

Department of Environmental Quality  
INL Oversight Program

**ENVIRONMENTAL SURVEILLANCE PROGRAM  
QUARTERLY DATA REPORT**

**January – March, 2014**



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# Table of Acronyms

aCi/L	-	attocuries per liter	QAPP	-	Quality Assurance Program Plan
ATR	-	Advanced Test Reactor	QA/QC	-	Quality Assurance/Quality Control
BEA		Battelle Energy Alliance, LLC	RCRA	-	Resource Conservation and Recovery Act
BLR		Big Lost River	RPD	-	relative percent difference
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act	RWMC	-	Radioactive Waste Management Complex
CFA	-	Central Facilities Area	RTC	-	Reactor Technology Complex
CFR	-	Code of Federal Regulations	SD	-	standard deviation
CITRC	-	Critical Infrastructure Test Range	SMCL	-	secondary maximum contaminant level
	-	Complex	TAN	-	Test Area North
CWI	-	CH2M-WG Idaho, LLC	TDS	-	total dissolved solids
DEQ-INL OP		The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program	TMI	-	Three Mile Island
			TRA	-	Test Reactor Area
DOE	-	U.S. Department of Energy	TSP	-	total suspended particulate
EBR I & II	-	Experimental Breeder Reactors I & II	TSS	-	total suspended solids
EFS	-	Experimental Field Station	USGS	-	U.S. Geological Survey
EIC	-	electret ionization chamber	VOC	-	volatile organic compound
EML	-	Environmental Monitoring Laboratory	WLAP	-	Wastewater Land Application Permit
EPA		Environmental Protection Agency			
ESER	-	Environmental Surveillance, Education and Research Program			
ESP	-	Environmental Surveillance Program			
ESRPA	-	Eastern Snake River Plain Aquifer			
GSS	-	Gonzales-Stoller Surveillance, LLC			
HPIC	-	high-pressure ion chamber			
LLD	-	lower limit of detection			
IBL	-	Idaho Bureau of Laboratories			
ICPP	-	Idaho Chemical Processing Plant			
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			
pCi/g	-	picocuries per gram			
pCi/L	-	picocuries per liter			
pCi/m <sup>3</sup>	-	picocuries per cubic meter			

## Introduction

The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program (DEQ-INL OP) conducts an Environmental Surveillance Program (ESP) at locations on the INL, near 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 environmental data and programs. This program also provides the citizens of Idaho with information on current and proposed DOE programs 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 first quarter, 2014 (**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. Starting in the first quarter of 2013 a new sampler (HVP 4304) is operating side by side at Idaho Falls air station with the current sampler (HVP 3804). The new sampler (HVP 4304) is being operated to test dependability and durability under field conditions. 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 first quarter of 2014 for TSP filters are presented in **Table 3**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

Annual composites of filters collected using TSP samplers are also analyzed using radiochemical separation techniques. Results from the annual composite analyses are typically presented in the following year's first quarter report. The samples are analyzed for Strontium-90, Plutonium-238, Plutonium-239/240, and Americium-241 (**Table 6**). Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons. DEQ-INL's action levels of 190 for Americium-241, 1900 for Strontium-90, 210 for Plutonium-238, and 200 for Plutonium-

239/240 (in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>) are 10 percent of the compliance values listed for the specific radionuclides in 40 CFR 61, Appendix E, Table 2. Field sample concentrations which exceed these amounts require further investigation. For the 2013 annual composites, the Rest Area sample exceeded the MDC for <sup>90</sup>Sr and the Van Buren sample exceeded the MDC for <sup>241</sup>Am. Though minimally exceeding the MDC, the results are well under the specified regulatory limits and DEQ-INL OP's action levels.

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

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the 11 monitoring stations. This moisture was stripped from the hygroscopic media and analyzed to calculate the atmospheric tritium concentration. Reported values are the result of either a single sample or a weighted mean based upon the volume of air sampled when more than one atmospheric moisture sample was collected during the calendar quarter. Atmospheric tritium weighted means were all below minimum detectable concentration (MDC) during the first quarter of 2014. There was one individual sample within a weighted mean that did exceed the MDC, located at Experimental Field Station: 0.35 pCi/m<sup>3</sup> (MDC 0.32 pCi/m<sup>3</sup>). The DEQ-INL OP action level for atmospheric tritium is 150 pCi/m<sup>3</sup> (40 CFR 61). Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the first quarter of 2014. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides with all results below minimum detectable concentration. 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.

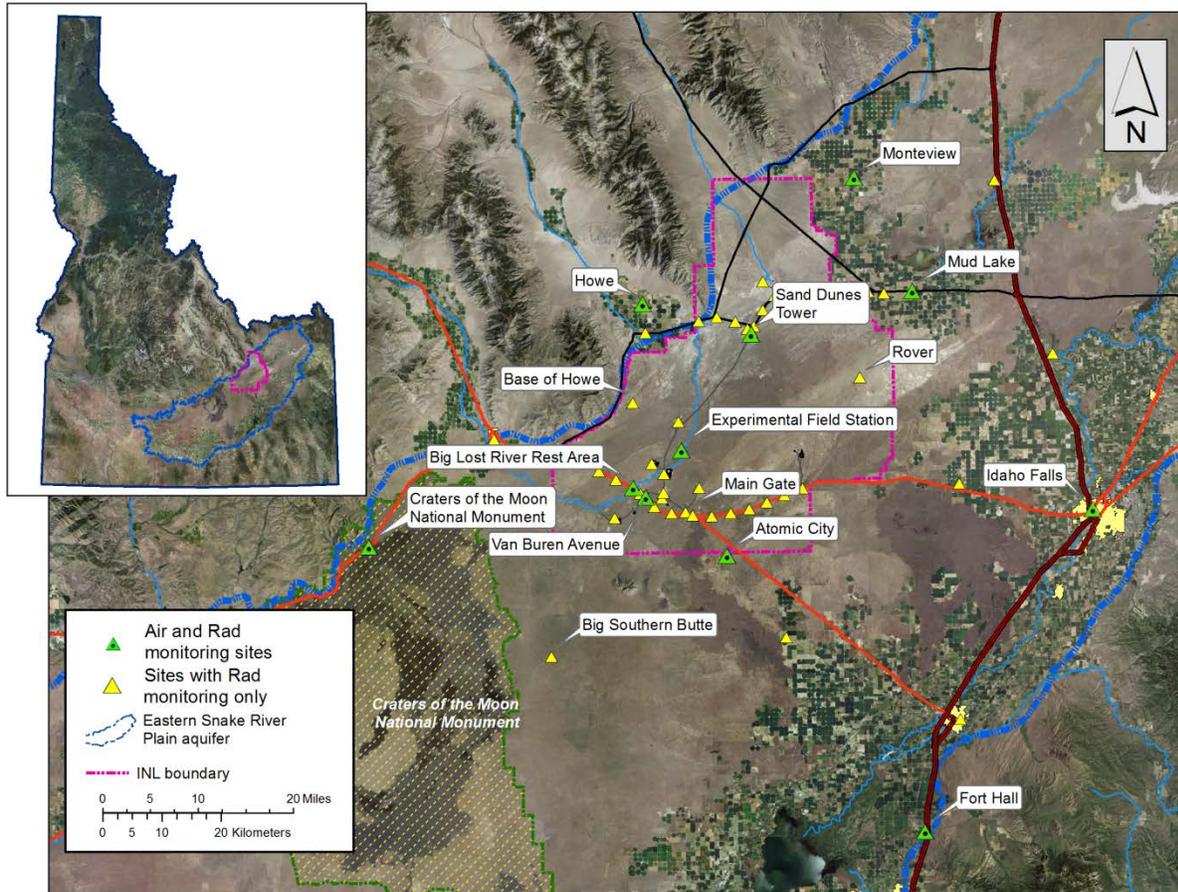


Figure 1. Air and radiation monitoring sites.

