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
BEA	-	Battelle Energy Alliance, LLC
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act
CFA	-	Central Facilities Area
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
EIC	-	electret ionization chamber
EML	-	Environmental Monitoring Laboratory
EPA	-	Environmental Protection Agency
ESER	-	Environmental Surveillance, Education and Research Program (SM Stoller)
ESP	-	Environmental Surveillance Program
ESRPA	-	Eastern Snake River Plain Aquifer
HPIC	-	high-pressure ion chamber
LLD	-	lower limit of detection
IBL	-	Idaho Bureau of Laboratories
INL	-	Idaho National Laboratory
INTEC	-	Idaho Nuclear Technology and Engineering Center
LSC	-	liquid scintillation counting
MFC	-	Materials and Fuels Complex
µg/L	-	micrograms per liter
mg/L	-	milligrams per liter
mrem	-	millirem or 1/1000th 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
NRF	-	Naval Reactors Facility
pCi/g	-	picocuries per gram
pCi/L	-	picocuries per liter
pCi/m^3	-	picocuries per cubic meter
PCE	-	perchloroethene
QAPP	-	Quality Assurance Program Plan
QA/QC	-	Quality Assurance/Quality Control
RCRA	-	Resource Conservation and Recovery Act
RPD	-	relative percent difference
RWMC	-	Radioactive Waste Management Complex
RTC	-	Reactor Technology Complex
SD	-	standard deviation
SMCL	-	secondary maximum contaminant level
TAN	-	Test Area North
TCE	-	trichloroethene
TDS	-	total dissolved solids
TMI	-	Three Mile Island
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's (DEQ-INL OP) Environmental Surveillance Program (ESP) is conducted at locations on the INL, on the boundaries of the INL, and at distant locations to the INL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

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

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

Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the third quarter, 2010 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter, gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. The Fort Hall station uses identical instrumentation and sampling protocol as the ten stations operated by the ESP. The DEQ-INL OP reports the Fort Hall station data as an additional distant site.

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

Composites of filters collected using TSP samplers during the course of a calendar quarter are analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma spectroscopy results for the third quarter of 2010 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 within its sponge-like pores. Each week, canisters are collected from all eleven air monitoring stations and analyzed together as a composite. If Iodine-131 is detected in this grouping, the canisters are individually analyzed. No radioactive isotopes of iodine, specifically Iodine-

131, were detected on the weekly charcoal cartridges used to collect this nuclide during the third 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 measured above the minimum detectable concentration (MDC) at the Experimental Field Station site during the third quarter of 2010. While results for this sampling site are above MDC they are still well below regulatory limits. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the third quarter of 2010. 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 third quarter of 2010. Tritium and Cesium-137 analysis results are presented in **Table 5**. Reported values were either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter. There was insufficient sample at Mud Lake to perform gamma spectroscopy.

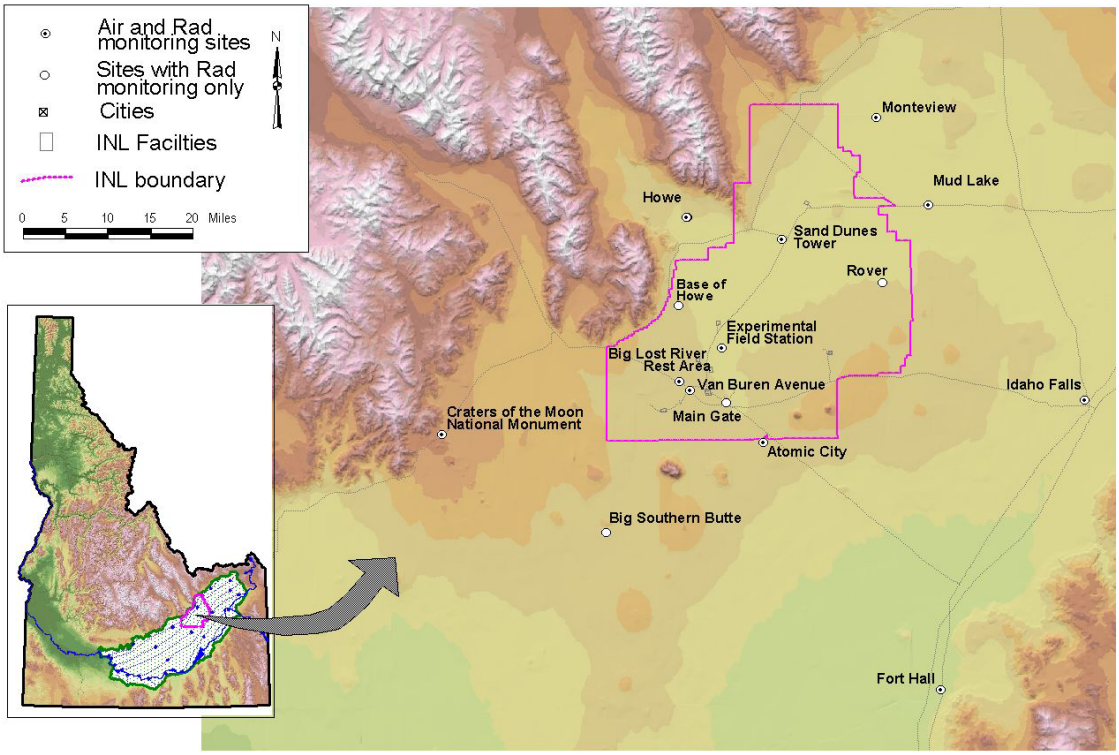

Figure 1. Air and radiation monitoring sites.

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, third quarter, 2010.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.9	-	3.2	30.8	-	76.5
Experimental Field Station	0.9	-	2.5	25.2	-	61.9
Sand Dunes Tower	0.6	-	1.7	23.8	-	57.7
Van Buren Avenue	0.5	-	2.1	27.3	-	57.4
Boundary Locations						
Atomic City	0.7	-	2.0	27.2	-	61.1
Howe	0.8	-	2.1	25.5	-	49.4
Monteview	1.0	-	2.5	29.1	-	64.6
Mud Lake	0.8	-	3.6	27.0	-	62.1
Distant Locations						
Craters of the Moon	0.8	-	1.3	23.2	-	44.3
Fort Hall[1]	0.9	-	2.0	21.2	-	44.2
Idaho Falls	1.2	-	3.1	32.0	-	69.1

[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, third quarter, 2010.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	159.7	8.2	<MDC[2]
Experimental Field Station	135.0	7.0	<MDC
Sand Dunes Tower	132.0	7.0	<MDC
Van Buren Avenue	125.6	6.5	<MDC
Boundary Locations			
Atomic City	138.0	7.3	<MDC
Howe	138.1	7.4	<MDC
Monteview	171.1	8.7	<MDC
Mud Lake	142.8	7.5	<MDC
Distant Locations			
Craters of the Moon	125.3	6.7	<MDC
Fort Hall[1]	117.7	6.3	<MDC
Idaho Falls	176.5	9.2	<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), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Table 4. Tritium concentrations in air from atmospheric moisture, third quarter, 2010.

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.41	0.33	0.53
Experimental Field Station	0.75	0.30	0.47
Sand Dunes Tower	0.10	0.39	0.62
Van Buren Avenue	0.53	0.34	0.54
Boundary Locations			
Atomic City	0.18	0.38	0.62
Howe	0.18	0.46	0.74
Mud Lake	0.37	0.49	0.78
Monteview	0.29	0.50	0.85
Distant Locations			
Craters of the Moon	0.16	0.34	0.56
Fort Hall[1]	0.25	0.57	0.92
Idaho Falls	0.26	0.49	0.81

[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, third quarter, 2010.

