

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	RCRA	-	Resource Conservation and Recovery Act
BEA	-	Battelle Energy Alliance, LLC	RPD	-	relative percent difference
BLR	-	Big Lost River	RWMC	-	Radioactive Waste Management Complex
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act	RTC	-	Reactor Technology Complex
CFA	-	Central Facilities Area	SD	-	standard deviation
CWI	-	CH2M-WG Idaho, LLC	SMCL	-	secondary maximum contaminant level
DEQ-INL OP	-	The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program	TAN	-	Test Area North
DOE	-	U.S. Department of Energy	TCE	-	trichloroethene
EIC	-	electret ionization chamber	TDS	-	total dissolved solids
EML	-	Environmental Monitoring Laboratory	TMI	-	Three Mile Island
EPA	-	Environmental Protection Agency	TSP	-	total suspended particulate
ESER	-	Environmental Surveillance, Education and Research Program (Gonzales-Stoller Surveillance, LLC)	TSS	-	total suspended solids
ESP	-	Environmental Surveillance Program	USGS	-	U.S. Geological Survey
ESRPA	-	Eastern Snake River Plain Aquifer	VOC	-	volatile organic compound
HPIC	-	high-pressure ion chamber	WLAP	-	Wastewater Land Application Permit
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	-	milliRoentgen			
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			

## 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 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, 2011 (**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 2011 for TSP filters are presented in **Table 3**. There are three gamma-emitting radionuclides above MDC, beryllium-7, a naturally occurring, cosmogenic radionuclide and manmade  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  produced by fission occurring in nuclear reactors. The  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  are presumably due to the March 11, 2011 nuclear reactor accident in Fukushima, Japan.

Radioactive iodine samples are collected weekly. Samples are collected by drawing air through a cartridge filled with activated charcoal using a low-volume air pump. The activated charcoal contained in the cartridge traps the radioiodine within its sponge-like pores. Each week, cartridges are collected from all eleven air monitoring stations and analyzed together as a composite. If Iodine-131 is detected in

this composite, the cartridges are individually analyzed.  $^{131}\text{I}$  was detected on the weekly composite for weeks 3/31-4/07, 4/07-4/14, 4/14-4/21, and 4/21-4/28/11 (**Table 6**). Because of the  $^{131}\text{I}$  detections, charcoal cartridges from each station were analyzed individually (**Table 7**). All sampling sites were analyzed individually for the first two weeks of the quarter. The results showed steadily decreasing  $^{131}\text{I}$  concentrations. Because of the large number of samples and limited detector availability, not all sites were analyzed for the weeks of 4/14-4/21/11 and 4/21-4/28/11; a smaller group of sampling sites chosen from distant, on-site, and boundary locations were analyzed to represent the entire sampling area. All results were well below the regulatory limit for  $^{131}\text{I}$  shown in Table 8. The  $^{131}\text{I}$  detections are presumably due to the nuclear reactor accident in Fukushima, Japan.

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. Atmospheric tritium was measured above the minimum detectable concentration (MDC) during the second quarter of 2011 in one sample at each of the following sampling sites: Experimental Field Station and Van Buren. While results for these two individual samples are above MDC they are still well below regulatory limits. In addition, the quarterly average for both sites is below the MDC for the average. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the second quarter of 2011. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the second quarter of 2011. 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.

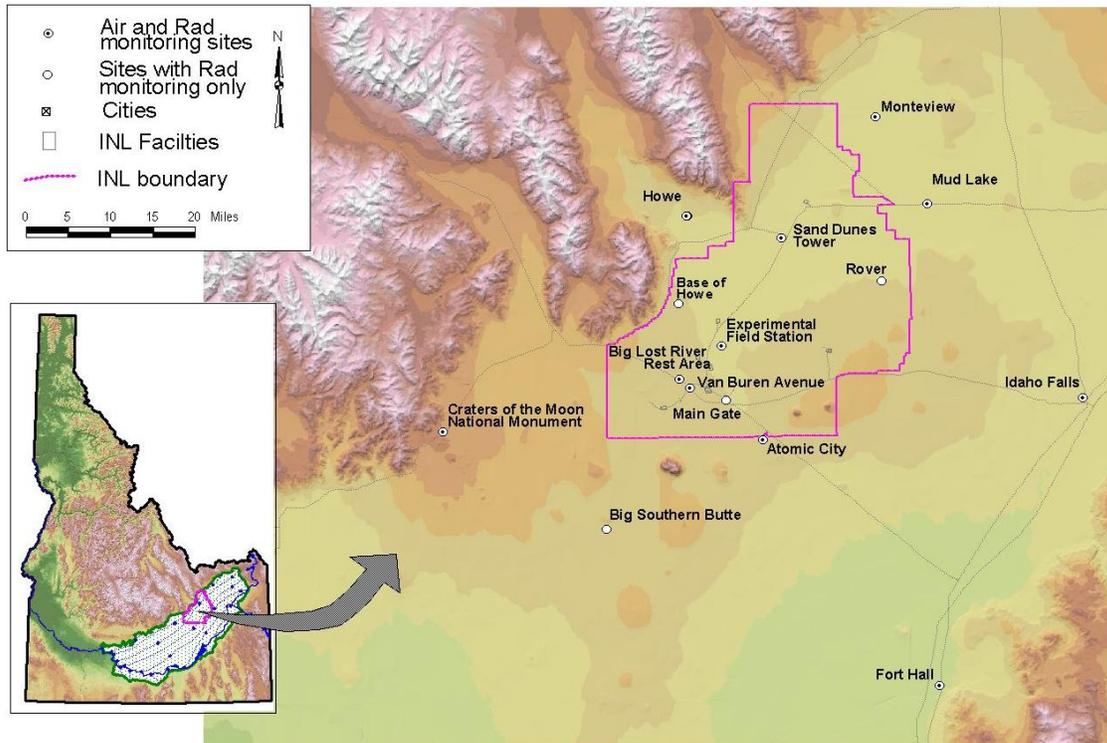


Figure 1. Air and radiation monitoring sites.

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	☐	☐	■	■
Experimental Field Station	☐	☐	■	
Sand Dunes Tower	☐	☐	■	
Van Buren Avenue	☐	☐	■	
<b>Boundary Locations</b>				
Atomic City	☐	☐	■	■
Howe	☐	☐	■	■
Monteview	☐	☐	■	■
Mud Lake	☐	☐	■	■
<b>Distant Locations</b>				
Craters of the Moon	☐	☐	■	
Fort Hall <sup>2</sup>	☐	☐	■	
Idaho Falls	☐	☐	■	■

<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, 2011.**

Station Location	Concentration					
	Gross Alpha			Gross Beta		
<b>On-Site Locations</b>						
Big Lost River Rest Area	0.6	-	1.5	22.3	-	39.4
Experimental Field Station	0.6	-	1.3	18.0	-	34.7
Sand Dunes Tower	0.5	-	1.2	16.7	-	32.0
Van Buren Avenue	0.6	-	1.4	21.7	-	36.1
<b>Boundary Locations</b>						
Atomic City	0.6	-	1.1	19.7	-	37.0
Howe	0.5	-	1.4	17.1	-	31.8
Montevieu	0.6	-	1.7	19.6	-	40.7
Mud Lake	0.6	-	1.6	18.6	-	34.6
<b>Distant Locations</b>						
Craters of the Moon	0.5	-	1.0	17.5	-	33.2
Fort Hall <sup>1</sup>	0.7	-	1.1	15.7	-	29.1
Idaho Falls	0.8	-	1.9	18.6	-	43.7

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

Note: Concentrations are expressed in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.

**Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, second quarter, 2011.**

Station Location	Naturally Occurring Radionuclide Beryllium-7		<sup>134</sup> Cs <sup>3</sup>		<sup>137</sup> Cs <sup>4</sup>		Other Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD	
<b>On-site Locations</b>							
Big Lost River Rest Area	101.6	5.4	0.27	0.08	0.27	0.08	<MDC
EFS <sup>2</sup>	89.2	4.8	0.19	0.07	0.28	0.08	<MDC
Sand Dunes Tower	85.4	4.5	0.30	0.08	0.35	0.07	<MDC
Van Buren Avenue	102.6	5.4	0.23	0.08	0.32	0.07	<MDC
<b>Boundary Locations</b>							
Atomic City	97.8	5.1	0.36	0.09	0.32	0.08	<MDC
Howe	91.4	4.9	0.16	0.07	0.24	0.09	<MDC
Montevieu	101.3	5.4	0.18	0.07	0.23	0.06	<MDC
Mud Lake	94.4	5.1	0.23	0.09	0.22	0.08	<MDC
<b>Distant Locations</b>							
Craters of the Moon	82.3	4.4	0.18	0.07	0.21	0.07	<MDC
Fort Hall <sup>1</sup>	70.6	3.0	0.12	0.05	0.19	0.07	<MDC
Idaho Falls	103.9	5.4	0.35	0.10	0.26	0.08	<MDC

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

<sup>2</sup>Experimental Field Station

<sup>3</sup>DCG = 200 pCi/ m<sup>3</sup> Cesium-134 for the public. The Derived Concentration Guide (DCG) from DOE 5400.5 is the concentration of a single radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., inhalation) would result in a committed effective dose equivalent of 100 mrem. The DCG applies to either inhalation or ingestion, not to a combination of both.

<sup>4</sup>DCG = 400 pCi/ m<sup>3</sup> (inhalation) Cesium-137 for the public.

Note: Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup> with associated uncertainty (± 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

**Table 4. Tritium concentrations in air from atmospheric moisture, second quarter, 2011.**

Station Location	Tritium		
	Concentration	± 2 SD	MDC
<b>On-site Locations</b>			
Big Lost River Rest Area	0.33	0.30	0.48
Experimental Field Station	0.47	0.32	0.51
Sand Dunes Tower	0.27	0.28	0.45
Van Buren Avenue	0.43	0.31	0.48
<b>Boundary Locations</b>			
Atomic City	0.33	0.34	0.55
Howe	0.22	0.31	0.52
Mud Lake	0.15	0.35	0.59
Monteview	0.17	0.27	0.44
<b>Distant Locations</b>			
Craters of the Moon	0.29	0.26	0.41
Fort Hall <sup>1</sup>	0.11	0.33	0.56
Idaho Falls	0.12	0.34	0.57

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

Note: Concentrations are reported in pCi/m<sup>3</sup> with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

**Table 5. Tritium and Cesium-137 concentrations from precipitation, second quarter, 2011.**

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
<b>On-site Locations</b>						
Big Lost River Rest Area	10	80	140	0.0	2.2	3.9
<b>Boundary Locations</b>						
Atomic City	50	80	140	0.8	1.9	3.2
Howe	10	80	140	1.2	1.9	3.2
Monteview	0	80	140	0.0	1.6	2.8
Mud Lake	0	80	140	0.6	2.9	5.0
<b>Distant Locations</b>						
Idaho Falls	0	80	140	0.0	2.1	3.6

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

**Table 6. Results of screening measurements for Iodine-131, second quarter 2011.**

Collection Date		Iodine-131 Activity (pCi/composite)		
Start	Stop	Value	± 2SD	MDA
3/31/11	4/07/11	127.18	6.74	3.37
4/07/11	4/14/11	60.99	4.01	3.47
4/14/11	4/21/11	17.53	2.14	2.56
4/21/11	4/28/11	4.67	1.52	2.26
4/28/11	5/05/11	2.14	1.80	2.93
5/05/11	5/12/11	1.04	1.35	2.23
5/12/11	5/19/11	1.31	1.46	2.39
5/19/11	5/26/11	-0.34	1.65	2.81
5/26/11	6/02/11	1.18	2.44	4.03
6/02/11	6/09/11	-0.26	1.52	2.59
6/09/11	6/16/11	-0.41	1.55	2.65
6/16/11	6/23/11	0.82	1.54	2.56
6/23/11	6/30/11	0.70	1.48	2.47

Note: Charcoal cartridges from all air stations are counted in one composite for each collection period (normally a week). These screening results are not decay corrected to time of sample collection.

