measure external gamma radiation for various radiological monitoring objectives. **Table 7** lists the average radiation exposure rates measured by the HPICs for second quarter 2009. **Table 8** lists the EIC monitoring results for second quarter 2009. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation.

**Table 6. Summary of instrumentation at radiation monitoring stations.**

Station Location	Instrument Type	
	HPIC	EIC
<b>On-site Locations</b>		
Base of Howe	■	■
Big Lost River Rest Area <sup>1</sup>		■
Experimental Field Station		■
Main Gate	■	■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
<b>Boundary Locations</b>		
Atomic City	■	■
Big Southern Butte	■	■
Howe	■	■
Monteview	■	■
Mud Lake	■	■
<b>Distant Locations</b>		
Craters of the Moon		■
Fort Hall <sup>2</sup>	■	■
Idaho Falls	■	■

<sup>1</sup> HPIC Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed.

<sup>2</sup> HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

**Table 7. Average gamma exposure rates for second quarter, 2009, from HPIC network.**

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
<b>On-site Locations</b>		
Base of Howe	11.2	1.8
Big Lost River Rest Area <sup>1</sup>	NA	NA
Main Gate	14.0	0.9
Rover	13.9	1.2
Sand Dunes Tower	14.1	1.9
<b>Boundary Locations</b>		
Atomic City	13.0	1.6
Big Southern Butte	13.8	1.3
Howe	13.0	1.7
Monteview	12.8	1.0
Mud Lake	12.6	1.6
<b>Distant Locations</b>		
Fort Hall <sup>2</sup>	14.4	1.7
Idaho Falls	11.5	0.8

<sup>1</sup> Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed.

<sup>2</sup> Operated by Shoshone-Bannock Tribes.

**Table 8. Electret ionization chamber (EIC) cumulative average exposure rates for second quarter, 2009.**

Station Location	Exposure Rate ( $\mu\text{R/hr}$ )	
	Quarterly Average	$\pm 2 \text{ SD}$
<b>On-site Locations</b>		
Base of Howe	13.7	2.0
Big Lost River Rest Area	13.6	2.6
Experimental Field Station	16.2	2.9
Main Gate	14.1	4.3
Rover <sup>1</sup>	11.4	1.8
Sand Dunes Tower	12.2	0.9
Van Buren Avenue	15.5	3.6
<b>Boundary Locations</b>		
Atomic City	14.5	0.2
Big Southern Butte <sup>1</sup>	25.5	8.8
Howe	14.0	1.8
Monteview	13.2	1.3
Mud Lake	13.9	3.2
<b>Distant Locations</b>		
Craters of the Moon	16.9	0.7
Fort Hall <sup>1</sup>	10.9	1.2
Idaho Falls	11.1	2.5

<sup>1</sup> Station operated by Shoshone-Bannock Tribes.

## Water Monitoring

Water monitoring sites are sampled for the purposes of examining trends of INL contaminants and other general ground water quality indicators and for verifying DOE monitoring results. Sites sampled include ground water locations (wells and springs), surface water locations (streams), and selected wastewater sites. Sample sites have been selected to aid in identifying INL impacts on the Eastern Snake River Plain Aquifer (ESRPA), and are categorized as up-gradient, facility, boundary, distant, surface water, and waste water, (**Figure 2 and Figure 3**). Up-gradient locations are not impacted by INL operations and are considered representative of background ground water quality conditions. Facility sites are sample locations on the INL near facilities, in areas of known contamination, or wells selected to illustrate trends for specific INL contaminants or indicators of ground water quality. Boundary locations are on or near the perimeter of the INL and are down-gradient of potential sources of INL contamination. Distant locations are monitored to provide trends in water quality down-gradient of the INL and include wells and springs used for irrigation, public water supply, livestock, domestic, and industrial purposes. During the second quarter of 2009, 4 up-gradient, 28 facility, 6 boundary, 15 distant, and 2 surface water locations were sampled.

Most sites sampled by DEQ-INL OP are sampled with another agency or organization. Samples are collected at about the same time using the same collection equipment as the other agency or organization (co-sampled). DEQ-INL OP verifies work by these agencies monitoring on behalf of DOE by comparing results from co-sampled sites.

Gross alpha and gross beta analyses are conducted as a screening tool for alpha and beta emitting radionuclides potentially released from INL operations. Quantitative gamma analyses are conducted to identify and determine concentrations of gamma emitting radionuclides. Selected sites are sampled for the man-made, alpha emitting isotopes of plutonium, uranium, americium, and neptunium; and beta emitting radionuclides technetium-99 and strontium-90, based on historic INL contamination. In the event of suspect or unexpected levels of gross radioactivity, additional samples may also be analyzed for other specific radionuclides.

Gross alpha radioactivity was detected at 2 up-gradient, 10 facility, 2 boundary, 1 distant, and 2 surface water locations. Concentrations observed at facility locations were in areas of known contamination and consistent with historical trends. All other locations with detectable results were within the range of concentrations observed for naturally-occurring radioactivity. The EPA maximum contaminant level (MCL) for alpha particles is 15 pCi/L.

Gross beta radioactivity was detected in each of the 5 areas (up-gradient, facility, boundary, distant, and surface water) sampled. Concentrations observed at facility locations were consistent with historical trends. Concentrations for up-gradient, boundary, distant, and surface water locations were within the range of concentrations observed for naturally-occurring radioactivity. The MCL for beta and gamma radioactivity is 4 mrem/year, equivalent to 8 pCi/l if the source is strontium-90; 900 pCi/L if technetium-99; 20,000 pCi/L if tritium; or 200 pCi/L if cesium-137. Man-made, gamma emitting cesium-137 was detected at one facility location, TAN-37. This well has had historical detectable concentrations. Results for gross alpha; gross beta; and man-made, gamma emitting radioactivity are shown in **Table 9**.

Eight sites were sampled for plutonium isotopes (**Table 10**). There were no detectable results for plutonium isotopes this quarter.

Ten sites were sampled for isotopes of uranium. All ten sample sites had detectable results for uranium-234, nine detectable results for uranium-238, and two detectable results for uranium-235 (**Table 11**). For all but one, the ratios of results observed cannot be distinguished from background concentrations, which means the uranium found in the samples is likely to be naturally occurring. One sample from TAN-28 may contain uranium above background concentrations, which is not surprising for this site. There were no detectable results for americium-241 (**Table 12**) neptunium-237, (**Table 13**) or Iodine-129 (**Table 14**).

Eight of nineteen samples analyzed for strontium-90 had detectable results this quarter (**Table 15**). All samples were from locations in areas of known contamination. All 14 locations sampled for technetium-99 had detectable results this quarter (**Table 16**). All results were within the expected ranges of concentrations.

Using the standard analytical method, tritium was detected in sixteen of twenty-eight facility samples (**Table 17**). Detections were consistent with historic concentrations for these sites. There were no detectable concentrations from other areas. Selected water samples with tritium concentrations not measurable using the standard method (typically a MDC of 130 pCi/L) are analyzed using an electrolytic enrichment method with a much lower MDC of 10 to 14 pCi/L. No samples were analyzed using the enrichment method this quarter, due to technical difficulties. There is currently a backlog of 31 samples.

Samples were also analyzed for metals and the results shown in **Table 18**. All other results were within their expected ranges. Common ion results are shown in **Table 19** and nutrient results are shown in **Table 20**. All results were consistent with historical values at those locations.

Twenty-two locations were sampled for Volatile Organic Compounds (VOCs) this quarter, eleven locations had detectable concentrations. All locations with detectable results are in areas of known contamination at RWMC and TAN. VOCs with detectable concentrations are shown in **Table 21** and a complete list of analyses is shown in **Appendix C**. The background concentrations for VOCs should be zero. The results discussed in this section only refer to detectable concentrations.

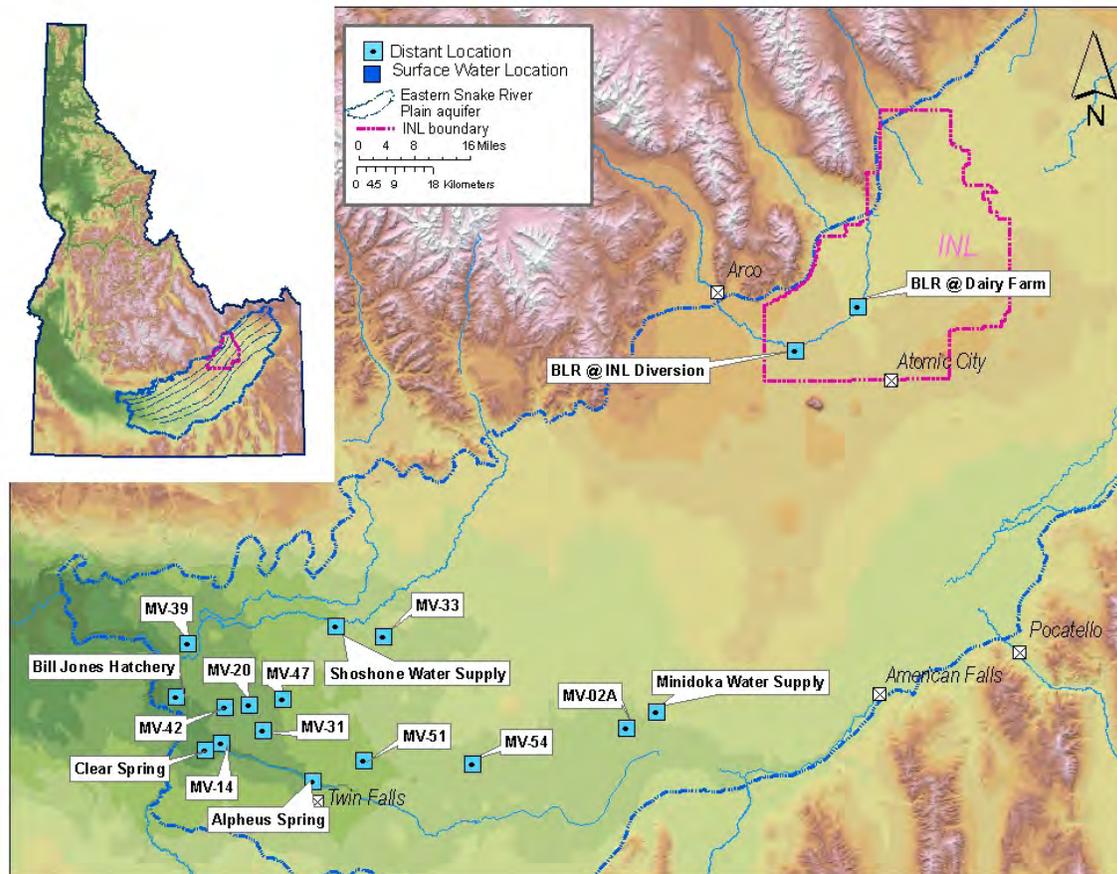


Figure 2. Distant sampling locations for second quarter, 2009.



