Department of Environmental Quality
INL Oversight Program

ENVIRONMENTAL SURVEILLANCE PROGRAM
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Boise Office
1410 N. Hilton
Boise, Idaho 83706
208-373-0428

Idaho Falls Office
900 N. Skyline, Suite B
Idaho Falls, Idaho 83402
208-528-2600

Table of Contents

List of Tables

List of Figures

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
ESP	-	Environmental Surveillance Program
ESRP	-	Eastern Snake River Plain
ESRPA	-	Eastern Snake River Plain Aquifer
Ft bls		feet below land surface
HPIC	-	high-pressure ion chamber
IBL	-	Idaho Bureau of Laboratories
ICPP	-	Idaho Chemical Processing Plant
ICP	-	Idaho Cleanup Project
ISB	-	In-situ bioremediation
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	-	Sample 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
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, 2020 (**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**. Results are within the expected historical range. Multiple air samplers were removed from service upon the discovery of inaccurate flow rates and mechanical issues. The lack of data at the locations shown in **Appendix A** was a result of lead times to receive replacement units.

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 2020 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. The weighted mean value from the Experimental Field Station exceeded the MDC, as did all three individual sample results. All other sample results were below their MDCs. Sample results from all locations were well below the DEQ-INL OP action level of 150 pCi/m^3 (40 CFR 61). Weighted mean atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the second quarter of 2020. 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 2020. Analysis results for Tritium (H-3) and Cesium-137, the most likely to be detected of manmade gamma-emitting radionuclides, are presented in **Table 5**.

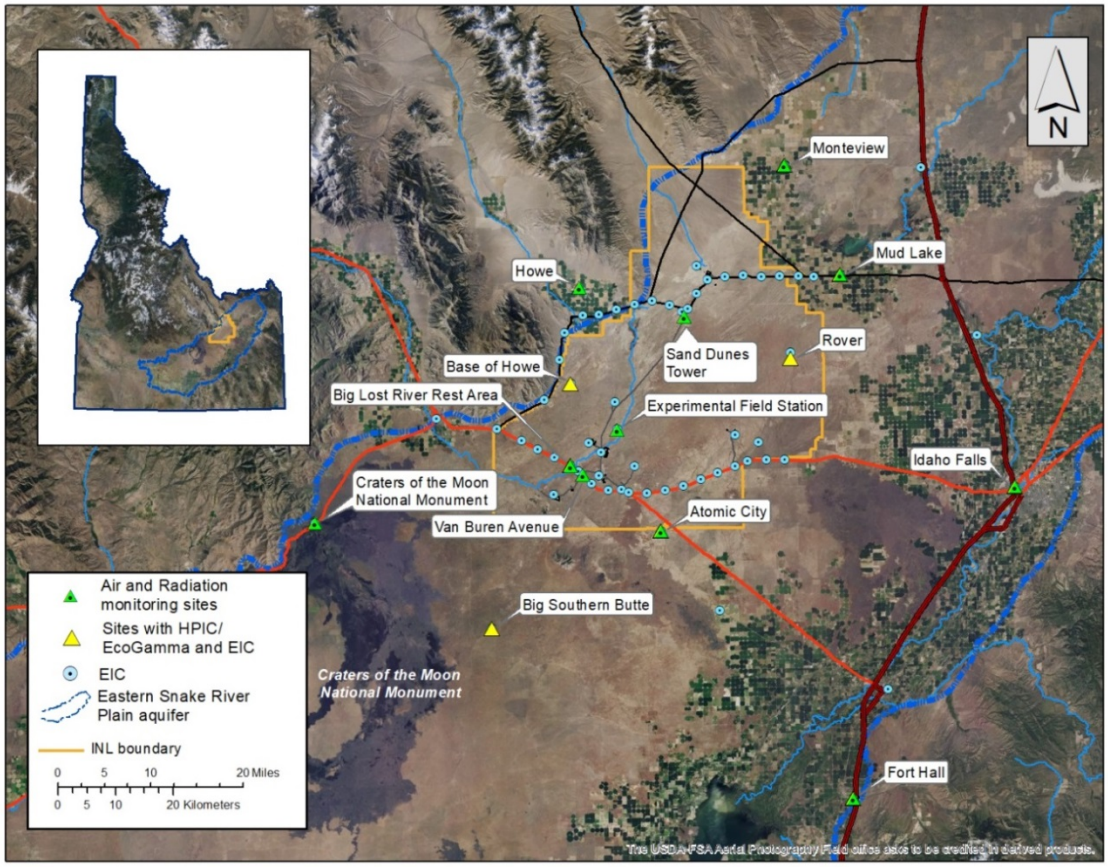

Figure 1. Air and radiation monitoring sites.

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, 2020.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.5	-	1.2	14.9	-	32.7
Experimental Field Station	0.5	-	1.1	17.8	-	25.4
Sand Dunes Tower	0.5	-	1.1	16.2	-	36.0
Van Buren Avenue	0.5	-	2.9	14.8	-	76.8
Boundary Locations						
Atomic City	0.3	-	1.3	10.7	-	27.1
Howe	0.5	-	1.8	15.5	-	30.9
Monteview	0.5	-	1.6	12.7	-	36.6
Mud Lake	0.6	-	0.9	22.2	-	24.8
Distant Locations						
Craters of the Moon	0.3	-	0.8	10.2	-	22.7
Fort Hall[1]	0.7	-	2.0	18.6	-	38.6
Idaho Falls	0.5	-	1.3	14.5	-	28.8

[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, 2020.

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	117.5	6.2	<MDC[2]	
Experimental Field Station	101.9	6.1	<MDC	
Sand Dunes Tower	125.7	6.6	<MDC	
Van Buren Avenue	173.0	9.8	<MDC	
Boundary Locations				
Atomic City	105.6	5.7	<MDC	
Howe	122.8	6.6	<MDC	
Monteview	110.1	6.0	<MDC	
Mud Lake	177.6	11.0	<MDC	
Distant Locations				
Craters of the Moon	75.1	4.1	<MDC	
Fort Hall[1]	160.4	8.6	<MDC	
Idaho Falls	94.6	5.1	<MDC	

[1]Operated by Shoshone-Bannock Tribes.
[2]MDC for Cs-137 typically (0.05-0.20) 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, 2020.

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.15	0.38	0.63
Experimental Field Station	0.94	0.43	0.65
Sand Dunes Tower	0.11	0.32	0.55
Van Buren Avenue	0.23	0.39	0.65
Boundary Locations			
Atomic City	0.12	0.42	0.70
Howe	0.21	0.39	0.65
Mud Lake	0.05	0.39	0.67
Monteview	0.08	0.43	0.72
Distant Locations			
Craters of the Moon	0.13	0.36	0.61
Fort Hall[1]	-0.01	0.46	0.80
Idaho Falls	0.16	0.43	0.73

[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, 2020.

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	-60	90	170	-0.4	1.1	2.1
Boundary Locations						
Atomic City	-10	100	170	0.6	1.2	2.0
Howe	0	100	170	0.5	1.1	1.9
Monteview	-60	100	170	0.3	1.6	2.8
Mud Lake	30	100	170	1.0	1.0	1.8
Distant Locations						
Idaho Falls	-7	100	170	1.1	1.5	2.5

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

Environmental Radiation Monitoring Results

The ESP operated 13 environmental radiation stations during the second quarter of 2020 (**Figure 1**). To detect gamma radiation, each station is instrumented with triplicate electret ionization chambers (EIC), and 10 of the stations also are equipped with a high-pressure ion chamber (HPIC) or EcoGamma dual Geiger–Müller gamma radiation monitor. (**Table 6**).

The Shoshone-Bannock Tribes operate an air monitoring station at Fort Hall which is also 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 and EcoGammas 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 and EcoGammas at each location are transmitted 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 67 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 HPIC/EcoGammas for second quarter 2020. **Table 8** lists the EIC monitoring results for second quarter 2020. 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 or EcoGamma	EIC
On-site Locations		
Base of Howe	■	■
Big Lost River Rest Area	■	■
Experimental Field Station		■
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, 2020, from HPIC/EcoGamma network.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average*	± 2 SD
On-site Locations		
[1]Base of Howe	-	-
Big Lost River Rest Area	13.1	3.0
Rover	17.5	2.4
Sand Dunes Tower	16.0	1.3
Boundary Locations		
Atomic City	13.0	1.4
Big Southern Butte	16.5	1.4
Howe Met Tower	12.5	1.2
Monteview	12.8	1.2
Mud Lake / Terreton	13.4	0.6
Distant Locations		
Fort Hall	12.8	1.5
Idaho Falls	9.6	3.4

[1]No data available for this location for second quarter 2020 due to electronic malfunctions / failures in instrumentation.
*The HPIC's and EcoGammas are sensitive electronic devices that can experience intermittent malfunctions and/or interference; this typically results in characteristic positive and/or negative data spikes. These aberrations are removed from the data set based on the judgement of the data analyst.

Table 8. Electret ionization chamber (EIC) cumulative average exposure rates, second quarter, 2020.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average[1]	± 2 SD
On-Site Locations		
Base of Howe	12.0	1.8
Big Lost River Rest Area	12.6	1.9
Experimental Field Station	13.2	2.7
Rover	14.9, 17.0	-
Sand Dunes Tower	11.1	3.6
Van Buren Avenue	11.7	1.6
Boundary Locations		
Atomic City	12.0	1.0
Big Southern Butte	14.8	3.5
Howe Met Tower	15.2	2.0
Monteview	12.6	2.6
Mud Lake/Terreton	14.2	2.9
Distant Locations		
Craters of the Moon	11.4	1.1
Fort Hall	9.5, 10.7	-
Idaho Falls	9.3	3.4

[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

DEQ-INL OP collects groundwater samples from wells and springs located within, upgradient of, and downgradient of the INL in order to evaluate the effects of INL contaminants on water quality in the eastern Snake River Plain (ESRP) aquifer and verify the results of DOE and USGS monitoring. Each year, DEQ-INL OP samples approximately 80-85 locations concurrently with a DOE contractor or the USGS and 15-20 locations independently. Co-sampled locations are primarily on or near the INL Site and are usually sampled during the second and fourth calendar quarters. DEQ-INL OP publishes a comparison of its own analytical results with those obtained by co-samplers in the DEQ-INL Oversight Program Annual Report. Locations sampled independently by DEQ-INL OP are mostly in the Magic Valley and are typically sampled during the third calendar quarter.

Most water samples are collected from wells drilled into the aquifer or springs formed by the intersection of the aquifer water table with the surface. Each aquifer well or spring is categorized as upgradient, facility, boundary, or distant based on its location (**Figure 2** and **Figure 3**):

- **Upgradient** sites are situated north or northeast of INL facilities in areas that have not been affected by INL operations. They are used to monitor background concentrations in the aquifer.

- **Facility** sites are located near facility complexes within the INL, including the Advanced Test Reactor complex (ATR), the Central Facilities Area (CFA), the Idaho Nuclear Technology and Engineering Center (INTEC), the Materials and Fuels Complex (MFC), the Naval Reactors Facility (NRF), the Radioactive Waste Management Complex (RWMC), and Test Area North

(TAN). Facility sites are located within or immediately downgradient of known areas of contamination and are sampled to monitor the concentrations and migration of specific contaminants.

- **Boundary** sites are located near the southern boundary of the INL, downgradient of potential sources of INL contamination. These include several wells equipped with Westbay Multilevel Groundwater Monitoring Systems ("Westbay wells"), which offer a look at the vertical distribution of constituents in the aquifer.

- **Distant** sites are located farther downgradient of the INL, primarily in the Magic Valley, and include wells and springs used for agricultural, municipal, domestic, and industrial purposes.

A small number of samples are also collected each year from streams, waste-pond effluent, and wells drilled into perched groundwater (groundwater that sits above the aquifer).

Samples collected from water-monitoring sites are analyzed for radiological and non-radiological constituents, many of which are present in the aquifer both naturally and as a result of INL operations. All locations are sampled for gross alpha and gross beta radioactivity, manmade gamma-emitting nuclides, tritium, common ions,[1] and nitrate-plus-nitrite.[2] Samples from locations at which tritium concentrations are too low to be detected by the standard method are re-analyzed for tritium using an electrolytic enrichment method (referred to as the low-level method), which has a minimum detectable concentration (MDC) about ten times lower than the standard method. Selected sites are also sampled for specific radionuclides—including uranium isotopes (^{234}U, ^{235}U, and ^{238}U), plutonium isotopes (^{238}Pu, $^{239/240}$Pu), americium-241 (^{241}Am), strontium-90 (^{90}Sr), and technetium-99 (^{99}Tc)—selected trace metals, total phosphorous, and/or volatile organic compounds (VOCs) based on past and present INL operations or a history of elevated concentrations. If unexpected levels of radioactivity are detected in gross measurements, additional samples will be collected and analyzed for specific radionuclides.

During the second quarter of 2020, DEQ-INL OP sampled groundwater from the aquifer at 30 facility locations, 15 boundary locations, six distant locations, and five upgradient locations. **Table 9** lists the sample date, co-sampler, well depth, and analyses requested for the location sampled this quarter. Analytical results are reported in **Tables 11 through 22** and summarized below. The results of low-level tritium analyses for 20 samples collected in the current and previous quarters are reported in **Table 13** and discussed below.

Table 10 shows the range of background concentrations for each constituent in the ESRP aquifer and the EPA drinking water maximum contaminant level (MCL) or secondary MCL. Background concentrations depend on local geology, and the concentrations of constituents at sites not influenced by INL activities may on occasion be higher than the given background ranges due to local factors and natural variability.

Gross alpha and gross beta radioactivity

Gross alpha and gross beta analyses are used to screen for unexpectedly high levels of radioactivity in samples. DEQ-INL OP has determined from past sampling that background concentration ranges for gross alpha and gross beta radioactivity in the ESRP aquifer are approximately 0-5.6 pCi/L and 0-8.6

[1] The common ions are calcium, magnesium, potassium, sodium, chloride, fluoride, sulfate, and bicarbonate (reported here as alkalinity).
[2] Distant locations Alpheus Spring, Bill Jones Hatchery, Clear Spring, Minidoka Water Supply, and Shoshone Water Supply and upgradient location Mud Lake Water Supply are sampled only for gross alpha and gross beta radioactivity, gamma-emitting radionuclides, and tritium during the second and fourth quarters. Samples for common ions, nitrate-plus-nitrate, and other constituents are collected at these locations during the third quarter.

pCi/L, respectively. Occasional measurements of concentrations above these background ranges in uncontaminated samples are statistically probable due to uncertainties inherent in measuring low levels of radioactivity. Additionally, some samples will have levels of radioactivity slightly higher than background ranges due to higher-than-average concentrations of naturally occurring uranium, thorium, or potassium-40.