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	40	100	170	0.1	1.5	2.7
Boundary Locations						
Atomic City	0.0	100	170	0.0	1.4	2.6
Howe	0.0	100	170	0.5	1.4	2.7
Monteview	0.0	100	170	0.2	1.7	3.0
Mud Lake	60	100	170	NS[1]	NS	NS
Distant Locations						
Idaho Falls	0.0	100	170	0.0	1.6	2.8

[1]Insufficient sample to perform gamma spectroscopy at Mud Lake.

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 third quarter of 2010 (**Figure 1**). To detect gamma radiation, each station is instrumented with an electret ionization chamber (EIC), and 10 of the stations also have high-pressure ion chambers (HPIC) (**Table 6**).

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

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

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 third quarter 2010. **Table 8** lists the EIC monitoring results for third quarter 2010. 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[1]		■
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	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall[2]	■	■
Idaho Falls	■	■

[1] HPIC Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed.
[2] HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

Table 7. Average gamma exposure rates, third quarter, 2010, from HPIC network.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	12.0	0.7
Big Lost River Rest Area[1]	NS	NS
Main Gate[2]	NS	NS
Rover[3]	NS	NS
Sand Dunes Tower	14.3	0.9
Boundary Locations		
Atomic City	13.6	0.7
Big Southern Butte	13.9	5.1
Howe Met Tower	13.3	1.4
Monteview	14.3	2.5
Mud Lake/Terreton	13.4	0.8
Distant Locations		
Fort Hall[5]	14.4	1.2
Idaho Falls	12.5	0.6

[1] Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed.
[2] Main Gate HPIC experienced equipment irregularity and then total failure near the end of the quarter which could not be repaired and therefore is reported as No Sample.
[3] The Rover HPIC was destroyed by a wildfire and is therefore reported as No Sample.
[4] Operated by Shoshone-Bannock Tribes.

Table 8. Electret ionization chamber (EIC) cumulative average exposure rates, third quarter, 2010.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	14.1	0.9
Big Lost River Rest Area	18.8	4.0
Experimental Field Station	16.1	3.0
Main Gate	13.9	3.8
Rover	21.1	0.2
Sand Dunes Tower	15.1	1.2
Van Buren Avenue	15.0	0.3
Boundary Locations		
Atomic City	13.0	0.1
Big Southern Butte	13.9	1.8
Howe Met Tower	13.8	1.0
Monteview	16.2	0.2
Mud Lake / Terreton	16.8	3.1
Distant Locations		
Craters of the Moon	16.1	0.5
Fort Hall[1]	13.7	0.7
Idaho Falls	14.6	0.9

[1] 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 Site 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 third quarter of 2010, 1 up-gradient, 1 boundary, 1 waste water and 14 distant locations were sampled. No facility or surface water sample sites were visited during this quarter.

Throughout the year, most sites sampled by DEQ-INL OP are sampled with another agency or organization, however during this sample period; all but two of the sites were sampled independent of the INL. For co-sampled sites, 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.

The DEQ-INL OP samples with Idaho Department of Water Resources at 43 private wells, irrigation wells, and springs within the Eastern Snake River Plain aquifer in the Magic Valley region. Approximately one-third of these sites are sampled each year during the summer, typically during the third quarter. Eleven Magic Valley sites were sampled during the third quarter, and one during the fourth calendar quarter. Distant sites Shoshone Water Supply and MV-36 both sample from the City of Shoshone public water system, MV-36 from the nearest wellhead and the Shoshone Water Supply from the men's rest room sink at the Chevron station at the corner of US 93 and Rail Street. The MV-36 site will be discontinued and replaced by the Shoshone Water Supply location.

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

Gross alpha radioactivity was detected at the up-gradient location, as well as, 11 distant locations. The concentrations observed at these locations are 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 samples from both upgradient and distant sites. Concentrations for up-gradient and distant locations were within the range of concentrations observed for naturally-occurring radioactivity. The MCL for beta and gamma radioactivity is 4 mrem/year, equivalent to 8 pCi/l if the source is strontium-90; 900 pCi/L if technetium-99; 20,000 pCi/L if tritium; or 200 pCi/L if cesium-137. Man-made, gamma emitting cesium-137 was not detected in samples from any of the locations. Results for gross alpha; gross beta; and man-made, gamma emitting radioactivity are shown in **Table 9**.

Tritium analyzed by the standard methodology was not detected in any of the samples collected (**Table 10**), consistent with historic analyses for these sites. 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. This method provides a much lower MDC of 10 to 14 pCi/L. No samples were analyzed using the enrichment method for the current quarter; however samples from 6 sites collected during previous quarters were completed (**Table 11**). A backlog of 29 samples remains.

Samples were also analyzed for metals and the results shown in **Table 12**. All results were within their expected ranges. Common ion results are shown in **Table 13** and nutrient results are shown in **Table 14**. All results were consistent with historical values at those locations. Location USGS-108 was deepened from 760 feet below land surface (ft bls) to 1196 ft bls and a Westbay™ packer sampling system was installed, with that installation completed during 2010. This sampling system allows water samples to be collected from discrete levels within the well. DEQ-INL sampled two zones at USGS-108 during the third quarter; zone #1 corresponding to a depth of 1174 feet, and zone #3 corresponding to a depth of 890 feet below land surface.

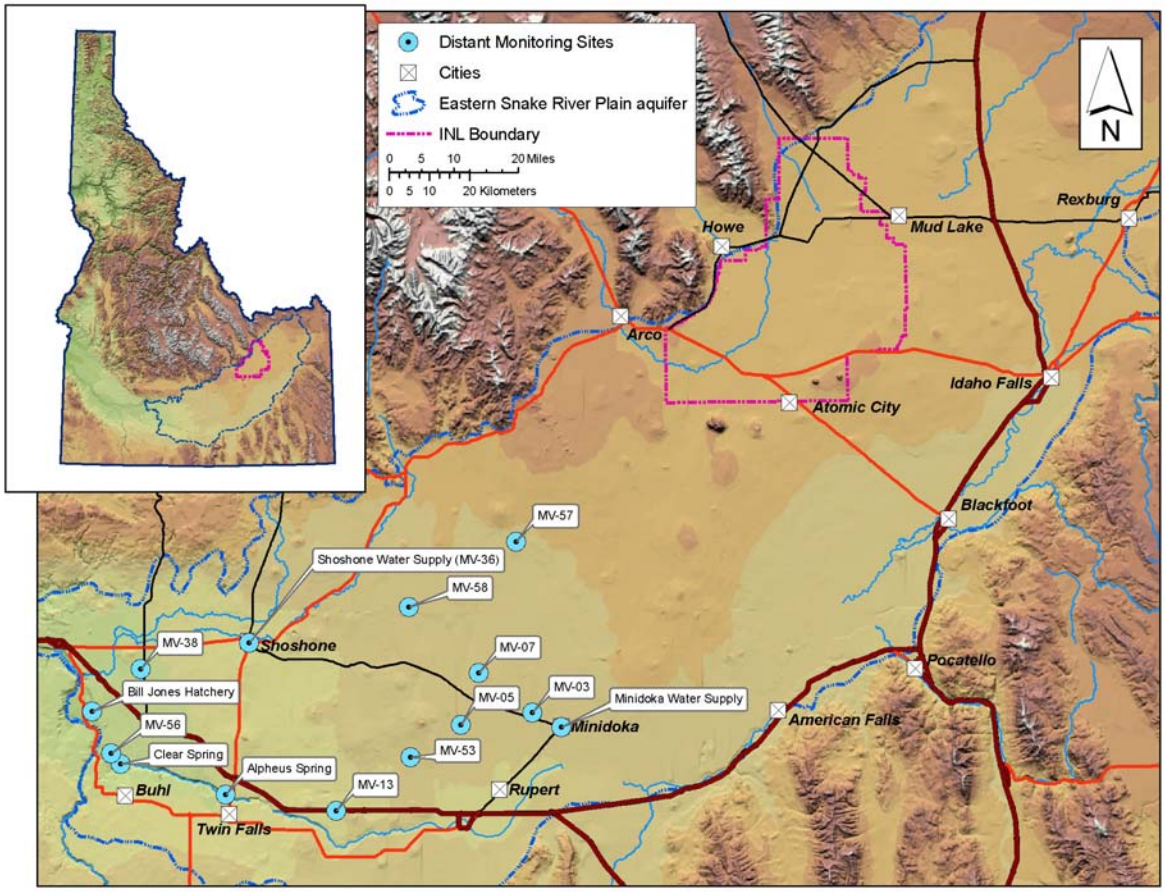

Figure 2. Distant sampling locations, third quarter, 2010.

