Chapter 4: Environmental Monitoring Programs – Eastern Snake River Plain Aquifer Monitoring

The eastern Snake River Plain Aquifer serves as the primary source of drinking water and crop irrigation in the upper Snake River Basin. This chapter presents the results of water monitoring conducted on and off the Idaho National Laboratory (INL) Site within the eastern Snake River Plain Aquifer hydrogeologic system. This includes the collection of water from the aquifer—including the drinking water wells—through downgradient springs along the Snake River where the aquifer discharges the water and an ephemeral stream (the Big Lost River), which flows through the INL Site and helps to recharge the aquifer.

The purpose of this monitoring program is to:

- Demonstrate that eastern Snake River Plain groundwater is protected from contamination from current INL Site activities
- Show that areas of known underground contamination from past INL Site operations are monitored and water-quality constituents are evaluated for increasing or decreasing trends
- Determine whether drinking water consumed by workers and visitors at the INL Site and by the public downgradient of the INL Site is safe
- Demonstrate that the Big Lost River, which occasionally flows through the INL Site, is not contaminated by INL Site activities before entering the aquifer via channel loss and playas on the north end of the INL Site.

Analytical results are compared to applicable regulatory guidelines for compliance and informational purposes. These include the following:

- State of Idaho groundwater primary and secondary constituent standards (IDAPA 58.01.11)
- Health-based maximum contaminant levels (MCLs) for drinking water according to the U.S. Environmental Protection Agency (EPA) (40 CFR 141)
- U.S. Department of Energy (DOE) Derived Concentration Standards (DCSs) for the ingestion of water (DOE 2022).

4.1 Organization of Monitoring Programs

Three organizations monitor the eastern Snake River Plain Aquifer hydrogeologic system:

- The U.S. Geological Survey (USGS) INL Project Office performs groundwater monitoring, analyses, and scientific studies to improve the understanding of the hydrogeological conditions affecting the movement of groundwater and contaminants in the eastern Snake River Plain Aquifer underlying and adjacent to the INL Site. USGS utilizes an extensive network of strategically placed monitoring wells on the INL Site and at locations throughout the eastern Snake River Plain.

  In 2025, USGS personnel collected and analyzed more than 1,200 samples for radionuclides and inorganic constituents, including trace elements, and another 24 samples for purgeable organic compounds. USGS INL Project Office personnel characterize the hydrology and geology of the eastern Snake River Plain and the eastern Snake River Plain Aquifer. Data gathered from these activities are used to create and refine hydrologic and geologic models of the aquifer, track contaminant plumes in the aquifer, and improve understanding of the complex relationships between the rocks, sediments, and water that compose the aquifer. The USGS INL Project Office publishes reports about their studies, which are available through the bibliography website.
- The Idaho Cleanup Project (ICP) contractor conducts groundwater monitoring at various waste area groups (WAGs) delineated on the INL Site for compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The ICP contractor also conducts drinking water monitoring at the Idaho Nuclear Technology and Engineering Center (INTEC), Radioactive Waste Management Complex (RWMC), and Naval Reactors Facility

(NRF) Deactivation and Decommissioning project. In 2025, the ICP contractor also monitored groundwater at Test Area North (TAN), the Advanced Test Reactor (ATR) Complex, INTEC, the Central Facilities Area (CFA), and the RWMC in WAGs 1, 2, 3, 4, and 7, respectively.

- The INL contractor monitors groundwater at the Materials and Fuels Complex (MFC), the ATR Complex, and the Remote-Handled Low-Level Waste (RHLLW) Disposal Facility. Groundwater compliance and surveillance monitoring at the ATR Complex and MFC are associated with effluent discharges and are presented in Chapter 3. As noted in Subsection 4.5.6, CERCLA groundwater monitoring for MFC in WAG 9 was discontinued in 2022. The RHLLW Disposal Facility does not generate or discharge liquid effluent. The 2025 RHLLW groundwater monitoring results are summarized in Subsection 4.6. The INL contractor also monitors the drinking water at eight INL Site facilities: the ATR Complex, CFA, the Critical Infrastructure Test Range Complex, the Experimental Breeder Reactor-I (EBR-I), the Gun Range, the Main Gate, MFC, and TAN/Contained Test Facility (CTF).

  The INL contractor also collects drinking water samples from offsite locations. Natural surface waters on and off the INL Site are sampled for surveillance purposes as well. This includes the Big Lost River, which occasionally flows through the INL Site, and springs along the Snake River that are downgradient from the INL Site.

Details of the integrated approach used by these three organizations for their aquifer, drinking water, and surface water compliance and surveillance monitoring programs may be found in the "Idaho National Laboratory Site Environmental Monitoring Plan" (DOE-ID 2023a), the "Technical Basis for Environmental Monitoring and Surveillance at the Idaho National Laboratory Site" (DOE-ID 2023b), the "Idaho National Laboratory Groundwater Monitoring and Contingency Plan Update" (DOE-ID 2021a) and "Field methods, quality-assurance, and data management plan for water-quality activities and water-level measurements, Idaho National Laboratory, Idaho" (Bartholomay et al. 2021).

4.2 Hydrogeologic Data Management

Over the years, hydrogeologic data at the INL Site has been collected by organizations such as the USGS and INL contractors. To ensure this information is well organized and accessible, several data management systems are used:

- *Environmental Data Warehouse* – Stores long-term environmental data collected by INL Site contractors and USGS, including sampling results and well information. These data support compliance reporting, trend analysis, and modeling.
- *Hydrogeologic Data Repository* – Provides technical information for site investigations and environmental studies, including well construction details, geophysical logs, aquifer characteristics, and soil data.
- *USGS Water Data for the Nation* – Houses water-related data collected by USGS at the INL Site, making it publicly available. Data is also available in the USGS INL Project Office data repository.