Gross alpha and beta radioactivity were detected at low levels in many samples. Gross alpha radioactivity was measured at concentrations within the known background range at all facility, upgradient, boundary, and distant locations. A re-analysis of TAN-28 gross alpha radioactivity was requested as the original result was quite low (-0.2 ± 2.7 pCi/L). The re-analysis result was as expected (4.6 ± 3.2 pCi/L) and is listed along with the original result in **Table 11.** Above background levels of gross beta radioactivity were detected at TAN and INTEC (**Table 11**), with a maximum of 1048.6 ± 12.7 pCi/L at TAN 2271. Another notable gross beta detection was at ICPP-MON-A-230 of 882.5 ± 7.2 pCi/L, an increase from 638.6 ± 6.2 pCi/L in 2019. These samples did not, however, exceed the drinking water MCL for gross alpha radioactivity and are being monitored closely together with the ICP contractor. The MCL for gross beta radioactivity is nuclide-dependent; see the Strontium-90 and Technetium-99 sections below for MCL values. All other detectable concentrations in groundwater were consistent with historical results, and all elevated concentrations at the INL were in areas of known contamination.

Manmade gamma-emitting radionuclides

No manmade gamma-emitting radionuclides were detected at the locations sampled this quarter, other than a questionable cesium-137 (^{137}Cs) result at Crossroads well, southwest of the INL. The original reported lab result of 2.9 ± 1.6 pCi/L was slightly above the MDC of 2.5 pCi/L, and was above previous measurements at this location. A re-analysis was requested and the result (1.1 ± 1.8 pCi/L) was consistent with historical results and below the MDC of 2.9 pCi/L. A third analysis was requested to confirm the value. The lab then performed three more analyses, each on a different detector. All three results were less than MDC. All five Crossroads well results are reported in **Table 11**. Also, samples from boundary wells upgradient of Crossroads (primarily Middle-2051, USGS-008, USGS-011, USGS-108, USGS-131A, and USGS-137A) all yielded non-detections for ^{137}Cs. All of these non-detections strongly suggest that the original result was a false positive detection. Occasional false positive results in uncontaminated samples are statistically probable due to uncertainties inherent in measuring low levels of radioactivity. The ^{137}Cs results from this well will be closely monitored in the future, and the well will be sampled again in April, 2021. All results for ^{137}Cs, the manmade gamma-emitter most likely to be detected in groundwater, are reported in **Table 11**.

Tritium

Tritium was measured at all locations sampled this quarter (**Table 12**). Using the standard analytical method, which typically has an MDC of 110 to 190 pCi/L, tritium was detected at 17 facility locations, and three boundary locations. The highest concentration measured was 1,810 ± 160 pCi/L in USGS-067 where is it well documented to have been in decline since monitoring at this location began in 2001.

Each of the boundary-area detections was in a well equipped with a multi-level monitoring system, which allows samples to be collected from multiple depths. Elevated tritium concentrations in these wells were found at depths ranging from 750 to 812 feet below land surface (ft bls), with a maximum of 810 ± 130 pCi/L at a depth of 812 ft bls in USGS-131A. All tritium concentrations were consistent with historical data and were measured in areas of known contamination related to past INL waste disposal practices.

Twelve samples from this quarter requiring low-level tritium analysis were analyzed this quarter and results were non-detections. The rest have not yet been analyzed by that method due to a sample backlog. Seven low-level tritium samples from 2019 and one from first quarter 2020 were analyzed in the second quarter of 2020, and the results are reported in **Table 13**. Three of these samples are from boundary wells, two are from facility wells, and the remaining three are from distant and upgradient locations. All reported concentrations are consistent with past results. A backlog of 13 samples to be analyzed for low-level tritium remains. All tritium concentrations reported in this quarter are well below the drinking water MCL of 20,000 pCi/L.

Strontium-90

Fifteen locations were sampled for ^{90}Sr during the second quarter 2020 (**Table 14**). Detectable concentrations were found in 11 aquifer samples from INTEC and TAN with a maximum concentration of 318 ± 75 pCi/L at TAN 2271. Seven locations had ^{90}Sr concentrations that exceeded the MCL of 8 pCi/L. All elevated concentrations were measured in samples from areas of known contamination and are consistent with historical trends.

Technetium-99

Three upgradient and 13 facility locations were sampled for ^{99}Tc during this quarter (**Table 15**). Four locations from INTEC and one location at RWMC had detectable concentrations with a maximum of 1,260 ± 200 pCi/L at ICPP-MON-A-230. Although this is a slight increase from last year (1040 ± 170 pCi/L), it is a significant decrease in concentration from a previous sampling event in 2003 which had a concentration of 2,418 ± 4 pCi/L. All concentrations, except for that from ICPP-MON-A-230, were below the drinking water MCL of 900 pCi/L and consistent with historical data and trends.

Actinides

Eighteen locations – six at INTEC, five at RWMC, six at TAN, and one at ATR – were sampled and analyzed for uranium isotopes this quarter (**Table 16**). Uranium-234 (^{234}U) was detected in all locations sampled with two exceeding natural background concentrations. There were 10 detections of uranium-235 (^{235}U) seven of which exceeded background concentrations, and six of which were less than three standard deviations (and therefore flagged as estimates). There were 17 detections of uranium-238 (^{238}U) with five exceeding background concentrations. The maximum concentrations of ^{234}U, ^{235}U, and ^{238}U were 5.21 ± 0.89 pCi/L, 0.185 ± 0.079 pCi/L, and 1.04 ± 0.23 pCi/L respectively, all at TAN-29. All detections were consistent with historical observations.

A re-analysis request was made on well TAN-28 to confirm a significant reduction in U isotope concentrations and the re-analysis came back consistent with the previous analysis. A verbal communication with the ICP contractor about in-situ bioremediation (ISB) injection activities at TAN revealed that a change in injection location from TAN-37A to TAN-1860A had caused conditions in the aquifer to become more reducing, thereby changing the solubility of uranium in the groundwater. TAN-28, being the well closest to the new injection location reflects this reduction in the uranium concentrations.

Thirteen facility locations – six at INTEC, six at RWMC, and one at ATR – were sampled for plutonium isotopes (Pu-238 and Pu-239/240) this quarter with one concentration >MDC at RWMC well M1S of 0.020 ± 0.029 pCi/L (**Table 17**). This result is less than two standard deviations, and is therefore considered a non-detection based on quality assurance criteria. Similarly, ^{241}Am was also analyzed in seven samples –six at RWMC and one at ATR – with no detectable concentrations (**Table 18**).

Common ions, trace metals, and nutrients

Select locations were sampled for common ions (calcium, magnesium, sodium, potassium, fluoride, chloride, sulfate, and alkalinity), trace metals, (arsenic, barium, chromium, iron, lead, manganese, selenium, and zinc) and dissolved nutrients (nitrate-plus-nitrite, phosphorous) (**Tables 19, 20, and 21**). Chloride was measured at 368 mg/L in NRF-06, exceeding the EPA's secondary MCL of 250 mg/L. Chromium was also measured in NRF-06 at 50 µg/L, the highest concentration since 2009, but still well below the MCL of 100 µg/L. These elevated concentrations at NRF are consistent with historical data.

Levels of barium, iron, manganese, sodium, chloride, alkalinity, and phosphorous in samples from TAN were elevated above historical trends due to changing redox conditions and increased competition for cation adsorption sites caused by ongoing in-situ bioremediation (ISB) injections at TAN-37. Three locations at INTEC (ICPP-2020, ICPP-MON-A-230, and USGS-067) had elevated nitrate + nitrite concentrations above background due to historical leaks from the underground tank farm. All other concentrations were consistent with past observations and trends with most within natural background ranges.

Volatile organic compounds (VOCs)

VOCs were measured at nine locations at TAN and seven locations at RWMC this quarter. All had detectable concentrations of at least one VOC, with the exception of M1S and TAN-56, where none were detected. Notable MCL exceedances and/or changes from previous measurements include:

- TAN-28 vinyl chloride = 70.6 µg/L, up from 3.77 µg/L in 2018
- TAN-28 TCE = 8.91 µg/L, down from 209 µg/L from 2019
- TAN-28 cis-1,2 DCE = 643 µg/L, up from 50.8 µg/L in 2019
- TAN-28 trans-1,2 DCE = 72.9 µg/L, down 126 µg/L in 2019
- TAN-51 PCE, TCE, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, 1,1-DCA all were higher for the previous two measurements reflecting changes in reducing conditions from ISB injections.
- A11A31 carbon tetrachloride, TCE and chloroform appear to be on an upward trend from the previous two measurements.
- M15S carbon tetrachloride, TCE and chloroform appear to be on an upward trend from the previous two measurements.

Well TAN-37 was planned to be sampled this quarter to verify decreasing concentrations of methyl ethyl ketone, but the pump was not working and sampling did not occur. There is a possibility that it will be sampled in 4th quarter 2020 to make sure these concentrations are decreasing as expected.

A new well, M7S at RWMC, was added to the program to further characterize the contamination northeast of the facility. Detectable concentrations of carbon tetrachloride, TCE, and chloroform were present but in the same ranges as other wells at this facility. It will continue to be sampled in the coming years to evaluate trends.

All other VOC detections were consistent with historical data and were measured in areas of known contamination. **Table 22** shows VOCs that were detected this quarter.

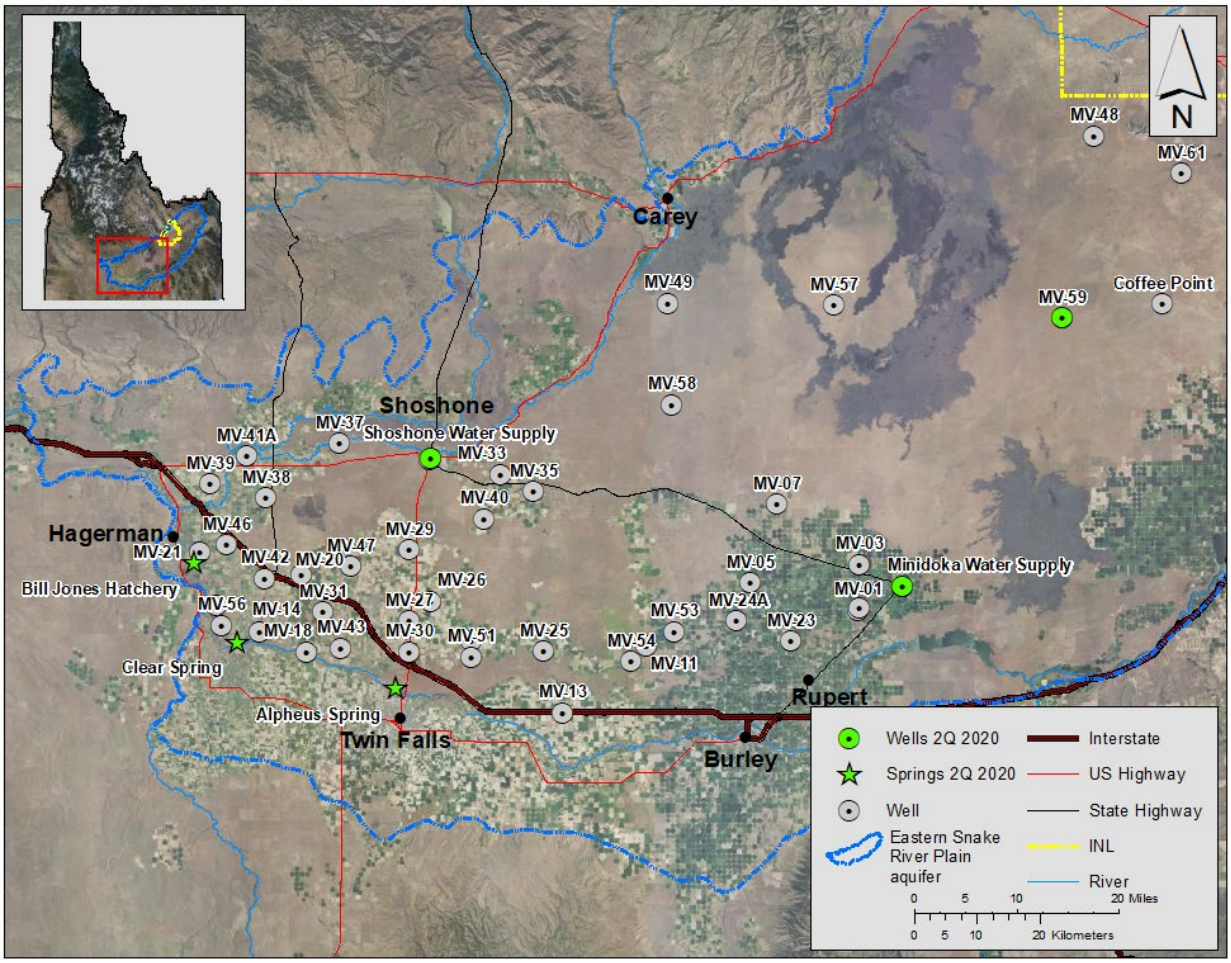

Figure 2. Distant and Surface Water monitoring locations.

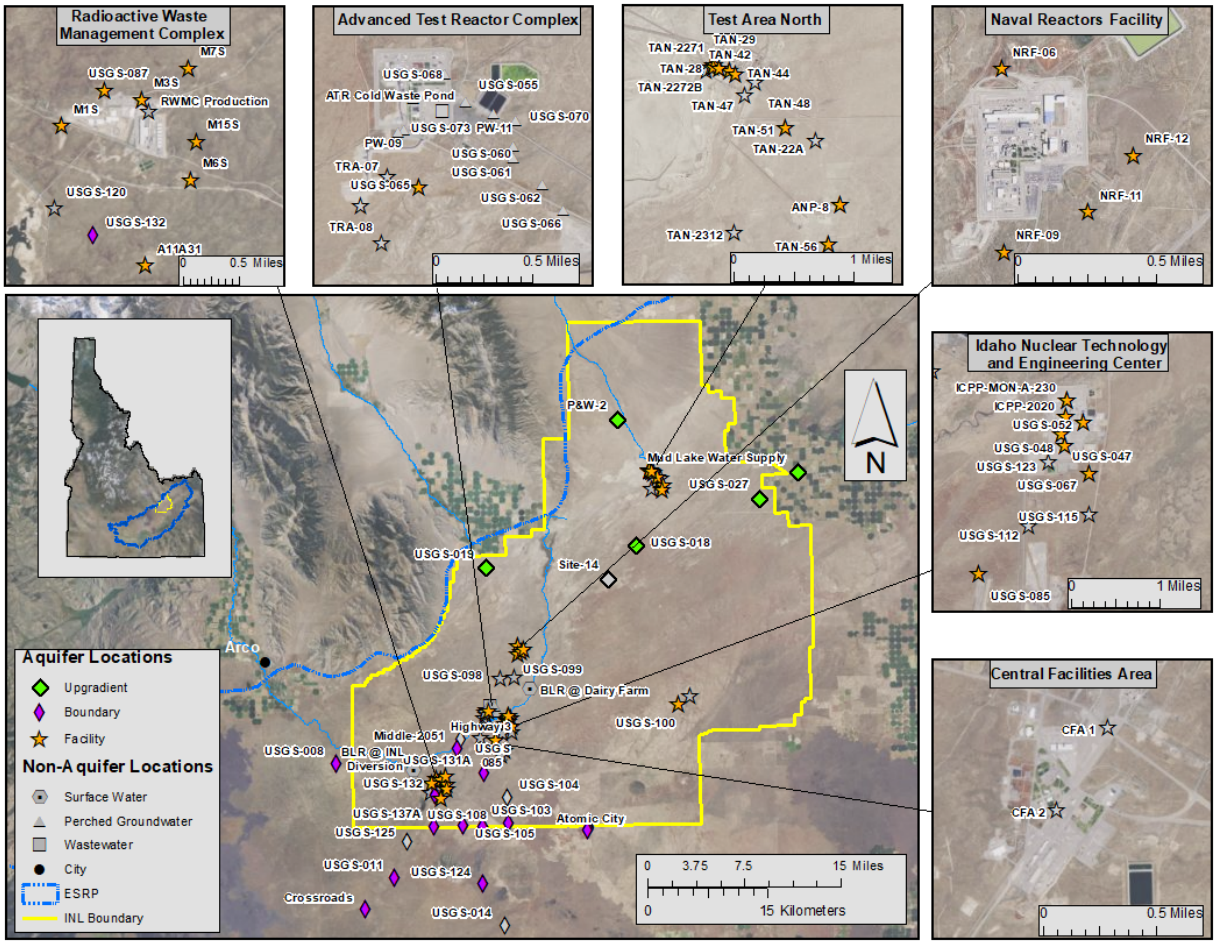

Figure 3. Upgradient, facility, boundary, perched groundwater (GW), and wastewater monitoring locations.