**Table 9. Alpha, beta, and gamma concentrations for water samples, second quarter, 2009.**

Sample Location	Sample Date	Gross Alpha			Gross Beta		Man-made gamma-emitting radionuclide Cesium-137		
		Concentration <sup>1,2</sup>		± 2 SD	Concentration <sup>1,2</sup>	± 2 SD	Concentration <sup>1,2</sup>		± 2 SD
<u>Up-gradient</u>									
Mud Lake Water Supply	5/20/2009	0.6	U	1.4	4.7	1.1	-0.6	U	2.6
P&W-2	4/14/2009	3.6		2.1	3.0	1.1	0.2	U	1.5
USGS-019	4/14/2009	2.8	U	2.1	2.2	1.1	1.8	U	1.8
USGS-027	4/14/2009	6.2		2.7	8.4	1.3	0.3	U	1.4
<u>Facility</u>									
A11A31	5/4/2009	2.6	U	2.4	3.5	1.2	-0.4	U	1.4
ANP-8	5/19/2009	0.1	U	2.2	4.5	1.2	-1.5	U	1.4
CFA 1	4/21/2009	7.2		3.0	9.1	1.4	-0.6	U	1.4
ICPP-2020	4/7/2009	7.8		2.9	193.3	3.6	1.0	U	1.5
GIN-04	5/19/2009	4.3		2.0	4.7	1.1	1.1	U	1.5
M1S	5/5/2009	4.0		2.0	3.1	1.1	0.1	U	1.5
M3S	5/5/2009	1.5	U	2.3	3.1	1.1	-0.8	U	1.4
M6S	5/4/2009	0.3	U	2.2	4.1	1.1	0.2	U	1.6
NRF-06	5/6/2009	3.7	U	4.9	8.2	2.2	0.0	U	1.5
NRF-09	5/6/2009	3.6	U	2.7	3.2	1.2	0.3	U	2.1
NRF-11	5/6/2009	1.5	U	2.7	2.9	1.2	0.0	U	1.4
NRF-12	5/4/2009	1.0	U	2.6	3.6	1.2	-0.4	U	1.4
TAN-16	5/19/2009	2.2	U	2.1	3.0	1.1	0.3	U	1.8
TAN-28	5/12/2009	1.4	U	2.3	3.7	1.1	-0.1	U	1.4
TAN-29	5/12/2009	9.8		3.3	29.1	2.2	-1.3	U	1.6
TAN-37	5/12/2009	14.8		8.8	814.4	15.8	4.0		2.2
TAN-51	5/19/2009	0.9	U	1.9	2.9	1.1	0.6	U	2.1
TAN-57	5/19/2009	2.7	U	1.8	7.3	1.2	0.4	U	1.5
USGS-047	4/6/2009	2.8	U	2.5	61.3	2.2	1.7	U	1.9
USGS-052	4/7/2009	6.3		2.4	152.1	3.1	0.7	U	1.9
USGS-065	4/13/2009	5.5		3.1	5.1	1.3	0.7	U	2.0
USGS-067	4/6/2009	5.8		2.6	74.7	2.3	-0.1	U	1.3
USGS-085	4/13/2009	3.9		2.2	11.7	1.3	-0.8	U	1.6
USGS-087	4/16/2009	1.7	U	1.9	4.1	1.1	0.0	U	1.7
USGS-099	5/4/2009	2.5	U	2.5	3.0	1.1	0.6	U	2.1
USGS-100	4/13/2009	0.9	U	2.0	4.5	1.1	-0.5	U	1.4
USGS-106	6/10/2009	-0.2	U	2.0	2.9	1.1	-0.1	U	1.4
USGS-107	6/10/2009	0.8	U	2.2	4.2	1.1	0.8	U	1.4

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 9 continued. Alpha, beta, and gamma concentrations for water samples, second quarter, 2009.**

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made gamma-emitting radionuclide Cesium-137			
		Concentration <sup>1,2</sup>	± 2 SD	Concentration <sup>1,2</sup>	± 2 SD	Concentration <sup>1,2</sup>	± 2 SD		
<u>Boundary</u>									
Atomic City	4/20/2009	1.6	U	1.8	3.5	1.1	0.3	U	1.5
Crossroads	4/21/2009	2.8	U	2.1	4.3	1.1	1.7	U	1.6
USGS-008	4/15/2009	4.8		2.3	3.2	1.1	0.4	U	1.3
USGS-011	4/20/2009	2.9	U	1.9	3.2	1.1	0.4	U	1.8
USGS-109	6/10/2009	-0.1	U	1.8	3.4	1.1	-0.9	U	1.3
USGS-124	4/20/2009	8.1		2.5	4.3	1.1	0.3	U	1.3
<u>Distant</u>									
Alpheus Spring	5/18/2009	3.6	U	2.7	7.8	1.3	0.2	U	1.3
Bill Jones Hatchery	5/18/2009	2.0	U	2.1	4.4	1.1	0.4	U	1.4
Clear Spring	5/18/2009	5.5		3.0	4.4	1.2	0.0	U	2.2
Clear Spring	6/24/2009	1.3	U	2.4	4.0	1.2	0.7	U	1.3
Minidoka Water Supply	5/18/2009	0.1	U	1.6	3.3	1.1	0.4	U	1.4
MV-02A	6/22/2009	0.1	U	2.6	6.1	1.3	0.5	U	2.2
MV-14	6/24/2009	0.4	U	2.5	4.8	1.2	0.9	U	1.4
MV-20	6/24/2009	0.4	U	2.2	3.5	1.1	0.4	U	1.5
MV-31	6/24/2009	-0.6	U	3.0	5.5	1.3	-0.3	U	1.4
MV-33	6/22/2009	1.1	U	1.7	3.4	1.1	-0.6	U	1.3
MV-39	6/24/2009	0.4	U	2.7	5.2	1.2	1.2	U	1.8
MV-42	6/22/2009	1.8	U	2.1	4.0	1.1	1.0	U	1.6
MV-47	6/24/2009	-0.2	U	1.8	3.8	1.1	0.0	U	1.4
MV-51	6/22/2009	1.0	U	2.8	6.5	1.3	0.2	U	1.5
MV-54	6/22/2009	4.9	U	3.3	7.2	1.3	-0.4	U	1.7
Shoshone Water Supply	05/18/09	1.8	U	2.0	3.4	1.1	0.4	U	1.4
<u>Surface water</u>									
BLR @ Dairy Farm	6/23/2009	7.4		2.7	8.1	1.3	0.0	U	1.4
BLR @ INEL									
Diversion	6/23/2009	7.0		2.7	7.7	1.2	0.2	U	1.4

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 10. Reported concentrations of plutonium isotopes in water samples, second quarter, 2009.**

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240			Plutonium-241		
		Concentration <sup>1,2</sup>		± 2S	Concentration <sup>1,2</sup>		± 2S	Concentration <sup>1,2</sup>		± 2S
<u>Facility</u>										
A11A31	5/4/2009	0	U	0.023	0.004	U	0.023	-1.8	U	3.7
ICPP-2020	4/7/2009	0	U	0.020	0.01	U	0.020	-3.0	U	3.7
M1S	5/5/2009	0	U	0.023	0.021	U	0.026	-1.4	U	4.2
M3S	5/5/2009	-0.005	U	0.024	0.001	U	0.024	0.1	U	4.0
M6S	5/4/2009	-0.004	U	0.021	0	U	0.021	1.7	U	3.9
USGS-047	4/6/2009	0	U	0.023	0.004	U	0.023	-4.5	U	3.9
USGS-052	4/7/2009	-0.009	U	0.022	0.008	U	0.021	-1.8	U	3.9
USGS-067	4/6/2009	0	U	0.022	0.006	U	0.022	2.0	U	4.0

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.<sup>2</sup> Concentrations expressed in pCi/L.**Table 11. Reported concentrations of uranium isotopes in water samples, second quarter, 2009.**

Sample Location	Sample Date	Uranium-234		Uranium-235		Uranium-238			
		Concentration <sup>1,2</sup>	± 2S	Concentration <sup>1,2</sup>	± 2S	Concentration <sup>1,2</sup>	± 2S		
<u>Facility</u>									
A11A31	5/4/2009	1.24	0.32	0.024	U	0.050	0.83	0.24	
ICPP-2020	4/7/2009	1.73	0.40	0.056	U	0.063	0.83	0.24	
M1S	5/5/2009	0.80	0.24	0.010	U	0.053	0.46	0.17	
M3S	5/5/2009	1.44	0.35	0.033	U	0.050	0.58	0.20	
M6S	5/4/2009	1.10	0.29	0.027	U	0.050	0.53	0.18	
TAN-28	5/12/2009	9.1	1.6	0.35		0.15	1.46	0.35	
TAN-37	5/12/2009	0.39	0.16	-0.004	U	0.051	0.062	U	0.066
USGS-047	4/6/2009	1.83	0.41	0.051	U	0.052	0.82	0.23	
USGS-052	4/7/2009	1.48	0.35	0.065	U	0.059	0.74	0.22	
USGS-067	4/6/2009	1.72	0.40	0.134		0.088	1.01	0.27	

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected<sup>2</sup> Concentrations expressed in pCi/L.**Table 12. Reported concentrations of americium-241 in water samples, second quarter, 2009.**

Sample Location	Sample Date	Americium-241		
		Concentration <sup>1,2</sup>		± 2S
<u>Facility</u>				
A11A31	5/4/2009	0.015	U	0.028
ICPP-2020	4/7/2009	0	U	0.018
M1S	5/5/2009	0.015	U	0.019
M3S	5/5/2009	0	U	0.034
M6S	5/4/2009	0.005	U	0.034
USGS-047	4/6/2009	-0.010	U	0.020
USGS-052	4/7/2009	0	U	0.022
USGS-067	4/6/2009	-0.012	U	0.021

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.<sup>2</sup> Concentrations expressed in pCi/L.