**Table 7. Concentration of Iodine-131 in air on charcoal cartridges for individual stations, second quarter 2011. Results decay corrected to time of sample collection.**

Sample Location	Collection Date		Iodine-131 Activity ( $10^{-3}$ pCi/m <sup>3</sup> )		
	Start	Stop	Value <sup>3</sup>	Uncertainty ( $\pm 2$ SD )	MDC
<b>On-Site Locations</b>					
Rest Area	3/31/11	4/07/11	0.204	0.035	0.038
	4/07/11	4/14/11	0.076	0.019	0.024
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
EFS <sup>2</sup>	3/31/11	4/07/11	0.272	0.044	0.054
	4/07/11	4/14/11	0.119	0.019	0.021
	4/14/11	4/21/11	0.043	0.015	0.023
	4/21/11	4/28/11	0.012	0.013	0.020
Sand Dunes	3/31/11	4/07/11	0.191	0.030	0.029
	4/07/11	4/14/11	0.088	0.021	0.027
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
Van Buren	3/31/11	4/07/11	0.207	0.032	0.032
	4/07/11	4/14/11	0.101	0.024	0.033
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
<b>Boundary Locations</b>					
Atomic City	3/31/11	4/07/11	0.219	0.027	0.036
	4/07/11	4/14/11	0.099	0.018	0.023
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
Howe	3/31/11	4/07/11	0.149	0.033	0.042
	4/07/11	4/14/11	0.043	0.023	0.036
	4/14/11	4/21/11	0.025	0.014	0.023
	4/21/11	4/28/11	0.007	0.010	0.016
Montevieu	3/31/11	4/07/11	0.213	0.044	0.055
	4/07/11	4/14/11	0.092	0.026	0.037
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
Mud Lake	3/31/11	4/07/11	0.219	0.048	0.064
	4/07/11	4/14/11	0.091	0.028	0.040
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
<b>Distant Locations</b>					
Craters of the Moon	3/31/11	4/07/11	0.256	0.051	0.062
	4/07/11	4/14/11	0.151	0.026	0.030
	4/14/11	4/21/11	0.033	0.013	0.020
	4/21/11	4/28/11	0.010	0.010	0.017
Fort Hall <sup>1</sup>	3/31/11	4/07/11	0.233	0.047	0.062
	4/07/11	4/14/11	0.081	0.032	0.048
	4/14/11	4/21/11	N/A	N/A	N/A
	4/21/11	4/28/11	N/A	N/A	N/A
Idaho Falls	3/31/11	4/07/11	0.142	0.031	0.035
	4/07/11	4/14/11	0.119	0.021	0.028
	4/14/11	4/21/11	0.050	0.017	0.026
	4/21/11	4/28/11	0.013	0.021	0.034

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

<sup>2</sup>Experimental Field Station

<sup>3</sup>DCG = 400 pCi/m<sup>3</sup> Iodine-131 for the public. The Derived Concentration Guide (DCG) from DOE 5400.5 is the concentration of a single radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., inhalation) would result in a committed effective dose equivalent of 100 mrem. The DCG applies to either inhalation or ingestion, not to a combination of both. N/A = not analyzed.

Note: 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.

## Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the second quarter of 2011 (**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 8**).

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/gamma-radiation-measurements.aspx>

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 40 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 9** lists the average radiation exposure rates measured by the HPICs for first quarter 2011. **Table 10** lists the EIC monitoring results for second quarter 2011. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation.

**Table 8. 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 Met Tower	■	■
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 9. Average gamma exposure rates, second quarter, 2011, from HPIC network.**

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
<b>On-site Locations</b>		
Base of Howe	11.9	0.9
Big Lost River Rest Area <sup>1</sup>	NS	NS
Main Gate <sup>2</sup>	NS	NS
Rover <sup>3</sup>	NS	NS
Sand Dunes Tower	14.3	0.8
<b>Boundary Locations</b>		
Atomic City	13.2	0.9
Big Southern Butte	13.6	4.0
Howe Met Tower	12.6	4.9
Monteview	14.3	1.4
Mud Lake/Terreton	13.3	1.2
<b>Distant Locations</b>		
Fort Hall <sup>4</sup>	14.1	1.1
Idaho Falls	12.4	0.9

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

<sup>2</sup> Main Gate HPIC experienced equipment irregularity and then total failure near the end of the quarter which could not be repaired and therefore is reported as No Sample (NS).

<sup>3</sup> The Rover HPIC was destroyed by a wildfire and is therefore reported as No Sample.

<sup>4</sup> Operated by Shoshone-Bannock Tribes.

**Table 10. Electret ionization chamber (EIC) cumulative average exposure rates, second quarter, 2011.**

Station Location	Exposure Rate ( $\mu\text{R/hr}$ )	
	Quarterly Average	$\pm 2 \text{ SD}$
<b>On-site Locations</b>		
Base of Howe	11.0	2.3
Big Lost River Rest Area	13.1	0.8
Experimental Field Station	13.1	2.2
Main Gate	14.5	2.1
Rover	12.3	2.5
Sand Dunes Tower	13.0	0.8
Van Buren Avenue	13.3	3.2
<b>Boundary Locations</b>		
Atomic City	11.8	2.3
Big Southern Butte	15.0	1.9
Howe Met Tower	10.1	2.0
Monteview <sup>2</sup>	13.3 (J)	9.3 (J)
Mud Lake / Terreton	11.2	2.1
<b>Distant Locations</b>		
Craters of the Moon	11.1	2.7
Fort Hall <sup>1, 2</sup>	12.4 (J)	7.0 (J)
Idaho Falls	10.0	3.4

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

<sup>2</sup>Monteview and Fort Hall data did not conform to DEQ-INL OP acceptance criteria and therefore the result is reported as an estimate (J qualifier).

## 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 2011, 3 up-gradient, 28 facility, 9 boundary, 17 distant, and 2 surface water locations were sampled. Of the 9 boundary locations, 4 are Westbay™ packer sampling systems, which allow water samples to be collected from discrete levels within the well. These wells include USGS-103, USGS-105, USGS-108, and USGS-132. Both USGS-105 and USGS-108 were sampled at two different levels. USGS-105 was sampled at zone #4 (corresponding to a depth of 849 feet below land surface (bls)) and zone #5 (corresponding to a depth of 726 feet bls). USGS-108 was sampled at zone #3 (corresponding to a depth of 890 feet bls) and zone #5 (corresponding to a

depth of 662 feet bls). USGS-103 was sampled at zone #1 corresponding to a depth of 1269 feet bls. USGS-132 was sampled from zone #6 at a depth of 636 feet bls.

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 1 up-gradient, 15 facility, 8 boundary, 4 distant, and 1 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 not detected at any of the sampled locations. Results for gross alpha; gross beta; and man-made, gamma emitting radioactivity are shown in **Table 11**.

Eight sites were sampled for plutonium isotopes (**Table 12**). 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, ten detectable results for uranium-238, and one detectable result for uranium-235 (**Table 13**). 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. Analysis results for samples from TAN-28 suggest uranium-238 at greater than natural background levels. Uranium related to historic waste disposal activities at Test Area North has previously been identified. Eight sites were sampled for americium-241. There were no detections.

Eleven of twenty samples analyzed for strontium-90 had detectable results this quarter (**Table 14**). All samples were from locations in areas of known contamination. All 13 locations sampled for technetium-99 had detectable results this quarter (**Table 15**). All results were within the expected ranges of concentrations.

Using the standard analytical method, tritium was detected in seventeen of twenty-eight facility samples (**Table 17**). Detections are consistent with historic concentrations for these sites. There were only two detectable concentrations found at other monitoring sites, including the boundary locations USGS-103 (zone #1) and USGS-105 (zone #4). These detections are consistent with historic INL waste disposal

influences. Three Westbay wells were sampled this quarter, including USGS-103, USGS-105, and USGS-108. Only USGS-105 and USGS-108 were sampled in multiple zones. 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. Three samples were analyzed using the enrichment method for the current quarter; however samples from 16 sites collected during previous quarters were completed and presented during this quarter (**Table 18**). A backlog of 37 samples remains.

Samples were also analyzed for metals and the results shown in **Table 19**. All other results were within their expected ranges. Common ion results are shown in **Table 20** and nutrient results are shown in **Table 21**. All results were consistent with historical values at those locations.

Twenty locations were sampled for Volatile Organic Compounds (VOCs) this quarter, ten 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 22** 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.

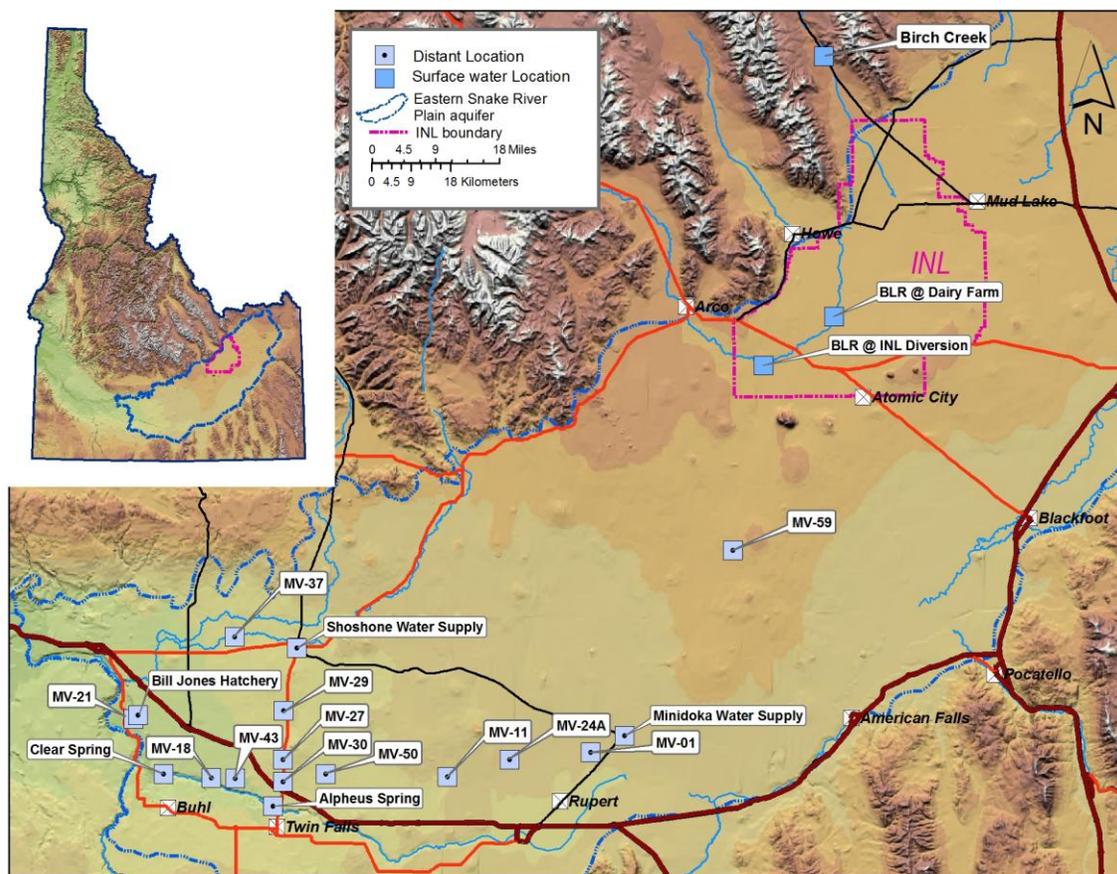


Figure 2. Distant sampling locations, second quarter, 2011.