Table 9. Locations sampled for water, second quarter, 2020.

Sample Location	Date Sampled	Co-sampler	Well Depth (ft bgs)	Analyses*
Aquifer Samples				
Upgradient				
Mud Lake Water Supply	5/20/2020	None	330	α, β, γ, ^{3}H
P&W-2	4/6/2020	USGS	386	α, β, γ, ^{3}H, ^{99}Tc, com. ions, Cr, NO_3+NO_2
USGS-018	4/6/2020	USGS	329	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-019	4/6/2020	USGS	405	α, β, γ, ^{3}H, ^{99}Tc, com. ions, Cr, NO_3+NO_2
USGS-027	4/6/2020	USGS	312	α, β, γ, ^{3}H, ^{99}Tc, com. ions, Cr, NO_3+NO_2
Facility				
Idaho Nuclear Technology and Engineering Center				
ICPP-2020	4/13/2020	Fluor	506	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, U iso, Pu iso, com. ions, Cr, NO_3+NO_2
ICPP-MON-A-230	4/13/2020	Fluor	n/a	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, U iso, Pu iso, com. ions, Cr, NO_3+NO_2
USGS-047	4/13/2020	Fluor	651	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, U iso, Pu iso, com. ions, Cr, NO_3+NO_2
USGS-048	4/21/2020	Fluor	750	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, U iso, Pu iso, com. ions, Cr, NO_3+NO_2
USGS-052	4/13/2020	Fluor	650	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, U iso, Pu iso, com. ions, Cr, NO_3+NO_2
USGS-067	4/21/2020	Fluor	694	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, U iso, Pu iso, com. ions, Cr, NO_3+NO_2
USGS-085	4/20/2020	USGS	637	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, com. ions, Cr, NO_3+NO_2
Advanced Test Reactor Complex				
USGS-065	4/8/2020	USGS	498	α, β, γ, ^{3}H, ^{90}Sr, U iso, Pu iso, ^{241}Am, com. ions, As, Ba, Cr, Fe, Pb, Mn, Se, Zn, NO_3+NO_2
Test Area North				
ANP-8	6/1/2020	Fluor	309	α, β, γ, ^{3}H, com. Ions, VOCs
TAN 2271	4/7/2020	Fluor	289	α, β, γ, ^{3}H, ^{90}Sr, U iso, com. ions, Cr, As, Ba, Fe, Pb, Mn, NO_3+NO_2, P, VOCs
TAN 2272B	4/7/2020	Fluor	287	α, β, γ, ^{3}H, ^{90}Sr, U iso, com. ions, Cr, As, Ba, Fe, Pb, Mn, NO_3+NO_2, P, VOCs
TAN-28	4/7/2020	Fluor	539	α, β, γ, ^{3}H, ^{90}Sr, U iso, com. ions, Cr, As, Ba, Fe, Pb, Mn, NO_3+NO_2, P, VOCs
TAN-29	4/7/2020	Fluor	522	α, β, γ, ^{3}H, ^{90}Sr, U iso, com. ions, Cr, As, Ba, Fe, Pb, Mn, NO_3+NO_2, P, VOCs
TAN-42	4/7/2020	Fluor	262	α, β, γ, ^{3}H, ^{90}Sr, U iso, com. ions, Cr, As, Ba, Fe, Pb, Mn, NO_3+NO_2, P, VOCs
TAN-44	4/7/2020	Fluor	416	α, β, γ, ^{3}H, ^{90}Sr, U iso, com. ions, Cr, As, Ba, Fe, Pb, Mn, NO_3+NO_2, P, VOCs
TAN-51	6/8/2020	Fluor	440	α, β, γ, ^{3}H, com. ions, NO_3+NO_2, VOCs
TAN-56	6/8/2020	Fluor	442	α, β, γ, ^{3}H, com. ions, NO_3+NO_2, VOCs
Central Facilities Area				
Naval Reactors Facility				
NRF-06	4/13/2020	USGS	417	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
NRF-09	4/13/2020	USGS	425	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
NRF-11	4/13/2020	USGS	425	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
NRF-12	4/13/2020	USGS	425	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
Radioactive Waste Management Complex				
A11A31	5/5/2020	Fluor	678	α, β, γ, ^{3}H, ^{99}Tc, U iso, Pu iso, ^{241}Am, com. ions, Cr, Pb, Zn, NO_3+NO_2 VOCs
M15S	5/4/2020	Fluor	n/a	α, β, γ, ^{3}H, ^{99}Tc, U iso, Pu iso, ^{241}Am, com. ions, Cr, NO_3+NO_2 VOCs
M1S	5/4/2020	Fluor	678	α, β, γ, ^{3}H, ^{99}Tc, U iso, Pu iso, ^{241}Am, com. ions, Cr, NO_3+NO_2, VOCs
M3S	5/4/2020	Fluor	660	α, β, γ, ^{3}H, ^{99}Tc, U iso, Pu iso, ^{241}Am, com. ions, Cr, NO_3+NO_2, VOCs
M6S	5/5/2020	Fluor	697	α, β, γ, ^{3}H, ^{99}Tc, U iso, Pu iso, ^{241}Am, com. ions, Cr, NO_3+NO_2, VOCs
M7S	5/13/2020	Fluor	n/a	α, β, γ, ^{3}H, ^{99}Tc, U iso, Pu iso, ^{241}Am, com. ions, Cr, NO_3+NO_2, VOCs
USGS-087	4/8/2020	USGS	673	α, β, γ, ^{3}H, ^{90}Sr, ^{99}Tc, Pu iso, ^{241}Am, com. ions, Cr, Pb, NO_3+NO_2, VOCs

Materials and Fuels Complex				
USGS-100	4/15/2020	USGS	750	α, β, γ, ^{3}H, com. ions, Cr, Pb, NO_3+NO_2
Boundary				
Atomic City	5/13/2020	USGS	639	α, β, γ, ^{3}H, com. ions, Cr, Pb, NO_3+NO_2
Crossroads	4/15/2020	USGS	796	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
Middle-2051	6/10/2020	USGS	1091	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
Middle-2051	6/10/2020	USGS	749	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-008	4/15/2020	USGS	812	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-011	4/27/2020	USGS	704	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-103	6/16/2020	USGS	1258	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-105	6/23/2020	USGS	1072	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-105	6/23/2020	USGS	952	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-108	6/17/2020	USGS	1172	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-124	4/27/2020	USGS	800	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-131A	6/22/2020	USGS	616	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-131A	6/22/2020	USGS	812	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-132	6/15/2020	USGS	765	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
USGS-137A	6/11/2020	USGS	747	α, β, γ, ^{3}H, com. ions, Cr, NO_3+NO_2
Distant				
Alpheus Spring	5/11/2020	None	0	α, β, γ, ^{3}H
Bill Jones Hatchery	5/11/2020	None	0	α, β, γ, ^{3}H
Clear Spring	5/11/2020	None	0	α, β, γ, ^{3}H
Minidoka Water Supply	5/11/2020	None	282	α, β, γ, ^{3}H
MV-59	6/9/2020	None	765	α, β, γ, ^{3}H, com. ions, NO_3+NO_2
Shoshone Water Supply	5/11/2020	None	n/a	α, β, γ, ^{3}H
Surface Water				
Perched Water				
Advanced Test Reactor Complex:				

ft bgs = feet below ground surface.
*α = gross alpha radioactivity; β = gross beta radioactivity; γ = manmade gamma-emitting radionuclides; ^{3}H = tritium; U iso. = ^{234}U, ^{235}U, ^{238}U; Pu iso = ^{238}Pu, $^{239/240}Pu$; com. ions = Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, SO_4^{2-}, alkalinity; NO_3+NO_2 = nitrate plus nitrite.

Table 10. Constituent background concentration ranges and EPA drinking water standards.

Constituent	Background[1]	MCL or SMCL[2]
Radiological Constituents (pCi/L)		
Gross alpha	0-5.6[a]	15
Gross beta	0-8.6[a]	4 mrem/yr
Cesium-137	0	200
Tritium	0-33[a]	20,000
Strontium-90	0	8
Technetium-99	0	900
Uranium-234	0.043-1.9[b]	30 µg/L (total U)
Uranium-235	0-0.048[b]	
Uranium-238	0.021-0.719[b]	
Plutonium-238	0	---
Plutonium-239/240	0	---
Americium-241	0	---
Non-radiological Constituents		
Common Ions (mg/L)		
Alkalinity (as $CaCO_3$)	91-261[a]	---
Calcium	23 – 71[a]	---
Chloride	4.9 – 66.6[a]	250*
Fluoride	0.1 – 1.50[a]	4
Magnesium	10.1 – 27.4[a]	---
Potassium	1.2 – 5.8[a]	---
Sodium	2.6 – 27.0[a]	---
Sulfate	9.6 – 40.4[a]	250*
Trace Metals (µg/L)		
Arsenic	2 – 3[c]	10
Barium	50 – 70[c]	2000
Chromium	<1.0 – 5.2[a]	100
Iron	4 – 16[d]	300*
Lead	<5[c]	15
Manganese	<1 – 4[a]	50*
Selenium	<1[c]	50
Zinc	<3 – 10.5[d]	5000*
Nutrients (mg/L)		
Nitrate plus nitrite	<0.04 – 3.59[b]	10 for NO_3^-, 1 for NO_2^-
Phosphorous	<0.01 – 0.02[d]	---
Volatile Organic Compounds (µg/L)		
Tetrachloroethene (PCE)	0	5
Trichloroethene (TCE)	0	5
1,1-Dichloroethene	0	7
cis-1,2-dichloroethene	0	70
trans-1,2-dichloroethene	0	100
Vinyl chloride	0	2
Carbon tetrachloride	0	5
Chloroform	0	80[e]
Chloromethane	0	---
Methylene Chloride	0	5
Methyl Ethyl Ketone	0	---
1,1-Dichloroethane	0	---

[1] Sources for background ranges are: [a] DEQ data compiled from distant, boundary, and surface water sites from 1993-2018;
[b] Bartholomay and Hall, 2016 (DOE/ID-22237); [c] Knobel and others, 1992; [d] Knobel and others, 1999 (DOE/ID-22164).
[2] Maximum Contaminant Levels (MCLs) are the highest levels of contaminants legally allowed in public drinking water systems in Idaho. Most wells sampled by DEQ-INL OP are not used for drinking water. A * designates a Secondary MCL (SMCL), which is a guideline recommended by the EPA for constituents that may affect the taste, color, or odor of drinking water. [e] MCL is for total trihalomethanes.

Table 11. Gross alpha, gross beta, and man-made gamma-emitting radionuclide concentrations (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Gross Alpha			Gross Beta			Cesium-137*		
		Concentration		2 SD	Concentration		2 SD	Concentration		2 SD
Aquifer Samples										
Upgradient										
Mud Lake Water Supply	5/20/2020	-0.9	U	0.6	4.0		0.9	0.7	U	1.4
P&W-2	4/6/2020	2.6		1.1	1.9		0.9	1.0	U	1.8
USGS-018	4/6/2020	2.5		1.1	4.1		0.9	-0.3	U	1.1
USGS-019	4/6/2020	2.2		1.1	2.1		0.9	-0.3	U	1.8
USGS-027	4/6/2020	0.9	U	1.4	8.1		1.2	2.4	U	1.7
Facility										
Idaho Nuclear Technology and Engineering Center										
ICPP-2020	4/13/2020	2.3		1.1	180.2		3.3	0.6	U	1.5
ICPP-MON-A-230	4/13/2020	5.4		1.4	882.5		7.2	0.6	U	1.5
USGS-047	4/13/2020	2.3		0.9	40.2		1.6	0.7	U	1.7
USGS-048	4/21/2020	2.1		0.9	23.9		1.4	0.5	U	1.5
USGS-052	4/13/2020	2.6		0.9	219.2		3.5	-0.1	U	1.8
USGS-067	4/21/2020	2.4		1.0	100.3		2.5	0.0	U	1.2
USGS-085	4/20/2020	0.3	U	1.1	5.9		1.0	0.7	U	1.1
Advanced Test Reactor Complex										
USGS-065	4/8/2020	2.2		1.1	5.1		1.0	0.6	U	1.6
Test Area North										
ANP-8	6/1/2020	2.1		1.1	4.7		1.0	0.1	U	1.9
TAN 2271	4/7/2020	0.6	U	2.8	1048.6		12.7	2.4	U	1.5
TAN 2272B	4/7/2020	1.1		0.6	467.7		4.8	1.7	U	2.0
TAN-28	4/7/2020	-0.2	U	2.7	433.1		8.4	0.3	U	1.1
TAN-28 re-analysis	4/7/2020	4.6		3.2	407.3		8.1	-	-	-
TAN-29	4/7/2020	3.3		1.4	47.5		1.9	1.5	U	1.5
TAN-42	4/7/2020	0.6	U	1.1	5.2		1.0	0.6	U	1.8
TAN-44	4/7/2020	1.3	U	1.3	4.8		1.1	1.2	U	1.3
TAN-51	6/8/2020	1.8	U	1.2	4.1	R	1.0	1.6	U	1.3
TAN-56	6/8/2020	3.5		1.3	3.1	R	0.9	0.5	U	1.2
Central Facilities Area										
Naval Reactors Facility										
NRF-06	4/13/2020	1.0	U	2.0	7.9		2.2	-0.3	U	1.7
NRF-09	4/13/2020	1.6	U	1.0	3.3		1.0	-0.5	U	1.2
NRF-11	4/13/2020	1.2	U	1.0	4.3		1.0	0.8	U	1.5
NRF-12	4/13/2020	2.0		1.1	3.7		1.0	-1.0	U	1.4
Radioactive Waste Management Complex										
A11A31	5/5/2020	0.5	U	1.1	4.5		1.0	0.2	U	1.4
M15S	5/4/2020	0.1	U	1.1	4.9		1.0	-0.4	U	1.1
M1S	5/4/2020	-0.2	U	0.7	3.2		0.8	1.0	U	1.6
M3S	5/4/2020	1.8		1.0	3.0		0.9	0.9	U	1.6
M6S	5/5/2020	0.1	U	1.0	4.0		0.9	-0.5	U	1.4
M7S	5/13/2020	1.0	U	0.9	4.2		0.9	0.1	U	1.2
USGS-087	4/8/2020	1.0	U	0.7	4.9		0.9	0.4	U	1.4
Materials and Fuels Complex										
USGS-100	4/15/2020	1.2		0.7	3.9		0.9	0.5	U	1.3
Boundary										
Atomic City	5/13/2020	1.0	U	0.9	3.9		0.9	1.2	U	1.7
Crossroads	4/15/2020	1.9		0.8	3.3		0.9	2.9		1.6
Crossroads re-analysis	4/15/2020	-	-	-	-	-	-	1.1	U	1.8
Crossroads re-analysis	4/15/2020	-	-	-	-	-	-	0.8	U	1.3
Crossroads re-analysis	4/15/2020	-	-	-	-	-	-	1.8	U	1.2
Crossroads re-analysis	4/15/2020	-	-	-	-	-	-	-0.7	U	1.4
Middle-2051 (1091 ft bls)	6/10/2020	1.1	U	1.1	2.9	R	0.9	0.4	U	1.6
Middle-2051 (749 ft bls)	6/10/2020	1.8		1.2	3.0	R	0.9	0.3	U	1.2
USGS-008	4/15/2020	1.5	U	1.2	2.3		0.9	-0.1	U	1.7