**Table 13. Reported concentrations of neptunium-237 in water samples, second quarter, 2009.**

Sample Location	Sample Date	Neptunium-237		
		Concentration <sup>1,2</sup>		± 2S
<u>Facility</u>				
ICPP-2020	4/7/2009	-0.012	U	0.071
USGS-047	4/6/2009	0.001	U	0.045
USGS-052	4/7/2009	0.012	U	0.042
USGS-067	4/6/2009	-0.002	U	0.043

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 14. Reported concentrations of Iodine-129 in water samples, second quarter, 2009.**

Sample Location	Sample Date	Iodine-129		
		Concentration <sup>1,2</sup>		± 2S
<u>Facility</u>				
USGS-106	6/10/2009	0.0571	U	0.0758
<u>Boundary</u>				
USGS-109	6/10/2009	0.0153	U	0.0688

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 15. Reported concentrations of strontium-90 in water samples, second quarter, 2009.**

Sample Location	Sample Date	Strontium-90		
		Concentration <sup>1,2</sup>		± 2S
<u>Facility</u>				
A11A31	5/4/2009	0.13	U	0.31
CFA 1	4/21/2009	0.20	U	0.26
ICPP-2020	4/7/2009	11.9		2.9
M1S	5/5/2009	0.13	U	0.25
M3S	5/5/2009	0.25	U	0.25
M6S	5/4/2009	0.13	U	0.29
NRF-06	5/6/2009	-0.08	U	0.26
NRF-09	5/6/2009	-0.11	U	0.27
NRF-11	5/6/2009	0.34	U	0.28
NRF-12	5/4/2009	0.18	U	0.24
TAN-28	5/12/2009	221		52
TAN-29	5/12/2009	10.2		2.5
TAN-37	5/12/2009	570		130
USGS-047	4/6/2009	20.8		5.0
USGS-052	4/7/2009	4.0		1.0
USGS-067	4/6/2009	13.7		3.3
USGS-085	4/13/2009	3.9		1.1
USGS-087	4/16/2009	0.55	U	0.33
USGS-099	5/4/2009	0.16	U	0.24

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 16. Reported concentrations of technetium-99 in water samples, second quarter, 2009.**

Sample Location	Sample Date	Technetium-99	
		Concentration <sup>1,2</sup>	± 2S
<u>Facility</u>			
A11A31	5/4/2009	1.2	0.2
CFA 1	4/21/2009	12.8	0.3
ICPP-2020	4/7/2009	416.8	1.9
M1S	5/5/2009	0.6	0.1
M3S	5/5/2009	1.5	0.2
M6S	5/4/2009	1.0	0.2
USGS-047	4/6/2009	2.6	0.2
USGS-052	4/7/2009	410.0	1.9
USGS-067	4/6/2009	148.3	1.1
USGS-085	4/13/2009	2.4	0.2
USGS-087	4/16/2009	1.1	0.2
USGS-106	6/10/2009	1.2	0.2
USGS-107	6/10/2009	0.5	0.2
<u>Boundary</u>			
USGS-109	6/10/2009	0.5	0.2

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 17. Tritium concentrations for water samples, second quarter, 2009.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		± 2 SD
<u>Up-gradient</u>				
Mud Lake Water Supply	5/20/2009	30	U	80
P&W-2	4/14/2009	-20	U	70
USGS-019	4/14/2009	-90	U	70
USGS-027	4/14/2009	0	U	70
<u>Facility</u>				
A11A31	5/4/2009	150		80
ANP-8	5/19/2009	90	U	80
CFA 1	4/21/2009	5590		220
ICPP-2020	4/7/2009	4180		190
GIN-04	5/19/2009	110	U	80
M1S	5/5/2009	20	U	80
M3S	5/5/2009	900		110
M6S	5/4/2009	20	U	80
NRF-06	5/6/2009	60	U	80
NRF-09	5/6/2009	40	U	80
NRF-11	5/6/2009	80	U	80
NRF-12	5/4/2009	60	U	80
TAN-16	5/19/2009	330		100
TAN-28	5/12/2009	1870		150
TAN-29	5/12/2009	1650		140
TAN-37	5/12/2009	1440		130
TAN-51	5/19/2009	570		100
TAN-57	5/19/2009	70	U	80
USGS-047	4/6/2009	610		100
USGS-052	4/7/2009	1550		130
USGS-065	4/13/2009	4850		200
USGS-067	4/6/2009	4030		190
USGS-085	4/13/2009	1870		140
USGS-087	4/16/2009	700		100
USGS-099	5/4/2009	40	U	90
USGS-100	4/13/2009	20	U	80
USGS-106	6/10/2009	470		100
USGS-107	6/10/2009	10	U	90

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 17 continued. Tritium concentrations for water samples, second quarter, 2009.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		± 2 SD
<u>Boundary</u>				
Atomic City	4/20/2009	40	U	80
Crossroads	4/21/2009	40	U	80
USGS-008	4/15/2009	20	U	80
USGS-011	4/20/2009	-10	U	70
USGS-109	6/10/2009	110	U	90
USGS-124	4/20/2009	130	U	80
<u>Distant</u>				
Alpheus Spring	5/18/2009	80	U	80
Bill Jones Hatchery	5/18/2009	-10	U	70
Clear Spring	5/18/2009	-20	U	70
Clear Spring	6/24/2009	-10	U	80
Minidoka Water Supply	5/18/2009	80	U	80
MV-02A	6/22/2009	10	U	80
MV-14	6/24/2009	60	U	80
MV-20	6/24/2009	-50	U	80
MV-31	6/24/2009	10	U	70
MV-33	6/22/2009	20	U	70
MV-39	6/24/2009	20	U	70
MV-42	6/22/2009	10	U	80
MV-47	6/24/2009	-50	U	70
MV-51	6/22/2009	-10	U	70
MV-54	6/22/2009	-10	U	70
Shoshone Water Supply	05/18/09	30	U	80
<u>Surface water</u>				
BLR @ Dairy Farm	6/23/2009	60	U	80
BLR @ INEL Diversion	6/23/2009	-20	U	70

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 18. Reported metals concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>										
		Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Mercury	Selenium	Zinc
<u>Up-gradient</u>												
P&W-2	4/14/2009	NR	48	NR	NR	1.2	NR	<1 U	<1 U	NR	NR	58
USGS-019	4/14/2009	NR	75	NR	NR	1.1	NR	<1 U	11	NR	NR	<2 U
USGS-027	4/14/2009	NR	88	NR	NR	4.9	NR	<1 U	5.3	NR	NR	<2 U
<u>Facility</u>												
A11A31 (total)	5/4/2009	2.1	36	<1 U	<1 U	16	160	6.2	2.4	<0.5 U	<2 U	540
CFA 1	4/21/2009	NR	100	NR	NR	11	NR	<1 U	<1 U	NR	NR	<2 U
ICPP-2020 (total)	4/7/2009	<2 U	130	<1 U	<1 U	160	710	<1 U	18	<0.5 U	<2 U	2
M1S (total)	5/5/2009	2.7	22	<1 U	<1 U	32	36	<1 U	2.1	<0.5 U	2.2	2.9
M3S (total)	5/5/2009	<2 U	45	<1 U	<1 U	13	39	<1 U	<1 U	<0.5 U	<2 U	<2 U
M6S (total)	5/4/2009	<2 U	32	<1 U	<1 U	26	1100	<1 U	4	<0.5 U	2.9	<2 U
NRF-06 (total)	5/6/2009	3.1	180	<1 U	<1 U	52	140	<1 U	1.7	<0.5 U	2.2	<2 U
NRF-09 (total)	5/6/2009	<2 U	150	<1 U	<1 U	9.9	16	<1 U	<1 U	<0.5 U	2	<2 U
NRF-11 (total)	5/6/2009	<2 U	150	<1 U	<1 U	13	150	<1 U	2.7	<0.5 U	<2 U	<2 U
NRF-12 (total)	5/4/2009	<2 U	150	<1 U	<1 U	11	49	<1 U	<1 U	<0.5 U	<2 U	<2 U
USGS-047 (total)	4/6/2009	<2 U	72	<1 U	<1 U	7	12	<1 U	<1 U	<0.5 U	<2 U	2.5
USGS-052 (total)	4/7/2009	<2 U	90	<1 U	<1 U	7.1	66	<1 U	1.4	<0.5 U	<2 U	2.7
USGS-065 (total)	4/13/2009	<2 U	49	NR	<1 U	94	<10 U	<1 U	<1 U	NR	<2 U	<2 U
USGS-067 (total)	4/6/2009	<2 U	130	<1 U	<1 U	7.2	58	<1 U	1.3	<0.5 U	<2 U	7.6
USGS-085	4/13/2009	<2 U	90	<1 U	<1 U	21	36	<1 U	<1 U	<0.5 U	<2 U	<2 U
USGS-087	4/16/2009	NR	26	NR	NR	5.7	NR	<1 U	4.5	NR	NR	21
USGS-099 (total)	5/4/2009	<2 U	110	<1 U	<1 U	5.2	17	2.6	<1 U	<0.5 U	<2 U	95
USGS-100	4/13/2009	NR		NR	NR	1.8	NR	15	<1 U	NR	NR	190
USGS-106	6/10/2009	<2 U	54	NR	<1 U	7.2	<10 U	13	<1 U	NR	<2 U	150
USGS-107	6/10/2009	2.4	63	NR	<1 U	4.4	<10 U	<1 U	<1 U	NR	<2 U	<2 U

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected, . A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations are expressed in µg/L. Samples are not filtered unless otherwise indicated.

**Table 18 continued. Reported metals concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>										
		Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Mercury	Selenium	Zinc
<u>Boundary</u>												
Atomic City	4/20/2009	NR	37	NR	NR	2.1	NR	<1 U	<1 U	NR	NR	34
Crossroads	4/21/2009	NR	34	NR	NR	3	NR	<1 U	<1 U	NR	NR	180
USGS-008	4/15/2009	NR	78	NR	NR	2.2	NR	<1 U	1.3	NR	NR	<2 U
USGS-011	4/20/2009	NR	55	NR	NR	3.3	NR	<1 U	<1 U	NR	NR	<2 U
USGS-109	6/10/2009	<2 U	34	NR	<1 U	6.3	44	<1 U	3.8	NR	<2 U	<2 U
USGS-124	4/20/2009	NR	32	NR	NR	5.5	NR	<1 U	7.9	NR	NR	<2 U
<u>Distant</u>												
Clear Spring	6/24/2009	2.1	39	NR	<1 U	2	<10 U	<1 U	<1 U	NR	<2 U	<2 U
MV-02A	6/22/2009	2.4	69	NR	<1 U	<1 U	10	<1 U	3.1	NR	<2 U	140
MV-14	6/24/2009	2.1	51	NR	<1 U	1.8	<10 U	<1 U	<1 U	NR	<2 U	6.2
MV-20	6/24/2009	2.2	23	NR	<1 U	2.8	<10 U	<1 U	<1 U	NR	<2 U	<2 U
MV-31	6/24/2009	2	59	NR	<1 U	1.6	<10 U	<1 U	<1 U	NR	<2 U	<2 U
MV-33	6/22/2009	2.1	15	NR	<1 U	3.2	<10 U	1.2	<1 U	NR	<2 U	280
MV-39	6/24/2009	2.3	69	NR	<1 U	<1 U	<10 U	<1 U	<1 U	NR	<2 U	<2 U
MV-42	6/22/2009	2.4	25	NR	<1 U	2.9	<10 U	<1 U	<1 U	NR	<2 U	26
MV-47	6/24/2009	2	21	NR	<1 U	2.7	<10 U	<1 U	<1 U	NR	<2 U	22
MV-51	6/22/2009	2.1	70	NR	<1 U	<1 U	23	<1 U	2.3	NR	<2 U	74
MV-54	6/22/2009	2.3	110	NR	<1 U	1.4	<10 U	<1 U	<1 U	NR	<2 U	430
<u>Surface water</u>												
BLR @ Dairy Farm	6/23/2009	<2 U	76	NR	<1 U	<1 U	<10 U	<1 U	3.2	NR	<2 U	<2 U
BLR @ INEL Diversion	6/23/2009	<2 U	76	NR	<1 U	<1 U	<10 U	<1 U	2.5	NR	<2 U	<2 U

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected, A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations are expressed in µg/L. Samples are not filtered unless otherwise indicated.

