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
ATR	-	Advanced Test Reactor
BEA	-	Battelle Energy Alliance, LLC
BLR	-	Big Lost River
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act
CFA	-	Central Facilities Area
CFR	-	Code of Federal Regulations
CITRC	-	Critical Infrastructure Test Range Complex
CWI	-	CH2M-WG Idaho, LLC
DEQ-INL OP	-	The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program
DOE	-	U.S. Department of Energy
EBR I & II	-	Experimental Breeder Reactors I & II
EFS	-	Experimental Field Station
EIC	-	electret ionization chamber
EML	-	Environmental Monitoring Laboratory
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 1/1000th 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^3	-	picocuries per cubic meter
QAPP	-	Quality Assurance Program Plan
QA/QC	-	Quality Assurance/Quality Control
RCRA	-	Resource Conservation and Recovery Act
RPD	-	relative percent difference
RWMC	-	Radioactive Waste Management Complex
RTC	-	Reactor Technology Complex
SD	-	standard deviation
SMCL	-	secondary maximum contaminant level
TAN	-	Test Area North
TDS	-	total dissolved solids
TMI	-	Three Mile Island
TRA	-	Test Reactor Area
TSP	-	total suspended particulate
TSS	-	total suspended solids
USGS	-	U.S. Geological Survey
VOC	-	volatile organic compound
WLAP	-	Wastewater Land Application Permit

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 second quarter, 2014 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter, gaseous radioiodine, precipitation, and water vapor for tritium analysis. (**Table1**). 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 second 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 second 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.

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 second quarter.

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the 11 monitoring stations. This moisture was stripped from the hygroscopic media and analyzed to calculate the atmospheric tritium concentration. Reported values are the result of either a single sample or a weighted mean based upon the volume of air sampled when more than one atmospheric moisture sample was collected during the calendar quarter. In analyzing the weighted means, atmospheric tritium was measured above the minimum detectable concentration (MDC) during the second quarter of 2014 at Experimental Field Station: 0.91 pCi/m^3 (MDC 0.59 pCi/m^3). There are three individual samples within the weighted mean that also exceed MDC, two located at the Big Lost River Rest Area station: 0.49 pCi/m^3 (MDC 0.39 pCi/m^3) and 0.62 pCi/m^3 (MDC 0.57 pCi/m^3); and one at the Van Buren station: 0.57 pCi/m^3 (MDC 0.43 pCi/m^3). The DEQ-INL OP action level for atmospheric tritium is 150 pCi/m^3 (40 CFR 61). Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the second quarter of 2014. 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 2014. 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.

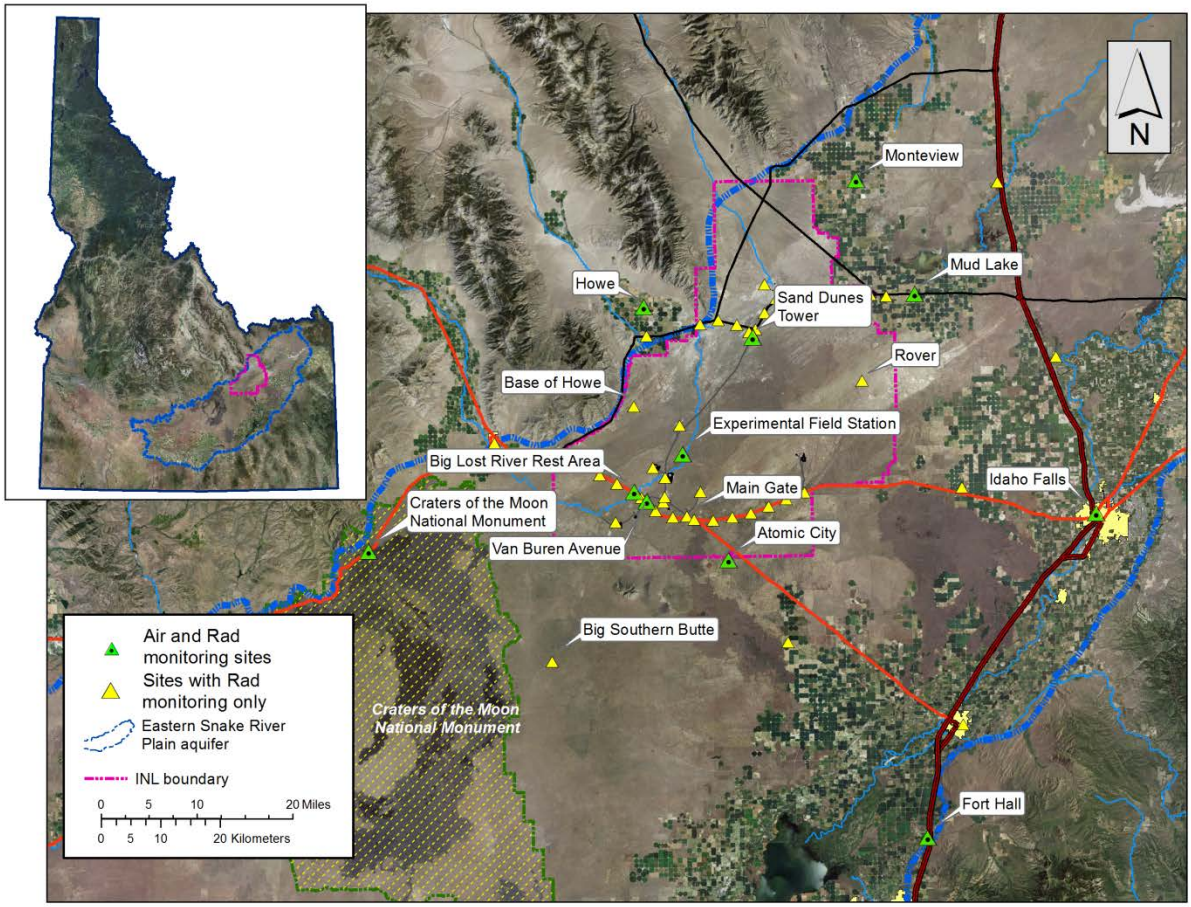

Figure 1. Air and radiation monitoring sites.

Table 1. Sampling locations and sample type.

Station Locations	Sample type[1]			
	TSP	Radioiodine	Water Vapor	Precipitation
On-site Locations				
Big Lost River Rest Area	□	□	■	■
Experimental Field Station	□	□	■	
Sand Dunes Tower	□	□	■	
Van Buren Avenue	□	□	■	
Boundary Locations				
Atomic City	□	□	■	■
Howe	□	□	■	■
Monteview	□	□	■	■
Mud Lake	□	□	■	■
Distant Locations				
Craters of the Moon	□	□	■	
Fort Hall[2]	□	□	■	
Idaho Falls	□	□	■	■

[1] □ Samples collected weekly; ■ Samples collected quarterly.
[2] TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

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

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.8	-	1.2	16.9	-	38.5
Experimental Field Station	0.5	-	1.2	13.6	-	31.7
Sand Dunes Tower	0.3	-	0.9	11.5	-	25.9
Van Buren Avenue	0.4	-	0.9	12.7	-	29.0
Boundary Locations						
Atomic City	0.8	-	2.0	14.8	-	29.9
Howe	0.3	-	1.7	12.1	-	27.4
Monteview	0.4	-	1.2	13.1	-	31.0
Mud Lake	0.8	-	2.1	18.3	-	40.2
Distant Locations						
Craters of the Moon	0.3	-	1.0	11.9	-	24.0
Fort Hall[1]	0.4	-	1.1	9.1	-	19.7
Idaho Falls – HVP 3804	0.7	-	1.7	18.6	-	36.9
Idaho Falls – HVP 4304	0.6	-	1.4	16.3	-	30.2

[1]Operated by Shoshone-Bannock Tribes.
Note: Concentrations are expressed in 1 x 10^{-3} pCi/m^3.

Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, second quarter, 2014.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	97.7	5.0	<MDC[2]
Experimental Field Station	77.2	4.1	<MDC
Sand Dunes Tower	70.1	3.6	<MDC
Van Buren Avenue	77.3	3.9	<MDC
Boundary Locations			
Atomic City	71.9	3.7	<MDC
Howe	73.5	3.8	<MDC
Monteview	77.9	4.0	<MDC
Mud Lake	101.5	5.4	<MDC
Distant Locations			
Craters of the Moon	66.5	3.6	<MDC
Fort Hall[1]	52.1	2.9	<MDC
Idaho Falls – HVP 3804	102.6	5.2	<MDC
Idaho Falls – HVP 4304	82.6	4.3	<MDC

[1]Operated by Shoshone-Bannock Tribes.
[2]MDC for Cs-137 typically (5-10)x10^{-5} pCi/m^3.
Note: Concentrations are reported in 1 x 10^{-3} pCi/m^3 with associated uncertainty (± 2 SD), and minimum detectable concentration (MDC).

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

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.44	0.33	0.51
Experimental Field Station	0.91	0.39	0.59
Sand Dunes Tower	0.12	0.31	0.49
Van Buren Avenue	0.39	0.33	0.51
Boundary Locations			
Atomic City	0.21	0.35	0.55
Howe	-0.31	0.50	0.82
Mud Lake	-0.02	0.57	0.93
Monteview	0.11	0.44	0.68
Distant Locations			
Craters of the Moon	-0.10	0.16	0.26
Fort Hall[1]	0.02	0.36	0.60
Idaho Falls	0.19	0.44	0.70

[1]Operated by Shoshone-Bannock Tribes.
Note: Concentrations are reported in pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Table 5. Tritium and Cesium-137 concentrations from precipitation, second quarter, 2014.