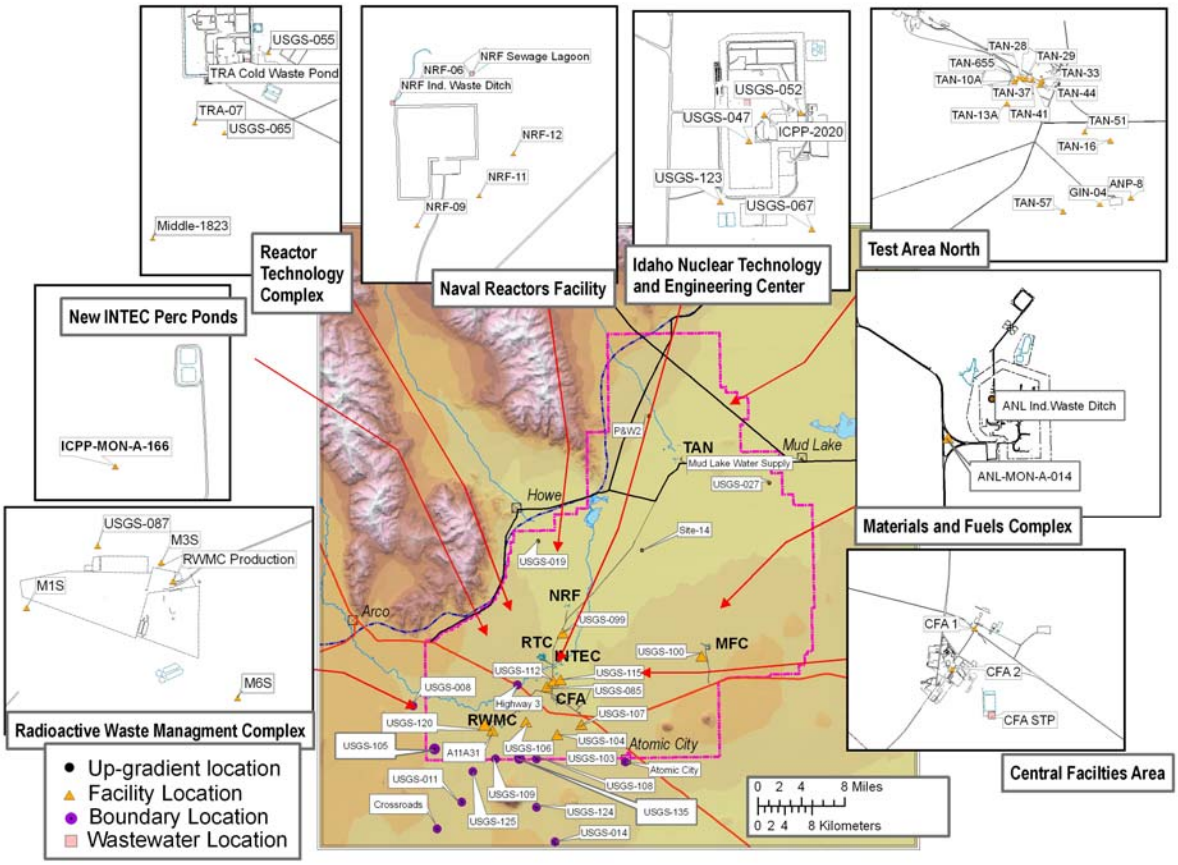

Figure 3. Up-gradient, facility, boundary and wastewater monitoring locations, third quarter 2010.

Table 9. Alpha, beta, and gamma concentrations for water samples, third quarter, 2010.

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
Up-gradient										
Mud Lake Water Supply	8/4/2010	3.5		1.0	1.9		0.8	0.9	U	1.6
Boundary										
USGS-108; Zone-1	9/20/2010	-0.1	U	1.1	2.5		0.8	0.6	U	1.2
USGS-108; Zone-3	9/20/2010	-0.6	U	1.1	2.9		0.8	0.3	U	1.0
Distant										
Alpheus Spring	8/3/2010	2.2		1.3	2.5		0.9	0.2	U	1.5
Bill Jones Hatchery	8/3/2010	1.8		1.0	-0.1	U	0.8	-0.3	U	1.3
Clear Spring	8/3/2010	2.2		1.2	5.1		1.0	0.4	U	2.0
Minidoka Water Supply	8/3/2010	1.8		1.1	3.5		0.9	0.3	U	1.8
MV-03	8/2/2010	1.8		1.0	5.6		0.9	-0.6	U	1.4
MV-05	8/2/2010	3.9		2.3	7.0		2.8	-0.8	U	1.6
MV-07	8/2/2010	2.4		1.1	4.6		0.9	0.0	U	1.8
MV-13	8/2/2010	1.7	U	1.2	5.6		1.0	0.2	U	1.8
Shoshone Water Supply - MV-36	8/3/2010	2.5		1.2	4.9		0.8	-0.7	U	2.0
MV-38	8/3/2010	2.3		1.1	3.9		0.8	0.8	U	1.4
MV-53	8/3/2010	2.6	U	2.3	5.7		3.2	1.0	U	1.7
MV-56	8/3/2010	2.9		1.2	4.0		0.8	0.9	U	1.5
MV-57	7/8/2010	1.6		0.8	3.0		0.7	0.3	U	1.8
MV-58	8/2/2010	0.6	U	0.7	3.2		0.7	0.3	U	1.7
Waste Water										
TRA Cold Waste Pond	7/7/2010	1.0	U	3.7	9.2		2.8	-1.2	U	1.6

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

[2] Concentrations expressed in pCi/L.

Table 10. Tritium concentrations for water samples, third quarter, 2010.

Sample Location	Sample Date	Tritium Concentration[1,2]		± 2 SD
Up-gradient				
Mud Lake Water Supply	8/4/2010	70	U	100
Boundary				
USGS-108; Zone-1	9/20/2010	30	U	100
USGS-108; Zone-3	9/20/2010	90	U	100
Distant				
Alpheus Spring	8/3/2010	70	U	100
Bill Jones Hatchery	8/3/2010	60	U	100
Clear Spring	8/3/2010	30	U	100
Minidoka Water Supply	8/3/2010	10	U	100
MV-03	8/2/2010	-30	U	100
MV-05	8/2/2010	40	U	100
MV-07	8/2/2010	20	U	100
MV-13	8/2/2010	30	U	100
Shoshone Water Supply - MV-36	8/3/2010	60	U	100
MV-38	8/3/2010	30	U	100
MV-53	8/3/2010	30	U	100
MV-56	8/3/2010	30	U	100
MV-57	7/8/2010	10	U	100
MV-58	8/2/2010	20	U	100
Waste Water				
TRA Cold Waste Pond	7/7/2010	30	U	90

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

[2] Concentrations expressed in pCi/L.

Table 11. Enriched tritium concentrations for water samples from previous sampling quarters, 2010.