**Table 19. Reported common ion concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>										
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Silica	Alkalinity <sup>3</sup>	TDS <sup>4</sup>	TSS <sup>5</sup>
<u>Up-gradient</u>												
P&W-2*	4/14/2009	40	16	7.2	1.2	0.2	6.5	26	NR	148	NR	NR
USGS-019*	4/14/2009	44	16	9.9	1.4	<0.2 U	11	22	NR	164	NR	NR
USGS-027*	4/14/2009	53	18	28	5.8	0.6	55	41	NR	153	NR	NR
<u>Facility</u>												
A11A31	5/4/2009	36	16	25	3.8	0.2	26	45	NR	134	NR	NR
CFA 1*	4/21/2009	63	19	32	4.0	<0.2 U	105	33	NR	127	NR	NR
ICPP-2020	4/7/2009	61	17	23	3.1	0.2	49	43	NR	146	NR	NR
M1S	5/5/2009	27	12	11	2.6	0.3	14	22	NR	98	NR	NR
M3S	5/5/2009	43	15	8.3	2.6	0.2	14	26	NR	142	NR	NR
M6S	5/4/2009	37	18	15	3.3	0.2	27	61	NR	104	NR	NR
NRF-06	5/6/2009	150	38	200	6.5	<0.2 U	544	106	NR	179	1400	<5 U
NRF-09	5/6/2009	71	22	20	2.6	<0.2 U	49	40	NR	201	330	<5 U
NRF-11	5/6/2009	68	21	19	2.5	<0.2 U	48	39	NR	199	340	<5 U
NRF-12	5/4/2009	67	21	17	2.4	<0.2 U	41	38	NR	198	320	<5 U
USGS-047	4/6/2009	53	14	10	2.0	0.2	18	25	NR	164	NR	NR
USGS-052	4/7/2009	51	14	14	2.8	0.2	24	26	NR	151	250	<5 U
USGS-065	4/13/2009	84	18	15	3.3	<0.2 U	19	152	NR	131	NR	NR
USGS-067	4/6/2009	56	15	28	3.7	0.3	61	29	NR	138	NR	NR
USGS-085*	4/13/2009	56	15	11	2.5	<0.2 U	16	41	NR	167	NR	NR
USGS-087*	4/16/2009	34	14	17	3.2	0.2	29	27	NR	119	NR	NR
USGS-099	5/4/2009	60	21	16	1.8	<0.2 U	23	28	NR	206	290	<5 U
USGS-100*	4/13/2009	37	12	17	3.2	0.7	17	17	NR	135	NR	NR
USGS-106*	6/10/2009	47	17	8.2	2.4	<0.2 U	16	23	NR	159	NR	NR
USGS-107*	6/10/2009	39	17	19	3.5	0.4	22	26	NR	145	NR	NR

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. \* = samples are filtered for calcium, magnesium, sodium and potassium. A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations expressed in mg/L. Samples are not filtered unless otherwise noted.

<sup>3</sup> As CaCO<sub>3</sub>

<sup>4</sup> =Total Dissolved Solids,

<sup>5</sup> = Total Suspended Solids

**Table 19 continued. Reported common ion concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>										
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Silica	Alkalinity <sup>3</sup>	TDS <sup>4</sup>	TSS <sup>5</sup>
<u>Boundary</u>												
Atomic City*	4/20/2009	34	13	17	3.2	0.6	18	18	NR	133	NR	NR
Crossroads*	4/21/2009	40	14	7.2	2.1	0.2	9.4	21	NR	142	NR	NR
USGS-008*	4/15/2009	44	15	6.8	1.8	0.2	8.1	23	NR	156	NR	NR
USGS-011*	4/20/2009	40	14	8.2	2.2	0.2	10	23	NR	140	NR	NR
USGS-109*	6/10/2009	39	15	12	2.8	0.2	14	25	NR	142	NR	NR
USGS-124*	4/20/2009	39	16	9.7	2.4	0.4	16	24	NR	140	NR	NR
<u>Distant</u>												
Clear Spring*	6/24/2009	45	19	26	4.1	0.7	38	49	NR	149	NR	NR
MV-02A*	6/22/2009	50	19	32	5.8	0.6	46	49	NR	161	NR	NR
MV-14*	6/24/2009	53	21	30	4.5	0.6	46	56	NR	160	NR	NR
MV-20*	6/24/2009	33	16	20	3.5	0.5	16	33	NR	139	NR	NR
MV-31*	6/24/2009	60	23	32	4.8	0.6	51	61	NR	170	NR	NR
MV-33*	6/22/2009	25	14	14	3.1	0.4	7.3	20	NR	123	NR	NR
MV-39*	6/24/2009	66	26	37	4.2	0.5	27	60	NR	241	NR	NR
MV-42*	6/22/2009	35	17	20	3.6	0.4	16	32	NR	148	NR	NR
MV-47*	6/24/2009	31	15	17	3.3	0.6	16	30	NR	127	NR	NR
MV-51*	6/22/2009	62	24	40	5.8	0.5	53	64	NR	190	NR	NR
MV-54*	6/22/2009	68	27	46	6.8	0.6	64	74	NR	207	NR	NR
<u>Surface water</u>												
BLR @ Dairy Farm*	6/23/2009	32	7.6	4.4	1.6	0.2	2.2	15	NR	103	NR	NR
BLR @ INEL Diversion*	6/23/2009	32	7.5	4.4	1.5	0.2	2.2	15	NR	103	NR	NR

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. \* = samples are filtered for calcium, magnesium, sodium and potassium. A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations expressed in mg/L. Samples are not filtered unless otherwise noted.

<sup>3</sup> As CaCO<sub>3</sub>

<sup>4</sup> =Total Dissolved Solids,

<sup>5</sup> = Total Suspended Solids

**Table 20. Reported nutrient concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>				
		Nitrite + Nitrate	Phosphorus	Nitrite	Total Kjeldahl Nitrogen	Ammonia
<u>Up-gradient</u>						
P&W-2	4/14/2009	0.50	0.015	NR	NR	NR
USGS-019	4/14/2009	0.85	0.0072	NR	NR	NR
USGS-027	4/14/2009	2.7	0.014	NR	NR	NR
<u>Facility</u>						
A11A31	5/4/2009	0.96	0.027	NR	NR	NR
CFA 1	4/21/2009	3.3	0.020	NR	NR	NR
ICPP-2020	4/7/2009	6.1	0.036	NR	NR	NR
M1S	5/5/2009	1.0	0.025	NR	NR	NR
M3S	5/5/2009	0.86	0.024	NR	NR	NR
M6S	5/4/2009	1.6	0.036	NR	NR	NR
NRF-06	5/6/2009	2.1	0.110	<0.01 U	0.14	0.045
NRF-09	5/6/2009	2.4	0.034	<0.01 U	0.12	0.048
NRF-11	5/6/2009	1.9	0.040	<0.01 U	<0.1 U	0.044
NRF-12	5/4/2009	1.9	0.033	<0.01 U	0.12	0.046
USGS-047	4/6/2009	1.7	0.036	NR	NR	NR
USGS-052	4/7/2009	3.2	0.028	NR	1.6	NR
USGS-065	4/13/2009	1.6	0.024	NR	NR	NR
USGS-067	4/6/2009	5.7	0.031	NR	NR	NR
USGS-085	4/13/2009	1.2	0.028	NR	NR	NR
USGS-087	4/16/2009	0.61	0.0094	NR	NR	NR
USGS-099	5/4/2009	1.8	0.029	<0.01 U	<0.1 U	0.046
USGS-100	4/13/2009	1.9	0.016	NR	NR	NR
USGS-106	6/10/2009	1.0	0.023	NR	NR	NR
USGS-107	6/10/2009	1.2	0.022	NR	NR	NR

<sup>1</sup> Data qualifiers: U = non-detection , J = estimate, R = rejected, NR = analysis not requested,

<sup>2</sup> Concentrations expressed in mg/L.

**Table 20 continued. Reported nutrient concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>				
		Nitrite + Nitrate	Phosphorus	Nitrite	Total Kjeldahl Nitrogen	Ammonia
<u>Boundary</u>						
Atomic City	4/20/2009	1.5	0.013	NR	NR	NR
Crossroads	4/21/2009	0.78	0.017	NR	NR	NR
USGS-008	4/15/2009	0.94	0.017	NR	NR	NR
USGS-011	4/20/2009	0.76	0.017	NR	NR	NR
USGS-109	6/10/2009	0.67	0.020	NR	NR	NR
USGS-124	4/20/2009	0.86	0.014	NR	NR	NR
<u>Distant</u>						
Clear Spring	6/24/2009	1.5	0.029	NR	NR	<0.010 U
MV-02A	6/22/2009	1.1	0.019	NR	NR	0.014
MV-14	6/24/2009	2.0	0.023	NR	NR	<0.010 U
MV-20	6/24/2009	1.5	0.028	NR	NR	<0.010 U
MV-31	6/24/2009	1.9	0.022	NR	NR	0.010
MV-33	6/22/2009	0.57	0.019	NR	NR	0.015
MV-39	6/24/2009	2.7	0.068	NR	NR	0.012
MV-42	6/22/2009	1.6	0.030	NR	NR	<0.010 U
MV-47	6/24/2009	0.73	0.019	NR	NR	0.014
MV-51	6/22/2009	2.6	0.048	NR	NR	0.017
MV-54	6/22/2009	4.8	0.030	NR	NR	0.012
<u>Surface water</u>						
BLR @ Dairy Farm	6/23/2009	0.088	0.026	NR	NR	0.054
BLR @ INEL						
Diversion	6/23/2009	0.084	0.025	NR	NR	0.085

<sup>1</sup> Data qualifiers: U = non-detection , J = estimate, R = rejected, NR = analysis not requested,

<sup>2</sup> Concentrations expressed in mg/L.

