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
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
HPIC	-	high-pressure ion chamber
IBL	-	Idaho Bureau of Laboratories
ICPP	-	Idaho Chemical Processing Plant
IDL	-	instrument detection limit
INL	-	Idaho National Laboratory
INTEC	-	Idaho Nuclear Technology and Engineering Center
ISU	-	Idaho State University
LLD	-	lower limit of detection
LSC	-	liquid scintillation counting
MCL	-	maximum contaminant level
MDA	-	minimum detectable activity
MDC	-	minimum detectable concentration
MFC	-	Materials and Fuels Complex
µg/L	-	micrograms per liter
mg/L	-	milligrams per liter
MP	-	milepost
mrem	-	millirem or 1/1000th of a rem
mR	-	milliRoentgen
mR/hr	-	milliRoentgen per hour
µR/hr	-	microRoentgen per hour
MV	-	Magic Valley
NIST	-	National Institute of Standards and Technology
nCi/L	-	nanocuries per liter
NCRP	-	National Council on Radiation Protection and Measurements
NOAA	-	National Oceanic and Atmospheric Administration
NRF	-	Naval Reactors Facility
PBF	-	Power Burst Facility
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
RTC	-	Reactor Technology Complex
RWMC	-	Radioactive Waste Management Complex
SD	-	standard deviation
SMC	-	Specific Manufacturing Capability
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
WAI	-	Wastren Advantage, Inc.
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. 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, 2016 (**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 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**. Results are within the expected historical range.

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 2016 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. Atmospheric tritium was detected above the minimum detectable concentration (MDC) during the second quarter of 2016 at the Van Buren sampling station. There is one individual sample within the weighted mean that exceeded MDC located at the Rest Area sampling site: 0.74 pCi/m^3 (MDC 0.69 pCi/m^3).While the results are above MDC they are still well below the DEQ-INL OP action level of 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 2016. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. 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. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the second quarter of 2016. Tritium and Cesium-137 analysis results are presented in **Table 5**.

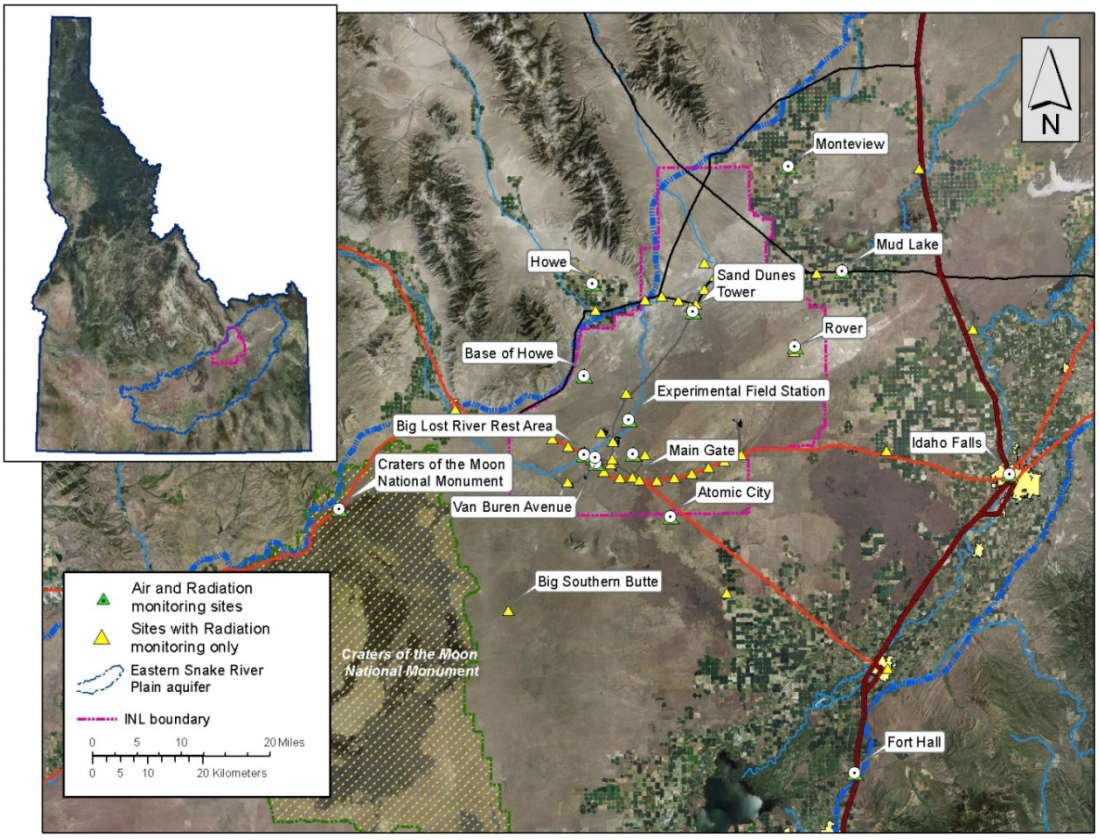

Figure 1. Air and radiation monitoring sites.

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, 2016.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.5	-	1.4	18.7	-	32.0
Experimental Field Station	0.6	-	1.3	15.5	-	27.9
Sand Dunes Tower	0.3	-	0.9	10.8	-	17.6
Van Buren Avenue	0.5	-	1.0	11.9	-	24.2
Boundary Locations						
Atomic City	0.5	-	1.2	14.7	-	25.5
Howe	0.5	-	1.2	13.3	-	24.7
Monteview	0.6	-	1.1	13.4	-	25.1
Mud Lake	0.7	-	1.6	18.5	-	33.4
Distant Locations						
Craters of the Moon	0.4	-	1.1	13.5	-	24.8
Fort Hall[1]	0.4	-	1.3	11.7	-	26.1
Idaho Falls – HVP 3804	0.7	-	1.5	18.4	-	33.5
Idaho Falls – HVP 4304	0.6	-	1.4	14.3	-	33.8

[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, 2016.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides	
	Concentration	± 2 SD	Concentration	MDC
On-site Locations				
Big Lost River Rest Area	94.5	5.1	<MDC[2]	
Experimental Field Station	82.5	4.4	<MDC	
Sand Dunes Tower	54.6	3.0	<MDC	
Van Buren Avenue	68.8	3.6	<MDC	
Boundary Locations				
Atomic City	80.0	4.1	<MDC	
Howe	76.3	4.0	<MDC	
Monteview	83.3	4.3	<MDC	
Mud Lake	107.8	5.5	<MDC	
Distant Locations				
Craters of the Moon	65.1	3.6	<MDC	
Fort Hall[1]	67.1	3.6	<MDC	
Idaho Falls – HVP 3804	100.7	5.2	<MDC	
Idaho Falls – HVP 4304	91.8	4.8	<MDC	

[1]Operated by Shoshone-Bannock Tribes.
[2]MDC for Cs-137 typically (0.05-0.10) x 10^{-3} 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, 2016

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.41	0.39	0.63
Experimental Field Station	0.55	0.49	0.76
Sand Dunes Tower	0.17	0.43	0.72
Van Buren Avenue	0.71	0.42	0.66
Boundary Locations			
Atomic City	0.29	0.41	0.67
Howe	0.27	0.45	0.73
Mud Lake	0.40	0.50	0.79
Monteview	0.30	0.48	0.78
Distant Locations			
Craters of the Moon	0.15	0.27	0.44
Fort Hall[1]	0.03	0.29	0.50
Idaho Falls	0.18	0.47	0.83

[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, 2016

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	50	110	180	1.0	1.6	2.7
Boundary Locations						
Atomic City	40	110	180	1.4	1.6	2.7
Howe	70	110	180	0.2	1.8	3.1
Monteview	60	110	180	0.5	1.2	2.1
Mud Lake	-10	110	180	0.1	1.5	2.6
Distant Locations						
Idaho Falls	130	110	180	0.3	1.2	2.1

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 2016 (**Figure 1**). To detect gamma radiation, each station is instrumented with triplicate electret ionization chambers (EIC), and 11 of the stations also are equipped with a high-pressure ion chamber (HPIC) (**Table 6**).

The Shoshone-Bannock Tribes operate an additional environmental radiation monitoring station at Fort Hall equipped with EICs and an HPIC, both of which are owned and operated by the DEQ-INL OP. The DEQ-INL OP reports these results as a distant site.

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 2016. **Table 8** lists the EIC monitoring results for second quarter 2016. 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	■	■
Idaho Falls	■	■

Table 7. Average gamma exposure rates, second quarter, 2016, from HPIC network.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	15.7	1.1
Big Lost River Rest Area	15.2	0.8
Main Gate	14.8	1.2
[2]Rover	-	-
Sand Dunes Tower	13.2	0.7
Boundary Locations		
Atomic City	13.1	0.8
Big Southern Butte	15.2	1.0
[1]Howe Met Tower	11.0	0.8
Monteview	13.3	0.8
Mud Lake / Terreton	14.3	0.8
Distant Locations		
Fort Hall	12.6	1.6
Idaho Falls	12.5	2.0

[1]Howe Met Tower HPIC electronics had various electronic malfunctions and/or extreme temperature interference and the data was therefore unusable for determining exposure for the entire quarter – the values listed above represent only 27% of the quarterly data that was usable.

[2]Rover location HPIC electronics had various electronic malfunctions and/or extreme temperature interference and the data was therefore unusable; no data is available for second quarter 2016 at this location.

Table 8. Electret ionization chamber (EIC) cumulative average exposure rates, second quarter, 2016.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average[1]	± 2 SD
On-Site Locations		
Base of Howe	11.3	2.5
Big Lost River Rest Area	14.0	3.5
Experimental Field Station	17.0	3.3
Main Gate	13.5, 14.3	
Rover	12.3	0.8
Sand Dunes Tower	13.7	2.4
Van Buren Avenue	12.9, 14.2	
Boundary Locations		
Atomic City	11.5, 12.8	
Big Southern Butte	10.0, 11.0	
Howe Met Tower	10.6	1.3
Monteview	12.3	0.8
Mud Lake/Terreton	14.1	2.6
Distant Locations		
Craters of the Moon	11.3	2.0
Fort Hall	11.4, 12.8	
Idaho Falls	11.2	2.1

[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.