Sample Location	Sample Date	Enriched Tritium Concentration[1,2]		± 2 SD
Boundary				
USGS-014	10/26/2009	3	U	6
USGS-124	4/21/2010	90		7
Facility				
USGS-100	4/8/2010	10		4
Distant				
Alpheus Spring	11/16/2009	21		7
Bill Jones Hatchery	11/16/2009	2	U	6
Clear Spring	11/16/2009	8	U	6

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

[2] Concentrations expressed in pCi/L.

Table 12. Reported metals concentrations in water samples, third quarter, 2010.

Sample Location	Sample Date	Concentration[1,2]																					
		Arsenic		Barium		Beryllium		Cadmium		Chromium		Iron		Lead		Manganese		Mercury		Selenium		Zinc	
Up-gradient																							
Mud Lake Water Supply	8/4/2010	10		31		-	-	<1.0	U	<1.0	U	250		1.2		270		-	-	<2.0	U	<2.0	U
Boundary																							
USGS-108; Zone-1	9/20/2010	-	-	48		-	-	-	-	2.9		-	-	<1.0	U	27		-	-	-	-	12	
USGS-108; Zone-3	9/20/2010	-	-	45		-	-	-	-	6.0		-	-	<1.0	U	<1.0	U	-	-	-	-	<2.0	U
Distant																							
Alpheus Spring	8/3/2010	2.4		86		-	-	<1.0	U	1.2		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
Bill Jones Hatchery	8/3/2010	2.0		21		-	-	<1.0	U	3.0		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
Clear Spring	8/3/2010	2.0		36		-	-	<1.0	U	2.1		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
Minidoka Water Supply	8/3/2010	<2.0	U	37		-	-	<1.0	U	1.6		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	43	
MV-03	8/2/2010	2.0		23		-	-	<1.0	U	2.0		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
MV-05	8/2/2010	2.8		62		-	-	<1.0	U	1.5		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
MV-07	8/2/2010	<2.0	U	22		-	-	<1.0	U	2.3		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
MV-13	8/2/2010	3.0		97		-	-	<1.0	U	<1.0	U	<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	<2.0	U
Shoshone Water Supply -MV-36	8/3/2010	<2.0	U	42		-	-	<1.0	U	1.8		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	2.6	
MV-38	8/3/2010	<2.0	U	32		-	-	<1.0	U	1.8		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	2.0	
MV-53	8/3/2010	2.6		100		-	-	<1.0	U	1.4		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	110	
MV-56	8/3/2010	2.2		26		-	-	<1.0	U	2.4		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	15	
MV-57	7/8/2010	<2.0	U	5.5		-	-	<1.0	U	3.6		<10	U	<1.0	U	<1.0	U	-	-	<2.0	U	13	
MV-58	8/2/2010	2.5		19		-	-	<1.0	U	3.4		18		<1.0	U	2.9		-	-	<2.0	U	37	
Waste Water																							
TRA Cold Waste Pond (not filtered)	7/7/2010	4.9		170		<1.0	U	<1.0	U	10		73		<1.0	U	1.1		<0.50	U	3.6		2.8	

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

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

Table 13. Reported common ion concentrations in water samples, third quarter, 2010.

Sample Location	Sample Date	Concentration[1,2]													
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Silica	Alkalinity[3]	TDS[4]		TSS[5]	
Up-gradient														
Mud Lake Water Supply*	8/4/2010	8.7	2.6	31	4.7	0.487	5.01	7.62	- -	89.0	-	-	-	-
Boundary														
USGS-108*; Zone-1	9/20/2010	47	18	8.2	2.3	<0.20 U	18.1	25.6	- -	165	-	-	-	-
USGS-108*; Zone-3	9/20/2010	42	17	8.1	2.2	<0.20 U	17.8	24.9	- -	152	-	-	-	-
Distant														
Alpheus Spring*	8/3/2010	58	21	35	6.6	0.344	45.6	57.3	- -	182	-	-	-	-
Bill Jones Hatchery*	8/3/2010	30	16	16	3.5	0.397	11.6	25.1	- -	134	-	-	-	-
Clear Spring*	8/3/2010	45	19	25	4.1	0.462	35.2	45.1	- -	146	-	-	-	-
Minidoka Water Supply*	8/3/2010	47	16	21	3.5	0.510	32.0	40.0	- -	138	-	-	-	-
MV-03*	8/2/2010	36	14	20	3.2	0.565	22.0	30.1	- -	127	-	-	-	-
MV-05*	8/2/2010	56	24	44	5.4	0.428	61.9	70.1	- -	176	-	-	-	-
MV-07*	8/2/2010	33	14	16	3.3	0.537	14.4	31.2	- -	124	-	-	-	-
MV-13*	8/2/2010	55	20	36	6.6	0.301	38.5	53.8	- -	184	-	-	-	-
Shoshone Water Supply* (MV-36)	8/3/2010	41	14	14	3.0	0.236	6.44	16.8	- -	167	-	-	-	-
MV-38*	8/3/2010	39	14	15	3.0	0.328	10.7	20.9	- -	152	-	-	-	-
MV-53*	8/3/2010	68	28	55	6.9	0.314	71.4	76.7	- -	217	-	-	-	-
MV-56*	8/3/2010	36	16	20	3.6	0.478	23.6	36.3	- -	133	-	-	-	-
MV-57*	7/8/2010	22	11	11	2.5	0.368	6.40	15.6	- -	102	-	-	-	-
MV-58*	8/2/2010	24	11	17	2.7	0.409	9.92	11.2	- -	116	-	-	-	-
Waste Water														
TRA Cold Waste Pond (not filtered)	7/7/2010	160	60	30	15	0.324	32.3	544	- -	102	1000		<5.0	U

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

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

[3] As $CaCO_3$.

[4] =Total Dissolved Solids.

[5] = Total Suspended Solids.

Table 14. Reported nutrient concentrations in water samples, third quarter, 2010.

Sample Location	Sample Date	Concentration [1,2]							
		Nitrite + Nitrate	Phosphorus	Nitrite		Total Kjeldahl Nitrogen		Ammonia	
Up-gradient									
Mud Lake Water Supply	8/4/2010	0.028	0.060	-	-	-	-	0.19	
Boundary									
USGS-108; Zone-1	9/20/2010	1.0	0.0073	-	-	-	-	-	-
USGS-108; Zone-3	9/20/2010	0.99	0.013	-	-	-	-	-	-
Distant									
Alpheus Spring	8/3/2010	2.1	0.026	-	-	-	-	<0.010	U
Bill Jones Hatchery	8/3/2010	1.0	0.020	-	-	-	-	<0.010	U
Clear Spring	8/3/2010	1.6	0.028	-	-	-	-	<0.010	U
Minidoka Water Supply	8/3/2010	1.0	0.018	-	-	-	-	<0.010	U
MV-03	8/2/2010	1.0	0.016	-	-	-	-	<0.010	U
MV-05	8/2/2010	2.7	0.022	-	-	-	-	<0.010	U
MV-07	8/2/2010	0.50	0.014	-	-	-	-	<0.010	U
MV-13	8/2/2010	1.9	0.027	-	-	-	-	<0.010	U
Shoshone Water Supply - MV-36	8/3/2010	1.2	0.032	-	-	-	-	<0.010	U
MV-38	8/3/2010	1.3	0.035	-	-	-	-	<0.010	U
MV-53	8/3/2010	4.6	0.024	-	-	-	-	<0.010	U
MV-56	8/3/2010	1.2	0.025	-	-	-	-	<0.010	U
MV-57	7/8/2010	0.42	0.015	-	-	-	-	<0.010	U
MV-58	8/2/2010	1.5	0.025	-	-	-	-	<0.010	U
Waste Water									
TRA Cold Waste Pond (not filtered)	7/7/2010	3.1	2.5	-	-	0.42		-	-

[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.