**Table 11. Alpha, beta, and gamma concentrations for water samples, second quarter, 2011.**

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
<b>Up-gradient</b>										
Mud Lake Water Supply	5/25/2011	-1.0	U	0.7	4.1		0.8	0.6	U	1.9
USGS-019	4/20/2011	0.6	U	0.8	1.2	U	0.8	1.2	U	2.4
USGS-027	4/19/2011	3.9		1.4	7.9		1.0	-0.4	U	1.9
<b>Facility</b>										
A11A31	5/18/2011	1.0	U	0.9	4.2		0.8	-0.1	U	1.2
ANP-8	5/16/2011	1.5	U	1.2	4.2		0.9	0.1	U	1.3
CFA 1	4/20/2011	3.0		1.1	7.8		1.0	-0.1	U	1.9
CFA 2	4/20/2011	3.2	U	2.6	2.7	U	1.9	-1.8	U	1.3
ICPP-2020	4/7/2011	2.4		1.1	158.1		2.9	0.1	U	2.0
ICPP-MON-A-166	4/18/2011	1.4		0.7	3.4		0.8	0.0	U	2.4
M1S	5/17/2011	1.4		0.8	4.2		0.8	0.3	U	1.7
M3S	5/17/2011	3.3		1.3	4.0		0.9	0.2	U	2.6
M6S	5/18/2011	2.7		1.3	5.3		0.9	-0.4	U	1.6
NRF-06	5/16/2011	0.7	U	3.2	9.1		2.3	0.2	U	1.5
NRF-09	5/19/2011	-0.5	U	1.5	2.8		0.8	-0.7	U	1.9
NRF-11	5/16/2011	0.1	U	1.2	3.8		0.9	0.1	U	0.7
NRF-12	5/16/2011	1.8	U	1.5	3.4		0.9	-0.7	U	1.9
TAN-16	5/16/2011	0.8	U	1.3	4.2		0.9	-0.2	U	1.9
TAN-28	5/9/2011	10.1		4.1	537.7		8.5	-0.1	U	1.6
TAN-29	5/9/2011	7.2		3.1	65.0		3.3	1.9	U	2.2
TAN-37	5/9/2011	1.1	U	3.7	1312.1		13.6	0.7	U	1.6
TAN-51	5/16/2011	-0.2	U	1.1	2.8		0.8	-1.0	U	1.9
TAN-55	5/16/2011	1.2		1.0	4.7		0.9	-0.2	U	2.0
USGS-047	4/7/2011	4.0		1.4	56.5		1.9	0.0	U	2.3
USGS-052	4/11/2011	3.0		1.2	165.3		3.0	-0.9	U	1.7
USGS-065	4/18/2011	4.7		1.5	3.9		0.9	-0.3	U	1.7
USGS-067	4/7/2011	2.4		1.1	17.4	R	1.2	-0.7	U	1.8
USGS-085	4/11/2011	1.0	U	0.9	70.6	R	2.0	0.3	U	1.6
USGS-087	4/18/2011	1.7		0.9	2.8		0.8	-0.4	U	1.4
USGS-099	5/19/2011	-0.6	U	1.5	2.9		0.9	-0.9	U	1.6
USGS-100	4/21/2011	1.6		0.9	3.3		0.8	-0.8	U	2.2
USGS-106	6/8/2011	-1.7	U	1.0	2.3		0.8	0.3	U	2.0

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

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

Table 11 continued.

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			
<b>Boundary</b>										
Atomic City	4/26/2011	2.2		0.9		2.9		0.8	U	2.0
Crossroads	4/28/2011	2.0		1.1		2.9		0.8	U	1.6
USGS-008	4/25/2011	3.2		1.0		2.7		0.8	U	1.4
USGS-011	4/26/2011	2.8		1.0		2.7		0.8	U	1.6
USGS-103 (Z1)	6/14/2011	0.9	U	0.9		3.1		0.8	U	1.9
USGS-105 (Z5)	6/22/2011	1.0	U	0.9		3.4		0.8	U	1.2
USGS-105 (Z4)	6/21/2011	2.8		1.1		2.4		0.8	U	1.9
USGS-108 (Z5)	6/20/2011	1.8		1.0		3.0		0.8	U	0.9
USGS-108 (Z3)	6/16/2011	1.3	U	1.1		3.2		0.9	U	1.6
USGS-124	4/26/2011	2.4		0.9		2.5		0.8	U	2.1
USGS-132 (Z6)	6/27/2011	1.7		1.1		5.0		0.9	U	2.9
<b>Distant</b>										
Alpheus Spring	5/23/2011	-1.4	U	1.4		6.7		1.0	U	2.2
Bill Jones Hatchery	5/23/2011	-0.8	U	0.9		3.2		0.8	U	1.4
Clear Spring	5/23/2011	-0.5	U	1.4		3.6		0.9	U	1.9
Minidoka Water Supply	5/23/2011	-0.2	U	1.4		2.7		0.9	U	2.2
MV-01	6/23/2011	1.1	U	1.4		5.9		1.0	U	2.0
MV-11	6/23/2011	2.3	U	1.6		6.9		1.0	U	2.1
MV-18	6/23/2011	1.3	U	1.5		6.4		1.0	U	2.1
MV-21	6/23/2011	1.1	U	1.2		3.9		0.9	U	2.0
MV-24A	6/23/2011	4.4		2.6		6.7		2.0	U	1.8
MV-27	6/22/2011	0.5	U	1.3		6.8		1.0	U	2.2
MV-29	6/22/2011	2.1		1.1		3.6		0.8	U	2.0
MV-30	6/23/2011	1.3	U	1.3		5.3		1.0	U	2.2
MV-37	6/22/2011	4.4		1.5		4.7		0.9	U	2.8
MV-43	6/23/2011	7.3		3.4		11.3		2.3	U	1.8
MV-50	6/22/2011	1.2	U	1.2		5.6		1.0	U	2.1
MV-59	6/6/2011	-0.7	U	0.9		3.7		0.8	U	2.0
Shoshone Water Supply	5/23/2011	2.0	U	1.6		2.3		0.9	U	2.6
<b>Surface water</b>										
BLR @ Dairy Farm	6/28/2011	0.5	U	1.0		3.0		0.8	U	2.1
BLR @ Diversion	4/28/2011	2.4		1.0		2.4		0.8	U	1.7

<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 plutonium isotopes in water samples, second quarter, 2011.**

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240			Plutonium-241		
		Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>										
A11A31	5/18/2011	-0.002	U	0.022	0.003	U	0.022	NR	-	-
ICPP-2020	4/7/2011	0.008	U	0.022	-0.005	U	0.022	NR	-	-
M1S	5/17/2011	0	U	0.022	0	U	0.022	NR	-	-
M3S	5/17/2011	0.010	U	0.022	0.001	U	0.022	NR	-	-
M6S	5/18/2011	0.007	U	0.025	-0.002	U	0.025	NR	-	-
USGS-047	4/7/2011	0.002	U	0.022	0.012	U	0.023	NR	-	-
USGS-052	4/11/2011	0.000	U	0.021	-0.003	U	0.021	NR	-	-
USGS-067	4/7/2011	-0.002	U	0.023	0.006	U	0.023	NR	-	-

<sup>1</sup> Concentrations expressed in pCi/L.<sup>2</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected, NR = analysis not requested.**Table 13. Reported concentrations of uranium isotopes in water samples, second quarter, 2011.**

Sample Location	Sample Date	Uranium-234			Uranium-235			Uranium-238		
		Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>										
A11A31	5/18/2011	1.45		0.37	0.016	U	0.053	0.68		0.22
ICPP-2020	4/7/2011	1.96		0.52	0.018	U	0.079	0.63		0.25
M1S	5/17/2011	1.37		0.34	0.029	U	0.051	0.65		0.21
M3S	5/17/2011	1.18		0.31	0.029	U	0.053	0.70		0.22
M6S	5/18/2011	1.19		0.39	0.02	U	0.11	0.65		0.25
TAN-28	5/9/2011	9.6		1.7	0.27		0.12	1.42		0.33
TAN-37	5/9/2011	0.28		0.12	0.012	U	0.047	0.092		0.072
USGS-047	4/7/2011	1.82		0.48	0.12	U <sup>a</sup>	0.11	0.80		0.28
USGS-052	4/11/2011	1.29		0.42	0.019	U	0.097	0.86		0.32
USGS-067	4/7/2011	1.35		0.41	0.058	U	0.088	0.79		0.29

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected<sup>2</sup> Concentrations expressed in pCi/L.<sup>a</sup> Result is greater than the a-priori MDC, but does not exceed 3 SD. It is not considered a detection.**Table 14. Reported concentrations of americium-241 in water samples, second quarter, 2011.**

Sample Location	Sample Date	Americium-241		
		Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>				
A11A31	5/18/2011	0.023	U	0.026
ICPP-2020	4/7/2011	0.046	U <sup>a</sup>	0.036
M1S	5/17/2011	0.019	U	0.023
M3S	5/17/2011	0.033	U <sup>a</sup>	0.028
M6S	5/18/2011	0.022	U	0.024
USGS-047	4/7/2011	0.011	U	0.021
USGS-052	4/11/2011	0.010	U	0.021
USGS-067	4/7/2011	0.008	U	0.028

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.<sup>2</sup> Concentrations expressed in pCi/L.<sup>a</sup> Result is greater than the a-priori MDC, but does not exceed 3 SD. It is not considered a detection

**Table 15. Reported concentrations of strontium-90 in water samples, second quarter, 2011.**

Sample Location	Sample Date	Strontium-90		
		Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>				
A11A31	5/18/2011	0.06	U	0.31
CFA 1	4/20/2011	0.01	U	0.15
CFA 2	4/20/2011	-0.02	U	0.16
ICPP-2020	4/7/2011	11.3		2.7
M1S	5/17/2011	-0.07	U	0.29
M3S	5/17/2011	0.01	U	0.30
M6S	5/18/2011	0.07	U	0.30
NRF-06	5/16/2011	0.03	U	0.33
NRF-09	5/19/2011	1.04		0.41
NRF-11	5/16/2011	0.27	U	0.33
NRF-12	5/16/2011	1.05		0.45
TAN-28	5/9/2011	251		59
TAN-29	5/9/2011	27.9		6.7
TAN-37	5/9/2011	580		140
USGS-047	4/7/2011	19.7		4.6
USGS-052	4/11/2011	2.74		0.68
USGS-067	4/7/2011	11.6		2.7
USGS-085	4/11/2011	2.61		0.65
USGS-087	4/18/2011	-0.06	U	0.15
USGS-099	5/19/2011	1.08		0.43

<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, 2011.**

Sample Location	Sample Date	Technetium-99		
		Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>				
A11A31 (dissolved)	5/18/2011	0.3		0.1
CFA 1 (dissolved)	4/20/2011	8.6		0.3
CFA 2 (dissolved)	4/20/2011	2.8		0.2
ICPP-2020 (dissolved)	4/7/2011	322.5		1.7
M1S (dissolved)	5/17/2011	0.4		0.1
M3S (dissolved)	5/17/2011	1.2		0.2
M6S (dissolved)	5/18/2011	0.5		0.1
USGS-047 (dissolved)	4/7/2011	3		0.2
USGS-052 (dissolved)	4/11/2011	438.7		2.0
USGS-067 (dissolved)	4/7/2011	138.3		1.1
USGS-085 (dissolved)	4/11/2011	1.3		0.2
USGS-087 (dissolved)	4/18/2011	0.6		0.2
USGS-106 (dissolved)	6/8/2011	0.5		0.1

<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, 2011.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		± 2SD
<b>Up-gradient</b>				
Mud Lake Water Supply	5/25/2011	-20	U	100
USGS-019	4/20/2011	-50	U	70
USGS-027	4/19/2011	20	U	100
<b>Facility</b>				
A11A31	5/18/2011	10	U	100
ANP-8	5/16/2011	-30	U	100
CFA 1	4/20/2011	5090		210
CFA 2	4/20/2011	4550		200
ICPP-2020	4/7/2011	2210		140
ICPP-MON-A-166	4/18/2011	80	U	80
M1S	5/17/2011	20	U	100
M3S	5/17/2011	910		120
M6S	5/18/2011	-50	U	100
NRF-06	5/16/2011	10	U	80
NRF-09	5/19/2011	50	U	80
NRF-11	5/16/2011	-20	U	80
NRF-12	5/16/2011	60	U	80
TAN-16	5/16/2011	220		100
TAN-28	5/9/2011	1330		130
TAN-29	5/9/2011	1570		130
TAN-37	5/9/2011	920		110
TAN-51	5/16/2011	360		100
TAN-55	5/16/2011	680		100
USGS-047	4/7/2011	550		110
USGS-052	4/11/2011	980		120
USGS-065	4/18/2011	4210		190
USGS-067	4/7/2011	3520		160
USGS-085	4/11/2011	1660		130
USGS-087	4/18/2011	660		110
USGS-099	5/19/2011	20	U	80
USGS-100	4/21/2011	20	U	100
USGS-106	6/8/2011	580		110
<b>Boundary</b>				
Atomic City	4/26/2011	-120	U	90
Crossroads	4/28/2011	-10	U	100
USGS-008	4/25/2011	-60	U	90
USGS-011	4/26/2011	-90	U	90
USGS-103 (Z1)	6/14/2011	310		110
USGS-105 (Z5)	6/22/2011	150	U	100
USGS-105 (Z4)	6/21/2011	180		100
USGS-108 (Z5)	6/20/2011	0	U	100
USGS-108 (Z3)	6/16/2011	80	U	100
USGS-124	4/26/2011	-50	U	90
USGS-132	6/27/2011	120	U	100

