

Department of Environmental Quality  
INL Oversight Program

**ENVIRONMENTAL SURVEILLANCE PROGRAM  
QUARTERLY DATA REPORT**

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**State of Idaho  
INL Oversight Program**

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## Table of Acronyms

|                    |   |  |      |   |                                      |
|--------------------|---|--|------|---|--------------------------------------|
| aCi/L              | - | attocuries per liter   | RWMC | - | Radioactive Waste Management Complex |
| BEA                | - | Battelle Energy Alliance, LLC  | RTC  | - | Reactor Technology Complex           |
| CERCLA             | - | Comprehensive Environmental Response, Compensation and Liability Act                                 | SD   | - | standard deviation                   |
| CFA                | - | Central Facilities Area  | SMCL | - | secondary maximum contaminant level  |
| CWI                | - | CH2M-WG Idaho, LLC   | TAN  | - | Test Area North                      |
| DEQ-INL            | - | The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program | TCE  | - | trichloroethene                      |
| DOE                | - | U.S. Department of Energy  | TDS  | - | total dissolved solids               |
| EIC                | - | electret ionization chamber  | TMI  | - | Three Mile Island                    |
| EML                | - | Environmental Monitoring Laboratory  | TSP  | - | total suspended particulate          |
| EPA                | - | Environmental Protection Agency  | TSS  | - | total suspended solids               |
| ESER               | - | Environmental Surveillance Education and Research Program (SM Stoller)                               | USGS | - | U.S. Geological Survey               |
| ESP                | - | Environmental Surveillance Program   | VOC  | - | volatile organic compound            |
| ESRPA              | - | Eastern Snake River Plain Aquifer  | WLAP | - | Wastewater Land Application Permit   |
| HPIC               | - | high-pressure ion chamber  |      |   |                                      |
| LLD                | - | lower limit of detection   |      |   |                                      |
| IBL                | - | Idaho Bureau of Laboratories   |      |   |                                      |
| INL                | - | Idaho National Laboratory  |      |   |                                      |
| INTEC              | - | Idaho Nuclear Technology and Engineering Center  |      |   |                                      |
| LSC                | - | liquid scintillation counting  |      |   |                                      |
| MFC                | - | Materials and Fuels Complex  |      |   |                                      |
| µg/L               | - | micrograms per liter   |      |   |                                      |
| mg/L               | - | milligrams per liter   |      |   |                                      |
| mrem               | - | millirem or 1/1000 <sup>th</sup> of a rem  |      |   |                                      |
| mR/hr              | - | milliRoentgen per hour   |      |   |                                      |
| µR/hr              | - | microRoentgen per hour   |      |   |                                      |
| MCL                | - | maximum contaminant level  |      |   |                                      |
| MDA                | - | minimum detectable activity  |      |   |                                      |
| MDC                | - | minimum detectable concentration   |      |   |                                      |
| NIST               | - | National Institute of Standards and Technology   |      |   |                                      |
| nCi/L              | - | nanocuries per liter   |      |   |                                      |
| NOAA               | - | National Oceanic and Atmospheric Administration  |      |   |                                      |
| NRF                | - | Naval Reactors Facility  |      |   |                                      |
| pCi/L              | - | picocuries per liter   |      |   |                                      |
| pCi/m <sup>3</sup> | - | picocuries per cubic meter   |      |   |                                      |
| PCE                | - | perchloroethene  |      |   |                                      |
| QAPP               | - | Quality Assurance Program Plan   |      |   |                                      |
| QA/QC              | - | Quality Assurance/Quality Control  |      |   |                                      |
| RCRA               | - | Resource Conservation and Recovery Act   |      |   |                                      |
| RPD                | - | relative percent difference  |      |   |                                      |

## Introduction

The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program's (DEQ-INL) Environmental Surveillance Program (ESP) is conducted at locations on the INL, on the boundaries of the INL, and at distant locations to the INL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

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

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

## Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the second quarter, 2008 (**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 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 in **Table 2**.

Composites of filters collected using TSP samplers during the course of a calendar quarter are analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma spectroscopy results for the second quarter of 2008 for TSP filters are presented in **Table 3**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

Versapor® 1200 filters have been used routinely to collect particulate matter from air using a TSP air sampling system. Due to supply problems, an alternative filter medium, Vesapor 3000, was used from 4/10/2008 through 5/15/2008. The supply of Vesapor 3000 was depleted before a shipment of Versapor® 1200 was acquired, consequently Staplex filters were used for the week 5/15/2008 through 5/22/2008. Staplex filters are designed for much higher flow rates and have different collection efficiencies and penetration depths than the Versapor® 1200 filters when operated on lower flow rate samplers. These differences may have contributed to the low activity concentrations observed with the Staplex filters for

most stations for the week 5/15/2008 through 5/22/2008. Versapor® 1200 filters were used for the remainder of the quarter.

Annual composites of filters collected using TSP samplers are also analyzed using radiochemical separation techniques. The samples are analyzed for Strontium-90, Plutonium-238, Plutonium-239/240, and Americium-241. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons. DEQ-INL's action levels of 190 for Americium-241, 1900 for Strontium-90, 210 for Plutonium-238, and 200 for Plutonium-239/240 (in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>) are 10 percent of the compliance values listed for the specific radionuclide in 40 CFR 61, Appendix E, Table 2. Field sample concentrations which exceed these amounts require further investigation. Results from the annual composites analysis are typically present in the following year's first quarter report.

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

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the 11 monitoring stations. This moisture was stripped from the hygroscopic media and analyzed to calculate the atmospheric tritium concentration. Reported values are the result of either a single sample or a weighted mean based upon the volume of air sampled when more than one atmospheric moisture sample was collected during the calendar quarter. Atmospheric tritium was measured above the minimum detectable concentration at the Experimental Field Station in all three of the samples analyzed during the second quarter of 2008. The level for one of the samples was less than 1 % of the DEQ-INL action level and the other two less than 2 % of the DEQ-INL action level. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at five monitoring locations during the second quarter of 2008. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the second quarter of 2008. Tritium and Cesium-137 analysis results are presented in **Table 5**. Reported values were either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter.

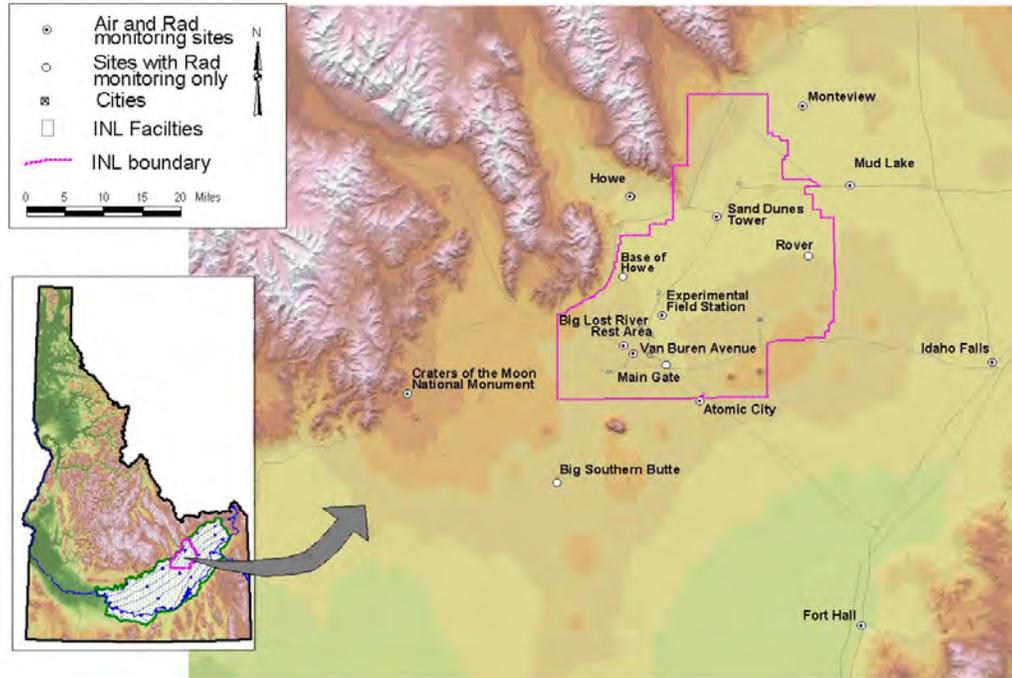


Figure 1. Air and radiation monitoring sites.

**Table 1. Sampling locations and sample type.**

| Station Locations          | Sample type <sup>1</sup> |             |             |                |
|----------------------------|--------------------------|-------------|-------------|----------------|
|                            | TSP                      | Radioiodine | Water Vapor | Precipitation  |
| <b>On-site Locations</b>   |                          |             |             |                |
| Big Lost River Rest Area   | ☐                        | ☐           | ■           | ■              |
| Experimental Field Station | ☐                        | ☐           | ■           |                |
| Sand Dunes Tower           | ☐                        | ☐           | ■           |                |
| Van Buren Avenue           | ☐                        | ☐           | ■           |                |
| <b>Boundary Locations</b>  |                          |             |             |                |
| Atomic City                | ☐                        | ☐           | ■           | ■              |
| Howe                       | ☐                        | ☐           | ■           | ■ <sup>3</sup> |
| Monteview                  | ☐                        | ☐           | ■           | ■              |
| Mud Lake                   | ☐                        | ☐           | ■           | ■              |
| <b>Distant Locations</b>   |                          |             |             |                |
| Craters of the Moon        | ☐                        | ☐           | ■           |                |
| Fort Hall <sup>2</sup>     | ☐                        | ☐           | ■           |                |
| Idaho Falls                | ☐                        | ☐           | ■           | ■              |

<sup>1</sup> ☐ Samples collected weekly; ■ Samples collected quarterly.

<sup>2</sup> TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

<sup>3</sup> No precipitation samples were collected.

**Table 2. Range of gross alpha and gross beta concentrations for TSP filters, second quarter, 2008. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.**

| Station Location           | Concentration |   |     |            |   |      |
|----------------------------|---------------|---|-----|------------|---|------|
|                            | Gross Alpha   |   |     | Gross Beta |   |      |
| <b>On-Site Locations</b>   |               |   |     |            |   |      |
| Big Lost River Rest Area   | 0.1           | - | 1.8 | 5.3        | - | 38.0 |
| Experimental Field Station | 0.2           | - | 2.5 | 3.8        | - | 34.9 |
| Sand Dunes Tower           | 0.1           | - | 1.8 | 4.9        | - | 30.2 |
| Van Buren Avenue           | 0.4           | - | 2.2 | 5.7        | - | 35.4 |
| <b>Boundary Locations</b>  |               |   |     |            |   |      |
| Atomic City                | 0.4           | - | 1.6 | 6.3        | - | 35.8 |
| Howe                       | 0.2           | - | 1.5 | 4.7        | - | 27.7 |
| Monteview                  | 0.3           | - | 3.1 | 7.6        | - | 63.4 |
| Mud Lake                   | 0.4           | - | 1.9 | 5.5        | - | 29.9 |
| <b>Distant Locations</b>   |               |   |     |            |   |      |
| Craters of the Moon        | 0.1           | - | 1.2 | 4.1        | - | 28.2 |
| Fort Hall <sup>1</sup>     | 0.5           | - | 1.7 | 5.6        | - | 23.3 |
| Idaho Falls                | 0.0           | - | 1.8 | 2.6        | - | 34.5 |

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

**Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, second quarter, 2008. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.**

| Station Location           | Naturally Occurring Radionuclide Beryllium-7 |            | Man-Made Gamma Emitting Radionuclides |
|----------------------------|--|------------|---------------------------------------|
|                            | Concentration                                | $\pm 2$ SD |                                       |
| <b>On-site Locations</b>   |  |            |                                       |
| Big Lost River Rest Area   | 106.4  | 3.8        | <MDC                                  |
| Experimental Field Station | 89.6   | 2.7        | <MDC                                  |
| Sand Dunes Tower           | 89.1   | 2.8        | <MDC                                  |
| Van Buren Avenue           | 99.9   | 3.0        | <MDC                                  |
| <b>Boundary Locations</b>  |  |            |                                       |
| Atomic City                | 100.9  | 3.1        | <MDC                                  |
| Howe                       | 79.4   | 2.9        | <MDC                                  |
| Monteview                  | 91.9   | 3.6        | <MDC                                  |
| Mud Lake                   | 90.0   | 2.6        | <MDC                                  |
| <b>Distant Locations</b>   |  |            |                                       |
| Craters of the Moon        | 84.9   | 3.0        | <MDC                                  |
| Fort Hall <sup>1</sup>     | 75.5   | 2.7        | <MDC                                  |
| Idaho Falls                | 74.6   | 2.9        | <MDC                                  |

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

**Table 4. Tritium concentrations in air from atmospheric moisture, second quarter, 2008. Concentrations are reported in pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).**

| Station Location           | Tritium       |            |      |
|----------------------------|---------------|------------|------|
|                            | Concentration | $\pm 2$ SD | MDC  |
| <b>On-site Locations</b>   |               |            |      |
| Big Lost River Rest Area   | 0.14          | 0.27       | 0.42 |
| Experimental Field Station | 0.73          | 0.22       | 0.33 |
| Sand Dunes Tower           | 0.09          | 0.14       | 0.23 |
| Van Buren Avenue           | 0.11          | 0.13       | 0.21 |
| <b>Boundary Locations</b>  |               |            |      |
| Atomic City                | 0.09          | 0.31       | 0.53 |
| Howe                       | 0.22          | 0.20       | 0.33 |
| Mud Lake                   | 0.03          | 0.36       | 0.63 |
| Monteview                  | 0.13          | 0.26       | 0.43 |
| <b>Distant Locations</b>   |               |            |      |
| Craters of the Moon        | 0.16          | 0.17       | 0.28 |
| Fort Hall <sup>1</sup>     | 0.23          | 0.24       | 0.38 |
| Idaho Falls                | 0.08          | 0.16       | 0.26 |

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

**Table 5. Tritium and cesium-137 concentrations from precipitation, second quarter 2008. Concentrations are reported in pCi/L with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).**

| Station Location          | Tritium       |            |     | Cesium-137    |            |     |
|---------------------------|---------------|------------|-----|---------------|------------|-----|
|                           | Concentration | $\pm 2$ SD | MDC | Concentration | $\pm 2$ SD | MDC |
| <b>On-site Locations</b>  |               |            |     |               |            |     |
| Big Lost River Rest Area  | 130           | 90         | 150 | 1.8           | 1.6        | 2.5 |
| <b>Boundary Locations</b> |               |            |     |               |            |     |
| Atomic City               | 60            | 90         | 150 | 0.6           | 1.5        | 2.5 |
| Monteview                 | 7.0           | 90         | 150 | 0.0           | 1.7        | 3.0 |
| Mud Lake                  | 100           | 90         | 150 | 0.2           | 1.5        | 2.5 |
| <b>Distant Locations</b>  |               |            |     |               |            |     |
| Idaho Falls               | 90            | 90         | 150 | 0.3           | 1.5        | 2.5 |

## Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the second quarter of 2008 (**Figure 1**). To detect gamma radiation, each station is instrumented with an electret ionization chamber (EIC), and 10 of the stations also have high-pressure ion chambers (HPIC) (**Table 6**).

The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall equipped with both an EIC and HPIC. The DEQ-INL reports these results.

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

EICs are a passive-integrating system that provides a cumulative measure of environmental gamma radiation exposure in the field. EICs are deployed, collected, and analyzed quarterly. EICs offer an inexpensive methodology to measure gamma radiation over a wide area, particularly in regions which do not have a power source. EICs can also provide valuable gamma radiation data in the event of an emergency. It is because of this reason that EICs are deployed at an additional 41 locations by DEQ-INL 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 to measure external gamma radiation for various radiological monitoring objectives. **Table 7** lists the average radiation exposure rates measured by the HPICs for second quarter 2008. **Table 8** lists the EIC monitoring results for second quarter 2008. Exposure rates were within the expected historical range of values observed by DEQ-INL for background radiation. The EIC's at remote located monitoring stations (Big Southern Butte, Rover, and Base of Howe) were inaccessible due to heavy snowfall at the end of the first quarter and thus were left out for two quarters (180 days). The reported values for these three EIC's are the average  $\mu$ R/hr over the whole period of time.

**Table 6. Summary of instrumentation at radiation monitoring stations.**

| Station Location                      | Instrument Type |     |
|---------------------------------------|-----------------|-----|
|                                       | HPIC            | EIC |
| <b>On-site Locations</b>              |                 |     |
| Base of Howe                          | ■               | ■   |
| Big Lost River Rest Area <sup>2</sup> |                 | ■   |
| Experimental Field Station            |                 | ■   |
| Main Gate                             | ■               | ■   |
| Rover                                 | ■               | ■   |
| Sand Dunes Tower                      | ■               | ■   |
| Van Buren Avenue                      |                 | ■   |
| <b>Boundary Locations</b>             |                 |     |
| Atomic City                           | ■               | ■   |
| Big Southern Butte                    | ■               | ■   |
| Howe                                  | ■               | ■   |
| Monteview                             | ■               | ■   |
| Mud Lake                              | ■               | ■   |
| <b>Distant Locations</b>              |                 |     |
| Craters of the Moon                   |                 | ■   |
| Fort Hall <sup>1</sup>                | ■               | ■   |
| Idaho Falls                           | ■               | ■   |

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

<sup>2</sup> HPIC Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed..