**Table 21. Reported VOC concentrations in water samples, second quarter, 2009.**

Sample Location	Sample Date	Concentrations <sup>1,2</sup>						
		1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl chloride
A11A31	5/4/2009	<0.5	3.1	<0.5	<0.5	<0.5	1.2	<0.5
ANP-8	5/18/2009	<0.5	<0.5	0.54	0.88	4.5	26	<0.5
GIN-04	5/19/2009	<0.5	<0.5	<0.5	<0.5	4.0	16	<0.5
M3S	5/5/2009	<0.5	4.8	<0.5	<0.5	<0.5	1.2	<0.5
M6S	5/4/2009	<0.5	3	<0.5	<0.5	<0.5	0.82	<0.5
TAN-16	5/19/2009	<0.5	<0.5	1.3	2.0	6.4	46	<0.5
TAN-28	5/12/2009	1.0	<0.5	59	150	7.1	450	8.4
TAN-29	5/12/2009	1.2	<0.5	81	34	22	690	0.67
TAN-37	5/12/2009	<0.5	<0.5	2.9	130	<0.5	17	<0.5
TAN-51	5/19/2009	0.56	<0.5	2.9	1.6	15	100	<0.5
TAN-57	5/19/2009	<0.5	<0.5	<0.5	<0.5	2.6	7.6	<0.5

<sup>1</sup> Data qualifiers: J= estimate, R= rejected. <DL = less than detection limit.

<sup>2</sup> Concentrations expressed in µg/L

## Terrestrial Monitoring Results

The ESP conducts terrestrial (soil and milk) monitoring and verification to provide an indication as to the long-term deposition and migration of contaminants in the environment, and to provide independent verification of DOE's analytical measurement of terrestrial variables.

DEQ-INL monitors long-term radiological conditions via soil sampling as well as field instrumentation capable of identifying and measuring quantities of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides some insight to transport, deposition, and accumulation of radioactive material in the environment as a result of INL operations as well as historical above ground testing of nuclear weapons. No in-situ gamma spectroscopic measurements were performed, nor were any soil samples physically collected during the second calendar quarter of 2009.

DEQ-INL monitors milk for naturally occurring potassium-40 and man-made iodine-131. DEQ-INL collects milk samples on a monthly basis. Results for analyses of milk samples are presented in **Table 23**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131 was not detected.

**Table 22. Gamma spectroscopy analysis data for milk samples, second quarter, 2009.**

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40		Man-made gamma-emitting radionuclide Iodine-131 <sup>1</sup>
		Concentration <sup>3</sup>	± 2 SD	
<b>Monitoring Samples</b>				
Howe/Nelson-Ricks Creamery	04/06/2009	1436	113	<MDC
	05/05/2009	1384	105	<MDC
	06/02/2009	1501	102	<MDC
Mud Lake/Nelson-Ricks Creamery	04/04/2009	1510	103	<MDC
	05/03/2009	1481	114	<MDC
	06/02/2009	1458	113	<MDC
Gooding/Glanbia	04/07/2009	1383	96	<MDC
	05/05/2009	1479	140	<MDC
	06/02/2009	1504	103	<MDC
Riverside	04/09/2009	1563	171	<MDC
	05/14/2009	1614	116	<MDC
	06/10/2009	1857	118	<MDC
<b>Verification Samples<sup>2</sup></b>				
Dietrich	04/07/2009	1450	108	<MDC
Terreton	04/07/2009	1448	110	<MDC
Terreton	05/05/2009	1436	108	<MDC
Rupert	05/05/2009	1613	119	<MDC
Idaho Falls	06/02/2009	1318	102	<MDC
Dietrich	06/02/2009	1319	94	<MDC

<sup>1</sup><MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).

<sup>2</sup> DEQ-INL samples collected by the off-site INL environmental surveillance contractor.

<sup>3</sup> Concentrations are expressed in pCi/L.

## Quality Assurance

The measurement of any physical quantity is subject to inaccuracy from errors that may be introduced during sample collection, measurement, calibration, and the reading and reporting of results. While all of these inaccuracies cannot be quantified with certainty for each analytical result, a quality assurance program can evaluate the overall quality of a data set and possibly identify and address errors or inaccuracies.

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the second quarter of 2009 for the DEQ-INL OP's ESP. It also summarizes the quality control (QC) samples (spikes, blanks, and duplicates) submitted to the Idaho Bureau of Laboratories-Boise (IBL) for non-radiological analyses and to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses during the quarter. All analyses and QC measures at the analytical laboratories used by the ESP are performed in accordance with approved written procedures maintained by each respective analytical laboratory. Sample collection is performed in accordance with written procedures maintained by the DEQ-INL OP.

Analytical results for blanks, duplicates, and spikes are used to assess the precision, accuracy, and representativeness of results from analyzing laboratories. During the second quarter of 2009, the DEQ-INL OP submitted 97 QC samples for various radiological and non-radiological analyses (**Table 24**).

### Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or immeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a "zero" result when no contaminant is expected to be present or an acceptable measure of "background," and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the second quarter of 2009 are presented in **Table 25**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 26**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 27**. Blank analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 28**, **Table 29**, and **Table 30**. One blank analysis for VOCs showed no detectable quantities and is not shown in the tables.

No anomalies were observed from the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL OP for the second quarter of 2009.

### Duplicate Samples

Duplicate samples are collected in a manner such that the samples are thought to be essentially identical in composition and are used to assess analytical precision. The difference between the original sample and the duplicate sample is expressed as a relative percent difference (RPD):

$$RPD = (R_1 - R_2) / ((R_1 + R_2) / 2) * 100$$

$R_1$  = first sample result

$R_2$  = second sample result

and is used to measure a laboratory's ability to reproduce consistent results. A relative percent difference is acceptable at  $\pm 20$  percent. For radiological analyses, the standard deviation of the differences can be

used as an indicator of the overall precision of the data set. Duplicate results for ground and surface water are presented in **Table 31**, **Table 32**, **Table 33**, and **Table 34** for radiological analyses, and non-radiological analyses.

No anomalies were observed from the assessment of field duplicate samples as measured by the analytical laboratories used by DEQ-INL OP for the second quarter of 2009.

## Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added in order to assess the bias a laboratory may have in accurately measuring these analytes. To determine agreement after laboratory analysis, DEQ-INL OP calculates the ratio of the spike concentration determined from the laboratory measurement to the known spike concentration in the sample. This result is known as percent recovery (%R) and the acceptable range used by DEQ-INL OP is  $100 \pm 25$  percent. Additionally, all results were qualified as “estimates (J)” if the associated quality control spike sample had a recovery of 50-74% or 126-150%, provided that each result was greater than the instrument detection limit (IDL). All results were qualified as “rejected (R)” if the associated quality control spike sample had a recovery of <50% or >150%, provided each result was also greater than the IDL.

During second quarter 2009, no field matrices were spiked to assess the influence of the sample media on laboratory performance. However, several spiked samples were created using de-ionized water and submitted to analytical laboratories for analyses. These non-radiological constituents were used to assess ground water analyte recovery rates and the results are presented in **Table 35**, **Table 36**, and **Table 37**.

DEQ-INL OP also prepares additional “spike-like” quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL OP irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and two additional exposures, ranging from 15 to 60 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement agrees within 25 percent of the known irradiated quantity. The irradiation results for first quarter 2009 are presented in **Table 38**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets.

There were no anomalies observed from the assessment of spiked samples as measured by DEQ-INL OP or the analytical laboratories used by DEQ-INL OP for the second quarter of 2009.

## Analytical QA/QC Assessment

No issues involving sample chain of custody, sample holding times, and the analysis of blank, duplicate, and spiked samples were observed during the second quarter of 2009, which significantly affected data quality. Methodologies and data reports issued by the contracting laboratories generally conformed to the requirements of DEQ-INL OP during the second quarter of 2009.

Data usability is the measure of data that is not rejected compared to the amount that was expected to be obtained. The overall data usability rate for the second quarter of 2009 met the minimum criteria of the DEQ-INL OP ESP and is summarized in **Table 24**.

## Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. Service reliability for air sampling equipment for the second quarter of 2009 is summarized in **Table 39**.

## **Conclusion**

All data collected for the second quarter of 2009, have been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data has been verified and deemed complete meeting the requirements and data quality objectives established by DEQ-INL OP.

**Table 23. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP for second quarter, 2009.**

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected <sup>1</sup>	Analyzing Lab <sup>2</sup>
<b>AIR</b>								
<b>Particulate</b>	4 inch filter	Gross alpha	141	13	0	0	0	ISU-EML
		Gross beta	141	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
<b>Water Vapor</b>	Desiccant column	Tritium	69	5	0	0	0	ISU-EML
<b>Gaseous</b>	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
<b>Precipitation</b>	Poly bottle	Tritium	6	0	0	0	0	ISU-EML
		Gamma emitters	6	0	0	0	0	ISU-EML
<b>WATER</b>								
<b>Groundwater &amp; Surface Water</b>	Grab or composite	Gross alpha	56	1	3	0	0	ISU-EML
		Gross beta	56	1	3	0	0	ISU-EML
		Gamma emitters	56	1	3	0	0	ISU-EML
		Tritium	56	1	3	0	0	ISU-EML
		Enriched tritium	0	0	0	0	0	ISU-EML
		Technetium-99	14	1	1	0	0	ISU-EML
		Radiochemical	87	9	8	0	0	ISU Sub
		Metals	42	1	3	2	0	IBL
		Common Ions	42	1	3	2	0	IBL
		Nutrients	42	1	3	2	0	IBL
		Volatile Organics	22	1	1	1	0	IBL
<b>TERRESTRIAL</b>								
<b>Milk</b>	Grab or composite	Gamma emitters	18	0	0	0	0	ISU-EML
<b>Soil</b>	<i>in situ</i>	Gamma emitters	0	0	0	0	0	DEQ-INL OP
	Grab – “puck”	Gamma emitters	0	0	0	0	0	ISU-EML
<b>RADIATION</b>								
<b>Ambient</b>	EICs	Gamma Radiation	54	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	11	NA	NA	NA	NA	DEQ-INL OP
<b>Total Test Analyses</b>			943	50	31	16	0	
<b>Total of QC Analyses (blanks, duplicates, and spikes)</b>			97					
<b>Percentage of QC analyses of total Test analyses<sup>3</sup></b>			10%					
<b>Percentage of usable data<sup>4</sup></b>			<b>100%</b>					

<sup>1</sup> Combined Laboratory and DEQ-INL OP rejection criteria (data was rejected for any reason).