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

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

**Table 17. continued.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		± 2SD
<b>Distant</b>				
Alpheus Spring	5/23/2011	0	U	100
Bill Jones Hatchery	5/23/2011	-30	U	100
Clear Spring	5/23/2011	70	U	100
Minidoka Water Supply	5/23/2011	-20	U	100
MV-01	6/23/2011	10	U	70
MV-11	6/23/2011	60	U	70
MV-18	6/23/2011	40	U	70
MV-21	6/23/2011	0	U	70
MV-24A	6/23/2011	90	U	70
MV-27	6/22/2011	-10	U	70
MV-29	6/22/2011	50	U	70
MV-30	6/23/2011	60	U	70
MV-37	6/22/2011	90	U	70
MV-43	6/23/2011	70	U	70
MV-50	6/22/2011	70	U	70
MV-59	6/6/2011	120	U	100
Shoshone Water Supply	5/23/2011	-20	U	100
<b>Surface water</b>				
BLR @ Dairy Farm	6/28/2011	40	U	70
BLR @ Diversion	4/28/2011	0	U	100

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

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

**Table 18. Enriched tritium concentrations for water samples from previous sampling quarters, 2010 and 2011.**

Sample Location	Sample Date	Enriched Tritium		
		Concentration <sup>1,2</sup>		± 2 SD
<b>Upgradient</b>				
Mud Lake Water Supply	11/10/2010	-9	U	6
<b>Facility</b>				
A11A31	11/10/2010	123		10
ICPP-MON-A-166	10/7/2010	109		9
M1S	11/8/2010	4	U	7
M6S	11/10/2010	11	U	7
USGS-104	10/18/2010	615		16
USGS-120	10/13/2010	128		9
<b>Boundary</b>				
Atomic City	4/26/2011	8	U	6
Highway 3	10/18/2010	69		8
USGS-008	4/25/2011	21		7
USGS-108	9/20/2010	75		8
USGS-124	4/26/2011	90		10
USGS-125	10/13/2010	44		7
<b>Distant</b>				
Alpheus Spring	11/9/2010	14		7
Bill Jones Hatchery	11/9/2010	-5	U	6
Clear Spring	11/9/2010	2	U	7
Minidoka Water Supply	11/9/2010	48	R	9
<b>Surface Water</b>				
Birch Creek	10/26/2010	12		8
<b>Waste Water</b>				
NRF Ind. Waste Ditch	12/7/2010	26		8

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

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

**Table 19. Reported metals concentrations in water samples, second quarter, 2011.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>																					
		Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Mercury	Selenium	Zinc											
<b>Up-gradient</b>																							
USGS-019	4/20/2011	NR	-	81		NR	-	NR	-	2.1		NR	-	<1.0	U	2.7		NR	-	NR	-	<2.0	U
USGS-027	4/19/2011	NR	-	88		NR	-	NR	-	4.0		NR	-	<1.0	U	7.9		NR	-	NR	-	<2.0	U
<b>Facility</b>																							
A11A31 (total)	5/18/2011	2.0		37		<1.0	U	<1.0	U	12		24		1.2		1.0		<0.5	U	<2.0	U	140	
CFA 1	4/20/2011	NR	-	96		NR	-	NR	-	8.4		NR	-	<1.0	U	<1.0	U	-	-	-	-	<2.0	U
CFA 2	4/20/2011	NR	-	110		NR	-	NR	-	7.9		NR	-	<1.0	U	28		-	-	-	-	5.2	
ICPP-2020 (total)	4/7/2011	<2.0	U	120		<1.0	U	<1.0	U	320		1800		<1.0	U	46		<0.5	U	<2.0	U	2.4	
ICPP-MON-A-166 (total)	4/18/2011	<2.0	U	51		<1.0	U	<1.0	U	5.5		70		<1.0	U	27		<0.5	U	<2.0	U	2.1	
M1S (total)	5/17/2011	3.0		23		<1.0	U	<1.0	U	30		31	J	<1.0	U	1.8		<0.5	U	2.5		2.2	
M3S (total)	5/17/2011	<2.0	U	46		<1.0	U	<1.0	U	12		52	J	<1.0	U	<1.0	U	<0.5	U	<2.0	U	<2.0	U
M6S (total)	5/18/2011	<2.0	U	33		<1.0	U	<1.0	U	22		2200		<1.0	U	5.0		<0.5	U	2.7		4.6	
NRF-06 (total)	5/16/2011	2.8		180		<1.0	U	<1.0	U	42		<10	U	<1.0	U	<1.0	U	<0.5	U	2.0		<2.0	U
NRF-09 (total)	5/19/2011	<2.0	U	150		<1.0	U	<1.0	U	10		13		<1.0	U	<1.0	U	<0.5	U	2.2		<2.0	U
NRF-11 (total)	5/16/2011	<2.0	U	160		<1.0	U	<1.0	U	13		56		<1.0	U	<1.0	U	<0.5	U	<2.0	U	<2.0	U
NRF-12 (total)	5/16/2011	<2.0	U	150		<1.0	U	<1.0	U	10		40		<1.0	U	<1.0	U	<0.5	U	<2.0	U	<2.0	U
USGS-047 (total)	4/7/2011	<2.0	U	72		<1.0	U	<1.0	U	8.9		33		<1.0	U	<1.0	U	<0.5	U	<2.0	U	<2.0	U
USGS-052 (total)	4/11/2011	<2.0	U	87		<1.0	U	<1.0	U	9.0		<10	U	<1.0	U	<1.0	U	<0.5	U	<2.0	U	<2.0	U
USGS-065	4/18/2011	NR	-	52		NR	-	NR	-	82		NR	-	<1.0	U	<1.0	U	NR	-	NR	-	<2.0	U
USGS-067 (total)	4/7/2011	<2.0	U	130		<1.0	U	<1.0	U	9.1		34		<1.0	U	<1.0	U	<0.5	U	<2.0	U	6.5	
USGS-085	4/11/2011	NR	-	89		NR	-	NR	-	24		NR	-	<1.0	U	<1.0	U	NR	-	NR	-	<2.0	U
USGS-087	4/18/2011	NR	-	26		NR	-	NR	-	6.6		NR	-	<1.0	U	4.5		NR	-	NR	-	12	
USGS-099 (total)	5/19/2011	<2.0	U	110		<1.0	U	<1.0	U	5.4		19		2.5		<1.0	U	<0.5	U	<2.0	U	84	
USGS-100	4/21/2011	NR	-	38		NR	-	NR	-	1.7		NR	-	13		<1.0	U	NR	-	NR	-	180	
USGS-106	6/8/2011	<5.0	U	51		NR	-	<1.0	U	7.7		<10	U	11		<2.0	U	NR	-	<10	U	150	

<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 filtered unless otherwise indicated.

Table 19. continued.

Sample Location	Sample Date	Concentration <sup>1,2</sup>																					
		Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Mercury	Selenium	Zinc											
<b>Boundary</b>																							
Atomic City	4/26/2011	NR	-	36		NR	-	NR	-	2.2		NR	-	<1.0	U	<1.0	U	NR	-	NR	-	42	
Crossroads	4/28/2011	NR	-	40		NR	-	NR	-	2.9		NR	-	1.1		<1.0	U	NR	-	NR	-	97	
USGS-008	4/25/2011	NR	-	82		NR	-	NR	-	2.4		NR	-	<1.0	U	<1.0	U	NR	-	NR	-	<2.0	U
USGS-011	4/26/2011	NR	-	54		NR	-	NR	-	3.4		NR	-	<1.0	U	<1.0	U	NR	-	NR	-	<2.0	U
USGS-103; Zone-1	6/14/2011	NR	-	46		NR	-	NR	-	6.4		NR	-	<5.0	U	<2.0	U	NR	-	NR	-	45	
USGS-105; Zone-5	6/22/2011	<5.0	U	37		NR	-	<1.0	U	6.1		18		<5.0	U	10		NR	-	<10	U	35	
USGS-105; Zone-4	6/21/2011	<5.0	U	38		NR	-	<1.0	U	7.8		<10	U	<5.0	U	<2.0	U	NR	-	<10	U	19	
USGS-108; Zone-5	6/20/2011	<5.0	U	38		NR	-	<1.0	U	<5.0	U	20		<5.0	U	3.5		NR	-	<10	U	24	
USGS-108; Zone-3	6/16/2011	NR	-	43		NR	-	NR	-	6.3		NR	-	<5.0	U	<2.0	U	NR	-	NR	-	19	
USGS-124	4/26/2011	NR	-	32		NR	-	NR	-	5.6		NR	-	<1.0	U	8.0		NR	-	NR	-	<2.0	U
USGS-132; Zone-6 (total)	6/27/2011	<5.0	U	51		NR	-	<1.0	U	9.4		<10	U	<5.0	U	<2.0	U	NR	-	<10	U	8.3	
<b>Distant</b>																							
MV-01	6/23/2011	<5.0	U	67		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-11	6/23/2011	<5.0	U	110		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-18	6/23/2011	<5.0	U	64		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-21	6/23/2011	<5.0	U	21		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-24A	6/23/2011	<5.0	U	140		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	2.1		NR	-	<10	U	220	
MV-27	6/22/2011	<5.0	U	62		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-29	6/22/2011	<5.0	U	19		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-30	6/23/2011	<5.0	U	79		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	9.7	
MV-37	6/22/2011	<5.0	U	44		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	6.9	
MV-43	6/23/2011	<5.0	U	150		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-50	6/22/2011	<5.0	U	62		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	<5.0	U
MV-59	6/6/2011	<5.0	U	12		NR	-	<1.0	U	<5.0	U	<10	U	<5.0	U	<2.0	U	NR	-	<10	U	130	
<b>Surface water</b>																							
BLR @ Dairy Farm	6/28/2011	NR	-	79		NR	-	NR	-	<5.0	U	NR	-	<5.0	U	2.2		NR	-	NR	-	<5.0	U
BLR @ Diversion	4/28/2011	NR	-	93		NR	-	NR	-	<1.0	U	NR	-	<1.0	U	1.7		NR	-	NR	-	<2.0	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 filtered unless otherwise indicated.