**Table 7. Average gamma exposure rates for first quarter, 2008, from HPIC network.**

| Station Location                      | Exposure Rate (µR/hr) |        |
|---------------------------------------|-----------------------|--------|
|                                       | Quarterly Average     | ± 2 SD |
| <b>On-site Locations</b>              |                       |        |
| Base of Howe                          | 12.5                  | 2.3    |
| Big Lost River Rest Area <sup>2</sup> | NA                    | NA     |
| Main Gate                             | 14.3                  | 0.7    |
| Rover                                 | 14.1                  | 0.8    |
| Sand Dunes Tower                      | 14.5                  | 2.2    |
| <b>Boundary Locations</b>             |                       |        |
| Atomic City                           | 13.1                  | 1.8    |
| Big Southern Butte                    | 13.7                  | 3.2    |
| Howe                                  | 13.2                  | 1.9    |
| Monteview                             | 12.6                  | 0.8    |
| Mud Lake                              | 12.7                  | 0.8    |
| <b>Distant Locations</b>              |                       |        |
| Fort Hall <sup>1</sup>                | 14.6                  | 1.5    |
| Idaho Falls                           | 11.3                  | 0.6    |

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

<sup>2</sup> HPIC Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed..

**Table 8. Electret ionization chamber (EIC) cumulative average exposure rates for second quarter, 2008.**

| Station Location                | Exposure Rate ( $\mu\text{R/hr}$ ) |                    |
|---------------------------------|------------------------------------|--------------------|
|                                 | Quarterly Average                  | $\pm 2 \text{ SD}$ |
| <b>On-site Locations</b>        |                                    |                    |
| Base of Howe <sup>1</sup>       | 15.6                               | 9.7                |
| Big Lost River Rest Area        | 13.7                               | 5.9                |
| Experimental Field Station      | 13.9                               | 2.9                |
| Main Gate                       | 13.2                               | 3.2                |
| Rover <sup>1</sup>              | 13.2                               | 1.8                |
| Sand Dunes Tower                | 14.8                               | 0.3                |
| Van Buren Avenue                | 16.3                               | 3.8                |
| <b>Boundary Locations</b>       |                                    |                    |
| Atomic City                     | 13.5                               | 4.9                |
| Big Southern Butte <sup>1</sup> | 10.4                               | 2.0                |
| Howe                            | 11.3                               | 0.3                |
| Monteview                       | 10.9                               | 1.4                |
| Mud Lake                        | 13.6                               | 2.8                |
| <b>Distant Locations</b>        |                                    |                    |
| Craters of the Moon             | 14.3                               | 6.3                |
| Fort Hall                       | 17.2                               | 6.2                |
| Idaho Falls                     | 9.3                                | 3.2                |

<sup>1</sup> EIC's were left out for two quarters due to heavy snowfall. The reported average is for a 180 day period.

## Water Monitoring

Water monitoring sites are sampled for the purposes of examining trends of INL contaminants and other general ground water quality indicators and for verifying DOE monitoring results. Sites sampled include ground water locations (wells and springs), surface water locations (streams), and selected wastewater sites. Sample sites have been selected to aid in identifying INL impacts on the Eastern Snake River Plain Aquifer (ESRPA), and are categorized as up-gradient, facility, boundary, distant, surface water, and waste water, (**Figure 2 and Figure 3**). Up-gradient locations are not impacted by INL operations and are considered representative of background ground water quality conditions. Facility sites are sample locations on the INL near facilities, in areas of known contamination, or wells selected to illustrate trends for specific INL contaminants or indicators of ground water quality. Boundary locations are on or near the perimeter of the INL and are down-gradient of potential sources of INL contamination. Distant locations are monitored to provide trends in water quality down-gradient of the INL and include wells and springs used for irrigation, public water supply, livestock, domestic, and industrial purposes. During the second quarter of 2008, 3 up-gradient, 23 facility locations, 8 boundary, and 16 distant locations were sampled.

Most sites sampled by DEQ-INL are sampled with another agency or organization. Samples are collected at about the same time using the same collection equipment as the other agency or organization (co-sampled). DEQ-INL verifies work by these agencies monitoring on behalf of DOE by comparing results from co-sampled sites.

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

Gross alpha radioactivity was detected at 5 facility locations and 2 boundary locations. Concentrations observed at facility locations were in areas of known contamination and consistent with historical trends. All other locations with detectable results were within the range of concentrations observed for naturally-occurring radioactivity. The EPA maximum contaminant level (MCL) for alpha particles is 15 pCi/L.

Gross beta radioactivity was detected in each of the 4 areas (up-gradient, facility, boundary, and distant) sampled. Concentrations observed at facility locations were consistent with historical trends. Gross beta radioactivity for up-gradient, boundary, and distant locations were within the range of concentrations observed for naturally-occurring radioactivity. The derived MCL for beta radioactivity is 8 pCi/L if the source of the radioactivity is strontium-90; 900 pCi/L if technetium-99; or 20,000 pCi/L if tritium. Man-made, gamma emitting cesium-137 was detected at one facility location, TAN-37. This well has had historical detectable concentrations. Results for gross alpha; gross beta; and man-made, gamma emitting radioactivity are shown in **Table 9**.

Two sites were sampled for plutonium isotopes (**Table 10**). There were no detectable results for plutonium isotopes this quarter.

Three sites were sampled for isotopes of uranium, each had detectable results for uranium-234. Two samples had detectable uranium-238 though none had detectable results for uranium-235 (**Table 11**). The ratios of results observed cannot be distinguished from background concentrations, which means the uranium found in the samples is likely to be naturally occurring. There were no detectable results for americium-241 (**Table 12**).

Five of fourteen samples analyzed for strontium-90 had detectable results this quarter (**Table 13**). All samples were from locations in areas of known contamination. All nine locations sampled for technetium-99 had detectable results this quarter (**Table 14**). All results were within the expected ranges of concentrations.

Using the standard analytical method, tritium was detected in eleven of the facility samples and one boundary sample (HWY 3) (**Table 15**). Detections were consistent with historic concentrations for these sites. There were no detectable concentrations from other areas. Selected water samples with tritium concentrations not measurable using the standard method (typically a MDC of 130 pCi/L) were analyzed using an electrolytic enrichment method with a much lower MDC of 10 to 14 pCi/L (**Table 16**). Sixteen samples were analyzed this quarter, all of which were from 2<sup>nd</sup> quarter sampling. There is currently a backlog of sixteen samples from 2<sup>nd</sup> quarter, due to the large number of samples for the quarter. All sample results were within the expected range of concentrations due to natural sources and levels remaining after the atomic bomb testing era.

Samples were also analyzed for metals and the results shown in **Table 17**. All metals results were within their expected ranges. Common ion results are shown in **Table 18** and nutrient results are shown in **Table 19**. All results were consistent with historical values at those locations.

Fifteen locations were sampled for Volatile Organic Compounds (VOCs) this quarter, seven locations had detectable concentrations. All locations are in areas of known contamination at either RWMC or TAN. VOCs with detectable concentrations are shown in **Table 20** and a complete list of analyses is shown in

Appendix C. The background concentrations for VOCs should be zero. The results discussed in this section only refer to detectable concentrations.

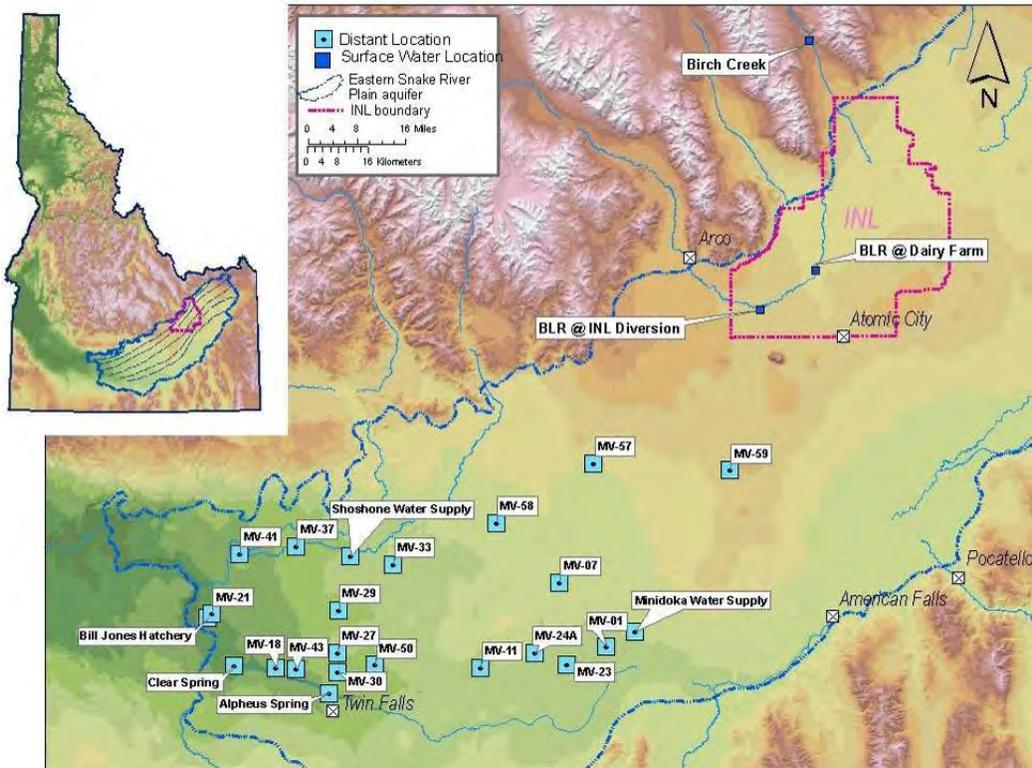


Figure 2. Distant sampling locations for second quarter, 2008.

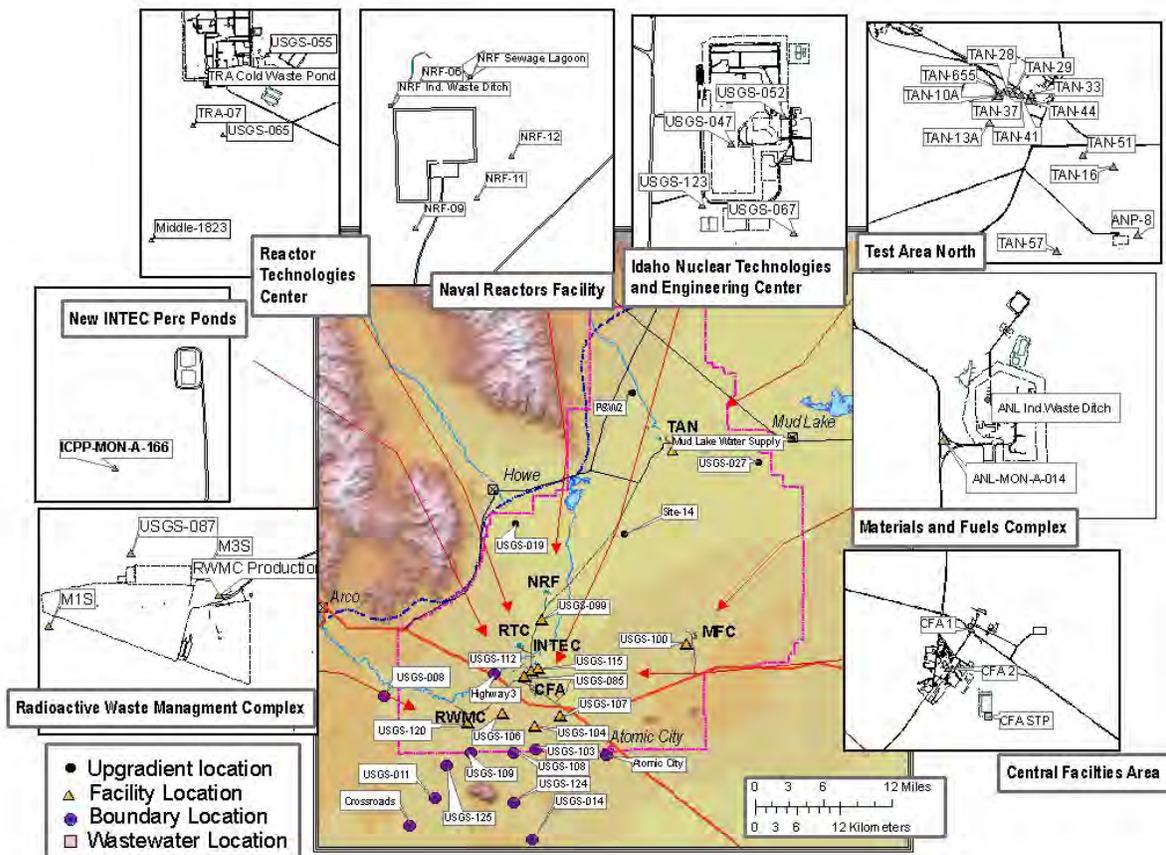


Figure 3. Up-gradient, facility, boundary and wastewater monitoring locations.

**Table 9. Alpha, beta, and gamma concentrations for water samples, second quarter, 2008.**

| Sample Location    | Sample Date | Gross Alpha                  |   |        | Gross Beta                   |   |        | Man-made gamma-emitting radionuclide Cesium-137 |   |        |
|--------------------|-------------|------------------------------|---|--------|------------------------------|---|--------|---|---|--------|
|                    |             | Concentration <sup>1,2</sup> |   | ± 2 SD | Concentration <sup>1,2</sup> |   | ± 2 SD | Concentration <sup>1,2</sup>                    |   | ± 2 SD |
| <u>Up-gradient</u> |             |                              |   |        |                              |   |        |   |   |        |
| P&W-2              | 4/23/2008   | 2.5                          | U | 2.2    | 3.1                          |   | 1.1    | -0.8  | U | 2.2    |
| USGS-019           | 4/23/2008   | 2.0                          | U | 2.2    | 2.3                          |   | 1.1    | -0.5  | U | 1.5    |
| USGS-027           | 4/24/2008   | 4.8                          |   | 2.8    | 8.8                          |   | 1.3    | 0.4   | U | 1.5    |
| <u>Facility</u>    |             |                              |   |        |                              |   |        |   |   |        |
| ANP-8              | 4/28/2008   | 0.0                          | U | 2.5    | 4.4                          |   | 1.2    | -0.5  | U | 1.5    |
| CFA 1              | 4/24/2008   | -2.2                         | U | 3.2    | 5.4                          |   | 1.4    | -0.2  | U | 2.0    |
| ICPP-MON-A-166     | 4/15/2008   | 2.1                          | U | 2.0    | 3.0                          |   | 1.1    | 0.9   | U | 1.6    |
| M1S                | 5/6/2008    | -1.0                         | U | 2.1    | 3.2                          |   | 1.1    | 0.8   | U | 1.6    |
| M3S                | 5/6/2008    | 3.9                          | U | 2.8    | 3.2                          |   | 1.2    | -1.4  | U | 1.8    |
| NRF-06             | 5/14/2008   | -1.5                         | U | 9.2    | 5.9                          |   | 3.4    | 0.0   | U | 1.4    |
| NRF-09             | 5/14/2008   | -1.8                         | U | 3.4    | 2.9                          |   | 1.3    | 0.3   | U | 1.7    |
| NRF-11             | 5/14/2008   | 1.1                          | U | 3.3    | 3.3                          |   | 1.3    | -0.5  | U | 1.4    |
| NRF-12             | 5/14/2008   | 2.7                          | U | 3.4    | 3.7                          |   | 1.3    | 0.7   | U | 1.5    |
| TAN-10A            | 4/22/2008   | 14.8                         |   | 6.6    | 240.9                        |   | 6.5    | 0.3   | U | 1.7    |
| TAN-13A            | 4/22/2008   | 0.6                          | U | 2.0    | 3.0                          |   | 1.1    | 1.0   | U | 1.4    |
| TAN-16             | 4/28/2008   | 3.2                          | U | 2.8    | 5.0                          |   | 1.3    | -0.3  | U | 1.3    |
| TAN-28             | 4/14/2008   | 17.8                         |   | 7.5    | 522.4                        |   | 9.3    | -0.2  | U | 1.4    |
| TAN-29             | 4/14/2008   | 2.9                          | U | 5.2    | 49.0                         |   | 3.7    | 0.1   | U | 1.4    |
| TAN-37             | 4/14/2008   | 29.4                         |   | 9.7    | 1711.3                       |   | 17.0   | 6.9   |   | 2.4    |
| TAN-51             | 4/28/2008   | 0.5                          | U | 2.4    | 4.2                          |   | 1.2    | 0.6   | U | 1.4    |
| USGS-065           | 4/15/2008   | 4.5                          |   | 2.8    | 3.6                          |   | 1.2    | 0.3   | U | 1.4    |
| USGS-085           | 4/9/2008    | 4.3                          |   | 2.7    | 9.5                          |   | 1.3    | -0.4  | U | 1.4    |
| USGS-087           | 4/10/2008   | 1.1                          | U | 2.1    | 2.4                          |   | 1.1    | 0.2   | U | 1.5    |
| USGS-099           | 5/15/2008   | 0.1                          | U | 3.0    | 2.5                          |   | 1.2    | 0.6   | U | 1.5    |
| USGS-100           | 4/23/2008   | 2.4                          | U | 2.4    | 3.6                          |   | 1.2    | 1.3   | U | 1.5    |
| USGS-106           | 6/9/2008    | -1.2                         | U | 2.5    | 1.6                          | U | 1.1    | 1.2   | U | 1.6    |
| USGS-107           | 6/9/2008    | 1.5                          | U | 2.7    | 3.1                          |   | 1.2    | 0.4   | U | 1.4    |
| <u>Boundary</u>    |             |                              |   |        |                              |   |        |   |   |        |
| Atomic City        | 4/29/2008   | 2.9                          | U | 2.5    | 3.5                          |   | 1.2    | 0.3   | U | 1.3    |
| Crossroads         | 4/30/2008   | 0.2                          | U | 2.4    | 1.7                          | U | 1.2    | -1.8  | U | 1.7    |
| Highway 3          | 4/30/2008   | 3.1                          | U | 2.4    | 3.3                          |   | 1.2    | 0.0   | U | 1.5    |
| USGS-008           | 4/28/2008   | 4.2                          |   | 2.4    | 2.8                          |   | 1.1    | 0.4   | U | 1.4    |
| USGS-011           | 4/29/2008   | 2.0                          | U | 2.1    | 2.5                          |   | 1.1    | -1.1  | U | 1.6    |
| USGS-108           | 4/29/2008   | 4.5                          |   | 2.8    | 3.4                          |   | 1.2    | -1.0  | U | 1.5    |
| USGS-109           | 6/9/2008    | -1.5                         | U | 2.8    | 2.7                          |   | 1.2    | 0.7   | U | 2.2    |
| USGS-124           | 4/29/2008   | 0.0                          | U | 2.5    | 1.4                          | U | 1.2    | -0.7  | U | 1.6    |