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

<sup>1</sup> □ Samples collected weekly; ■ Samples collected quarterly.  
<sup>2</sup> TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

**Table 2. Range of gross alpha and gross beta concentrations for TSP filters, first quarter, 2014.**

Station Location	Concentration					
	Gross Alpha			Gross Beta		
<b>On-Site Locations</b>						
Big Lost River Rest Area	0.3	-	2.2	12.3	-	82.0
Experimental Field Station	0.2	-	2.0	9.4	-	82.2
Sand Dunes Tower	0.2	-	1.5	9.0	-	59.8
Van Buren Avenue	0.1	-	1.5	9.1	-	68.7
<b>Boundary Locations</b>						
Atomic City	0.2	-	1.9	10.6	-	66.2
Howe	0.5	-	1.9	9.6	-	57.1
Monteviu	0.3	-	1.6	6.9	-	64.7
Mud Lake	0.4	-	2.3	13.9	-	96.0
<b>Distant Locations</b>						
Craters of the Moon	0.1	-	1.2	7.9	-	47.0
Fort Hall <sup>1</sup>	0.2	-	1.2	6.6	-	45.0
Idaho Falls – HVP 3804	0.3	-	1.6	12.3	-	70.7
Idaho Falls – HVP 4304	0.3	-	1.8	10.9	-	75.1

<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, first quarter, 2014.**

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
<b>On-site Locations</b>			
Big Lost River Rest Area	50.3	2.8	<MDC <sup>2</sup>
Experimental Field Station	44.7	2.6	<MDC
Sand Dunes Tower	40.8	2.2	<MDC
Van Buren Avenue	41.8	2.3	<MDC
<b>Boundary Locations</b>			
Atomic City	41.9	2.4	<MDC
Howe	41.5	2.3	<MDC
Monteviu	43.8	2.5	<MDC
Mud Lake	62.5	3.3	<MDC
<b>Distant Locations</b>			
Craters of the Moon	41.8	2.3	<MDC
Fort Hall <sup>1</sup>	37.9	2.1	<MDC
Idaho Falls – HVP 3804	61.5	3.2	<MDC
Idaho Falls – HVP 4304	57.1	3.0	<MDC

<sup>1</sup> Operated by Shoshone-Bannock Tribes.  
<sup>2</sup> MDC for Cs-137 typically  $(5-10) \times 10^{-5}$  pCi/m<sup>3</sup>.  
 Note: Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup> with associated uncertainty (± 2 SD), and minimum detectable concentration (MDC).

**Table 4. Tritium concentrations in air from atmospheric moisture, first quarter, 2014.**

Station Location	Tritium		
	Concentration	± 2 SD	MDC
<b>On-site Locations</b>			
Big Lost River Rest Area	-0.03	0.22	0.38
Experimental Field Station	0.02	0.21	0.35
Sand Dunes Tower	0.01	0.25	0.40
Van Buren Avenue	0.05	0.26	0.42
<b>Boundary Locations</b>			
Atomic City	-0.08	0.12	0.20
Howe	0.07	0.23	0.38
Mud Lake	-0.03	0.27	0.46
Monteview	0.10	0.29	0.47
<b>Distant Locations</b>			
Craters of the Moon	-0.01	0.25	0.41
Fort Hall <sup>1</sup>	0.18	0.32	0.53
Idaho Falls	0.03	0.30	0.49

<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, first quarter, 2014.**

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
<b>On-site Locations</b>						
Big Lost River Rest Area	10	110	180	0.7	1.7	2.9
<b>Boundary Locations</b>						
Atomic City	0.0	110	180	0.4	1.9	3.2
Howe	30	110	180	0.4	2.6	4.3
Monteview	-30	80	140	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
Mud Lake	-20	110	180	-0.8	1.3	2.3
<b>Distant Locations</b>						
Idaho Falls	0.0	110	180	0.9	1.8	3.0

<sup>1</sup>Insufficient sample to perform gamma spectroscopy at Monteview.

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

**Table 6. Annual radiochemical separation analysis data for TSP particulate filters, composite samples, collected during 2013.**

Station Location	Sr <sup>90</sup>			Pu <sup>238</sup>			Pu <sup>239/240</sup>			Am <sup>241</sup>		
	Value <sup>1</sup>	±2SD	MDC	Value <sup>1</sup>	± 2SD	MDC	Value <sup>1</sup>	±2SD	MDC	Value <sup>1</sup>	±2SD	MDC
<b>On-Site Locations</b>												
Rest Area	23.2	9.1	14.3	2.2	2.7	4.5	0.2	1.7	3.2	2.1	2.0	3.3
EFS <sup>3</sup>	7.8	7.0	14.2	0.8	2.5	4.5	-0.9	1.6	3.5	0.6	1.5	2.8
Sand Dunes	8.8	6.7	13.0	2.6	2.3	3.6	0.4	1.2	2.2	0.4	1.5	2.8
Van Buren	6.3	7.1	14.9	2.3	2.1	3.3	1.6	1.7	2.6	2.3	1.6	2.1
<b>Boundary Locations</b>												
Atomic City	11.2	7.1	13.6	1.7	2.5	4.2	0.6	1.4	2.5	-0.9	1.5	3.1
Howe	10.6	8.2	16.3	2.1	3.1	5.3	0.6	1.4	2.6	0.6	1.6	2.8
Montevieu	5.2	7.3	15.7	-1.1	2.1	4.2	0.5	1.3	2.4	0.5	1.5	2.7
Mud Lake	11.7	6.7	12.4	0.5	2.4	4.4	1.2	1.6	2.7	0.3	1.7	3.1
<b>Distant Locations</b>												
Craters of Moon	11.7	7.6	14.6	0.7	2.4	4.4	-0.5	1.3	2.9	0.3	1.6	3.0
Fort Hall <sup>2</sup>	4.6	6.3	13.6	2.2	2.3	3.8	0.1	1.2	2.4	0.9	1.6	2.7
Idaho Falls 3804	5.8	8.2	17.6	-0.2	2.6	4.9	0.7	1.7	3.1	0.0	1.9	3.6
Idaho Falls 4304	16.0	9.0	16.3	3.1	2.9	4.6	1.0	1.3	2.1	1.1	2.0	3.5

Note: Concentrations are reported in  $1 \times 10^{-6}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar year.

<sup>1</sup> Measurable quantities of these radionuclides are expected in the environment due to historic above-ground testing of nuclear weapons. DEQ-INL OP's action levels of 190 for americium-241, 1900 for strontium-90, 210 for plutonium-238, and 200 for plutonium-239/240 (in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>) are 10 percent of the compliance values listed for the specific radionuclide in 40 CFR 61, Appendix E, Table 2.

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

<sup>3</sup> Experimental Field Station

## Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the first quarter of 2014 (**Figure 1**). To detect gamma radiation, each station is instrumented with an electret ionization chamber (EIC), and 11 of the stations also have high-pressure ion chambers (HPIC) (**Table 7**).

The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall equipped with an EIC and HPIC, both of which belong to the DEQ-INL OP. The DEQ-INL OP reports these results.

HPICs are instruments capable of real-time measurements, and are sensitive enough to detect small changes in gamma radiation levels. The real-time gamma radiation measurements collected by the HPICs at each location are radioed to DEQ-INL OP and presented graphically via the worldwide web at <http://www.deq.idaho.gov/inl-oversight/monitoring/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 8** lists the average radiation exposure rates measured by the HPICs for first quarter 2014. **Table 9** lists the EIC monitoring results for first quarter 2014. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation.

**Table 7. 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	■	■
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/Terreton	■	■
<b>Distant Locations</b>		
Craters of the Moon		■
Fort Hall <sup>1</sup>	■	■
Idaho Falls	■	■

<sup>1</sup> HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

**Table 8. Average gamma exposure rates, first quarter, 2014, from HPIC network.**

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
<b>On-site Locations</b>		
Base of Howe	16.0	1.0
Big Lost River Rest Area	15.3	1.0
Main Gate <sup>1</sup>	-	-
Rover <sup>1</sup>	-	-
Sand Dunes Tower	13.4	0.9
<b>Boundary Locations</b>		
Atomic City <sup>2</sup>	12.9	1.0
Big Southern Butte <sup>2</sup>	14.8	0.8
Howe Met Tower	13.2	0.8
Monteview	13.3	0.7
Mud Lake/Terreton	14.5	0.9
<b>Distant Locations</b>		
Fort Hall <sup>1,3</sup>	-	-
Idaho Falls	11.1	1.1

<sup>1</sup> Insufficient data recovery to report.

<sup>2</sup> Data recovery or technical issues invalidated measurements during part of this quarter. The values reported here are estimated based on data considered to be valid.

<sup>3</sup> Operated by Shoshone-Bannock Tribes.