4.3 USGS Radiological Groundwater Monitoring at the INL Site

Historical waste disposal practices have produced localized areas of radiochemical contamination in the eastern Snake River Plain Aquifer beneath the INL Site. The USGS collects samples annually from select wells at the INL Site for tritium, strontium-90 (^{90}Sr), gross alpha, gross beta, gamma spectrometry analyses, and plutonium and americium isotope activities. When USGS installs new monitoring wells, a sample is collected for uranium isotope activity and stable isotope characterization as well. Periodically, USGS collects samples for analysis of iodine-129 (^{129}I). The most recent interpretation of radiochemical trends in groundwater, from 1989 through 2021, are summarized in Treinen et al. (2024a; 2024b). Results for wells sampled in 2025 are available here (USGS 2026).

Presently, ^{90}Sr is the only radionuclide that continues to be detected by the USGS above the primary constituent standard (PCS) in some surveillance wells at TAN and between INTEC and CFA. Other radionuclides (e.g., gross alpha) have been detected above the PCS in wells monitored at individual WAGs.

Tritium. Because tritium is equivalent in chemical behavior to hydrogen—a key component of water—it has formed the largest plume of any of the radiochemical pollutants at the INL Site. The lateral extent of the tritium contamination area, based on the most recent interpreted USGS data (2021), are shown in figure 15 of Treinen et al. (2024a). The area of elevated tritium concentrations near CFA likely represents water originating at INTEC some years earlier when larger amounts of tritium were disposed. This source is further supported by the fact that there are no known sources of tritium contamination in groundwater at CFA.

Two monitoring wells downgradient of the ATR Complex (e.g., USGS-065) and INTEC (e.g., USGS-114) have continually shown the highest tritium concentrations in the aquifer over the past 20 years. For this reason, these two wells are considered representative of maximum concentration trends in the rest of the aquifer. The concentration of tritium in USGS-065 near the ATR Complex decreased slightly from 1,230 ± 80 pCi/L in 2024 to 980 ± 80 pCi/L in 2025. The tritium concentration in USGS-114, which is south of INTEC, increased slightly from 3,250 ± 130 pCi/L in 2024 to 3,400 ± 100 pCi/L in 2025.

The Idaho PCS for tritium (20,000 pCi/L) in groundwater is the same as the EPA MCL for tritium in drinking water. The values in Wells USGS-065 and USGS-114 dropped below this limit in 1997 due to radioactive decay (e.g., tritium has a half-life of 12.33 years), discontinuation of tritium disposal, advective dispersion, and dilution within the aquifer. An evaluation of long-term tritium trends at monitoring wells can be found in Treinen et al. (2024a) and Fisher et al. (2021).

Strontium-90. The configuration and extent of ^{90}Sr in groundwater, based on the latest published USGS data, are shown in Treinen et al. (2024a). The contamination originated at INTEC from the historical injection of wastewater. All ^{90}Sr at the ATR Complex was disposed to infiltration ponds in contrast to the direct injection that occurred at INTEC. At the ATR Complex, ^{90}Sr is retained in surficial sedimentary deposits, interbeds, and perched groundwater zones.

The ^{90}Sr trends from 1989 to 2021 are all showing decreasing trends in Wells USGS-047, USGS-057, and USGS-113, which are all located at or downgradient from the INTEC facility. Concentrations in Well USGS-047 have varied throughout time but are consistent with a decreasing trend with a concentration of 10.5 ± 0.9 pCi/L in 2025. Concentrations in Wells USGS-057 and USGS-113 have generally decreased during this period, with concentrations of 5.5 ± 0.9 and 3.9 ± 0.8 pCi/L, respectively.

Summary of other USGS Radiological Groundwater Monitoring. In 2025, concentrations of cesium-137 (^{137}C), plutonium-239/240 ($^{239/240}$Pu), and americium-241 (^{241}Am) were less than the reporting level, which is three times the standard deviation (3*s*) provided by the laboratory, in all sampled wells or surface water locations.

Gross beta radioactivity exceeded the reporting level in 46 of the 71 sampled sites in 2025, while concentrations ranged from 2.2 ± 0.7 to 432 ± 24 pCi/L in 2025 (USGS 2026). Gross alpha radioactivity exceeded the reporting level in only one of 73 sites sampled.

4.4 USGS Non-radiological Groundwater Monitoring at the INL Site

USGS collects samples annually from select wells at the INL Site for chloride, sulfate, sodium, fluoride, nitrate, chromium, and other trace elements and volatile organic compounds (VOCs). Treinen et al. (2024a) provides a detailed discussion of the results for samples collected during 2019–2021. A concentration of chromium at the MCL of 100 µg/L was observed in Well USGS-065 in 2009 (Fisher et al. 2021), and while its concentration has since been below the MCL, this concentration increased to 98.2 µg/L in 2025. However, this well has shown a long-term decreasing chromium trend overall (Fisher et al. 2021, Appendix 7).

Concentrations of chloride, nitrate, sodium, and sulfate historically have been above the background concentrations in many wells at the INL Site. Current concentrations of chloride, nitrate, sodium, and sulfate for all INL wells monitored by USGS can be found here.

VOCs are present in water from the eastern Snake River Plain Aquifer because of historical waste disposal practices at the INL Site. Products containing VOCs were used for degreasing, decontamination, and other activities at INL Site facilities. USGS sampled purgeable organic compounds in groundwater at the INL Site during 2025. Samples from 25 groundwater monitoring wells were collected and submitted to the USGS National Water Quality Laboratory in Lakewood, Colorado; the samples were analyzed for 61 purgeable organic compounds. USGS reports describe the methods used to collect the water samples and ensure sampling and analytical quality (Mann 1996; Bartholomay et al. 2003; Knobel et al. 2008; Bartholomay et al. 2021).