Water Monitoring Results

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 2016, 4 up-gradient, 18 facility, 12 boundary, and 7 distant locations were sampled. Of the 12 boundary locations, 7 are Westbay™ packer sampling systems, which allow water samples to be collected from discrete levels or zones within the well. These wells include USGS-103 (sampled at 1269 feet below land surface [ft bls]), USGS-108 (1172 ft bls), USGS-132 (765 ft bls), USGS-137A (747 ft bls), Middle-2051 (749 ft bls, 1091 ft bls, and 1141 ft bls), USGS-131A (616 ft bls and 812 ft bls) and USGS-105 (952 ft bls and 1072 ft 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 3 up-gradient, 11 facility, 1 distant, and 7 boundary locations. Concentrations observed at facility locations are consistent with historical trends associated with each facility. 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) and at every sample site except one facility location. Concentrations observed at facility locations were consistent with historical trends and elevated levels 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 not detected at any well sampled this quarter. Results for gross alpha, gross beta, and man-made, gamma emitting ^{137}Cs are shown in **Table 9**.

Six facility locations were sampled for isotopes of uranium with all reporting detectable concentrations for ^{234}U, and ^{238}U (**Table 10**). Three sites, ICPP-2020, USGS-047, and USGS-052, indicated detectable concentrations for ^{235}U that were greater than the MDC; however, those values are less than three standard deviations and are considered non-detections. The results observed at all six sample sites cannot be distinguished from background values, which means the uranium found in the samples is likely to be naturally occurring. Six locations were sampled for plutonium isotopes (**Table 11**). There were no detectable results for plutonium isotopes this quarter. One site was sampled for ^{241}Am this quarter. The result was a non-detection (**Table 12**).

Eight of the sixteen facility locations analyzed for ^{90}Sr had detectable results this quarter, with five above the drinking water MCL of 8 pCi/L (**Table 13**). All samples were collected in areas of known contamination at or near the INTEC and ATR Complex facilities. Three up-gradient and eight facility locations were sampled for ^{99}Tc. All facility locations reported values within the expected ranges of concentrations typically found at these sites with each of these values well below the MCL of 900 pCi/L (**Table 14**). 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, two reported detectable results.

Using the standard analytical method, ^{3}H was detected at ten of the eighteen facility locations sampled (**Table 15**). Tritium levels found are comparable to historic concentrations for these sites and are consistent with INL waste disposal influences. There were eight detections found at Westbay boundary locations, including Middle-2051 at all three sampled depths (749 ft bls, 1091 ft bls, and 1141 ft bls), USGS-105 at both sampled depths (952 ft bls and 1072 ft bls), USGS-131A at both sampled depths (616

ft bls and 812 ft bls), and USGS-132 at 765 ft bls. 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. No samples were analyzed using the enrichment method for the current quarter, while sample analysis for six sites collected during previous quarters was completed and results presented during this quarter (**Table 16**). A backlog of 87 samples remains.
Samples were also analyzed for metals, common ions, and nutrients with results shown in **Tables 17, 18** and **19**. All results were within expected ranges at each location.

Volatile Organic Compounds (VOCs) were sampled from two locations, a westbay well and a well located near the RWMC facility. Tetrachloroethene (PCE) was unexpectedly detected in westbay well Middle-2051 by the DOE contractor Fluor. DEQ-INL OP participated in co-sampling Middle-2051 with both USGS and Fluor to validate positive results for tetrachloroethene (PCE). Investigation results suggest PCE contamination originated from inside the well casing and not as a result of aquifer contamination caused by INL activities. Due to the construction of this type of well, the water inside the well casing is independent of the aquifer water. The well casing was filled with water when the well was constructed in 2005 and does not mix with the aquifer. Well casing water from other westbay wells was also sampled and similar PCE concentrations found; the cause of PCE contamination is still being investigated. DEQ-INL OP results are shown in **Table 20.** The background concentrations for VOCs should be non-detectable. The results discussed in this section only refer to detectable VOC concentrations; a complete list of analytes is shown in **Appendix C**.

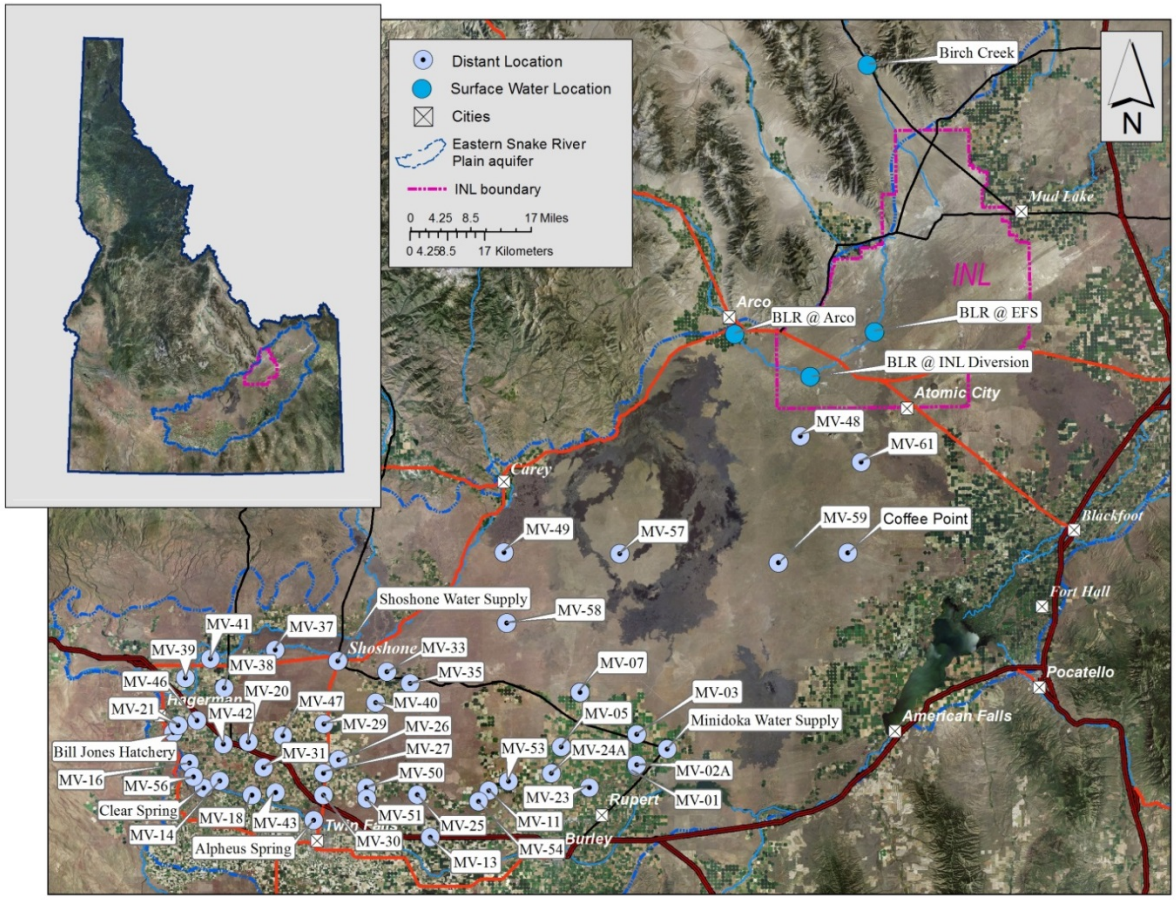

Figure 2. Distant and Surface Water monitoring locations.

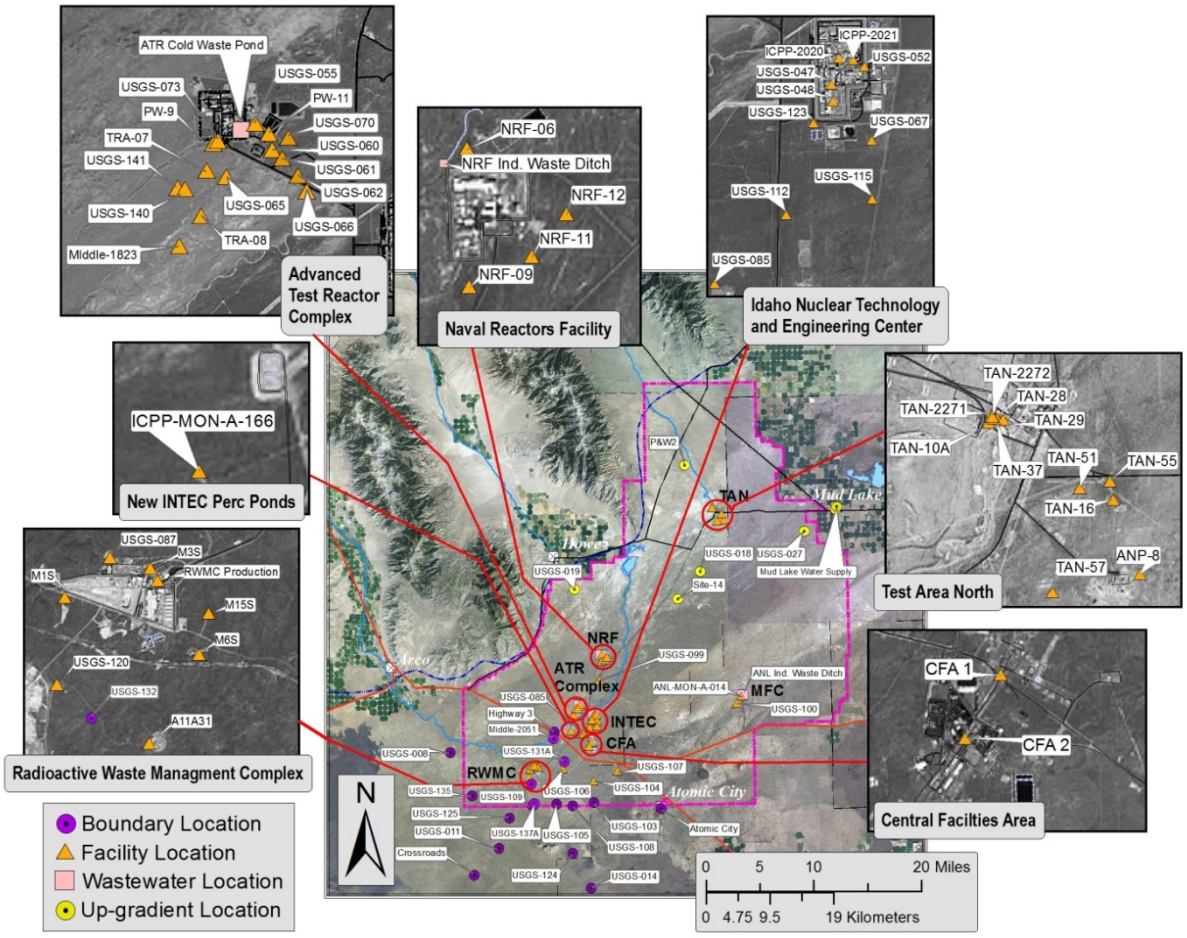

Figure 3. Up-gradient, facility, boundary, and wastewater monitoring locations.