**Table 9. Electret ionization chamber (EIC) cumulative average exposure rates, first quarter, 2014.**

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average <sup>1</sup>	± 2 SD
<b>On-site Locations</b>		
Base of Howe	13.0	1.1
Big Lost River Rest Area	12.7, 12.5	
Experimental Field Station	15.0 15.1	
Main Gate	14.5	2.7
Rover	13.1	3.3
Sand Dunes Tower	13.0	2.0
Van Buren Avenue	15.2	1.9
<b>Boundary Locations</b>		
Atomic City	12.8	3.2
Big Southern Butte	13.2, 14.5	
Howe Met Tower	13.3	2.8
Monteview	11.9	0.6
Mud Lake / Terretton	13.5	0.1
<b>Distant Locations</b>		
Craters of the Moon	13.5, 13.2	
Fort Hall <sup>2</sup>	11.0	2.9
Idaho Falls	13.3	2.9

<sup>1</sup> Results are the average of triplicate measurements with the associated variability (±2 SD), or the 2 measured exposure rates remaining after deletion of an outlying value, based on the historical population variability (reject if outside of ± 2 SD) and judgment of the data analyst.

<sup>2</sup> Station operated by Shoshone-Bannock Tribes.

## Water Monitoring

Water monitoring sites are sampled for the purposes of examining trends of INL contaminants and other general ground water quality indicators and for verifying DOE monitoring results. Sites sampled include ground water locations (wells and springs), surface water locations (streams), and selected wastewater sites. Sample sites have been selected to aid in identifying INL impacts on the Eastern Snake River Plain Aquifer (ESRPA), and are categorized as up-gradient, facility, boundary, distant, surface water, and waste water, (**Figure 1 and Figure 2**). 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 first quarter of 2014, five facility locations were sampled at or near the INTEC facility. One location, USGS-047, could not be sampled due to equipment failure. USGS-048, located approximately 700 feet to the south of USGS-047, was sampled instead.

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 alpha emitting isotopes of plutonium ( $^{238}\text{Pu}$ ,  $^{239/240}\text{Pu}$ ), uranium ( $^{234}\text{U}$ ,  $^{235}\text{U}$ , and  $^{238}\text{U}$ ), and americium ( $^{241}\text{Am}$ ); and beta emitting radionuclides technetium-99 ( $^{99}\text{Tc}$ ) and strontium-90 ( $^{90}\text{Sr}$ ), 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 three of the five INTEC facility locations and was 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 at all five INTEC facility locations sampled this quarter. Concentrations observed at these locations are similar to previous values collected and with the exception of one site, USGS-123, represent past INL waste disposal practices. The MCL for beta and gamma radioactivity is 4 mrem/year, equivalent to 8 pCi/L if the source is  $^{90}\text{Sr}$ ; 900 pCi/L if  $^{99}\text{Tc}$ ; 20,000 pCi/L if tritium ( $^3\text{H}$ ); or 200 pCi/L if  $^{137}\text{Cs}$ . Man-made, gamma emitting radioactivity was not detected at any of the sampled locations. Results for gross alpha; gross beta; and man-made, gamma emitting  $^{137}\text{Cs}$  are shown in **Table 10**.

All sites were sampled for isotopes of plutonium, with all results reporting as non-detectable (**Table 11**). All sites were sampled for isotopes of uranium with all showing detectable results for  $^{234}\text{U}$  and  $^{238}\text{U}$  and all showing non-detections for  $^{235}\text{U}$  (**Table 12**). The results observed at the five sample sites cannot be distinguished from background values, which means the uranium found in the samples is likely to be naturally occurring. All sites were sampled for  $^{241}\text{Am}$  this quarter. There were no detections (**Table 13**). Four of the five samples analyzed for  $^{90}\text{Sr}$  had detectable results this quarter, with three above the MCL of 8 pCi/L (**Table 14**). All samples were collected in an area of known contamination at or near the INTEC facility. All locations were sampled for  $^{99}\text{Tc}$  with reported values within the expected ranges of concentrations typically found at these sites. All reported values are well below the MCL of 900 pCi/L (**Table 15**).

Using the standard analytical method,  $^3\text{H}$  was detected at all locations sampled (**Table 16**). Tritium levels found are comparable to historic concentrations for these sites and are consistent with INL waste disposal influences at the INTEC facility. Sample location USGS-048, which was sampled in place of USGS-047, reports a  $^3\text{H}$  value over three times what is typically seen at USGS-047 ( $1470\pm 130$  pCi/L in 2014 compared to  $370\pm 110$  pCi/L in 2013 respectively). 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. There were no samples analyzed using the enrichment method for the current quarter; however sample analyses from sixteen sites collected during previous quarters were completed and results presented during this quarter (**Table 17**). There are two separate values reported for MV-57. This sample was originally analyzed and reported in the 2013 fourth quarter INL-OP report as  $32\pm 8$  pCi/L, more than double its normal value. The lab reanalyzed the sample by recounting (RC) receiving a result less than half the original reported value of  $14\pm 9$  pCi/L. Based on two conflicting results, the lab reanalyzed again by re-pipetting and recounting (RP) receiving a result closely resembling the RC value at  $16\pm 10$  pCi/L. The RC result is considered to be the most representative value for groundwater conditions at MV-57. A backlog of 22 samples remains.

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

Volatile Organic Compounds (VOCs) were sampled at one location, USGS-123, this quarter. There were no detectable concentrations for any analytes and therefore a result table is not included. The background concentrations for VOCs should be zero. A complete list of analytes is shown in **Appendix C**.

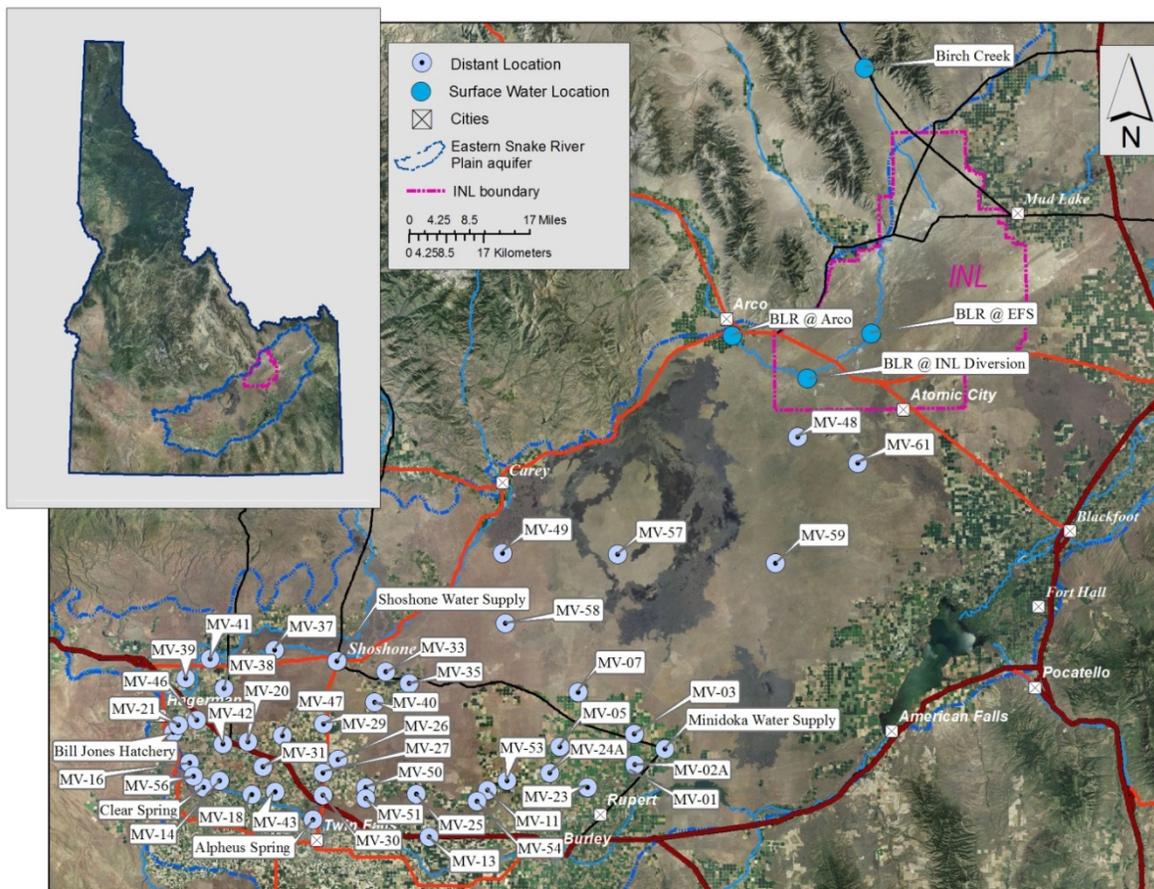


Figure 2. Distant and surface water monitoring locations.