Historically, concentrations of VOCs in water samples from several wells at and near the RWMC exceeded the reporting levels (Table 8; Treinen et al. 2024a). However, concentrations for all VOCs, except trichloroethene, were less than the MCL for drinking water (40 CFR 141, Subpart G). The RWMC production well was monitored monthly for tetrachloromethane during 2025 (except October and November). Concentrations were below the MCL of 5 µg/L during the 10 months that data were available.

The only VOC MCL exceedance among the 25 sample sites occurred at GIN 2, near the TAN facility, where trichloroethene was detected at 11.2 µg/L, exceeding the MCL of 5 µg/L.

4.5 Comprehensive Environmental Response, Compensation, and Liability Act Groundwater Monitoring During 2025

CERCLA activities at the INL Site are divided into WAGs that roughly correspond to the major facilities, with the addition of the INL Sitewide WAG 10. The following subsections provide an overview of the groundwater sampling results. More detailed discussions of CERCLA groundwater sampling can be found in the WAG-specific monitoring reports within the CERCLA Administrative Record at Administrative Record Information Repository (ARIR) Home – ARIR. WAG 8 is managed by NRF and is not discussed in this report.

4.5.1 Summary of Waste Area Group 1 Groundwater Monitoring Results

Groundwater is monitored at WAG 1 to evaluate the progress of remedial actions at TAN. The VOC groundwater plume at TAN has been divided into three zones based on the 1997 trichloroethylene (TCE) concentrations with three different remedy components, which work together to remediate the entire VOC plume. The monitoring program and results are summarized by plume zone in the following paragraphs.

Hot Spot Zone (Historical TCE Concentrations Exceeding 20,000 µg/L). In situ bioremediation (ISB) was used in the hot spot near Well TSF-05 to create conditions favorable for naturally occurring anaerobic bacteria in the aquifer to break down chlorinated solvents, principally TCE. The hot spot concentration was defined using TCE data from 1997, which is identified in Figure 4-1, and is not reflective of current concentrations, as shown in Figure 4-2. With regulatory agency concurrence, an ISB rebound test began in July 2012 to determine whether the residual TCE source in the aquifer had been sufficiently treated. Currently, the ISB rebound test has been split into two components: (1) an ISB rebound test for the area near the former Injection Well TSF-05; and (2) ISB activities to treat the TCE source affecting Well TAN-28.

Data collected in 2025 during the ISB rebound test for the area near former injection Well TSF-05 indicated that anaerobic conditions created by ISB were still present in the hot spot area, and that TCE concentrations were near or below the MCLs in the wells near the former injection Well TSF-05, as shown in Figure 4-2. After background aquifer conditions are re-established, the effectiveness of the ISB part of the remedy will be re-evaluated (DOE-ID 2026a). To address the source of TCE in Well TAN-28, continued dual ISB injections into Wells TAN-2336 and TAN-37A were made in order to increase the efficiency of the injection strategy. During 2025, a total of 15 totes of amendment (or 3,750 gal) were injected over the course of four injection events into these two wells. Four injections with a total of nine totes of amendment (or 2,250 gal) were performed at Well TAN-2336, while four additional injections with a total of six totes of amendment (or 1,500 gal) went into Well TAN-37A (DOE-ID 2026a). Despite some variations, TCE concentrations have declined in Well TAN-28 due to the ISB injections, which were aimed at treating the TCE source. ISB injections will continue into these wells until it can be determined that the TCE source in Well TAN-28 has been successfully treated and a transition to a rebound test for the TCE source in this well can be made. Despite the decrease of TCE concentrations within TAN-28, concentrations remain high within TAN-29 (DOE-ID 2026a).

Medial Zone (Historical TCE Concentrations Between 1,000 and 20,000 µg/L). A pump and treat system have been used in the medial zone, which extracts contaminated groundwater, circulates the groundwater through air strippers to remove VOCs like TCE, and reinjects treated groundwater back into the aquifer. Generally, throughout 2025, the Pump and Treat Facility operated Monday through Thursday, except for shutdowns due to maintenance. All Pump and Treat Facility compliance samples during 2025 were below the discharge limits. The TCE concentrations used to define the medial zone (e.g., 1,000 to 20,000 µg/L) are based on data collected in 1997, which is before remedial actions began, as shown in Figure 4-1, and do not reflect the current concentrations shown in Figure 4-2. In 2025, none of the wells were above the concentration of 1,000 µg/L used historically to define the medial zone. The concentrations of TCE in Wells TAN-33, TAN-36, and TAN-44 near the Pump and Treat Facility are used as indicators of TCE concentrations migrating past the Pump and Treat Facility extraction wells into the distal zone. During 2025, the TCE concentrations for Wells TAN-33, TAN-36, and TAN-44 ranged from 8.66 to 29.3 µg/L (DOE-ID 2026a).