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	-100	80	150	0.5	1.3	2.2
Boundary Locations						
Atomic City	20	90	150	0.1	1.1	1.9
Howe	-70	80	150	0.1	1.3	2.3
Monteview	-60	80	150	0.5	1.6	2.7
Mud Lake	-60	80	150	0.5	1.4	2.3
Distant Locations						
Idaho Falls	-70	80	150	0.5	1.4	2.3

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

Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the second 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 7** lists the average radiation exposure rates measured by the HPICs for second quarter 2014. **Table 8** lists the EIC monitoring results for second quarter 2014. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation.

Table 6. Summary of instrumentation at radiation monitoring stations.

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

[1] HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

Table 7. Average gamma exposure rates, second quarter, 2014, from HPIC network.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	15.9	0.9
Big Lost River Rest Area	15.2	0.9
Main Gate	14.7	0.8
Rover	16.5	0.7
Sand Dunes Tower	13.3	0.7
Boundary Locations		
Atomic City	13.5	2.1
Big Southern Butte[2]	15.2	0.8
Howe Met Tower	13.0	1.1
Monteview	13.4	0.7
Mud Lake / Terreton	14.4	1.2
Distant Locations		
Fort Hall[1]	12.8	3.0
Idaho Falls	12.3	1.7

[1]Operated by Shoshone-Bannock Tribes.

Table 8. Electret ionization chamber (EIC) cumulative average exposure rates, second quarter, 2014.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average[1]	± 2 SD
On-site Locations		
Base of Howe	12.2	2.2
Big Lost River Rest Area	15.3,13.8	
Experimental Field Station	16.3,16.8	
Main Gate	14.5,15.0	
Rover	12.7,12.7	
Sand Dunes Tower	11.7	1.0
Van Buren Avenue	13.8	3.3
Boundary Locations		
Atomic City	11.4,11.0	
Big Southern Butte	15.4,14.8	
Howe Met Tower	14.1,14.3	
Monteview	12.5	1.5
Mud Lake / Terreton	11.2	1.8
Distant Locations		
Craters of the Moon	10.6	0.6
Fort Hall[2]	10.9	0.9
Idaho Falls	11.1	3.4

[1] 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.
[2] Station operated by Shoshone-Bannock Tribes.

Water Monitoring

Water monitoring sites are sampled for the purposes of examining trends of INL contaminants and other general ground water quality indicators and for verifying DOE monitoring results. Sites sampled include ground water locations (wells and springs), surface water locations (streams), and selected wastewater sites. Sample sites have been selected to aid in identifying INL impacts on the Eastern Snake River Plain Aquifer (ESRPA), and are categorized as up-gradient, facility, boundary, distant, surface water, and waste water, (**Figure 2 and Figure 3**). Up-gradient locations are not impacted by INL operations and are considered representative of background ground water quality conditions. Facility sites are sample locations on the INL near facilities, in areas of known contamination, or wells selected to illustrate trends for specific INL contaminants or indicators of ground water quality. Boundary locations are on or near the perimeter of the INL and are down-gradient of potential sources of INL contamination. Distant locations are monitored to provide trends in water quality down-gradient of the INL and include wells and springs used for irrigation, public water supply, livestock, domestic, and industrial purposes. During the second quarter of 2014, 4 up-gradient, 18 facility, 10 boundary, and 5 distant locations were sampled. Of the 10 boundary locations, 5 are Westbay™ packer sampling systems, which allow water samples to be collected from discrete levels or zones within the well. These wells include Middle-2051, USGS-132, USGS-108 and USGS-105 which was sampled from two different zones. Middle-2051 was sampled at a depth of 1091.1 feet bls (below land surface). USGS-105 was sampled at two different depths, including 849.0 feet bls, and 1069.6 feet bls. USGS-108 was sampled a depth of 1174.0 feet bls. Lastly, USGS-132 was sampled at a depth of 765.4 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 alpha emitting isotopes of plutonium (^{238}Pu, $^{239/240}$Pu), uranium (^{234}U, ^{235}U, and ^{238}U), and americium (^{241}Am); and beta emitting radionuclides technetium-99 (^{99}Tc) and strontium-90 (^{90}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 8 facility, 2 boundary and 2 distant locations. All 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 four areas sampled this quarter (up-gradient, facility, boundary, and distant). Concentrations observed at facility locations were consistent with historical trends and 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}Sr; 900 pCi/L if ^{99}Tc; 20,000 pCi/L if tritium (^{3}H); or 200 pCi/L if ^{137}Cs. Man-made, gamma emitting ^{137}Cs was detected at one facility location, TAN-37. This well has shown detectable concentrations in the past, most recently in May 2010; however, the concentration of 11.7 ± 2.3 pCi/L is almost double any of the previous detectable concentrations. A recount was requested from the lab which confirmed original results at 12.6 ± 2.7 pCi/L. Results for gross alpha, gross beta, and man-made, gamma emitting ^{137}Cs are shown in **Table 9**.

None of the sample locations were sampled for isotopes of plutonium. Three facility locations were sampled for isotopes of uranium with all showing detectable results for ^{234}U and ^{238}U and two of the three having detectable results for ^{235}U (**Table 10**). Analysis results for samples collected from TAN-28 and TAN-29 suggest ^{238}U and ^{234}U at greater than natural background levels. Uranium related to historic waste disposal activities at Test Area North has previously been identified. None of the sample locations were sampled for ^{241}Am this quarter.

Four of the eleven facility locations analyzed for ^{90}Sr had detectable results this quarter, with three above the MCL of 8 pCi/L (**Table 11**). All samples were collected in an area of known contamination at or near the INTEC facility. Three up-gradient and three facility locations were sampled for ^{99}Tc. All three facility locations 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 12**). The three up-gradient locations were sampled for ^{99}Tc as part of an ongoing internal study to determine whether positive low level ^{99}Tc results are due in whole or in part to analytical interference from naturally occurring beta activity. All three up-gradient locations should have no ^{99}Tc, however, all reported detectable results.

Using the standard analytical method, ^{3}H was detected at ten of the eighteen facility locations sampled (**Table 13**). Tritium levels found are comparable to historic concentrations for these sites and are consistent with INL waste disposal influences. There were four detections found at Westbay boundary locations, including Middle-2051 at 1091.1 ftbls, USGS-132 at 765.4 ftbls, and USGS-105 at 849.0 ftbls and 1069.6 ftbls. These detections are consistent with historic INL waste disposal influences. 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. Ten samples were analyzed using the enrichment method for the current quarter, while sample

analyses for seventeen sites collected during previous quarters were completed and results presented during this quarter (**Table 14**). A backlog of 17 samples remains.

Samples were also analyzed for metals and the results shown in **Table 15**. All results were within their expected ranges. Common ion results are shown in **Table 16** and nutrient results are shown in **Table 17**. All results are consistent with historical values at those locations.

Volatile Organic Compounds (VOCs) were sampled at seven locations at or near the TAN facility, with each location reporting detectable concentrations for multiple analytes. Results are shown in **Table 18.** The background concentrations for these VOCs should be zero. The results discussed in this section only refer to detectable VOC concentrations; a complete list of analytes is shown in **Appendix C**.

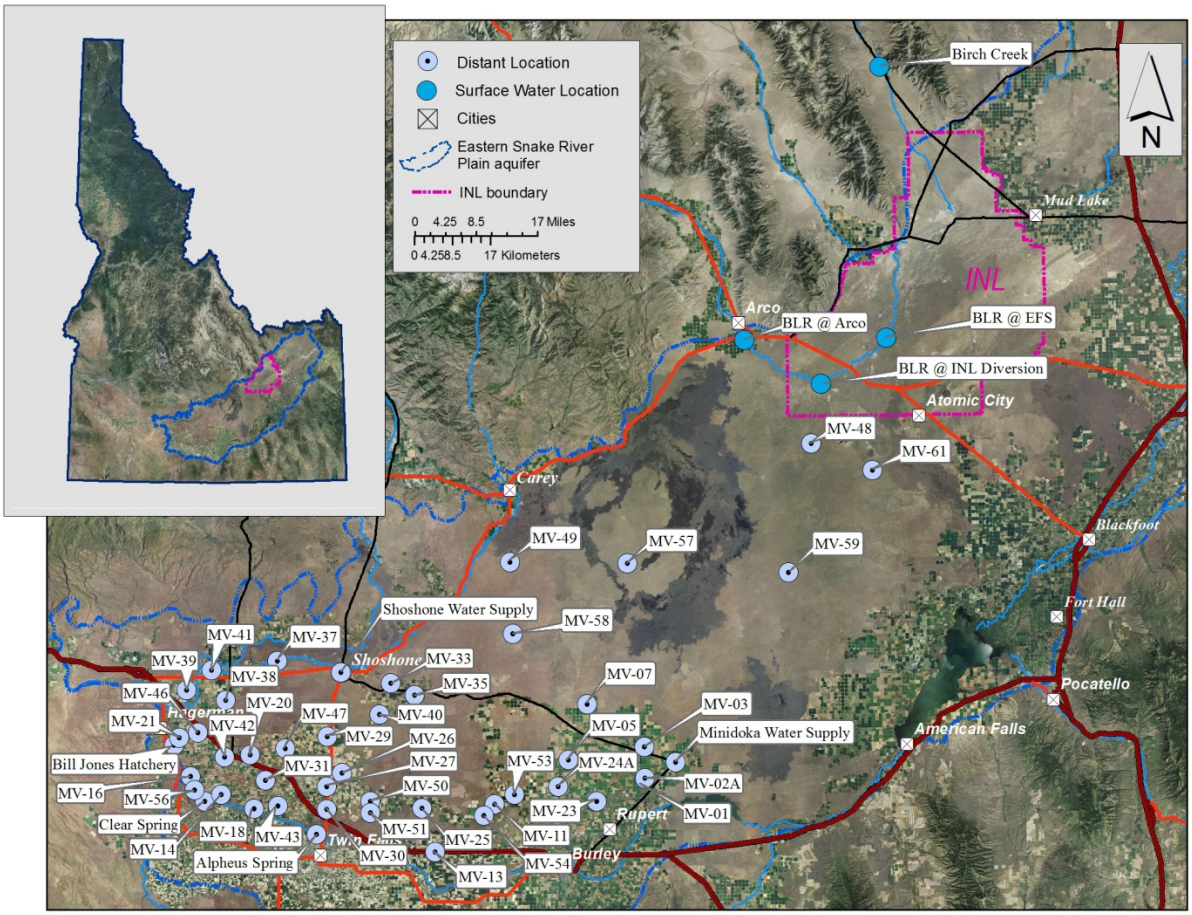

Figure 2. Distant and surface water monitoring locations.