Table 9. Gross alpha, gross beta, and gamma-emitting radionuclide concentrations for water samples, second quarter, 2016.

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	5/18/2016	-0.3	U	0.6	4.3		0.8	-1.0	U	1.6
P&W-2	4/11/2016	2.9	J	1.0	1.5	J	0.8	0.5	U	1.4
USGS-019	4/11/2016	2.3	J	1.2	1.6	J	0.9	0.0	U	1.4
USGS-027	4/11/2016	4.0		1.5	10.6		1.2	0.0	U	1.3
Facility										
CFA 1	4/11/2016	1.6		0.9	8.2		1.0	-0.4	U	1.4
ICPP-2020	4/26/2016	2.1		1.2	148		3.0	0.8	U	1.2
ICPP-MON-A-166	4/12/2016	1.4		0.8	4.5		0.9	1.2	U	1.4
NRF-06	5/17/2016	2.9	U	3.0	7.5		2.9	0.1	U	1.7
NRF-09	5/17/2016	2.0		1.1	2.4		0.9	0.2	U	1.1
NRF-11	5/17/2016	0.6	U	1.1	2.5		0.9	-0.5	U	1.2
NRF-12	5/17/2016	3.7		1.6	3.3		1.0	-0.4	U	1.2
USGS-047	4/26/2016	1.0	U	0.9	36.9		1.6	1.5	U	1.6
USGS-048	4/27/2016	1.0	U	0.8	22.5		1.3	0.5	U	1.5
USGS-052	4/25/2016	1.7		0.9	170.6		3.0	0.9	U	1.8
USGS-062	4/14/2016	-0.1	U	0.2	0.3	U	0.6	-0.2	U	1.2
USGS-065	4/14/2016	1.7		0.8	3.3		0.8	1.5	U	1.7
USGS-067	4/25/2016	0.8	U	0.8	95.5		2.3	1.0	U	1.5
USGS-070	4/14/2016	4.7		1.5	58.3		2.0	0.7	U	1.4
USGS-085	4/4/2016	1.9		1.1	8.5		1.0	0.1	U	1.3
USGS-087	4/13/2016	1.3		0.7	3.6		0.8	-0.6	U	1.5
USGS-099	5/18/2016	0.0	U	0.9	2.9		0.8	0.2	U	1.6
USGS-100	4/12/2016	2.2		0.9	4.5		0.9	2.0	U	1.9
Boundary										
Atomic City	4/13/2016	0.8	U	0.7	2.2	J	0.8	0.5	U	1.4
Crossroads	4/12/2016	2.4		0.9	2.9		0.8	1.1	U	1.7
Middle-2051 (1091 ft bls)	6/8/2016	2.3		1.1	3.6		0.9	0.0	U	1.2
Middle-2051 (749 ft bls)	6/8/2016	1.5		0.8	2.0		0.8	0.2	U	1.9
Middle-2051 (1141 ft bls)	6/30/2016	0.2	U	1.3	3.1		0.9	0.5	U	1.4
USGS-008	4/12/2016	2.7		1.1	2.7		0.9	0.4	U	1.4
USGS-011	4/13/2016	2.4		0.9	2.0		0.8	0.5	U	1.3
USGS-103 (1269 ft bls)	6/14/2016	-1.0	U	1.0	4.5		0.8	0.7	U	1.5
USGS-105 (1072 ft bls)	6/16/2016	0.2	U	1.1	3.4		0.8	-0.6	U	1.6
USGS-105 (952 ft bls)	6/16/2016	-0.6	U	1.0	3.1		0.8	-0.4	U	1.5
USGS-108 (1172 ft bls)	6/15/2016	0.8	U	0.7	2.6		0.8	-0.6	U	1.4
USGS-124	4/13/2016	1.4		0.8	4.2		0.9	1.1	U	1.5
USGS-131A (616 ft bls)	6/29/2016	-0.3	U	1.1	3.6		0.9	-0.2	U	1.4
USGS-131A (812 ft bls)	6/29/2016	0.2	U	1.4	3.2		0.9	0.3	U	1.2
USGS-132 (765 ft bls)	6/7/2016	1.3	U	1.2	3.5		0.8	-0.2	U	1.2
USGS-137A (747 ft bls)	6/13/2016	2.1		1.0	2.9		0.8	-0.4	U	1.2
Distant										
Alpheus Spring	5/16/2016	2.1	U	1.5	9.7		1.1	0.7	U	1.2
Bill Jones Hatchery	5/16/2016	-0.1	U	0.7	3.5		0.7	0.3	U	1.3
Clear Spring	5/16/2016	0.4	U	1.1	3.8		0.8	0.7	U	1.5
Minidoka Water Supply	5/16/2016	1.0	U	0.9	3.4		0.8	1.1	U	1.5
MV-57	6/9/2016	1.5		0.7	2.0		0.7	-1.0	U	1.6
MV-58	6/9/2016	-0.4	U	0.9	3.1		0.8	0.7	U	1.4
Shoshone Water Supply	5/16/2016	1.4	U	1.2	4.0		0.9	1.6	U	1.4

[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, 2016.

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										
ICPP-2020	4/26/2016	1.91		0.45	0.087*	U	0.077	0.92		0.27
USGS-047	4/26/2016	1.23		0.31	0.052*	U	0.053	0.60		0.19
USGS-048	4/27/2016	1.61		0.38	0.065	U	0.063	0.70		0.22
USGS-052	4/25/2016	1.55		0.38	0.100*	U	0.078	1.02		0.28
USGS-065	4/14/2016	1.93		0.44	0.023	U	0.050	0.93		0.26
USGS-067	4/25/2016	1.58		0.39	0.030	U	0.055	0.80		0.24

[1]Data qualifiers: U = non-detection, J = estimate, R = rejected.
[2]Concentrations expressed in pCi/L.
*The result is greater than the MDC but is less than 3 SD so is therefore considered a non-detection.

Table 11. Reported concentrations of plutonium isotopes in water samples, second quarter, 2016.

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240		
		Concentration[1,2]		±2 SD	Concentration[1,2]		±2 SD
Facility							
ICPP-2020	4/26/2016	0.003	U	0.019	-0.002	U	0.019
USGS-047	4/26/2016	0.001	U	0.020	-0.004	U	0.020
USGS-048	4/27/2016	0.003	U	0.017	0.003	U	0.017
USGS-052	4/25/2016	-0.002	U	0.018	0	U	0.018
USGS-065	4/14/2016	-0.008	U	0.021	0.009	U	0.021
USGS-067	4/25/2016	-0.004	U	0.019	-0.002	U	0.019

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

Table 12. Reported concentrations of americium-241 in water samples, second quarter, 2016.

Sample Location	Sample Date	Americium-241		
		Concentration[1,2]		±2 SD
Facility				
USGS-065	4/14/2016	-0.014	U	0.016

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

Table 13. Reported concentrations of strontium-90 in water samples, second quarter, 2016.

Sample Location	Sample Date	Strontium-90		
		Concentration[1,2]		±2 SD
Facility				
CFA 1	4/11/2016	0.10	U	0.24
ICPP-2020	4/26/2016	9.7		2.4
NRF-06	5/17/2016	0.15	U	0.16
NRF-09	5/17/2016	0.30	U	0.29
NRF-11	5/17/2016	0.18	U	0.17
NRF-12	5/17/2016	0.08	U	0.25
USGS-047	4/26/2016	11.9		2.9
USGS-048	4/27/2016	12.3		3.0
USGS-052	4/25/2016	2.64		0.74
USGS-062	4/14/2016	0.96		0.39
USGS-065	4/14/2016	0.43	U	0.28
USGS-067	4/25/2016	10.9		2.7
USGS-070	4/14/2016	19.4		4.7
USGS-085	4/4/2016	2.38		0.70
USGS-087	4/13/2016	-0.28	U	0.24
USGS-099	5/18/2016	0.16	U	0.25

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

Table 14. Reported concentrations of technetium-99 in water samples, second quarter, 2016.

Sample Location	Sample Date	Technetium-99		
		Concentration[1,2]		±2 SD
Upgradient				
P&W-2	4/11/2016	-0.1	U	0.1
USGS-019	4/11/2016	0.5		0.2
USGS-027	4/11/2016	1.9		0.2
Facility				
CFA 1	4/11/2016	8.6		0.3
ICPP-2020	4/26/2016	242.2		1.5
USGS-047	4/26/2016	1.9	J	0.2
USGS-048	4/27/2016	2.2		0.2
USGS-052	4/25/2016	351.1		1.7
USGS-067	4/25/2016	131.2		1.1
USGS-085	4/4/2016	1.2		0.2
USGS-087	4/13/2016	1.2		0.6

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

Table 15. Tritium concentrations for water samples, second quarter, 2016.