Distal Zone (Historical TCE Concentrations Between 5 and 1,000 µg/L). Monitored natural attenuation is the remedial action for the distal zone of the plume, as shown in Figure 4-1. Monitored natural attenuation is the sum of physical, chemical, and biological processes that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of groundwater contaminants. Institutional controls are in place to protect current and future users from the health risks associated with groundwater contamination until the concentrations decline through natural attenuation to levels below the MCL. The TCE data collected in fiscal year (FY) 2025 from the distal zone wells indicate that all wells are consistent with the model predictions or show significantly decreasing trends, which are calculated to meet the

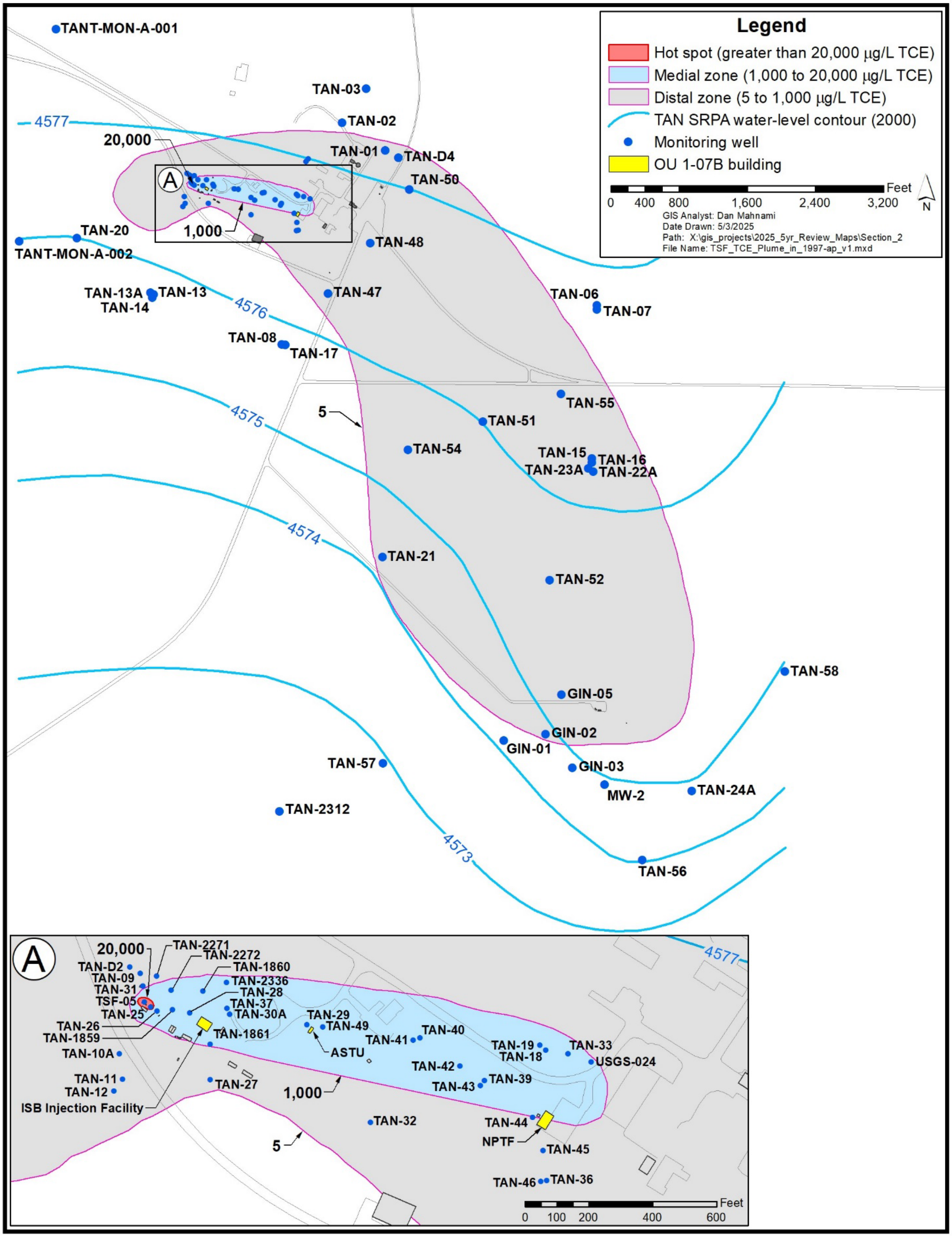

Figure 4-1. TCE plume at TAN in 1997.