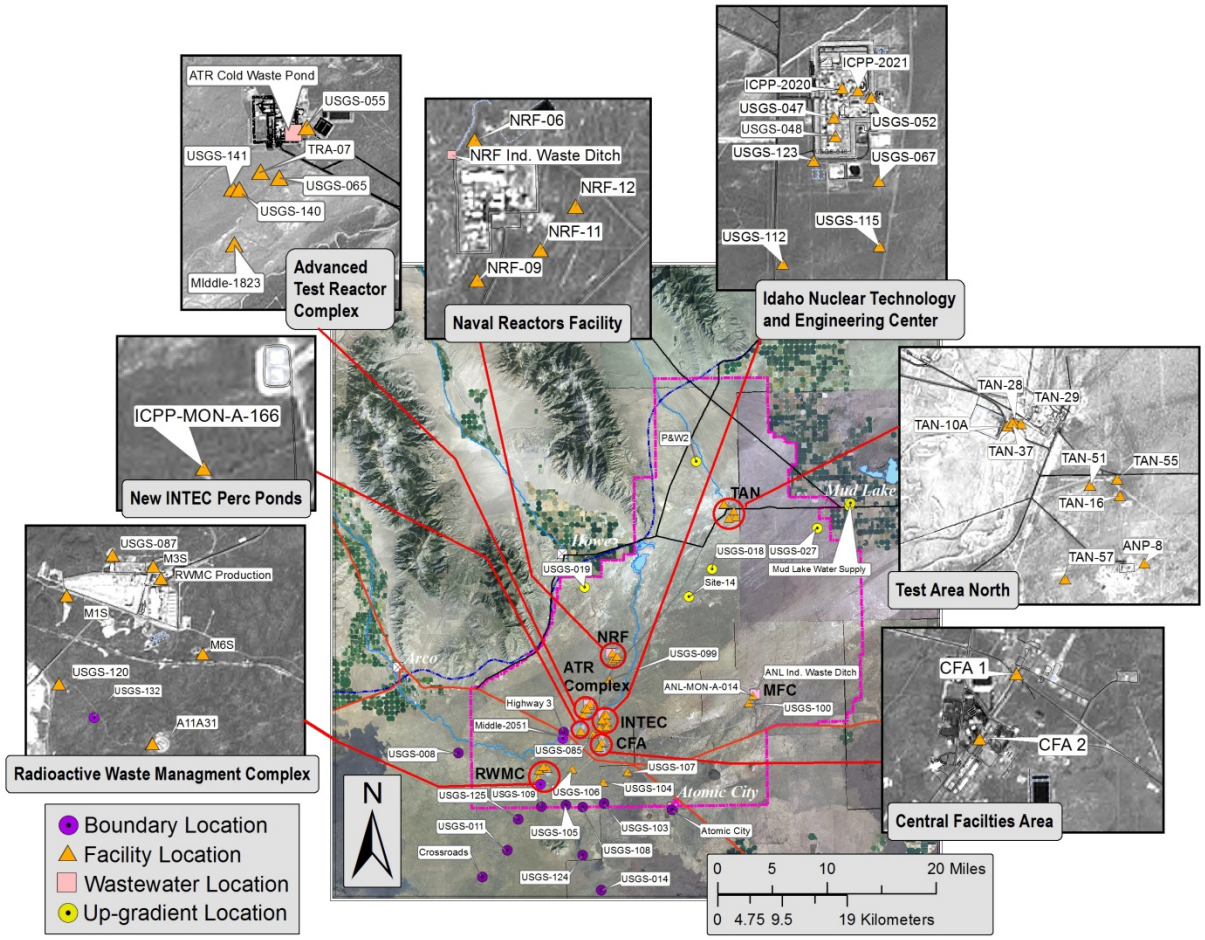

Figure 3. Up-gradient, facility, boundary, and wastewater monitoring locations.

Table 9. Alpha, beta, and gamma concentrations for water samples, second quarter, 2014.

Sample Location	Sample Date	Gross Alpha			Gross Beta			Man-made gamma-emitting radionuclide Cesium-137		
		Concentration[1,2]		±2 SD	Concentration[1,2]		±2 SD	Concentration[1,2]		±2 SD
Upgradient										
Mud Lake Water Supply	5/15/2014	0.4	U	0.6	4.6		0.8	-0.4	U	1.3
P&W-2	4/15/2014	0.7	U	0.9	2.3		0.8	-1.4	U	1.3
USGS-019	4/15/2014	-0.1	U	0.9	1.6		0.8	-0.9	U	2.3
USGS-027	4/15/2014	-0.5	U	1.0	4.6		1.0	0.6	U	2.1
Facility										
ANP-8	5/14/2014	1.7		1.0	3.4		0.9	1.3	U	2.1
CFA 1	4/14/2014	4.1		1.6	11.1		1.2	-0.8	U	1.2
ICPP-MON-A-166	4/9/2014	1.0	U	1.0	3.0		0.8	-0.3	U	1.3
NRF-06	5/13/2014	-1.9	U	4.0	9.2		2.7	1.5	U	2.0
NRF-09	5/13/2014	1.4	U	1.2	3.1		1.0	0.3	U	1.1
NRF-11	5/13/2014	0.4	U	1.1	5.3		1.1	-0.4	U	1.4
NRF-12	5/13/2014	2.1		1.3	4.1		1.1	0.2	U	1.4
TAN-16	5/14/2014	1.4		1.0	6.3		1.0	0.2	U	1.4
TAN-28	4/8/2014	6.7		3.8	542.1		9.0	-0.2	U	1.5
TAN-29	4/8/2014	3.3		1.6	56.8		2.7	2.8	U	2.1
TAN-37	4/8/2014	1.0	U	2.6	699.3		10.1	11.7		2.3
TAN-51	5/14/2014	0.1	U	0.8	3.2		0.9	0.3	U	1.4
TAN-55	5/14/2014	1.5	U	1.1	3.9		1.0	-0.9	U	1.3
USGS-065	4/14/2014	0.5	U	1.2	4.7		1.0	0.2	U	1.3
USGS-085	4/7/2014	0.4	U	0.7	9.7		1.1	0.1	U	1.3
USGS-087	4/17/2014	-0.4	U	0.7	4.1		0.9	0.9	U	1.6
USGS-099	5/14/2014	2.2		1.2	2.5		1.0	0.2	U	1.2
USGS-100	4/14/2014	1.5		0.8	4.4		0.9	0.3	U	1.6
Boundary										
Atomic City	4/16/2014	-0.2	U	0.8	3.1		0.8	0.7	U	1.3
Crossroads	4/30/2014	1.8		0.8	3.5		0.9	-0.4	U	1.4
Middle-2051 (1091.1 ftbls)	6/18/2014	1.0	U	1.0	2.9		0.9	0.5	U	1.2
USGS-008	4/30/2014	1.3		0.8	3.1		0.9	0.4	U	1.1
USGS-011	4/16/2014	0.9	U	0.9	3.2		0.8	-0.3	U	1.6
USGS-105 (1069.6 ftbls)	6/25/2014	0.4	U	0.9	4.3		0.9	0.4	U	1.4
USGS-105 (849.0 ftbls)	6/25/2014	0.7	U	1.0	4.2		0.9	1.0	U	1.8
USGS-108 (1174.0 ftbls)	6/24/2014	0.7	U	1.0	2.8		0.9	0.2	U	1.2
USGS-124	4/16/2014	0.2	U	0.8	3.4		0.9	0.0	U	1.6
USGS-132 (765.4 ftbls)	6/17/2014	1.0	U	0.9	4.2		0.9	0.8	U	1.7
Distant										
Alpheus Spring	5/12/2014	-0.7	U	0.7	8.3		1.1	0.2	U	1.3
Bill Jones Hatchery	5/12/2014	0.7	U	0.7	3.2		0.8	-1.0	U	1.3
Clear Spring	5/12/2014	1.4		0.9	4.2		0.9	-0.2	U	1.4
Minidoka Water Supply	5/12/2014	0.6	U	0.8	4.6		0.9	-0.8	U	1.3
Shoshone Water Supply	5/12/2014	2.2		0.9	3.0		0.9	1.1	U	1.8

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

Table 10. Reported concentrations of uranium isotopes in water samples, second quarter, 2014.

Sample Location	Sample Date	Uranium-234			Uranium-235			Uranium-238		
		Concentration[1,2]		±2 SD	Concentration[1,2]		±2 SD	Concentration[1,2]		±2 SD
Facility										
TAN-28	4/8/2014	8.4		1.6	0.36		0.17	1.20		0.33
TAN-29	4/8/2014	6.1		1.1	0.24		0.12	1.24		0.31
TAN-37	4/8/2014	0.66		0.20	0.012	U	0.045	0.097		0.069

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

Table 11. Reported concentrations of strontium-90 in water samples, second quarter 2014.