Sample Location	Sample Date	Tritium		
		Concentration[1,2]		±2 SD
Upgradient				
Mud Lake Water Supply	5/18/2016	0	U	80
P&W-2	4/11/2016	0	U	80
USGS-019	4/11/2016	0	U	110
USGS-027	4/11/2016	70	U	110
Facility				
CFA 1	4/11/2016	2680		170
ICPP-2020	4/26/2016	1830		150
ICPP-MON-A-166	4/12/2016	110	U	90
NRF-06	5/17/2016	30	U	80
NRF-09	5/17/2016	0	U	110
NRF-11	5/17/2016	20	U	80
NRF-12	5/17/2016	-110	U	110
USGS-047	4/26/2016	320		100
USGS-048	4/27/2016	890		120
USGS-052	4/25/2016	730		110
USGS-062	4/14/2016	60	U	80
USGS-065	4/14/2016	2410		170
USGS-067	4/25/2016	2230		160
USGS-070	4/14/2016	1690		150
USGS-085	4/4/2016	1010		120
USGS-087	4/13/2016	490		100
USGS-099	5/18/2016	-10	U	80
USGS-100	4/12/2016	90	U	90
Boundary				
Atomic City	4/13/2016	-10	U	110
Crossroads	4/12/2016	10	U	140
Middle-2051 (1091 ft bls)	6/8/2016	190		110
Middle-2051 (749 ft bls)	6/8/2016	220		110
Middle-2051 (1141 ft bls)	6/30/2016	220		110
USGS-008	4/12/2016	40	U	80
USGS-011	4/13/2016	60	U	110
USGS-103 (1269 ft bls)	6/14/2016	120	U	110
USGS-105 (1072 ft bls)	6/16/2016	220		120
USGS-105 (952 ft bls)	6/16/2016	210		110
USGS-108 (1172 ft bls)	6/15/2016	20	U	110
USGS-124	4/13/2016	40	U	80
USGS-131A (616 ft bls)	6/29/2016	940		130
USGS-131A (812 ft bls)	6/29/2016	1150		130
USGS-132 (765 ft bls)	6/7/2016	220		110
USGS-137A (747 ft bls)	6/13/2016	0	U	110
DIstant				
Alpheus Spring	5/16/2016	-50	U	110
Bill Jones Hatchery	5/16/2016	0	U	110
Clear Spring	5/16/2016	-150	U	110
Minidoka Water Supply	5/16/2016	-70	U	110
MV-57	6/9/2016	-50	U	110
MV-58	6/9/2016	70	U	110
Shoshone Water Supply	5/16/2016	-70	U	110

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

Table 16. Enriched tritium concentrations for water samples from previous sampling quarters.

Sample Location	Sample Date	Enriched Tritium		
		Concentration[1,2]		±2 SD
Upgradient				
Site-14	10/13/2015	5	U	8
Facility				
USGS-060	10/13/2015	12		7
Distant				
MV-41	6/30/2015	18		9
MV-43	7/13/2015	11	U	8
Shoshone Water Supply	7/13/2015	9	U	7
Waste Water				
ATR Cold Waste Pond	10/15/2015	4	U	4

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

Table 17. Reported metals concentrations in water samples, second quarter, 2016.

Sample Location	Sample Date	Concentration[1,2]															
		Arsenic		Barium		Chromium		Iron		Lead		Manganese		Selenium		Zinc	
Upgradient																	
P&W-2	4/11/2016	<2.0	U	47		1.8		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-019	4/11/2016	<2.0	U	77		1.9		37	J	<1.0	U	8.3	J	<2.0	U	<10	U
USGS-027	4/11/2016	2.8		84		5.7		23	J	<1.0	U	2.1	J	2.1		<10	U
Facility																	
CFA 1	4/11/2016	<2.0	U	86		11		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
ICPP-2020	4/26/2016	<2.0	U	120		9.6		48		<1.0	U	5.9		<2.0	U	<10	U
ICPP-MON-A-166	4/12/2016	<2.0	U	50		5.3		<10	U	<1.0	U	4.8	J	<2.0	U	<10	U
NRF-06	5/17/2016	3.4		150		40		<10	U	<1.0	U	<1.0	U	2.5		<10	U
NRF-09	5/17/2016	<2.0	U	150		12		<10	U	<1.0	U	<1.0	U	2.6		<10	U
NRF-11	5/17/2016	<2.0	U	140		12		<10	U	<1.0	U	<1.0	U	2.2		<10	U
NRF-12	5/17/2016	<2.0	U	140		10		<10	U	<1.0	U	<1.0	U	2.1		<10	U
USGS-047	4/26/2016	<2.0	U	67		8.2		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-048	4/27/2016	<2.0	U	78		7.7		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-052	4/25/2016	<2.0	U	86		7.6		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-062	4/14/2016	8.9		56		11		<10	U	<1.0	U	1.3	J	2.0		<10	U
USGS-065	4/14/2016	<2.0	U	50		77		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-067	4/25/2016	<2.0	U	120		7.4		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-070	4/14/2016	8.6		82		23		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-085	4/4/2016	<2.0	U	83		21		<10	U	<1.0	U	1.2		<2.0	U	<10	U
USGS-087	4/13/2016	<2.0	U	24		5.8		<10	U	<1.0	U	4.4	J	<2.0	U	<10	U
USGS-099	5/18/2016	<2.0	U	100		5.9		12		<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-100	4/12/2016	2.1		36		2.7		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
Boundary																	
Atomic City	4/13/2016	2.4		36		2.7		<10	U	1.8		<1.0	U	<2.0	U	28	
Crossroads	4/12/2016	<2.0	U	23		3.5		<10	U	<1.0	U	3.0	J	<2.0	U	78	
Middle-2051 (1091 ft bls)	6/8/2016	<2.0	U	39		7.1		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
Middle-2051 (749 ft bls)	6/8/2016	<2.0	U	61		7.3		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
Middle-2051 (1141 ft bls)	6/30/2016	<2.0	U	35		6.7		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-008	4/12/2016	<2.0	U	80		2.7		32	J	<1.0	U	2.6	J	<2.0	U	<10	U
USGS-011	4/13/2016	<2.0	U	52		4.2		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-103 (1269.4 ft bls)	6/14/2016	<2.0	U	46		6.6		<10	U	<1.0	U	<1.0	U	<2.0	U	18	
USGS-105 (1072 ft bls)	6/16/2016	<2.0	U	36		8.5		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-105 (952 ft bls)	6/16/2016	<2.0	U	36		7.9		<10	U	<1.0	U	<1.0	U	<2.0	U	85	
USGS-108 (1172 ft bls)	6/15/2016	<2.0	U	42		6.3		<10	U	<1.0	U	2.9		<2.0	U	83	
USGS-124	4/13/2016	<2.0	U	31		6.3		25	J	<1.0	U	7.2	J	<2.0	U	<10	U
USGS-131A (616 ft bls)	6/29/2016	<2.0	U	30		11		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-131A (812 ft bls)	6/29/2016	<2.0	U	57		11		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
USGS-132 (765 ft bls)	6/7/2016	<2.0	U	42		8.7		<10	U	<1.0	U	<1.0	U	<2.0	U	32	
USGS-137A (747 ft bls)	6/13/2016	<2.0	U	33		7.2		<10	U	<1.0	U	<1.0	U	<2.0	U	12	
Distant																	
MV-57	6/9/2016	<2.0	U	5.3		3.8		<10	U	<1.0	U	<1.0	U	<2.0	U	<10	U
MV-58	6/9/2016	2.5		17		3.2		16		<1.0	U	2.4		<2.0	U	40	

[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 18. Reported common ion concentrations in water samples, second quarter, 2016.