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

**Table 9 continued. Alpha, beta, and gamma concentrations for water samples, second quarter, 2008.**

| Sample Location | Sample Date | Gross Alpha                  |   |        | Gross Beta                   |       |        | Man-made gamma-emitting radionuclide Cesium-137 |     |        |
|-----------------|-------------|------------------------------|---|--------|------------------------------|-------|--------|---|-----|--------|
|                 |             | Concentration <sup>1,2</sup> |   | ± 2 SD | Concentration <sup>1,2</sup> |       | ± 2 SD | Concentration <sup>1,2</sup>                    |     | ± 2 SD |
| <u>Distant</u>  |             |                              |   |        |                              |       |        |   |     |        |
| Alpheus Spring  | 5/20/2008   | 1.8                          | U | 3.0    | 7.6                          | 1.3   | 0.8    | U   | 1.5 |        |
| Alpheus Spring  | 6/17/2008   | -0.7                         | U | 3.1    | 7.1                          | 1.3   | 0.2    | U   | 1.3 |        |
| Bill Jones      |             |                              |   |        |                              |       |        |   |     |        |
| Hatchery        | 5/20/2008   | 1.6                          | U | 2.1    | 4.2                          | 1.1   | 1.1    | U   | 1.9 |        |
| Clear Spring    | 5/20/2008   | 1.7                          | U | 2.4    | 4.1                          | 1.2   | -2.0   | U   | 1.5 |        |
| Minidoka Water  |             |                              |   |        |                              |       |        |   |     |        |
| Supply          | 5/20/2008   | -1.6                         | U | 2.6    | 2.6                          | 1.2   | 0.1    | U   | 1.4 |        |
| MV-01           | 6/17/2008   | -1.6                         | U | 2.8    | 7.6                          | 1.3   | 0.1    | U   | 1.4 |        |
| MV-11           | 6/17/2008   | 4.1                          | U | 5.1    | 4.8                          | 2.8   | -0.3   | U   | 1.8 |        |
| MV-18           | 6/18/2008   | -0.8                         | U | 3.1    | 3.3                          | 1.3   | 0.7    | U   | 1.5 |        |
| MV-21           | 6/18/2008   | -0.4                         | U | 2.2    | 2.2                          | 1.1   | -0.1   | U   | 1.4 |        |
| MV-23           | 6/17/2008   | -1.6                         | U | 4.5    | 2.3                          | U 2.7 | -0.9   | U   | 1.4 |        |
| MV-24A          | 6/17/2008   | 0.3                          | U | 3.6    | 4.6                          | 2.8   | 0.0    | U   | 1.3 |        |
| MV-29           | 6/17/2008   | 0.4                          | U | 2.2    | 2.4                          | 1.1   | 0.0    | U   | 1.8 |        |
| MV-30           | 6/17/2008   | 0.1                          | U | 3.4    | 6.3                          | 1.4   | 0.4    | U   | 1.4 |        |
| MV-37           | 6/18/2008   | 2.6                          | U | 2.6    | 4.5                          | 1.2   | 1.3    | U   | 1.7 |        |
| MV-43           | 6/18/2008   | 1.7                          | U | 7.4    | 9.3                          | 3.1   | 0.6    | U   | 1.5 |        |
| Shoshone Water  |             |                              |   |        |                              |       |        |   |     |        |
| Supply          | 5/20/2008   | -0.5                         | U | 2.5    | 3.1                          | 1.2   | 1.0    | U   | 1.8 |        |

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

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

**Table 10. Reported concentrations of plutonium isotopes in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Plutonium-238                |   |       | Plutonium-239/240            |   |       | Plutonium-241                |   |       |
|-----------------|-------------|------------------------------|---|-------|------------------------------|---|-------|------------------------------|---|-------|
|                 |             | Concentration <sup>1,2</sup> |   | ± 2SD | Concentration <sup>1,2</sup> |   | ± 2SD | Concentration <sup>1,2</sup> |   | ± 2SD |
| <u>Facility</u> |             |                              |   |       |                              |   |       |                              |   |       |
| M1S             | 5/6/2008    | 0                            | U | 0.023 | 0.023                        | U | 0.026 | 4.0                          | U | 4.5   |
| M3S             | 5/6/2008    | 0                            | U | 0.021 | 0.020                        | U | 0.026 | -1.0                         | U | 3.9   |

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

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

**Table 11. Reported concentrations of uranium isotopes in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Uranium-234                  |       | Uranium-235                  |       |                              | Uranium-238 |         |
|-----------------|-------------|------------------------------|-------|------------------------------|-------|------------------------------|-------------|---------|
|                 |             | Concentration <sup>1,2</sup> | ± 2SD | Concentration <sup>1,2</sup> | ± 2SD | Concentration <sup>1,2</sup> | ± 2SD       |         |
| <u>Facility</u> |             |                              |       |                              |       |                              |             |         |
| M1S             | 5/6/2008    | 0.85                         | 0.26  | 0.027                        | U     | 0.058                        | 0.38        | 0.16    |
| M3S             | 5/6/2008    | 1.35                         | 0.33  | 0.027                        | U     | 0.050                        | 0.62        | 0.20    |
| TAN-37          | 4/14/2008   | 0.27                         | 0.13  | 0.026                        | U     | 0.055                        | 0.057       | U 0.060 |

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

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

**Table 12. Reported concentrations of americium-241 in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Americium-241                |   |       |
|-----------------|-------------|------------------------------|---|-------|
|                 |             | Concentration <sup>1,2</sup> |   | ± 2SD |
| <u>Facility</u> |             |                              |   |       |
| M1S             | 5/6/2008    | 0.008                        | U | 0.030 |
| M3S             | 5/6/2008    | 0.017                        | U | 0.022 |

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

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

**Table 13. Reported concentrations of strontium-90 in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Strontium-90                 |   |       |
|-----------------|-------------|------------------------------|---|-------|
|                 |             | Concentration <sup>1,2</sup> |   | ± 2SD |
| <u>Facility</u> |             |                              |   |       |
| CFA 1           | 4/24/2008   | 0.04                         | U | 0.21  |
| M1S             | 5/6/2008    | 0.27                         | U | 0.33  |
| M3S             | 5/6/2008    | 0.16                         | U | 0.28  |
| NRF-06          | 5/14/2008   | 0.04                         | U | 0.20  |
| NRF-09          | 5/14/2008   | -0.04                        | U | 0.22  |
| NRF-11          | 5/14/2008   | 0.12                         | U | 0.20  |
| NRF-12          | 5/14/2008   | -0.02                        | U | 0.24  |
| TAN-10A         | 4/22/2008   | 99                           |   | 23    |
| TAN-28          | 4/14/2008   | 254                          |   | 60    |
| TAN-29          | 4/14/2008   | 20.1                         |   | 4.8   |
| TAN-37          | 4/14/2008   | 650                          |   | 150   |
| USGS-085        | 4/9/2008    | 3.17                         |   | 0.87  |
| USGS-087        | 4/10/2008   | -0.01                        | U | 0.21  |
| USGS-099        | 5/15/2008   | 0.19                         | U | 0.24  |

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

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

**Table 14. Reported concentrations of technetium-99 in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Technetium-99                |       |
|-----------------|-------------|------------------------------|-------|
|                 |             | Concentration <sup>1,2</sup> | ± 2SD |
| <u>Facility</u> |             |                              |       |
| CFA 1           | 4/24/2008   | 9.7                          | 0.2   |
| M1S             | 5/6/2008    | 1.3                          | 0.2   |
| M3S             | 5/6/2008    | 1.7                          | 0.2   |
| USGS-085        | 4/9/2008    | 3.4                          | 0.2   |
| USGS-087        | 4/10/2008   | 2.0                          | 0.2   |
| USGS-106        | 6/9/2008    | 1.4                          | 0.2   |
| USGS-107        | 6/9/2008    | 1.7                          | 0.2   |
| <u>Boundary</u> |             |                              |       |
| Highway 3       | 4/30/2008   | 1.8                          | 0.2   |
| USGS-109        | 6/9/2008    | 1.1                          | 0.2   |

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

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

**Table 15. Tritium concentrations for water samples, second quarter, 2008.**

| Sample Location    | Sample Date | Tritium                      |        |
|--------------------|-------------|------------------------------|--------|
|                    |             | Concentration <sup>1,2</sup> | ± 2 SD |
| <u>Up-gradient</u> |             |                              |        |
| P&W-2              | 4/23/2008   | -20 U                        | 80     |
| USGS-019           | 4/23/2008   | -30 U                        | 80     |
| USGS-027           | 4/24/2008   | 30 U                         | 70     |
| <u>Facility</u>    |             |                              |        |
| ANP-8              | 4/28/2008   | 60 U                         | 90     |
| CFA 1              | 4/24/2008   | 6390                         | 190    |
| ICPP-MON-A-166     | 4/15/2008   | 50 U                         | 90     |
| M1S                | 5/6/2008    | -30 U                        | 90     |
| M3S                | 5/6/2008    | 1010                         | 110    |
| NRF-06             | 5/14/2008   | 10 U                         | 90     |
| NRF-09             | 5/14/2008   | 30 U                         | 90     |
| NRF-11             | 5/14/2008   | -50 U                        | 90     |
| NRF-12             | 5/14/2008   | 10 U                         | 90     |
| TAN-13A            | 4/22/2008   | -10 U                        | 90     |
| TAN-16             | 4/28/2008   | 210                          | 90     |
| TAN-28             | 4/14/2008   | 1820                         | 120    |
| TAN-29             | 4/14/2008   | 1610                         | 120    |
| TAN-37             | 4/14/2008   | 1490                         | 120    |
| TAN-51             | 4/28/2008   | 290                          | 90     |
| USGS-065           | 4/15/2008   | 5010                         | 170    |
| USGS-085           | 4/9/2008    | 1800                         | 130    |
| USGS-087           | 4/10/2008   | 660                          | 100    |
| USGS-099           | 5/15/2008   | -30 U                        | 90     |
| USGS-100           | 4/23/2008   | -10 U                        | 70     |
| USGS-106           | 6/9/2008    | 640                          | 110    |
| USGS-107           | 6/9/2008    | -40 U                        | 90     |
| <u>Boundary</u>    |             |                              |        |
| Atomic City        | 4/29/2008   | -20 U                        | 70     |
| Crossroads         | 4/30/2008   | 0 U                          | 80     |
| Highway 3          | 4/30/2008   | 180                          | 90     |
| USGS-008           | 4/28/2008   | 40 U                         | 80     |
| USGS-011           | 4/29/2008   | -20 U                        | 80     |
| USGS-108           | 4/29/2008   | 50 U                         | 70     |
| USGS-109           | 6/9/2008    | 0 U                          | 90     |
| USGS-124           | 4/29/2008   | 90 U                         | 80     |

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

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

**Table 15 continued. Tritium concentrations for water samples, second quarter, 2008.**

| Sample Location       | Sample Date | Tritium                      |        |
|-----------------------|-------------|------------------------------|--------|
|                       |             | Concentration <sup>1,2</sup> | ± 2 SD |
| <u>Distant</u>        |             |                              |        |
| Alpheus Spring        | 5/20/2008   | -10 U                        | 90     |
| Bill Jones Hatchery   | 5/20/2008   | -40 U                        | 90     |
| Clear Spring          | 5/20/2008   | -50 U                        | 90     |
| Minidoka Water Supply | 5/20/2008   | -40 U                        | 90     |
| MV-01                 | 6/17/2008   | -20 U                        | 90     |
| MV-11                 | 6/17/2008   | 70 U                         | 90     |
| MV-18                 | 6/18/2008   | 80 U                         | 90     |
| MV-21                 | 6/18/2008   | 20 U                         | 90     |
| MV-23                 | 6/17/2008   | -10 U                        | 90     |
| MV-24A                | 6/17/2008   | 50 U                         | 90     |
| MV-29                 | 6/17/2008   | 20 U                         | 90     |
| MV-30                 | 6/17/2008   | 10 U                         | 90     |
| MV-37                 | 6/18/2008   | 80 U                         | 90     |
| MV-43                 | 6/18/2008   | -40 U                        | 90     |
| Shoshone Water Supply | 5/20/2008   | -30 U                        | 90     |

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected<sup>2</sup> Concentrations expressed in pCi/L.**Table 16. Enriched tritium concentrations for water samples, second quarter, 2008**

| Sample Location       | Sample Date | Enriched Tritium             |        |
|-----------------------|-------------|------------------------------|--------|
|                       |             | Concentration <sup>1,2</sup> | ± 2 SD |
| <u>Up-gradient</u>    |             |                              |        |
| P&W-2                 | 4/23/2008   | 11                           | 5      |
| USGS-019              | 4/23/2008   | 4 U                          | 6      |
| USGS-027              | 4/24/2008   | 0 U                          | 6      |
| <u>Facility</u>       |             |                              |        |
| USGS-100              | 4/23/2008   | 11                           | 6      |
| <u>Boundary</u>       |             |                              |        |
| Atomic City           | 4/29/2008   | 6 U                          | 6      |
| Crossroads            | 4/30/2008   | 16                           | 6      |
| Highway 3             | 4/30/2008   | 73                           | 9      |
| USGS-008              | 4/28/2008   | 27                           | 6      |
| USGS-011              | 4/29/2008   | 15                           | 5      |
| USGS-108              | 4/29/2008   | 33                           | 7      |
| USGS-124              | 4/29/2008   | 87                           | 8      |
| <u>Distant</u>        |             |                              |        |
| Alpheus Spring        | 5/20/2008   | 21                           | 7      |
| Bill Jones Hatchery   | 5/20/2008   | 2 U                          | 6      |
| Clear Spring          | 5/20/2008   | 9 U                          | 6      |
| Minidoka Water Supply | 5/20/2008   | 3 U                          | 6      |
| Shoshone Water Supply | 5/20/2008   | 14                           | 6      |