USGS-011	4/27/2020	0.7	U	1.0	2.4		0.9	1.1	U	1.1
USGS-103	6/16/2020	1.4	U	1.4	3.9		1.0	2.1	U	1.5
USGS-105 (1072 ft bls)	6/23/2020	1.5	U	1.1	3.2		0.9	-0.4	U	1.2
USGS-105 (952 ft bls)	6/23/2020	1.1	U	1.0	3.3		0.9	1.6	U	1.3
USGS-108	6/17/2020	0.8	U	1.0	3.4		0.9	1.2	U	1.7
USGS-124	4/27/2020	1.4		0.8	3.2		0.9	1.2	U	1.5
USGS-131A (616 ft bls)	6/22/2020	1.4	U	1.1	3.6		1.0	0.1	U	1.5
USGS-131A (812 ft bls)	6/22/2020	1.4	U	1.2	4.5		1.0	0.5	U	1.2
USGS-132	6/15/2020	1.3	U	1.2	3.2		1.0	0.1	U	1.2
USGS-137A	6/11/2020	2.1		1.2	2.9	R	0.9	-0.5	U	1.5
Distant										
Alpheus Spring	5/11/2020	0.0	U	1.5	8.1		1.2	-0.8	U	1.4
Bill Jones Hatchery	5/11/2020	-0.3	U	0.9	4.9		1.0	0.7	U	1.2
Clear Spring	5/11/2020	1.1	U	1.0	4.9		1.0	1.6	U	1.5
Minidoka Water Supply	5/11/2020	-0.8	U	1.0	4.2		1.0	0.3	U	1.2
MV-59	6/9/2020	2.9		1.1	3.8	R	0.9	-0.4	U	1.2
Shoshone Water Supply	5/11/2020	1.8		1.1	3.0		0.9	-0.5	U	1.5
Surface Water										
Perched Water										
Advanced Test Reactor Complex:										

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
*ISU-EML analyzes water samples for all common manmade gamma-emitting radionuclides. If none are detected, only the results for ^{137}Cs, the manmade gamma-emitter most likely to be detected in groundwater, are reported in this table.
"-" = not analyzed.

Table 12. Tritium concentrations (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Tritium		
		Concentration		2 SD
Aquifer Samples				
Upgradient				
Mud Lake Water Supply	5/20/2020	40	U	100
P&W-2	4/6/2020	-20	U	90
USGS-018	4/6/2020	-20	U	90
USGS-019	4/6/2020	-30	U	90
USGS-027	4/6/2020	60	U	90
Facility				
Idaho Nuclear Technology and Engineering Center				
ICPP-2020	4/13/2020	1170		140
ICPP-MON-A-230	4/13/2020	900		140
USGS-047	4/13/2020	190	U	120
USGS-048	4/21/2020	650		130
USGS-052	4/13/2020	400		110
USGS-067	4/21/2020	1810		160
USGS-085	4/20/2020	740		130
Advanced Test Reactor Complex				
USGS-065	4/8/2020	1350		150
Test Area North				
ANP-8	6/1/2020	70	U	90
TAN 2271	4/7/2020	430		110
TAN 2272B	4/7/2020	480		120
TAN-28	4/7/2020	1400		150
TAN-29	4/7/2020	1020		140
TAN-42	4/7/2020	430		110
TAN-44	4/7/2020	500		120
TAN-51	6/8/2020	380		110
TAN-56	6/8/2020	-10	U	90
Central Facilities Area				
Naval Reactors Facility				
NRF-06	4/13/2020	50	U	100
NRF-09	4/13/2020	-60	U	90
NRF-11	4/13/2020	-10	U	90
NRF-12	4/13/2020	-40	U	90
Radioactive Waste Management Complex				
A11A31	5/5/2020	20	U	90
M15S	5/4/2020	40	U	90
M1S	5/4/2020	30	U	90
M3S	5/4/2020	540		110
M6S	5/5/2020	-10	U	90
M7S	5/13/2020	560		120
USGS-087	4/8/2020	430		130
Materials and Fuels Complex				
USGS-100	4/15/2020	60	U	120
Boundary				
Atomic City	5/13/2020	40	U	90
Crossroads	4/15/2020	60	U	90
Middle-2051 (1091 ft bls)	6/10/2020	10	U	100
Middle-2051 (749 ft bls)	6/10/2020	190		100
USGS-008	4/15/2020	-80	U	90
USGS-011	4/27/2020	0	U	90
USGS-103	6/16/2020	90	U	100
USGS-105 (1072 ft bls)	6/23/2020	140	U	100
USGS-105 (952 ft bls)	6/23/2020	120	U	100
USGS-108	6/17/2020	0	U	90
USGS-124	4/27/2020	40	U	120

USGS-131A (616 ft bls)	6/22/2020	640		120
USGS-131A (812 ft bls)	6/22/2020	810		130
USGS-132	6/15/2020	100	U	100
USGS-137A	6/11/2020	60	U	100
Distant				
Alpheus Spring	5/11/2020	-10	U	90
Bill Jones Hatchery	5/11/2020	-10	U	90
Clear Spring	5/11/2020	-20	U	90
Minidoka Water Supply	5/11/2020	50	U	90
MV-59	6/9/2020	-30	U	90
Shoshone Water Supply	5/11/2020	-20	U	90
Surface Water				
Perched Water				
Advanced Test Reactor Complex:				

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 13. Low-level tritium concentrations (pCi/L) for water samples collected during 2019-2020 and analyzed using the electrolytic enrichment method, second quarter, 2020.

Sample Location	Sample Date	Tritium		
		Concentration		2 SD
Aquifer Samples				
Upgradient				
Mud Lake Water Supply	8/7/2019	6	U	11
USGS-019	4/6/2020	6	U	11
USGS-027	4/6/2020	7	U	12
Facility				
A11A31	5/5/2020	10	U	13
ANP-8	6/1/2020	10	U	13
ICPP-MON-A-166	3/30/2020	7	U	9
M15S	5/4/2020	9	U	11
M1S	5/4/2020	7	U	12
M6S	5/5/2020	7	U	12
NRF-06	4/13/2020	5	U	8
USGS-100	4/15/2020	5	U	9
USGS-148	11/7/2019	7	U	11
Boundary				
Atomic City	5/13/2020	6	U	10
Crossroads	4/15/2020	6	U	9
Middle-2051	6/27/2019	15	J*	13
USGS-103	6/18/2019	14	J*	13
USGS-105	6/26/2019	10	J*	9
USGS-124	4/27/2020	6	U	8
Distant				
Bill Jones Hatchery	8/6/2019	7	U	12
Shoshone Water Supply	8/6/2019	6	U	9
Surface Water				

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively. ft bgs = feet below ground surface.
*Result is >MDC and >2SD but <3SD, and is therefore considered questionable and J-flagged as an estimate.

Table 14. Strontium-90 concentrations (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Strontium-90		
		Concentration		2 SD
Aquifer Samples				
Facility				
Idaho Nuclear Technology and Engineering Center				
ICPP-2020	4/13/2020	7.8		1.9
ICPP-MON-A-230	4/13/2020	1.81		0.55
USGS-047	4/13/2020	16.1		3.9
USGS-048	4/21/2020	8.1		2.0
USGS-052	4/13/2020	2.27		0.69
USGS-067	4/21/2020	10.4		2.5
USGS-085	4/20/2020	1.82		0.56
Advanced Test Reactor Complex				
USGS-065	4/8/2020	-0.03	U	0.24
Test Area North				
TAN 2271	4/7/2020	318		75
TAN 2272B	4/7/2020	310		73
TAN-28	4/7/2020	166		39
TAN-29	4/7/2020	16.1		3.9
TAN-42	4/7/2020	0.02	U	0.25
TAN-44	4/7/2020	0.07	U	0.24
Central Facilities Area				
Radioactive Waste Management Complex				
USGS-087	4/8/2020	0.19	U	0.24
Perched Water *Advanced Test Reactor Complex:*				

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 15. Technetium-99 concentrations (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Technetium-99		
		Concentration		2 SD
Aquifer Samples				
Upgradient				
P&W-2	4/6/2020	0.9	U	2.5
USGS-019	4/6/2020	0.5	U	2.6
USGS-027	4/6/2020	2.2	U	2.9
Facility				
Idaho Nuclear Technology and Engineering Center				
ICPP-2020	4/13/2020	211		36
ICPP-MON-A-230	4/13/2020	1260		200
USGS-047	4/13/2020	3.1	U	3
USGS-048	4/21/2020	0.3	U	2.4
USGS-052	4/13/2020	316		53
USGS-067	4/21/2020	105		19
USGS-085	4/20/2020	-0.9	U	2.3
Central Facilities Area				
Radioactive Waste Management Complex				
A11A31	5/5/2020	0.4	U	2.4
M15S	5/4/2020	5.1		3.2
M1S	5/4/2020	2.4	U	2.7
M3S	5/4/2020	0.4	U	2.4
M6S	5/5/2020	-0.7	U	2.6
USGS-087	4/8/2020	-0.6	U	2.3

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 16. Uranium isotope concentrations (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Uranium-234			Uranium-235			Uranium-238		
		Concentration		2 SD	Concentration		2 SD	Concentration		2 SD
Aquifer Samples										
Facility										
Idaho Nuclear Technology and Engineering Center										
ICPP-2020	4/13/2020	1.71		0.34	0.069		0.045	0.59		0.15
ICPP-MON-A-230	4/13/2020	1.80		0.35	0.033	J#	0.030	0.91		0.20
USGS-047	4/13/2020	1.24		0.26	0.047	J#	0.041	0.54		0.15
USGS-048	4/21/2020	1.36		0.28	0.051	J#	0.041	0.67		0.17
USGS-052	4/13/2020	1.39		0.28	0.079		0.047	0.65		0.16
USGS-067	4/21/2020	1.26		0.27	0.068	J#	0.051	0.70		0.18
Advanced Test Reactor Complex										
USGS-065	4/8/2020	1.77		0.35	0.081		0.051	0.88		0.20
Test Area North										
TAN 2271	4/7/2020	0.123		0.057	0.005	U	0.026	0.024	U	0.025
TAN 2272B	4/7/2020	1.25		0.30	0.020	U	0.044	0.29		0.12
TAN-28	4/7/2020	0.74		0.20	0.040	U*	0.041	0.137		0.072
TAN-28 re-analysis	4/7/2020	0.82		0.21	0.026	U	0.036	0.107		0.068
TAN-29	4/7/2020	5.21		0.89	0.185		0.079	1.04		0.23
TAN-42	4/7/2020	1.75		0.34	0.039	J#	0.038	0.73		0.17
TAN-44	4/7/2020	1.93		0.42	0.105	J#	0.072	0.94		0.25
Radioactive Waste Management Complex										
A11A31	5/5/2020	1.82		0.41	0.024	U	0.046	0.67		0.20
M15S	5/4/2020	1.00		0.26	0.050	U*	0.051	0.43		0.15
M1S	5/4/2020	0.74		0.21	0.022	U	0.041	0.45		0.15
M3S	5/4/2020	1.49		0.34	0.048	U	0.053	0.63		0.19
M6S	5/5/2020	1.15		0.29	0.020	U	0.046	0.52		0.17

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
*Result is >MDC but <2SD, and is therefore considered a non-detection.
#Result is >MDC and >2SD but <3SD, and is therefore considered questionable and J-flagged as an estimate.

Table 17. Plutonium isotope concentrations (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240		
		Concentration		2 SD	Concentration		2 SD
Aquifer Samples							
Facility							
Idaho Nuclear Technology and Engineering Center							
ICPP-2020	4/13/2020	-0.009	U	0.028	-0.008	U	0.028
ICPP-MON-A-230	4/13/2020	0.006	U	0.025	0.002	U	0.025
USGS-047	4/13/2020	-0.013	U	0.025	0	U	0.025
USGS-048	4/21/2020	0.006	U	0.026	0.008	U	0.026
USGS-052	4/13/2020	0.009	U	0.025	0.007	U	0.025
USGS-067	4/21/2020	0	U	0.054	0	U	0.054
Advanced Test Reactor Complex							
USGS-065	4/8/2020	0.006	U	0.024	0	U	0.024
Radioactive Waste Management Complex							
A11A31	5/5/2020	-0.004	U	0.024	0.007	U	0.024
USGS-087	4/8/2020	-0.008	U	0.024	0.006	U	0.027
M15S	5/4/2020	-0.004	U	0.024	0	U	0.023
M1S	5/4/2020	0.020	U*	0.029	-0.003	U	0.029
M3S	5/4/2020	0.005	U	0.023	0.005	U	0.023
M6S	5/5/2020	0	U	0.028	0.006	U	0.028

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
* Result is >MDC but <2SD, and is therefore considered a non-detection.