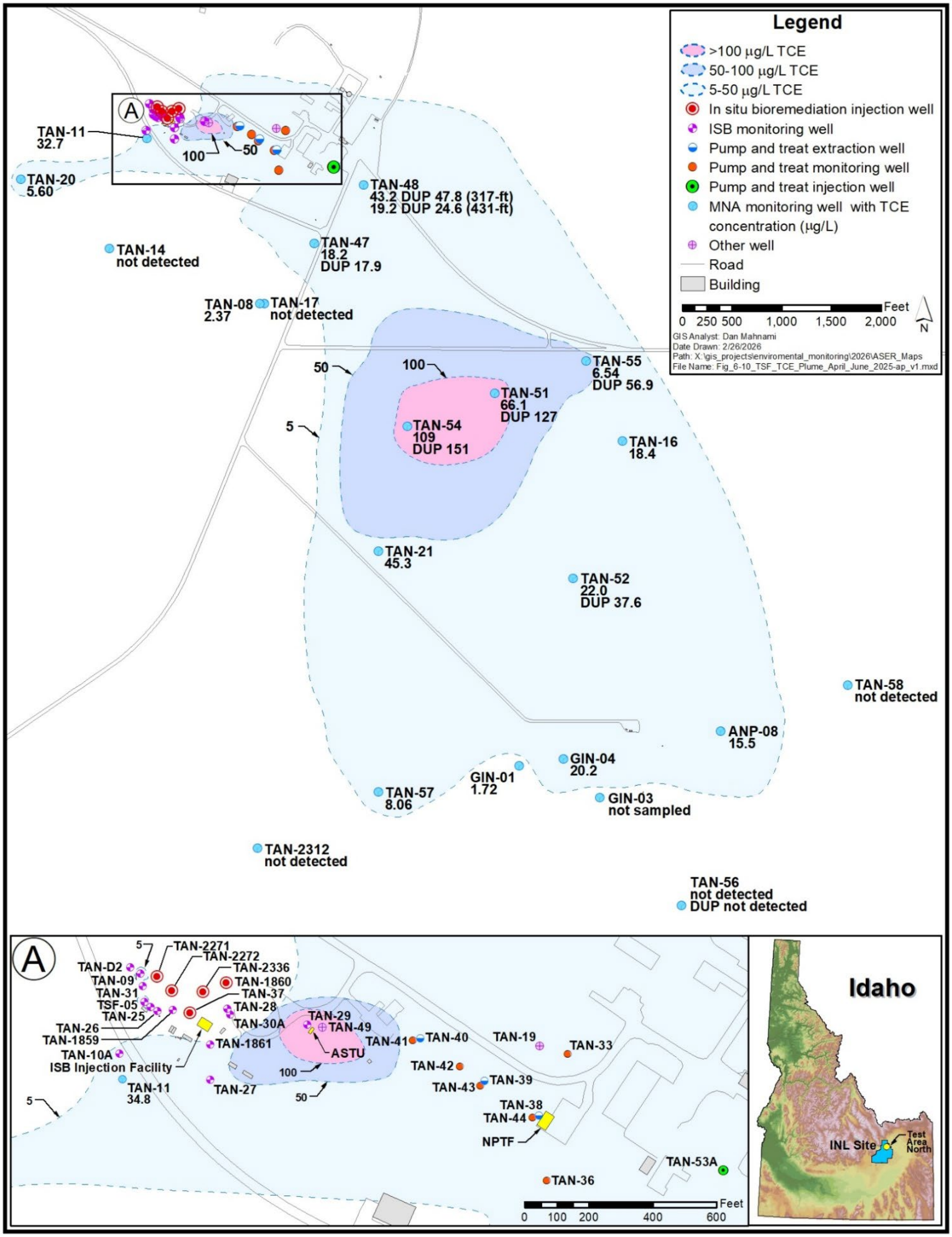

Figure 4-2. Distribution of TCE in the Snake River Plain Aquifer from April to June 2025.

remedial action objective of all wells below the MCL by 2095 (DOE-ID 2026a). TCE data from the plume expansion wells suggest that the plume expansion is currently within the limits allowed in the Record of Decision Amendment (DOE-ID 2001).

***Radionuclide Monitoring*.** In addition to the VOC plume, ^{90}Sr, ^{137}Cs, tritium, and uranium-234 (^{234}U) are listed as contaminants of concern in the Record of Decision Amendment (DOE-ID 2001). Concentrations of ^{90}Sr and ^{137}Cs were detected in FY 2025, with concentrations ranging from 15.6 to 727 pCi/L for ^{90}Sr and 778 to 4,960 pCi/L for ^{137}Cs. These concentrations are expected to naturally decline below their respective MCLs before 2095. However, wells in the source/ISB area currently show elevated concentrations of ^{90}Sr and ^{137}Cs compared with the levels prior to starting ISB. The elevated ^{90}Sr and ^{137}Cs concentrations are due to enhanced mobility created by elevated concentrations of competing cations (e.g., calcium, magnesium, sodium, potassium) for adsorption sites in the aquifer. The elevated cation concentrations are due to ISB activities to treat VOCs. As competing cation concentrations decline toward background conditions, ^{90}Sr and ^{137}Cs are trending lower. The radionuclide concentrations are expected to continue to decrease, and concentration trends will continue to be evaluated to determine whether the remedial action objective of declining below MCLs by 2095 will be met. Sampling will be conducted for ^{234}U after ISB conditions dissipate because ISB conditions suppress the uranium concentrations (DOE-ID 2026a).

4.5.2 Summary of Waste Area Group 2 Groundwater Monitoring Results

Groundwater samples were collected from seven aquifer wells to monitor WAG 2 in the ATR Complex during 2025. All wells were sampled and analyzed for ^{90}Sr, gamma-emitting radionuclides (e.g., the target analyte is cobalt-60), tritium, and chromium (total, filtered) in accordance with the groundwater monitoring plan (DOE-ID 2025). The results for the October 2025 sampling event will be included in the FY 2026 Annual Report for WAG 2 (DOE-ID 2026b). The MCL for chromium was exceeded within TRA-07 for total chromium with a result of 214 µg/L, and within USGS-065 for filtered chromium, with a result of 105 µg/L, and total chromium with a result of 110 µg/L (DOE-ID 2026b). The exceedance of the chromium MCL within TRA-07 is likely due to increased turbidity from bailing the well. The increased chromium concentrations within USGS-065 are likely due to continued chromium fluxes resulting from historical discharges to the cold waste pond.

Tritium was the only radionuclide analyte detected in the aquifer and was below the MCL of 20,000 pCi/L in all sampled wells. The highest tritium concentration was 2,150 pCi/L in Well TRA-07 (DOE-ID 2026b). Chromium and tritium concentrations in the aquifer have continued to decline faster than predicted by the WAG 2 models used for the Operable Unit 2-12 Record of Decision and the revised modeling performed after the first 5-year review (DOE-NE-ID 2005).

The October 2025 eastern Snake River Plain Aquifer water table map prepared for the vicinity of the ATR Complex is to be included in the WAG 2 FY 2026 Annual Report (DOE-ID 2026b).