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

**Table 17. Reported metals concentrations in water samples, second quarter, 2008.**

| Sample Location        | Sample Date | Concentration <sup>1,2</sup> |        |           |         |          |       |      |           |         |          |      |  |
|------------------------|-------------|------------------------------|--------|-----------|---------|----------|-------|------|-----------|---------|----------|------|--|
|                        |             | Arsenic                      | Barium | Beryllium | Cadmium | Chromium | Iron  | Lead | Manganese | Mercury | Selenium | Zinc |  |
| <u>Up-gradient</u>     |             |                              |        |           |         |          |       |      |           |         |          |      |  |
| P&W-2                  | 4/23/2008   | NR                           | 44     | NR        | NR      | <2 U     | NR    | <5 U | <2 U      | NR      | NR       | 57   |  |
| USGS-019               | 4/23/2008   | NR                           | 72     | NR        | NR      | <5 U     | NR    | <5 U | 4         | NR      | NR       | <5 U |  |
| USGS-027               | 4/24/2008   | NR                           | 78     | NR        | NR      | 5        | NR    | <5 U | 13        | NR      | NR       | <5 U |  |
| <u>Facility</u>        |             |                              |        |           |         |          |       |      |           |         |          |      |  |
| CFA 1                  | 4/24/2008   | NR                           | 88     | NR        | NR      | 9        | NR    | <5 U | <2 U      | NR      | NR       | <5 U |  |
| ICPP-MON-A-166 (total) | 4/15/2008   | <5 U                         | 53     | NR        | <1 U    | 6        | <10 U | <5 U | 4         | NR      | <10 U    | <5 U |  |
| M1S (total)            | 5/6/2008    | <5 U                         | 22     | <1 U      | <1 U    | 34       | 40    | <5 U | 3         | <0.5 U  | <10 U    | <5 U |  |
| M3S (total)            | 5/6/2008    | <5 U                         | 45     | <1 U      | <1 U    | 14       | 50    | <5 U | <2 U      | <0.5 U  | <10 U    | <5 U |  |
| NRF-06 (total)         | 5/14/2008   | <5 U                         | 189    | <1 U      | <1 U    | 52       | 80    | <5 U | <2 U      | <0.5 U  | <10 U    | <5 U |  |
| NRF-09 (total)         | 5/14/2008   | <5 U                         | 153    | <1 U      | <1 U    | 11       | 20    | <5 U | <2 U      | <0.5 U  | <10 U    | <5 U |  |
| NRF-11 (total)         | 5/14/2008   | <5 U                         | 158    | <1 U      | <1 U    | 14       | 40    | <5 U | <2 U      | <0.5 U  | <10 U    | <5 U |  |
| NRF-12 (total)         | 5/14/2008   | <5 U                         | 149    | <1 U      | <1 U    | 12       | 290   | <5 U | 4         | <0.5 U  | <10 U    | <5 U |  |
| TAN-10A (total)        | 4/22/2008   | <5 U                         | 310    | <1 U      | <1 U    | <5 U     | 1700  | <5 U | 1040      | <0.5 U  | <10 U    | 10   |  |
| TAN-13A (total)        | 4/22/2008   | <5 U                         | 75     | <1 U      | <1 U    | 5        | 40    | <5 U | 4         | <0.5 U  | <10 U    | 47   |  |
| USGS-065 (total)       | 4/15/2008   | <5 U                         | 50     | <1 U      | <1 U    | 93       | <10 U | <5 U | <2 U      | <0.5 U  | <10 U    | <5 U |  |
| USGS-085               | 4/9/2008    | NR                           | 86     | NR        | NR      | 22       | NR    | <5 U | <2 U      | NR      | NR       | <5 U |  |
| USGS-087               | 4/10/2008   | NR                           | 26     | NR        | NR      | 8        | NR    | <5 U | 6         | NR      | NR       | 14   |  |
| USGS-099 (total)       | 5/15/2008   | <5 U                         | 114    | <1 U      | <1 U    | 5        | 30    | <5 U | <2 U      | <0.5 U  | <10 U    | 105  |  |
| USGS-100               | 4/23/2008   | -                            | 35     | NR        | NR      | <5 U     | NR    | 14   | <2 U      | NR      | NR       | 210  |  |
| USGS-106               | 6/9/2008    | <5 U                         | 51     | NR        | <1 U    | 8        | 10    | 14   | <2 U      | NR      | <10 U    | 187  |  |
| USGS-107               | 6/9/2008    | <5 U                         | 64     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |  |

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

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

**Table 17 continued. Reported metals concentrations in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Concentration <sup>1,2</sup> |        |           |         |          |       |      |           |         |          |      |
|-----------------|-------------|------------------------------|--------|-----------|---------|----------|-------|------|-----------|---------|----------|------|
|                 |             | Arsenic                      | Barium | Beryllium | Cadmium | Chromium | Iron  | Lead | Manganese | Mercury | Selenium | Zinc |
| <u>Boundary</u> |             |                              |        |           |         |          |       |      |           |         |          |      |
| Crossroads      | 4/30/2008   | NR                           | 35     | NR        | NR      | <5 U     | NR    | <5 U | <2 U      | NR      | NR       | 109  |
| Highway 3       | 4/30/2008   | NR                           | 51     | NR        | NR      | <5 U     | NR    | <5 U | <2 U      | NR      | NR       | 78   |
| USGS-008        | 4/28/2008   | NR                           | 74     | NR        | NR      | <5 U     | NR    | <5 U | <2 U      | NR      | NR       | <5 U |
| USGS-011        | 4/29/2008   | NR                           | 50     | NR        | NR      | <5 U     | NR    | <5 U | <2 U      | NR      | NR       | <5 U |
| USGS-108        | 4/29/2008   | NR                           | 38     | NR        | NR      | 7        | NR    | <5 U | <2 U      | NR      | NR       | <5 U |
| USGS-109        | 6/9/2008    | <5 U                         | 32     | NR        | <1 U    | 6        | 20    | <5 U | 4         | NR      | <10 U    | 159  |
| USGS-124        | 4/29/2008   | NR                           | 29     | NR        | NR      | 6        | NR    | <5 U | 14        | NR      | NR       | <5 U |
| <u>Distant</u>  |             |                              |        |           |         |          |       |      |           |         |          |      |
| <u>Alpheus</u>  |             |                              |        |           |         |          |       |      |           |         |          |      |
| Spring          | 6/17/2008   | <5 U                         | 88     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |
| MV-01           | 6/17/2008   | <5 U                         | 66     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |
| MV-11           | 6/17/2008   | <5 U                         | 113    | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |
| MV-18           | 6/18/2008   | <5 U                         | 66     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |
| MV-21           | 6/18/2008   | <5 U                         | 22     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |
| MV-23           | 6/17/2008   | <5 U                         | 104    | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | 61   |
| MV-24A          | 6/17/2008   | <5 U                         | 155    | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | 275  |
| MV-29           | 6/17/2008   | <5 U                         | 21     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | <5 U |
| MV-30           | 6/17/2008   | <5 U                         | 84     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | 10   |
| MV-37           | 6/18/2008   | <5 U                         | 47     | NR        | <1 U    | <5 U     | <10 U | <5 U | <2 U      | NR      | <10 U    | 13   |
| MV-43           | 6/18/2008   | <5 U                         | 166    | NR        | <1 U    | <5 U     | 10    | <5 U | <2 U      | NR      | <10 U    | <5 U |

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

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

**Table 18. Reported common ion concentrations in water samples second quarter, 2008.**

| Sample Location    | Sample Date | Concentration <sup>1,2</sup> |           |        |           |          |          |         |        |                         |                  |                  |
|--------------------|-------------|------------------------------|-----------|--------|-----------|----------|----------|---------|--------|-------------------------|------------------|------------------|
|                    |             | Calcium                      | Magnesium | Sodium | Potassium | Fluoride | Chloride | Sulfate | Silica | Alkalinity <sup>3</sup> | TDS <sup>4</sup> | TSS <sup>5</sup> |
| <u>Up-gradient</u> |             |                              |           |        |           |          |          |         |        |                         |                  |                  |
| P&W-2*             | 4/23/2008   | 40                           | 16        | 7.4    | 1.3       | 0.192    | 8.43     | 26.8    | NR     | 142                     | NR               | NR               |
| USGS-019*          | 4/23/2008   | 43                           | 16        | 10     | 1.4       | 0.169    | 11.0     | 21.6    | NR     | 165                     | NR               | NR               |
| USGS-027*          | 4/24/2008   | 50                           | 18        | 28     | 6.0       | 0.631    | 51.9     | 40.7    | NR     | 151                     | NR               | NR               |
| <u>Facility</u>    |             |                              |           |        |           |          |          |         |        |                         |                  |                  |
| CFA 1*             | 4/24/2008   | 64                           | 18        | 22     | 3.4       | 0.169    | 87.6     | 29.1    | NR     | 130                     | NR               | NR               |
| ICPP-MON-A-166     | 4/15/2008   | 34                           | 12        | 9.5    | 2.7       | 0.27     | 8.43     | 18.2    | 28     | 130                     | 191              | 7                |
| M1S                | 5/6/2008    | 26                           | 12        | 11     | 2.6       | 0.263    | 14.0     | 21.3    | NR     | 98                      | NR               | NR               |
| M3S                | 5/6/2008    | 43                           | 14        | 8.5    | 2.6       | 0.215    | 14.1     | 25.7    | NR     | 142                     | NR               | NR               |
| NRF-06             | 5/14/2008   | 169                          | 43        | 228    | 6.7       | 0.132    | 545      | 103     | 24     | 177                     | 1400             | <2 U             |
| NRF-09             | 5/14/2008   | 76                           | 23        | 20     | 2.6       | 0.161    | 47.4     | 39.7    | 24     | 204                     | 363              | <2 U             |
| NRF-11             | 5/14/2008   | 74                           | 23        | 20     | 2.6       | 0.162    | 46.0     | 39.1    | 24     | 201                     | 363              | <2 U             |
| NRF-12             | 5/14/2008   | 72                           | 22        | 18     | 2.5       | 0.163    | 44.5     | 46.0    | 24     | 199                     | 346              | <2 U             |
| TAN-10A            | 4/22/2008   | 90                           | 25        | 52     | 4.0       | 0.199    | 121      | 38.0    | 20     | 272                     | 541              | <5 U             |
| TAN-13A            | 4/22/2008   | 38                           | 10        | 5.6    | 2.3       | 0.234    | 3.3      | 15.0    | 25     | 134                     | 178              | <5 U             |
| USGS-065           | 4/15/2008   | 79                           | 18        | 15     | 3.2       | 0.184    | 19.0     | 159     | NR     | 128                     | NR               | NR               |
| USGS-085*          | 4/9/2008    | 56                           | 14        | 12     | 2.6       | 0.199    | 15.7     | 40.0    | NR     | 163                     | NR               | NR               |
| USGS-087*          | 4/10/2008   | 36                           | 14        | 15     | 3.2       | 0.21     | 26.4     | 26.2    | NR     | 119                     | NR               | NR               |
| USGS-099           | 5/15/2008   | 65                           | 22        | 16     | 1.8       | 0.128    | 24.1     | 28.1    | 21     | 206                     | 301              | 3                |
| USGS-100*          | 4/23/2008   | 36                           | 12        | 17     | 3.3       | 0.727    | 16.9     | 17.0    | NR     | 132                     | NR               | NR               |
| USGS-106*          | 6/9/2008    | 46                           | 17        | 8.2    | 2.4       | 0.178    | 15.8     | 23.9    | NR     | 258                     | NR               | NR               |
| USGS-107*          | 6/9/2008    | 38                           | 16        | 18     | 3.5       | 0.407    | 22.6     | 27.1    | NR     | 243                     | NR               | NR               |

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

<sup>2</sup> Concentrations expressed in mg/L. Samples are not filtered unless otherwise noted.

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

<sup>4</sup> =Total Dissolved Solids,

<sup>5</sup> = Total Suspended Solids

**Table 18 continued. Reported common ion concentrations in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Concentration <sup>1,2</sup> |           |        |           |          |          |         |        |                         |                  |                  |
|-----------------|-------------|------------------------------|-----------|--------|-----------|----------|----------|---------|--------|-------------------------|------------------|------------------|
|                 |             | Calcium                      | Magnesium | Sodium | Potassium | Fluoride | Chloride | Sulfate | Silica | Alkalinity <sup>3</sup> | TDS <sup>4</sup> | TSS <sup>5</sup> |
| <u>Boundary</u> |             |                              |           |        |           |          |          |         |        |                         |                  |                  |
| Crossroads*     | 4/30/2008   | 41                           | 14        | 7.2    | 2.2       | 0.208    | 9.01     | 20.8    | NR     | 144                     | NR               | NR               |
| Highway 3*      | 4/30/2008   | 44                           | 11        | 6.0    | 2.4       | 0.216    | 6.24     | 20.9    | NR     | 147                     | NR               | NR               |
| USGS-008*       | 4/28/2008   | 44                           | 15        | 7.0    | 1.8       | 0.192    | 8.0      | 22.2    | NR     | 155                     | NR               | NR               |
| USGS-011*       | 4/29/2008   | 40                           | 14        | 8.3    | 2.3       | 0.222    | 10.4     | 22.6    | NR     | 143                     | NR               | NR               |
| USGS-108*       | 4/29/2008   | 36                           | 15        | 12     | 2.7       | 0.322    | 16.4     | 23.4    | NR     | 134                     | NR               | NR               |
| USGS-109*       | 6/9/2008    | 39                           | 15        | 12     | 2.8       | 0.233    | 14.6     | 27.2    | NR     | 242                     | NR               | NR               |
| USGS-124*       | 4/29/2008   | 38                           | 16        | 9.7    | 2.4       | 0.351    | 15.7     | 23.1    | NR     | 140                     | NR               | NR               |
| <u>Distant</u>  |             |                              |           |        |           |          |          |         |        |                         |                  |                  |
| <u>Alpheus</u>  |             |                              |           |        |           |          |          |         |        |                         |                  |                  |
| Spring*         | 6/17/2008   | 61                           | 20        | 36     | 6.6       | 0.389    | 44.2     | 58.2    | NR     | 182                     | NR               | NR               |
| MV-01*          | 6/18/2008   | 48                           | 18        | 35     | 6.6       | 0.547    | 42.5     | 47.2    | NR     | 170                     | NR               | NR               |
| MV-11*          | 6/18/2008   | 74                           | 29        | 49     | 7.0       | 0.376    | 66.6     | 79.0    | NR     | 212                     | NR               | NR               |
| MV-18*          | 6/18/2008   | 65                           | 26        | 37     | 5.5       | 0.465    | 51.8     | 65.6    | NR     | 193                     | NR               | NR               |
| MV-21*          | 6/17/2008   | 30                           | 15        | 17     | 3.5       | 0.426    | 11.1     | 24.6    | NR     | 132                     | NR               | NR               |
| MV-23*          | 6/17/2008   | 79                           | 23        | 30     | 5.9       | 0.218    | 38.4     | 66.4    | NR     | 208                     | NR               | NR               |
| MV-24A*         | 6/17/2008   | 80                           | 34        | 69     | 7.4       | 0.316    | 74.0     | 93.0    | NR     | 257                     | NR               | NR               |
| MV-29*          | 6/17/2008   | 31                           | 14        | 18     | 3.4       | 0.575    | 15.1     | 29.0    | NR     | 120                     | NR               | NR               |
| MV-30*          | 6/18/2008   | 67                           | 25        | 39     | 6.2       | 0.389    | 50.2     | 66.6    | NR     | 192                     | NR               | NR               |
| MV-37*          | 6/18/2008   | 48                           | 16        | 20     | 3.6       | 0.306    | 13.7     | 27.0    | NR     | 183                     | NR               | NR               |
| MV-43*          | 6/18/2008   | 125                          | 46        | 49     | 6.7       | 0.401    | 69.2     | 92.0    | NR     | 345                     | NR               | NR               |

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

<sup>2</sup> Concentrations expressed in mg/L. Samples are not filtered unless otherwise noted.

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

<sup>4</sup> =Total Dissolved Solids,

<sup>5</sup> = Total Suspended Solids

**Table 19. Reported nutrient concentrations in water samples, second quarter, 2008.**

| Sample Location        | Sample Date | Concentration <sup>1,2</sup> |            |         |                         |         |
|------------------------|-------------|------------------------------|------------|---------|-------------------------|---------|
|                        |             | Nitrite + Nitrate            | Phosphorus | Nitrite | Total Kjeldahl Nitrogen | Ammonia |
| <u>Up-gradient</u>     |             |                              |            |         |                         |         |
| P&W-2                  | 4/23/2008   | 0.6                          | 0.015      | NR      | NR                      | NR      |
| USGS-019               | 4/23/2008   | 0.93                         | 0.008      | NR      | NR                      | NR      |
| USGS-027               | 4/24/2008   | 2.0                          | 0.015      | NR      | NR                      | NR      |
| <u>Facility</u>        |             |                              |            |         |                         |         |
| CFA 1                  | 4/24/2008   | 2.3                          | 0.022      | NR      | NR                      | NR      |
| ICPP-MON-A-166 (total) | 4/15/2008   | 0.28                         | 0.023      | NR      | NR                      | NR      |
| M1S (total)            | 5/6/2008    | 1.0                          | 0.021      | NR      | NR                      | NR      |
| M3S (total)            | 5/6/2008    | 0.84                         | 0.021      | NR      | NR                      | NR      |
| NRF-06 (total)         | 5/14/2008   | 2.0                          | 0.094      | <0.01 U | 0.41                    | <0.01 U |
| NRF-09 (total)         | 5/14/2008   | 2.3                          | 0.032      | <0.01 U | <0.1 U                  | <0.01 U |
| NRF-11 (total)         | 5/14/2008   | 1.9                          | 0.031      | <0.01 U | <0.1 U                  | <0.01 U |
| NRF-12 (total)         | 5/14/2008   | 1.8                          | 0.029      | <0.01 U | 0.04                    | <0.01 U |
| TAN-10A (total)        | 4/22/2008   | <0.01 U                      | 0.074      | NR      | 0.29                    | 0.21    |
| TAN-13A (total)        | 4/22/2008   | 0.44                         | 0.025      | NR      | 0.19                    | 0.04    |
| USGS-065 (total)       | 4/15/2008   | 1.6                          | 0.021      | NR      | NR                      | NR      |
| USGS-085 (total)       | 4/9/2008    | 1.3                          | 0.027      | NR      | NR                      | NR      |
| USGS-087               | 4/10/2008   | 0.73                         | 0.010      | NR      | NR                      | NR      |
| USGS-099 (total)       | 5/15/2008   | 1.8                          | 0.026      | <0.01 U | 0.06                    | <0.01 U |
| USGS-100               | 4/23/2008   | 1.6                          | 0.016      | NR      | NR                      | NR      |
| USGS-106               | 6/9/2008    | 1.0                          | 0.020      | NR      | NR                      | NR      |
| USGS-107               | 6/9/2008    | 1.2                          | 0.015      | NR      | NR                      | NR      |
| <u>boundary</u>        |             |                              |            |         |                         |         |
| Crossroads             | 4/30/2008   | 0.82                         | 0.018      | NR      | NR                      | NR      |
| Highway 3              | 4/30/2008   | 0.45                         | 0.023      | NR      | NR                      | NR      |
| USGS-008               | 4/28/2008   | 0.95                         | 0.015      | NR      | NR                      | NR      |
| USGS-011               | 4/29/2008   | 0.72                         | 0.017      | NR      | NR                      | NR      |
| USGS-108               | 4/29/2008   | 0.81                         | 0.018      | NR      | NR                      | NR      |
| USGS-109               | 6/9/2008    | 0.67                         | 0.013      | NR      | NR                      | NR      |
| USGS-124               | 4/29/2008   | 0.87                         | 0.015      | NR      | NR                      | NR      |