Sample Location	Sample Date	Concentration[1,2]																	
		Calcium		Magnesium		Sodium		Potassium		Fluoride		Chloride		Sulfate		Alkalinity[3]			
Upgradient																			
P&W-2*	4/11/2016	40		16		7.9		1.6		<0.20	U	7.9		28.4		148			
USGS-019*	4/11/2016	46		17		10		1.4		<0.20	U	13.3		23.3		168			
USGS-027*	4/11/2016	52		18		28		6.0		0.58		47.6		39.9		162			
Facility																			
CFA 1*	4/11/2016	58		17		24		3.4		<0.20	U	76.9		30.2		139			
ICPP-2020*	4/26/2016	59		17		21		3.1		0.215		54.1		38.3		144			
ICPP-MON-A-166*	4/12/2016	35		12		9.8		2.7		0.244		11.8		18.8		128			
NRF-06*	5/17/2016	140		37		190		6.5		<0.20	U	500		79.5		189			
NRF-09*	5/17/2016	72		22		20		2.7		<0.20	U	52.4		41.6		208			
NRF-11*	5/17/2016	67		21		19		2.6		<0.20	U	41.4		38.4		207			
NRF-12*	5/17/2016	67		22		17		2.5		<0.20	U	38.1		39.4		210			
USGS-047*	4/26/2016	48		14		9.4		2.0		0.219		15.0		23.4		156			
USGS-048*	4/27/2016	48		14		11		2.4		0.212		18.6		24.4		155			
USGS-052*	4/25/2016	48		15		12		2.7		0.212		22.2		25.7		154			
USGS-062*	4/14/2016	82		25		15		3.3		<0.20	U	20.1		161		146			
USGS-065*	4/14/2016	82		18		15		3.9		<0.20	U	19.2		152		134			
USGS-067*	4/25/2016	52		15		23		3.5		0.224		43.1		28.8		145			
USGS-070*	4/14/2016	72		22		14		3.4		<0.20	U	17.4		124		156			
USGS-085*	4/4/2016	56		15		10		2.5		<0.20	U	14.0		42.0		165			
USGS-087*	4/13/2016	34		14		18		3.4		<0.20	U	29.7		26.5		122			
USGS-099*	5/18/2016	57		20		16		1.8		<0.20	U	21.8		28.1		209			
USGS-100*	4/12/2016	36		12		17		3.2		0.664		16.1		16.5		139			
Boundary																			
Atomic City*	4/13/2016	34		14		17		3.4		0.549		17.1		17.0		140			
Crossroads*	4/12/2016	38		16		9.0		2.6		<0.20	U	11.6		21.8		156			
Middle-2051* (1091 ft bls)	6/8/2016	38		18		7.8		2.4		<0.20	U	12.4		24.0		152			
Middle-2051* (749 ft bls)	6/8/2016	44		16		8.5		2.3		<0.20	U	11.3		26.5		159			
Middle-2051* (1141 ft bls)	6/30/2016	38		18		7.8		2.5		0.303		12.2		23.8		152			
USGS-008*	4/12/2016	45		15		6.9		1.8		<0.20	U	7.8		21.8		161			
USGS-011*	4/13/2016	40		14		8.3		2.3		0.207		9.74		22.7		147			
USGS-103* (1269 ft bls)	6/14/2016	39		16		8.9		2.5		0.216		15.1		23.4		146			
USGS-105* (1072 ft bls)	6/16/2016	40		15		10		2.9		0.216		13.4		24.8		150			
USGS-105* (952 ft bls)	6/16/2016	40		16		10		2.8		0.218		13.4		24.6		150			
USGS-108* (1172 ft bls)	6/15/2016	45		19		8.2		2.3		<0.20	U	17.9		25.8		162			
USGS-124*	4/13/2016	39		16		10		2.4		0.345		16.4		23.6		145			
USGS-131A* (616 ft bls)	6/29/2016	43		15		7.7		2.6		0.318		17.3		23.6		142			
USGS-131A* (812 ft bls)	6/29/2016	51		17		9.5		2.7		0.271		26.3		28.1		157			
USGS-132* (765 ft bls)	6/7/2016	40		16		9.8		2.6		0.238		11.6		26.3		148			
USGS-137A* (747 ft bls)	6/13/2016	39		15		11		2.7		0.224		12.7		26.2		146			
Distant																			
MV-57*	6/9/2016	23		12		11		2.5		0.346		6.18		16.5		108			
MV-58*	6/9/2016	22		11		14		2.7		0.482		6.88		11.1		110			

[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 19. Reported nutrient concentrations in water samples, second quarter, 2016.

Sample Location	Sample Date	Concentration[1,2]			
		Nitrite + Nitrate		Phosphorus	
Upgradient					
P&W-2	4/11/2016	0.48		0.017	
USGS-019	4/11/2016	0.95		0.0072	
USGS-027	4/11/2016	2.6		0.014	
Facility					
CFA 1	4/11/2016	2.6		0.020	
ICPP-2020	4/26/2016	4.3		0.022	
ICPP-MON-A-166	4/12/2016	0.27		0.023	
NRF-06	5/17/2016	2.1		0.091	
NRF-09	5/17/2016	2.7		0.030	
NRF-11	5/17/2016	2.1		0.029	
NRF-12	5/17/2016	2.0		0.029	
USGS-047	4/26/2016	1.2		0.032	
USGS-048	4/27/2016	1.7		0.028	
USGS-052	4/25/2016	2.4		0.026	
USGS-062	4/14/2016	1.7		0.140	
USGS-065	4/14/2016	1.5		0.022	
USGS-067	4/25/2016	5.1		0.027	
USGS-070	4/14/2016	1.6		0.250	
USGS-085	4/4/2016	1.1		0.027	
USGS-087	4/13/2016	0.55		0.0097	
USGS-099	5/18/2016	1.7		0.026	
USGS-100	4/12/2016	2.1		0.017	
Boundary					
Atomic City	4/13/2016	1.6		0.014	
Crossroads	4/12/2016	0.69		0.016	
Middle-2051 (1091 ft bls)	6/8/2016	0.89		0.016	
Middle-2051 (749 ft bls)	6/8/2016	0.82		0.021	
Middle-2051 (1141 ft bls)	6/30/2016	0.92		0.016	
USGS-008	4/12/2016	0.96		0.016	
USGS-011	4/13/2016	0.72		0.017	
USGS-103 (1269 ft bls)	6/14/2016	0.81		0.018	
USGS-105 (1072 ft bls)	6/16/2016	0.82		0.015	
USGS-105 (952 ft bls)	6/16/2016	0.83		0.019	
USGS-108 (1172 ft bls)	6/15/2016	1.0		0.026	
USGS-124	4/13/2016	0.85		0.016	
USGS-131A (616 ft bls)	6/29/2016	0.94		0.019	
USGS-131A (812 ft bls)	6/29/2016	1.3		0.018	
USGS-132 (765 ft bls)	6/7/2016	0.72		0.017	
USGS-137A (747 ft bls)	6/13/2016	0.69		0.018	
Distant					
MV-57	6/9/2016	0.40		0.018	
MV-58	6/9/2016	1.4		0.023	

[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 20. Reported VOC concentrations in water samples, second quarter, 2016.

Sample Location	Sample Date	Concentrations[1,2]						
		1,1-Dichloroethene	Carbon tetrachloride	Cis-1,2-Dichloroethene	Trans-1,2-Dichloroethene	Tetrachloroethene (PCE)	Trichloroethylene	Vinyl Chloride
Middle-2051 (749 ft bls)	6/8/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Middle-2051 (1091 ft bls)	6/8/2016	<0.5	<0.5	<0.5	<0.5	0.67	<0.5	<0.5
Middle-2051 (1141 ft bls)	6/30/2016	<0.5	<0.5	<0.5	<0.5	0.70	<0.5	<0.5
USGS-087	4/13/2016	<0.5	3.47	<0.5	<0.5	<0.5	0.80	<0.5

[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. Physical 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 2016.

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. Results for analyses of milk samples are presented in **Table 21**. ^{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 21. Gamma spectroscopy analysis data for milk samples, second quarter, 2016.

Sample Location/Dairy	Sample Date	Naturally occurring Potassium-40		Man-made Iodine-131[1]
		Concentration[3]	± 2 SD	
Monitoring Samples				
Riverside	04/04/2016	1624	124	<MDC
	05/09/2016	1799	115	<MDC
	06/06/2016	1764	126	<MDC
Gooding/Glanbia	04/19/2016	1456	111	<MDC
	05/11/2016	1529	103	<MDC
	06/09/2016	1504	97	<MDC
Verification Samples[2]				
Rupert	04/12/2016	1310	108	<MDC
Howe	04/05/2016	1373	106	<MDC
Terreton	05/02/2016	1392	111	<MDC
Dietrich	05/03/2016	1503	113	<MDC
Rupert	06/07/2016	1515	102	<MDC
Idaho Falls	06/07/2016	1480	112	<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 with associated uncertainties (±2 SD) 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 2016 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 2016, the DEQ-INL OP submitted 111 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 second quarter of 2016 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 analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 26, Table 27, Table 28,** and **Table 29**.

One field blank water sample failed acceptance criteria for gross alpha and gross beta during the second quarter of 2016. Four sites were analyzed with the blank sample, with two of the sites reporting detectable concentrations of gross alpha, and three of the sites reporting detectable concentrations of gross beta. These detections of gross alpha and of gross beta are consistent with expected values; however, all of these samples will be flagged with a "J" and qualified as estimates based on the gross alpha and gross beta detections in the blank sample.

One field blank water sample failed acceptance criteria for iron during the second quarter of 2016, with a concentration of 39 µg/L (**Table 27**). There were fifteen sites that were analyzed on the same day as the blank sample, with four of the sites reporting detectable concentrations for iron. All four sample results are flagged with a "J" and qualified as estimates based on the iron detection in the blank sample.

Two field blank water samples failed acceptance criteria for manganese during the second quarter of 2016, with concentrations of 10 and 19 µg/L (**Table 27**). There were sixteen sites that were analyzed on the same day as both blank samples. Of the sixteen sites, eight reported detectable concentrations for

manganese. These eight sample results are flagged with a "J" and qualified as estimates based on the manganese detections in both blank samples.

One field blank water sample result for Total Alkalinity is at the detection level of 1.0 mg/L. With results for alkalinity ranging from 108 to 210 mg/L (**Table 28**), significantly above the blank value of 1.0 mg/L, no qualifiers or flags will be attached with the alkalinity results analyzed on the same day as this 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 that have 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 30** for radiological analyses, and **Table 31**, **Table 32,** and **Table 33** for non-radiological analyses.

One duplicate water sample comparison for technetium-99 (^{99}Tc) failed DEQ-INL OP criteria for the second quarter of 2016. There were nine samples analyzed for ^{99}Tc within the same batch as the failed QC sample, including one other duplicate sample set that did pass comparison criteria. All nine samples reported detectible concentrations for ^{99}Tc, with all sample results agreeing with historical data. Only the failed duplicate result is flagged with a "J" and qualified as an estimate.

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.

During second quarter 2016, several spiked samples were created using de-ionized (DI) water and submitted to analytical laboratories for analyses. These non-radiological constituents were used to assess ground water analyte recovery rates and the results are presented in **Table 34,** and **Table 35**. All spiked samples passed DEQ-INL OP percent recovery criteria.

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 triplicate EICs are conducted in a repeatable geometry to a known exposure of near 30 mR and two additional groups of 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 the average triplicate measurement has a percent recovery of 100 ± 25% when compared to the known irradiated quantity. The irradiation results for second quarter 2016 are presented in **Table 36**. 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 2016, 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 2016.

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 2016 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 prescribed periodicity. During the second quarter of 2016 the radioiodine pump at Atomic City and a TSP blower at Idaho Falls were replaced. Service reliability for air sampling equipment for the second quarter of 2016 is summarized in **Table 37**.

Conclusion

All data collected for the second quarter of 2016 have been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data have 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, second quarter, 2016.