Terrestrial Monitoring Results

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

Milk

DEQ-INL OP monitors milk for naturally occurring potassium-40 and man-made iodine-131. DEQ-INL OP collects milk samples on a monthly basis. Results for analyses of milk samples are presented in **Table 15**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131 was not detected.

Table 15. Gamma spectroscopy analysis data for milk samples, third quarter, 2010.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40		Man-made gamma-emitting radionuclide Iodine-131[1]
		Concentration[3]	± 2 SD	
Monitoring Samples				
Howe/Nelson-Ricks Creamery	7/6/2010	1430	103	<MDC
	8/2/2010	1369	107	<MDC
	9/5/2010	1351	107	<MDC
Mud Lake/Nelson-Ricks Creamery	7/4/2010	1415	103	<MDC
	8/2/2010	1427	118	<MDC
	9/5/2010	1476	105	<MDC
Gooding/Glanbia	7/6/2010	1382	109	<MDC
	8/3/2010	1514	107	<MDC
	9/7/2010	1370	108	<MDC
Riverside	7/7/2010	1729	116	<MDC
	8/9/2010	1453	104	<MDC
Fort Hall	7/7/2010	1348	115	<MDC
	8/3/2010	1257	103	<MDC
Verification Samples[2]				
Minidoka	7/6/2010	1405	110	<MDC
Idaho Falls	7/6/2010	1497	121	<MDC
Dietrich	8/3/2010	1466	105	<MDC
Howe	8/3/2010	1442	110	<MDC
Minidoka	9/7/2010	1374	101	<MDC
Terreton	9/7/2010	1406	117	<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.

Soil

DEQ-INL OP monitors long-term radiological conditions via physical soil sampling as well as field instrumentation capable of identifying and measuring in-situ concentrations of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides some insight to transport, deposition, and accumulation of radioactive material in the environment as a result of INL operations as well as historical above ground testing of nuclear weapons. Ten physical soil samples were collected and prepared in the field at five locations during the third calendar quarter of 2010. Results are shown in **Table 16**.

In-Situ gamma spectroscopic measurements were performed at 34 locations (**Figure 4**) including onsite, boundary, and distant monitoring locations during the third calendar quarter of 2010. No man-made radionuclides other than ^{137}Cs were identified. In-situ gamma spectroscopic data are currently being evaluated and quantitative results and will appear in a later report.

Table 16. Gamma spectroscopy analysis results (^{137}Cs) for physical soil sampling, third quarter, 2010.

Location	Sample Type[1]	Sample Depth (cm)	Date Collected	Concentration[2]	±2 SD	MDC
Mud Lake	Puck	0 to 5	7/19/2010	0.28	0.04	0.06
Mud Lake	Puck	5 to 10	7/19/2010	0.13	0.04	0.08
Saint Anthony	Puck	0 to 5	7/19/2010	0.64	0.06	0.08
Saint Anthony	Puck	5 to 10	7/19/2010	0.49	0.05	0.08
Reno Ranch	Puck	0 to 5	7/19/2010	0.45	0.05	0.08
Reno Ranch	Puck	5 to 10	7/19/2010	0.13	0.04	0.08
Frenchman's Cabin	Puck	0 to 5	7/27/2010	0.23	0.04	0.07
Frenchman's Cabin	Puck	5 to 10	7/27/2010	0.05 U[3]	0.03	0.06
Butte City	Puck	0 to 5	7/27/2010	0.32	0.04	0.07
Butte City	Puck	5 to 10	7/27/2010	0.05 U	0.03	0.06

[1]Soil samples were collected in a "puck" (a cylindrical plastic container with a diameter of 6.5 cm and a height of 3.0 cm) and prepared in the field for gamma spectroscopic analysis at ISU.
[2]Concentrations reported in pCi/g.
[3]U = Non-detection.

The Cesium-137 values, in the physical samples were well below the DEQ-INL OP action level of 6.4 pCi/g and the recommended federal screening limit for surface soil of 6.8 pCi/g. Based upon terrestrial radiological measurements of soil and milk, there were no discernable impacts to the environment from INL operations. Long-term accumulation of radionuclides observed by soil monitoring was consistent with historical measurements and was in the range of concentrations expected as a result of historic above-ground testing of nuclear weapons.

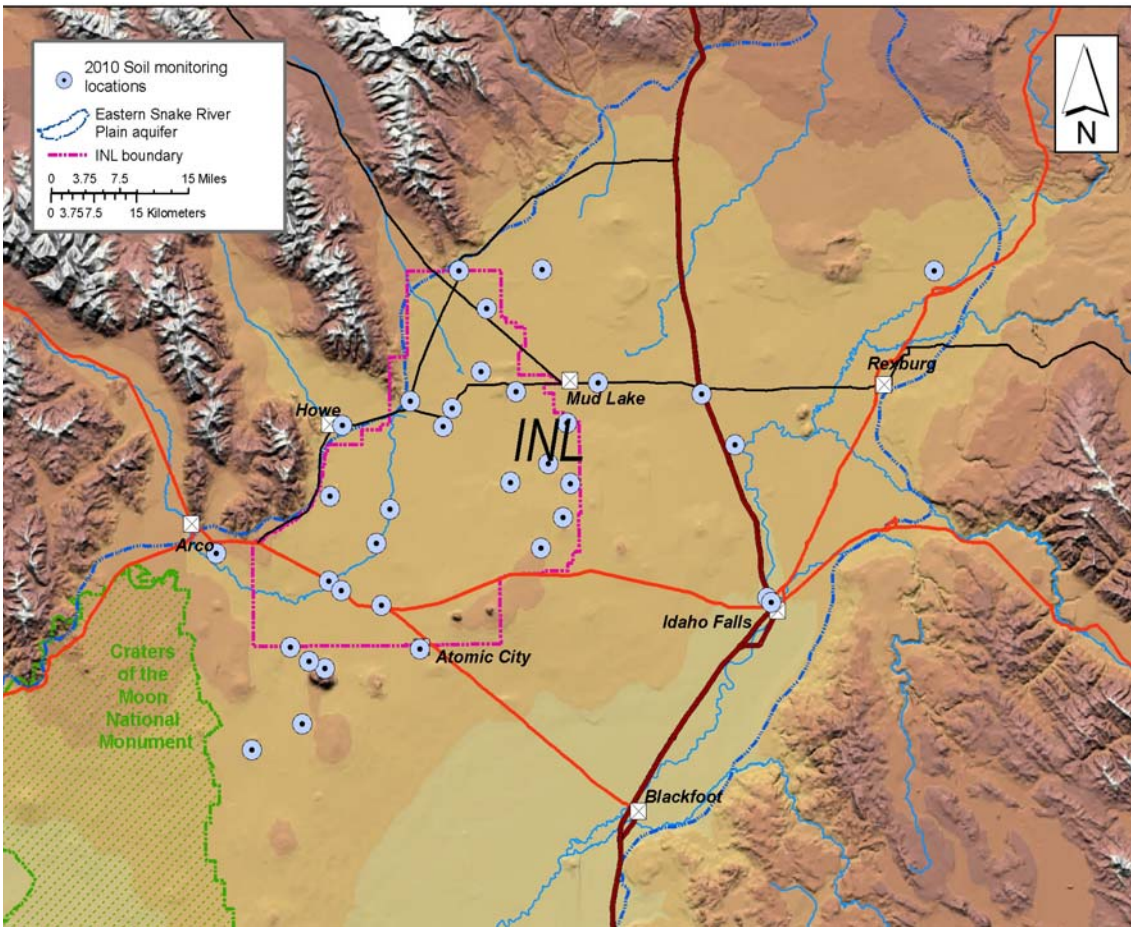

Figure 4. In-situ soil monitoring sites, third quarter 2010.

Quality Assurance

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

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the third quarter of 2010 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 third quarter of 2010, the DEQ-INL OP submitted 62 QC samples for various radiological and non-radiological analyses (**Table 17**).

Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or immeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a "zero" result when no contaminant is expected to be present or an acceptable measure of "background," and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the third quarter of 2010 are presented in **Table 18**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 19**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 20**. Blank analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 21**, **Table 22**, and **Table 23**.

No anomalies were observed from the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL OP for the third quarter of 2010.

Duplicate Samples

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

$RPD = (R_1-R_2)/((R_1+R_2)/2)*100$
R_1 = first sample result
R_2 = second sample result

and is used to measure a laboratory's ability to reproduce consistent results. A relative percent difference is acceptable at ± 20 percent.

DEQ-INL OP also uses standard radiological counting error (expressed as "sigma") to compare results for radiological analyses. Comparison tests that have an acceptable range of "3 sigma" allow for compared results to differ by as much as three times the pooled error for these measurements.
This is accomplished using the following equation:

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

Where:

R_1 = First sample value.

R_2 = Second sample value.

S_1 = Counting error associated with the laboratory measurement of the first sample.

S_2 = Counting error associated with the laboratory measurement of the second sample.

Duplicate results for ground and surface water are presented in **Table 24**, **Table 25**, and **Table 26**, for radiological analyses, and non-radiological analyses, **Table 27** for physical soil analyses.

No anomalies were observed from the assessment of field duplicate samples as measured by the analytical laboratories used by DEQ-INL OP for the third quarter of 2010.

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 third quarter 2010, no field matrices were spiked to assess the influence of the sample media on laboratory performance.

DEQ-INL OP also prepares additional "spike-like" quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL OP irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and two additional exposures, ranging from 15 to 60 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement agrees within 25 percent of the known irradiated quantity. The irradiation results for third quarter 2010 are presented in **Table 28**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets.

There were no anomalies observed from the assessment of spiked samples as measured by DEQ-INL OP or the analytical laboratories used by DEQ-INL OP for the third quarter of 2010.

Analytical QA/QC Assessment

No issues involving sample chain of custody, sample holding times, analysis of blank, duplicate, and spiked samples were observed during the third quarter of 2010, 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 third quarter of 2010.

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 third quarter of 2010 met the minimum criteria of the DEQ-INL OP ESP and is summarized in **Table 17**.

Three weekly TSP air filters from Mud Lake were rejected because they did not meet the minimum air volume requirement to be considered a valid sample.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. Service reliability for air sampling equipment for the third quarter of 2010 is summarized in **Table 29**.

During the third quarter of 2010, a wildfire destroyed the remote HPIC station named Rover.
The TSP blower motor was replaced at Mud Lake.

Conclusion

All data collected for the third quarter of 2010, 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 17. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP, third quarter, 2010.

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	143	13	0	0	3	ISU-EML
		Gross beta	143	13	0	0	3	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	54	1	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	5	0	0	0	0	ISU-EML
WATER								
Groundwater & Surface Water	Grab or composite	Gross alpha	15	1	1	0	0	ISU-EML
		Gross beta	15	1	1	0	0	ISU-EML
		Gamma emitters	16	1	1	0	0	ISU-EML
		Tritium	16	1	1	0	0	ISU-EML
		Enriched tritium	6	1	1	0	0	ISU-EML
		Technetium-99	0	0	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
		Metals	18	1	1	0	0	IBL
		Common Ions	18	1	1	0	0	IBL
		Nutrients	18	1	1	0	0	IBL
		Volatile Organics	0	0	0	0	0	IBL
TERRESTRIAL								
Milk	Grab or composite	Gamma emitters	19	0	0	0	0	ISU-EML
Soil	*in situ*	Gamma emitters	34	0	0	0	0	DEQ-INL OP
	Grab – "puck"	Gamma emitters	10	0	2	0	0	ISU-EML
RADIATION								
Ambient	EICs	Gamma Radiation	55	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	9	NA	NA	NA	NA	DEQ-INL OP
Total Analyses			**624**	**35**	**10**	**9**	**6**	
Total of QC Analyses (blanks, duplicates, and spikes)			**60**					
Percentage of QC analyses of Total Test analyses[3]			**9.6%**					
Percentage of usable data[4]			**99.0%**					

[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 18. Blank analysis results for gross alpha and beta in particulate air (TSP), third quarter, 2010.

Collection Period		Corrected volume (m^3) [1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
7/01/10	7/08/10	1399	-0.1	0.1	-0.2	0.6
7/08/10	7/15/10	1399	-0.2	0.2	-1.5	0.8
7/15/10	7/22/10	1399	-0.1	0.2	-0.3	0.6
7/22/10	7/29/10	1399	-0.2	0.1	-1.0	0.6
7/29/10	8/05/10	1399	-0.1	0.1	-0.2	0.6
8/05/10	8/12/10	1399	-0.1	0.2	-1.0	0.6
8/12/10	8/19/10	1399	0.0	0.2	0.3	0.6
8/19/10	8/26/10	1399	0.0	0.1	-0.4	0.6
8/26/10	9/02/10	1399	0.0	0.2	0.4	0.6
9/02/10	9/09/10	1399	0.1	0.2	0.7	0.6
9/09/10	9/16/10	1399	0.0	0.2	0.5	0.6
9/16/10	9/23/10	1399	0.1	0.2	0.7	0.6
9/23/10	9/30/10	1399	-0.1	0.1	-0.4	0.6

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 19. Blank analysis results for gamma spectroscopy for TSP particulate air filters, third quarter, 2010.

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
10/23/10	-6	38	66	26	35	57	-5	6	12

Analysis Date	Cesium-134			Cesium-137		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC
10/23/10	-2	3	6	-2	4	8

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 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 20. Blank analysis results for tritium in water vapor from air samples, third quarter, 2010.

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP102ZTR01	9/15/10	9/17/10	9/28/10	0.02	0.08	0.13

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

Table 21. Radiological blank analysis in ground and surface water for samples for the third quarter, 2010.

Sample Number	Sample Date	Concentration	± 2 SD	MDC	Within Blank Criteria?
Gross Alpha					
101W390	8/3/2010	0.0	0.2	0.4	Yes
Gross Beta					
101W390	8/3/2010	0.4	0.5	0.9	Yes
Cesium-137					
101W390	8/3/2010	0.5	1.4	2.5	Yes
Tritium					
101W391	8/3/2010	0	100	160	Yes
Enriched Tritium					
091W579	11/3/2009	30	6	8	Yes

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

Table 22. Blank analysis results (µg/L) for metals in ground and surface water for the third quarter, 2010.

Sample Number	Sample Date	Arsenic	Barium	Beryllium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
101W393	8/3/2010	<2	<1	-	<1	<1	<10	<1	<1	<2	<2

Table 23. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water for the third quarter, 2010.

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
101W393,392,394	8/3/2010	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	1	<0.01	<0.005

Table 24. Duplicate radiological analysis results in pCi/L for ground and surface water, third quarter, 2010.

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									
MV-05	101W330	3.9	2.3	101W360	1.7	1.2	2.2	3.9	yes
Gross Beta									
MV-05	101W330	7.0	2.8	101W360	5.7	0.9	1.3	4.4	yes
Gamma Spectroscopy Cesium-137									
MV-05	101W330	-0.8	1.6	101W360	0.6	1.8	1.4	3.6	yes
Tritium									
MV-05	101W331	40	100	101W361	0	100	40	212	yes
Enriched Tritium									
USGS-125	091W518	45	7	091W594	57	8	12	16	yes

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

Table 25. Duplicate results for metals (µg/L) in ground water and/or surface water for the third quarter, 2010.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
MV-05 (dissolved)	101W333	8/2/2010	2.8	62	<1	1.5	<10	<1	<1	<2	<2
MV-05 (dissolved)	101W363	8/2/2010	2.7	63	<1	1.5	<10	<1	<1	<2	2.1
RPD			-4	2	0	0	0	0	0	0	-5

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

Table 26. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water for third quarter, 2010.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
MV-05*	101W333,332	8/2/2010	56	24	44	5.4	0.428	61.9	70.1	176	2.7	0.022
MV-05*	101W363,362	8/2/2010	56	24	44	5.3	0.393	60.1	67.5	178	2.7	0.022
RPD			0.0	0.0	0	1.9	8.5	3.0	3.8	-1.1	0.0	0.0

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

Table 27. Duplicate analyses of gamma emitting radionuclides in physical soil samples, third quarter, 2010.