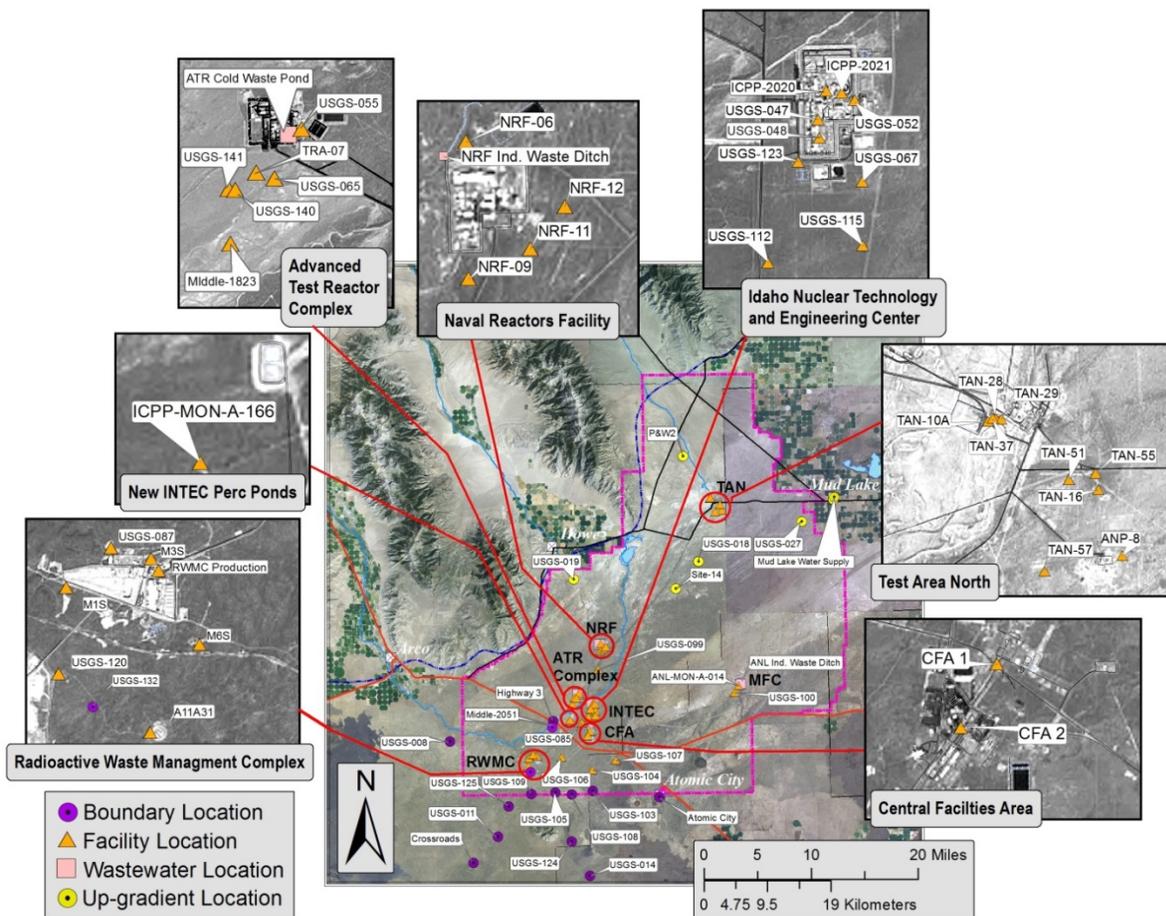


Figure 3. Upgradient, facility, boundary, and wastewater monitoring locations.

Table 10. Alpha, beta, and gamma concentrations for water samples, first quarter, 2014.

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>Facility</b>										
ICPP-2020	3/20/2014	1.5		0.9	131.5		2.8	-0.2	U	1.7
USGS-048	3/20/2014	-0.6	U	0.5	30		1.5	0.9	U	1.3
USGS-052	3/20/2014	1.2		0.8	163.9		3.0	-0.6	U	1.4
USGS-067	3/18/2014	1.0	U	0.8	103.6		2.5	-0.6	U	1.3
USGS-123	3/3/2014	1.6		0.7	3.8		0.9	-1.3	U	1.3

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

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

**Table 11. Reported concentrations of plutonium isotopes in water samples, first quarter, 2014.**

Sample Location	Sample Date	Plutonium-238		Plutonium-239/240			
		Concentration <sup>1,2</sup>	±2 SD	Concentration <sup>1,2</sup>	±2 SD		
<b>Facility</b>							
ICPP-2020	3/20/2014	0.003	U	0.012	0.001	U	0.012
USGS-048	3/20/2014	-0.001	U	0.014	0.003	U	0.014
USGS-052	3/20/2014	0	U	0.013	-0.006	U	0.013
USGS-067	3/18/2014	-0.001	U	0.012	-0.003	U	0.012
USGS-123	3/3/2014	0.0019	U	0.0092	-0.0037	U	0.0092

<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 uranium isotopes in water samples, first quarter, 2014.**

Sample Location	Sample Date	Uranium-234		Uranium-235		Uranium-238		
		Concentration <sup>1,2</sup>	±2 SD	Concentration <sup>1,2</sup>	±2 SD	Concentration <sup>1,2</sup>	±2 SD	
<b>Facility</b>								
ICPP-2020	3/20/2014	1.96	0.44	0.070	U	0.067	0.84	0.24
USGS-048	3/20/2014	1.40	0.33	0.042	U	0.047	0.69	0.20
USGS-052	3/20/2014	1.63	0.38	0.028	U	0.046	0.68	0.20
USGS-067	3/18/2014	1.65	0.37	0.056	U	0.058	0.92	0.24
USGS-123	3/3/2014	1.15	0.28	0.018	U	0.040	0.61	0.18

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

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

**Table 13. Reported concentrations of americium-241 in water samples, first quarter, 2014.**

Sample Location	Sample Date	Americium-241		
		Concentration <sup>1,2</sup>	±2 SD	
<b>Facility</b>				
ICPP-2020	3/20/2014	-0.009	U	0.015
USGS-048	3/20/2014	-0.009	U	0.015
USGS-052	3/20/2014	-0.002	U	0.017
USGS-067	3/18/2014	-0.007	U	0.015
USGS-123	3/3/2014	-0.015	U	0.014

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

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

**Table 14. Reported concentrations of strontium-90 in water samples, first quarter 2014.**

Sample Location	Sample Date	Strontium-90		
		Concentration <sup>1,2</sup>	±2 SD	
<b>Facility</b>				
ICPP-2020	3/20/2014	10.4	2.5	
USGS-048	3/20/2014	10.3	2.5	
USGS-052	3/20/2014	2.15	0.61	
USGS-067	3/18/2014	11.0	2.7	
USGS-123	3/3/2014	0.13	U	0.30

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

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

**Table 15. Reported concentrations of technetium-99 in water samples, first quarter, 2014.**

Sample Location	Sample Date	Technetium-99		
		Concentration <sup>1,2</sup>		±2 SD
<b>Facility</b>				
ICPP-2020	3/20/2014	222.1		1.3
USGS-048	3/20/2014	3.5		0.2
USGS-052	3/20/2014	362.1		1.6
USGS-067	3/18/2014	141.3		1.0
USGS-123	3/3/2014	2.3		0.2

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

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

**Table 16. Tritium concentrations for water samples, first quarter, 2014.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		±2 SD
<b>Facility</b>				
ICPP-2020	3/20/2014	2200		150
USGS-048	3/20/2014	1470		130
USGS-052	3/20/2014	890		120
USGS-067	3/18/2014	2820		160
USGS-123	3/3/2014	2700		160

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

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

**Table 17. Enriched Tritium concentrations for water samples from previous sampling quarters, 2013.**

Sample Location	Sample Date	Enriched Tritium		
		Concentration <sup>1,2</sup>		±2 SD
<b>Upgradient</b>				
Mud Lake Water Supply	8/15/2013	1	U	6
<b>Facility</b>				
ICPP-MON-A-166	9/17/2013	68		8
<b>Boundary</b>				
USGS-103*	6/03/2013	114		10
USGS-108*	6/05/2013	45		8
<b>Distant</b>				
Alpheus Spring	8/13/2013	15		6
Bill Jones Hatchery	8/13/2013	10		5
Clear Spring	8/13/2013	7	U	7
Minidoka Water Supply	8/13/2013	4	U	7
MV-31	6/25/2013	17		9
MV-35	7/8/2013	1	U	7
MV-41	7/8/2013	15		7
MV-57 <sup>3</sup>	6/24/2013	14 (RC)	U	9
MV-57 <sup>3</sup>	6/24/2013	16 (RP)	U	10
MV-58	8/28/2013	8	U	6
Shoshone Water Supply	8/13/2013	25		7
<b>Waste Water</b>				
TRA Cold Waste Pond	7/17/2013	44		8

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

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

<sup>3</sup>This sample was analyzed and reported previously in the 2013 fourth quarter INL-OP report as 32±8 pCi/L; it was reanalyzed by recounting (RC) and again by re-pipetting and recounting (RP). The RC result is considered to be the most representative value for groundwater conditions at MV-57.