4.5.3 Summary of Waste Area Group 3 Groundwater Monitoring Results

At INTEC, groundwater samples are collected from 17 Snake River Plain Aquifer monitoring wells during odd-numbered years and from 14 wells during even-numbered years. During the reporting period, all required wells were sampled. Groundwater samples were analyzed for a suite of radionuclides and inorganic constituents. The data are summarized in the 2025 Annual Report (DOE-ID 2026c).

Strontium-90, technetium-99 (^{99}Tc), and nitrate (as N) exceeded their respective drinking water MCLs in one or more of the eastern Snake River Plain Aquifer monitoring wells at or near INTEC, with ^{90}Sr exceeding its MCL by the greatest margin. Strontium-90 was detected at 13 monitoring well locations sampled during the reporting period. Concentrations of ^{90}Sr remained above the MCL (e.g., 8 pCi/L) at four of the well locations sampled. During 2025, the highest level of ^{90}Sr in the eastern Snake River Plain Aquifer groundwater was measured at monitoring Well USGS-047 (9.81 ± 0.963 pCi/L), which is located south (downgradient) of the former INTEC injection well. All wells sampled in 2025 showed stable or declining trends from the previous reporting period.

Technetium-99 was detected at eight monitoring wells. During 2025, the highest ^{99}Tc level in eastern Snake River Plain Aquifer groundwater was located at Well ICPP-MON-A-230 (1,340 ± 78.2 pCi/L), which lies north of the INTEC Tank Farm. All sampled wells showed stable or declining trends from the previous reporting period.

Nitrate was detected in all monitoring wells sampled during this reporting period. During 2025, monitoring Well ICPP-20201-AQ was the only location to exceed the nitrate concentration MCL of 10 mg/L with an elevated nitrate level reported at 14 mg/L. The presence of nitrate concentrations in groundwater southeast of the tank farm is attributed primarily to impacts from tank farm releases and residual vadose-zone sources. These nitrate concentrations were similar or slightly lower than those observed in previous years.

Tritium was detected at most of the sampled wells, but none of the groundwater samples exceeded the tritium MCL (20,000 pCi/L). The highest tritium concentrations in groundwater were reported at Well USGS-051 (1,900 ± 230 pCi/L), situated southeast of INTEC. Tritium concentrations have declined at nearly all locations over the past few years.

During the reporting period, no plutonium isotope analyses were performed because the current monitoring plan identifies the contingency for plutonium analysis if gross alpha exceeds 15 pCi/L. Uranium-238 (^{238}U) was detected at all eastern Snake River Plain Aquifer well locations, with the highest concentration at Well ICPP-MON-A-230 (1.27 ± 0.19 pCi/L). Uranium-234 was detected in all groundwater samples as well, with the greatest concentrations of 2.12 ± 0.271 pCi/L measured at Well ICPP-MON-A-230. Uranium-234 is the daughter product (from alpha decay) of the long-lived, naturally occurring ^{238}U. All uranium results for the other wells are consistent with background concentrations reported for Snake River Plain Aquifer groundwater. The $^{234}U/^{238}U$ ratio for all samples fell within the background range of 1.5 to 3.1 (Roback et al. 2001), except for monitoring Well USGS-057 at 3.59 due to no detection of ^{238}U.

Uranium-235 (^{235}U) was detected at three of the 17 sample locations. The highest reported level at any sample location for ^{235}U was measured at ICPP-2021-AQ (0.227 ± 0.0648 pCi/L). Uranium concentrations reported in pCi/L were converted to mass-basis concentrations (µg/L) for comparison to the total uranium MCL of 30 µg/L. The highest total uranium concentration in the groundwater samples was 3.8 µg/L, which was sampled at Well ICPP-MON-A-230. Thus, the uranium results for all Snake River Plain Aquifer wells were well below the total uranium MCL.

4.5.4 Summary of Waste Area Group 4 Groundwater Monitoring Results

The WAG 4 groundwater monitoring consists of two different components: (1) monitoring the CFA landfill, and (2) monitoring a nitrate plume south of CFA. The wells at the CFA landfills are monitored to determine potential impacts from the landfills, while the nitrate plume south of CFA is monitored to evaluate nitrate trends. Groundwater monitoring for the CFA landfills consisted of sampling seven wells for metals (filtered), VOCs, and anions (nitrate, chloride, sulfate) and two wells for VOCs only, in accordance with the long-term monitoring plan (DOE-ID 2018). Four wells south of CFA were sampled for nitrate, sulfate, and chloride to monitor the CFA nitrate plume.

In 2025, no analytes exceeded the EPA MCL. The pH secondary MCL was exceeded in one well. The elevated pH in this well was due to grout placed beneath the well screens during well construction. A complete list of the groundwater sampling results is included in the FY 2025 CFA annual monitoring report (DOE-ID 2026d).

In the CFA nitrate plume monitoring wells south of CFA, Well CFA-MON-A-002 continued to exceed the nitrate groundwater MCL of 10 mg/L-N. The nitrate concentration within Well CFA-MON-A-002 remained mostly stable with a reading of 13.5 mg/L-N in 2024 and 13.5 mg/L-N in 2025. However, Well CFA-MON-A-002 is consistent with a declining trend that began in 2006. The nitrate concentration of 7.90 mg/L-N in Well CFA-MON-A-003 is below the MCL and reveals a slight downtrend (DOE-ID 2026d).

Water level measurements taken at CFA showed a decrease on the average of 1.33 ft from August 2024 to August 2025. This is in contrast to the increase that was seen in 2024.