<sup>1</sup> Data qualifiers: U = non-detection , J = estimate, R = rejected, NR = analysis not requested,

<sup>2</sup> Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

**Table 19 continued. Reported nutrient concentrations in water samples, second quarter, 2008.**

| Sample Location | Sample Date | Concentration <sup>1,2</sup> |            |         |                         |         |
|-----------------|-------------|------------------------------|------------|---------|-------------------------|---------|
|                 |             | Nitrite + Nitrate            | Phosphorus | Nitrite | Total Kjeldahl Nitrogen | Ammonia |
| <u>distant</u>  |             |                              |            |         |                         |         |
| Alpheus Spring  | 6/17/2008   | 2.0                          | 0.023      | NR      | NR                      | 0.02    |
| MV-01           | 6/17/2008   | 1.0                          | 0.020      | NR      | NR                      | <0.01 U |
| MV-11           | 6/17/2008   | 5.1                          | 0.022      | NR      | NR                      | <0.01 U |
| MV-18           | 6/18/2008   | 2.6                          | 0.039      | NR      | NR                      | <0.01 U |
| MV-21           | 6/18/2008   | 1.2                          | 0.019      | NR      | NR                      | 0.01    |
| MV-23           | 6/17/2008   | 4.4                          | 0.044      | NR      | NR                      | 0.01    |
| MV-24A          | 6/17/2008   | 6.7                          | 0.030      | NR      | NR                      | <0.01 U |
| MV-29           | 6/17/2008   | 0.57                         | 0.015      | NR      | NR                      | 0.01    |
| MV-30           | 6/17/2008   | 2.8                          | 0.033      | NR      | NR                      | <0.01 U |
| MV-37           | 6/18/2008   | 1.8                          | 0.060      | NR      | NR                      | <0.01 U |
| MV-43           | 6/18/2008   | 30                           | 0.029      | NR      | NR                      | 0.01    |

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected, NR = analysis not requested,

<sup>2</sup> Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

**Table 20. Reported VOC concentrations in water samples, second quarter, 2008.**

| Analysis <sup>1</sup>      | ANP-8                | M3S                 | TAN-16               | TAN-28               | TAN-29               | TAN-37               | TAN-51               | DL  | Units |
|----------------------------|----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----|-------|
|                            | 081W150<br>4/28/2008 | 081W230<br>5/6/2008 | 081W153<br>4/28/2008 | 081W158<br>4/14/2008 | 081W162<br>4/14/2008 | 081W167<br>4/14/2008 | 081W170<br>4/28/2008 |     |       |
| 1,1-Dichloroethene         | <DL                  | <DL                 | <DL                  | 0.8                  | 0.94                 | <DL                  | <DL                  | 0.5 | µg/L  |
| Carbon tetrachloride       | <DL                  | 4                   | <DL                  | <DL                  | <DL                  | <DL                  | <DL                  | 0.5 | µg/L  |
| cis-1,2-Dichloroethene     | <DL                  | <DL                 | 1.3                  | 57                   | 71                   | 1.4                  | 1.6                  | 0.5 | µg/L  |
| trans-1,2-Dichloroethene   | <DL                  | <DL                 | 0.51                 | 149                  | 57                   | 173                  | 0.55                 | 0.5 | µg/L  |
| Tetrachloroethylene (PERC) | 4.85                 | <DL                 | 7                    | 3.8                  | 19                   | <DL                  | 18                   | 0.5 | µg/L  |
| Trichloroethylene          | 25.8                 | 1.1                 | 49                   | 368                  | 620                  | 0.72                 | 84                   | 0.5 | µg/L  |
| Vinyl chloride             | <DL                  | <DL                 | <DL                  | 8.2                  | 1.6                  | 2.3                  | <DL                  | 0.2 | µg/L  |

<sup>1</sup> Data qualifiers: J= estimate, R= rejected. <DL = less than detection limit.

## Terrestrial Monitoring Results

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

DEQ-INL monitors long-term radiological conditions via soil sampling as well as field instrumentation capable of identifying and measuring quantities of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides some insight to transport, deposition, and accumulation of radioactive material in the environment as a result of INL operations as well as historical above ground testing of nuclear weapons. No in-situ gamma spectroscopic measurements were performed, nor were any soil samples physically collected during the second calendar quarter of 2008.

DEQ-INL monitors milk for naturally occurring potassium-40 and man-made iodine-131. DEQ-INL collects milk samples on a monthly basis. An additional sampling site at Fort Hall was added during this quarter. Results for analyses of milk samples are presented in **Table 21**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131 was not detected.

**Table 21. Gamma spectroscopy analysis data for milk samples, second quarter, 2008. Concentrations are expressed in pCi/L.**

| Sample Location/Dairy                   | Sample Date | Naturally occurring gamma-emitting radionuclide Potassium-40 |        | Man-made gamma-emitting radionuclide Iodine-131 |
|---|-------------|--|--------|---|
|   |             | Concentration  | ± 2 SD |   |
| <b>Monitoring Samples</b>               |             |  |        |   |
| Howe/Nelson-Ricks Creamery              | 04/03/2008  | 1443   | 110    | <MDC  |
|   | 05/05/2008  | 1505   | 113    | <MDC  |
|   | 06/03/2008  | 1520   | 115    | <MDC  |
| Mud Lake/Nelson-Ricks Creamery          | 04/03/2008  | 1466   | 113    | <MDC  |
|   | 05/04/2008  | 1480   | 101    | <MDC  |
|   | 06/02/2008  | 1473   | 101    | <MDC  |
| Gooding/Glanbia                         | 04/02/2008  | 1244   | 91     | <MDC  |
|   | 05/06/2008  | 1455   | 116    | <MDC  |
|   | 06/03/2008  | 1556   | 104    | <MDC  |
| Fort Hall                               | 05/05/2008  | 1512   | 102    | <MDC  |
|   | 06/09/2008  | 1462   | 114    | <MDC  |
| Riverside                               | 04/09/2008  | 1576   | 106    | <MDC  |
|   | 05/07/2008  | 1714   | 111    | <MDC  |
|   | 06/11/2008  | 1801   | 115    | <MDC  |
| <b>Verification Samples<sup>2</sup></b> |             |  |        |   |
| Moreland                                | 04/01/2008  | 1578   | 119    | <MDC  |
| Terreton                                | 04/01/2008  | 1414   | 99     | <MDC  |
| Moreland                                | 05/06/2008  | 1473   | 114    | <MDC  |
| Idaho Falls                             | 05/06/2008  | 1495   | 100    | <MDC  |
| Terreton                                | 06/03/2008  | 1571   | 117    | <MDC  |
| Rupert                                  | 06/03/2008  | 1557   | 116    | <MDC  |

<sup>1</sup><MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).

<sup>2</sup> DEQ-INL samples collected by the off-site INL environmental surveillance contractor..

## Quality Assurance

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

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the second quarter of 2008 for the DEQ-INL’s ESP (**Table 22**). It also summarizes the quality control (QC) samples (spikes, blanks, and duplicates) submitted to the Idaho Bureau of Laboratories-Boise (IBL) for non-radiological analyses and to Idaho State University’s Environmental Monitoring Laboratory (ISU-EML) for radiological analyses during the quarter. All analyses and QC measures at the analytical laboratories used by the ESP are performed in accordance with approved written procedures maintained

by each respective analytical laboratory. Sample collection is performed in accordance with written procedures maintained by the DEQ-INL.

Analytical results for blanks, duplicates, and spikes are used to assess the precision, accuracy, and representativeness of results from analyzing laboratories. During the second quarter of 2008, the DEQ-INL submitted 92 QC samples for various radiological and non-radiological analyses (**Table 22**)

## Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or immeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a “zero” result when no contaminant is expected to be present or an acceptable measure of “background,” and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the second quarter of 2008 are presented in **Table 23**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 24**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 25**. Blank analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 26**, **Table 27**, and **Table 28**. Additionally, one VOC blank was submitted second quarter. For this blank, IBL returned a detectable chloromethane result of 0.61 µg/L. This result is currently under investigation. Because chloromethane was not detectable in any samples this quarter, none of the data has been rejected or qualified.

No anomalies were observed from the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL for the second quarter of 2008.

## Duplicate Samples

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

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

R<sub>1</sub> = first sample result

R<sub>2</sub> = second sample result

and is used to measure a laboratory’s ability to reproduce consistent results. A relative percent difference is acceptable at ± 20 percent. For radiological analyses, the standard deviation of the differences can be used as an indicator of the overall precision of the data set. Duplicate results for ground and surface water are presented in **Table 29**, **Table 30**, **Table 31**, and **Table 32** for radiological analyses, non-radiological analyses and VOCs. Three duplicate comparisons (technetium-99, total nitrogen, and zinc) each failed the DEQ-INL criteria. Each of these failures is under investigation as the causes are not immediately evident. At the conclusion of this investigation, the data will be flagged appropriately.

No other anomalies were observed from the assessment of field duplicate samples as measured by the analytical laboratories used by DEQ-INL for the second quarter of 2008.

## Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added in order to assess the bias a laboratory may have in accurately measuring these analytes. To determine agreement after laboratory analysis, DEQ-INL calculates the difference between the known concentration in the sample and the measured concentration by the laboratory. This result is known as percent recovery (%R)

and the acceptable range used by DEQ-INL is  $100 \pm 25$  percent. Additionally, all results were qualified as “estimates (J)” if the associated quality control spike sample had a recovery of 50-74% or 126-150%, provided that each result was greater than the instrument detection limit (IDL). All results were qualified as “rejected (R)” if the associated quality control spike sample had a recovery of <50% or >150%, provided each result was also greater than the IDL.

During second quarter 2008, no field matrices were spiked to assess the influence of the sample media on laboratory performance. However, several spiked samples were created using de-ionized water and submitted to analytical laboratories for analyses. These non-radiological constituents were used to assess ground water analyte recovery rates and the results are presented in **Table 33**, **Table 34**, and **Table 35**.

DEQ-INL also prepares additional “spike-like” quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and two additional exposures, ranging from 15 to 60 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement agrees within 25 percent of the known irradiated quantity. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets. No irradiations were done for 2nd qtr 2008.

There were no anomalies observed from the assessment of spiked samples as measured by DEQ-INL or the analytical laboratories used by DEQ-INL for the second quarter of 2008.

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

Other than the ones previously mentioned, no issues involving sample chain of custody, sample holding times, the analysis of blank, duplicate, and spike samples were observed during the second quarter of 2008, which significantly affected data quality. Methodologies and data reports issued by the contracting laboratories generally conformed to the requirements of DEQ-INL during the second quarter of 2008.

Data usability is the measure of data that is not rejected compared to the amount that was expected to be obtained. The overall data usability rate for the second quarter of 2008 met the minimum criteria of the DEQ-INL ESP and is summarized in **Table 22**.

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

All equipment was calibrated and checked according to pre-described periodicity. Service reliability for air sampling equipment for the second quarter of 2008 is summarized in **Table 36**. All equipment performed well during this period.

### **Conclusion**

Other than the ones previously mentioned, all data collected for the second quarter of 2008, have been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data has been verified and deemed complete meeting the requirements and data quality objectives established by DEQ-INL.

**Table 22. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL ESP for second quarter, 2008.**

| Media Sampled   | Collection Device | Analyte           | Test Analyses | Blank Analyses | Duplicate Analyses | Spike Analyses | Data Rejected <sup>1</sup> | Analyzing Lab <sup>2</sup> |
|---|-------------------|-------------------|---------------|----------------|--------------------|----------------|----------------------------|----------------------------|
| <b>AIR</b>  |                   |                   |               |                |                    |                |                            |                            |
| <b>Particulate</b>  | 4 inch filter     | Gross alpha       | 143           | 13             | 0                  | 0              | 0                          | ISU-EML                    |
|   |                   | Gross beta        | 143           | 13             | 0                  | 0              | 0                          | ISU-EML                    |
|   |                   | Gamma emitters    | 11            | 1              | 0                  | 0              | 0                          | ISU-EML                    |
|   |                   | Radiochemical     | 0             | 0              | 0                  | 0              | 0                          | ISU Sub                    |
| <b>Water Vapor</b>  | Desiccant column  | Tritium           | 47            | 5              | 0                  | 0              | 0                          | ISU-EML                    |
| <b>Gaseous</b>  | Charcoal filter   | Iodine-131        | 13            | 0              | 0                  | 0              | 0                          | ISU-EML                    |
| <b>Precipitation</b>  | Poly bottle       | Tritium           | 5             | 0              | 0                  | 0              | 0                          | ISU-EML                    |
|   |                   | Gamma emitters    | 5             | 0              | 0                  | 0              | 0                          | ISU-EML                    |
| <b>WATER</b>  |                   |                   |               |                |                    |                |                            |                            |
| <b>Groundwater &amp; Surface Water</b>                              | Grab or composite | Gross alpha       | 51            | 2              | 4                  | 0              | 0                          | ISU-EML                    |
|   |                   | Gross beta        | 51            | 2              | 4                  | 0              | 0                          | ISU-EML                    |
|   |                   | Gamma emitters    | 51            | 2              | 4                  | 0              | 0                          | ISU-EML                    |
|   |                   | Tritium           | 48            | 2              | 3                  | 0              | 0                          | ISU-EML                    |
|   |                   | Enriched tritium  | 16            | 0              | 2                  | 0              | 0                          | ISU-EML                    |
|   |                   | Technetium-99     | 9             | 1              | 1                  | 0              | 0                          | ISU-EML                    |
|   |                   | Radiochemical     | 31            | 8              | 8                  | 0              | 0                          | ISU Sub                    |
|   |                   | Metals            | 38            | 2              | 3                  | 2              | 0                          | IBL                        |
|   |                   | Common Ions       | 38            | 2              | 3                  | 2              | 0                          | IBL                        |
|   |                   | Nutrients         | 38            | 2              | 3                  | 2              | 0                          | IBL                        |
|   |                   | Volatile Organics | 15            | 1              | 3                  | 2              | 0                          | IBL                        |
| <b>TERRESTRIAL</b>  |                   |                   |               |                |                    |                |                            |                            |
| <b>Milk</b>   | Grab or composite | Gamma emitters    | 20            | 0              | 0                  | 0              | 0                          | ISU-EML                    |
| <b>Soil</b>   | <i>in situ</i>    | Gamma emitters    | 0             | 0              | 0                  | 0              | 0                          | DEQ-INL                    |
|   | Grab – "puck"     | Gamma emitters    | 0             | 0              | 0                  | 0              | 0                          | ISU-EML                    |
| <b>RADIATION</b>  |                   |                   |               |                |                    |                |                            |                            |
| <b>Ambient</b>  | EICs              | Gamma Radiation   | 56            | 0              | 0                  | 0              | 0                          | DEQ-INL                    |
|   | HPICs             | Gamma Radiation   | 11            | NA             | NA                 | NA             | NA                         | DEQ-INL                    |
| <b>Total Test Analyses</b>  |                   |                   | <b>840</b>    | <b>56</b>      | <b>38</b>          | <b>8</b>       | <b>0</b>                   |                            |
| <b>Total of QC Analyses (blanks, duplicates, and spikes)</b>        |                   |                   | <b>102</b>    |                |                    |                |                            |                            |
| <b>Percentage of QC analyses of total Test analyses<sup>3</sup></b> |                   |                   | <b>12%</b>    |                |                    |                |                            |                            |
| <b>Percentage of usable data<sup>4</sup></b>                        |                   |                   | <b>100</b>    |                |                    |                |                            |                            |

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

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

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

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

**Table 23. Blank analysis results for gross alpha and beta in particulate air (TSP) for the second quarter, 2008.**

| Collection Period |         | Corrected volume (m <sup>3</sup> ) <sup>1</sup> | Gross alpha |                      | Gross beta |                      |
|-------------------|---------|---|-------------|----------------------|------------|----------------------|
| Start             | Stop    |   | Value       | Uncertainty (± 2 SD) | Value      | Uncertainty (± 2 SD) |
| 3/27/08           | 4/3/08  | 1630  | -0.1        | 0.2                  | 0.0        | 0.3                  |
| 4/3/08            | 4/10/08 | 1630  | -0.1        | 0.2                  | 0.0        | 0.3                  |
| 4/10/08           | 4/17/08 | 1630  | -0.2        | 0.2                  | 0.2        | 0.4                  |
| 4/17/08           | 4/24/08 | 1630  | 0.0         | 0.2                  | -0.1       | 0.3                  |
| 4/24/08           | 5/1/08  | 1630  | 0.0         | 0.2                  | -0.5       | 0.3                  |
| 5/1/08            | 5/8/08  | 1630  | -0.2        | 0.2                  | -0.1       | 0.3                  |
| 5/8/08            | 5/15/08 | 1630  | 0.0         | 0.2                  | 0.3        | 0.3                  |
| 5/15/08           | 5/22/08 | 1630  | 0.0         | 0.2                  | 0.0        | 0.3                  |
| 5/22/08           | 5/29/08 | 1630  | 0.0         | 0.2                  | 0.1        | 0.3                  |
| 5/29/08           | 6/5/08  | 1630  | -0.2        | 0.2                  | 0.0        | 0.3                  |
| 6/5/08            | 6/12/08 | 1630  | 0.0         | 0.2                  | 0.2        | 0.3                  |
| 6/12/08           | 6/19/08 | 1630  | -0.1        | 0.2                  | 0.1        | 0.3                  |
| 6/19/08           | 6/26/08 | 1630  | -0.2        | 0.2                  | -0.5       | 0.3                  |

Note: Concentrations and associated uncertainties (±2 SD) are expressed in 1 x 10<sup>-3</sup> pCi/m<sup>3</sup>.