<sup>2</sup> ISU-EML = Idaho State University – Environmental Monitoring Laboratory; ISU Sub = Subcontract laboratory to ISU-EML; IBL = Idaho Bureau of Laboratories, Boise; IBL Sub = Subcontract laboratory to IBL; DEQ-INL OP = Analyzed by INL Oversight Program, Idaho Department of Environmental Quality.

<sup>3</sup> Analyzing quality control samples at a rate of approximately 5 to 10 percent of the total number of test analyses performed for the year is deemed appropriate for the DEQ-INL OP ESP.

<sup>4</sup> Data usability rate [total analyses – rejected data]/[total analyses] of 90 percent or higher is acceptable for the DEQ-INL OP ESP.

**Table 24. Blank analysis results for gross alpha and beta in particulate air (TSP) for the second quarter, 2009.**

Collection Period		Corrected volume (m <sup>3</sup> ) <sup>1</sup>	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
4/2/09	4/9/09	1652	-0.1	0.2	-0.3	0.3
4/9/09	4/16/09	1652	0.1	0.2	0.0	0.3
4/16/09	4/23/09	1652	-0.1	0.2	-0.1	0.3
4/23/09	4/30/09	1652	-0.3	0.3	-0.3	0.3
4/30/09	5/7/09	1652	-0.1	0.2	0.0	0.3
5/7/09	5/15/09	1652	-0.1	0.2	0.2	0.3
5/15/09	5/21/09	1652	0.1	0.2	-0.2	0.3
5/21/09	5/28/09	1652	-0.1	0.2	-0.1	0.3
5/28/09	6/4/09	1652	-0.1	0.2	-0.1	0.3
6/4/09	6/11/09	1652	-0.1	0.2	0.0	0.3
6/11/09	6/18/09	1652	-0.2	0.2	0.0	0.3
6/18/09	6/25/09	1652	0.0	0.2	-0.2	0.3
6/25/09	7/2/09	1652	-0.1	0.1	-0.1	0.2

Note: Concentrations and associated uncertainties (± 2 SD) are expressed in 1 x 10<sup>-3</sup> pCi/m<sup>3</sup>.

<sup>1</sup> A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

**Table 25. Blank analysis results for gamma spectroscopy for TSP particulate air filters for the second quarter, 2009.**

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration <sup>1</sup>	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
7/29/09	11	36	61	2	48	82	2	10	17
Analysis Date	Cesium-134			Cesium-137					
	Concentration <sup>1</sup>	± 2 SD	MDC	Concentration	± 2 SD	MDC			
7/29/09	3	4	7	-2	4	7			

Note: Concentrations are expressed in 1 x 10<sup>-5</sup> pCi/m<sup>3</sup> with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

<sup>1</sup> These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A composite volume equal to the sum of the average volumes collected through each valid field filter was used to compute "air concentrations" for the blank for meaningful comparison to sample results. No air was actually passed through the blank filters.

**Table 26. Blank analysis results for tritium in water vapor from air samples for the second quarter, 2009.**

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP092ZTR01	5/26/09	5/27/09	7/10/09	0.06	0.09	0.15
OP092ZTR02	6/15/09	6/17/09	7/24/09	0.03	0.08	0.13
OP092ZTR03	6/19/09	6/23/09	7/24/09	-0.03	0.07	0.13
OP092ZTR04	6/29/09	6/30/09	8/11/09	-0.02	0.08	0.13
OP092ZTR05	7/10/09	7/14/09	8/11/09	0.02	0.08	0.13

Note: Concentrations are expressed in nCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

**Table 27. Radiological blank analysis in ground and surface water for samples for second quarter, 2009.**

Sample Number	Sample Date	Concentration	± 2 SD	MDC	Within Blank Criteria?
<b>Gross Alpha</b>					
091W001	4/8/2009	1.2	0.6	1.0	Yes
<b>Gross Beta</b>					
091W001	4/8/2009	0.2	0.9	1.4	Yes
<b>Cesium-137</b>					
091W001	4/8/2009	0.1	1.3	2.2	Yes
<b>Tritium</b>					
091W003	4/8/2009	10	80	0.14	Yes
<b>Strontium-90</b>					
091W004	4/8/2009	0.13	0.26	0.58	Yes
<b>Technetium-99</b>					
091W002	4/8/2009	0	0.1	0.2	Yes
<b>Plutonium-238</b>					
091W004	4/8/2009	-0.002	0.023	0.033	Yes
<b>Plutonium-239/240</b>					
091W004	4/8/2009	0.004	0.023	0.033	Yes
<b>Plutonium-241</b>					
091W004	4/8/2009	-5.5	4.1	7.1	Yes
<b>Americium-241</b>					
091W004	4/8/2009	-0.002	0.026	0.055	Yes
<b>Neptunium-237</b>					
091W004	4/8/2009	-0.004	0.043	0.062	Yes
<b>Uranium-234</b>					
091W005	4/8/2009	0.062	0.075	0.056	Yes
<b>Uranium-235</b>					
091W005	4/8/2009	0.08	0.10	0.15	Yes
<b>Uranium-238</b>					
091W005	4/8/2009	0.014	0.075	0.108	Yes

Note: Concentrations are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

**Table 28. Blank analysis results (µg/L) for metals in ground and surface water for the second quarter, 2009.**

Sample Number	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
091W007	4/8/2009	<2	<1	<1	<1	<1	<10	<1	<1	<2	<2

**Table 29. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water for the second quarter, 2009.**

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
091W006,007,008	4/8/2009	<0.10	<0.10	<0.10	<0.10	<0.20	<0.40	<0.80	<1.0	<0.010	<0.0050

**Table 30. Duplicate radiological analysis results in pCi/L for ground and surface water, second quarter, 2009.**

Analysis/ Sample Location	Original Sample Number	Concentration	±2 SD	Duplicate Sample Number	Concentration	±2 SD	/R <sub>1</sub> -R <sub>2</sub> /	3(s <sub>1</sub> <sup>2</sup> +s <sub>2</sub> <sup>2</sup> ) <sup>1/2</sup>	Within Criteria? <sup>1</sup>
<b>Gross Alpha</b>									
M3S	091W181	1.5	2.3	091W201	0.5	2.8	1.0	5.4	yes
MV-14	091W294	0.4	2.5	091W312	0.2	2.5	0.2	5.3	yes
USGS-124	091W045	8.1	2.5	091W111	3.0	2.4	5.1	5.2	yes
<b>Gross Beta</b>									
M3S	091W181	3.1	1.1	091W201	3.3	2.4	0.2	4.0	yes
MV-14	091W294	4.8	1.2	091W312	4.5	1.2	0.3	2.5	yes
USGS-124	091W045	4.3	1.1	091W111	3.5	1.2	0.8	2.4	yes
<b>Gamma Spectroscopy Cesium-137</b>									
M3S	091W181	-0.8	1.4	091W201	-0.2	1.4	0.6	3.0	yes
MV-14	091W294	0.9	1.4	091W312	0.3	1.5	0.6	3.1	yes
USGS-124	091W045	0.3	1.3	091W111	1.2	1.7	0.9	3.2	yes
<b>Tritium</b>									
M3S	091W183	900	110	091W203	1060	120	160	244	yes
MV-14	091W295	60	80	091W313	-40	80	100	170	yes
USGS-124	091W046	130	80	091W112	40	80	90	170	yes
<b>Strontium-90</b>									
M3S	091W184	0.25	0.25	091W204	0.32	0.28	0.07	0.6	yes
<b>Technetium-99</b>									
M3S	091W182	1.5	0.2	091W202	1.6	0.2	0.1	0.4	yes
<b>Plutonium-238</b>									
M3S	091W184	-0.005	0.024	091W204	0	0.023	0.024	0.050	yes
<b>Plutonium-239/240</b>									
M3S	091W184	0.001	0.024	091W204	0.003	0.023	0.002	0.050	yes
<b>Plutonium-241</b>									
M3S	091W184	0.1	4.0	091W204	-3.3	3.9	3.4	8.4	yes
<b>Uranium-234</b>									
M3S	091W185	1.44	0.35	091W205	1.47	0.36	0.03	0.75	yes
<b>Uranium-235</b>									
M3S	091W185	0.033	0.050	091W205	0.012	0.052	0.021	0.108	yes
<b>Uranium-238</b>									
M3S	091W185	0.58	0.20	091W205	0.74	0.23	0.16	0.46	yes
<b>Americium-241</b>									
M3S	091W184	0	0.034	091W204	-0.009	0.035	0.009	0.07	yes

<sup>1</sup> /R<sub>1</sub>-R<sub>2</sub>/ ≤ 3(s<sub>1</sub><sup>2</sup>+s<sub>2</sub><sup>2</sup>)<sup>1/2</sup>

**Table 31. Duplicate results for metals (µg/L) in ground water and/or surface water for the second quarter, 2009.**

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
M3S (total)	091W187	5/5/2009	<2	45	<1	13	39	<1	<1	<2	<2
M3S (total)	091W207	5/5/2009	<2	45	<1	13	41	<1	<1	<2	<2
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
MV-14 (dissolved)	091W298	6/24/2009	2.1	51	<1	1.8	<10	<1	<1	<2	6.2
MV-14 (dissolved)	091W316	6/24/2009	2	51	<1	1.8	<10	<1	<1	<2	5.1
<b>RPD</b>			<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>
USGS-124 (dissolved)	091W048	4/20/2009	NR	32	NR	5.5	NR	<1	7.9	NR	<2
USGS-124 (dissolved)	091W114	4/20/2009	NR	32	NR	5.4	NR	<1	7.7	NR	<2
<b>RPD</b>				<b>0</b>		<b>2</b>		<b>0</b>	<b>3</b>		<b>0</b>

Relative Percent Difference = (R1-R2) / ((R1+ R2)/2)\*100. NR= not requested.