Sample Location	Sample Date	Strontium-90		
		Concentration[1,2]		±2 SD
Facility				
CFA 1	4/14/2014	0.26	UJ	0.29
NRF-06	5/13/2014	0.28	UJ	0.27
NRF-09	5/13/2014	0.46	UJ	0.30
NRF-11	5/13/2014	0.08	UJ	0.27
NRF-12	5/13/2014	0.06	UJ	0.27
TAN-28	4/8/2014	186		44
TAN-29	4/8/2014	20.0		4.8
TAN-37	4/8/2014	206		48
USGS-085	4/7/2014	2.18		0.64
USGS-087	4/17/2014	0.08	UJ	0.26
USGS-099	5/14/2014	0.43	UJ	0.30

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

Table 12. Reported concentrations of technetium-99 in water samples, second quarter, 2014.

Sample Location	Sample Date	Technetium-99		
		Concentration[1,2]		±2 SD
Upgradient				
P&W-2 (dissolved)	4/15/2014	1.4		0.2
USGS-019 (dissolved)	4/15/2014	0.8		0.2
USGS-027 (dissolved)	4/15/2014	2.1		0.2
Facility				
CFA 1 (dissolved)	4/14/2014	9.7		0.3
USGS-085 (dissolved)	4/7/2014	0.9		0.2
USGS-087 (dissolved)	4/17/2014	1.2		0.2

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

Table 13. Tritium concentrations for water samples, second quarter, 2014.

Sample Location	Sample Date	Tritium		
		Concentration[1,2]		±2 SD
Upgradient				
Mud Lake Water Supply	5/15/2014	-50	U	110
P&W-2	4/15/2014	10	U	80
USGS-019	4/15/2014	0	U	80
USGS-027	4/15/2014	50	U	80
Facility				
ANP-8	5/14/2014	30	U	110
CFA 1	4/14/2014	3630		190
ICPP-MON-A-166	4/9/2014	110	U	80
NRF-06	5/13/2014	-30	U	110
NRF-09	5/13/2014	-30	U	100
NRF-11	5/13/2014	40	U	110
NRF-12	5/13/2014	0	U	110
TAN-16	5/14/2014	160		90
TAN-28	4/8/2014	1560		140
TAN-29	4/8/2014	1400		130
TAN-37	4/8/2014	1110		120
TAN-51	5/14/2014	330		90
TAN-55	5/14/2014	600		100
USGS-065	4/14/2014	2930		170
USGS-085	4/7/2014	1150		130
USGS-087	4/17/2014	580		100
USGS-099	5/14/2014	-20	U	110
USGS-100	4/14/2014	50	U	80
Boundary				
Atomic City	4/16/2014	20	U	80
Crossroads	4/30/2014	60	U	80
Middle-2051 (1091.1 ftbls)	6/18/2014	200		110
USGS-008	4/30/2014	60	U	80
USGS-011	4/16/2014	60	U	80
USGS-105 (1069.6 ftbls)	6/25/2014	260		110
USGS-105 (849.0 ftbls)	6/25/2014	230		110
USGS-108 (1174.0 ftbls)	6/24/2014	60	U	110
USGS-124	4/16/2014	90	U	80
USGS-132 (765.4 ftbls)	6/17/2014	230		110
DIstant				
Alpheus Spring	5/12/2014	90	U	110
Bill Jones Hatchery	5/12/2014	-10	U	110
Clear Spring	5/12/2014	-70	U	100
Minidoka Water Supply	5/12/2014	70	U	110
Shoshone Water Supply	5/12/2014	70	U	110

[1]Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2]Concentrations expressed in pCi/L.

Table 14. Enriched Tritium concentrations for water samples from current and previous sampling quarters.

Sample Location	Sample Date	Enriched Tritium		
		Concentration[1,2]		±2 SD
Upgradient				
Mud Lake Water Supply	11/20/2013	2	U	5
P&W-2	4/15/2014	59		7
Site-14	10/31/2013	-1	U	5
USGS-019	4/15/2014	6	U	7
USGS-027	4/15/2014	3	U	7
Facility				
A11A31	11/5/2013	111		10
ICPP-MON-A-166	9/17/2013	81		9
ICPP-MON-A-166	4/09/2014	16		9
M1S	11/4/2013	2	U	5
M6S	11/5/2013	6	U	9
USGS-100	4/10/2012	15		7
USGS-100	4/14/2014	14		7
USGS-120	10/29/2013	143		11
Boundary				
Atomic City	4/16/2014	23		8
Crossroads	4/30/2014	12		7
Highway 3	10/30/2013	68		8
USGS-008	4/30/2014	18		7
USGS-011	4/16/2014	17		7
USGS-014	10/29/2013	7	U	6
USGS-124	4/16/2014	63		10
USGS-125	10/29/2013	60		8
Distant				
Alpheus Spring	11/19/2013	18		6
Bill Jones Hatchery	11/19/2013	2	U	8
Clear Spring	11/19/2013	21		6
Minidoka Water Supply	11/19/2013	7	U	5
Shoshone Water Supply	11/19/2013	19		9
Surface Water				
Birch Creek	10/30/2013	8	U	6

[1]Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2]Concentrations expressed in pCi/L.

Table 15. Reported metals concentrations in water samples, second quarter, 2014.

Sample Location	Sample Date	Concentration[1,2]															
		Arsenic		Barium		Chromium		Iron		Lead		Manganese		Selenium		Zinc	
Upgradient																	
P&W-2	4/15/2014	<5	U	48		<5	U	<10	U	<5	U	<2	U	<10	U	<5	U
USGS-019	4/15/2014	<5	U	81		<5	U	170		<5	U	7.4	J	<10	U	<5	U
USGS-027	4/15/2014	<5	U	87		5.6		16		<5	U	2.3	J	<10	U	<5	U
Facility																	
ANP-8 (total)	5/14/2014	<5	U	96		<5	U	3100		<5	U	63		<10	U	27	
CFA 1	4/14/2014	<5	U	93		14		<10	U	<5	U	<2	U	<10	U	<5	U
ICPP-MON-A-166	4/9/2014	<5	U	50		5.6		84		<5	U	19		<10	U	<5	U
NRF-06 (total)	5/13/2014	<5	U	130		36		<10	UJ	<5	U	<2	U	<10	U	<5	U
NRF-09 (total)	5/13/2014	<5	U	150		15		200	J	<5	U	2.5	J	<10	U	<5	U
NRF-11 (total)	5/13/2014	<5	U	160		15		<10	UJ	<5	U	<2	U	<10	U	<5	U
NRF-12 (total)	5/13/2014	<5	U	150		10		<10	UJ	<5	U	<2	U	<10	U	<5	U
TAN-16 (total)	5/14/2014	<5	U	100		5.7		39		<5	U	<2	U	<10	U	33	R
TAN-29 (total)	4/8/2014	<5	U	270		<5	U	18		<5	U	520		<10	U	22	
USGS-065	4/14/2014	<5	U	50		74		<10	U	<5	U	<2	U	<10	U	<5	U
USGS-085	4/7/2014	<5	U	87		23		<10	U	<5	U	<2	U	<10	U	<5	U
USGS-087	4/17/2014	<5	U	28		9		<10	U	<5	U	2.8	J	<10	U	10	
USGS-099 (total)	5/14/2014	<5	U	110		5.2		210		<5	U	<2	U	<10	U	11	
USGS-100	4/14/2014	<5	U	38		<5	U	<10	U	<5	U	<2	U	<10	U	<5	U
Boundary																	
Atomic City	4/16/2014	<5	U	36		<5	U	<10	U	<5	U	<2	U	<10	U	34	
Crossroads	4/30/2014	<5	U	26		<5	U	<10	U	<5	U	11		<10	U	110	
Middle-2051 (1091.1 ftbls)	6/18/2014	<5	U	40		7.4		<10	U	<5	U	<2	U	<10	U	21	
USGS-008	4/30/2014	<5	U	82		<5	U	14		<5	U	<2	U	<10	U	<5	U
USGS-011	4/16/2014	<5	U	54		<5	U	<10	U	<5	U	<2	U	<10	U	<5	U
USGS-105 (1069.6 ftbls)	6/25/2014	<5	U	36		8.5		<10	U	<5	U	<2	U	<10	U	32	
USGS-105 (849.0 ftbls)	6/25/2014	<5	U	39		8.1		<10	U	<5	U	<2	U	<10	U	14	
USGS-108 (1174.0 ftbls)	6/24/2014	<5	U	43		6.3		<10	U	<5	U	13		<10	U	61	
USGS-124	4/16/2014	<5	U	32		6.1		18		<5	U	5.4	J	<10	U	<5	U
USGS-132 (765.4 ftbls)	6/17/2014	<5	U	44		8.8		<10	U	<5	U	<2	U	<10	U	55	

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

[2]Concentrations are expressed in µg/L. Samples are filtered unless otherwise indicated.

Table 16. Reported common ion concentrations in water samples, second quarter, 2014.