<sup>1</sup> A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

**Table 24. Blank analysis results for gamma spectroscopy for TSP particulate air filters, for the second quarter, 2008.**

| Analysis Date | Beryllium-7                |        |     | Ruthenium-106/<br>Rhodium-106 |        |     | Antimony-125  |        |     |
|---------------|----------------------------|--------|-----|-------------------------------|--------|-----|---------------|--------|-----|
|               | Concentration <sup>1</sup> | ± 2 SD | MDC | Concentration                 | ± 2 SD | MDC | Concentration | ± 2 SD | MDC |
| 7/16/08       | 7                          | 28     | 48  | 4                             | 26     | 46  | -2            | 7      | 12  |
| Analysis Date | Cesium-134                 |        |     | Cesium-137                    |        |     |               |        |     |
|               | Concentration <sup>1</sup> | ± 2 SD | MDC | Concentration                 | ± 2 SD | MDC |               |        |     |
| 7/16/08       | 0                          | 4      | 5   | 0                             | 3      | 6   |               |        |     |

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

<sup>1</sup> These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A composite volume equal to the sum of the average volumes collected through each valid field filter was used to compute "air concentrations" for the blank for meaningful comparison to sample results. No air was actually passed through the blank filters.

**Table 25. Blank analysis results for tritium in water vapor from air samples for the second quarter, 2008.**

| Sample Number | Start Date | Collect Date | Analysis Date | Tritium       |        |      |
|---------------|------------|--------------|---------------|---------------|--------|------|
|               |            |              |               | Concentration | ± 2 SD | MDC  |
| OP082ZTR01    | 5/2/08     | 5/5/08       | 6/26/08       | 0.01          | 0.08   | 0.14 |
| OP082ZTR02    | 5/2/08     | 5/30/08      | 6/26/08       | -0.01         | 0.08   | 0.14 |
| OP082ZTR03    | 6/17/08    | 6/18/08      | 6/26/08       | -0.01         | 0.08   | 0.14 |
| OP082ZTR04    | 6/27/08    | 7/9/08       | 7/29/08       | 0.01          | 0.09   | 0.15 |
| OP082ZTR05    | 7/7/08     | 7/9/08       | 7/29/08       | -0.02         | 0.09   | 0.15 |

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

**Table 26. Radiological blank analysis in ground and surface water for samples for the second quarter, 2008. Concentrations are expressed in pCi/L with associated uncertainty ( $\pm 2$ SD) and minimum detectable concentration (MDC).**

| Sample Number            | Sample Date | Concentration | ± 2 SD | MDC   | Within Blank Criteria? |
|--------------------------|-------------|---------------|--------|-------|------------------------|
| <b>Gross Alpha</b>       |             |               |        |       |                        |
| 081W190                  | 4/15/2008   | 0.3           | 0.6    | 1.0   | yes                    |
| 081W244                  | 5/6/2008    | -0.6          | 0.6    | 1.3   | yes                    |
| <b>Gross Beta</b>        |             |               |        |       |                        |
| 081W190                  | 4/15/2008   | 0.9           | 0.9    | 1.5   | yes                    |
| 081W244                  | 5/6/2008    | 0.4           | 0.9    | 1.5   | yes                    |
| <b>Cesium-137</b>        |             |               |        |       |                        |
| 081W190                  | 4/15/2008   | 0.9           | 1.7    | 2.8   | yes                    |
| 081W244                  | 5/6/2008    | 0.8           | 1.7    | 2.9   | yes                    |
| <b>Tritium</b>           |             |               |        |       |                        |
| 081W191                  | 4/15/2008   | -30           | 90     | 150   | yes                    |
| 081W252                  | 5/6/2008    | 30            | 90     | 150   | yes                    |
| <b>Strontium-90</b>      |             |               |        |       |                        |
| 081W246                  | 5/6/2008    | -0.19         | 0.20   | 0.54  | yes                    |
| <b>Technetium-99</b>     |             |               |        |       |                        |
| 081W245                  | 5/6/2008    | 0.0           | 0.1    | 0.24  | yes                    |
| <b>Plutonium-238</b>     |             |               |        |       |                        |
| 081W246                  | 5/6/2008    | 0.007         | 0.019  | 0.035 | yes                    |
| <b>Plutonium-239/240</b> |             |               |        |       |                        |
| 081W246                  | 5/6/2008    | 0.048         | 0.034  | 0.035 | yes                    |
| <b>Plutonium-241</b>     |             |               |        |       |                        |
| 081W246                  | 5/6/2008    | 2.0           | 3.8    | 6.4   | yes                    |
| <b>Americium-241</b>     |             |               |        |       |                        |
| 081W246                  | 5/6/2008    | 0.001         | 0.022  | 0.041 | yes                    |
| <b>Uranium-234</b>       |             |               |        |       |                        |
| 081W247                  | 5/6/2008    | 0.001         | 0.045  | 0.089 | yes                    |
| <b>Uranium-235</b>       |             |               |        |       |                        |
| 081W247                  | 5/6/2008    | 0.006         | 0.053  | 0.092 | yes                    |
| <b>Uranium-238</b>       |             |               |        |       |                        |
| 081W247                  | 5/6/2008    | 0.03          | 0.045  | 0.079 | yes                    |

**Table 27. Blank analysis results (µg/L) for metals in ground and surface water for the second quarter, 2008.**

| Sample Number | Sample Date | Arsenic | Barium | Cadmium | Chromium | Iron | Lead | Manganese | Selenium | Zinc |
|---------------|-------------|---------|--------|---------|----------|------|------|-----------|----------|------|
| 081W193       | 4/15/2008   | NR      | <2     | NR      | <5       | NR   | <5   | <2        | NR       | <5   |
| 081W240       | 5/6/2008    | <5      | <2     | <1      | <5       | <10  | <5   | <2        | <10      | <5   |

**Table 28. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water for the second quarter, 2008.**

| Sample Number | Sample Date | Calcium | Magnesium | Sodium | Potassium | Fluoride | Chloride | Sulfate | Total Alkalinity | Total Nitrogen | Total Phosphorus |
|---------------|-------------|---------|-----------|--------|-----------|----------|----------|---------|------------------|----------------|------------------|
| 081W192,194   | 4/15/2008   | <0.1    | <0.1      | <0.1   | <0.1      | <0.1     | <1       | <1      | <1               | <0.01          | <0.005           |
| 081W248,250   | 5/6/2008    | <0.1    | <0.1      | <0.1   | <0.1      | <0.1     | <1       | <1      | <1               | <0.01          | <0.005           |

**Table 29. Duplicate radiological analysis results in pCi/L for ground and surface water, second quarter, 2008.**

| Analysis/<br>Sample Location         | Original<br>Sample<br>Number | Concentration | ±2<br>SD | Duplicate<br>Sample<br>Number | Concentration | ±2 SD | /R <sub>1</sub> -R <sub>2</sub> / | 3(s <sub>1</sub> <sup>2</sup> +s <sub>2</sub> <sup>2</sup> ) <sup>1/2</sup> | Within<br>Criteria? <sup>1</sup> |
|--------------------------------------|------------------------------|---------------|----------|-------------------------------|---------------|-------|-----------------------------------|---|----------------------------------|
| <b>Gross Alpha</b>                   |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W222                      | 3.9           | 2.8      | 081W232                       | 0.1           | 2.5   | 3.8                               | 5.6   | yes                              |
| USGS-100                             | 081W094                      | 2.4           | 2.4      | 081W195                       | 0.6           | 2.4   | 1.8                               | 5.1   | yes                              |
| Clear Spring                         | 081W257                      | 1.7           | 2.4      | 081W293                       | -3.7          | 2.6   | 5.4                               | 5.3   | yes                              |
| MV-37                                | 081W390                      | 2.6           | 2.6      | 081W342                       | 1.3           | 2.9   | 1.3                               | 5.8   | yes                              |
| <b>Gross Beta</b>                    |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W222                      | 3.2           | 1.2      | 081W232                       | 5.3           | 1.2   | 2.1                               | 2.5   | yes                              |
| USGS-100                             | 081W094                      | 3.6           | 1.2      | 081W195                       | 4.1           | 1.2   | 0.5                               | 2.5   | yes                              |
| Clear Spring                         | 081W257                      | 4.1           | 1.2      | 081W293                       | 3.8           | 1.2   | 0.3                               | 2.5   | yes                              |
| MV-37                                | 081W390                      | 4.5           | 1.2      | 081W342                       | 3.6           | 1.2   | 0.9                               | 2.5   | yes                              |
| <b>Gamma Spectroscopy Cesium-137</b> |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W222                      | -1.4          | 1.8      | 081W232                       | -0.6          | 1.4   | 0.8                               | 3.4   | yes                              |
| USGS-100                             | 081W094                      | 1.3           | 1.5      | 081W195                       | -0.5          | 1.4   | 1.8                               | 2.1   | yes                              |
| Clear Spring                         | 081W257                      | -2.0          | 1.5      | 081W293                       | -0.5          | 1.6   | 1.5                               | 3.6   | yes                              |
| MV-37                                | 081W390                      | 1.3           | 1.7      | 081W342                       | 0.1           | 1.4   | 1.2                               | 3.1   | yes                              |
| <b>Tritium</b>                       |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W224                      | 1010          | 110      | 081W234                       | 1010          | 110   | 0                                 | 233   | yes                              |
| USGS-100                             | 081W095                      | -10           | 70       | 081W196                       | -10           | 70    | 0                                 | 148   | yes                              |
| MV-37                                | 081W391                      | 80            | 90       | 081W343                       | 70            | 90    | 10                                | 191   | yes                              |
| <b>Enriched Tritium</b>              |                              |               |          |                               |               |       |                                   |   |                                  |
| USGS-100                             | 081W095                      | 11            | 6        | 081W196                       | 0             | 6     | 11                                | 13  | yes                              |
| Clear Spring                         | 081W258                      | 9             | 6        | 081W294                       | 4             | 6     | 5                                 | 13  | yes                              |
| <b>Strontium-90</b>                  |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W225                      | 0.16          | 0.28     | 081W235                       | 0.01          | 0.27  | 0.15                              | 0.58  | yes                              |
| <b>Technetium-99</b>                 |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W223                      | 1.7           | 0.2      | 081W233                       | 2.3           | 0.2   | 0.6                               | 0.4   | no                               |
| <b>Plutonium-238</b>                 |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W225                      | 0             | 0.021    | 081W235                       | 0.009         | 0.020 | 0.009                             | 0.044   | yes                              |
| <b>Plutonium-239/240</b>             |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W225                      | 0.020         | 0.026    | 081W235                       | 0.003         | 0.020 | 0.017                             | 0.049   | yes                              |
| <b>Plutonium-241</b>                 |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W225                      | -1.0          | 3.9      | 081W235                       | -0.40         | 3.9   | 0.6                               | 8.3   | yes                              |
| <b>Uranium-234</b>                   |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W226                      | 1.35          | 0.33     | 081W236                       | 1.75          | 0.41  | 0.4                               | 0.79  | yes                              |
| <b>Uranium-235</b>                   |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W226                      | 0.027         | 0.050    | 081W236                       | 0.040         | 0.060 | 0.013                             | 0.117   | yes                              |
| <b>Uranium-238</b>                   |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W226                      | 0.62          | 0.20     | 081W236                       | 0.54          | 0.19  | 0.08                              | 0.41  | yes                              |
| <b>Americium-241</b>                 |                              |               |          |                               |               |       |                                   |   |                                  |
| M3S                                  | 081W225                      | 0.017         | 0.022    | 081W235                       | 0.001         | 0.023 | 0.016                             | 0.048   | yes                              |

<sup>1</sup> /R<sub>1</sub>-R<sub>2</sub>/ ≤ 3(s<sub>1</sub><sup>2</sup>+s<sub>2</sub><sup>2</sup>)<sup>1/2</sup>

**Table 30. Duplicate results for metals (µg/L) in ground water and/or surface water for the second quarter, 2008.**

| Analysis/ Sample Location | Original Sample Number | Concentration | Duplicate Sample Number | Concentration | RPD <sup>1</sup> |
|---------------------------|------------------------|---------------|-------------------------|---------------|------------------|
| <b>Metals (µg/L)</b>      |                        |               |                         |               |                  |
| <b>Arsenic</b>            |                        |               |                         |               |                  |
| M3S                       | 081W228                | <5            | 081W238                 | <5            | 0                |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | <5            | 081W346                 | <5            | 0                |
| <b>Barium</b>             |                        |               |                         |               |                  |
| M3S                       | 081W228                | 45            | 081W238                 | 49            | -9               |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | 47            | 081W346                 | 47            | 0                |
| <b>Beryllium</b>          |                        |               |                         |               |                  |
| M3S                       | 081W228                | <1            | 081W238                 | <1            | 0                |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | NR            | 081W346                 | NR            | NR               |
| <b>Cadmium</b>            |                        |               |                         |               |                  |
| M3S                       | 081W228                | <1            | 081W238                 | <1            | 0                |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | <1            | 081W346                 | <1            | 0                |
| <b>Chromium</b>           |                        |               |                         |               |                  |
| M3S                       | 081W228                | 14            | 081W238                 | 14            | 0                |
| USGS-100                  | 081W097                | <5            | 081W198                 | <5            | 0                |
| MV-37                     | 081W394                | <5            | 081W346                 | <5            | 0                |
| <b>Iron</b>               |                        |               |                         |               |                  |
| M3S                       | 081W228                | 50            | 081W238                 | 50            | 0                |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | <10           | 081W346                 | <10           | 0                |
| <b>Lead</b>               |                        |               |                         |               |                  |
| M3S                       | 081W228                | <5            | 081W238                 | <5            | 0                |
| USGS-100                  | 081W097                | 14            | 081W198                 | 14            | 0                |
| MV-37                     | 081W394                | <5            | 081W346                 | <5            | 0                |
| <b>Manganese</b>          |                        |               |                         |               |                  |
| M3S                       | 081W228                | <2            | 081W238                 | <2            | 0                |
| USGS-100                  | 081W097                | <2            | 081W198                 | <2            | 0                |
| MV-37                     | 081W394                | <2            | 081W346                 | <2            | 0                |
| <b>Mercury</b>            |                        |               |                         |               |                  |
| M3S                       | 081W228                | <0.5          | 081W238                 | <0.5          | 0                |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | NR            | 081W346                 | NR            | NR               |
| <b>Selenium</b>           |                        |               |                         |               |                  |
| M3S                       | 081W228                | <10           | 081W238                 | <10           | 0                |
| USGS-100                  | 081W097                | NR            | 081W198                 | NR            | NR               |
| MV-37                     | 081W394                | <10           | 081W346                 | <10           | 0                |
| <b>Zinc</b>               |                        |               |                         |               |                  |
| M3S                       | 081W228                | <5            | 081W238                 | <5            | 0                |
| USGS-100                  | 081W097                | 210           | 081W198                 | 210           | 0                |
| MV-37                     | 081W394                | 13            | 081W346                 | 9             | 36               |

<sup>1</sup>Relative Percent Difference = (R1-R2) / ((R1+ R2)/2)\*100, NR = analysis not requested,