Sample Location	Sample Date	Original Result Cs-137 (pCi/g)[1]	QA Result Cs-137 (pCi/g)[1]	Cs-137 RPD (%)	Cs-137 Less than 3 sigma test	Cs-137 Meets either criteria?
Frenchmans Cabin 0-5cm	7/27/10	0.23 ± 0.04	0.29 ± 0.18	23.1	In Spec	Yes
Frenchmans Cabin 5-10cm	7/27/10	0.05 ± 0.03	0.04 ± 0.03	22.2	In Spec	Yes

[1]Result ± 2 SD

Table 28. Electret ionization chamber irradiation results (categorized as spiked samples), third quarter, 2010.

Electret #	Exposure Received		Net Measured Exposure[1]		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	40	2.0	40.8	1.4	102.1%
Spike 1	40	2.0	39.4	1.4	98.4%
Spike 1	40	2.0	38.4	1.4	96.1%
Spike 2	30	1.5	29.8	1.4	99.4%
Spike 2	30	1.5	28.5	1.4	95.2%
Spike 2	30	1.5	29.1	1.4	96.9%
Spike 3	25	1.3	23.9	1.3	95.6%
Spike 3	25	1.3	27.2	1.3	108.8%
Spike 3	25	1.3	23.6	1.3	94.2%

Note: A percent recovery (%R) of 100 ± 25 is considered acceptable.
[1] Net measured exposure estimate includes a correction for atmospheric pressure.

Table 29. Air sampling field equipment service reliability (percent operational), third quarter, 2010.

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 %	100 %	100 %	100 %
Howe	100 %	100 %	100 %	100 %
Monteview	100 %	100 %	100 %	100 %
Mud Lake	77 %	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, third quarter, 2010.

Sample location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
On-Site Locations						
Rest Area	7/01/10	7/08/10	0.9	0.3	30.8	1.4
	7/08/10	7/15/10	1.3	0.3	41.5	1.6
	7/15/10	7/22/10	1.3	0.3	45.0	1.7
	7/22/10	7/29/10	1.5	0.3	43.7	1.7
	7/29/10	8/05/10	1.5	0.3	53.3	1.8
	8/05/10	8/12/10	1.1	0.3	48.1	1.8
	8/12/10	8/19/10	0.9	0.3	38.9	1.6
	8/19/10	8/26/10	3.2	0.5	76.5	2.7
	8/26/10	9/02/10	1.5	0.3	40.7	1.6
	9/02/10	9/09/10	1.2	0.3	36.5	1.6
	9/09/10	9/16/10	1.2	0.3	45.8	1.7
	9/16/10	9/23/10	1.3	0.3	46.7	1.7
	9/23/10	9/30/10	2.2	0.4	66.4	2.0
Experimental Field Station	7/01/10	7/08/10	1.1	0.3	25.2	1.3
	7/08/10	7/15/10	1.2	0.3	36.4	1.5
	7/15/10	7/22/10	1.0	0.3	41.1	1.6
	7/22/10	7/29/10	1.3	0.3	35.2	1.5
	7/29/10	8/05/10	1.1	0.3	47.1	1.8
	8/05/10	8/12/10	1.5	0.4	41.1	1.7
	8/12/10	8/19/10	0.9	0.3	34.9	1.6
	8/19/10	8/26/10	1.7	0.3	45.7	1.8
	8/26/10	9/02/10	1.4	0.3	33.5	1.6
	9/02/10	9/09/10	1.2	0.3	35.3	1.6
	9/09/10	9/16/10	1.0	0.3	46.1	1.8
	9/16/10	9/23/10	1.4	0.3	41.8	1.7
	9/23/10	9/30/10	2.5	0.4	61.9	2.0

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, third quarter, 2010.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Sand Dunes	7/01/10	7/08/10	0.6	0.2	23.8	1.3
	7/08/10	7/15/10	0.9	0.3	33.6	1.5
	7/15/10	7/22/10	1.0	0.3	38.5	1.6
	7/22/10	7/29/10	1.4	0.3	37.2	1.6
	7/29/10	8/05/10	1.3	0.3	42.9	1.7
	8/05/10	8/12/10	1.2	0.3	34.7	1.5
	8/12/10	8/19/10	0.6	0.2	30.6	1.4
	8/19/10	8/26/10	1.3	0.3	41.3	1.6
	8/26/10	9/02/10	1.0	0.3	33.1	1.4
	9/02/10	9/09/10	1.2	0.3	32.0	1.4
	9/09/10	9/16/10	0.8	0.3	34.2	1.4
	9/16/10	9/23/10	1.1	0.3	39.8	1.5
	9/23/10	9/30/10	1.7	0.3	57.7	1.8
Van Buren	7/01/10	7/08/10	0.9	0.3	27.3	1.4
	7/08/10	7/15/10	0.9	0.3	32.1	1.4
	7/15/10	7/22/10	1.2	0.3	38.5	1.6
	7/22/10	7/29/10	0.8	0.3	34.0	1.5
	7/29/10	8/05/10	1.6	0.3	45.1	1.7
	8/05/10	8/12/10	1.3	0.3	38.9	1.6
	8/12/10	8/19/10	0.5	0.2	29.6	1.4
	8/19/10	8/26/10	1.6	0.3	42.1	1.6
	8/26/10	9/02/10	0.9	0.3	31.8	1.5
	9/02/10	9/09/10	0.9	0.3	33.8	1.5
	9/09/10	9/16/10	1.0	0.3	40.8	1.6
	9/16/10	9/23/10	1.2	0.3	39.9	1.6
	9/23/10	9/30/10	2.1	0.4	57.4	1.9
Boundary Locations						
Atomic City	7/01/10	7/08/10	0.7	0.2	27.2	1.4
	7/08/10	7/15/10	1.3	0.3	36.2	1.6
	7/15/10	7/22/10	1.1	0.3	39.9	1.6
	7/22/10	7/29/10	1.3	0.3	35.3	1.6
	7/29/10	8/05/10	1.4	0.3	48.6	1.8
	8/05/10	8/12/10	1.5	0.4	39.4	1.6
	8/12/10	8/19/10	1.2	0.3	36.4	1.5
	8/19/10	8/26/10	1.7	0.3	42.8	1.7
	8/26/10	9/02/10	1.5	0.3	34.9	1.5
	9/02/10	9/09/10	1.2	0.3	33.1	1.5
	9/09/10	9/16/10	1.1	0.3	43.2	1.7
	9/16/10	9/23/10	1.0	0.3	41.5	1.6
	9/23/10	9/30/10	2.0	0.4	61.1	2.0