\*USGS-103 (Zone 1) = 1269.4 ft below land surface (bls).

\*USGS-108 (Zone 7) = 890.0 ft bls.

**Table 18. Reported metals concentrations in water samples, first quarter, 2014.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>															
		Arsenic		Barium	Chromium		Iron		Lead		Manganese		Selenium		Zinc		
<b>Facility</b>																	
ICPP-2020	3/20/2014	<5.0	U	120		85		620		<5.0	U	18		<10	U	<5.0	U
USGS-048	3/20/2014	<5.0	U	82		7.5		51		<5.0	U	2.1		<10	U	<5.0	U
USGS-052	3/20/2014	<5.0	U	86		7.9		<10	U	<5.0	U	<2.0	U	<10	U	<5.0	U
USGS-067	3/18/2014	<5.0	U	120		7.3		12		<5.0	U	<2.0	U	<10	U	<5.0	U
USGS-123	3/3/2014	<5.0	U	48		12		560		<5.0	U	7.8	J	<10	U	<5.0	U

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

<sup>2</sup>Concentrations are expressed in µg/L. Samples are filtered unless otherwise indicated.

**Table 19. Reported common ion concentrations in water samples, first quarter, 2014.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>															
		Calcium	Magnesium		Sodium	Potassium	Fluoride	Chloride	Sulfate	Alkalinity <sup>3</sup>							
<b>Facility</b>																	
ICPP-2020	3/20/2014	60		17		21		3.2		0.277		53.6		38.9		139	
USGS-048	3/20/2014	50		14		13		2.5		0.304		22.7		25.8		147	
USGS-052	3/20/2014	50		15		13		2.8		<0.20	U	22.6		25.8		145	
USGS-067	3/18/2014	54		15		24		3.6		0.228		48.1		29.6		137	
USGS-123	3/3/2014	40		16		11		3.5		0.255		23.6		22.1		126	

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

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

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

**Table 20. Reported nutrient concentrations in water samples, first quarter, 2014.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>	
		Nitrite + Nitrate	Phosphorus
<b>Facility</b>			
ICPP-2020	3/20/2014	4.7	0.030
USGS-048	3/20/2014	2.6	0.031
USGS-052	3/20/2014	2.7	0.028
USGS-067	3/18/2014	5.8	0.030
USGS-123	3/3/2014	1.1	0.035

<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.

## Terrestrial Monitoring Results

The DEQ-INL OP conducts terrestrial (soil and milk) monitoring to characterize deposition and migration of contaminants, and provide independent verification of DOE's terrestrial monitoring programs. Soil sampling and *in-situ* gamma spectrometry are used to characterize actual deposition and accumulation of radioactive contaminants in soils. Milk samples are collected to evaluate the potential for ingestion of radioactivity by the population around the INL.

### Milk

DEQ-INL OP monitors milk for the naturally occurring radionuclide potassium-40 ( $^{40}\text{K}$ ) and man-made iodine-131 ( $^{131}\text{I}$ ). Milk samples are collected on a monthly basis. Riverside is a small operation that was able to resume milk sampling in March. Results for analyses of milk samples are presented in **Table 21**.  $^{40}\text{K}$  was detected in all samples within the expected range of concentration.  $^{131}\text{I}$  was not detected. Based on measurements of radionuclides in milk, there were no discernable impacts to the off-site environment from INL operations.

**Table 21. Gamma spectroscopy analysis data for milk samples, first quarter, 2014.**

Sample Location/Dairy	Sample Date	Naturally occurring Potassium-40		Man-made Iodine-131 <sup>1</sup>
		Concentration <sup>3</sup>	± 2 SD	
<b>Monitoring Samples</b>				
Ft. Hall	1/06/2014	1397	110	<MDC
	2/04/2014	1620	116	<MDC
	3/03/2014	1711	120	<MDC
Gooding/Glanbia	1/07/2014	1411	111	<MDC
	2/03/2014	1874	117	<MDC
	3/19/2014	1723	121	<MDC
Riverside	3/02/2014	1855	116	<MDC
<b>Verification Samples<sup>2</sup></b>				
Dietrich	1/07/2014	1489	118	<MDC
Howe	1/07/2014	1649	113	<MDC
Rupert	2/04/2014	1617	116	<MDC
Terreton	2/04/2014	1768	111	<MDC
Idaho Falls	3/04/2014	1766	111	<MDC
Dietrich	3/04/2014	1610	117	<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.

### Soil

No *in-situ* gamma spectroscopic measurements were performed, nor were any soil samples physically collected during the first calendar quarter of 2014.

## 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, in many cases, identify and address errors or inaccuracies. The DEQ-INL OP quality assurance program is designed to (1) ensure sample integrity, (2) ensure precision and accuracy in the analytical results, and (3) ensure that the environmental data are representative and complete.

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the first quarter of 2014 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 first quarter of 2014, the DEQ-INL OP submitted 73 QC samples for various radiological and non-radiological analyses (**Table 22**).

### Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or immeasurable amounts of the analyst(s) of interest in them. They are designed to determine if an analysis will yield a "zero" result when no contaminant is present, or a sufficiently low result to serve as an acceptable measure of "background." Blank samples are used to monitor for bias introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the first quarter of 2014 are presented in **Table 23**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 24**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 25**. Blank analysis results for radiochemical separation analyses for TSP particulate filters collected during 2013 are presented in **Table 26**. Blank analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 27**, **Table 28**, **Table 29**, and **Table 30**.

One anomaly was noticed during the assessment of field blank water samples as measured by the analytical laboratories used by DEQ-INL OP for the first quarter of 2014. This included a detection for manganese in a blank sample with a concentration of 40 µg/L (**Table 28**). There was only one site (USGS-123) that was sampled on the same day as the blank sample. This site had a detectable concentration for manganese at a level similar to previous concentrations. The sample will be flagged with a "J" and qualified as an estimate based on the manganese detection in the blank sample.

### Duplicate Samples

A laboratory's analytical precision capability, i.e., its ability to reproduce results, is assessed by comparing duplicate sample results. Duplicate samples are samples collected from the same location at approximately the same time and are considered to be essentially identical in composition. The difference

between duplicate sample results is expressed as the relative percent difference (RPD), calculated from the following equation:

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

Where:

R<sub>1</sub> = First sample result.

R<sub>2</sub> = Second sample result.

A relative percent difference of up to ± 20 percent is acceptable. For non-radiological analysis, the RPD is used to compare each set of duplicate samples in which both of the results exceed five times the detection level. If one or both of the duplicate sample results are less than five times the detection level, the absolute difference between the two results is acceptable if it is less than or equal to the method detection limit.

For radiological analysis, the RPD is calculated (using the above equation) to compare duplicate samples if both duplicate results are greater than the sample-specific minimum detectable concentration (MDC). DEQ-INL OP also considers duplicate sample results that have an absolute difference of no more than three times the pooled error (three times the root mean square of the standard deviations) to be in acceptable agreement. This is accomplished using the following equation:

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

Where:

R<sub>1</sub> = First sample result.

R<sub>2</sub> = Second sample result.

S<sub>1</sub> = Counting error (one standard deviation) associated with the laboratory measurement of the first sample.

S<sub>2</sub> = Counting error (one standard deviation) associated with the laboratory measurement of the second sample.

Radiological duplicate sample results satisfying either the RPD or pooled error test are considered acceptable.

Duplicate results for ground and surface water are presented in **Table 31** for radiological analyses, and **Table 32** and **Table 33** for non-radiological analyses.

All duplicate comparisons passed DEQ-INL criteria for the first quarter of 2014.

## 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 ± 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.

Spike samples were not used during the first quarter of 2014.

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 (EICs) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of near 30 mR and two additional higher and lower 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% of the known irradiated quantity. The irradiation results for first quarter 2014 are presented in **Table 34**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets. All EIC spiked samples passed the DEQ-INL OP criteria.

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

Other than the blank 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 first quarter of 2014, 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 first quarter of 2014.

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 first quarter of 2014 met the minimum criteria of the DEQ-INL OP ESP and is summarized in **Table 22**.