**Table 31. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water for second quarter, 2008.**

| Analysis/ Sample Location               | Original Sample Number | Concentration | Duplicate Sample Number | Concentration | RPD <sup>1</sup> |
|---|------------------------|---------------|-------------------------|---------------|------------------|
| <b>Common Ions and Nutrients (mg/L)</b> |                        |               |                         |               |                  |
| <b>Calcium</b>                          |                        |               |                         |               |                  |
| M3S                                     | 081W228                | 43            | 081W238                 | 43            | 0                |
| USGS-100                                | 081W097                | 36            | 081W198                 | 36            | 0                |
| MV-37                                   | 081W394                | 48            | 081W346                 | 48            | 0                |
| <b>Magnesium</b>                        |                        |               |                         |               |                  |
| M3S                                     | 081W228                | 14            | 081W238                 | 14            | 0                |
| USGS-100                                | 081W097                | 12            | 081W198                 | 12            | 0                |
| MV-37                                   | 081W394                | 16            | 081W346                 | 16            | 0                |
| <b>Sodium</b>                           |                        |               |                         |               |                  |
| M3S                                     | 081W228                | 8.5           | 081W238                 | 8.5           | 0                |
| USGS-100                                | 081W097                | 17            | 081W198                 | 17            | 0                |
| MV-37                                   | 081W394                | 20            | 081W346                 | 20            | 0                |
| <b>Potassium</b>                        |                        |               |                         |               |                  |
| M3S                                     | 081W228                | 2.6           | 081W238                 | 2.6           | 0                |
| USGS-100                                | 081W097                | 3.3           | 081W198                 | 3.3           | 0                |
| MV-37                                   | 081W394                | 3.6           | 081W346                 | 3.6           | 0                |
| <b>Fluoride</b>                         |                        |               |                         |               |                  |
| M3S                                     | 081W227                | 0.215         | 081W237                 | 0.215         | 0                |
| USGS-100                                | 081W096                | 0.727         | 081W197                 | 0.726         | 0                |
| MV-37                                   | 081W392                | 0.306         | 081W344                 | 0.306         | 0                |
| <b>Chloride</b>                         |                        |               |                         |               |                  |
| M3S                                     | 081W227                | 14.1          | 081W237                 | 14.1          | 0                |
| USGS-100                                | 081W096                | 16.9          | 081W197                 | 16.9          | 0                |
| MV-37                                   | 081W392                | 13.7          | 081W344                 | 14.0          | -2               |
| <b>Sulfate</b>                          |                        |               |                         |               |                  |
| M3S                                     | 081W227                | 25.7          | 081W237                 | 25.7          | 0                |
| USGS-100                                | 081W096                | 17.0          | 081W197                 | 17.3          | -2               |
| MV-37                                   | 081W392                | 27.0          | 081W344                 | 27.0          | 0                |
| <b>Total Alkalinity</b>                 |                        |               |                         |               |                  |
| M3S                                     | 081W227                | 142           | 081W237                 | 142           | 0                |
| USGS-100                                | 081W096                | 132           | 081W197                 | 136           | -3               |
| MV-37                                   | 081W392                | 183           | 081W344                 | 181           | 1                |
| <b>Total Nitrogen</b>                   |                        |               |                         |               |                  |
| M3S                                     | 081W229                | 0.84          | 081W239                 | 0.85          | -1               |
| USGS-100                                | 081W098                | 1.6           | 081W199                 | 2.1           | -27              |
| MV-37                                   | 081W395                | 1.8           | 081W347                 | 1.8           | 0                |
| <b>Total Phosphorus</b>                 |                        |               |                         |               |                  |
| M3S                                     | 081W229                | 0.021         | 081W239                 | 0.022         | -5               |
| USGS-100                                | 081W098                | 0.016         | 081W199                 | 0.016         | 0                |
| MV-37                                   | 081W395                | 0.060         | 081W347                 | 0.062         | -3               |

<sup>1</sup>Relative Percent Difference = (R1-R2) / ((R1+ R2)/2)\*100

**Table 32. Duplicate results for VOCs in ground water and/or surface water for second quarter, 2008.**

| Analysis/ Sample Location   | Original Sample Number | Concentration | Duplicate Sample Number | Concentration | RPD <sup>1</sup> |
|---|------------------------|---------------|-------------------------|---------------|------------------|
| <b>Volatile Organic Compounds (µg/L)</b>                              |                        |               |                         |               |                  |
| <b><i>Carbon tetrachloride</i></b>                                    |                        |               |                         |               |                  |
| M3S   | 081W230                | 4.00          | 081W240                 | 4.08          | -2               |
| <b><i>Trichloroethylene</i></b>                                       |                        |               |                         |               |                  |
| M3S   | 081W230                | 1.10          | 081W240                 | 1.12          | -2               |
| <sup>1</sup> Relative Percent Difference = (R1-R2) / ((R1+ R2)/2)*100 |                        |               |                         |               |                  |

**Table 33. De-ionized water spike results (in µg/L) and percent recovery for metals in ground and surface water for the second quarter, 2008.**

| Spike Sample Number | Sample Date | Barium |        |                 | Chromium |        |             | Lead  |        |            | Manganese |        |              | Zinc  |        |             |
|---------------------|-------------|--------|--------|-----------------|----------|--------|-------------|-------|--------|------------|-----------|--------|--------------|-------|--------|-------------|
|                     |             | spike  | result | %R <sup>1</sup> | spike    | result | %R          | spike | result | %R         | spike     | result | %R           | spike | result | %R          |
| 081W201             | 4/23/2008   | 45.4   | 45     | <b>99.1</b>     | 52.3     | 52     | <b>99.4</b> | 2.23  | <5     | <b>100</b> | 5.42      | 6      | <b>110.7</b> | 143   | 143    | <b>100</b>  |
| 081W242             | 5/6/2008    | 46.1   | 48     | <b>104</b>      | 53.2     | 52     | <b>97.7</b> | 2.28  | <5     | <b>100</b> | 5.51      | 6      | <b>108.9</b> | 146   | 140    | <b>95.9</b> |

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 34. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2008.**

| Spike Sample Number | Sample Date | Calcium |        |                 | Magnesium |        |             | Sodium |        |              | Potassium |        |              | Fluoride |        |             |
|---------------------|-------------|---------|--------|-----------------|-----------|--------|-------------|--------|--------|--------------|-----------|--------|--------------|----------|--------|-------------|
|                     |             | spike   | result | %R <sup>1</sup> | spike     | result | %R          | spike  | result | %R           | spike     | result | %R           | spike    | result | %R          |
| 081W200             | 4/23/2008   | 13.3    | 13     | <b>97.7</b>     | 6.81      | 6.7    | <b>98.4</b> | 13.3   | 13     | <b>97.7</b>  | 2.55      | 2.6    | <b>102</b>   | 0.705    | 0.686  | <b>97.3</b> |
| 081W241             | 5/6/2008    | 13.5    | 13     | <b>96.3</b>     | 6.92      | 6.8    | <b>98.3</b> | 13.5   | 14     | <b>103.7</b> | 2.59      | 2.6    | <b>100.4</b> | 0.95     | 0.954  | <b>100</b>  |

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

Table 34. continued. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2008.

| Spike Sample Number | Sample Date | Chloride |        |                 | Sulfate |        |             | Total Alkalinity as CaCO <sub>3</sub> |        |              | Total Nitrogen |        |             | Total Phosphorus |        |             |
|---------------------|-------------|----------|--------|-----------------|---------|--------|-------------|---------------------------------------|--------|--------------|----------------|--------|-------------|------------------|--------|-------------|
|                     |             | spike    | result | %R <sup>1</sup> | spike   | result | %R          | spike                                 | result | %R           | spike          | result | %R          | spike            | result | %R          |
| 081W200, 202        | 4/23/2008   | 29.8     | 29.8   | <b>100</b>      | 20.8    | 20.3   | <b>97.6</b> | 37.2                                  | 38     | <b>102.2</b> | 2.01           | 1.7    | <b>84.6</b> | 0.026            | 0.023  | <b>88.5</b> |
| 081W241,243         | 5/6/2008    | 42.2     | 41.9   | <b>99.3</b>     | 21.4    | 20.8   | <b>97.2</b> | 24.6                                  | 21     | <b>85.4</b>  | 1.01           | 1.0    | <b>99.0</b> | 0.0216           | 0.017  | <b>78.7</b> |

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 35. De-ionized water spike results (in µg/L) and percent recovery for VOCs in ground and surface water for the second quarter, 2008.**

| Spike Sample Number | Sample Date | Carbon Tetrachloride       |        |                 | Styrene                     |        |             | Tetrachloroethylene |        |              | Trichloroethylene |        |              | Vinyl Chloride |        |            |
|---------------------|-------------|----------------------------|--------|-----------------|-----------------------------|--------|-------------|---------------------|--------|--------------|-------------------|--------|--------------|----------------|--------|------------|
|                     |             | spike                      | result | %R <sup>1</sup> | spike                       | result | %R          | spike               | result | %R           | spike             | result | %R           | spike          | result | %R         |
| 081W172             | 4/28/2008   | 14.2                       | 15     | <b>106</b>      | 15.5                        | 15     | <b>96.8</b> | 8.46                | 7.7    | <b>91.0</b>  | 12.3              | 13     | <b>105.7</b> | 15.6           | 16     | <b>103</b> |
| Spike Sample Number | Sample Date | cis- 1, 2-Dichloroethylene |        |                 | trans-1, 2-Dichloroethylene |        |             | Toluene             |        |              | Trichloroethylene |        |              | Vinyl Chloride |        |            |
| 081W171             | 4/14/2008   | 18.4                       | 18     | <b>97.8</b>     | 14.6                        | 17     | <b>116</b>  | 10.9                | 11     | <b>100.9</b> | 14.3              | 16     | <b>111.9</b> | 8.76           | 10     | <b>114</b> |

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 36. Air sampling field equipment service reliability (percent operational) for second quarter, 2008.**

| Station Locations          | Sample Type <sup>1</sup> |             |                      |               |
|----------------------------|--------------------------|-------------|----------------------|---------------|
|                            | TSP                      | Radioiodine | Atmospheric Moisture | Precipitation |
| <b>Onsite Locations</b>    |                          |             |                      |               |
| Big Lost River Rest Area   | 100 %                    | 100 %       | 100 %                | 100 %         |
| Experimental Field Station | 100 %                    | 100 %       | 100 %                | NC            |
| Sand Dunes Tower           | 100 %                    | 100 %       | 100 %                | NC            |
| Van Buren Avenue           | 100 %                    | 100 %       | 100 %                | NC            |
| <b>Boundary Locations</b>  |                          |             |                      |               |
| Atomic City                | 100 %                    | 100 %       | 100 %                | 100 %         |
| Howe <sup>2</sup>          | 100 %                    | 100 %       | 100 %                | 0 %           |
| Monteview                  | 100 %                    | 100 %       | 100 %                | 100 %         |
| Mud Lake                   | 100 %                    | 100 %       | 100 %                | 100 %         |
| <b>Distant Locations</b>   |                          |             |                      |               |
| Craters of the Moon        | 100 %                    | 100 %       | 100 %                | NC            |
| Idaho Falls                | 100 %                    | 100 %       | 100 %                | 100 %         |

Note: The values in this table were calculated by dividing the number of weeks the equipment was in operation by the number of weeks in the quarter.

<sup>1</sup> NC = sample not collected at this location

<sup>2</sup> Precipitation sampling at Howe was suspended due to irrigation water entering the sample

## Appendix A

**Table A-1. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2008.**

| Sample location                   | Collection Date |          | Gross Alpha   |        | Gross Beta    |        |
|-----------------------------------|-----------------|----------|---------------|--------|---------------|--------|
|                                   | Start           | Stop     | Concentration | ± 2 SD | Concentration | ± 2 SD |
| <b>Rest Area</b>                  | 03/27/08        | 04/03/08 | 0.7           | 0.3    | 18.4          | 1.0    |
|                                   | 04/03/08        | 04/10/08 | 0.7           | 0.3    | 23.0          | 1.1    |
|                                   | 04/10/08        | 04/17/08 | 0.9           | 0.3    | 25.5          | 1.1    |
|                                   | 04/17/08        | 04/24/08 | 1.7           | 0.3    | 25.7          | 1.2    |
|                                   | 04/24/08        | 05/01/08 | 1.4           | 0.3    | 27.1          | 1.2    |
|                                   | 05/01/08        | 05/08/08 | 1.0           | 0.3    | 30.8          | 1.2    |
|                                   | 05/08/08        | 05/15/08 | 1.4           | 0.3    | 21.8          | 1.1    |
|                                   | 05/15/08        | 05/22/08 | 0.1           | 0.2    | 5.3           | 0.6    |
|                                   | 05/22/08        | 05/29/08 | 0.7           | 0.3    | 16.0          | 0.9    |
|                                   | 05/29/08        | 06/05/08 | 0.5           | 0.3    | 18.1          | 1.0    |
|                                   | 06/05/08        | 06/12/08 | 0.8           | 0.3    | 13.1          | 0.8    |
|                                   | 06/12/08        | 06/19/08 | 1.2           | 0.3    | 33.0          | 1.3    |
|                                   | 06/19/08        | 06/26/08 | 1.8           | 0.4    | 38.0          | 1.4    |
| <b>Experimental Field Station</b> | 03/27/08        | 04/03/08 | 0.3           | 0.2    | 14.5          | 0.9    |
|                                   | 04/03/08        | 04/10/08 | 0.8           | 0.3    | 20.1          | 1.0    |
|                                   | 04/10/08        | 04/17/08 | 0.7           | 0.3    | 19.9          | 1.0    |
|                                   | 04/17/08        | 04/24/08 | 1.4           | 0.3    | 24.6          | 1.1    |
|                                   | 04/24/08        | 05/01/08 | 2.5           | 0.5    | 27.6          | 1.5    |
|                                   | 05/01/08        | 05/08/08 | 1.0           | 0.3    | 33.3          | 1.4    |
|                                   | 05/08/08        | 05/15/08 | 0.8           | 0.3    | 18.8          | 1.0    |
|                                   | 05/15/08        | 05/22/08 | 0.3           | 0.2    | 3.8           | 0.6    |
|                                   | 05/22/08        | 05/29/08 | 0.2           | 0.2    | 11.1          | 0.8    |
|                                   | 05/29/08        | 06/05/08 | 0.6           | 0.3    | 17.5          | 1.0    |
|                                   | 06/05/08        | 06/12/08 | 0.5           | 0.2    | 13.2          | 0.9    |
|                                   | 06/12/08        | 06/19/08 | 1.0           | 0.4    | 28.2          | 1.5    |
|                                   | 06/19/08        | 06/26/08 | 1.7           | 0.4    | 34.9          | 1.4    |

**Table A-1 continued.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2008.

| Sample Location | Collection Date |          | Gross Alpha   |        | Gross Beta    |        |
|-----------------|-----------------|----------|---------------|--------|---------------|--------|
|                 | Start           | Stop     | Concentration | ± 2 SD | Concentration | ± 2 SD |
| Sand Dunes      | 03/27/08        | 04/03/08 | 0.5           | 0.3    | 17.1          | 1.0    |
|                 | 04/03/08        | 04/10/08 | 0.7           | 0.3    | 22.0          | 1.1    |
|                 | 04/10/08        | 04/17/08 | 1.7           | 0.4    | 21.0          | 1.3    |
|                 | 04/17/08        | 04/24/08 | 1.1           | 0.3    | 24.0          | 1.1    |
|                 | 04/24/08        | 05/01/08 | 1.3           | 0.3    | 24.7          | 1.2    |
|                 | 05/01/08        | 05/08/08 | 0.8           | 0.3    | 27.4          | 1.2    |
|                 | 05/08/08        | 05/15/08 | 1.8           | 0.4    | 21.2          | 1.3    |
|                 | 05/15/08        | 05/22/08 | 0.1           | 0.2    | 4.9           | 0.6    |
|                 | 05/22/08        | 05/29/08 | 0.3           | 0.2    | 11.1          | 0.8    |
|                 | 05/29/08        | 06/05/08 | 0.5           | 0.3    | 21.9          | 1.1    |
|                 | 06/05/08        | 06/12/08 | 0.6           | 0.3    | 10.8          | 0.8    |
|                 | 06/12/08        | 06/19/08 | 0.9           | 0.3    | 27.9          | 1.2    |
|                 | 06/19/08        | 06/26/08 | 1.3           | 0.3    | 30.2          | 1.3    |
| Van Buren       | 03/27/08        | 04/03/08 | 0.6           | 0.2    | 18.5          | 1.0    |
|                 | 04/03/08        | 04/10/08 | 0.9           | 0.3    | 21.8          | 1.0    |
|                 | 04/10/08        | 04/17/08 | 0.5           | 0.3    | 20.1          | 1.0    |
|                 | 04/17/08        | 04/24/08 | 1.1           | 0.3    | 27.3          | 1.2    |
|                 | 04/24/08        | 05/01/08 | 1.0           | 0.3    | 25.7          | 1.1    |
|                 | 05/01/08        | 05/08/08 | 1.3           | 0.3    | 28.0          | 1.2    |
|                 | 05/08/08        | 05/15/08 | 1.1           | 0.3    | 22.7          | 1.1    |
|                 | 05/15/08        | 05/22/08 | 0.4           | 0.2    | 5.7           | 0.6    |
|                 | 05/22/08        | 05/29/08 | 0.4           | 0.2    | 13.3          | 0.8    |
|                 | 05/29/08        | 06/05/08 | 0.5           | 0.3    | 21.3          | 1.0    |
|                 | 06/05/08        | 06/12/08 | 0.8           | 0.3    | 14.2          | 0.9    |
|                 | 06/12/08        | 06/19/08 | 1.0           | 0.3    | 27.9          | 1.2    |
|                 | 06/19/08        | 06/26/08 | 2.2           | 0.4    | 35.4          | 1.3    |
| Atomic City     | 03/27/08        | 04/03/08 | 0.6           | 0.3    | 19.8          | 1.0    |
|                 | 04/03/08        | 04/10/08 | 0.8           | 0.3    | 19.6          | 1.0    |
|                 | 04/10/08        | 04/17/08 | 0.7           | 0.3    | 19.3          | 1.0    |
|                 | 04/17/08        | 04/24/08 | 1.6           | 0.4    | 29.8          | 1.5    |
|                 | 04/24/08        | 05/01/08 | 1.3           | 0.3    | 29.8          | 1.2    |
|                 | 05/01/08        | 05/08/08 | 1.3           | 0.3    | 32.3          | 1.3    |
|                 | 05/08/08        | 05/15/08 | 1.1           | 0.3    | 25.4          | 1.1    |
|                 | 05/15/08        | 05/22/08 | 0.4           | 0.2    | 6.3           | 0.6    |
|                 | 05/22/08        | 05/29/08 | 0.5           | 0.2    | 13.3          | 0.9    |
|                 | 05/29/08        | 06/05/08 | 0.7           | 0.3    | 23.2          | 1.1    |
|                 | 06/05/08        | 06/12/08 | 1.2           | 0.3    | 14.7          | 0.9    |
|                 | 06/12/08        | 06/19/08 | 1.1           | 0.3    | 32.7          | 1.3    |
|                 | 06/19/08        | 06/26/08 | 1.6           | 0.3    | 35.8          | 1.4    |