Sample Location	Sample Date	Concentration[1,2]															
		Calcium		Magnesium		Sodium		Potassium		Fluoride		Chloride		Sulfate		Alkalinity[3]	
Upgradient																	
P&W-2*	4/15/2014	41		16		8.2		1.6		0.214		7.33		28.1		140	
USGS-019*	4/15/2014	46		18		9.7		1.4		<0.20	U	12.3		22.8		160	
USGS-027*	4/15/2014	52		18		29		6.1		0.628		47.5		40.3		152	
Facility																	
ANP-8	5/14/2014	48		16		7.9		3.6		0.301		15.5		31.4		139	
CFA 1*	4/14/2014	60		19		32		4.1		0.209		91.1		33.4		125	
ICPP-MON-A-166*	4/9/2014	34		12		9.8		2.7		0.343		9.41		18.3		124	
NRF-06	5/13/2014	150		38		170		6.4		<0.20	U	440		87.7		168	
NRF-09	5/13/2014	76		23		21		2.8		0.202		48.7		40.3		198	
NRF-11	5/13/2014	71		22		20		2.7		0.207		45.6		38.5		196	
NRF-12	5/13/2014	70		22		18		2.6		0.224		38.8		37.4		197	
TAN-16	5/14/2014	56		16		8.2		3.1		0.270		25.2		33.6		143	
TAN-29	4/8/2014	70		21		58		5.2		<0.20	U	95.8		40.5		226	
USGS-065*	4/14/2014	87		19		16		3.4		0.223		19.5		160		126	
USGS-085*	4/7/2014	55		15		11		2.5		0.256		14.2		42.1		156	
USGS-087*	4/17/2014	38		15		14		3.2		0.255		22.0		25.8		123	
USGS-099	5/14/2014	60		20		17		2.1		<0.20	U	21.2		26.7		196	
USGS-100*	4/14/2014	37		12		17		3.3		0.710		16.1		16.5		130	
Boundary																	
Atomic City*	4/16/2014	35		14		17		3.4		0.596		17.3		17.0		133	
Crossroads*	4/30/2014	39		16		8.9		2.6		0.226		10.6		21.1		138	
Middle-2051* (1091.1 ftbls)	6/18/2014	39		19		8.0		2.6		<0.20	U	11.6		23.0		144	
USGS-008*	4/30/2014	46		15		7.1		1.8		0.233		7.49		22.1		152	
USGS-011*	4/16/2014	41		14		8.3		2.3		0.254		9.36		22.6		139	
USGS-105* (1069.6 ftbls)	6/25/2014	40		15		11		3.0		<0.20	U	12.4		24.0		137	
USGS-105* (849.0 ftbls)	6/25/2014	41		15		12		2.8		0.261		11.8		24.9		140	
USGS-108* (1174.0 ftbls)	6/24/2014	46		19		8.4		2.4		<0.20	U	17.5		25.1		154	
USGS-124*	4/16/2014	40		16		10		2.4		0.418		16.1		23.4		137	
USGS-132* (765.4 ftbls)	6/17/2014	41		16		10		2.7		<0.20	U	10.9		25.5		140	

[1]Data qualifiers: U = non-detection, J = estimate, R = rejected. * = samples are filtered for calcium, magnesium, sodium and potassium. "<" = a result below the Minimum Detectable Concentration (MDC). NR = analysis not requested.

[2]Concentrations are expressed in mg/L.

[3]As $CaCO_3$.

Table 17. Reported nutrient concentrations in water samples, second quarter, 2014.

Sample Location	Sample Date	Concentration[1,2]			
		Nitrite + Nitrate		Phosphorus	
Upgradient					
P&W-2	4/15/2014	0.48		0.021	
USGS-019	4/15/2014	0.95		0.012	
USGS-027	4/15/2014	2.6		0.019	
Facility					
ANP-8	5/14/2014	0.86		0.025	
CFA 1	4/14/2014	2.9		0.024	
ICPP-MON-A-166	4/9/2014	0.2		0.032	
NRF-06	5/13/2014	2.0		0.078	
NRF-09	5/13/2014	2.5		0.038	
NRF-11	5/13/2014	2.1		0.034	
NRF-12	5/13/2014	2.0		0.034	
TAN-16	5/14/2014	1.2		0.027	
TAN-29	4/8/2014	0.25		0.046	
USGS-065	4/14/2014	1.5		0.027	
USGS-085	4/7/2014	1.1		0.028	
USGS-087	4/17/2014	0.70		0.016	
USGS-099	5/14/2014	1.7		0.031	
USGS-100	4/14/2014	2.0		0.020	
Boundary					
Atomic City	4/16/2014	1.5		0.020	
Crossroads	4/30/2014	0.67		0.019	
Middle-2051 (1091.1 ftbls)	6/18/2014	0.92		0.022	
USGS-008	4/30/2014	0.96		0.020	
USGS-011	4/16/2014	0.71		0.022	
USGS-105 (1069.6 ftbls)	6/25/2014	0.76		0.022	
USGS-105 (849.0 ftbls)	6/25/2014	0.72		0.022	
USGS-108 (1174.0 ftbls)	6/24/2014	1.0		0.028	
USGS-124	4/16/2014	0.85		0.021	
USGS-132 (765.4 ftbls)	6/17/2014	0.76		0.024	

[1]Data qualifiers: U = non-detection, J = estimate, R = rejected, NR = analysis not requested.

[2]Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

Table 18. Reported VOC concentration in water samples second quarter, 2014.

Sample Location	Sample Date	Concentrations[1,2]						
		1,1-Dichloroethene	Carbon tetrachloride	Cis-1,2-Dichloroethene	Trans-1,2-Dichlorethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl Chloride
ANP-8	5/14/2014	<0.5	<0.5	<0.5	<0.5	2.8	23	<0.5J
TAN-16	5/14/2014	<0.5	<0.5	0.96	<0.5	5.2	41	<0.5J
TAN-28	4/8/2014	0.79	<0.5	64	64	6.1	630	3.2
TAN-29	4/8/2014	0.74	<0.5	72	93	7.5	400	13
TAN-37	4/8/2014	<0.5	<0.5	0.70	110	<0.5	1.3	0.64
TAN-51	5/14/2014	<0.5	<0.5	2.6	1.0	14	100	<0.5J
TAN-55	5/14/2014	<0.5	<0.5	2.3	0.82	7.7	18	<0.5J

[1]Data qualifiers: J = estimate, R = rejected, "<" = less than detection limit.

[2]Concentrations expressed in µg/L.

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

Milk

DEQ-INL OP monitors milk for the naturally occurring radionuclide potassium-40 (^{40}K) and man-made iodine-131 (^{131}I). Milk samples are collected on a monthly basis. Ft.Hall is a small operation that had to suspend milk sampling starting in June. Results for analyses of milk samples are presented in **Table 19**. ^{40}K was detected in all samples within the expected range of concentration. ^{131}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 19. Gamma spectroscopy analysis data for milk samples, second quarter, 2014.

Sample Location/Dairy	Sample Date	Naturally occurring Potassium-40		Man-made Iodine-131[1]
		Concentration[3]	± 2 SD	
Monitoring Samples				
Ft. Hall	4/03/2014	1682	120	<MDC
	5/04/2014	1502	109	<MDC
Gooding/Glanbia	4/14/2014	1723	121	<MDC
	5/29/2014	1664	119	<MDC
	6/15/2014	1824	111	<MDC
Riverside	4/03/2014	1929	119	<MDC
	5/04/2014	2238	134	<MDC
	6/01/2014	2041	136	<MDC
Verification Samples[2]				
Howe	4/01/2014	1594	113	<MDC
Rupert	4/01/2014	1831	114	<MDC
Terreton	5/06/2014	1722	121	<MDC
Dietrich	5/06/2014	1663	106	<MDC
Rupert	6/03/2014	1768	108	<MDC
Idaho Falls	6/03/2014	1595	116	<MDC

[1] <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for iodine-131).
[2] DEQ-INL OP samples collected by the off-site INL environmental surveillance contractor.
[3] 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, 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 second 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 second quarter of 2014, the DEQ-INL OP submitted 104 QC samples for various radiological and non-radiological analyses (**Table 20**).

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 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 second quarter of 2014 are presented in **Table 21**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 22**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 23**. Blank analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 24**, **Table 25**, **Table 26**, and **Table 27**.

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 second quarter of 2014. This included a detection for manganese in a blank sample with a concentration of 26 µg/L (**Table 25**). There were fourteen sites that were sampled on the same day as the blank sample. Of the fourteen sites only five reported detectable concentrations for manganese. These five samples will be flagged with a "J" and qualified as estimates 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_1 = First sample result.

R_2 = 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 with an absolute difference of no more than three times the pooled error (or "3 sigma") 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_1 = First sample result.

R_2 = Second sample result.

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

S_2 = Uncertainty (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 28** for radiological analyses, and **Table 29** and **Table 30** for non-radiological analyses.

There were two duplicate comparisons that failed DEQ-INL criteria for the second quarter of 2014. The first failed comparison involved ^{90}Sr. There were six other samples analyzed for ^{90}Sr along with the duplicates. All six samples reported non-detects for ^{90}Sr agreeing with historical data. All six samples, along with the duplicates, will be flagged with a "J" and qualified as estimates. The other failed duplicate pair was for Iron. There were three other samples that were analyzed with the failed duplicate. All three samples, along with the duplicates, will be flagged with a "J" and qualified as estimates.

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.

Two spike samples did not pass DEQ-INL OP criteria during the second quarter of 2014. The anomalies include failures in Zinc and Vinyl Chloride recovery. There was only one Zinc sample analyzed the same day as the spike. There were no previous Zinc results to compare to the current value, so this Zinc result will be flagged with an "R" and qualified as rejected. There were four other Vinyl Chloride samples analyzed the same day as the spike and all reported non-detects which are in line with historical results. All four samples will be flagged with a "J" and qualified as estimates.

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 has a percent recovery of 100 ± 25 when compared to the known irradiated quantity. The irradiation results for second quarter 2014 are presented in **Table 35**. 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 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 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 second 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 second quarter of 2014 met the minimum criteria of the DEQ-INL OP ESP and is summarized in **Table 20**.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. During the second quarter of 2014, the radioiodine pump at the Van Buren sampling station was replaced. Service reliability for air sampling equipment for the second quarter of 2014 is summarized in **Table 36**.

Conclusion

All data collected for the second 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 20. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP, second quarter, 2014.