4.5.5 Summary of Waste Area Group 7 Groundwater Monitoring Results

Groundwater samples collected from nine monitoring wells near and downgradient of RWMC in May 2025 were analyzed for radionuclides, inorganic constituents, and VOCs. Carbon tetrachloride was the only analyte that slightly exceeded its MCL (5 µg/L) at 5.05 µg/L in Well M15S. All other analytical results were consistent with historical monitoring with no MCL exceedances or notable trends. Detailed information regarding the monitoring network, groundwater levels, and sampling results data can be found in Section 4 of the "Operable Unit 07-13/14 Operations, Maintenance and Monitoring Report for Fiscal Year 2025" (DOE-ID 2026e) at Document Details – ARIR.

4.5.6 Summary of Waste Area Group 9 Groundwater Monitoring Results

Groundwater monitoring at MFC under the WAG 9 Record of Decision was conducted from 1998 through 2022 to meet CERCLA requirements (ANL-W 1998). As noted in DOE-ID (2015), data collected during this period confirmed that:

- Contaminant concentrations never exceeded groundwater or drinking water standards.
- Remedies achieved their intended outcomes.
- No discernible impacts from past or current MFC activities have been detected.

CERCLA-specific monitoring was formally discontinued in 2022 (DOE-ID 2021b). Current groundwater monitoring at select wells continues only to meet reuse permit and DOE surveillance requirements; results are discussed in Chapter 3 monitoring.

4.5.7 Summary of Waste Area Group 10 Groundwater Monitoring Results

In accordance with the Operable Unit 10-08 monitoring plan (DOE-ID 2021c), groundwater samples are collected every two years. In 2025, seven wells and three intervals from two Westbay wells were sampled. Groundwater samples from all wells were analyzed for chloride, nitrate/nitrite as nitrogen, gross alpha, and gross beta. Sulfate and VOCs were collected from a subset of Operable Unit 10-08 monitoring wells. None of the above analytes exceeded EPA MCLs or secondary MCLs (DOE-ID 2026f). However, concentrations of nitrate are showing increasing trends, and a rise in gross beta within USGS-009 was noted. The elevated levels in nitrate and gross beta still remain below their respective MCLs.

4.6 Remote-Handled Low-Level Waste Disposal Facility

The RHLLW Disposal Facility does not generate or discharge liquid effluents; however, the INL contractor does monitor groundwater at the RHLLW Disposal Facility to demonstrate compliance with DOE O 435.1, "Radioactive Waste Management," the surveillance requirements of NE O 458.1A, "Radiation Protection of the Public and the Environment," and IDAPA 58.01.11, "Ground Water Quality Rule." Samples were collected from one up-gradient and two down-gradient monitoring wells in 2025 in accordance "Monitoring Plan for the INL RHLLW Disposal Facility" (INL 2024). The monitoring results are presented in the "Annual Summary Report for the Remote-Handled Low-Level Waste Disposal Facility – FY 2025" (INL 2026). Aquifer water samples were analyzed for indicator-analytes gross alpha and gross beta, and for target analytes carbon-14 (^{14}C), tritium, ^{129}I, and ^{99}Tc. Tritium was detected in all three aquifer wells at levels less than the drinking water MCL, and while concentrations in each well increased from the previous year, the long-term data continue to exhibit a decreasing trend. Gross beta was positively detected in all three aquifer wells while gross alpha was positively detected in two wells. All gross alpha and gross beta results were well below drinking water MCLs. Carbon-14, ^{129}I, and ^{99}Tc were not detected in any samples. All results are consistent with concentrations in the aquifer established prior to facility completion (INL 2017).

While not required for compliance at the RHLLW Disposal Facility, facility performance is monitored by collecting and analyzing soil-pore water samples, where sufficient water is present, from vadose-zone lysimeters installed in native materials adjacent to and below the base of the vault arrays. In 2025, samples were collected from all six lysimeters specified in the monitoring plan for the post-baseline monitoring phase and analyzed for gross alpha, gross beta and tritium. Gross alpha and gross beta were positively identified in samples from the five lysimeters that produced enough water for a gross alpha and gross beta analysis. Tritium was positively identified in one lysimeter (HFEF-South), which is consistent with the previous year. The tritium concentration in this lysimeter continues to decline from an unexpectedly high result in 2020. For comparison purposes, the 2025 tritium result was well below the drinking water MCL. All 2025 performance monitoring sample results were less than action levels and within the bounds identified in the baseline data summary report (INL 2023). The 2025 performance monitoring results are presented in INL (2026).

4.7 Onsite Drinking Water Sampling

The INL Site contractors monitor drinking water to ensure it is safe and meets all federal and state standards under the Safe Drinking Water Act (40 CFR 141, 142). Parameters are sampled according to a 9-year monitoring cycle, which identifies the frequency and the specific classes of contaminants to monitor at each drinking water source. Parameters with primary MCLs must be monitored at least once every 3 years, unless a waiver is granted for reduced monitoring every 6 or 9 years. Many parameters require more frequent sampling during an initial period to establish a baseline, and a subsequent monitoring frequency is determined from the baseline results.

The INL Site has 11 drinking water systems. Of these, the INL contractor monitors eight systems, while the ICP contractor monitors three systems. NRF also monitors a drinking water system; however, the results are not included in this annual report but are addressed in the "Naval Reactors Facility Environmental Monitoring Report for Calendar Year 2025" (FMP 2026). According to IDAPA 58.01.08, INL Site drinking water systems are classified as either non-transient or transient, non-community water systems. The four INL contractor transient, non-community water systems are located at Critical Infrastructure Test Range Complex, EBR-I, the Gun Range, and the Main Gate. The four remaining INL contractor water systems are classified as non-transient, non-community water systems. They are located at the ATR Complex, CFA, MFC, and TAN/CTF. Two of the ICP contractor systems, located at INTEC and RWMC, are classified as non-transient, non-community water systems, while the NRF Deactivation and Decommissioning Facility is classified as a transient, non-community water system. The NRF Deactivation and Decommissioning Facility is separate from the NRF drinking water system and was managed by ICP until May 1, 2025, at which time DEQ determined that it no longer met the definition of a Public Water System pursuant to IDAPA 58.01.08.