**Table 32. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water for second quarter, 2009.**

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
M3S	091W187,186	5/5/2009	43	15	8.3	2.6	0.23	14.1	26	142	0.86	0.024
M3S	091W207,206	5/5/2009	43	15	8.3	2.6	0.22	14.2	26.1	141	0.85	0.025
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>-4</b>
MV-14	091W298, 296, 299	6/24/2009	53	21	30	4.5	0.648	45.7	56	160	2.0	0.023
MV-28	091W316, 314, 317	6/24/2009	55	22	30	4.4	0.694	45.5	56.9	162	2.0	0.024
<b>RPD</b>			<b>-4</b>	<b>-5</b>	<b>0</b>	<b>2</b>	<b>-7</b>	<b>0</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>-4</b>
USGS-124	091W047, 048, 049	4/20/2009	39	16	9.7	2.4	0.373	16	23.6	140	0.86	0.014
USGS-124	091W113, 114, 115	4/20/2009	39	16	9.7	2.4	0.374	15.9	23.6	141	0.86	0.014
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>-1</b>	<b>0</b>	<b>0</b>

Relative Percent Difference = (R1-R2) / ((R1+ R2)/2)\*100

**Table 33. Duplicate results (in ug/L) for VOCs in groundwater and/or surface water second quarter, 2009.**

Sample Location	Sample Date	Sample Number	Concentrations						
			1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl chloride
M3S	5/5/2009	091W189	<0.5	4.8	<0.5	<0.5	<0.5	1.2	<0.5
M3S	5/5/2009	091W209	<0.5	4.9	<0.5	<0.5	<0.5	1.2	<0.5
<b>RPD</b>			<b>0</b>	<b>-2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Relative Percent Difference =  $(R1-R2) / ((R1+ R2)/2)*100$

**Table 34. De-ionized water spike results (in µg/L) and percent recovery for metals in ground and surface water for the second quarter, 2009.**

Spike Sample Number	Sample Date	Barium			Chromium			Lead			Manganese			Zinc		
		spike	result	%R <sup>1</sup>	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
091W041	4/10/2009	104	110	<b>106</b>	120	120	<b>100</b>	5.10	5.4	<b>106</b>	12.4	12	<b>97</b>	327	310	<b>95</b>
091W123	4/23/2009	77.3	81	<b>105</b>	89.2	86	<b>96</b>	6.81	7.2	<b>106</b>	9.25	9.0	<b>97</b>	244	210	<b>86</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 35. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2009.**

Spike Sample Number	Sample Date	Calcium			Magnesium			Sodium			Potassium			Fluoride		
		spike	result	%R <sup>1</sup>	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
091W040, 41	4/10/2009	30.3	29.3	<b>97</b>	15.5	15	<b>97</b>	30.4	30	<b>99</b>	5.83	5.6	<b>96</b>	1.08	1.03	<b>95</b>
091W121, 123	4/23/2009	22.6	22	<b>97</b>	11.6	11	<b>95</b>	22.7	22	<b>97</b>	4.35	4.2	<b>97</b>	0.800	0.792	<b>99</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 35 continued. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2009.**

Spike Sample Number	Sample Date	Chloride			Sulfate			Total Alkalinity as CaCO <sub>3</sub>			Total Nitrogen			Total Phosphorus		
		spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
091W040, 42	4/10/2009	22.3	22.4	<b>100</b>	15.7	15.6	<b>99</b>	16.5	16.0	<b>97</b>	1.04	1.0	<b>96</b>	0.0274	0.027	<b>99</b>
091W121,122	4/23/2009	11.9	12.0	<b>101</b>	9.50	9.47	<b>100</b>	26.5	28.0	<b>106</b>	3.39	3.5	<b>103</b>	0.0156	0.014	<b>90</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 36. De-ionized water spike results (in µg/L) and percent recovery for VOCs in ground and surface water for the second quarter, 2009.**

Spike Sample Number	Sample Date	Carbon Tetrachloride			Styrene			Tetrachloroethylene			Trichloroethylene			Vinyl Chloride		
		spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
091W124	4/23/2009	17.0	20	<b>118</b>	18.5	16	<b>86</b>	10.2	10	<b>98</b>	14.8	16	<b>108</b>	18.7	23	<b>123</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 37. Electret ionization chamber irradiation results (categorized as spiked samples) for second quarter, 2009.**

Electret #	Exposure Received		Net Measured Exposure <sup>1</sup>		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	40	2.0	39.0	1.3	97.5
Spike 1	40	2.0	37.2	1.4	93.0
Spike 1	40	2.0	37.5	1.4	93.7
Spike 2	30	1.5	29.0	1.4	96.5
Spike 2	30	1.5	29.2	1.4	97.4
Spike 2	30	1.5	30.5	1.3	101.6
Spike 3	25	1.3	25.3	1.3	101.3
Spike 3	25	1.3	20.5	1.3	81.9
Spike 3	25	1.3	24.3	1.4	97.2

Note: A percent recovery (%R) of 100 ± 25 is considered acceptable.

<sup>1</sup>Net measured exposure estimate includes a correction for atmospheric pressure.

**Table 38. Air sampling field equipment service reliability (percent operational) for second quarter, 2009.**

Station Locations	Sample Type			
	TSP	Radioiodine	Atmospheric Moisture	Precipitation
<b>Onsite Locations</b>				
Big Lost River Rest Area	100 %	100 %	100 %	100 %
Experimental Field Station	100 %	100 %	100 %	NC <sup>1</sup>
Sand Dunes Tower	100 %	100 %	100 %	NC <sup>1</sup>
Van Buren Avenue	100 %	100 %	100 %	NC <sup>1</sup>
<b>Boundary Locations</b>				
Atomic City	100 %	100 %	100 %	100 %
Howe	92 %	100 %	100 %	100 %
Monteview	100 %	100 %	100 %	100 %
Mud Lake	100 %	100 %	100 %	100 %
<b>Distant Locations</b>				
Craters of the Moon	92 %	100 %	100 %	NC <sup>1</sup>
Idaho Falls	100 %	100 %	100 %	100 %

Note: The values in this table were calculated by dividing the number of weeks the equipment was in operation by the number of weeks in the quarter.

<sup>1</sup>NC = sample not collected at this location

## Appendix A

**Table A-1. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2009.**

Sample location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Rest Area</b>	04/02/09	04/09/09	0.6	0.3	20.4	1.0
	04/09/09	04/16/09	0.5	0.3	22.2	1.1
	04/16/09	04/23/09	1.3	0.3	34.6	1.3
	04/23/09	04/30/09	0.7	0.4	20.6	1.1
	04/30/09	05/07/09	0.8	0.3	15.5	0.9
	05/07/09	05/14/09	1.0	0.3	23.4	1.1
	05/14/09	05/21/09	1.4	0.3	38.2	1.4
	05/21/09	05/28/09	1.3	0.3	40.8	1.4
	05/28/09	06/04/09	0.8	0.3	27.3	1.2
	06/04/09	06/11/09	0.6	0.3	16.6	0.9
	06/11/09			0.3	15.6	0.9
	06/18/09			0.3	23.5	1.1
	06/25/09			0.3	35.4	1.3
<b>Experimental Field Station</b>	04/02/09			0.3	17.2	1.0
	04/09/09			0.3	18.9	1.0
	04/16/09	04/23/09	1.0	0.3	28.5	1.2
	04/23/09	04/30/09	0.7	0.3	21.7	1.1
	04/30/09	05/07/09	0.5	0.3	16.0	0.9
	05/07/09	05/14/09	0.9	0.3	23.7	1.1
	05/14/09	05/21/09	1.2	0.3	34.9	1.3
	05/21/09	05/28/09	1.6	0.4	36.6	1.4
	05/28/09	06/04/09	1.0	0.3	24.5	1.1
	06/04/09	06/11/09	0.5	0.3	17.1	1.0
	06/11/09	06/18/09	0.3	0.3	15.9	0.9
	06/18/09	06/25/09	1.2	0.3	23.1	1.1
	06/25/09	07/02/09	1.0	0.3	32.9	1.3

<sup>1</sup> Sampler not operating.

**Table A-1 continued. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2009.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Sand Dunes</b>	04/02/09	04/09/09	0.3	0.3	17.5	1.0
	04/09/09	04/16/09	0.7	0.3	19.1	1.0
	04/16/09	04/23/09	1.1	0.3	29.2	1.2
	04/23/09	04/30/09	0.6	0.3	19.9	1.0
	04/30/09	05/07/09	0.6	0.3	14.7	0.9
	05/07/09	05/14/09	0.7	0.3	23.1	1.1
	05/14/09	05/21/09	1.4	0.3	34.7	1.3
	05/21/09	05/28/09	1.2	0.3	34.9	1.3
	05/28/09	06/04/09	0.9	0.3	26.3	1.2
	06/04/09	06/11/09	0.6	0.3	18.2	1.0
	06/11/09	06/18/09	0.5	0.3	13.8	0.9
	06/18/09	06/25/09	0.5	0.3	21.4	1.1
	06/25/09	07/02/09	1.2	0.3	34.0	1.3
<b>Van Buren</b>	04/02/09	04/09/09	0.3	0.3	20.9	1.0
	04/09/09	04/16/09	0.8	0.3	19.4	1.0
	04/16/09	04/23/09	1.2	0.3	31.8	1.3
	04/23/09	04/30/09	1.0	0.3	21.2	1.0
	04/30/09	05/07/09	0.6	0.3	15.2	0.9
	05/07/09	05/14/09	1.0	0.3	23.2	1.1
	05/14/09	05/21/09	1.6	0.3	38.1	1.4
	05/21/09	05/28/09	1.4	0.3	39.3	1.4
	05/28/09	06/04/09	1.5	0.5	45.0	1.8
	06/04/09	06/11/09	0.8	0.3	22.3	1.2
	06/11/09	06/18/09	0.5	0.3	16.7	0.9
	06/18/09	06/25/09	0.8	0.3	23.5	1.1
	06/25/09	07/02/09	1.1	0.3	36.2	1.3
<b>Atomic City</b>	04/02/09	04/09/09	0.7	0.3	23.6	1.1
	04/09/09	04/16/09	0.9	0.3	19.6	1.0
	04/16/09	04/23/09	1.3	0.3	31.1	1.3
	04/23/09	04/30/09	1.0	0.4	26.0	1.2
	04/30/09	05/07/09	0.7	0.3	17.6	1.0
	05/07/09	05/14/09	1.1	0.3	25.0	1.1
	05/14/09	05/21/09	1.8	0.4	39.0	1.4
	05/21/09	05/28/09	1.7	0.4	43.4	1.5
	05/28/09	06/04/09	0.9	0.3	28.8	1.2
	06/04/09	06/11/09	0.5	0.3	22.5	1.1
	06/11/09	06/18/09	0.5	0.3	18.7	1.0
	06/18/09	06/25/09	0.9	0.3	24.7	1.1
	06/25/09	07/02/09	1.1	0.3	33.8	1.3