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected[1]	Analyzing Lab[2]
Air								
Particulate	4-inch filter	Gross alpha	152	13	0	0	4	ISU-EML
		Gross beta	152	13	0	0	4	ISU-EML
		Gamma emitters	12	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	34	4	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	6	0	0	0	0	ISU-EML
		Gamma emitters	6	0	0	0	0	ISU-EML
Water								
Groundwater & Surface Water	Grab or composite	Gross alpha	37	3	4	0	0	ISU-EML
		Gross beta	37	3	4	0	0	ISU-EML
		Gamma emitters	37	3	4	0	0	ISU-EML
		Tritium	37	3	4	0	0	ISU-EML
		Enriched tritium	27	3	3	0	0	ISU-EML
		Technetium-99	6	0	0	0	0	ISU-EML
		Radiochemical	14	0	5	0	0	ISU Sub
		Metals	27	2	3	2	1	IBL
		Common Ions	27	2	3	2	0	IBL
		Nutrients	27	2	3	2	0	IBL
		Volatile Organics	7	2	1	1	0	IBL
Terrestrial								
Milk	Grab or composite	Gamma emitters	14	0	0	0	0	ISU-EML
Soil	*in situ*	Gamma emitters	0	0	0	0	0	DEQ-INL OP
	Grab – "puck"	Gamma emitters	0	0	0	0	0	ISU-EML
Radiation								
Ambient	EICs	Gamma Radiation	55	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	12	NA	NA	NA	0	DEQ-INL OP
Total Test Analyses			**739**	**54**	**34**	**16**	**9**	
Total of QC Analyses (blanks, duplicates, and spikes)			**104**					
Percentage of QC analyses of total Test analyses[3]			**14.1%**					
Percentage of usable data[4]			**98.8%**					

[1] Combined Laboratory and DEQ-INL OP rejection criteria (data was rejected for any reason).

[2] 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.

[3] 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.

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

Table 21. Blank analysis results for gross alpha and beta in particulate air (TSP), second quarter, 2014.

Collection Period		Corrected volume (m^3)[1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
04/03/14	04/10/14	2024	0.1	0.1	-0.2	0.5
04/10/14	04/17/14	2024	0.0	0.1	0.1	0.4
04/17/14	04/24/14	2024	0.0	0.1	-0.3	0.4
04/24/14	05/01/14	2024	0.1	0.1	0.3	0.5
05/01/14	05/08/14	2024	-0.1	0.1	-0.7	0.5
05/08/14	05/15/14	2024	-0.1	0.1	0.0	0.4
05/15/14	05/22/14	2024	0.0	0.1	-0.3	0.4
05/22/14	05/29/14	2024	0.0	0.1	-0.2	0.4
05/29/14	06/05/14	2024	-0.1	0.1	-0.1	0.4
06/05/14	06/12/14	2024	0.0	0.1	0.1	0.5
06/12/14	06/19/14	2024	0.0	0.1	-0.1	0.5
06/19/14	06/25/14	2024	0.0	0.1	0.2	0.4
06/25/14	07/03/14	2024	-0.1	0.1	-0.4	0.4

Note: Concentrations and associated uncertainties (± 2 SD) are expressed in 1 x 10^{-3} pCi/m^3.

[1]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 22. Blank analysis results, gamma spectroscopy for TSP particulate air filters for the second quarter, 2014.

Analysis Date	Beryllium-7			Ruthenium-106/Rhodium-106			Antimony-125		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
7/18/2014	5	41	68	-25	30	53	-5	8	14
Analysis Date	**Cesium-134**			**Cesium-137**		
	Concentration[1]	**± 2 SD**	**MDC**	**Concentration**	**± 2 SD**	**MDC**
7/18/2014	0	4	6	-1	3	6

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

[1]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 23. Blank analysis results for tritium in water vapor from air samples, second quarter, 2014.

Sample Number	Start Date	Collection Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP142ZTR01	05/20/2014	05/21/2014	07/31/2014	0.04	0.07	0.12
OP142ZTR02	05/27/2014	05/28/2014	07/31/2014	0.02	0.07	0.12
OP142ZTR03	06/26/2014	07/01/2014	07/31/2014	-0.02	0.07	0.12
OP142ZTR04	07/09/2014	07/16/2014	07/31/2014	0.06	0.08	0.12

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

Table 24. Radiological blank analysis in groundwater and/or surface water, second quarter, 2014.

Sample Number	Sample Date	Concentration[1]	± 2 SD	MDC	Within Blank Criteria?
Gross Alpha					
141W317	6/26/2014	-0.1	0.2	0.5	Yes
141W023	4/21/2014	-0.2	0.2	0.4	Yes
141W229	5/15/2014	0.1	0.2	0.4	Yes
Gross Beta					
141W317	6/26/2014	0.6	0.6	0.9	Yes
141W023	4/21/2014	0.5	0.6	0.9	Yes
141W229	5/15/2014	-0.5	0.6	1.0	Yes
Cesium-137					
141W317	6/26/2014	0.9	1.6	2.6	Yes
141W023	4/21/2014	-0.5	1.5	2.5	Yes
141W229	5/15/2014	0.4	1.4	2.5	Yes
Tritium					
141W318	6/26/2014	0	110	180	Yes
141W024	4/21/2014	10	80	130	Yes
141W230	5/15/2014	-90	100	180	Yes
Enriched Tritium					
141W012	3/3/2014	25*	9	14	Yes
131W553	10/30/2013	21*	7	10	Yes
141W024	4/21/2014	28*	9	14	Yes

[1] 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 25. Blank analysis results (µg/L) for metals in ground and surface water, second quarter, 2014.

Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
141W320	6/26/2014	<5	<2	<5	<10	<5	<2	<10	<5
141W026	4/21/2014	<5	<2	<5	<10	<5	26	<10	<5

Table 26. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water, second quarter, 2014.

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
141W321,320,319	6/26/2014	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1	<0.01	<0.005
141W027,026,025	4/21/2014	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1	<0.01	<0.005

Table 27. Blank analysis results (µg/L) for VOCs in groundwater and/or surface water, second quarter, 2014.

Sample Number	Sample Date	1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl chloride
141W022	4/9/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
141W234	5/15/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table 28. Duplicate radiological analysis results in pCi/L for ground and surface water, second quarter, 2014.

Analysis/Sample Location	Original Sample Number	Concentration	± 2 SD	Duplicate Sample Number	Concentration	± 2 SD	$/R_1-R_2/$	$3(S_1^2+S_2^2)^{1/2}$	Within Criteria?[1]
Gross Alpha									
NRF-09	141W263	1.4	1.2	141W269	1.1	1.2	0.3	2.5	Yes
TAN-29	141W064	3.3	1.6	141W125	4.7	1.8	1.4	3.6	Yes
Crossroads	141W157	1.8	0.8	141W162	1.3	0.7	0.5	1.6	Yes
Bill Jones Hatchery	141W237	0.7	0.7	141W239	1.0	0.8	0.3	1.6	Yes
Gross Beta									
NRF-09	141W263	3.1	1.0	141W269	3.0	1.0	0.1	2.1	Yes
TAN-29	141W064	56.8	2.7	141W125	57.8	2.7	1.0	5.7	Yes
Crossroads	141W157	3.5	0.9	141W162	2.5	0.8	1.0	1.7	Yes
Bill Jones Hatchery	141W237	3.2	0.8	141W239	3.6	0.9	0.4	1.8	Yes
Gamma Spectroscopy Cesium-137									
NRF-09	141W263	0.3	1.1	141W269	0.0	1.1	0.3	2.3	Yes
TAN-29	141W064	2.8	2.1	141W125	2.8	2.3	0.0	4.7	Yes
Crossroads	141W157	-0.4	1.4	141W162	-0.7	1.3	0.3	2.9	Yes
Bill Jones Hatchery	141W237	-1.0	1.3	141W239	-0.7	1.6	0.3	3.1	Yes
Tritium									
NRF-09	141W265	-30	100	141W271	-20	110	10	223	Yes
TAN-29	141W066	1400	130	141W127	1460	130	60	276	Yes
Crossroads	141W158	60	80	141W163	40	110	20	204	Yes
Bill Jones Hatchery	141W238	-10	110	141W240	80	110	90	233	Yes
Enriched Tritium									
Site-14	131W590	-1	5	131W595	-1	6	0	12	Yes
ICPP-MON-A-166	131W533	68	8	131W538	81	9	13	18	Yes
Bill Jones Hatchery	131W760	2	8	131W762	6	6	4	15	Yes
Strontium-90									
NRF-09	141W264	0.46	0.30	141W270	1.67	0.53	1.21	0.91	No
TAN-29	141W065	20.0	4.8	141W126	19.0	4.5	1.0	9.9	Yes
Uranium-234									
TAN-29	141W067	6.1	1.1	141W128	5.4	1.0	0.7	2.2	Yes
Uranium-235									
TAN-29	141W067	0.24	0.12	141W128	0.18	0.10	0.06	0.23	Yes
Uranium-238									
TAN-29	141W067	1.24	0.31	141W128	0.89	0.25	0.35	0.60	Yes

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

Table 29. Duplicate results for metals (µg/L) in ground water and/or surface water, second quarter, 2014.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
NRF-09 (total)	141W267	5/13/2014	<5.0	150	15	200	<5.0	2.5	<10	<5.0
NRF-09 (total)	141W273	5/13/2014	<5.0	150	14	120	<5.0	<2.0	<10	<5.0
RPD			**0.0**	**0.0**	**6.9**	**50.0**	**0.0**	**22.2[1]**	**0.0**	**0.0**
TAN-29 (total)	141W069	4/8/2014	<5.0	270	<5.0	18	<5.0	520	<10	22
TAN-29 (total)	141W130	4/8/2014	<5.0	270	<5.0	18	<5.0	510	<10	22
RPD			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.9**	**0.0**	**0.0**
Crossroads (dissolved)	141W160	4/30/2014	<5.0	26	<5.0	<10	<5.0	11	<10	110
Crossroads (dissolved)	141W165	4/30/2014	<5.0	25	<5.0	<10	<5.0	10	<10	110
RPD			**0.0**	**3.9**	**0.0**	**0.0**	**0.0**	**9.5**	**0.0**	**0.0**

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

[1]Both results were less than five times the detection limit; their absolute difference is acceptable (≤ the method detection limit of 2.0 µg/L).