**Table 20. Reported common ion concentrations in water samples, second quarter, 2011.**

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>						
<b>Up-gradient</b>																		
USGS-019*	4/20/2011	45	17	9.8	1.4	0.207		12.8	22.5	NR	-	166	NR	-	NR	-		
USGS-027*	4/19/2011	52	19	28	5.9	0.622		52.2	42.1	NR	-	152	NR	-	NR	-		
<b>Facility</b>																		
A11A31	5/18/2011	34	16	23	3.7	<0.20	U	23.6	41.3	NR	-	134	NR	-	NR	-		
CFA 1*	4/20/2011	62	19	21	3.3	<0.20	U	83.9	31.0	NR	-	133	NR	-	NR	-		
CFA 2*	4/20/2011	83	29	36	4.7	<0.20	U	151	57.4	NR	-	144	NR	-	NR	-		
ICPP-2020	4/7/2011	61	17	21	3.2	<0.20	U	53.7	40.6	NR	-	144	NR	-	NR	-		
ICPP-MON-A-166	4/18/2011	32	12	9.2	2.6	0.285		8.4	17.7	NR	-	129	180		<5.0	U		
M1S	5/17/2011	26	12	11	2.6	0.261		13.0	21.1	NR	-	99	NR	-	NR	-		
M3S	5/17/2011	42	14	8.2	2.6	0.211		14.2	25.5	NR	-	142	NR	-	NR	-		
M6S	5/18/2011	36	17	14	3.2	0.227		24.3	56.0	NR	-	104	NR	-	NR	-		
NRF-06	5/16/2011	150	40	200	6.4	<0.20	U	511	97.4	22		173	1400		<5.0	U		
NRF-11	5/16/2011	70	22	19	2.5	<0.20	U	44.5	38.3	22		198	360		<5.0	U		
NRF-12	5/16/2011	68	22	17	2.4	<0.20	U	38.7	36.9	22		199	340		<5.0	U		
USGS-047	4/7/2011	49	14	9.8	2.0	<0.20	U	18.9	24.9	NR	-	160	NR	-	NR	-		
USGS-052	4/11/2011	48	14	12	2.7	<0.20	U	24.6	26.8	NR	-	150	240		<5.0	U		
USGS-065*	4/18/2011	84	19	15	3.4	<0.20	U	20.8	172	NR	-	129	NR	-	NR	-		
USGS-067	4/7/2011	50	14	25	3.6	<0.20	U	50.9	29.9	NR	-	138	NR	-	NR	-		
USGS-085*	4/11/2011	54	15	11	2.5	<0.20	U	16.5	42.5	NR	-	164	NR	-	NR	-		
USGS-087*	4/18/2011	36	14	13	3.1	0.216		21.9	24.6	NR	-	124	NR	-	NR	-		
USGS-100*	4/21/2011	36	12	17	3.3	0.659		16.3	16.0	NR	-	135	NR	-	NR	-		
USGS-106*	6/8/2011	44	17	8.0	2.3	<0.20	U	15.2	23.9	NR	-	156	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 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. continued.**

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>				
<b>Boundary</b>																
Atomic City*	4/26/2011	33	13	16	3.3	0.445	17.6	17.7	NR	-	136	NR	-	NR	-	
Crossroads*	4/28/2011	41	14	7.2	2.2	<0.20	U	8.82	21.1	NR	-	143	NR	-	NR	-
USGS-008*	4/25/2011	45	15	6.9	1.8	<0.20	U	7.96	21.9	NR	-	156	NR	-	NR	-
USGS-011*	4/26/2011	40	14	8.3	2.3	<0.20	U	9.84	22.9	NR	-	142	NR	-	NR	-
USGS-103; Zone-1*	6/14/2011	40	15	8.8	2.5	<0.20	U	14.1	22.4	NR	-	139	NR	-	NR	-
USGS-105; Zone-5*	6/22/2011	39	15	12	2.8	0.211		12.1	24.3	NR	-	140	NR	-	NR	-
USGS-105; Zone-4*	6/21/2011	39	14	12	2.7	0.239		12.1	24.6	NR	-	144	NR	-	NR	-
USGS-108; Zone-5*	6/20/2011	37	15	11	2.5	0.321		15.9	23.5	NR	-	133	NR	-	NR	-
USGS-108; Zone-3*	6/16/2011	43	17	8.4	2.3	<0.20	U	16.8	24.7	NR	-	151	NR	-	NR	-
USGS-124*	4/26/2011	39	16	9.8	2.4	0.285		15.8	23.6	NR	-	142	NR	-	NR	-
USGS-132; Zone-6*	6/27/2011	33	17	23	3.6	0.234		17.5	34.9	26		143	NR	-	NR	-
<b>Distant</b>																
MV-01*	6/23/2011	52	21	36	6.8	0.587		41.9	46.4	40		170	NR	-	NR	-
MV-11*	6/23/2011	75	30	50	7.0	0.407		65.7	79.0	38		210	NR	-	NR	-
MV-18*	6/23/2011	64	26	37	5.5	0.511		50.7	65.5	38		191	NR	-	NR	-
MV-21*	6/23/2011	31	16	17	3.6	0.398		11.1	25.3	35		133	NR	-	NR	-
MV-24A*	6/23/2011	82	34	57	7.3	0.298		67.6	83.2	37		250	NR	-	NR	-
MV-27*	6/22/2011	63	24	37	5.3	0.489		55.6	70.1	36		176	NR	-	NR	-
MV-29*	6/22/2011	31	14	17	3.5	0.589		14.9	29.3	35		117	NR	-	NR	-
MV-30*	6/23/2011	64	24	38	6.2	0.420		48.3	65.0	39		192	NR	-	NR	-
MV-37*	6/22/2011	50	17	21	3.7	0.301		14.3	28.9	33		177	NR	-	NR	-
MV-43*	6/23/2011	110	43	48	6.5	0.334		62.8	89.9	47		297	NR	-	NR	-
MV-50*	6/22/2011	62	23	38	5.5	0.438		53.5	64.8	36		178	NR	-	NR	-
MV-59*	6/6/2011	25	13	17	3.2	0.478		13.2	19.6	36		115	NR	-	NR	-
<b>Surface water</b>																
BLR @ Dairy Farm*	6/28/2011	35	8.2	4.6	1.5	0.221		2.66	14.4	NR	-	111	NR	-	NR	-
BLR @ Diversion*	4/28/2011	40	10	5.9	1.3	<0.20	U	3.35	20.8	NR	-	132	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 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 21. Reported nutrient concentrations in water samples, second quarter, 2011.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>									
		Nitrite + Nitrate		Phosphorus		Nitrite		Total Kjeldahl Nitrogen		Ammonia	
<b>Up-gradient</b>											
USGS-019	4/20/2011	0.92		0.013		NR	-	NR	-	NR	-
USGS-027	4/19/2011	2.4		0.018		NR	-	NR	-	NR	-
<b>Facility</b>											
A11A31 (Total)	5/18/2011	0.85		0.021		NR	-	NR	-	NR	-
CFA 1	4/20/2011	2.4		0.024		NR	-	NR	-	NR	-
CFA 2	4/20/2011	3.7		0.022		NR	-	NR	-	NR	-
ICPP-2020 (Total)	4/7/2011	4.1		0.051		NR	-	NR	-	NR	-
ICPP-MON-A-166 (Total)	4/18/2011	0.23		0.032		NR	-	<0.10	U	NR	-
M1S (Total)	5/17/2011	0.96		0.027		NR	-	NR	-	NR	-
M3S (Total)	5/17/2011	0.84		0.026		NR	-	NR	-	NR	-
M6S (Total)	5/18/2011	1.2		0.039		NR	-	NR	-	NR	-
NRF-06 (Total)	5/16/2011	2		0.098		<0.18	U	<0.10	U	0.021	
NRF-09 (Total)	5/19/2011	2.5		0.034		<0.18	U	0.18		0.011	
NRF-11 (Total)	5/16/2011	2		0.035		<0.18	U	0.12		0.022	
NRF-12 (Total)	5/16/2011	1.9		0.034		<0.18	U	0.13		0.021	
USGS-047 (Total)	4/7/2011	1.7		0.039		NR	-	NR	-	NR	-
USGS-052 (Total)	4/11/2011	2.5		0.031		NR	-	0.10		NR	-
USGS-065	4/18/2011	1.5		0.026		NR	-	NR	-	NR	-
USGS-067 (Total)	4/7/2011	5.8		0.035		NR	-	NR	-	NR	-
USGS-085	4/11/2011	1.1		0.029		NR	-	NR	-	NR	-
USGS-087	4/18/2011	0.61		0.013		NR	-	NR	-	NR	-
USGS-099 (Total)	5/19/2011	1.8		0.029		<0.18	U	0.16		0.019	
USGS-100	4/21/2011	1.9		0.021		NR	-	NR	-	NR	-
USGS-106 (Total)	6/8/2011	1		0.021		NR	-	NR	-	NR	-
<b>Boundary</b>											
Atomic City	4/26/2011	1.5		0.025		NR	-	NR	-	NR	-
Crossroads	4/28/2011	0.78		0.022		NR	-	NR	-	NR	-
USGS-008	4/25/2011	0.95		0.020		NR	-	NR	-	NR	-
USGS-011	4/26/2011	0.69		0.020		NR	-	NR	-	NR	-
USGS-103; Zone-1	6/14/2011	0.8		0.021		NR	-	NR	-	NR	-
USGS-105; Zone-5	6/22/2011	0.7		0.016		NR	-	NR	-	NR	-
USGS-105; Zone-4	6/21/2011	0.72		0.020		NR	-	NR	-	NR	-
USGS-108; Zone-5	6/20/2011	0.78		0.018		NR	-	NR	-	NR	-
USGS-108; Zone-3	6/16/2011	0.99		0.021		NR	-	NR	-	NR	-
USGS-124	4/26/2011	0.83		0.020		NR	-	NR	-	NR	-
USGS-132; Zone-6 (Total)	6/27/2011	0.89		0.021		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. Samples are filtered unless otherwise noted.

**Table 21. continued.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>									
		Nitrite + Nitrate		Phosphorus		Nitrite		Total Kjeldahl Nitrogen		Ammonia	
<b>Distant</b>											
MV-01	6/23/2011	1.0		0.026	J	NR	-	NR	-	<0.010	U
MV-11	6/23/2011	5.1		0.026	J	NR	-	NR	-	<0.010	U
MV-18	6/23/2011	3.0		0.038	J	NR	-	NR	-	0.012	
MV-21	6/23/2011	1.3		0.025	J	NR	-	NR	-	0.011	
MV-24A	6/23/2011	6.9		0.033	J	NR	-	NR	-	<0.010	U
MV-27	6/22/2011	2.2		0.027	J	NR	-	NR	-	<0.010	U
MV-29	6/22/2011	0.58		0.022	J	NR	-	NR	-	0.011	
MV-30	6/23/2011	2.7		0.033	J	NR	-	NR	-	0.012	
MV-37	6/22/2011	1.8		0.072	J	NR	-	NR	-	0.011	
MV-43	6/23/2011	26		0.032	J	NR	-	NR	-	<0.010	U
MV-50	6/22/2011	2.3		0.032	J	NR	-	NR	-	<0.010	U
MV-59	6/6/2011	0.77		0.020		NR	-	NR	-	<0.010	U
<b>Surface water</b>											
BLR @ Dairy Farm	6/28/2011	0.023		0.019		NR	-	NR	-	NR	-
BLR @ Diversion	4/28/2011	<0.01	U	0.0078		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. Samples are filtered unless otherwise noted.

**Table 22. Reported VOC concentrations in water samples, second quarter, 2011.**

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
A11A31	5/18/2011	<0.5	1.4	<0.5	<0.5	<0.5	0.97
ANP-8	5/16/2011	<0.5	<0.5	<0.5	<0.5	4.2	27
M3S	5/17/2011	<0.5	2.8	<0.5	<0.5	<0.5	1.1
M6S	5/18/2011	<0.5	1.4	<0.5	<0.5	<0.5	0.64
TAN-16	5/16/2011	<0.5	<0.5	0.9	0.58	5.2	42
TAN-28	5/09/2011	<0.5	<0.5R	39	180	1.2R	230
TAN-29	5/09/2011	<0.5	<0.5R	11	10	0.8R	100
TAN-37	5/09/2011	<0.5	<0.5R	<0.5	180	<0.5	1.9
TAN-51	5/16/2011	0.61	<0.5	2.3	1.4	14	100
TAN-55	5/16/2011	0.82	<0.5	3.2	2.0	14	100

<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.

### Soil

DEQ-INL OP 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 2011.

### Milk

DEQ-INL OP monitors milk for naturally occurring potassium-40 and man-made iodine-131. DEQ-INL OP 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 detected above MDC in three samples, presumably from the Fukushima, Japan reactor accident. All three samples are well below the FDA (Food and Drug Administration) derived intervention level of 4700 pCi/L for milk.

**Table 23. Gamma spectroscopy analysis data for milk samples, second quarter, 2011.**

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	Concentration <sup>3</sup>	± 2 SD
<b>Monitoring Samples</b>					
Howe/Nelson-Ricks Creamery	04/05/11	1366	112	3.1	1.6
	05/01/11	1381	105	<MDC	
	03/02/11	1391	120	<MDC	
Mud Lake/Nelson-Ricks Creamery	04/05/11	1504	103	<MDC	
	05/03/11	1438	121	<MDC	
	06/01/11	1472	106	<MDC	
Gooding/Glanbia	04/05/11	1396	113	<MDC	
	05/03/11	1380	118	<MDC	
	06/07/11	1544	100	<MDC	
Fort Hall	04/06/11	1468	103	13.4	2.8
	05/03/11	1474	108	3.4	1.8
	06/07/11	1410	105	<MDC	
Riverside	4/13/2011	1586	122	<MDC	
	5/12/2011	1629	113	<MDC	
	06/08/11	2026	148	<MDC	
<b>Verification Samples<sup>2</sup></b>					
Idaho Falls	04/05/2011	1378	100	<MDC	
Dietrich	04/05/2011	1365	95	<MDC	
Minidoka	05/03/2011	1434	109	<MDC	
Howe	05/03/2011	1332	116	<MDC	
Dietrich	06/07/2011	1400	119	<MDC	
Terreton	06/07/2011	1370	102	<MDC	

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

<sup>2</sup> DEQ-INL OP 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 2011 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 2011, the DEQ-INL OP submitted 109 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 2011 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**.