### **Preventative Maintenance and Equipment Reliability**

All equipment was calibrated and checked according to pre-described periodicity. During the first quarter of 2014 there were no equipment failures. Service reliability for air sampling equipment for the first quarter of 2014 is summarized in **Table 35**.

### **Conclusion**

All data collected for the first quarter of 2014 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 22. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP, first quarter, 2014.**

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>								
Particulate	4-inch filter	Gross alpha	155	13	0	0	1	ISU-EML
		Gross beta	155	13	0	0	1	ISU-EML
		Gamma emitters	12	1	0	0	0	ISU-EML
		Radiochemical	48	4	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	22	2	0	0	ISU-EML	
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	ISU-EML	
Precipitation	Poly bottle	Tritium	6	0	0	0	0	ISU-EML
		Gamma emitters	5	0	0	0	0	ISU-EML
<b>Water</b>								
Groundwater & Surface Water	Grab or composite	Gross alpha	5	1	1	0	0	ISU-EML
		Gross beta	5	1	1	0	0	ISU-EML
		Gamma emitters	5	1	1	0	0	ISU-EML
		Tritium	5	1	1	0	0	ISU-EML
		Enriched tritium	16	4	1	0	0	ISU-EML
		Technetium-99	5	0	1	0	0	ISU-EML
		Radiochemical	20	0	4	0	0	ISU Sub
		Metals	5	1	1	0	0	IBL
		Common Ions	5	1	1	0	0	IBL
Nutrients	5	1	1	0	0	IBL		
Volatile Organics	1	1	0	0	0	IBL		
<b>Terrestrial</b>								
Milk	Grab or composite	Gamma emitters	13	0	0	0	0	ISU-EML
Soil	<i>in situ</i>	Gamma emitters	0	0	9	0	0	DEQ-INL OP
	Grab – “puck”	Gamma emitters	0	0	0	0	0	ISU-EML
<b>Radiation</b>								
Ambient	EICs	Gamma Radiation	55	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	12	NA	NA	NA	3	DEQ-INL OP
<b>Total Test Analyses</b>			<b>573</b>	<b>45</b>	<b>22</b>	<b>9</b>		
<b>Total of QC Analyses (blanks, duplicates, and spikes)</b>			<b>76</b>					
<b>Percentage of QC analyses of total Test analyses<sup>3</sup></b>			<b>13.3%</b>					
<b>Percentage of usable data<sup>4</sup></b>			<b>99.1%</b>					

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

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

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

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

**Table 23. Blank analysis results for gross alpha and beta in particulate air (TSP), first quarter, 2014.**

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)
01/02/14	01/09/14	2017	0.0	0.1	-0.1	0.4
01/09/14	01/16/14	2017	0.1	0.1	0.1	0.4
01/16/14	01/23/14	2017	0.1	0.1	0.3	0.4
01/23/14	01/30/14	2017	0.0	0.1	0.2	0.5
01/30/14	02/06/14	2017	0.1	0.1	-0.2	0.4
02/06/14	02/13/14	2017	0.0	0.1	-0.5	0.4
02/13/14	02/20/14	2017	0.0	0.1	-0.3	0.5
02/20/14	02/27/14	2017	0.1	0.1	0.2	0.5
02/27/14	03/06/14	2017	0.0	0.1	-0.9	0.5
03/06/14	03/12/14	2017	0.1	0.1	0.0	0.5
03/12/14	03/20/14	2017	0.0	0.1	-0.3	0.5
03/20/14	03/27/14	2017	0.0	0.1	-0.3	0.4
03/27/14	04/03/14	2017	0.0	0.1	-0.3	0.4

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 24. Blank analysis results for gamma spectroscopy for TSP particulate air filters, first quarter, 2014.**

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
04/22/14	2	25	43	27	29	47	-1	6	10
Analysis Date	Cesium-134			Cesium-137					
	Concentration <sup>1</sup>	± 2 SD	MDC	Concentration	± 2 SD	MDC			
04/22/14	0	2	4	1	2	3			

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 weekly 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 25. Blank analysis results for tritium in water vapor from air samples, first quarter, 2014.**

Sample Number	Start Date	Collection Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP141ZTR01	04/14/14	04/16/14	04/29/14	0.01	0.11	0.18
OP141ZTR02	04/14/14	04/16/14	04/29/14	-0.06	0.10	0.18

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

**Table 26. Blank analysis results for 2013 TSP annual radiochemical composites of air filters.**

Location	<sup>90</sup> Sr			<sup>238</sup> Pu			<sup>239</sup> Pu/ <sup>240</sup> Pu			<sup>241</sup> Am		
	Value <sup>1</sup>	± 2 SD	MDC	Value <sup>1</sup>	± 2 SD	MDC	Value <sup>1</sup>	± 2 SD	MDC	Value <sup>1</sup>	± 2 SD	MDC
Blank	0	0.61	1.29	-0.01	0.20	0.37	-0.05	0.12	0.26	-0.06	0.16	0.32

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 year. 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 radiological analytes in ground and surface water, first quarter, 2014.**

Sample Number	Sample Date	Concentration <sup>1</sup>	± 2 SD	MDC	Within Blank Criteria?
<b>Gross Alpha</b>					
141W011	3/3/2014	0.1	0.2	0.3	Yes
<b>Gross Beta</b>					
141W011	3/3/2014	0.3	0.6	1.0	Yes
<b>Cesium-137</b>					
141W011	3/3/2014	0.4	2.3	3.9	Yes
<b>Tritium</b>					
141W011	3/3/2014	-90	110	190	Yes
<b>Enriched Tritium</b>					
131W118	7/8/2013	20*	8	12	Yes
131W129	6/3/2013	30*	10	16	Yes
131W508	7/17/2013	19*	6	9	Yes
131W543	9/26/2013	18*	8	11	Yes

<sup>1</sup> Concentrations are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentrations (MDC).

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

**Table 28. Blank analysis results (µg/L) for metals in ground and surface water, first quarter, 2014.**

Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
141W014	3/3/2014	<5	<2	<5	<10	<5	40	<10	<5

**Table 29. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water, first quarter, 2014.**

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
141W015,014,013	3/3/2014	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1	<0.01	<0.005

**Table 30. Blank analysis results (µg/L) for VOCs in groundwater and/or surface water, first quarter, 2014.**

Sample Number	Sample Date	1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl chloride
131W016	3/3/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

**Table 31. Duplicate radiological analysis results in pCi/L for ground and surface water, first quarter, 2014.**

Analysis/ Sample Location	Original Sample Number	Concentration	± 2 SD	Duplicate Sample Number	Concentration	± 2 SD	R <sub>1</sub> -R <sub>2</sub>	$3(S_1^2+S_2^2)^{1/2}$	Within Criteria? <sup>1</sup>
<b>Gross Alpha</b>									
USGS-052	141W029	1.2	0.8	141W039	2.9	1.0	1.7	1.9	Yes
<b>Gross Beta</b>									
USGS-052	141W029	163.9	3.0	141W039	168.7	3.1	4.8	6.5	Yes
<b>Gamma Spectroscopy Cesium-137</b>									
USGS-052	141W029	-0.6	1.4	141W039	-0.1	1.7	0.5	3.3	Yes
<b>Tritium</b>									
USGS-052	141W034	890	120	141W044	870	120	20	255	Yes
<b>Enriched Tritium</b>									
Mud Lake Water Supply	131W492	1	6	131W497	4	6	3	13	Yes
<b>Strontium-90</b>									
USGS-052	141W032	2.15	0.61	141W042	3.00	0.85	0.85	1.57	Yes
<b>Technetium-99</b>									
USGS-052	141W033	362.1	1.6	141W043	354.8	1.6	7.3	3.39	Yes <sup>2</sup>
<b>Plutonium-238</b>									
USGS-052	141W031	0.000	0.015	141W041	0.000	0.013	0.000	0.03	Yes
<b>Plutonium-239/240</b>									
USGS-052	141W031	-0.006	0.013	141W041	-0.002	0.015	0.004	0.03	Yes
<b>Uranium-234</b>									
USGS-052	141W035	1.63	0.38	141W045	1.47	0.34	0.16	0.76	Yes
<b>Uranium-235</b>									
USGS-052	141W035	0.028	0.046	141W045	0.067	0.055	0.039	0.11	Yes
<b>Uranium-238</b>									
USGS-052	141W035	0.68	0.20	141W045	0.68	0.19	0.00	0.41	Yes
<b>Americium-241</b>									
USGS-052	141W030	-0.002	0.017	141W040	-0.004	0.017	0.002	0.04	Yes

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

<sup>2</sup> Compared using RPD criteria.