Table 30. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water, second quarter, 2014.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
NRF-09	141W268,267,266	5/13/2014	76	23	21	2.8	0.202	48.7	40.3	198	2.5	0.038
NRF-09	141W274,273,272	5/13/2014	75	23	21	2.8	<0.200	48.2	40.3	197	2.5	0.040
RPD			**1.3**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**0.5**	**0.0**	**-5.1**
TAN-29	141W070,069,068	4/8/2014	70	21	58	5.2	<0.200	95.8	40.5	226	0.25	0.046
TAN-29	141W131,130,129	4/8/2014	70	21	57	5.2	0.248	94.9	40.6	226	0.26	0.045
RPD			**0.0**	**0.0**	**1.7**	**0.0**	**-21.4[1]**	**0.9**	**-0.2**	**0.0**	**-3.9**	**2.2**
Crossroads*	141W161,160,159	4/30/2014	39	16	8.9	2.6	0.226	10.6	21.1	138	0.67	0.019
Crossroads*	141W166,165,164	4/30/2014	39	16	8.9	2.6	0.226	10.6	21.0	138	0.67	0.020
RPD			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.5**	**0.0**	**0.0**	**-5.0**

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

[1]Both results were less than five times the detection limit; their absolute difference is acceptable (≤ the method detection limit of 0.20 mg/L).

*Samples are filtered for calcium, magnesium, sodium and potassium.

Table 31. Duplicate results for VOCs (in µg/L) in groundwater, second quarter, 2014.

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
TAN-29	4/8/2014	141W071	0.74	0.0	72	93	7.5	400	13
TAN-29	4/8/2014	141W132	0.86	0.0	70	88	7.5	410	14
RPD			**-15.0**	**0.0**	**2.8**	**5.5**	**0.0**	**-2.5**	**-7.4**

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

Table 32. De-ionized water spike results (in µg/L) and percent recovery for metals in groundwater, second quarter, 2014.

Spike Sample Number	Sample Date	Barium			Chromium			Lead			Manganese			Zinc		
		Spike	Result	%R[1]	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
141W138	4/14/2014	119	130	**109.2**	17.1	18.0	**105.3**	7.62	8.30	**108.9**	7.68	8.00	**104.2**	93.8	89.0	**94.9**
141W134	5/15/2014	53.4	58.0	**108.6**	7.64	8.20	**107.3**	6.53	7.80	**119.4**	6.58	7.00	**106.4**	20.9	42.0	**201.0**

[1] A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

Table 33. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in groundwater and/or surface water, second quarter, 2014.

Spike Sample Number	Sample Date	Calcium			Magnesium			Sodium			Potassium			Fluoride		
		Spike	Result	%R[1]	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
141W138,137	4/14/2014	21.6	22.0	**101.9**	8.55	8.50	**99.4**	19.2	20.0	**104.2**	1.68	1.70	**101.2**	2.65	2.51	**94.7**
141W134,133	5/15/2014	9.64	10.0	**103.7**	3.82	3.90	**102.1**	8.59	9.10	**105.9**	1.44	1.50	**104.2**	2.42	2.22	**91.7**

[1] A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

Table 33. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in groundwater and/or surface water, second quarter, 2014 continued.

Spike Sample Number	Sample Date	Chloride			Sulfate			Total Alkalinity as $CaCO_3$			Total Nitrogen			Total Phosphorus		
		Spike	Result	%R[1]	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
141W138,137	4/14/2014	75.6	75.3	**99.6**	35.8	34.5	**96.4**	84.1	85.0	**101.1**	1.36	1.40	**102.9**	0.0207	0.0220	**106.3**
141W134,133	5/15/2014	91.8	93.6	**102.0**	17.2	16.7	**97.1**	61.7	61.0	**98.9**	1.13	1.10	**97.3**	0.0256	0.0250	**97.7**

[1] A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

Table 34. De-ionized water spike results (in µg/L) and percent recovery for VOCs in groundwater and/or surface water, second quarter, 2014.

Spike Sample Number	Sample Date	Styrene			Tetrachloroethylene			Trichloroethylene			Carbon Tetrachloride			Vinyl Chloride		
		Spike	Result	%R[1]	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
141W136	5/15/2014	8.45	7.60	**89.9**	7.17	6.50	**90.7**	8.06	8.70	**107.9**	5.65	5.30	**93.8**	8.64	4.30	**49.8**

[1] A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

Table 35. Electret ionization chamber irradiation results (categorized as spiked samples), second quarter, 2014.

Electret #	Exposure Received		Net Measured Exposure[1]		%R
	(mR)	Uncertainty (±1 SD, mR)	(mR)	Uncertainty (±1 SD, mR)	
SGP578	40.0	2.00	33.8	1.3	85
SGO593	40.0	2.00	36.0	1.3	90
SGP624	40.0	2.00	36.1	1.3	90
SGO621	30.0	1.50	25.3	1.4	84
SGP536	30.0	1.50	26.0	1.4	87
SGP559	30.0	1.50	26.9	1.3	90
SGP526	23.0	1.15	19.3	1.4	84
SGO583	23.0	1.15	20.6	1.4	89
SGO640	23.0	1.15	19.3	1.4	84

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

[1] Net measured exposure estimate includes a correction for atmospheric pressure.

Table 36. Air sampling field equipment service reliability (percent operational), second quarter, 2014.

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

[1] NC = Sample not collected at this location.

Appendix A

Table A-1. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2014.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
On-Site Locations						
Rest Area	04/03/14	04/10/14	0.9	0.2	25.5	1.1
	04/10/14	04/17/14	1.2	0.2	26.8	1.1
	04/17/14	04/24/14	1.2	0.2	28.0	1.2
	04/24/14	05/01/14	0.9	0.2	16.9	0.9
	05/01/14	05/08/14	0.9	0.2	27.3	1.2
	05/08/14	05/15/14	0.9	0.2	18.9	1.0
	05/15/14	05/22/14	1.2	0.2	28.7	1.2
	05/22/14	05/29/14	1.2	0.2	32.1	1.2
	05/29/14	06/05/14	1.2	0.2	38.5	1.3
	06/05/14	06/12/14	1.1	0.2	27.7	1.1
	06/12/14	06/19/14	0.8	0.2	18.8	1.0
	06/19/14	06/25/14	0.9	0.2	31.3	1.3
	06/25/14	07/03/14	1.0	0.2	23.9	1.0
Experimental Field Station	04/03/14	04/10/14	0.7	0.2	21.8	1.1
	04/10/14	04/17/14	1.2	0.3	22.9	1.1
	04/17/14	04/24/14	1.0	0.2	24.8	1.1
	04/24/14	05/01/14	0.6	0.2	13.6	0.9
	05/01/14	05/08/14	0.9	0.2	22.4	1.1
	05/08/14	05/15/14	0.6	0.2	14.2	0.9
	05/15/14	05/22/14	0.7	0.2	21.0	1.0
	05/22/14	05/29/14	0.9	0.2	27.0	1.2
	05/29/14	06/05/14	1.2	0.3	31.7	1.2
	06/05/14	06/12/14	1.1	0.2	21.3	1.1
	06/12/14	06/19/14	0.8	0.2	15.9	1.0
	06/19/14	06/25/14	0.6	0.2	26.3	1.3
	06/25/14	07/03/14	0.5	0.2	19.7	0.9
Sand Dunes	04/03/14	04/10/14	0.6	0.2	18.5	0.9
	04/10/14	04/17/14	0.8	0.2	18.6	0.9
	04/17/14	04/24/14	0.8	0.2	19.5	1.0
	04/24/14	05/01/14	0.5	0.2	11.5	0.8
	05/01/14	05/08/14	0.6	0.2	18.4	0.9
	05/08/14	05/15/14	0.3	0.1	11.9	0.8
	05/15/14	05/22/14	0.6	0.2	19.0	0.9
	05/22/14	05/29/14	0.7	0.2	21.2	1.0
	05/29/14	06/05/14	0.9	0.2	25.9	1.1
	06/05/14	06/12/14	0.7	0.2	17.5	0.9
	06/12/14	06/19/14	0.7	0.2	14.5	0.9
	06/19/14	06/25/14	0.6	0.2	20.1	1.1
	06/25/14	07/03/14	0.5	0.2	15.1	0.8

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2014.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Van Buren	04/03/14	04/10/14	0.7	0.2	18.9	1.0
	04/10/14	04/17/14	0.8	0.2	18.1	1.0
	04/17/14	04/24/14	0.9	0.2	23.2	1.1
	04/24/14	05/01/14	0.5	0.2	12.7	0.8
	05/01/14	05/08/14	0.6	0.2	19.6	1.0
	05/08/14	05/15/14	0.4	0.2	13.8	0.9
	05/15/14	05/22/14	0.7	0.2	22.2	1.0
	05/22/14	05/29/14	0.9	0.2	24.8	1.1
	05/29/14	06/05/14	0.9	0.2	29.0	1.1
	06/05/14	06/12/14	0.8	0.2	20.0	1.0
	06/12/14	06/19/14	0.7	0.2	14.3	0.9
	06/19/14	06/25/14	0.6	0.2	23.3	1.2
	06/25/14	07/03/14	0.6	0.2	18.2	0.9
Boundary Locations						
Atomic City	04/03/14	04/10/14	0.8	0.2	20.0	1.0
	04/10/14	04/17/14	1.2	0.2	20.3	1.0
	04/17/14	04/24/14	1.6	0.3	21.1	1.0
	04/24/14	05/01/14	0.8	0.2	14.8	0.9
	05/01/14	05/08/14	1.1	0.2	21.0	1.0
	05/08/14	05/15/14	1.3	0.3	14.8	0.9
	05/15/14	05/22/14	1.1	0.2	22.5	1.0
	05/22/14	05/29/14	1.1	0.2	25.7	1.1
	05/29/14	06/05/14	1.1	0.2	29.9	1.1
	06/05/14	06/12/14	1.6	0.3	20.2	1.0
	06/12/14	06/19/14	2.0	0.3	16.4	0.9
	06/19/14	06/25/14	0.8	0.2	23.6	1.1
	06/25/14	07/03/14	1.0	0.2	18.8	0.9
Howe	04/03/14	04/10/14	1.1	0.2	17.5	1.0
	04/10/14	04/17/14	1.7	0.3	18.9	1.0
	04/17/14	04/24/14	1.5	0.3	20.8	1.1
	04/24/14	05/01/14	0.6	0.2	12.1	0.9
	05/01/14	05/08/14	1.1	0.3	20.0	1.1
	05/08/14	05/15/14	0.3	0.2	13.2	0.9
	05/15/14	05/22/14	1.1	0.2	20.7	1.0
	05/22/14	05/29/14	1.2	0.3	24.7	1.1
	05/29/14	06/05/14	1.1	0.2	27.4	1.2
	06/05/14	06/12/14	0.8	0.2	20.3	1.0
	06/12/14	06/19/14	0.9	0.2	15.6	0.9
	06/19/14	06/25/14	0.9	0.2	22.3	1.2
	06/25/14	07/03/14	0.7	0.2	17.9	0.9