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, third quarter, 2010.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Howe	7/01/10	7/08/10	0.8	0.3	25.5	1.3
	7/08/10	7/15/10	1.0	0.3	37.4	1.6
	7/15/10	7/22/10	1.0	0.3	36.4	1.6
	7/22/10	7/29/10	1.2	0.3	35.9	1.6
	7/29/10	8/05/10	1.5	0.3	47.9	1.8
	8/05/10	8/12/10	1.1	0.3	40.9	1.7
	8/12/10	8/19/10	1.0	0.3	32.4	1.5
	8/19/10	8/26/10	2.1	0.4	44.8	1.9
	8/26/10	9/02/10	1.1	0.3	32.5	1.5
	9/02/10	9/09/10	1.0	0.3	31.2	1.5
	9/09/10	9/16/10	0.8	0.3	37.6	1.6
	9/16/10	9/23/10	1.5	0.3	36.5	1.6
	9/23/10	9/30/10	1.8	0.4	49.4	1.8
Monteview	7/01/10	7/08/10	1.7	0.3	29.1	1.5
	7/08/10	7/15/10	1.4	0.3	40.3	1.6
	7/15/10	7/22/10	1.0	0.3	47.5	1.8
	7/22/10	7/29/10	1.6	0.3	40.1	1.6
	7/29/10	8/05/10	1.6	0.3	50.9	1.8
	8/05/10	8/12/10	1.6	0.4	43.4	1.8
	8/12/10	8/19/10	1.2	0.3	34.6	1.5
	8/19/10	8/26/10	2.0	0.4	48.8	1.8
	8/26/10	9/02/10	1.9	0.4	41.0	1.8
	9/02/10	9/09/10	2.0	0.4	36.9	1.6
	9/09/10	9/16/10	1.5	0.3	45.5	1.7
	9/16/10	9/23/10	1.9	0.4	48.2	1.8
	9/23/10	9/30/10	2.5	0.4	64.6	2.0
Mud Lake	7/01/10	7/08/10	1.1	0.3	27.0	1.4
	7/08/10	7/15/10	1.8	0.4	33.1	1.5
	7/15/10	7/22/10	R[1]	R[1]	R[1]	R[1]
	7/22/10	7/29/10	R[1]	R[1]	R[1]	R[1]
	7/29/10	8/05/10	2.4	0.4	60.7	2.2
	8/05/10	8/12/10	3.6	0.6	47.9	2.1
	8/12/10	8/19/10	1.2	0.3	32.1	1.5
	8/19/10	8/26/10	1.7	0.4	42.7	1.8
	8/26/10	9/02/10	R[1]	R[1]	R[1]	R[1]
	9/02/10	9/09/10	2.6	0.4	31.5	1.5
	9/09/10	9/16/10	0.8	0.3	38.6	1.6
	9/16/10	9/23/10	1.5	0.3	41.9	1.7
	9/23/10	9/30/10	2.9	0.5	62.1	2.1

[1]R – Result rejected due to insufficient sample volume.

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, third quarter, 2010.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Distant Locations						
Craters	7/01/10	7/08/10	0.9	0.3	23.2	1.3
	7/08/10	7/15/10	0.9	0.3	29.6	1.4
	7/15/10	7/22/10	1.1	0.3	33.8	1.5
	7/22/10	7/29/10	1.0	0.3	30.8	1.5
	7/29/10	8/05/10	1.1	0.3	42.5	1.7
	8/05/10	8/12/10	1.3	0.4	37.9	1.7
	8/12/10	8/19/10	0.8	0.3	34.5	1.6
	8/19/10	8/26/10	1.0	0.3	39.9	1.7
	8/26/10	9/02/10	1.1	0.3	29.6	1.5
	9/02/10	9/09/10	1.0	0.3	29.0	1.5
	9/09/10	9/16/10	0.8	0.3	38.3	1.7
	9/16/10	9/23/10	1.1	0.3	37.7	1.6
	9/23/10	9/30/10	1.0	0.3	44.3	1.8
Fort Hall[1]	7/01/10	7/08/10	1.5	0.3	21.2	1.2
	7/08/10	7/15/10	1.8	0.4	29.8	1.4
	7/15/10	7/22/10	1.2	0.3	27.6	1.4
	7/22/10	7/29/10	1.4	0.3	26.9	1.4
	7/29/10	8/05/10	1.3	0.3	38.6	1.6
	8/05/10	8/12/10	1.1	0.3	31.4	1.5
	8/12/10	8/19/10	2.0	0.4	28.9	1.4
	8/19/10	8/26/10	1.7	0.3	34.8	1.5
	8/26/10	9/02/10	1.6	0.4	32.7	1.7
	9/02/10	9/09/10	1.0	0.3	26.8	1.4
	9/09/10	9/16/10	0.9	0.3	33.0	1.5
	9/16/10	9/23/10	1.2	0.3	30.8	1.4
	9/23/10	9/30/10	2.0	0.4	44.2	1.7
Idaho Falls	7/01/10	7/08/10	1.2	0.3	32.0	1.5
	7/08/10	7/15/10	1.4	0.3	33.5	1.5
	7/15/10	7/22/10	1.7	0.4	42.4	1.7
	7/22/10	7/29/10	1.5	0.3	43.1	1.7
	7/29/10	8/05/10	1.3	0.3	55.3	1.9
	8/05/10	8/12/10	1.2	0.3	38.6	1.7
	8/12/10	8/19/10	1.2	0.3	45.8	1.7
	8/19/10	8/26/10	2.4	0.4	49.7	1.8
	8/26/10	9/02/10	1.8	0.4	41.6	1.7
	9/02/10	9/09/10	2.0	0.4	45.5	1.7
	9/09/10	9/16/10	1.6	0.3	50.1	1.8
	9/16/10	9/23/10	2.3	0.4	47.5	1.7
	9/23/10	9/30/10	3.1	0.5	69.1	2.1

[1]Operated by Shoshone-Bannock Tribes.

Appendix B

Table B-1. Results for all electret locations, third quarter, 2010.

Sample Location	Net Corrected Exposure Rate (μR/h)	± 2 SD (μR/h)
Arco	16.9	0.1
Craters	16.1	0.5
Rest Area	18.8	4.0
Van Buren	15.0	0.3
EFS	16.1	3.0
Main Gate	13.9	3.8
Atomic City	13.0	0.1
Taber	13.1	2.5
Blackfoot	14.5	0.4
Ft. Hall	13.7	0.7
Idaho Falls	14.6	0.9
Mud Lake/ Terreton	16.8	3.1
Monteview	16.2	0.2
Sand Dunes	15.1	1.2
Howe Met. Tower	13.8	1.0
MP276 -20	11.5	1.0
MP274 -20	10.8	1.2
MP272 -20	13.0	1.6
MP270 -20	13.1	1.2
MP268 -20	12.6	3.2
MP266 -20	13.4	2.3
MP264 -20	13.8	3.0
MP270 -20/26	14.1	2.1
MP268 -20/26	18.3	1.9
MP266 -20/26	15.5	1.2
MP263 -20/26	13.7	3.0
MP261 -20/26	15.5	0.8
MP259 -20/26	12.8	0.1
MFC (EBR II)	16.8	1.3
EBR I	13.5	3.3
RWMC	16.1	0.4
CFA	14.9	0.3
CITRC (PBF)	15.6	1.3

Table B-1 continued. Results for all electret locations, third quarter, 2010.

Sample Location	Net Corrected Exposure Rate (µR/h)	± 2 SD (µR/h)
INTEC (ICPPI)	13.9	1.7
ATR (TRA)	27.0	1.7
NRF	13.8	2.7
TAN	12.8	2.8
Mud Lake Bank of Commerce	15.2	0.9
MP43-33	16.7	0.9
MP41-33	16.2	3.5
MP39-33	13.7	2.9
MP37-33	12.5	2.5
MP35-33	14.9	3.4
MP33-33	15.3	3.9
MP31-33	16.5	2.6
MP29-33	12.4	1.1
MP27-33	18.9	4.0
MP25-33	13.3	3.1
MP23-33	15.1	2.4
Base of Howe	14.1	0.9
Rover	21.1	0.2
Hamer	14.8	3.7
Sugar City	19.0	1.5
Roberts	12.2	3.0
Big Southern Butte	13.9	1.8

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