**Table 32. Duplicate results for metals (µg/L) in ground water and/or surface water, first quarter, 2014.**

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
USGS-052	141W037	3/20/2014	<5	86	7.9	<10	<5	<2	<10	<5
USGS-052	141W047	3/20/2014	<5	86	7.4	<10	<5	<2	<10	<5
<b>RPD</b>			<b>0.0</b>	<b>0.0</b>	<b>7.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>

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

**Table 33. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water, first quarter, 2014.**

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
USGS-052	141W038,037,036	3/20/2014	50	15	13	2.8	<0.200	22.6	25.8	145	2.7	0.028
USGS-052	141W048,047,046	3/20/2014	50	15	13	2.8	0.249	22.6	25.9	145	2.7	0.028
<b>RPD</b>			<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>-21.8<sup>1</sup></b>	<b>0.0</b>	<b>-0.4</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>

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

<sup>1</sup>Both results were less than five times the detection limit; their absolute difference is acceptable ( $\leq$  the method detection limit of 0.20 mg/L).

**Table 34. Electret ionization chamber irradiation results (categorized as spiked samples), first quarter, 2014.**

Electret #	Exposure Received		Net Measured Exposure <sup>1</sup>		%R
	(mR)	Uncertainty (±1 SD, mR)	(mR)	Uncertainty (±1 SD, mR)	
SGP586	40.0	2.0	34.4	1.4	86
SGP560	40.0	2.0	35.1	1.4	88
SGP528	40.0	2.0	36.5	1.4	91
SFV760	30.1	1.5	30.8	1.2	102
SFV701	30.1	1.5	30.7	1.2	102
SFV727	30.1	1.5	30.0	1.2	100
SFV724	24.0	1.2	24.7	1.2	103
SFV784	24.0	1.2	23.9	1.2	100
SFV745	24.0	1.2	26.0	1.2	108

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

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

**Table 35. Air sampling field equipment service reliability (percent operational), first quarter, 2014.**

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%	100%	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, first quarter, 2014.**

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>	01/02/14	01/09/14	0.7	0.2	38.2	1.3
	01/09/14	01/16/14	0.5	0.2	19.6	1.0
	01/16/14	01/23/14	2.2	0.3	82.0	1.9
	01/23/14	01/30/14	1.0	0.3	55.8	1.6
	01/30/14	02/06/14	0.5	0.2	22.1	1.0
	02/06/14	02/13/14	0.5	0.2	24.5	1.1
	02/13/14	02/20/14	0.3	0.2	13.9	0.9
	02/20/14	02/27/14	0.5	0.2	18.3	1.0
	02/27/14	03/06/14	0.5	0.2	23.5	1.1
	03/06/14	03/12/14	0.5	0.2	12.3	0.9
	03/12/14	03/20/14	0.7	0.2	19.9	0.9
	03/20/14	03/27/14	0.8	0.2	26.3	1.1
	03/27/14	04/03/14	0.6	0.2	13.1	0.9
<b>Experimental Field Station</b>	01/02/14	01/09/14	0.6	0.2	33.8	1.3
	01/09/14	01/16/14	0.5	0.2	18.4	1.0
	01/16/14	01/23/14	2.0	0.3	82.2	1.9
	01/23/14	01/30/14	0.8	0.2	49.3	1.5
	01/30/14	02/06/14	0.4	0.2	19.7	1.0
	02/06/14	02/13/14	0.3	0.2	20.8	1.1
	02/13/14	02/20/14	0.3	0.2	11.3	0.8
	02/20/14	02/27/14	0.4	0.2	15.8	0.9
	02/27/14	03/06/14	0.5	0.2	18.7	1.0
	03/06/14	03/12/14	0.2	0.1	9.4	0.9
	03/12/14	03/20/14	0.4	0.2	18.0	0.9
	03/20/14	03/27/14	0.7	0.2	21.6	1.1
	03/27/14	04/03/14	0.3	0.2	10.5	0.8
<b>Sand Dunes</b>	01/02/14	01/09/14	0.6	0.2	29.6	1.1
	01/09/14	01/16/14	0.5	0.2	15.3	0.8
	01/16/14	01/23/14	1.5	0.2	59.8	1.5
	01/23/14	01/30/14	0.8	0.2	48.3	1.4
	01/30/14	02/06/14	0.3	0.1	21.0	1.0
	02/06/14	02/13/14	0.5	0.2	25.8	1.1
	02/13/14	02/20/14	0.3	0.1	11.4	0.8
	02/20/14	02/27/14	0.3	0.1	12.7	0.8
	02/27/14	03/06/14	0.4	0.2	17.5	0.9
	03/06/14	03/12/14	0.3	0.1	9.1	0.8
	03/12/14	03/20/14	0.4	0.1	15.0	0.8
	03/20/14	03/27/14	0.6	0.2	19.3	0.9
	03/27/14	04/03/14	0.2	0.1	9.0	0.7

**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, first quarter, 2014.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
<b>Van Buren</b>	01/02/14	01/09/14	0.5	0.2	28.2	1.1
	01/09/14	01/16/14	0.5	0.2	15.4	0.9
	01/16/14	01/23/14	1.5	0.3	68.7	1.7
	01/23/14	01/30/14	0.9	0.2	42.5	1.4
	01/30/14	02/06/14	0.4	0.2	17.4	0.9
	02/06/14	02/13/14	0.3	0.1	18.5	1.0
	02/13/14	02/20/14	0.1	0.1	9.8	0.8
	02/20/14	02/27/14	0.5	0.2	14.1	0.9
	02/27/14	03/06/14	0.5	0.2	17.3	1.0
	03/06/14	03/12/14	0.2	0.1	9.1	0.8
	03/12/14	03/20/14	0.6	0.2	15.7	0.8
	03/20/14	03/27/14	0.8	0.2	21.0	1.0
	03/27/14	04/03/14	0.3	0.1	9.6	0.8
<b>Boundary Locations</b>						
<b>Atomic City</b>	01/02/14	01/09/14	0.7	0.2	31.1	1.2
	01/09/14	01/16/14	0.4	0.2	16.8	0.9
	01/16/14	01/23/14	1.9	0.3	66.2	1.6
	01/23/14	01/30/14	0.9	0.2	48.1	1.4
	01/30/14	02/06/14	0.2	0.1	18.5	0.9
	02/06/14	02/13/14	0.3	0.1	17.6	0.9
	02/13/14	02/20/14	0.3	0.1	10.6	0.8
	02/20/14	02/27/14	0.3	0.1	14.6	0.9
	02/27/14	03/06/14	0.5	0.2	16.7	0.9
	03/06/14	03/12/14	0.3	0.2	10.6	0.9
	03/12/14	03/20/14	0.4	0.1	16.3	0.8
	03/20/14	03/27/14	0.7	0.2	21.4	1.0
	03/27/14	04/03/14	0.5	0.2	10.7	0.8
<b>Howe</b>	01/02/14	01/09/14	1.2	0.2	26.5	1.2
	01/09/14	01/16/14	0.5	0.2	15.4	0.9
	01/16/14	01/23/14	1.9	0.3	57.1	1.6
	01/23/14	01/30/14	0.9	0.2	41.5	1.4
	01/30/14	02/06/14	0.6	0.2	20.9	1.0
	02/06/14	02/13/14	0.8	0.2	27.2	1.2
	02/13/14	02/20/14	1.2	0.3	12.1	0.9
	02/20/14	02/27/14	0.6	0.2	13.9	0.9
	02/27/14	03/06/14	0.8	0.2	17.5	1.0
	03/06/14	03/12/14	1.4	0.3	12.2	1.0
	03/12/14	03/20/14	0.8	0.3	18.8	1.2
	03/20/14	03/27/14	1.2	0.2	20.7	1.1
	03/27/14	04/03/14	0.5	0.2	9.6	0.8