**Table A-1 continued.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2008.

| Sample Location  | Collection Date |          | Gross Alpha   |        | Gross Beta    |        |
|------------------|-----------------|----------|---------------|--------|---------------|--------|
|                  | Start           | Stop     | Concentration | ± 2 SD | Concentration | ± 2 SD |
| <b>Howe</b>      | 03/27/08        | 04/03/08 | 0.6           | 0.3    | 16.5          | 0.9    |
|                  | 04/03/08        | 04/10/08 | 0.4           | 0.2    | 18.2          | 1.0    |
|                  | 04/10/08        | 04/17/08 | 1.3           | 0.4    | 19.5          | 1.3    |
|                  | 04/17/08        | 04/24/08 | 1.1           | 0.3    | 19.1          | 1.0    |
|                  | 04/24/08        | 05/01/08 | 0.9           | 0.3    | 14.6          | 0.9    |
|                  | 05/01/08        | 05/08/08 | 1.1           | 0.3    | 24.8          | 1.1    |
|                  | 05/08/08        | 05/15/08 | 1.1           | 0.3    | 14.9          | 0.9    |
|                  | 05/15/08        | 05/22/08 | 0.4           | 0.2    | 4.7           | 0.6    |
|                  | 05/22/08        | 05/29/08 | 0.4           | 0.2    | 9.0           | 0.7    |
|                  | 05/29/08        | 06/05/08 | 0.5           | 0.3    | 18.0          | 1.0    |
|                  | 06/05/08        | 06/12/08 | 0.2           | 1.0    | 11.7          | 2.2    |
|                  | 06/12/08        | 06/19/08 | 0.4           | 0.2    | 25.4          | 1.1    |
|                  | 06/19/08        | 06/26/08 | 1.5           | 0.3    | 27.7          | 1.2    |
| <b>Montevieu</b> | 03/27/08        | 04/03/08 | 0.4           | 0.2    | 15.7          | 0.9    |
|                  | 04/03/08        | 04/10/08 | 0.6           | 0.3    | 21.4          | 1.0    |
|                  | 04/10/08        | 04/17/08 | 1.6           | 0.3    | 17.4          | 0.9    |
|                  | 04/17/08        | 04/24/08 | 3.1           | 0.7    | 19.4          | 1.7    |
|                  | 04/24/08        | 05/01/08 | 1.0           | 0.3    | 22.4          | 1.1    |
|                  | 05/01/08        | 05/08/08 | 1.6           | 0.3    | 27.5          | 1.2    |
|                  | 05/08/08        | 05/15/08 | 1.0           | 0.3    | 19.9          | 1.0    |
|                  | 05/15/08        | 05/22/08 | 1.4           | 0.5    | 63.4          | 2.5    |
|                  | 05/22/08        | 05/29/08 | 0.3           | 0.2    | 7.6           | 0.7    |
|                  | 05/29/08        | 06/05/08 | 0.5           | 0.3    | 14.6          | 0.9    |
|                  | 06/05/08        | 06/12/08 | 0.4           | 0.2    | 8.3           | 0.7    |
|                  | 06/12/08        | 06/19/08 | 0.8           | 0.3    | 21.1          | 1.0    |
|                  | 06/19/08        | 06/26/08 | 1.0           | 0.3    | 23.7          | 1.1    |
| <b>Mud Lake</b>  | 03/27/08        | 04/03/08 | 0.7           | 0.3    | 15.9          | 1.0    |
|                  | 04/03/08        | 04/10/08 | 0.5           | 0.3    | 18.2          | 1.0    |
|                  | 04/10/08        | 04/17/08 | 1.4           | 0.4    | 19.2          | 1.1    |
|                  | 04/17/08        | 04/24/08 | 1.9           | 0.3    | 21.8          | 1.1    |
|                  | 04/24/08        | 05/01/08 | 1.5           | 0.4    | 23.6          | 1.2    |
|                  | 05/01/08        | 05/08/08 | 1.4           | 0.3    | 24.5          | 1.2    |
|                  | 05/08/08        | 05/15/08 | 1.0           | 0.3    | 17.0          | 1.0    |
|                  | 05/15/08        | 05/22/08 | 0.4           | 0.2    | 5.5           | 0.6    |
|                  | 05/22/08        | 05/29/08 | 0.4           | 0.3    | 10.3          | 0.8    |
|                  | 05/29/08        | 06/05/08 | 0.5           | 0.3    | 21.6          | 1.1    |
|                  | 06/05/08        | 06/12/08 | 0.7           | 0.3    | 13.0          | 0.9    |
|                  | 06/12/08        | 06/19/08 | 1.1           | 0.3    | 28.2          | 1.2    |
|                  | 06/19/08        | 06/26/08 | 1.5           | 0.4    | 29.9          | 1.3    |

**Table A-1 continued.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2008.

| Sample Location          | Collection Date              |          | Gross Alpha   |        | Gross Beta       |        |
|--------------------------|------------------------------|----------|---------------|--------|------------------|--------|
|                          | Start                        | Stop     | Concentration | ± 2 SD | Concentration    | ± 2 SD |
| <b>Distant Locations</b> |                              |          |               |        |                  |        |
| <b>Craters</b>           | 03/27/08                     | 04/03/08 | 0.5           | 0.2    | 14.6             | 0.9    |
|                          | 04/03/08                     | 04/10/08 | 0.5           | 0.3    | 14.5             | 0.9    |
|                          | 04/10/08                     | 04/17/08 | 0.8           | 0.3    | 17.2             | 1.0    |
|                          | 04/17/08                     | 04/24/08 | 1.1           | 0.3    | 21.2             | 1.0    |
|                          | 04/24/08                     | 05/01/08 | 1.1           | 0.3    | 24.1             | 1.1    |
|                          | 05/01/08                     | 05/08/08 | 1.0           | 0.3    | 25.6             | 1.1    |
|                          | 05/08/08                     | 05/15/08 | 1.0           | 0.3    | 17.0             | 0.9    |
|                          | 05/15/08                     | 05/22/08 | 0.1           | 0.2    | 4.1              | 0.5    |
|                          | 05/22/08                     | 05/29/08 | 0.3           | 0.2    | 11.4             | 0.8    |
|                          | 05/29/08                     | 06/05/08 | 0.3           | 0.2    | 18.7             | 1.0    |
|                          | 06/05/08                     | 06/12/08 | 0.4           | 0.2    | 11.1             | 0.8    |
|                          | 06/12/08                     | 06/19/08 | 0.8           | 0.3    | 25.1             | 1.1    |
|                          | <b>Fort Hall<sup>1</sup></b> | 03/27/08 | 04/03/08      | 0.6    | 0.3              | 13.6   |
| 04/03/08                 |                              | 04/10/08 | 0.9           | 0.3    | 13.1             | 0.9    |
| 04/10/08                 |                              | 04/17/08 | 0.9           | 0.3    | 13.3             | 0.9    |
| 04/17/08                 |                              | 04/24/08 | 1.7           | 0.3    | 18.5             | 1.0    |
| 04/24/08                 |                              | 05/01/08 | 1.3           | 0.3    | 16.5             | 1.0    |
| 05/01/08                 |                              | 05/08/08 | 1.1           | 0.3    | 21.0             | 1.1    |
| 05/08/08                 |                              | 05/15/08 | 1.0           | 0.3    | 16.5             | 0.9    |
| 05/15/08                 |                              | 05/22/08 | 0.6           | 0.2    | 5.6              | 0.6    |
| 05/22/08                 |                              | 05/29/08 | 0.6           | 0.3    | 11.5             | 0.8    |
| 05/29/08                 |                              | 06/05/08 | 0.6           | 0.3    | 18.6             | 1.0    |
| 06/05/08                 |                              | 06/12/08 | 0.5           | 0.2    | 9.7              | 0.7    |
| 06/12/08                 |                              | 06/19/08 | 1.2           | 0.3    | 22.9             | 1.1    |
| 06/19/08                 |                              | 06/26/08 | 1.2           | 0.3    | 23.3             | 1.1    |
| <b>Idaho Falls</b>       | 03/27/08                     | 04/03/08 | 0.7           | 0.3    | 16.1             | 0.9    |
|                          | 04/03/08                     | 04/10/08 | 1.0           | 0.3    | 18.3             | 1.0    |
|                          | 04/10/08                     | 04/17/08 | 1.2           | 0.3    | 19.4             | 1.0    |
|                          | 04/17/08                     | 04/24/08 | 1.5           | 0.3    | 21.9             | 1.1    |
|                          | 04/24/08                     | 05/01/08 | 1.1           | 0.3    | 18.2             | 1.0    |
|                          | 05/01/08                     | 05/08/08 | 1.0           | 0.3    | 25.3             | 1.1    |
|                          | 05/08/08                     | 05/15/08 | 1.2           | 0.3    | 19.3             | 1.0    |
|                          | 05/15/08                     | 05/22/08 | 0.6           | 0.3    | 2.6              | 0.5    |
|                          | 05/22/08                     | 05/29/08 | -0.1          | 0.2    | 0.1 <sup>2</sup> | 0.3    |
|                          | 05/29/08                     | 06/05/08 | 0.0           | 0.2    | 0.5 <sup>2</sup> | 0.3    |
|                          | 06/05/08                     | 06/12/08 | 0.8           | 0.3    | 11.3             | 0.8    |
|                          | 06/12/08                     | 06/19/08 | 1.0           | 0.3    | 25.8             | 1.1    |
|                          | 06/19/08                     | 06/26/08 | 1.8           | 0.4    | 34.5             | 1.4    |

<sup>1</sup>Operated by Shoshone-Bannock Tribes.<sup>2</sup>Vacuum pump seal problems were noted for these samples.

## Appendix B

**Table B-1. Results for all electret locations, second quarter, 2008.**

| Sample Location     | Net Corrected Exposure ( $\mu\text{R/h}$ ) | $\pm 2$ SD ( $\mu\text{R/h}$ ) |
|---------------------|--|--------------------------------|
| Arco                | 14.1                                       | 4.3                            |
| Craters             | 14.3                                       | 6.3                            |
| Rest Area           | 13.7                                       | 5.9                            |
| Van Buren           | 16.3                                       | 3.8                            |
| EFS                 | 13.9                                       | 2.9                            |
| Main Gate           | 13.2                                       | 3.2                            |
| Atomic City         | 13.5                                       | 4.9                            |
| Taber               | 17.0                                       | 9.9                            |
| Blackfoot           | 12.8                                       | 7.4                            |
| Ft. Hall            | 17.2                                       | 6.2                            |
| Idaho Falls         | 9.3  | 3.2                            |
| Mud Lake/ Terretton | 13.6                                       | 2.8                            |
| Monteview           | 10.9                                       | 1.4                            |
| Sand Dunes          | 14.8                                       | 0.3                            |
| Howe                | 11.3                                       | 0.3                            |
| Howe Met. Tower     | 14.9                                       | 7.5                            |
| MP276 -20           | 12.4                                       | 2.8                            |
| MP274 -20           | 9.7  | 2.8                            |
| MP272 -20           | 9.7  | 2.8                            |
| MP270 -20           | 13.8                                       | 2.8                            |
| MP268 -20           | 12.7                                       | 2.8                            |
| MP266 -20           | 12.4                                       | 2.8                            |
| MP264 -20           | 12.2                                       | 2.8                            |
| MP270 -20/26        | 12.7                                       | 2.8                            |
| MP268 -20/26        | 12.1                                       | 2.8                            |
| MP266 -20/26        | 12.1                                       | 2.8                            |
| MP263 -20/26        | 9.1  | 2.8                            |
| MP261 -20/26        | 12.9                                       | 2.8                            |
| MP259 -20/26        | 11.6                                       | 2.8                            |
| MFC (EBR II)        | 12.4                                       | 3.2                            |
| EBR I               | 12.0                                       | 3.0                            |
| RWMC                | 13.0                                       | 3.2                            |
| CFA                 | 16.5                                       | 4.1                            |
| CITRC (PBF)         | 12.5                                       | 3.7                            |

**Table B-1 continued.** Results for all electret locations, second quarter, 2008.

| <b>Sample Location</b>    | <b>Net Corrected Exposure (<math>\mu\text{R/h}</math>)</b> | <b><math>\pm 2</math> SD (<math>\mu\text{R/h}</math>)</b> |
|---------------------------|--|---|
| INTEC (ICPPI)             | 13.7   | 1.1   |
| ATR (TRA)                 | 15.7   | 3.4   |
| NRF                       | 8.6  | 14.2  |
| TAN                       | 12.0   | 1.0   |
| Mud Lake Bank of Commerce | 14.9   | 2.9   |
| MP43-33                   | 16.0   | 3.8   |
| MP41-33                   | 13.6   | 3.8   |
| MP39-33                   | 13.9   | 3.8   |
| MP37-33                   | 10.2   | 3.8   |
| MP35-33                   | 11.9   | 3.8   |
| MP33-33                   | 15.2   | 3.8   |
| MP31-33                   | 13.5   | 3.8   |
| MP29-33                   | 9.8  | 3.8   |
| MP27-33                   | 11.9   | 3.8   |
| MP25-33                   | 13.0   | 3.8   |
| MP23-33                   | 13.8   | 3.8   |
| Base of Howe              | 15.6   | 9.7   |
| Rover                     | 13.2   | 1.8   |
| Hamer                     | 14.0   | 1.9   |
| Sugar City                | 17.3   | 2.4   |
| Roberts                   | 14.5   | 4.3   |
| Big Southern Butte        | 10.4   | 2.0   |

## Appendix C

**Table C-1. List of volatile organic compounds (VOCs) analyzed for water samples. Minimum detectable concentrations (MDC) are expressed in µg/L.**

| Analyte                    | Minimum detectable concentrations (MDC)<br>(expressed in µg/L) |
|----------------------------|--|
| Benzene                    | 0.5  |
| Carbon tetrachloride       | 0.5  |
| Chlorobenzene              | 0.5  |
| 1,4-Dichlorobenzene        | 0.5  |
| 1,2-Dichlorobenzene        | 0.5  |
| 1,2-Dichloroethane         | 0.5  |
| 1,1-Dichloroethene         | 0.5  |
| cis-1,2-Dichloroethene     | 0.5  |
| trans-1,2-Dichloroethene   | 0.5  |
| 1,2-Dichloropropane        | 0.5  |
| Ethylbenzene               | 0.5  |
| Methylene Chloride         | 0.5  |
| Styrene                    | 0.5  |
| Tetrachloroethylene (PERC) | 0.5  |
| Toluene                    | 0.5  |
| 1,2,4-Trichlorobenzene     | 0.5  |
| 1,1,1-Trichloroethane      | 0.5  |
| 1,1,2-Trichloroethane      | 0.5  |
| Trichloroethylene          | 0.5  |
| Vinyl chloride             | 0.5  |
| Xylenes (total)            | 0.5  |
| Bromodichloromethane       | 0.5  |
| Dibromochloromethane       | 0.5  |
| Bromoform                  | 0.5  |
| Chloroform                 | 0.5  |
| Bromobenzene               | 0.5  |
| Bromochloromethane         | 0.5  |
| Bromomethane               | 0.5  |
| n-Butylbenzene             | 0.5  |
| sec-Butylbenzene           | 0.5  |
| tert-Butylbenzene          | 0.5  |
| Chloroethane               | 0.5  |
| Chloromethane              | 0.5  |
| 2-Chlorotoluene            | 0.5  |

**Table C.1 continued. List of volatile organic compounds (VOCs) analyzed for water samples. Minimum detectable concentrations (MDC) are expressed in µg/L.**

| Analyte                            | Minimum detectable concentrations (MDC)<br>(expressed in µg/L) |
|------------------------------------|--|
| 4-Chlorotoluene                    | 0.5  |
| 1,2-Dibromo-3-chloropropane (DBCP) | 1.0  |
| 1,2-Dibromoethane (EDB)            | 0.5  |
| Dibromomethane                     | 0.5  |
| 1,3-Dichlorobenzene                | 0.5  |
| Dichlorodifluoromethane            | 0.5  |
| 1,1-Dichloroethane                 | 0.5  |
| 1,3-Dichloropropane                | 0.5  |
| 2,2-Dichloropropane                | 0.5  |
| 1,1-Dichloropropene                | 0.5  |
| cis-1,3-Dichloropropene            | 0.5  |
| trans-1,3-Dichloropropene          | 0.5  |
| Hexachlorobutadiene                | 0.5  |
| Isopropylbenzene                   | 0.5  |
| p-Isopropyltoluene                 | 0.5  |
| Methyl Tert Butyl Ether (MTBE)     | 1.0  |
| Naphthalene                        | 1.0  |
| n-Propylbenzene                    | 0.5  |
| 1,1,1,2-Tetrachloroethane          | 0.5  |
| 1,1,2,2-Tetrachloroethane          | 0.5  |
| 1,2,3-Trichlorobenzene             | 1.25   |
| Trichlorofluoromethane             | 0.5  |
| 1,2,3-Trichloropropane             | 0.5  |
| 1,2,4-Trimethylbenzene             | 0.5  |
| 1,3,5-Trimethylbenzene             | 0.5  |