Table 18. Americium-241 concentration (pCi/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Americium-241		
		Concentration		2 SD
Aquifer Samples				
Facility				
Advanced Test Reactor Complex				
USGS-065	4/8/2020	0.003	U	0.033
Radioactive Waste Management Complex				
A11A31	5/5/2020	-0.022	U	0.027
USGS-087	4/8/2020	-0.028	U	0.027
M15S	5/4/2020	-0.026	U	0.025
M1S	5/4/2020	-0.016	U	0.04
M3S	5/4/2020	0.011	U	0.038
M6S	5/5/2020	-0.019	U	0.027

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 19. Common ion concentrations (mg/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Calcium*		Magnesium*		Sodium*		Potassium*		Fluoride		Chloride		Sulfate		Alkalinity†	
Aquifer Samples																	
Upgradient																	
P&W-2	4/6/2020	40		15		8.1		1.7		-	-	8.83		29.9		144	
USGS-018	4/6/2020	34		16		12		2.9		-	-	12.1		26.8		138	
USGS-019	4/6/2020	44		16		9.7		1.3		-	-	11.9		22.9		163	
USGS-027	4/6/2020	51		18		27		5.7		-	-	45.1		39.4		163	
Facility																	
Idaho Nuclear Technology and Engineering Center																	
ICPP-2020	4/13/2020	61		17		18		3		-	-	58.3		32.4		142	
ICPP-MON-A-230	4/13/2020	58		18		20		3.7		-	-	58.4		33.1		138	
USGS-047	4/13/2020	47		13		8.4		1.9		-	-	12.4		21.9		154	
USGS-048	4/21/2020	47		13		10		2.2		-	-	15.8		22.4		150	
USGS-052	4/13/2020	48		14		10		2.5		-	-	19.4		23.8		149	
USGS-067	4/21/2020	53		14		20		3.2		-	-	40.4		27		142	
USGS-085	4/20/2020	54		14		9.1		2.2		-	-	12.3		41.2		157	
Advanced Test Reactor Complex																	
USGS-065	4/8/2020	82		18		14		3.3		-	-	19.1		142		134	
Test Area North																	
ANP-8	6/1/2020	47		16		7.4		3.3		-	-	15.2		30.4		146	
TAN 2271	4/7/2020	69		56		120		8.4		<0.2	U	112		35.5		526	
TAN 2272B	4/7/2020	77		110		290		7.7		0.401		120		5.4		1150	
TAN-28	4/7/2020	140		41		99		6.7		<0.2	U	103		<0.8	U	428	
TAN-29	4/7/2020	65		19		49		4.8		<0.2	U	76.1		36.9		216	
TAN-42	4/7/2020	62		16		20		3		<0.2	U	50.4		33.9		162	
TAN-44	4/7/2020	65		17		23		3.2		<0.2	U	64.7		34.8		162	
TAN-51	6/8/2020	52		15		7.3		3		-	-	32		29		136	
TAN-56	6/8/2020	35		15		13		3.4		0.398		10.6		27.8		140	
Central Facilities Area																	
Naval Reactors Facility																	
NRF-06	4/13/2020	130		35		130		5.3		-	-	368		76.6		177	
NRF-09	4/13/2020	74		22		20		2.5		-	-	52.2		41		205	
NRF-11	4/13/2020	70		21		18		2.4		-	-	42		37.3		205	
NRF-12	4/13/2020	68		21		16		2.4		-	-	35		34.8		205	
Radioactive Waste Management Complex																	
A11A31	5/5/2020	38		17		26		3.8		-	-	29.1		50.3		140	
M15S	5/4/2020	43		20		16		3.7		-	-	67.4		41.6		96	
M1S	5/4/2020	25		11		11		2.3		-	-	13.1		21.3		98	
M3S	5/4/2020	43		14		8.1		2.5		-	-	15		25.5		148	
M6S	5/5/2020	35		17		13		2.9		-	-	24.8		51.7		103	

M7S	5/13/2020	42		14		8		2.6		-	-	14.3		24.5		144	
USGS-087	4/8/2020	38		14		13		3.1		-	-	23		25.7		130	
Materials and Fuels Complex																	
USGS-100	4/15/2020	37		12		16		3.1		-	-	15.7		16.9		138	
Boundary																	
Atomic City	5/13/2020	34		13		16		3.1		-	-	16.2		17		136	
Crossroads	4/15/2020	29		13		8.2		2.4		-	-	11.8		16.1		118	
Middle-2051 (1091 ft bls)	6/10/2020	37		18		7.7		2.4		-	-	11.1		22		150	
Middle-2051 (749 ft bls)	6/10/2020	44		15		8.2		2.2		-	-	10		24		157	
USGS-008	4/15/2020	46		15		6.6		1.7		-	-	7.64		22.3		161	
USGS-011	4/27/2020	41		14		7.6		2.1		-	-	9.17		22.2		144	
USGS-103	6/16/2020	40		16		9.1		2.5		-	-	14.2		22.4		144	
USGS-105 (1072 ft bls)	6/23/2020	39		15		11		2.8		-	-	13.1		25.9		144	
USGS-105 (952 ft bls)	6/23/2020	40		16		10		2.7		-	-	12.9		25.1		144	
USGS-108	6/17/2020	44		18		8		2.2		-	-	16.7		24.2		157	
USGS-124	4/27/2020	40		16		9.4		2.3		-	-	16.1		23.4		144	
USGS-131A (616 ft bls)	6/22/2020	44		15		7.3		2.4		-	-	17.7		24		142	
USGS-131A (812 ft bls)	6/22/2020	51		16		9.3		2.5		-	-	24.1		27.7		154	
USGS-132	6/15/2020	40		16		10		2.6		-	-	10.6		24.7		151	
USGS-137A	6/11/2020	39		15		11		2.6		-	-	11.6		24		144	
Distant																	
MV-59	6/9/2020	25		13		16		3.2		-	-	13.1		18.6		121	
Surface Water																	
Perched Water																	
Advanced Test Reactor Complex:																	

Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
* Sample was filtered in the field.
† As $CaCO_3$.
"-" = not analyzed.

Table 20. Dissolved metals concentrations (µg/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Arsenic		Barium		Chromium		Iron		Lead		Manganese		Selenium		Zinc	
Aquifer Samples																	
Upgradient																	
P&W 2	4/6/2020	-	-	-	-	2		-	-	-	-	-	-	-	-	-	-
USGS-018	4/6/2020	-	-	-	-	3		-	-	-	-	-	-	-	-	-	-
USGS-019	4/6/2020	-	-	-	-	1.3		-	-	-	-	-	-	-	-	-	-
USGS-027	4/6/2020	-	-	-	-	5.1		-	-	-	-	-	-	-	-	-	-
Facility																	
Idaho Nuclear Technology and Engineering Center																	
ICPP-2020	4/13/2020	-	-	-	-	6.3		-	-	-	-	-	-	-	-	-	-
ICPP-MON-A-230	4/13/2020	-	-	-	-	5.4		-	-	-	-	-	-	-	-	-	-
USGS-047	4/13/2020	-	-	-	-	6.3		-	-	-	-	-	-	-	-	-	-
USGS-048	4/21/2020	-	-	-	-	6		-	-	-	-	-	-	-	-	-	-
USGS-052	4/13/2020	-	-	-	-	5.8		-	-	-	-	-	-	-	-	-	-
USGS-067	4/21/2020	-	-	-	-	6.4		-	-	-	-	-	-	-	-	-	-
USGS-085	4/20/2020	-	-	-	-	18		-	-	-	-	-	-	-	-	-	-
Advanced Test Reactor Complex																	
USGS-065	4/8/2020	<2	U	43		75		<10	U	<1	U	<1	-	<2	U	-	-
Test Area North																	
TAN 2271	4/7/2020	<2	U	720		1.9		2600		<1	U	1200	-	-	-	-	-
TAN 2272B	4/7/2020	3.1		1000		5.6		1600		<1	U	930	-	-	-	-	-
TAN-28	4/7/2020	<2	U	410		5.3		3000		<1	U	5700	-	-	-	-	-
TAN-29	4/7/2020	<2	U	210		1.4		<10	U	<1	U	110		-	-	-	-
TAN-42	4/7/2020	2.1		160		5.4		11		<1	U	<1	U	-	-	-	-
TAN-44	4/7/2020	2		170		5		99		<1	U	1		-	-	-	-
TAN-56	6/8/2020	2.3		85		3.1		<10	U	<1	U	<1	U	<2	U	-	-
Central Facilities Area																	
Naval Reactors Facility																	
NRF-06	4/13/2020	-	-	-	-	50		-	-	-	-	-	-	-	-	-	-
NRF-09	4/13/2020	-	-	-	-	12		-	-	-	-	-	-	-	-	-	-
NRF-11	4/13/2020	-	-	-	-	14		-	-	-	-	-	-	-	-	-	-
NRF-12	4/13/2020	-	-	-	-	10		-	-	-	-	-	-	-	-	-	-
Radioactive Waste Management Complex																	
A11A31	5/5/2020	-	-	-	-	14		-	-	-	-	-	-	-	-	52	-
M15S	5/4/2020	-	-	-	-	32		-	-	-	-	-	-	-	-	-	-
M1S	5/4/2020	-	-	-	-	32		-	-	-	-	-	-	-	-	-	-
M3S	5/4/2020	-	-	-	-	11		-	-	-	-	-	-	-	-	-	-
M6S	5/5/2020	-	-	-	-	25		-	-	-	-	-	-	-	-	-	-
M7S	5/13/2020	-	-	-	-	11		-	-	-	-	-	-	-	-	-	-
USGS-087	4/8/2020	-	-	-	-	8.8		-	-	-	-	-	-	-	-	-	-
Materials and Fuels Complex																	
USGS-100	4/15/2020	-	-	-	-	2.9		-	-	-	-	-	-	-	-	-	-
Boundary																	
Atomic City	5/13/2020	-	-	-	-	2.7		-	-	-	-	-	-	-	-	-	-
Crossroads	4/15/2020	-	-	-	-	<1	U	-	-	-	-	-	-	-	-	-	-
Middle-2051 (1091 ft bls)	6/10/2020	-	-	-	-	6.7		-	-	-	-	-	-	-	-	-	-
Middle-2051 (749 ft bls)	6/10/2020	-	-	-	-	6.7		-	-	-	-	-	-	-	-	-	-
USGS-008	4/15/2020	-	-	-	-	2.6		-	-	-	-	-	-	-	-	-	-
USGS-011	4/27/2020	-	-	-	-	3.7		-	-	-	-	-	-	-	-	-	-
USGS-103	6/16/2020	-	-	-	-	6		-	-	-	-	-	-	-	-	-	-
USGS-105 (1072 ft bls)	6/23/2020	-	-	-	-	8.6		-	-	-	-	-	-	-	-	-	-
USGS-105 (952 ft bls)	6/23/2020	-	-	-	-	8		-	-	-	-	-	-	-	-	-	-
USGS-108	6/17/2020	-	-	-	-	6.3		-	-	-	-	-	-	-	-	-	-
USGS-124	4/27/2020	-	-	-	-	5.4		-	-	-	-	-	-	-	-	-	-
USGS-131A (616 ft bls)	6/22/2020	-	-	-	-	11		-	-	-	-	-	-	-	-	-	-
USGS-131A (812 ft bls)	6/22/2020	-	-	-	-	10		-	-	-	-	-	-	-	-	-	-

USGS-132	6/15/2020	-	-	-	-	7.4		-	-	-	-	-	-	-	-	-	-
USGS-137A	6/11/2020	-	-	-	-	7		-	-	-	-	-	-	-	-	-	-
Distant																	
Perched Water																	
Advanced Test Reactor Complex:																	

Samples were filtered in the field unless otherwise noted.
Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
"-" = not analyzed.

Table 21. Dissolved nutrient concentrations (mg/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	Nitrate + Nitrite*		Total Phosphorus	
Aquifer Samples					
Upgradient					
P&W 2	4/6/2020	0.48		-	-
USGS-018	4/6/2020	0.62		-	-
USGS-019	4/6/2020	0.88		-	-
USGS-027	4/6/2020	2.5		-	-
Facility					
Idaho Nuclear Technology and Engineering Center					
ICPP-2020	4/13/2020	3.8		-	-
ICPP-MON-A-230	4/13/2020	6.1		-	-
USGS-047	4/13/2020	1		-	-
USGS-048	4/21/2020	1.7		-	-
USGS-052	4/13/2020	1.9		-	-
USGS-067	4/21/2020	5.1		-	-
USGS-085	4/20/2020	0.94		-	-
Advanced Test Reactor Complex					
USGS-065	4/8/2020	1.4		-	-
Test Area North					
TAN 2271	4/7/2020	<0.01	U	0.89	
TAN 2272B	4/7/2020	<0.01	U	0.4	
TAN-28	4/7/2020	<0.01	U	0.16	
TAN-29	4/7/2020	2.2		0.042	
TAN-42	4/7/2020	1.6		0.035	
TAN-44	4/7/2020	2		0.032	
TAN-51	6/8/2020	1.2		-	-
TAN-56	6/8/2020	0.75		0.019	
Central Facilities Area					
Naval Reactors Facility					
NRF-06	4/13/2020	2.1		-	-
NRF-09	4/13/2020	3		-	-
NRF-11	4/13/2020	2.2		-	-
NRF-12	4/13/2020	2.2		-	-
Radioactive Waste Management Complex					
A11A31	5/5/2020	1		-	-
M15S	5/4/2020	1.3		-	-
M1S	5/4/2020	1		-	-
M3S	5/4/2020	0.84		-	-
M6S	5/5/2020	1.6		-	-
M7S	5/13/2020	0.78		-	-
USGS-087	4/8/2020	0.72		-	-
Materials and Fuels Complex					
USGS-100	4/15/2020	2.2		-	-
Boundary					
Atomic City	5/13/2020	1.6		-	-
Crossroads	4/15/2020	0.26		-	-
Middle-2051 (1091 ft bls)	6/10/2020	0.9		-	-

Middle-2051 (749 ft bls)	6/10/2020	0.81		-	-
USGS-008	4/15/2020	0.99		-	-
USGS-011	4/27/2020	0.73		-	-
USGS-103	6/16/2020	0.78		-	-
USGS-105 (1072 ft bls)	6/23/2020	0.75		-	-
USGS-105 (952 ft bls)	6/23/2020	0.79		-	-
USGS-108	6/17/2020	1		-	-
USGS-124	4/27/2020	0.85		-	-
USGS-131A (616 ft bls)	6/22/2020	0.96		-	-
USGS-131A (812 ft bls)	6/22/2020	1.3		-	-
USGS-132	6/15/2020	0.74		-	-
USGS-137A	6/11/2020	0.71		-	-
Distant					
MV-59	6/9/2020	0.79		-	-
Surface Water					
Perched Water *Advanced Test Reactor Complex:*					

Samples were filtered in the field unless otherwise noted.
Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
* As N.
"-" = not analyzed.

Table 22. Volatile organic compound concentrations (µg/L) for water samples, second quarter, 2020.

Sample Location	Sample Date	PCE		TCE		Vinyl Chloride		Carbon tetrachloride		Methylene Chloride		Chloro-methane	
A11A31	05/5/2020	<0.5	U	2.56		<0.5	U	4.98		<0.5	U	<0.5	U
M15S	05/4/2020	<0.5	U	3.37		<0.5	U	5.83		<0.5	U	<0.5	U
M1S	05/4/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U
M3S	05/4/2020	<0.5	U	1.26		<0.5	U	3.09		<0.5	U	<0.5	U
M6S	05/5/2020	<0.5	U	0.68		<0.5	U	2.28		<0.5	U	<0.5	U
M7S	05/13/2020	<0.5	U	2.02		<0.5	U	4.24		<0.5	U	<0.5	U
ANP-8	06/1/2020	2.18		15.5		<0.5	U	<0.5	U	<0.5	U	<0.5	U
TAN 2271	04/7/2020	<0.5	U	2.42		0.94		<0.5	U	<0.5	U	<0.5	U
TAN-2272B	04/7/2020	<0.5	U	1.2		<0.5	U	<0.5	U	<0.5	U	<0.5	U
TAN-28	04/7/2020	<0.5	U	8.91		70.6		<0.5	U	<0.5	U	<0.5	U
TAN-29	04/7/2020	16.4		464		0.54		<0.5	U	<0.5	U	<0.5	U
TAN-42	04/7/2020	5.7		41.1		<0.5	U	<0.5	U	<0.5	U	<0.5	U
TAN-44	04/7/2020	2.97		29.2		<0.5	U	<0.5	U	<0.5	U	<0.5	U
TAN-51	06/8/2020	23.9		165		<0.5	U	<0.5	U	<0.5	U	<0.5	U
TAN-56	06/8/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U
USGS-087	04/8/2020	<0.5	U	1.24		<0.5	U	3.91		<0.5	U	<0.5	U

Table 22 cont. Volatile organic compound concentrations (µg/L) in water samples, second quarter, 2020.