There were four anomalies noticed during the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL OP for the second quarter of 2011. The first includes a detection of enriched tritium from a sample collected during the fourth quarter in 2010, however, the reported concentration of 24 pCi/L remains an acceptable measure of “background” tritium in DI (deionized) water so it remains in control (**Table 28**). The other three anomalies include detectable concentrations of Total Alkalinity for all three blank analyses of common ions (**Table 30**). The minimum detectable concentration limit for alkalinity is 1.0 mg/L, two of the samples reported a concentration of 1.0 mg/L and one sample was measured at 2.0 mg/L. With results for alkalinity ranging from 99 to 297 mg/L (**Table 18**), significantly above the blank values of 1.0 - 2.0 mg/L, no qualifiers or flags will be attached with alkalinity results analyzed on the same day as these blank samples.

## 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.

DEQ-INL OP also uses standard radiological counting error (expressed as one standard deviation) to compare results for radiological analyses. Comparison tests that have an absolute difference in the two sample results of no more than three times the pooled error (or “3 sigma”) for these measurements are considered acceptable. This is accomplished using the following equation:

$$|R_1 - R_2| \leq 3(S_1^2 + S_2^2)^{1/2}$$

Where:

$R_1$  = First sample value.

$R_2$  = Second sample value.

$S_1$  = Counting error (one standard deviation) associated with the laboratory measurement of the first sample.

$S_2$  = Counting error (one standard deviation) associated with the laboratory measurement of the second sample.

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.

Five duplicate comparisons failed DEQ-INL criteria for the second quarter of 2011. Two field duplicates for Gross Beta analysis failed both the RPD and the 3 sigma test (**Table 31**). Shoshone Water Supply failed the RPD test and barely failed the 3 sigma test with an absolute difference between the results (2.0) being slightly higher than the 3 sigma value (1.9). This amount of variation between results is to be expected on occasion and because both results are so close there will be no qualifiers or flags attached to Gross Beta values analyzed in the same batch as the Shoshone Water Supply samples. The other failed comparison test includes USGS-085, with one of the values abnormally high. As part of the investigation, a recount of the sample was requested with results confirming the original values reported. Looking at historic values of the batch of samples analyzed on the same day, there is one other sample that does not match historic values from its site (abnormally low), it is possible these two samples were swapped. Both Gross Beta samples for USGS-085 and USGS-067 analyzed on 4/28/11 will be flagged with a (R) and qualified as rejected. One field duplicate for enriched tritium failed the RPD test and the 3 sigma test (**Table 31**). Minidoka Water Supply included one sample with detection and the other as undetected, the lab confirmed these results. The detected sample (111W145) result is abnormally high when compared with historic values and will be flagged with a (R) and qualified as rejected. The rest of the enriched tritium results will not be flagged because the results found at each location correspond with historic levels. A field duplicate for iron collected at M3S failed comparison criteria (**Table 32**). The RPD between the two samples was found to be 67 %; an RPD over a 20 % difference is not in control. Samples that were analyzed on 5/24/2011 for iron will be flagged with a (J) and will be qualified as estimates. These include samples for M1S (111W256) and M3S (111W268 and 111W280). The last duplicate sample to fail comparison criteria includes an analysis for phosphorus collected at MV-18 (**Table 33**). The RPD between the two samples was found out of control with a value of 24%. Samples that were analyzed for phosphorus on 7/7/2011 will be flagged with a (J) and qualified as an estimate. This includes samples for MV-01, MV-11, MV-18, MV-21, MV-24A, MV-27, MV-29, MV-30, MV-37, MV-43, and MV-50.

## 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 2011, 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**.

Spiked samples for VOC analyses, specifically tetrachloroethylene, carbon tetrachloride, styrene and vinyl chloride submitted for analysis 5/10/11 and analyzed 5/20/11 either exceeded or did not achieve recovery limits (**Table 37**). Also a substance not included in the spike was detected, methylene chloride. This sample was not analyzed by the analytical laboratory typically used (Idaho Bureau of Laboratories, IBL) due to equipment repair/maintenance. It was instead sub-contracted to a different analytical laboratory by IBL. All results for tetrachloroethylene analyzed with the specific spiked sample, and which exceeded the IDL were flagged with a (R) and qualified as rejected. All results for carbon tetrachloride analyzed with the specific spiked sample, even those which did not exceed the IDL were flagged with a (R) and qualified as rejected since the percent recovery was zero. These unacceptable recoveries resulted in qualifiers applied to sample results from TAN-28, TAN-29, and TAN-37. There were no results for styrene or vinyl chloride above the IDL, so qualifiers were not applied.

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 near 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 second quarter 2011 are presented in **Table 38**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets. **Table 38** is followed immediately by **Table 39** which is a corrected version of the first quarter 2011 EIC irradiation results table that had been published with incorrect data.

Other than the previously discussed VOC spikes, 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 2011.

### **Analytical QA/QC Assessment**

Other than those listed above, 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 2011, 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 2011.

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 2011 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 2011 is summarized in **Table 40**. The radioiodine pump at Montevue failed and was replaced with a new pump. Enough air was drawn through the filter to be considered a valid sample for the week of 6/2-6/9/11.

### **Conclusion**

All data collected for the second quarter of 2011, 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 24. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP, second quarter, 2011.**

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	143	13	0	0	0	ISU-EML
		Gross beta	143	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	39	3	0	0	0	ISU-EML
<b>Gaseous</b>	Charcoal filter	Iodine-131	43	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	62	3	5	0	0	ISU-EML
		Gross beta	62	3	5	0	2	ISU-EML
		Gamma emitters	62	3	5	0	0	ISU-EML
		Tritium	62	3	5	0	0	ISU-EML
		Enriched tritium	19	1	2	0	1	ISU-EML
		Technetium-99	13	0	3	0	0	ISU-EML
		Radiochemical	46	0	3	0	0	ISU Sub
		Metals	48	3	4	2	0	IBL
		Common Ions	46	3	4	2	0	IBL
		Nutrients	48	3	4	2	0	IBL
		Volatile Organics	20	0	1	1	5	IBL Sub
<b>TERRESTRIAL</b>								
<b>Milk</b>	Grab or composite	Gamma emitters	21	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	55	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	9	NA	NA	NA	NA	DEQ-INL OP
<b>Total Analyses</b>			964	52	41	16	8	
<b>Total of QC Analyses (blanks, duplicates, and spikes)</b>			109					
<b>Percentage of QC analyses of Total Test analyses<sup>3</sup></b>			11.3%					
<b>Percentage of usable data<sup>4</sup></b>			99.2%					

<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 25. Blank analysis results for gross alpha and beta in particulate air (TSP), second quarter, 2011.**

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)
3/31/11	4/07/11	1391	-0.1	0.1	-0.2	0.6
4/07/11	4/14/11	1391	0.0	0.1	-0.5	0.5
4/14/11	4/21/11	1391	0.0	0.1	0.0	0.6
4/21/11	4/28/11	1391	0.0	0.1	0.0	0.6
4/28/11	5/05/11	1391	-0.1	0.1	-1.1	0.6
5/05/11	5/12/11	1391	0.0	0.1	-0.2	0.6
5/12/11	5/19/11	1391	-0.1	0.2	-0.1	0.6
5/19/11	5/26/11	1391	0.0	0.1	0.2	0.6
5/26/11	6/02/11	1391	0.0	0.1	0.3	0.6
6/02/11	6/09/11	1391	0.0	0.2	0.2	0.6
6/09/11	6/16/11	1391	0.1	0.2	-0.8	0.6
6/16/11	6/23/11	1391	0.0	0.1	0.4	0.6
6/23/11	6/30/11	1391	0.0	0.2	0.1	0.6

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 26. Blank analysis results for gamma spectroscopy for TSP particulate air filters, second quarter, 2011.**

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
07/19/11	-20	32	56	45	9	55	8	9	15
Analysis Date	Cesium-134			Cesium-137					
	Concentration <sup>1</sup>	± 2 SD	MDC	Concentration	± 2 SD	MDC			
7/19/11	-1	4	6	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 27. Blank analysis results for tritium in water vapor from air samples, second quarter, 2011.**

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP112ZTR01	06/06/11	06/08/11	07/11/11	0.02	0.09	0.16
OP112ZTR02	07/14/11	07/15/11	07/20/11	0.03	0.08	0.13
OP112ZTR03	07/14/11	07/15/11	07/20/11	-0.02	0.07	0.13

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

**Table 28. Radiological blank analysis in ground and surface water for samples, second quarter, 2011.**

Sample Number	Sample Date	Concentration	± 2 SD	MDC	Within Blank Criteria?
<b>Gross Alpha</b>					
111W215	4/19/2011	0.1	0.2	0.4	yes
111W205	4/26/2011	0	0.2	0.4	yes
111W451	6/20/2011	0.1	0.3	0.4	yes
<b>Gross Beta</b>					
111W215	4/19/2011	0.3	0.6	1.0	yes
111W205	4/26/2011	0.8	0.6	1.0	yes
111W451	6/20/2011	0.2	0.6	1.0	yes
<b>Cesium-137</b>					
111W215	4/19/2011	-1.0	1.3	2.5	yes
111W205	4/26/2011	-0.5	1.5	2.7	yes
111W451	6/20/2011	0.5	1.0	1.6	yes
<b>Tritium</b>					
111W216	4/19/2011	10	100	160	yes
111W206	4/26/2011	60	100	160	yes
111W453	6/20/2011	30	100	160	yes
<b>Enriched Tritium</b>					
101W594	10/7/2010	24*	8	13	yes

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

\*Note: Reflects typical concentrations found in DI water.

**Table 29. Blank analysis results (µg/L) for metals in ground and surface water for the second quarter, 2011.**

Sample Number	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
111W218	4/19/2011	<2	<1	<1	<1	<1	<10	<1	<1	<2	<2
111W208	4/26/2011	<2	<1	<1	<1	<1	<10	<1	<1	<2	<2
111W455	6/20/2011	<5	<2	NR	<1	<5	<10	<5	<2	<10	<5

NR: No result reported.