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	154	13	0	0	5	ISU-EML
		Gross beta	154	13	0	0	5	ISU-EML
		Gamma emitters	12	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	33	3	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	45	4	4	0	0	ISU-EML
		Gross beta	45	4	4	0	0	ISU-EML
		Gamma emitters	45	4	4	0	0	ISU-EML
		Tritium	45	4	4	0	0	ISU-EML
		Enriched tritium	6	2	0	0	0	ISU-EML
		Technetium-99	11	0	2	0	0	ISU-EML
		Radiochemical	29	0	5	0	0	ISU Sub
		Metals	39	4	4	1	0	IBL
		Common Ions	39	4	4	1	0	IBL
		Nutrients	39	4	4	1	0	IBL
		Volatile Organics	4	3	1	0	0	IBL
Terrestrial								
Milk	Grab or composite	Gamma emitters	12	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			**804**	**63**	**36**	**12**	**10**	
Total of QC Analyses (blanks, duplicates, and spikes)			**111**					
Percentage of QC analyses of total Test analyses[3]			**13.8%**					
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 23. Blank analysis results for gross alpha and beta in particulate air (TSP), second quarter, 2016.

Collection Period		Corrected volume (m^3)[1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
03/31/16	04/07/16	2030	0.0	0.1	-0.5	0.5
04/07/16	04/14/16	2030	0.0	0.1	0.1	0.5
04/14/16	04/21/16	2030	0.0	0.1	0.0	0.5
04/21/16	04/28/16	2030	0.0	0.1	-0.1	0.5
04/28/16	05/05/16	2030	0.0	0.1	0.1	0.5
05/05/16	05/12/16	2030	0.0	0.1	0.2	0.5
05/12/16	05/19/16	2030	-0.1	0.1	0.1	0.5
05/19/16	05/26/16	2030	0.0	0.1	0.1	0.5
05/26/16	06/02/16	2030	0.0	0.1	0.2	0.5
06/02/16	06/09/16	2030	-0.1	0.1	-0.1	0.5
06/09/16	06/16/16	2030	0.0	0.1	0.0	0.5
06/16/16	06/23/16	2030	0.0	0.1	0.1	0.5
06/23/16	06/30/16	2030	0.0	0.1	0.0	0.5

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 24. Blank analysis results for gamma spectroscopy for TSP particulate air filters, composite samples, second quarter, 2016.

Analysis Date	Beryllium-7			Ruthenium-106/Rhodium-106			Antimony-125		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
07/20/2016	-2	23	39	23	43	73	1	7	11

Analysis Date	Cesium-134			Cesium-137		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC
07/20/2016	0	2	4	1	2	4

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 25. Blank analysis results for tritium in water vapor from air samples, second quarter, 2016.

Sample Number	Start Date	Collection Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP162ZTR01	07/13/2016	07/19/2016	07/25/2016	0.08	0.09	0.14
OP162ZTR02	07/13/2016	07/19/2016	07/25/2016	-0.01	0.08	0.14
OP162ZTR03	07/13/2016	07/19/2016	07/25/2016	0.07	0.09	0.14

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

Table 26. Radiological blank analysis results in groundwater and/or surface water, second quarter, 2016.

Sample Number	Sample Date	Concentration[1]	± 2 SD	MDC	Within Blank Criteria?
Gross Alpha					
161W022	4/11/2016	0.7	0.3	0.4	No
161W040	5/18/2016	-0.5	0.3	0.7	Yes
161W358	6/30/2016	-0.6	0.3	0.6	Yes
161W034	6/8/2016	-0.5	0.3	0.6	Yes
Gross Beta					
161W022	4/11/2016	3.3	0.7	1.0	No
161W040	5/18/2016	0.5	0.6	0.9	Yes
161W358	6/30/2016	0.3	0.6	1.0	Yes
161W034	6/8/2016	-0.3	0.5	0.9	Yes
Cesium-137					
161W022	4/11/2016	0.3	1.3	2.2	Yes
161W040	5/18/2016	0.5	1.5	2.5	Yes
161W358	6/30/2016	-0.4	1.2	2.2	Yes
161W034	6/8/2016	-0.2	1.2	4.7	Yes
Tritium					
161W023	4/11/2016	10	80	140	Yes
161W041	5/18/2016	50	80	140	Yes
161W359	6/30/2016	70	110	180	Yes
161W035	6/8/2016	20	110	180	Yes
Enriched Tritium					
151W544	7/13/2015	13	5	8	Yes*
151W002	8/27/2015	17	7	11	Yes*

[1] Concentrations are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentrations (MDC).
* These detectable values are typical of DI water.

Table 27. Blank analysis results (µg/L) for metals in groundwater and/or surface water, second quarter, 2016.

Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
161W025	4/11/2016	<2.0	<1.0	<1.0	39	<1.0	10	<2.0	<10
161W043	5/18/2016	<2.0	<1.0	<1.0	<10	<1.0	19	<2.0	<10
161W361	6/30/2016	<2.0	<1.0	<1.0	<10	<1.0	<1.0	<2.0	<10
161W037	6/8/2016	<2.0	<1.0	<1.0	<10	<1.0	<1.0	<2.0	<10

Table 28. Blank analysis results (mg/L) for common ions and nutrients in groundwater and/or surface water, second quarter, 2016.

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
161W026,025,024	4/11/2016	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1.0	<0.01	<0.005
161W044,043,042	5/18/2016	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	1.0	<0.01	<0.005
161W362,361,360	6/30/2016	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1.0	<0.01	<0.005
161W038,037,036	6/8/2016	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1.0	<0.01	<0.005

Table 29. Blank analysis results (µg/L) for VOCs in groundwater and/or surface water, second quarter, 2016.

Sample Number	Sample Date	1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethene (PCE)	Trichloroethylene	Vinyl chloride
161W027	4/13/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
161W363	6/30/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
161W039	6/8/2016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table 30. Duplicate radiological analysis results in pCi/L for groundwater and/or surface water, second quarter, 2016.

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-12	161W272	3.7	1.6	161W278	1.6	1.5	2.1	3.3	Yes
USGS-047	161W148	1.0	0.9	161W158	2.3	1.1	1.3	2.1	Yes
USGS-085	161W207	1.9	1.1	161W214	2.7	1.2	0.8	2.4	Yes
MV-58	161W120	-0.4	0.9	161W302	0.8	0.6	1.2	1.6	Yes
Gross Beta									
NRF-12	161W272	3.3	1.0	161W278	2.4	0.9	0.9	2.0	Yes
USGS-047	161W148	36.9	1.6	161W158	40.6	1.7	3.7	3.5	Yes[2]
USGS-085	161W207	8.5	1.0	161W214	8.8	1.0	0.3	2.1	Yes
MV-58	161W120	3.1	0.8	161W302	2.8	0.8	0.3	1.7	Yes
Gamma Spectroscopy Cesium-137									
NRF-12	161W272	-0.4	1.2	161W278	0.9	1.5	1.3	2.9	Yes
USGS-047	161W148	1.5	1.6	161W158	0.4	1.5	1.1	3.3	Yes
USGS-085	161W207	0.1	1.3	161W214	-0.5	1.4	0.6	2.9	Yes
MV-58	161W120	0.7	1.4	161W302	0.5	2.0	0.2	3.7	Yes
Tritium									
NRF-12	161W274	-110	110	161W280	-40	80	70	204	Yes
USGS-047	161W153	320	100	161W163	380	100	60	212	Yes
USGS-085	161W210	1010	120	161W217	1090	120	80	255	Yes
MV-58	161W122	70	110	161W304	0	110	70	233	Yes
Strontium-90									
NRF-12	161W273	0.08	0.25	161W279	0.32	0.29	0.24	0.57	Yes
USGS-047	161W151	11.9	2.9	161W161	14.1	3.4	2.2	6.70	Yes
USGS-085	161W208	2.38	0.70	161W215	2.48	0.67	0.10	1.45	Yes
Technetium-99									
USGS-047	161W152	1.9	0.2	161W162	1.4	0.2	0.5	0.42	No
USGS-085	161W209	1.2	0.2	161W216	0.9	0.1	0.3	0.34	Yes
Plutonium-238									
USGS-047	161W150	0.001	0.020	161W160	0.009	0.021	0.008	0.04	Yes
Plutonium-239/240									
USGS-047	161W150	-0.004	0.020	161W160	0	0.021	0.004	0.04	Yes
Uranium-234									
USGS-047	161W154	1.23	0.31	161W164	1.47	0.36	0.24	0.71	Yes
Uranium-235									
USGS-047	161W154	0.052	0.053	161W164	0.027	0.049	0.025	0.11	Yes
Uranium-238									
USGS-047	161W154	0.60	0.19	161W164	0.68	0.21	0.08	0.42	Yes

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

[2] Compared using Relative Percent Difference (RPD) criteria. RPD = $(R_1-R_2) / ((R_1+R_2)/2)*100$

Table 31. Duplicate results for metals (µg/L) in groundwater, second quarter, 2016.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
NRF-12 (dissolved)	161W276	5/17/2016	<2.0	140	10	<10	<1.0	<1.0	2.1	<10
NRF-12 (dissolved)	161W282	5/17/2016	<2.0	140	10	<10	<1.0	<1.0	2.2	<10
RPD			**0**	**0**	**0**	**0**	**0**	**0**	**-5**	**0**
USGS-047 (dissolved)	161W156	4/26/2016	<2.0	67	8.2	<10	<1.0	<1.0	<2.0	<10
USGS-047 (dissolved)	161W166	4/26/2016	<2.0	66	8.0	<10	<1.0	<1.0	<2.0	<10
RPD			**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**
USGS-085 (dissolved)	161W212	4/4/2016	<2.0	83	21	<10	<1.0	1.2	<2.0	<10
USGS-085 (dissolved)	161W219	4/4/2016	<2.0	86	20	<10	<1.0	1.0	<2.0	<10
RPD			**0**	**-4**	**5**	**0**	**0**	**18**	**0**	**0**
MV-58 (dissolved)	161W124	6/9/2016	2.5	17	3.2	16	<1.0	2.4	<2.0	40
MV-58 (dissolved)	161W306	6/9/2016	2.4	17	3.1	14	<1.0	2.1	<2.0	39
RPD			**4**	**0**	**3**	**13**	**0**	**13**	**0**	**3**