Sample Location	Sample Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		1,1-DCA		Chloroform		Methyl Ethyl Ketone	
A11A31	05/5/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	1.22	R	<10	U
M15S	05/4/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	1.88	R	<10	U
M1S	05/4/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<10	U
M3S	05/4/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<10	U
M6S	05/5/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<10	U
M7S	05/13/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	0.92	R	<10	U
ANP-8	06/1/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<10	U
TAN 2271	04/7/2020	<0.5	U	1.74		75.6		<0.5	U	<0.5	U	<10	U
TAN-2272B	04/7/2020	<0.5	U	0.63		55.2		<0.5	U	<0.5	U	<10	U
TAN-28	04/7/2020	1.57		643		72.9		<0.5	U	<0.5	U	16.9	
TAN-29	04/7/2020	0.68		46.4		13.2		0.53		<0.5	U	<10	U
TAN-42	04/7/2020	<0.5	U	1.44		<0.5	U	<0.5	U	<0.5	U	<10	U
TAN-44	04/7/2020	<0.5	U	0.89		<0.5	U	<0.5	U	<0.5	U	<10	U
TAN-51	06/8/2020	0.66		3.83		1.16		0.61		<0.5	U	<10	U
TAN-56	06/8/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<10	U
USGS-087	04/8/2020	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<10	U

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 2020.

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 23**. ^{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 23. Gamma spectroscopy analysis data for milk samples, second quarter, 2020.

Sample Location/Dairy	Sample Date	Naturally occurring Potassium-40		Man-made Iodine-131[1]
		Concentration[3]	± 2 SD	
Monitoring Samples				
Glanbia/Gooding	04/20/2020	1384	119	<MDC
	05/13/2020	1418	121	<MDC
	06/15/2020	1426	115	<MDC
Goat/Riverside	04/13/2020	1618	127	<MDC
	05/03/2020	1751	98	<MDC
	06/01/2020	1799	138	<MDC
Verification Samples[2]				
Astle/Dietrich	04/07/2020	1476	124	<MDC
Korn/Terreton	04/07/2020	1491	86	<MDC
Reed's/Idaho Falls	05/05/2020	1505	89	<MDC
Minidoka/Rupert	05/05/2020	1508	126	<MDC
Barzee/Howe	06/01/2020	1427	121	<MDC
Astle/Dietrich	06/01/2020	1385	85	<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

Measurements of constituent concentrations in environmental media are subject to inaccuracy from errors that may be introduced during the collection, transportation, and analysis of samples, calibration of equipment, and recording and reporting of results. While it is impossible to quantify every error that may affect a result, a quality assurance (QA) program can evaluate the overall quality of a dataset and, in many cases, identify and address errors or inaccuracies. DEQ-INL OP's QA program is designed to (1) ensure sample integrity, (2) evaluate the precision and accuracy of analytical results, and (3) ensure that the environmental data are representative and complete.

This section summarizes the quality assurance assessment of the data collected by DEQ-INL OP in the second quarter of 2020. Included are the results of quality control (QC) samples (blanks, duplicates, and spikes) that DEQ-INL OP submitted to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses and to the Idaho Bureau of Laboratories-Boise (IBL) for non-radiological analyses during the quarter. The analytical results of QC samples are used to assess the precision, accuracy, and representativeness of the environmental data presented in this report. During the second quarter of 2020, DEQ-INL OP submitted 124 QC samples for various radiological and non-radiological analyses (**Table 24**).

All samples referenced in this report were collected in accordance with written procedures maintained by the DEQ-INL OP. Analytical methods and QC procedures used by the laboratories were performed in accordance with approved written procedures maintained by each lab. QC samples analyzed by the labs as part of each lab's internal QA program are not discussed in this report.

Blank Samples

Blank samples consist of matrices that contain immeasurable or acceptably low concentrations of the analyte(s) of interest. They are used to monitor for contamination introduced during sample collection, storage, shipment, and analysis. For water matrices, a blank sample consists of 18-megaohm deionized water from the DEQ-Idaho Falls Regional office and is categorized as a field blank, equipment blank, or trip blank depending on how the blank is handled. A field blank is used to monitor for contamination introduced from the environment during sample collection, an equipment blank is used to monitor for contamination introduced by contaminated equipment, and a trip blank is used to monitor for contamination introduced during transportation of samples (trip blanks are typically only used for VOCs). Most water blank samples submitted to laboratories by DEQ-INL OP are field blanks.

For all analyses except low-level tritium in water, a blank sample result is considered acceptable if it is less than or equal to the minimum detectable concentration (MDC). For low-level tritium analyses in water samples, a blank sample result is acceptable if it is less than or equal to 33 pCi/L.[3] If a blank result exceeds acceptance criteria, above-MDC results in other samples collected, transported, or analyzed together with the failed blank may be qualified as biased high (J+) or rejected (R), or may remain unqualified, depending on the relative sizes of the blank detection and other sample results.

Blank sample results submitted for gross alpha and gross beta screening in air for the second quarter of 2020 are presented in **Table 25**. Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 26**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 27**. Blank sample results for radiological analytes in

[3] The water used by DEQ-INL OP to create blank samples contains measureable concentrations of tritium produced cosmogenically and by above-ground testing of nuclear weapons during the twentieth century. The highest tritium concentration that DEQ considers acceptable in a blank is calculated as the mean tritium concentration in DEQ blanks from 2013 to 2017 plus two standard deviations.

groundwater are presented in **Table 28**. Blank sample results for metals, common ions and nutrients, and VOCs in groundwater are presented in **Tables 29, 30, and 31.**

One blank water sample gross beta result was unusually high at 3.6 ± 1.2 pCi/L (MDC = 1.2 pCi/L) and did not pass acceptance criteria. Six associated sample results have been qualified as rejected (R) because they are either less than or not significantly higher than the blank result.

All other blank sample results passed acceptance criteria in the second quarter of 2020.

Duplicate Samples

A duplicate sample is one that is collected at the same location and approximately the same time as another sample (referred to as the "original" sample). Duplicate sample results are compared to the original sample's results to evaluate reproducibility. Significant differences between the two could indicate poor analytical precision or a non-uniform sample matrix.

The difference between the results of an original and duplicate sample (referred to below as a "duplicate-sample pair") is evaluated differently for radiological and non-radiological analyses. For radiological analyses, the results of a duplicate-sample pair are considered to be in agreement if their absolute difference is less than or equal to three times the pooled error of the results:

$$|R_1 - R_2| \leq 3\sqrt{S_1^2 + S_2^2}$$

R_1 = Original sample result
R_2 = Duplicate sample result
S_1 = Analytical uncertainty (1 SD) of the original result
S_2 = Analytical uncertainty (1 SD) of the duplicate result

Radiological results are also considered to be in agreement if their relative percent difference (RPD) is no more than ±20 percent. RPD is calculated as:

$$RPD = \frac{R_1 - R_2}{(R_1 + R_2)/2} \times 100$$

For non-radiological analyses, the RPD is used to evaluate duplicate sample pairs in which both results exceed five times the MDC. An RPD of up to ±20 percent is acceptable. If one or both of the sample results is less than five times the MDC, the results are in agreement if their absolute difference is less than or equal to the MDC.

Duplicate results for radiological analyses in groundwater and surface water are presented in **Table 32**. Duplicate results for metals, common ions and nutrients, and VOCs are presented in **Tables 33, 34, and 35.**

All duplicate results passed acceptance criteria in the second quarter of 2020.

Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added. They are used to assess a laboratory's analytical accuracy. The percent recovery (%R) of each spiked-sample analysis is calculated as the ratio of the spike concentration determined by the lab to the known spike concentration. DEQ-INL OP considers the lab's result to be in control if the percent recovery is 100 ± 25%. If the percent recovery of a spiked sample is 50-74%, above-MDC results of samples analyzed in

the same batch as the spiked sample may be qualified as low-biased estimates (J-), and below-MDC results may be qualified as undetected estimates (UJ). If the percent recovery of a spiked sample is 126-150%, above-MDC results of associated samples may be qualified as high-biased estimates (J+), and below-MDC results may be qualified as undetected (U). If the percent recovery of a spiked sample is <50% or >150%, the results of all associated samples may be qualified as rejected (R), except for sample results below MDC associated with a spiked-sample analysis having a percent recovery >150%, in which case the sample result remains qualified as undetected (U).

One spiked water sample was analyzed during the second quarter of 2020. There were two unexpected VOC detections identified as methylene chloride and chloroform, which had not been added to this spiked sample. Although these results were only slightly higher than their MDCs, the three associated field sample results for chloroform were less than 3x the spiked sample result and are considered rejected (R). All other spiked results passed acceptance criteria for the second quarter of 2020. Spiked water sample results for metals, common ions and nutrients, and VOCs are presented in **Tables 36, 37, and 38.**

DEQ-INL OP also prepares additional "spike-like" quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL OP irradiates a number of electret ionization chambers (EICs) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of near 30 mR and two additional higher and lower exposures, ranging from 15 to 60 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement has a percent recovery of 100 ± 25% when compared to the known irradiated quantity. The irradiation results for second quarter 2020 are presented in **Table 39**. 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.

Laboratory QC Issues

There were no laboratory QC issues in the second quarter of 2020.

Qualification of Low Level Sample Results

Sample results >MDC are generally considered detections, with the following exceptions[4] that apply primarily to radionuclide concentrations in water samples:

1. Results >MDC but < 2SD are considered non-detections and U-flagged as undetected, where SD is the sample standard deviation.
2. Results >MDC and >2SD but <3SD are considered questionable and J-flagged as estimates.

Analytical QA/QC Assessment

Other than those discussed 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 2020, 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 2020.

Data usability is the measure of field sample results that are not rejected divided by the total number of field sample results obtained. The overall data usability of 98.9% for the second quarter of 2020 is well above the acceptable value of 90% for the DEQ-INL OP ESP and is summarized in **Table 24**. The overall data completeness (usable results divided by the total number of field sample results expected) of 91.4% is also acceptable. The lower percentage for data completeness is due primarily to several TSP samplers taken out of service for repair and upgrades during the second quarter (see **Appendix A**).

[4] Monitoring and Surveillance Committee, Consistency in Reporting Results Subcommittee Meeting Summary, 2/5/04 and 4/1/04.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to prescribed periodicity. The Craters of the Moon, Idaho Falls, and Monteview TSP samplers were out of service for repair/replacement for the last two weeks of the quarter. The Experimental Field Station and Van Buren TSP samplers were out of service for repair/replacement for nine weeks from the week of 4/15/20 to the week of 6/17/20. The Mud Lake TSP sampler was out of service and a replacement was on order, for 11 weeks from the week of 4/01/20 to the week of 6/17/20. Service reliability for air sampling equipment for the second quarter of 2020 is summarized in **Table 40.**

Conclusion

All data collected for the second quarter of 2020 have been assigned the applicable qualifiers to designate the appropriate use of the data. The overall data usability of 98.9% and data completeness of 91.4% are acceptable for the quarter, with the data meeting the requirements and data quality objectives established by DEQ-INL OP.

Table 24. Summary of the analyses performed, second quarter, 2020.

Media Sampled	Collection Device	Analyte	Sample Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected[1]	Analyzing Lab[2]
Air								
Particulate	4-inch filter	Gross alpha	108	13	0	0	0	ISU-EML
		Gross beta	108	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	33	6	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	7	0	0	0	0	ISU-EML
		Gamma emitters	7	0	0	0	0	ISU-EML
Water								
Groundwater & Surface Water	Grab or composite	Gross alpha	55	6	3	0	0	ISU-EML
		Gross beta	55	6	3	0	6	ISU-EML
		Gamma emitters	55	6	3	0	0	ISU-EML
		Tritium	55	6	3	0	0	ISU-EML
		Low-level tritium	20	3	0	0	0	ISU-EML
		Technetium-99	16	0	2	0	0	ISU Sub
		Radiochemical	63	0	8	0	0	ISU Sub
		Metals	49	5	3	1	0	IBL
		Common Ions	49	5	3	1	0	IBL
		Nutrients	47	5	3	1	0	IBL
		Volatile Organics	16	3	2	1	3	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	67	0	0	9	0	DEQ-INL OP
	HPICs/Eco Gammas	Gamma Radiation	9	NA	NA	NA	0	DEQ-INL OP
Total analyses performed			**855**	**78**	**33**	**13**	**9**	
Total QC analyses performed (blanks, duplicates, and spikes)			**124**					
Ratio (percent) of total QC analyses to total sample analyses[3]			**14.5%**					
Data usability[4], percent			**98.9%**					
Data completeness[5], percent			**91.4%**					

[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] DEQ-INL OP requires that the number of QC analyses performed be at least 10 percent of the number of sample analyses performed.

[4] Data usability is calculated as [total analyses – rejected data]/[total analyses]. DEQ-INL OP considers a data usability rate of 90 percent or higher to be acceptable.

[5]Data completeness is calculated as usable results divided by the total number of field sample results expected. DEQ-INL OP considers a data completeness rate of 90 percent or higher to be acceptable.

Table 25. Blank analysis results for gross alpha and beta in TSP air filters, second quarter, 2020.

Collection Period		Corrected volume (m^3)[1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
04/01/2020	04/08/2020	2066	0.0	0.1	0.1	0.5
04/08/2020	04/15/2020	2066	0.1	0.1	0.0	0.5
04/15/2020	04/22/2020	2066	0.0	0.1	-0.1	0.5
04/22/2020	04/29/2020	2066	0.1	0.1	0.4	0.5
04/29/2020	05/06/2020	2066	0.0	0.1	0.1	0.5
05/06/2020	05/13/2020	2066	0.0	0.1	0.1	0.5
05/13/2020	05/20/2020	2066	0.0	0.1	0.0	0.5
05/20/2020	05/27/2020	2066	0.0	0.1	0.1	0.4
05/27/2020	06/03/2020	2066	0.0	0.1	-0.2	0.5
06/03/2020	06/10/2020	2066	0.1	0.1	-0.1	0.4
06/10/2020	06/17/2020	2066	0.1	0.1	-0.1	0.4
06/17/2020	06/24/2020	2066	0.0	0.1	0.0	0.4
06/24/2020	07/01/2020	2066	-0.1	0.2	0.4	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 26. Blank analysis results for gamma spectroscopy for TSP air filters, composite samples, second quarter, 2020.

Analysis Date	Beryllium-7			Ruthenium-106/Rhodium-106			Antimony-125		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
07/12/2020	-17	28	50	-3	57	101	0	6	11

Analysis Date	Cesium-134			Cesium-137		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC
07/12/2020	0	3	5	0	3	5

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 27. Blank analysis results for tritium in water vapor from air samples, second quarter, 2020.