**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, first quarter, 2014.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
<b>Montevieu</b>	01/02/14	01/09/14	0.5	0.2	31.1	1.2
	01/09/14	01/16/14	0.3	0.2	19.3	1.0
	01/16/14	01/23/14	1.6	0.3	64.7	1.7
	01/23/14	01/30/14	0.9	0.2	46.4	1.5
	01/30/14	02/06/14	0.5	0.2	26.1	1.1
	02/06/14	02/13/14	0.7	0.2	27.2	1.1
	02/13/14	02/20/14	0.4	0.2	11.6	0.8
	02/20/14	02/27/14	0.5	0.2	15.4	0.9
	02/27/14	03/06/14	0.7	0.2	23.7	1.1
	03/06/14	03/12/14	0.3	0.1	10.6	0.9
	03/12/14	03/20/14	0.6	0.2	13.8	0.8
	03/20/14	03/27/14	0.9	0.2	21.3	1.0
	03/27/14	04/03/14	0.6	0.2	6.9	0.7
<b>Mud Lake</b>	01/02/14	01/09/14	0.8	0.2	41.8	1.4
	01/09/14	01/16/14	0.6	0.2	25.5	1.1
	01/16/14	01/23/14	2.3	0.3	96.0	2.0
	01/23/14	01/30/14	0.8	0.2	54.3	1.5
	01/30/14	02/06/14	0.6	0.2	30.0	1.2
	02/06/14	02/13/14	0.6	0.2	32.4	1.2
	02/13/14	02/20/14	0.4	0.2	15.7	0.9
	02/20/14	02/27/14	0.8	0.2	23.3	1.1
	02/27/14	03/06/14	1.4	0.3	28.3	1.2
	03/06/14	03/12/14	0.9	0.2	14.6	1.0
	03/12/14	03/20/14	1.3	0.2	25.1	1.0
	03/20/14	03/27/14	1.4	0.3	29.1	1.2
	03/27/14	04/03/14	1.0	0.2	13.9	0.9
<b>Distant Locations</b>						
<b>Craters of the Moon</b>	01/02/14	01/09/14	0.4	0.2	19.9	1.0
	01/09/14	01/16/14	0.2	0.1	11.2	0.8
	01/16/14	01/23/14	1.2	0.2	47.0	1.5
	01/23/14	01/30/14	0.4	0.2	32.6	1.3
	01/30/14	02/06/14	0.2	0.1	15.2	0.9
	02/06/14	02/13/14	0.3	0.2	11.2	0.8
	02/13/14	02/20/14	0.1	0.1	9.3	0.8
	02/20/14	02/27/14	0.3	0.1	10.8	0.8
	02/27/14	03/06/14	0.2	0.2	13.2	0.9
	03/06/14	03/12/14	0.2	0.1	7.9	0.8
	03/12/14	03/20/14	0.4	0.2	14.8	0.9
	03/20/14	03/27/14	0.5	0.2	18.4	1.0
	03/27/14	04/03/14	0.2	0.1	8.0	0.8

**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, first quarter, 2014.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
<b>Fort Hall<sup>1</sup></b>	01/02/14	01/09/14	NS <sup>3</sup>	NS <sup>3</sup>	NS <sup>3</sup>	NS <sup>3</sup>
	01/09/14	01/16/14	0.4	0.2	12.4	0.8
	01/16/14	01/23/14	1.2	0.2	45.0	1.4
	01/23/14	01/30/14	0.6	0.2	32.1	1.2
	01/30/14	02/06/14	0.2	0.1	11.3	0.8
	02/06/14	02/13/14	0.3	0.1	11.5	0.8
	02/13/14	02/20/14	0.3	0.2	7.4	0.7
	02/20/14	02/27/14	0.5	0.2	10.3	0.8
	02/27/14	03/06/14	0.3	0.2	10.4	0.8
	03/06/14	03/12/14	0.3	0.2	6.6	0.8
	03/12/14	03/20/14	0.6	0.2	11.0	0.8
	03/20/14	03/27/14	0.8	0.2	16.5	0.9
	03/27/14	04/03/14	0.3	0.1	7.2	0.7
<b>Idaho Falls - HVP 3804</b>	01/02/14	01/09/14	0.7	0.2	33.9	1.3
	01/09/14	01/16/14	0.5	0.2	16.7	1.0
	01/16/14	01/23/14	1.6	0.3	70.7	1.8
	01/23/14	01/30/14	0.9	0.3	52.8	1.6
	01/30/14	02/06/14	0.3	0.2	18.1	1.1
	02/06/14	02/13/14	0.5	0.2	24.9	1.1
	02/13/14	02/20/14	0.4	0.2	14.4	0.9
	02/20/14	02/27/14	0.7	0.2	17.8	1.0
	02/27/14	03/06/14	0.6	0.2	21.8	1.1
	03/06/14	03/12/14	0.5	0.2	12.4	1.0
	03/12/14	03/20/14	0.8	0.2	19.3	1.0
	03/20/14	03/27/14	1.3	0.3	28.7	1.2
	03/27/14	04/03/14	0.5	0.2	12.3	0.9
<b>Idaho Falls - HVP 4304<sup>2</sup></b>	01/02/14	01/09/14	0.6	0.2	33.5	1.2
	01/09/14	01/16/14	0.4	0.2	17.2	0.9
	01/16/14	01/23/14	1.8	0.3	75.1	1.8
	01/23/14	01/30/14	0.8	0.2	52.6	1.5
	01/30/14	02/06/14	0.3	0.2	16.6	1.0
	02/06/14	02/13/14	0.6	0.2	24.2	1.1
	02/13/14	02/20/14	0.4	0.2	11.5	0.8
	02/20/14	02/27/14	0.5	0.2	14.9	0.9
	02/27/14	03/06/14	0.6	0.2	19.2	1.0
	03/06/14	03/12/14	0.3	0.2	11.2	0.9
	03/12/14	03/20/14	0.9	0.2	17.7	0.9
	03/20/14	03/27/14	1.5	0.3	24.7	1.1
	03/27/14	04/03/14	0.4	0.2	10.9	0.8

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

<sup>2</sup> HVP 4304 – This is a new sampler model being operated side by side with sampler HVP 3804 to test the dependability and durability in field conditions.

<sup>3</sup> NS – No sample for this week due to the sampler not being restarted after filter exchange.

## Appendix B

**Table B-1. Results for all EIC locations, first quarter, 2014.**

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R/hr}$ ) <sup>1</sup>	$\pm 2$ SD ( $\mu\text{R/hr}$ )
Arco	15.6	2.7
Craters	13.5, 13.2	
Rest Area	12.7, 12.5	
Van Buren	15.2	1.9
EFS	15.0, 15.1	
Main Gate	14.5	2.7
Atomic City	12.8	3.2
Taber	12.3	2.8
Blackfoot	11.8	2.1
Fort Hall <sup>2</sup>	11.0	2.9
Idaho Falls	13.3	2.9
Mud Lake/Terreton	13.5	0.1
Montevieu	11.9	0.6
Sand Dunes	13.0	2.0
Howe Met. Tower	13.3	2.8
MP276 -20	11.3	1.4
MP274 -20	11.0	0.6
MP272 -20	10.3	1.9
MP270 -20	11.9	0.9
MP268 -20	12.2, 14.0	
MP266 -20	11.0	0.4
MP264 -20	10.4, 11.0	
MP270 -20/26	14.3, 13.1	
MP268 -20/26	16.0	3.7
MP266 -20/26	12.8, 14.6	
MP263 -20/26	14.8	1.0
MP261 -20/26	12.9	2.7
MP259 -20/26	13.4, 15.2	
MFC (EBR II)	11.5, 12.5	
EBR I	11.0, 11.1	
RWMC	11.5, 12.5	
CFA	14.7	3.2
CITRC (PBF)	12.4	2.2

<sup>1</sup>Results are the average of triplicate exposure rate measurements with the associated sample variability ( $\pm 2$  SD), or the 2 measured exposure rates remaining after removal of an outlying value. One of the triplicate measurements is rejected if it is outside the average of the triplicate measurements  $\pm 2$  SD of the historical population variability. Typically, the two most consistent measurements are reported, based on judgment of the data analyst.

<sup>2</sup>Station operated by Shoshone-Bannock Tribes.

**Table B-1 continued. Results for all EIC locations, first quarter, 2014.**

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R/hr}$ )	$\pm 2 \text{ SD}$ ( $\mu\text{R/hr}$ )
INTEC	14.3	1.7
ATR (TRA)	12.2	0.5
NRF	13.5	1.8
TAN	8.4	3.0
Mud Lake Bank of Commerce	14.8	0.3
MP43-33	15.6	1.6
MP41-33	16.5	0.7
MP39-33	13.7, 15.2	
MP37-33	15.1, 14.7	
MP35-33	11.9, 12.3	
MP33-33	12.7, 14.0	
MP31-33	12.4, 13.6	
MP29-33	14.5	2.1
MP27-33	18.3	1.8
MP25-33	13.1	2.1
MP23-33	11.0	3.4
Base of Howe	13.0	1.1
Rover	13.1	3.3
Hamer	12.7, 11.8	
Sugar City	12.5	0.4
Roberts	9.9, 11.4	3.8
Big Southern Butte	13.2, 14.5	

## 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