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

Table 32. Duplicate results for common ions and nutrients (mg/L) in groundwater, second quarter, 2016.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
NRF-12*	161W277,276,275	5/17/2016	67	22	17	2.5	<0.2	38.1	39.4	210	2.0	0.029
NRF-12*	161W283,282,281	5/17/2016	67	22	17	2.5	<0.2	38.2	39.6	204	2.0	0.029
RPD			**0**	**0**	**0**	**0**	**0**	**0**	**-1**	**3**	**0**	**0**
USGS-047*	161W157,156,155	4/26/2016	48	14	9.4	2.0	0.219	15.0	23.4	156	1.2	0.032
USGS-047*	161W167,166,165	4/26/2016	48	14	9.5	2.1	0.215	14.9	23.3	157	1.2	0.031
RPD			**0**	**0**	**-1**	**-5**	**2**	**1**	**0**	**-1**	**0**	**3**
USGS-085*	161W213,212,211	4/4/2016	56	15	10	2.5	<0.2	14.0	42.0	165	1.1	0.027
USGS-085*	161W220,219,218	4/4/2016	56	15	10	2.5	<0.2	14.1	42.1	166	1.0	0.026
RPD			**0**	**0**	**0**	**0**	**0**	**-1**	**0**	**-1**	**10**	**4**
MV-58*	161W125,124,123	6/9/2016	22	11	14	2.7	0.482	6.88	11.1	110	1.4	0.023
MV-58*	161W307,306,305	6/9/2016	22	11	14	2.7	0.395	6.41	11.0	112	1.4	0.024
RPD			**0**	**0**	**0**	**0**	**20**	**7**	**1**	**-2**	**0**	**-4**

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

Table 33. Duplicate results for VOCs (µg/L) in groundwater, second quarter, 2016.

Sample Location	Sample Date	Sample Number	Concentrations						
			1,1-Dichloroethene	Carbon tetrachloride	Cis-1,2-Dichloroethene	Trans-1,2-Dichloroethene	Tetrachloroethene (PCE)	Trichloroethylene	Vinyl chloride
Middle-2051	6/30/2016	161W369	<0.5	<0.5	<0.5	<0.5	0.70	<0.5	<0.5
Middle-2051	6/30/2016	161W375	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	<0.5
RPD			**0**	**0**	**0**	**0**	**-1.4**	**0**	**0**

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

Table 34. De-ionized water spike results (in µg/L) and percent recovery for metals in groundwater and/or surface water, second quarter, 2016.

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
161W031	4/11/2016	45.3	50	**110**	10.5	10	**95**	5.43	5.8	**107**	5.83	6.5	**111**	21.2	24	**113**

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

Table 35. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in groundwater and/or surface water, second quarter, 2016.

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
161W031	4/11/2016	14	14	**100**	3.57	3.6	**101**	7.3	7.4	**101**	1.46	1.50	**103**	1.24	1.05	**85**

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

Table 35. continued. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in groundwater and/or surface water, second quarter, 2016.

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
161W031	4/11/2016	52.0	50.8	**98**	19.8	19.1	**96**	99.6	104	**104**	1.01	1.00	**99**	0.0242	0.0230	**95**

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

Table 36. Electret ionization chamber (EIC) irradiation results (categorized as spiked samples), second quarter, 2016.

Electret #	Exposure Received		Net Measured Exposure[1]		%R
	(mR)	Uncertainty (±1 SD, mR)	(mR)	Uncertainty (±1 SD, mR)	
SIR436	42.0	2.1	37.3	1.3	88.8
SHD976	42.0	2.1	40.5	1.3	96.4
SHC794	42.0	2.1	38.0	1.4	90.5
				Triplicate AVG	**91.9%**
SHD936	30.4	1.5	29.1	1.4	95.7
SHD984	30.4	1.5	30.6	1.3	100.7
SIR446	30.4	1.5	29.8	1.4	98.0
				Triplicate AVG	**98.1%**
SHY824	22.0	1.1	21.1	1.4	95.9
SHY833	22.0	1.1	20.0	1.4	90.9
SHC690	22.0	1.1	20.1	1.3	91.4
				Triplicate AVG	**92.7%**

Note: The average percent recovery (%R) of 100 ± 25 is considered acceptable. The triplicate average %R value is now being shown, whereas in previous reports only the individual values were shown.
[1] Net measured exposure estimate includes a correction for atmospheric pressure.

Table 37. Air sampling field equipment service reliability (percent operational), second quarter, 2016.

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%	100%	100%	NC[1]
Boundary Locations				
Atomic City	100%	92%	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	92%	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, 2016.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
On-Site Locations						
Big Lost River Rest Area	03/31/16	04/07/16	0.6	0.2	18.7	1.0
	04/07/16	04/14/16	1.2	0.3	32.0	1.2
	04/14/16	04/21/16	0.9	0.2	22.4	1.1
	04/21/16	04/28/16	0.5	0.2	19.8	1.0
	04/28/16	05/05/16	0.7	0.2	27.7	1.2
	05/05/16	05/12/16	0.8	0.2	26.9	1.2
	05/12/16	05/19/16	0.8	0.2	24.5	1.1
	05/19/16	05/26/16	0.8	0.2	19.8	1.0
	05/26/16	06/02/16	1.4	0.3	30.8	1.2
	06/02/16	06/09/16	1.2	0.3	31.4	1.3
	06/09/16	06/16/16	0.9	0.2	28.1	1.2
	06/16/16	06/23/16	1.3	0.3	27.6	1.2
	06/23/16	06/30/16	1.2	0.3	29.2	1.2
Experimental Field Station	03/31/16	04/07/16	R[1]	R[1]	R[1]	R[1]
	04/07/16	04/14/16	0.7	0.2	26.1	1.2
	04/14/16	04/21/16	0.9	0.2	18.5	1.0
	04/21/16	04/28/16	1.3	0.4	24.5	1.8
	04/28/16	05/05/16	0.7	0.2	22.4	1.1
	05/05/16	05/12/16	0.9	0.2	21.2	1.1
	05/12/16	05/19/16	0.9	0.4	26.0	1.7
	05/19/16	05/26/16	0.6	0.2	15.5	1.0
	05/26/16	06/02/16	1.1	0.2	25.2	1.2
	06/02/16	06/09/16	1.1	0.3	27.9	1.2
	06/09/16	06/16/16	0.9	0.2	23.0	1.1
	06/16/16	06/23/16	0.8	0.2	22.9	1.3
	06/23/16	06/30/16	R[1]	R[1]	R[1]	R[1]
Sand Dunes Tower	03/31/16	04/07/16	0.4	0.2	11.4	0.8
	04/07/16	04/14/16	0.6	0.2	17.4	0.9
	04/14/16	04/21/16	0.3	0.1	13.2	0.8
	04/21/16	04/28/16	0.3	0.1	10.8	0.8
	04/28/16	05/05/16	0.4	0.2	14.7	0.9
	05/05/16	05/12/16	0.6	0.2	15.7	0.9
	05/12/16	05/19/16	0.4	0.2	13.7	0.8
	05/19/16	05/26/16	0.3	0.1	11.7	0.8
	05/26/16	06/02/16	0.6	0.2	17.4	0.9
	06/02/16	06/09/16	0.7	0.2	17.6	1.0
	06/09/16	06/16/16	0.6	0.2	15.7	0.9
	06/16/16	06/23/16	0.5	0.2	14.6	0.9
	06/23/16	06/30/16	0.9	0.2	17.2	0.9

[1]R – Results rejected due to insufficient sample volume caused by known power outage.

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, 2016.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Van Buren Avenue	03/31/16	04/07/16	0.5	0.2	11.9	1.2
	04/07/16	04/14/16	1.0	0.2	21.8	1.1
	04/14/16	04/21/16	0.5	0.2	14.5	0.9
	04/21/16	04/28/16	0.5	0.2	14.7	0.9
	04/28/16	05/05/16	1.0	0.2	18.5	1.0
	05/05/16	05/12/16	0.5	0.2	17.0	1.0
	05/12/16	05/19/16	0.6	0.2	16.8	0.9
	05/19/16	05/26/16	0.5	0.2	12.6	0.8
	05/26/16	06/02/16	1.0	0.2	21.9	1.1
	06/02/16	06/09/16	0.9	0.2	24.2	1.1
	06/09/16	06/16/16	0.9	0.2	18.5	1.0
	06/16/16	06/23/16	0.8	0.2	18.8	1.0
	06/23/16	06/30/16	0.7	0.2	22.4	1.1
Boundary Locations						
Atomic City	03/31/16	04/07/16	0.5	0.2	14.9	0.9
	04/07/16	04/14/16	1.1	0.2	23.8	1.1
	04/14/16	04/21/16	0.8	0.2	17.0	0.9
	04/21/16	04/28/16	0.7	0.2	14.7	0.9
	04/28/16	05/05/16	0.7	0.2	19.9	1.0
	05/05/16	05/12/16	0.8	0.2	19.4	1.0
	05/12/16	05/19/16	0.6	0.2	18.6	1.0
	05/19/16	05/26/16	0.6	0.2	15.6	0.9
	05/26/16	06/02/16	1.2	0.2	22.1	1.1
	06/02/16	06/09/16	0.8	0.2	25.2	1.1
	06/09/16	06/16/16	1.1	0.2	23.8	1.1
	06/16/16	06/23/16	1.0	0.2	20.9	1.0
	06/23/16	06/30/16	0.7	0.2	25.5	1.1
Howe	03/31/16	04/07/16	0.7	0.2	14.5	1.0
	04/07/16	04/14/16	0.9	0.2	20.4	1.1
	04/14/16	04/21/16	0.7	0.2	15.5	1.0
	04/21/16	04/28/16	1.2	0.4	22.7	2.0
	04/28/16	05/05/16	0.7	0.2	18.2	1.0
	05/05/16	05/12/16	0.8	0.3	23.2	1.5
	05/12/16	05/19/16	0.6	0.2	18.2	1.0
	05/19/16	05/26/16	0.5	0.2	13.3	0.9
	05/26/16	06/02/16	1.1	0.3	20.8	1.1
	06/02/16	06/09/16	0.9	0.2	24.7	1.2
	06/09/16	06/16/16	0.7	0.2	20.9	1.1
	06/16/16	06/23/16	0.7	0.2	18.1	1.0
	06/23/16	06/30/16	0.6	0.2	21.6	1.1