**Table A-1 continued. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2009.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Howe</b>	04/02/09	04/09/09	0.5	0.3	18.0	1.0
	04/09/09	04/16/09	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
	04/16/09	04/23/09	0.8	0.3	25.5	1.1
	04/23/09	04/30/09	0.5	0.3	21.2	1.0
	04/30/09	05/07/09	0.5	0.3	14.2	0.9
	05/07/09	05/14/09	0.8	0.3	21.0	1.0
	05/14/09	05/21/09	1.6	0.3	33.7	1.3
	05/21/09	05/28/09	1.3	0.3	33.5	1.3
	05/28/09	06/04/09	0.8	0.3	24.5	1.1
	06/04/09	06/11/09	0.6	0.3	16.1	0.9
	06/11/09	06/18/09	0.3	0.3	15.2	0.9
	06/18/09	06/25/09	0.5	0.3	20.6	1.0
	06/25/09	07/02/09	0.8	0.2	28.9	1.2
<b>Montevieu</b>	04/02/09	04/09/09	0.2	0.3	9.0	0.7
	04/09/09	04/16/09	0.5	0.3	9.7	0.7
	04/16/09	04/23/09	0.8	0.3	13.0	0.8
	04/23/09	04/30/09	0.6	0.3	11.9	0.8
	04/30/09	05/07/09	0.5	0.3	9.5	0.7
	05/07/09	05/14/09	0.7	0.3	18.8	1.0
	05/14/09	05/21/09	1.0	0.3	28.6	1.2
	05/21/09	05/28/09	0.9	0.3	28.3	1.2
	05/28/09	06/04/09	0.6	0.3	21.4	1.0
	06/04/09	06/11/09	0.6	0.3	16.5	0.9
	06/11/09	06/18/09	0.4	0.2	16.1	0.9
	06/18/09	06/25/09	0.7	0.3	22.6	1.1
	06/25/09	07/02/09	1.5	0.3	47.6	1.5
<b>Mud Lake</b>	04/02/09	04/09/09	0.6	0.3	18.5	1.0
	04/09/09	04/16/09	0.7	0.3	19.2	1.0
	04/16/09	04/23/09	1.2	0.3	25.8	1.2
	04/23/09	04/30/09	0.5	0.3	22.5	1.1
	04/30/09	05/07/09	0.9	0.3	15.9	1.0
	05/07/09	05/14/09	1.1	0.3	21.6	1.1
	05/14/09	05/21/09	1.6	0.4	32.1	1.3
	05/21/09	05/28/09	1.3	0.3	37.5	1.4
	05/28/09	06/04/09	0.8	0.3	25.9	1.2
	06/04/09	06/11/09	0.5	0.3	14.5	0.9
	06/11/09	06/18/09	0.3	0.3	14.0	0.9
	06/18/09	06/25/09	1.0	0.3	19.8	1.1
	06/25/09	07/02/09	0.9	0.3	29.6	1.3

<sup>1</sup> NS - Insufficient sample collected due to sampler failure.

**Table A-1 continued. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2009.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Distant Locations</b>						
<b>Craters</b>						
	04/02/09	04/09/09	0.3	0.3	15.2	0.9
	04/09/09	04/16/09	0.5	0.3	17.1	1.0
	04/16/09	04/23/09	0.8	0.3	26.8	1.2
	04/23/09	04/30/09	0.6	0.3	19.4	1.0
	04/30/09	05/07/09	0.4	0.3	12.7	0.8
	05/07/09	05/14/09	NS <sup>2</sup>	NS <sup>2</sup>	NS <sup>2</sup>	NS <sup>2</sup>
	05/14/09	05/21/09	1.3	0.3	30.4	1.3
	05/21/09	05/28/09	0.9	0.3	30.3	1.3
	05/28/09	06/04/09	0.7	0.3	23.6	1.1
	06/04/09	06/11/09	0.4	0.3	16.2	1.0
	06/11/09	06/18/09	0.4	0.3	13.0	0.9
	06/18/09	06/25/09	0.5	0.3	19.4	1.0
	06/25/09	07/02/09	0.8	0.2	27.1	1.2
<b>Fort Hall<sup>1</sup></b>						
	04/02/09	04/09/09	0.9	0.3	15.4	0.9
	04/09/09	04/16/09	0.9	0.3	16.2	0.9
	04/16/09	04/23/09	1.9	0.4	22.7	1.1
	04/23/09	04/30/09	0.7	0.3	18.4	1.0
	04/30/09	05/07/09	0.6	0.3	14.0	0.9
	05/07/09	05/14/09	1.0	0.3	17.3	1.0
	05/14/09	05/21/09	1.2	0.3	25.4	1.1
	05/21/09	05/28/09	1.2	0.3	28.1	1.2
	05/28/09	06/04/09	1.1	0.3	22.1	1.1
	06/04/09	06/11/09	0.9	0.3	15.2	0.9
	06/11/09	06/18/09	0.6	0.2	14.8	0.7
	06/18/09	06/25/09	1.0	0.6	16.4	1.5
	06/25/09	07/02/09	1.2	0.3	24.1	1.1
<b>Idaho Falls</b>						
	04/02/09	04/09/09	0.9	0.3	22.2	1.1
	04/09/09	04/16/09	0.9	0.4	25.2	1.3
	04/16/09	04/23/09	1.4	0.4	31.4	1.4
	04/23/09	04/30/09	1.2	0.5	39.0	1.8
	04/30/09	05/07/09	1.1	0.4	25.1	1.4
	05/07/09	05/14/09	1.2	0.4	27.6	1.3
	05/14/09	05/21/09	2.2	0.4	42.5	1.6
	05/21/09	05/28/09	1.9	0.4	52.1	1.7
	05/28/09	06/04/09	1.5	0.3	39.2	1.4
	06/04/09	06/11/09	0.8	0.3	27.2	1.2
	06/11/09	06/18/09	0.8	0.3	22.7	1.1
	06/18/09	06/25/09	1.1	0.3	29.3	1.2
	06/25/09	07/02/09	1.9	0.4	45.3	1.6

<sup>1</sup> Operated by Shosone-Bannack Tribe

<sup>2</sup> Insufficient Sample Volume collected

## Appendix B

**Table B-1. Results for all electret locations, second quarter, 2009.**

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R/h}$ )	$\pm 2$ SD ( $\mu\text{R/h}$ )
Arco	14.5	2.2
Craters	16.9	0.7
Rest Area	13.6	2.6
Van Buren	15.5	3.6
EFS	16.2	2.9
Main Gate	14.1	4.3
Atomic City	14.5	0.2
Taber	17.7	2.1
Blackfoot	12.3	0.2
Ft. Hall	10.9	1.2
Idaho Falls	11.1	2.5
Mud Lake/ Terretton	13.9	3.2
Monteview	13.2	1.3
Sand Dunes	12.2	0.9
Howe	14.0	1.8
Howe Met. Tower	14.3	0.2
MP276 -20	14.7	4.3
MP274 -20	10.1	4.3
MP272 -20	14.0	4.3
MP270 -20	14.4	4.3
MP268 -20	17.3	4.3
MP266 -20	12.2	4.3
MP264 -20	13.1	4.3
MP270 -20/26	15.6	4.3
MP268 -20/26	14.9	4.3
MP266 -20/26	17.1	4.3
MP263 -20/26	12.8	4.3
MP261 -20/26	11.9	4.3
MP259 -20/26 <sup>1</sup>	22.0	
MFC (EBR II)	16.4	0.4
EBR I	11.8	4.1
RWMC	12.0	0.4
CFA	16.1	5.1
CITRC (PBF)	14.6	2.5

<sup>1</sup> Sample was determined to be an outlier since the data was greater than 3 standard deviations with respect to accompanying Highway 20 readings. Therefore the data was not included in Standard Deviation calculation but the exposure rate is reported.

**Table B-1 continued. Results for all electret locations, second quarter, 2009.**

<b>Sample Location</b>	<b>Net Corrected Exposure Rate (<math>\mu\text{R/h}</math>)</b>	<b><math>\pm 2</math> SD (<math>\mu\text{R/h}</math>)</b>
INTEC (ICPPI)	13.3	1.8
ATR (TRA)	16.7	1.0
NRF	13.1	1.5
TAN	10.7	0.2
Mud Lake Bank of Commerce	16.5	1.5
MP43-33	14.1	3.8
MP41-33	12.5	3.8
MP39-33	12.6	3.8
MP37-33 <sup>2</sup>	NS	NS
MP35-33	11.7	3.8
MP33-33	12.3	3.8
MP31-33	12.5	3.8
MP29-33	12.2	3.8
MP27-33	16.4	3.8
MP25-33	9.2	3.8
MP23-33 <sup>3</sup>	NS	NS
Base of Howe	13.7	2.0
Rover	11.4	1.8
Hamer	14.1	0.9
Sugar City	15.6	2.8
Roberts	11.3	1.4
Big Southern Butte	25.5	8.8

<sup>2</sup> Sample was determined to be an outlier since the data was greater than 3 standard deviations with respect to accompanying Highway 33 readings. Operator error was suspected due to excessive voltage loss therefore the data was specified as no sample (NS).

<sup>3</sup> Sample was specified as no sample (NS) since the can containing the electret could not be found.

## Appendix C

**Table C-1. List of volatile organic compounds (VOCs) analyzed for water samples. Minimum detectable concentrations (MDC) are expressed in µg/L.**

Analyte	Minimum detectable concentrations (MDC) (expressed in µg/L)
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
1,4-Dichlorobenzene	0.5
1,2-Dichlorobenzene	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
Ethylbenzene	0.5
Methylene Chloride	0.5
Styrene	0.5
Tetrachloroethylene (PERC)	0.5
Toluene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethylene	0.5
Vinyl chloride	0.5
Xylenes (total)	0.5
Bromodichloromethane	0.5
Dibromochloromethane	0.5
Bromoform	0.5
Chloroform	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	0.5
tert-Butylbenzene	0.5
Chloroethane	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5

**Table C.1 continued. List of volatile organic compounds (VOCs) analyzed for water samples. Minimum detectable concentrations (MDC) are expressed in µg/L.**

Analyte	Minimum detectable concentrations (MDC) (expressed in µg/L)
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	1.0
1,2-Dibromoethane (EDB)	0.5
Dibromomethane	0.5
1,3-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	0.5
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Tert Butyl Ether (MTBE)	1.0
Naphthalene	1.0
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	1.25
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	0.5
1,3,5-Trimethylbenzene	0.5