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2014.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Monteview	04/03/14	04/10/14	0.9	0.2	19.0	1.0
	04/10/14	04/17/14	1.1	0.2	19.6	1.0
	04/17/14	04/24/14	1.1	0.2	24.7	1.1
	04/24/14	05/01/14	0.8	0.2	13.1	0.9
	05/01/14	05/08/14	1.0	0.2	20.5	1.0
	05/08/14	05/15/14	0.4	0.2	14.0	0.9
	05/15/14	05/22/14	0.9	0.2	20.2	1.0
	05/22/14	05/29/14	0.9	0.2	26.7	1.1
	05/29/14	06/05/14	1.2	0.2	31.0	1.2
	06/05/14	06/12/14	0.8	0.2	21.8	1.0
	06/12/14	06/19/14	0.7	0.2	16.4	0.9
	06/19/14	06/25/14	1.0	0.2	23.0	1.2
	06/25/14	07/03/14	0.8	0.2	19.2	0.9
Mud Lake	04/03/14	04/10/14	1.0	0.2	28.4	1.2
	04/10/14	04/17/14	1.7	0.3	27.4	1.1
	04/17/14	04/24/14	2.1	0.3	34.3	1.3
	04/24/14	05/01/14	1.0	0.2	18.3	1.0
	05/01/14	05/08/14	1.1	0.2	28.5	1.2
	05/08/14	05/15/14	0.8	0.2	19.2	1.0
	05/15/14	05/22/14	1.5	0.3	27.9	1.2
	05/22/14	05/29/14	1.5	0.3	35.2	1.3
	05/29/14	06/05/14	1.4	0.3	40.2	1.3
	06/05/14	06/12/14	1.5	0.3	32.3	1.2
	06/12/14	06/19/14	1.1	0.2	21.5	1.0
	06/19/14	06/25/14	1.2	0.3	29.9	1.3
	06/25/14	07/03/14	1.0	0.2	25.6	1.0
Distant Locations						
Craters of the Moon	04/03/14	04/10/14	0.5	0.2	16.5	1.0
	04/10/14	04/17/14	0.9	0.2	18.5	1.0
	04/17/14	04/24/14	0.8	0.2	18.8	1.0
	04/24/14	05/01/14	0.3	0.2	12.0	0.9
	05/01/14	05/08/14	0.8	0.2	17.2	1.0
	05/08/14	05/15/14	0.3	0.2	11.9	0.8
	05/15/14	05/22/14	0.5	0.2	18.6	1.0
	05/22/14	05/29/14	0.7	0.2	20.8	1.1
	05/29/14	06/05/14	1.0	0.2	24.0	1.1
	06/05/14	06/12/14	0.8	0.2	18.0	1.0
	06/12/14	06/19/14	0.5	0.2	12.9	0.9
	06/19/14	06/25/14	0.4	0.2	20.2	1.1
	06/25/14	07/03/14	0.5	0.2	15.7	0.9

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2014.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Fort Hall[1]	04/03/14	04/10/14	0.7	0.2	13.3	0.9
	04/10/14	04/17/14	1.0	0.2	15.9	0.9
	04/17/14	04/24/14	0.8	0.2	16.2	0.9
	04/24/14	05/01/14	0.5	0.2	9.8	0.8
	05/01/14	05/08/14	0.7	0.2	14.0	0.9
	05/08/14	05/15/14	0.5	0.2	9.5	0.8
	05/15/14	05/22/14	1.1	0.2	16.1	0.9
	05/22/14	05/29/14	0.8	0.2	17.8	1.0
	05/29/14	06/05/14	0.9	0.2	19.7	1.0
	06/05/14	06/12/14	1.0	0.2	15.4	0.9
	06/12/14	06/19/14	0.4	0.2	9.1	0.8
	06/19/14	06/25/14	0.6	0.2	16.8	1.0
	06/25/14	07/03/14	0.5	0.2	12.6	0.8
Idaho Falls - HVP 3804	04/03/14	04/10/14	1.3	0.2	24.2	1.1
	04/10/14	04/17/14	1.7	0.3	25.5	1.2
	04/17/14	04/24/14	1.4	0.3	29.5	1.2
	04/24/14	05/01/14	1.1	0.2	18.6	1.0
	05/01/14	05/08/14	NS[3]	NS[3]	NS[3]	NS[3]
	05/08/14	05/15/14	0.9	0.2	19.7	1.0
	05/15/14	05/22/14	1.3	0.3	31.6	1.3
	05/22/14	05/29/14	NS[3]	NS[3]	NS[3]	NS[3]
	05/29/14	06/05/14	1.5	0.3	36.9	1.3
	06/05/14	06/12/14	1.5	0.3	26.1	1.2
	06/12/14	06/19/14	1.2	0.2	20.0	1.1
	06/19/14	06/25/14	1.2	0.3	32.4	1.4
	06/25/14	07/03/14	0.7	0.2	23.1	1.0
Idaho Falls - HVP 4304[2]	04/03/14	04/10/14	1.1	0.2	23.0	1.1
	04/10/14	04/17/14	1.4	0.3	23.7	1.1
	04/17/14	04/24/14	1.1	0.2	23.5	1.1
	04/24/14	05/01/14	0.9	0.2	16.3	0.9
	05/01/14	05/08/14	NS[3]	NS[3]	NS[3]	NS[3]
	05/08/14	05/15/14	0.8	0.2	16.9	0.9
	05/15/14	05/22/14	1.1	0.2	26.9	1.1
	05/22/14	05/29/14	NS[3]	NS[3]	NS[3]	NS[3]
	05/29/14	06/05/14	1.1	0.2	30.2	1.2
	06/05/14	06/12/14	1.4	0.2	23.0	1.1
	06/12/14	06/19/14	1.0	0.2	18.6	1.0
	06/19/14	06/25/14	0.8	0.2	24.8	1.2
	06/25/14	07/03/14	0.6	0.2	20.3	0.9

[1] Operated by Shoshone Bannock-Tribes.

[2] 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.

[3] 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, second quarter, 2014.

Sample Location	Net Corrected Exposure Rate (µR/hr)[1]	± 2 SD (µR/hr)
Arco	12.4	1.3
Craters	10.6	0.6
Rest Area	15.3, 13.8	
Van Buren	13.8	3.3
EFS	16.3, 16.8	
Main Gate	14.5, 15.0	
Atomic City	11.4, 11.0	
Taber	14.7	2.0
Blackfoot	13.1, 13.4	
Fort Hall[2]	10.9	0.9
Idaho Falls	11.1	3.4
Mud Lake/Terreton	11.2	1.8
Monteview	12.5	1.5
Sand Dunes	11.7	1.0
Howe Met. Tower	14.3, 14.1	
MP276 -20	13.2	2.4
MP274 -20	10.9	3.2
MP272 -20	13.3	1.5
MP270 -20	12.8	2.4
MP268 -20	11.4, 12.5	
MP266 -20	13.6	1.4
MP264 -20	14.7	1.8
MP270 -20/26	13.9	2.8
MP268 -20/26	13.9	2.8
MP266 -20/26	15.7	2.5
MP263 -20/26	12.8	2.0
MP261 -20/26	12.0	1.5
MP259 -20/26	12.6	1.6
MFC (EBR II)	13.6	2.6
EBR I	10.6	1.0
RWMC	11.8	2.4
CFA	14.1	3.0
CITRC (PBF)	12.5, 10.9	

[1]Results are the average of triplicate exposure rate measurements with the associated sample variability (±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 ±2 SD of the historical population variability. Typically, the two most consistent measurements are reported, based on judgment of the data analyst.
[2]Station operated by Shoshone-Bannock Tribes.

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

Sample Location	Net Corrected Exposure Rate (µR/hr)	± 2 SD (µR/hr)
INTEC	15.9	1.2
ATR (TRA)	13.4	0.1
NRF	12.8	1.4
TAN	11.8	2.2
Mud Lake Bank of Commerce	13.6	1.4
MP43-33	15.2	1.9
MP41-33	16.8	2.9
MP39-33	13.9	3.4
MP37-33	10.5	1.2
MP35-33	11.9	2.1
MP33-33	14.1	3.7
MP31-33	12.1,12.8	
MP29-33	12.3	2.4
MP27-33	14.0	2.5
MP25-33	12.0	2.5
MP23-33	10.2	1.1
Base of Howe	12.2	2.2
Rover	12.7, 12.8	
Hamer	14.0	1.0
Sugar City	14.3	2.2
Roberts	11.7	1.3
Big Southern Butte	15.4, 14.8	

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