**Table 30. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water for the second quarter, 2011.**

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
111W219,218,217	4/19/2011	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	2	<0.01	<0.005
111W209,208,207	4/26/2011	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	1	<0.01	<0.005
111W456,455,454	6/20/2011	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	1	<0.01	<0.005

**Table 31. Duplicate radiological analysis results in pCi/L for ground and surface water, second quarter, 2011.**

Analysis/ Sample Location	Original Sample Number	Concentration	$\pm 2$ SD	Duplicate Sample Number	Concentration	$\pm 2$ SD	$ R_1 - R_2 $	$3(s_1^2 + s_2^2)^{1/2}$	Within Criteria? <sup>1</sup>
<b>Gross Alpha</b>									
M3S	111W260	3.3	1.3	111W272	2.7	1.2	0.6	2.7	yes
USGS-052	111W023	3.0	1.2	111W042	2.3	1.1	0.7	2.4	yes
USGS-085	111W062	1.0	0.9	111W162	0.8	1.4	0.2	2.5	yes
Shoshone Water Supply	111W345	2.0	1.6	111W347	-0.8	1.3	2.8	3.1	yes
MV-18	111W376	1.3	1.5	111W366	0.4	1.9	0.9	3.6	yes
<b>Gross Beta</b>									
M3S	111W260	4.0	0.9	111W272	3.5	0.8	0.5	1.8	yes
USGS-052*	111W023	165.3	3.0	111W042	153.3	2.9	12	6.3	yes
USGS-085*	111W062	70.6	2.0	111W162	8.8	1.0	61.8	3.4	no
Shoshone Water Supply	111W345	2.3	0.9	111W347	4.3	0.9	2	1.9	no
MV-18	111W376	6.4	1.0	111W366	6.4	1.9	0	3.2	yes
<b>Gamma Spectroscopy Cesium-137</b>									
M3S	111W260	0.2	2.6	111W272	0.8	2.6	0.6	5.5	yes
USGS-052	111W023	-0.9	1.7	111W042	0.6	1.7	1.5	3.6	yes
USGS-085	111W062	0.3	1.6	111W162	-0.6	1.0	0.9	2.8	yes
Shoshone Water Supply	111W345	2.4	2.6	111W347	2.0	2.3	0.4	5.2	yes
MV-18	111W376	1.0	2.1	111W366	-0.3	1.6	1.3	4.0	yes
<b>Tritium</b>									
M3S	111W265	910	120	111W277	920	120	10	255	yes
USGS-052	111W028	980	120	111W047	1150	120	170	255	yes
USGS-085	111W065	1660	130	111W165	1520	130	140	276	yes
Shoshone Water Supply	111W346	-20	100	111W348	40	100	60	212	yes
MV-18	111W377	40	70	111W367	10	70	30	148	yes
<b>Enriched Tritium</b>									
A11A31	101W474	123	10	101W577	132	12	9	23	yes
Minidoka Water Supply	101W145	48	9	101W454	-2	7	50	17	no
<b>Strontium-90</b>									
M3S	111W263	0.01	0.30	111W275	-0.06	0.32	0.07	0.66	yes
USGS-052	111W026	2.74	0.68	111W045	3.04	0.75	0.3	1.52	yes
USGS-085	111W063	2.61	0.65	111W163	3.66	0.90	1.05	1.67	yes
<b>Technetium-99</b>									
M3S	111W264	1.2	0.2	111W276	1.1	0.2	0.1	0.42	yes
USGS-052*	111W027	438.7	2.0	111W046	425	2.0	13.7	4.24	yes
USGS-085	111W064	1.3	0.2	111W164	1.2	0.2	0.1	0.42	yes
<b>Plutonium-238</b>									
M3S	111W262	0.010	0.022	111W274	-0.002	0.023	0.01	0.05	yes
USGS-052	111W025	0	0.021	111W044	-0.002	0.022	0.002	0.05	yes
<b>Plutonium-239/240</b>									
M3S	111W262	0.001	0.022	111W274	-0.004	0.023	0.01	0.05	yes
USGS-052	111W025	-0.003	0.021	111W044	-0.002	0.022	0.001	0.05	yes
<b>Uranium-234</b>									
M3S	111W266	1.18	0.31	111W278	0.79	0.24	0.39	0.59	yes
USGS-052	111W048	1.29	0.42	111W220	1.29	0.41	0.00	0.88	yes
<b>Uranium-235</b>									

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M3S	111W266	0.029	0.053	111W278	0.030	0.055	0.00	0.11	yes
USGS-052	111W048	0.019	0.097	111W220	0.067	0.090	0.05	0.20	yes
<b>Uranium-238</b>									
M3S	111W266	0.70	0.22	111W278	0.41	0.16	0.29	0.41	yes
USGS-052	111W048	0.86	0.32	111W220	0.60	0.25	0.26	0.61	yes
<b>Americium-241</b>									
M3S	111W261	0.033	0.028	111W273	0.011	0.020	0.02	0.05	yes
USGS-052	111W024	0.010	0.021	111W043	0.006	0.022	0	0.05	yes

$$^1/R_1-R_2/ \leq 3(s_1^2+s_2^2)^{1/2}$$

Note\* Results were greater than 5 times the detection limit. Duplicates compared using Relative Percent Difference (RPD) Method.

**Table 32. Duplicate results for metals (µg/L) in ground water and/or surface water for the second quarter, 2011.**

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
M3S (total)	111W268	5/17/2011	<2	46	<1	12	52	<1	<1	<2	<2
M3S (total)	111W280	5/17/2011	<2	47	<1	12	26	<1	<1	<2	<2
<b>RPD</b>			<b>0</b>	<b>-2</b>	<b>0</b>	<b>0</b>	<b>67</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
USGS-052 (total)	111W030	4/11/2011	<2	87	<1	9	<10	<1	<1	<2	<2
USGS-052 (total)	111W050	4/11/2011	<2	87	<1	10	<10	<1	<1	<2	<2
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>-10.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
USGS-085 (dissolved)	111W067	4/11/2011	-	89	-	24	-	<1	<1	-	<2
USGS-085 (dissolved)	111W167	4/11/2011	-	90	-	24	-	<1	<1	-	<2
<b>RPD</b>			<b>0</b>	<b>-1</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
MV-18 (dissolved)	111W379	6/23/2011	<5	64	<1	<5	<10	<5	<2	<10	<5
MV-18 (dissolved)	111W369	6/23/2011	<5	64	<1	<5	<10	<5	<2	<10	<5
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Table 33. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water for second quarter, 2011.**

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
M3S (total)	111W268,267	5/17/2011	42	14	8.2	2.6	0.211	14.2	25.5	142	0.84	0.026
M3S (total)	111W280,279	5/17/2011	42	14	8.2	2.6	<0.2	14.2	25.5	143	0.84	0.025
<b>RPD</b>			<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>5.4</b>	<b>0.0</b>	<b>0.0</b>	<b>-0.7</b>	<b>0.0</b>	<b>3.9</b>
USGS-052 (total)	111W030,029	4/11/2011	48	14	12	2.7	<0.2	24.6	26.8	150	2.5	0.031
USGS-052 (total)	111W050,049	4/11/2011	48	14	12	2.7	0.207	24.2	26.6	150	2.4	0.03
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>3.4</b>	<b>1.6</b>	<b>0.7</b>	<b>0.0</b>	<b>4.1</b>	<b>3</b>
USGS-085 (dissolved)	111W067,066	4/11/2011	54	15	11	2.5	<0.2	16.5	42.5	164	1.1	0.029
USGS-085 (dissolved)	111W167,166	4/11/2011	54	15	11	2.5	<0.2	16.7	42.8	165	1.1	0.029
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>-1.2</b>	<b>-0.7</b>	<b>-0.6</b>	<b>0.0</b>	<b>0</b>
MV-18 (dissolved)	111W378,380	6/23/2011	66	27	37	5.5	0.494	50.6	64.8	191	3	0.03
MV-18 (dissolved)	111W368,370	6/23/2011	64	26	37	5.5	0.407	50.7	65.5	191	3	0.038
<b>RPD</b>			<b>3</b>	<b>4</b>	<b>0.0</b>	<b>0</b>	<b>19</b>	<b>-0.2</b>	<b>-1.1</b>	<b>0.0</b>	<b>0.0</b>	<b>-24</b>

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

**Table 34. Duplicate results for VOCs (µg/L) in groundwater and/or surface water, second quarter, 2011.**

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	5/17/2011	101W270	<0.5	2.8	<0.5	<0.5	<0.5	1.1	<0.5
M3S	5/17/2011	101W282	<0.5	2.9	<0.5	<0.5	<0.5	1.1	<0.5
RPD			<b>0</b>	<b>-3.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>

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

**Table 35. De-ionized water spike results (in µg/L) and percent recovery for metals in ground and surface water for the second quarter, 2011.**

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
111W213	4/11/2011	85.2	89	<b>104.5</b>	12.2	13	<b>106.6</b>	6.65	7.2	<b>108.3</b>	6.7	7.2	<b>107.5</b>	66.9	63	<b>94.2</b>
111W202	5/10/2011	63.5	66	<b>103.9</b>	9.09	8.8	<b>96.8</b>	7.89	8.4	<b>106.5</b>	7.96	7.7	<b>96.7</b>	49.8	46	<b>92.4</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 mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2011.**

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
111W213,212	4/11/2011	15.4	14	<b>90.9</b>	6.1	5.7	<b>93.4</b>	12.1	13	<b>107.4</b>	1.47	1.4	<b>95.2</b>	2.57	2.36	<b>91.8</b>
111W201,202	5/10/2011	11.5	11	<b>95.7</b>	4.54	4.2	<b>92.5</b>	10.2	10	<b>98.0</b>	1.74	1.7	<b>97.7</b>	2.02	1.81	<b>89.6</b>

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

**Table 36. 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, 2011.**

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
111W213,214	4/11/2011	69	69.2	<b>100.3</b>	40.9	39.3	<b>96.1</b>	108	108	<b>100.0</b>	1.14	1.1	<b>96.5</b>	0.0159	0.015	<b>94.3</b>
111W201,203	5/10/2011	85	82	<b>96.5</b>	20	19.5	<b>97.5</b>	25.3	25	<b>98.8</b>	1.62	1.6	<b>98.8</b>	0.0218	0.02	<b>91.7</b>

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

**Table 37. De-ionized water spike results (in µg/L) and percent recovery for VOCs in ground and surface water for the second quarter, 2011.**

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
111W204	5/10/2011	6.35	0.0	<b>0.0</b>	9.23	6.2	<b>67.2</b>	12.5	4.6	<b>36.8</b>	11.2	8.5	<b>75.9</b>	7.6	10	<b>131.6</b>

\*Note: The lab did not report any detection of Carbon Tetrachloride, however, (1.3 µg/L) of Methylene Chloride was reported. The sample was not spiked for Methylene Chloride.

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

**Table 38. Electret ionization chamber irradiation results (categorized as spiked samples) for second quarter, 2011.**

Electret #	Exposure Received		Net Measured Exposure <sup>1</sup>		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	51.1	2.6	47.6	1.4	93.1%
Spike 1	51.1	2.6	52.4	1.4	102.4%
Spike 1	51.1	2.6	50.6	1.3	99.0%
Spike 2	30.3	1.5	28.2	1.4	93.1%
Spike 2	30.3	1.5	30.3	1.4	100.2%
Spike 2	30.3	1.5	29.3	1.3	96.9%
Spike 3	24.0	1.2	22.0	1.4	91.6%
Spike 3	24.0	1.2	25.3	1.4	105.3%
Spike 3	24.0	1.2	22.9	1.4	95.4%

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

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

Reported in Table 39 below is the corrected version of the 1<sup>st</sup> quarter 2011 electret ionization chamber irradiation results.

**Table 39. Electret ionization chamber irradiation results (categorized as spiked samples), first quarter, 2011.**

Electret #	Exposure Received		Net Measured Exposure <sup>1</sup>		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	40	2.0	38.2	1.4	95.4%
Spike 1	40	2.0	42.0	1.4	105.0%
Spike 1	40	2.0	40.6	1.4	101.5%
Spike 2	25	1.25	26.0	1.4	104.1%
Spike 2	25	1.25	24.3	1.4	97.1%
Spike 2	25	1.25	26.0	1.3	104.0%
Spike 3	29.99	1.5	30.7	1.4	102.4%
Spike 3	29.99	1.5	27.7	1.4	92.3%
Spike 3	29.99	1.5	31.4	1.4	104.9%

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

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

**Table 40. Air sampling field equipment service reliability (percent operational), second quarter, 2011.**

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	100 %	100 %	100 %	100 %
Montevieu	100 %	92 %	100 %	100 %
Mud Lake	100 %	100 %	100 %	100 %
<b>Distant Locations</b>				
Craters of the Moon	100 %	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, 2011.**

Sample location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>On-site Locations</b>						
<b>Rest Area</b>	3/31/11	4/07/11	0.7	0.2	39.0	1.6
	4/07/11	4/14/11	1.0	0.3	34.1	1.5
	4/14/11	4/21/11	1.5	0.3	39.0	1.6
	4/21/11	4/28/11	1.1	0.3	24.0	1.5
	4/28/11	5/05/11	0.6	0.3	22.3	1.5
	5/05/11	5/12/11	1.0	0.3	27.7	1.4
	5/12/11	5/19/11	0.9	0.3	31.6	1.5
	5/19/11	5/26/11	0.9	0.3	27.7	1.4
	5/26/11	6/02/11	0.9	0.3	25.2	1.3
	6/02/11	6/09/11	1.1	0.3	28.7	1.4
	6/09/11	6/16/11	0.9	0.3	36.7	1.5
	6/16/11	6/23/11	0.6	0.2	25.3	1.3
	6/23/11	6/30/11	1.2	0.3	39.4	1.6
	<b>Experimental Field Station</b>	3/31/11	4/07/11	0.8	0.3	33.4
4/07/11		4/14/11	0.7	0.2	31.9	1.5
4/14/11		4/21/11	1.3	0.3	31.3	1.5
4/21/11		4/28/11	0.7	0.2	23.1	1.3
4/28/11		5/05/11	0.8	0.3	21.6	1.4
5/05/11		5/12/11	0.8	0.3	23.3	1.3
5/12/11		5/19/11	0.8	0.3	26.1	1.4
5/19/11		5/26/11	0.6	0.2	23.2	1.3
5/26/11		6/02/11	0.9	0.3	22.8	1.3
6/02/11		6/09/11	0.9	0.3	25.5	1.4
6/09/11		6/16/11	0.9	0.3	30.1	1.5
6/16/11		6/23/11	0.8	0.3	18.0	1.5
6/23/11		6/30/11	1.1	0.3	34.7	1.6