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, 2016.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Monteview	03/31/16	04/07/16	0.8	0.2	13.4	0.9
	04/07/16	04/14/16	0.9	0.2	23.0	1.1
	04/14/16	04/21/16	0.7	0.2	15.6	1.0
	04/21/16	04/28/16	0.7	0.2	15.4	0.9
	04/28/16	05/05/16	0.7	0.2	21.0	1.0
	05/05/16	05/12/16	1.0	0.2	19.5	1.0
	05/12/16	05/19/16	0.6	0.3	19.9	1.1
	05/19/16	05/26/16	0.6	0.2	15.8	0.9
	05/26/16	06/02/16	1.1	0.3	23.1	1.1
	06/02/16	06/09/16	1.0	0.2	25.1	1.2
	06/09/16	06/16/16	0.9	0.2	23.4	1.1
	06/16/16	06/23/16	0.7	0.2	20.0	1.1
	06/23/16	06/30/16	1.0	0.3	23.5	1.1
Mud Lake	03/31/16	04/07/16	0.8	0.2	18.5	1.0
	04/07/16	04/14/16	1.0	0.2	26.0	1.1
	04/14/16	04/21/16	0.9	0.2	21.4	1.1
	04/21/16	04/28/16	0.8	0.2	19.3	1.0
	04/28/16	05/05/16	1.1	0.2	28.8	1.2
	05/05/16	05/12/16	1.2	0.3	26.5	1.2
	05/12/16	05/19/16	1.1	0.3	27.1	1.2
	05/19/16	05/26/16	0.7	0.2	18.6	1.0
	05/26/16	06/02/16	1.5	0.3	30.6	1.3
	06/02/16	06/09/16	1.4	0.3	32.0	1.3
	06/09/16	06/16/16	1.6	0.3	33.4	1.3
	06/16/16	06/23/16	1.2	0.2	23.1	1.1
	06/23/16	06/30/16	1.3	0.3	31.0	1.3
Distant Locations						
Craters of the Moon	03/31/16	04/07/16	0.4	0.2	13.8	0.9
	04/07/16	04/14/16	0.6	0.2	19.4	1.0
	04/14/16	04/21/16	0.5	0.2	13.5	0.9
	04/21/16	04/28/16	0.4	0.2	14.4	0.9
	04/28/16	05/05/16	0.5	0.2	17.2	0.9
	05/05/16	05/12/16	0.5	0.2	15.9	1.0
	05/12/16	05/19/16	0.6	0.2	16.7	1.0
	05/19/16	05/26/16	R[1]	R[1]	R[1]	R[1]
	05/26/16	06/02/16	0.9	0.2	19.9	1.0
	06/02/16	06/09/16	1.1	0.3	24.8	1.2
	06/09/16	06/16/16	0.7	0.2	18.5	1.1
	06/16/16	06/23/16	R[1]	R[1]	R[1]	R[1]
	06/23/16	06/30/16	0.7	0.2	20.1	1.1

[1]R – Results rejected due to insufficient sample volume caused by a tripped breaker.

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, 2016.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Fort Hall[1]	03/31/16	04/07/16	NS[4]	NS[4]	NS[4]	NS[4]
	04/07/16	04/14/16	NS[4]	NS[4]	NS[4]	NS[4]
	04/14/16	04/21/16	0.4	0.2	11.9	0.9
	04/21/16	04/28/16	0.7	0.2	11.7	0.8
	04/28/16	05/05/16	0.5	0.2	14.9	0.9
	05/05/16	05/12/16	0.8	0.2	14.9	0.9
	05/12/16	05/19/16	0.5	0.2	14.8	0.9
	05/19/16	05/26/16	0.4	0.2	11.9	0.8
	05/26/16	06/02/16	1.0	0.2	16.1	1.0
	06/02/16	06/09/16	1.0	0.2	19.3	1.0
	06/09/16	06/16/16	0.8	0.2	17.7	1.0
	06/16/16	06/23/16	1.3	0.3	26.1	1.2
	06/23/16	06/30/16	0.9	0.2	17.8	1.0
Idaho Falls - HVP 3804	03/31/16	04/07/16	1.0	0.2	18.4	1.0
	04/07/16	04/14/16	1.5	0.3	26.3	1.4
	04/14/16	04/21/16	0.7	0.2	19.9	1.1
	04/21/16	04/28/16	1.2	0.3	19.1	1.0
	04/28/16	05/05/16	1.0	0.2	23.1	1.1
	05/05/16	05/12/16	1.0	0.2	22.3	1.1
	05/12/16	05/19/16	0.7	0.2	22.9	1.1
	05/19/16	05/26/16	0.7	0.2	19.3	1.2
	05/26/16	06/02/16	1.5	0.3	30.3	1.3
	06/02/16	06/09/16	1.4	0.3	33.5	1.3
	06/09/16	06/16/16	1.2	0.3	27.6	1.2
	06/16/16	06/23/16	1.3	0.3	25.0	1.2
	06/23/16	06/30/16	1.4	0.3	28.4	1.2
Idaho Falls - HVP 4304[2]	03/31/16	04/07/16	0.8	0.2	15.3	0.9
	04/07/16	04/14/16	1.0	0.3	22.2	1.3
	04/14/16	04/21/16	R[3]	R[3]	R[3]	R[3]
	04/21/16	04/28/16	0.9	0.2	18.9	1.0
	04/28/16	05/05/16	1.0	0.2	25.8	1.1
	05/05/16	05/12/16	1.1	0.2	22.1	1.1
	05/12/16	05/19/16	1.0	0.2	25.9	1.1
	05/19/16	05/26/16	0.6	0.2	21.8	1.3
	05/26/16	06/02/16	1.4	0.3	27.5	1.2
	06/02/16	06/09/16	1.3	0.3	33.8	1.3
	06/09/16	06/16/16	1.0	0.2	26.3	1.2
	06/16/16	06/23/16	0.8	0.2	14.3	0.9
	06/23/16	06/30/16	1.1	0.3	27.2	1.2

[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] R – Results rejected due to insufficient sample volume caused by equipment failure.

[4] NS – No sample due to equipment failure.

Appendix B

Table B.1. Results for all electret ionization chamber (EIC) locations, second quarter, 2016.

Sample Location	Net Corrected Exposure Rate (µR/hr)[1]	± 2 SD (µR/hr)
Arco	13.1, 15.8	
Craters of the Moon	11.3	2.0
Big Lost River Rest Area	14.0	3.5
Van Buren Avenue	12.9, 14.2	
Experimental Field Station	17.0	3.3
Main Gate	13.5, 14.3	
Atomic City	11.5, 12.8	
Taber	14.7	1.7
Blackfoot	13.4	1.8
Ft. Hall	11.4, 12.8	
Idaho Falls	11.2	2.1
Mud Lake/ Terreton	14.1	2.6
Monteview	12.3	0.8
Sand Dunes Tower	13.7	2.4
Howe Met. Tower	10.6	1.3
MP276 -20	11.1	2.8
MP274 -20	9.0, 10.7	
MP272 -20	9.5	2.5
MP270 -20	12.3, 14.5	
MP268 -20	11.6	1.0
MP266 -20	11.0	1.5
MP264 -20	15.1, 16.0	
MP270 -20/26	10.1, 10.9	
MP268 -20/26	13.5	1.1
MP266 -20/26	12.3, 15.6	
MP263 -20/26	12.4	0.9
MP261 -20/26	11.9, 13.8	
MP259 -20/26	12.2	1.3
MFC (EBR II)	15.3, 16.7	
EBR I	10.2	0.5
RWMC	16.3	1.1
CFA	12.7	0.9
CITRC (PBF)	12.5, 14.3	
INTEC	17.9, 18.8	
ATR (TRA)	14.2	0.7
NRF	14.3	1.7
TAN/SMC	12.4	2.5
Mud Lake Bank of Commerce	11.5, 12.3	
MP43-33	11.7	1.5
MP41-33	13.7	2.3
MP39-33	12.0, 12.0	
MP 37-33	10.8	1.1
MP35-33	13.5, 14.0	
MP33-33	12.9	3.0
MP31-33	12.2	3.4
MP29-33	11.2, 13.9	
MP27-33	13.6	1.9
MP25-33	11.2	3.7
MP23-33	11.8	0.8
Base of Howe	11.3	2.5

Table B.1. continued. Results for all electret ionization chamber (EIC) locations, second quarter, 2016.

Sample Location	Net Corrected Exposure Rate (µR/hr)[1]	± 2 SD (µR/hr)
Rover	12.3	0.8
Hamer	13.2, 15.4	
Sugar City	13.2, 13.5	
Roberts	12.3	2.9
Big Southern Butte	10.0, 11.0	

[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.

Appendix C

Table C-1. List of volatile organic compounds (VOCs) analyzed for water samples.

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
Tetrachloroethene (PCE)	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	1.0
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.

Analyte	Minimum detectable concentrations (MDC) (expressed in µg/L)
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.5
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	1.0
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Tert Butyl Ether (MTBE)	0.5
Naphthalene	0.5
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	0.5
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	1.0
1,3,5-Trimethylbenzene	0.5