Sample Number	Start Date	Collection Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP202ZTR01	06/05/2020	06/05/2020	07/28/2020	0.01	0.09	0.15
OP202ZTR02	06/05/2020	06/05/2020	07/28/2020	0.02	0.09	0.15
OP202ZTR03	07/16/2020	07/17/2020	07/28/2020	0.04	0.09	0.15
OP202ZTR04	07/16/2020	07/17/2020	07/28/2020	0.05	0.09	0.15
OP202Sink	06/02/2020	07/20/2020	07/28/2020	0.02	0.09	0.15

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

Table 28. Blank analysis results (pCi/L) for radiological constituents in water, second quarter, 2020.

Sample Number	Sample Date	Blank Type	Concentration	± 2 SD	MDC	Within Blank Criteria?
Gross Alpha						
201W128	5/11/2020	Field	-0.4	0.2	0.5	Yes
201W454	6/17/2020	Field	-0.1	0.2	0.5	Yes
201W133	4/15/2020	Field	0.2	0.2	0.3	Yes
201W392	6/1/2020	Field	-0.1	0.2	0.4	Yes
201W242	4/6/2020	Field	-0.1	0.5	0.8	Yes
201W387	6/8/2020	Field	-0.7	0.6	1.2	Yes
Gross Beta						
201W128	5/11/2020	Field	0.0	0.6	1.0	Yes
201W454	6/17/2020	Field	0.2	0.6	1.0	Yes
201W133	4/15/2020	Field	0.4	0.6	1.0	Yes
201W392	6/1/2020	Field	0.6	0.6	1.0	Yes
201W242	4/6/2020	Field	0.1	0.6	1.1	Yes
201W387	6/8/2020	Field	3.6	0.8	1.2	No
Cesium-137						
201W128	5/11/2020	Field	0.9	1.8	3.0	Yes
201W454	6/17/2020	Field	0.9	1.2	2.0	Yes
201W133	4/15/2020	Field	-0.8	1.5	2.7	Yes
201W392	6/1/2020	Field	0.9	1.2	2.0	Yes
201W242	4/6/2020	Field	0.2	1.2	2.1	Yes
201W387	6/8/2020	Field	0.1	1.5	2.6	Yes
Tritium (standard method)						
201W129	5/11/2020	Field	50	90	150	Yes
201W455	6/17/2020	Field	-80	90	160	Yes
201W134	4/15/2020	Field	40	120	200	Yes
201W393	6/1/2020	Field	70	90	150	Yes
201W243	4/6/2020	Field	-30	90	150	Yes
201W388	6/8/2020	Field	0	90	160	Yes
Tritium (low-level method)						
201W129	5/11/2020	Field	15	8	13	Yes*
201W134	4/15/2020	Field	27	7	9	Yes*
201W393	6/1/2020	Field	10	8	13	Yes*

MDC = minimum detectable concentration.
* Detections in this range are typical of the DI water used by DEQ to prepare blank samples.

Table 29. Blank analysis results (µg/L) for metals in groundwater and/or surface water, second quarter, 2020.

Sample Number	Sample Date	Blank Type	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
201W457	6/17/2020	Field	-	-	<1.0	-	-	-	-	-
201W395	6/1/2020	Field	-	-	<1.0	-	-	-	-	-
201W136	4/15/2020	Field	-	-	<1.0	-	-	-	-	-
201W245	4/6/2020	Field	-	-	<1.0	-	-	-	-	-
201W390	6/8/2020	Field	-	-	<1.0	-	-	-	-	-

Table 30. Blank analysis results (mg/L) for common ions and nutrients in groundwater and/or surface water, second quarter, 2020.

Sample Number	Sample Date	Blank Type	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Alkalinity†	NO_3+NO_2*	Total Phosphorus
201W457,456	6/17/2020	Field	<0.1	<0.1	<0.1	<0.1	-	<0.4	<0.8	<1.0	<0.01	-
201W136,135	4/15/2020	Field	<0.1	<0.1	<0.1	<0.1	-	<0.4	<0.8	<1.0	<0.01	-
201W395,394	6/1/2020	Field	<0.1	<0.1	<0.1	<0.1	-	<0.4	<0.8	<1.0	<0.01	-
201W245,244	4/6/2020	Field	<0.1	<0.1	<0.1	<0.1	-	<0.4	<0.8	<1.0	<0.01	-
201W390,389	6/8/2020	Field	<0.1	<0.1	<0.1	<0.1	-	<0.4	<0.8	<1.0	<0.01	-

† As $CaCO_3$.

* As N.

Table 31. Blank analysis results (µg/L) for VOCs in water, second quarter, 2020.

Sample Number	Sample Date	Blank Type	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1-DCA	Carbon Tetrachloride	Methylene Chloride	Chloro-form	Chloro-methane	MEK
201W369	4/20/2020	Trip	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
201W403	4/16/2020	Trip	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
201W459	6/8/2020	Trip	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Abbreviations: PCE = tetrachloroethene; TCE = trichloroethene; 1,1-DCE = 1,1-dichloroethene; cis-1,2-DCE = cis-1,2-dichloroethene; trans-1,2-DCE = trans-1,2-dichloroethene; 1,1-DCA = 1,1-dichloroethane.
MEK = Methyl Ethyl Ketone.

Table 32. Duplicate sample results (pCi/L) for radiological constituents in groundwater and/or surface water, second quarter, 2020.

Analysis/Sample Location	Original Sample Number	Concentration	± 2 SD	Duplicate Sample Number	Concentration	± 2 SD	RPD	$\lvert R_1-R_2 \rvert$	$3(S_1^2+S_2^2)^{1/2}$	Within Criteria?
Gross Alpha										
M15S	201W297	0.1	1.1	201W353	1.1	1.0	-167	1.0	2.2	Yes
TAN-29	201W192	3.3	1.4	201W200	4.9	1.8	-39	1.6	3.4	Yes
USGS-067	201W112	2.4	1.0	201W270	1.9	1.1	23	0.5	2.2	Yes
Gross Beta										
M15S	201W297	4.9	1.0	201W353	5.6	1.0	-13	0.7	2.1	Yes
TAN-29	201W192	47.5	1.9	201W200	54.8	2.1	-14	7.3	4.2	Yes
USGS-067	201W112	100.3	2.5	201W270	109.7	2.6	-9	9.4	5.4	Yes
Cesium-137										
M15S	201W297	-0.4	1.1	201W353	0.9	1.2	-520	1.3	2.4	Yes
TAN-29	201W192	1.5	1.5	201W200	1.0	1.3	40	0.5	3.0	Yes
USGS-067	201W112	0.0	1.2	201W270	0.3	1.6	-200	0.3	3.0	Yes
Tritium (standard method)										
M15S	201W301	40	90	201W357	110	100	-93	70	202	Yes
TAN-29	201W194	1020	140	201W202	760	130	29	260	287	Yes
USGS-067	201W116	1810	160	201W275	1620	160	11	190	339	Yes
Sr-90										
TAN-29	201W193	16.1	3.9	201W201	17.0	4.1	-5	0.9	8.5	Yes
USGS-067	201W114	10.4	2.5	201W273	10.5	2.6	-1	0.1	5.4	Yes
Tc-99										
M15S	201W300	5.1	3.2	201W356	-0.6	2.3	253	5.7	5.9	Yes
USGS-067	201W115	105	19	201W274	114	21	-8	9	42	Yes
U-234										
M15S	201W302	1.00	0.26	201W358	1.08	0.27	-8	0.08	0.56	Yes
TAN-29	201W195	5.21	0.89	201W203	4.87	0.83	7	0.34	1.83	Yes
USGS-067	201W117	1.26	0.27	201W276	1.51	0.35	-18	0.25	0.66	Yes
U-235										
M15S	201W302	0.050	0.051	201W358	0.029	0.041	53	0.021	0.098	Yes
TAN-29	201W195	0.185	0.079	201W203	0.208	0.082	-12	0.023	0.171	Yes
USGS-067	201W117	0.068	0.051	201W276	0.031	0.043	75	0.037	0.100	Yes
U-238										
M15S	201W302	0.43	0.15	201W358	0.51	0.16	-17	0.08	0.33	Yes
TAN-29	201W195	1.04	0.23	201W203	0.96	0.21	8	0.08	0.47	Yes
USGS-067	201W117	0.70	0.18	201W276	0.68	0.20	3	0.02	0.40	Yes
Pu-238										
M15S	201W299	-0.004	0.024	201W355	-0.009	0.032	-77	0.005	0.06	Yes
USGS-067	201W113	0.000	0.054	201W272	0.005	0.041	-200	0.005	0.10	Yes

Pu-238/240										
M15S	201W299	0.000	0.023	201W355	-0.016	0.032	-200	0.016	0.06	Yes
USGS-067	201W113	0.000	0.054	201W272	0.027	0.050	-200	0.027	0.11	Yes
Am-241										
M15S	201W298	-0.026	0.025	201W354	-0.020	0.027	26	0.006	0.06	Yes

RPD = relative percent difference.

Table 33. Duplicate sample results for metals (µg/L) in groundwater, second quarter, 2020.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
M15S	201W304	5/4/2020	-	-	32	-	-	-	-	-
M15S	201W360	5/4/2020	-	-	31	-	-	-	-	-
RPD			**-**	**-**	**3.2**	**-**	**-**	**-**	**-**	**-**
TAN-29	201W197	4/7/2020	<2.0	210	1.4	<10	<1.0	110	-	-
TAN-29	201W205	4/7/2020	<2.0	210	1.2	<10	<1.0	130	-	-
RPD			**0**	**0**	**15**	**0**	**0**	**-17**	**-**	**-**
USGS-067	201W119	4/21/2020	-	-	6.4	-	-	-	-	-
USGS-067	201W278	4/21/2020	-	-	6.5	-	-	-	-	-
RPD			**-**	**-**	**-2**	**-**	**-**	**-**	**-**	**-**

RPD = relative percent difference.

Table 34. Duplicate sample results for common ions and nutrients (mg/L) in groundwater, second quarter, 2020.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity[†]	Total Nitrogen	Total Phosphorus
M15S	201W304,303	5/4/2020	43	20	16	3.7	-	67.4	41.6	96.0	1.3	-
M15S	201W360,359	5/4/2020	43	20	16	3.7	-	66.7	41.3	98.0	1.3	-
RPD			**0**	**0**	**0**	**0**	**-**	**1**	**1**	**-2**	**0**	**-**
TAN-29	201W197,196	4/7/2020	65	19	49	4.8	<0.2	76.1	36.9	216	2.2	0.042
TAN-29	201W205,204	4/7/2020	66	19	50	4.8	<0.2	76.1	36.8	216	2.4	0.043
RPD			**-2**	**0**	**-2**	**0**	**0**	**0**	**0**	**0**	**-9**	**-2**
USGS-067	201W119,118	4/21/2020	53	14	20	3.2	-	40.4	27.0	142	5.1	-
USGS-067	201W278,277	4/21/2020	53	14	20	3.2	-	38.6	27.0	140	5.1	-
RPD			**0**	**0**	**0**	**0**	**-**	**5**	**0**	**1**	**0**	**-**

RPD = relative percent difference.

[†] As $CaCO_3$.

Table 35. Duplicate sample results (µg/L) for VOCs in water, second quarter, 2020.

Location	Sample Number	Sample Date	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1-DCA	Carbon Tetrachloride	Methylene Chloride	Chloro-methane	Styrene	Chloro-form
TAN-29	201W199	4/7/2020	16.4	464	0.68	46.4	13.2	0.54	0.53	<0.5	<0.5	<0.5	<0.5	<0.5
TAN-29	201W207	4/7/2020	16.7	464	0.74	47.4	13.4	0.62	0.55	<0.5	<0.5	<0.5	<0.5	<0.5
RPD			**-2**	**0**	**-8**	**-2**	**-2**	**-14**	**-4**	**0**	**0**	**0**	**0**	**0**
M15S	201W306	5/4/2020	<0.5	3.37	<0.5	<0.5	<0.5	<0.5	<0.5	5.83	<0.5	<0.5	<0.5	1.88
M15S	201W362	5/4/2020	<0.5	3.43	<0.5	<0.5	<0.5	<0.5	<0.5	6.40	<0.5	<0.5	<0.5	1.88
RPD			**0**	**-2**	**0**	**0**	**0**	**0**	**0**	**-9**	**0**	**0**	**0**	**0**

RPD = relative percent difference.
Abbreviations: PCE = tetrachloroethene; TCE = trichloroethene; 1,1-DCE = 1,1-dichloroethene; cis-1,2-DCE = cis-1,2-dichloroethene; trans-1,2-DCE = trans-1,2-dichloroethene; 1,1-DCA = 1,1-dichloroethane.
MEK = Methyl Ethyl Ketone.

Table 36. Spiked sample results (µg/L) for metals in water, second quarter, 2020.

Sample Number	Sample Date	Barium			Chromium			Lead			Manganese			Zinc		
		Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
201W338	5/5/2020	100	100	100	84	81	96	6.53	6.60	101	8.00	8.20	103	64.6	59.0	91

Table 37. Spiked sample results (mg/L) for common ions and nutrients in water, second quarter, 2020.

Sample Number	Sample Date	Calcium			Magnesium			Sodium			Potassium			Fluoride		
		Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
201W338,337	5/5/2020	12.7	12.0	94	12.1	12.0	99	12.8	12.0	94	4.64	4.40	95	0.785	0.735	94

Table 37. (Continued). Spiked sample results (mg/L) for common ions and nutrients in water, second quarter, 2020.

Sample Number	Sample Date	Chloride			Sulfate			Total Alkalinity as $CaCO_3$			Total Nitrogen			Total Phosphorus		
		Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
201W338,337	5/5/2020	57.2	55.8	98	36.4	34.9	96	114	112	98	1.38	1.40	101	0.0288	0.0270	94

Table 38. Spiked sample results (µg/L) for VOCs in water, second quarter, 2020.

Sample Number	Sample Date	Carbon Tetrachloride			Styrene			Tetrachloroethene			Trichloroethene			Vinyl Chloride		
		Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R	Spike	Result	%R
201W340	5/5/2020	11.8	11.4	97	19.9	18.6	93	16.2	16.0	99	10.9	11.4	105	11.6	12.5	108

Table 39. Electret ionization chamber (EIC) irradiation results (categorized as spiked samples), second quarter, 2020.

Electret #	Exposure Received		Net Measured Exposure[1]		%R	Within Spec?
	(mR)	Uncertainty (±1 SD, mR)	(mR)	Uncertainty (±1 SD, mR)		
SJE214	40.0	2.0	32.7	1.3	81.8%	Y
SKR326	40.0	2.0	38.0	1.3	95.0%	Y
SJX057	40.0	2.0	36.8	1.3	92.0%	Y
				Triplicate AVG:	**89.6**	**Y**
SJE208	29.9	1.5	27.1	1.3	90.6%	Y
SJE085	29.9	1.5	26.1	1.3	87.3%	Y
SJE128	29.9	1.5	26.8	1.3	89.6%	Y
				Triplicate AVG:	**89.2%**	**Y**
SJE158	19.9	1.0	18.7	1.3	94.0%	Y
SJE138	19.9	1.0	17.4	1.2	87.4%	Y
SJE047	19.9	1.0	17.2	1.3	86.4%	Y
				Triplicate AVG:	**89.3%**	**Y**

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

Table 40. Air sampling field equipment service reliability (percent operational), second quarter, 2020.