**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, 2011.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Sand Dunes</b>	3/31/11	4/07/11	0.9	0.3	30.7	1.4
	4/07/11	4/14/11	0.5	0.2	25.3	1.2
	4/14/11	4/21/11	1.0	0.2	30.7	1.4
	4/21/11	4/28/11	0.6	0.2	21.5	1.2
	4/28/11	5/05/11	0.6	0.2	17.7	1.1
	5/05/11	5/12/11	0.7	0.2	20.5	1.2
	5/12/11	5/19/11	0.8	0.3	24.5	1.2
	5/19/11	5/26/11	0.5	0.2	16.7	1.1
	5/26/11	6/02/11	0.8	0.2	17.7	1.1
	6/02/11	6/09/11	0.7	0.2	20.7	1.2
	6/09/11	6/16/11	0.8	0.2	25.9	1.3
	6/16/11	6/23/11	0.8	0.2	19.5	1.1
	6/23/11	6/30/11	1.2	0.3	32.0	1.4
<b>Van Buren</b>	3/31/11	4/07/11	1.0	0.3	36.1	1.5
	4/07/11	4/14/11	1.1	0.3	29.0	1.4
	4/14/11	4/21/11	1.4	0.3	33.6	1.5
	4/21/11	4/28/11	0.7	0.3	24.0	1.4
	4/28/11	5/05/11	0.8	0.3	22.5	1.3
	5/05/11	5/12/11	1.0	0.3	26.2	1.3
	5/12/11	5/19/11	0.9	0.3	28.1	1.4
	5/19/11	5/26/11	0.9	0.3	24.1	1.3
	5/26/11	6/02/11	0.8	0.2	22.3	1.2
	6/02/11	6/09/11	0.6	0.2	26.4	1.3
	6/09/11	6/16/11	0.8	0.3	30.2	1.4
	6/16/11	6/23/11	1.2	0.3	21.7	1.2
	6/23/11	6/30/11	1.1	0.3	33.0	1.5
<b>Boundary Locations</b>						
<b>Atomic City</b>	3/31/11	4/07/11	0.9	0.3	35.5	1.5
	4/07/11	4/14/11	0.8	0.2	30.5	1.4
	4/14/11	4/21/11	1.0	0.3	37.0	1.5
	4/21/11	4/28/11	0.7	0.2	23.9	1.3
	4/28/11	5/05/11	0.8	0.3	19.7	1.2
	5/05/11	5/12/11	0.6	0.2	22.5	1.3
	5/12/11	5/19/11	0.7	0.3	26.2	1.3
	5/19/11	5/26/11	0.8	0.2	22.0	1.2
	5/26/11	6/02/11	1.1	0.3	21.5	1.2
	6/02/11	6/09/11	0.6	0.3	27.1	1.4
	6/09/11	6/16/11	0.8	0.2	27.7	1.4
	6/16/11	6/23/11	0.7	0.2	20.9	1.2
	6/23/11	6/30/11	0.9	0.3	34.0	1.5

**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, 2011.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Howe</b>	3/31/11	4/07/11	0.6	0.2	28.3	1.4
	4/07/11	4/14/11	0.7	0.2	31.5	1.5
	4/14/11	4/21/11	1.4	0.3	31.8	1.5
	4/21/11	4/28/11	0.7	0.2	22.9	1.3
	4/28/11	5/05/11	1.0	0.3	17.1	1.2
	5/05/11	5/12/11	1.0	0.3	20.2	1.2
	5/12/11	5/19/11	0.9	0.3	22.6	1.3
	5/19/11	5/26/11	0.6	0.2	18.5	1.2
	5/26/11	6/02/11	1.0	0.3	19.3	1.2
	6/02/11	6/09/11	0.9	0.3	23.0	1.3
	6/09/11	6/16/11	0.6	0.2	27.5	1.4
	6/16/11	6/23/11	0.5	0.3	17.6	1.4
	6/23/11	6/30/11	1.3	0.3	31.7	1.5
<b>Montevieu</b>	3/31/11	4/07/11	1.0	0.3	36.5	1.6
	4/07/11	4/14/11	0.8	0.2	35.0	1.5
	4/14/11	4/21/11	1.6	0.3	40.7	1.6
	4/21/11	4/28/11	0.8	0.3	27.8	1.4
	4/28/11	5/05/11	1.3	0.3	19.6	1.3
	5/05/11	5/12/11	0.9	0.3	26.7	1.4
	5/12/11	5/19/11	1.1	0.3	34.4	1.5
	5/19/11	5/26/11	0.6	0.2	22.3	1.3
	5/26/11	6/02/11	1.0	0.3	23.9	1.3
	6/02/11	6/09/11	0.8	0.3	27.8	1.4
	6/09/11	6/16/11	0.9	0.3	32.0	1.5
	6/16/11	6/23/11	0.9	0.3	24.0	1.3
	6/23/11	6/30/11	1.7	0.4	39.0	1.6
<b>Mud Lake</b>	3/31/11	4/07/11	1.2	0.3	28.0	1.4
	4/07/11	4/14/11	1.0	0.3	28.3	1.4
	4/14/11	4/21/11	1.6	0.3	32.8	1.5
	4/21/11	4/28/11	1.0	0.3	27.7	1.4
	4/28/11	5/05/11	1.3	0.3	18.6	1.3
	5/05/11	5/12/11	1.0	0.3	21.2	1.3
	5/12/11	5/19/11	0.7	0.3	26.1	1.4
	5/19/11	5/26/11	0.7	0.2	19.0	1.2
	5/26/11	6/02/11	0.6	0.2	19.5	1.2
	6/02/11	6/09/11	1.3	0.3	24.3	1.4
	6/09/11	6/16/11	0.9	0.3	27.2	1.4
	6/16/11	6/23/11	0.7	0.2	22.6	1.3
	6/23/11	6/30/11	1.2	0.3	34.6	1.6

**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, 2011.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Distant Locations</b>						
<b>Craters</b>	3/31/11	4/07/11	0.7	0.3	26.2	1.4
	4/07/11	4/14/11	1.0	0.3	25.6	1.4
	4/14/11	4/21/11	0.8	0.2	24.7	1.4
	4/21/11	4/28/11	0.6	0.2	21.1	1.3
	4/28/11	5/05/11	0.6	0.3	18.6	1.3
	5/05/11	5/12/11	0.6	0.2	17.5	1.2
	5/12/11	5/19/11	0.8	0.3	23.7	1.4
	5/19/11	5/26/11	0.5	0.2	20.0	1.3
	5/26/11	6/02/11	0.5	0.2	18.8	1.2
	6/02/11	6/09/11	0.6	0.3	21.5	1.3
	6/09/11	6/16/11	0.8	0.3	26.0	1.4
	6/16/11	6/23/11	0.6	0.2	19.0	1.2
	6/23/11	6/30/11	0.8	0.3	33.2	1.6
	<b>Fort Hall<sup>1</sup></b>	3/31/11	4/07/11	0.9	0.3	29.1
4/07/11		4/14/11	0.7	0.2	27.0	1.3
4/14/11		4/21/11	1.0	0.3	25.7	1.3
4/21/11		4/28/11	1.1	0.3	19.7	1.2
4/28/11		5/05/11	1.0	0.3	15.7	1.2
5/05/11		5/12/11	0.7	0.2	17.0	1.1
5/12/11		5/19/11	1.1	0.3	20.4	1.2
5/19/11		5/26/11	1.1	0.3	21.3	1.2
5/26/11		6/02/11	1.0	0.3	19.3	1.2
6/02/11		6/09/11	1.0	0.3	19.1	1.2
6/09/11		6/16/11	0.7	0.2	20.3	1.2
6/16/11		6/23/11	0.9	0.2	18.5	1.2
6/23/11		6/30/11	1.0	0.3	23.1	1.2
<b>Idaho Falls</b>		3/31/11	4/07/11	1.0	0.3	37.6
	4/07/11	4/14/11	1.2	0.3	36.9	1.5
	4/14/11	4/21/11	1.9	0.3	43.7	1.7
	4/21/11	4/28/11	0.9	0.3	22.7	1.3
	4/28/11	5/05/11	0.8	0.3	18.6	1.2
	5/05/11	5/12/11	1.2	0.3	22.7	1.3
	5/12/11	5/19/11	0.8	0.3	28.8	1.4
	5/19/11	5/26/11	1.0	0.3	26.9	1.4
	5/26/11	6/02/11	1.1	0.3	21.4	1.2
	6/02/11	6/09/11	1.3	0.3	29.1	1.4
	6/09/11	6/16/11	0.9	0.3	27.9	1.4
	6/16/11	6/23/11	0.9	0.3	23.2	1.3
	6/23/11	6/30/11	1.4	0.3	33.4	1.5

<sup>1</sup> Operated by Shosone-Bannock Tribes

## Appendix B

**Table B-1. Results for all electret locations, second quarter, 2011.**

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R/h}$ )	$\pm 2$ SD ( $\mu\text{R/h}$ )
Arco	12.2	2.8
Craters	11.1	2.7
Rest Area	13.1	0.8
Van Buren	13.3	3.2
EFS	13.1	2.2
Main Gate	14.5	2.1
Atomic City	11.8	2.3
Taber	10.4	0.6
Blackfoot	10.0	0.6
Ft. Hall <sup>1</sup>	12.4 (J)	7.0 (J)
Idaho Falls	10.0	3.4
Mud Lake/ Terretton	11.2	2.1
Monteview	13.3 (J)	9.3 (J)
Sand Dunes	13.0	0.8
Howe Met. Tower	10.1	2.0
MP276 -20	14.3	3.0
MP274 -20	9.9	2.3
MP272 -20	10.7	2.5
MP270 -20	11.0	3.1
MP268 -20	13.5	2.3
MP266 -20	13.5	3.6
MP264 -20	13.2	0.6
MP270 -20/26	11.5	0.1
MP268 -20/26	12.9	1.9
MP266 -20/26	15.8	3.1
MP263 -20/26	13.0	3.4
MP261 -20/26	10.4	1.2
MP259 -20/26	13.8	2.6
MFC (EBR II)	13.1	1.7
EBR I	13.1	3.8
RWMC	13.4	2.4
CFA	15.0	3.3
CITRC (PBF)	12.5	2.8

The reported result is the mean of the results from three individual electrets placed at each location. The "J" qualifier (estimate) indicates that the individual results did not meet DEQ-INL OP agreement criteria.

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

**Table B-1 continued. Results for all electret locations, second quarter, 2011.**

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R/h}$ )	$\pm 2$ SD ( $\mu\text{R/h}$ )
INTEC (ICPPI)	15.5	1.2
ATR (TRA)	25.2	3.8
NRF	13.7	2.7
TAN	11.2	2.5
Mud Lake Bank of Commerce	13.5	2.6
MP43-33	14.7	2.3
MP41-33	13.1	3.3
MP39-33	11.8	2.0
MP37-33	10.7	1.3
MP35-33	10.3	2.9
MP33-33	14.8	3.5
MP31-33	15.0	3.2
MP29-33	11.1	2.0
MP27-33	13.4	3.4
MP25-33	11.9	2.2
MP23-33	12.3	3.1
Base of Howe	11.0	2.3
Rover	12.3	2.5
Hamer	15.7	1.8
Sugar City	17.1	1.9
Roberts	12.3	2.0
Big Southern Butte	15.0	1.9

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

## 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