Station Locations	Sample Type			
	TSP	Radioiodine	Atmospheric Moisture	Precipitation
Onsite Locations				
Big Lost River Rest Area	100%	100%	100%	100%
Experimental Field Station	31%	100%	100%	NC[1]
Sand Dunes Tower	92%	100%	100%	NC[1]
Van Buren Avenue	31%	100%	100%	NC[1]
Boundary Locations				
Atomic City	100%	100%	100%	100%
Howe	100%	100%	100%	100%
Monteview	85%	100%	100%	100%
Mud Lake	15%	100%	100%	100%
Distant Locations				
Craters of the Moon	85%	100%	100%	NC[1]
Idaho Falls	85%	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, 2020.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
On-Site Locations						
Big Lost River Rest Area	04/01/20	04/08/20	0.5 J[4]	0.2 J	18.9 J	1.0 J
	04/08/20	04/15/20	1.0	0.2	25.0	1.1
	04/15/20	04/22/20	0.8	0.2	29.0	1.2
	04/22/20	04/29/20	1.0	0.2	21.9	1.1
	04/29/20	05/06/20	0.8	0.2	27.4	1.2
	05/06/20	05/13/20	0.9	0.2	22.4	1.1
	05/13/20	05/20/20	0.6 J[5]	0.2 J	18.1 J	1.0 J
	05/20/20	05/27/20	0.5	0.2	14.9	0.9
	05/27/20	06/03/20	1.2	0.3	32.7	1.2
	06/03/20	06/10/20	0.8	0.2	22.2	1.1
	06/10/20	06/17/20	1.0 J[5]	0.3 J	28.5 J	1.3 J
	06/17/20	06/24/20	0.8 J[5]	0.2 J	30.1 J	1.3 J
	06/24/20	07/01/20	0.8	0.3	26.3	1.1
Experimental Field Station	04/01/20	04/08/20	0.8	0.2	25.4	1.1
	04/08/20	04/15/20	1.1 J[2]	0.2 J	18.7 J	1.0 J
	04/15/20	04/22/20	NS[1]	NS	NS	NS
	04/22/20	04/29/20	NS[1]	NS	NS	NS
	04/29/20	05/06/20	NS[1]	NS	NS	NS
	05/06/20	05/13/20	NS[1]	NS	NS	NS
	05/13/20	05/20/20	NS[1]	NS	NS	NS
	05/20/20	05/27/20	NS[1]	NS	NS	NS
	05/27/20	06/03/20	NS[1]	NS	NS	NS
	06/03/20	06/10/20	NS[1]	NS	NS	NS
	06/10/20	06/17/20	NS[1]	NS	NS	NS
	06/17/20	06/24/20	0.5	0.2	17.8	1.0
	06/24/20	07/01/20	0.9	0.3	19.9	1.0
Sand Dunes Tower	04/01/20	04/08/20	0.5	0.2	20.0	1.0
	04/08/20	04/15/20	0.9	0.2	24.0	1.1
	04/15/20	04/22/20	0.7 J[2]	0.2 J	32.2 J	1.2 J
	04/22/20	04/29/20	0.8	0.2	23.5	1.1
	04/29/20	05/06/20	1.0	0.2	29.3	1.2
	05/06/20	05/13/20	1.0	0.2	25.0	1.1
	05/13/20	05/20/20	0.8	0.2	22.2	1.1
	05/20/20	05/27/20	0.6	0.2	16.2	0.9
	05/27/20	06/03/20	1.0	0.2	36.0	1.3
	06/03/20	06/11/20[3]	1.1	0.2	24.5	1.0
	06/11/20	06/17/20[3]	0.8	0.2	25.4	1.2
	06/17/20	06/24/20	1.0	0.2	29.7	1.2
	06/24/20	07/01/20	0.8	0.3	28.6	1.2

[1]NS – No sample. Sampler was out of service for repair/replacement.
[2]The volume was mistakenly not recorded in the field; the value is J-flagged as an estimate based on the average of the start and

stop flow rate and the recorded elapsed time.
[3] Power was out upon arrival on 06/10/20. The filter was changed on 06/11/20.
[4]Flow rate was 5.0 cfm. Calibrator indicated 6.0 cfm. Values are J-flagged as estimates.
[5]Total volume indicator malfunction. Total volumes are estimated based on the average of the start and stop flow rate and the recorded elapsed time. The elapsed time (for Rest Area only) is based on the timer on the iodine sampler. Values are J-flagged as estimates.

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, 2020.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Van Buren Avenue	04/01/20	04/08/20	1.6	0.3	48.1	1.5
	04/08/20	04/15/20[1]	2.9	0.4	76.8	2.2
	04/15/20	04/22/20	NS[1]	NS	NS	NS
	04/22/20	04/29/20	NS[1]	NS	NS	NS
	04/29/20	05/06/20	NS[1]	NS	NS	NS
	05/06/20	05/13/20	NS[1]	NS	NS	NS
	05/13/20	05/20/20	NS[1]	NS	NS	NS
	05/20/20	05/27/20	NS[1]	NS	NS	NS
	05/27/20	06/03/20	NS[1]	NS	NS	NS
	06/03/20	06/10/20	NS[1]	NS	NS	NS
	06/10/20	06/17/20	NS[1]	NS	NS	NS
	06/17/20	06/24/20	0.5	0.2	20.9	1.0
	06/24/20	07/01/20	0.5	0.2	14.8	0.9
Boundary Locations						
Atomic City	04/01/20	04/08/20	0.5	0.2	19.5	1.0
	04/08/20	04/15/20	1.1	0.2	22.0	1.1
	04/15/20	04/22/20	0.8	0.2	24.1	1.1
	04/22/20	04/29/20	1.1	0.2	17.4	1.0
	04/29/20	05/06/20	1.3	0.3	25.7	1.1
	05/06/20	05/13/20	0.9	0.2	22.2	1.0
	05/13/20	05/20/20	0.7	0.2	15.6	0.9
	05/20/20	05/27/20	0.3	0.2	10.7	0.8
	05/27/20	06/03/20	1.0	0.2	27.1	1.1
	06/03/20	06/10/20	0.8	0.2	17.4	0.9
	06/10/20	06/17/20	0.7	0.2	17.4	0.9
	06/17/20	06/24/20	0.7	0.2	19.0	1.0
	06/24/20	07/01/20	0.7	0.2	21.6	1.0
Howe	04/01/20	04/08/20	0.6	0.2	19.6	1.0
	04/08/20	04/15/20	1.8	0.3	28.4	1.2
	04/15/20	04/22/20	0.9	0.2	29.9	1.2
	04/22/20	04/29/20	1.5	0.3	20.9	1.1
	04/29/20	05/06/20	1.5	0.3	30.9	1.3
	05/06/20	05/13/20	1.0	0.2	15.5	0.9
	05/13/20	05/20/20	0.6	0.2	17.5	1.0
	05/20/20	05/27/20	0.5	0.2	15.9	0.9
	05/27/20	06/03/20	1.1	0.2	27.6	1.2
	06/03/20	06/10/20	0.7	0.2	23.0	1.1
	06/10/20	06/17/20	1.2	0.3	20.3	1.0
	06/17/20	06/24/20	0.9	0.2	26.0	1.1
	06/24/20	07/01/20	0.8	0.3	26.9	1.1

[1]NS – No sample. Pump was running loud; removed from service on 04/15/20. The sampler was out of service for repairs until 06/17/20.

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, 2020.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Monteview	04/01/20	04/08/20	0.9	0.2	19.1	1.0
	04/08/20	04/15/20	1.6	0.3	26.2	1.1
	04/15/20	04/22/20	1.5	0.3	36.6	1.3
	04/22/20	04/29/20	0.9	0.2	18.1	1.0
	04/29/20	05/06/20	1.1	0.3	25.1	1.1
	05/06/20	05/13/20	1.0	0.2	20.5	1.0
	05/13/20	05/20/20	0.8	0.2	14.1	0.9
	05/20/20	05/27/20	0.5	0.2	12.7	0.8
	05/27/20	06/03/20	1.0	0.2	29.2	1.2
	06/03/20	06/10/20	0.7	0.2	21.8	1.0
	06/10/20	06/17/20	0.9	0.2	21.0	1.0
	06/17/20	06/24/20	NS[1]	NS	NS	NS
	06/24/20	07/01/20	NS[1]	NS	NS	NS
Mud Lake	04/01/20	04/08/20	NS[1]	NS	NS	NS
	04/08/20	04/15/20	NS[1]	NS	NS	NS
	04/15/20	04/22/20	NS[1]	NS	NS	NS
	04/22/20	04/29/20	NS[1]	NS	NS	NS
	04/29/20	05/06/20	NS[1]	NS	NS	NS
	05/06/20	05/13/20	NS[1]	NS	NS	NS
	05/13/20	05/20/20	NS[1]	NS	NS	NS
	05/20/20	05/27/20	NS[1]	NS	NS	NS
	05/27/20	06/03/20	NS[1]	NS	NS	NS
	06/03/20	06/10/20	NS[1]	NS	NS	NS
	06/10/20	06/17/20	NS[1]	NS	NS	NS
	06/17/20	06/24/20	0.6	0.2	22.2	1.1
	06/24/20	07/01/20	0.9	0.3	24.8	1.1
Distant Locations						
Craters of the Moon	04/01/20	04/08/20	0.3	0.2	12.4	0.8
	04/08/20	04/15/20	0.6	0.2	16.1	1.0
	04/15/20	04/22/20	0.4	0.2	21.5	1.1
	04/22/20	04/29/20	0.6	0.2	14.1	0.9
	04/29/20	05/06/20	0.7	0.2	19.5	1.0
	05/06/20	05/13/20	0.7	0.2	14.2	0.9
	05/13/20	05/20/20	0.5	0.2	11.9	0.8
	05/20/20	05/27/20	0.3	0.2	10.2	0.8
	05/27/20	06/03/20	0.7	0.2	22.7	1.1
	06/03/20	06/10/20	0.8	0.2	17.6	1.0
	06/10/20	06/17/20	0.7	0.2	17.2	1.0
	06/17/20	06/24/20	NS[1]	NS	NS	NS
	06/24/20	07/01/20	NS[1]	NS	NS	NS

[1]NS – No sample. Sampler was out of service for repair/replacement.

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, 2020.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	±2 SD	Concentration	±2 SD
Fort Hall[2]	04/01/20	04/08/20	0.7	0.2	21.7	1.0
	04/08/20	04/15/20	2.0	0.3	32.4	1.3
	04/15/20	04/22/20	1.0	0.2	37.5	1.3
	04/22/20	04/29/20	1.4	0.3	25.7	1.1
	04/29/20	05/06/20	1.6	0.3	35.1	1.3
	05/06/20	05/13/20	1.8	0.3	27.0	1.2
	05/13/20	05/20/20	1.2	0.3	21.6	1.1
	05/20/20	05/27/20	0.7	0.2	18.6	1.0
	05/27/20	06/03/20	1.6	0.3	38.6	1.3
	06/03/20	06/10/20	1.3	0.3	29.5	1.2
	06/10/20	06/17/20	1.2	0.2	27.7	1.1
	06/17/20	06/24/20	0.9	0.2	26.9	1.1
	06/24/20	07/01/20	1.1	0.3	32.0	1.2
Idaho Falls	04/01/20	04/08/20	0.5	0.2	15.0	0.9
	04/08/20	04/15/20	1.1	0.2	21.7	1.1
	04/15/20	04/22/20	1.2	0.3	27.8	1.2
	04/22/20	04/29/20	1.2	0.2	19.0	1.0
	04/29/20	05/06/20	1.2	0.3	28.8	1.2
	05/06/20	05/13/20	1.3	0.3	25.0	1.1
	05/13/20	05/20/20	0.8	0.2	14.5	0.9
	05/20/20	05/27/20	0.6	0.2	15.1	0.9
	05/27/20	06/03/20	1.2	0.3	26.1	1.1
	06/03/20	06/10/20	1.0	0.2	19.4	1.0
	06/10/20	06/17/20	1.2	0.2	22.7	1.1
	06/17/20	06/24/20	NS[1]	NS	NS	NS
	06/24/20	07/01/20	NS[1]	NS	NS	NS

[1]NS – No sample. Sampler was out of service for repair/replacement.
[2] Operated by Shoshone Bannock-Tribes.

Appendix B

Table B-1. Results for all electret ionization chamber (EIC) locations, second quarter, 2020.

Sample Location	Net Corrected Exposure Rate (µR/hr)[1]	± 2 SD (µR/hr)
Arco	12.0	2.3
Craters of the Moon	11.4	1.1
Rest Area	12.6	1.9
Van Buren Avenue	11.7	1.6
Experimental Field Station	13.2	2.7
Main Gate	12.0, 13.8	-
Atomic City	12.0	1.0
Taber	13.4, 14.9	-
Blackfoot	11.7, 12.7	-
Ft. Hall	9.5, 10.7	-
Idaho Falls	9.3	3.4
Mud Lake/ Terreton	14.2	2.9
Monteview	12.6	2.6
Sand Dunes	11.1	3.6
Howe Met. Tower	15.2	2.0
MP282 -20	11.5, 13.4	-
MP280 -20	12.9	3.3
MP278 -20	11.9	1.3
MP276 -20	10.2, 12.4	-
MP274 -20	10.7	2.4
MP272 -20	15.8, 18.0	-
MP270 -20	14.2	2.6
MP268 -20	12.6	3.0
MP266 -20	11.8	2.4
MP264 -20	13.4	2.1
MP270 -20/26	13.7	1.8
MP268 -20/26	15.3	2.4
MP266 -20/26	11.3, 11.3	-
MP263 -20/26	13.7	3.2
MP261 -20/26	13.1	2.4
MP259 -20/26	11.0	1.9
MP256 -20/26	10.1, 11.0	-
MFC (EBR II)	11.6	1.5
EBR I	13.3	1.2
RWMC	11.4	0.2
CFA	12.4	1.0
CITRC (PBF)	15.2	2.2
INTEC	18.2	1.1
ATR (TRA)	14.5	2.3
NRF	12.6	2.7
TAN/SMC	11.9, 13.6	-
Mud Lake Bank of Commerce	13.7	3.2
MP43-33	12.5, 15.3	-
MP41-33	15.5	3.3
MP39-33	11.3, 13.8	-
MP37-33	12.0	1.6
MP35-33	10.5	2.5
MP33-33	13.9	1.7
MP31-33	11.5	2.2
MP29-33	10.3	2.3
MP27-33	13.1	2.6

Table B-1. continued. Results for all electret ionization chamber (EIC) locations, second quarter, 2020.

Sample Location	Net Corrected Exposure Rate (µR/hr)[1]	± 2 SD (µR/hr)
MP25-33	8.6, 11.1	-
MP23-33	9.5	2.9
MP21-33	9.4, 11.0	-
MP19-33	9.7, 10.4	-
MP14-33	11.6	2.6
MP11-33	11.9	1.6
MP06-33	11.0	2.8
MP03-33	10.6	3.0
Base of Howe	12.0	1.8
Rover	14.9, 17.0	-
Hamer	12.4	3.9
Sugar City	13.5, 14.3	-
Roberts	10.9, 12.7	-
Big Southern Butte	14.8	3.5
T4 North	12.1, 12.8	-
T4 South	12.9	1.6

[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 Ethyl Ketone (MEK)	10
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