As required by the state of Idaho, INL Site contractors drinking water programs use EPA-approved (or equivalent) analytical methods to analyze drinking water in compliance with the current editions of IDAPA 58.01.08 and 40 CFR Parts 141–143. State regulations also require that analytical laboratories be certified by Idaho or another state whose certification is recognized by Idaho. Idaho Department of Environmental Quality (DEQ) oversees the certification program and maintains a list of approved laboratories.

4.7.1 INL Site Drinking Water Monitoring Results

During 2025, the INL contractor collected 83 routine compliance samples from the seven INL-operated drinking water systems. The eighth system, Main Gate, was not active during 2025 because a new disinfection system was being installed to improve water quality; therefore, no compliance samples were collected. Semiannual sampling was conducted at all seven water systems for gross alpha, gross beta, ^{90}Sr, and tritium. In addition, CFA was sampled for ^{129}I due to its location downgradient of the plume near INTEC. In addition to routine samples, the INL contractor collected 198 surveillance bacteriological, radiological, and per- and polyfluoroalkyl substances (PFAS) samples.

The ICP contractor collected routine compliance samples, from the ICP operated drinking water systems. ICP also collected 198 surveillance bacteriological, PFAS, synthetic organic compound, and VOC samples. Semiannual gross alpha and gross beta samples were obtained from both the INTEC and RWMC drinking water systems, and one tritium sample was collected from each system.

All INL Site drinking water systems remain well below their respective MCLs, and no upward trends have been observed over the past 5 years. Nitrate sampling was conducted across all systems, and every result was below the MCL of 10 mg/L; the highest concentration was 3.25 mg/L at CFA. Samples collected by INL Site contractors for total trihalomethanes and haloacetic acids at the ATR Complex, CFA, INTEC, MFC, RWMC, and TAN/CTF were below the MCLs of 80 ppb and 60 ppb, respectively. These results indicate that disinfection byproduct levels remain low and consistent with historical data.

Gross alpha was detected by the INL Site contractors in all INL Site drinking water systems except EBR-1, and all results were well below the MCL of 15 pCi/L. The highest result was 3.31 ± 1.09 pCi/L at CFA, consistent with previous years. Gross beta was detected by the INL Site contractors in all drinking water systems, with results well below the MCL of 50 pCi/L. The highest reported result was 7.4 ± 1.17 pCi/L at CFA.

INL Site contractors did not detect ^{90}Sr in any drinking water systems. Iodine-129 was also not detected at CFA.

The INL contractor detected tritium in five drinking water samples. Tritium concentrations remained below the MCL of 20,000 pCi/L at all systems. Results ranged from 375 ± 93 pCi/L at the Gun Range to 1,610 ± 206 pCi/L at CFA. While CFA has historically shown higher tritium concentrations, its levels have steadily declined over the past 25 years, from a peak of 12,500 pCi/L in the year 2000 to approximately 1,950 pCi/L in recent years. The ICP contractor did not detect tritium in either drinking water system. Since all INL-operated water systems are categorized as public water systems, data for all regulated (non-radiological) constituents are shown on the Idaho DEQ's PWS Switchboard.

In 2024, the INL Site contractors completed the 5-year baseline PFAS sampling effort, which included sampling all operating potable water wells and all entry points to the distribution system. In 2025, the INL contractor collected PFAS samples from ATR, CFA, and TAN/CTF as part of initial monitoring requirements. Due to ongoing construction of drinking water wells at MFC, initial monitoring sampling will be conducted in 2026. In 2025, the ICP contractor collected PFAS samples from two drinking water wells at INTEC and one well at RWMC. All sample results at ICP facilities were below the MCLs for PFAS. There were no detections of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) at ATR, CFA, and TAN/CTF. Both CFA and TAN/CTF had detections of perfluorohexane sulfonic acid (PFHxS). All sample results at the INL Site were below the final MCLs for PFAS, and levels were consistently low throughout the baseline sampling and initial monitoring periods.

4.8 Offsite Drinking Water Sampling

The public drinking water source in southeastern Idaho is primarily derived from groundwater. Due to the potential for contaminant migration beyond the INL Site boundary, surveillance monitoring of radioactivity in offsite drinking water systems are conducted by the INL contractor to meet NE O 458.1A. Samples are collected from municipal water sources that have been through a water treatment facility or a well that is used for drinking water. Samples collected offsite are included as drinking water samples but are not used for compliance with drinking water regulations. Instead, media results are used to assess groundwater quality. Public water system owners and operators are responsible for complying with state and federal regulations to monitor water quality.

4.8.1 Offsite Drinking Water Monitoring Results

As part of the offsite surveillance monitoring program, drinking water samples were collected off the INL Site for radiological analyses in 2025. Two downgradient locations of the INL Site at Shoshone and Minidoka, and one upgradient location at Mud Lake, in May and November 2025. Samples were collected at Atomic City, Craters of the Moon, Howe, Idaho Falls, and the public rest area on Highway 20/26 as well. A total of 40 samples, including duplicates and controls, were collected and analyzed for gross alpha, gross beta, and tritium during 2025.

Gross alpha activity was detected in several locations, as observed in Table 4-1. The concentrations were similar to previous results from offsite drinking water sampling.

Table 4-1. Gross alpha concentrations detected in offsite drinking water samples collected by the INL contractor in 2025.

LOCATION	SAMPLE RESULTS (pCi/L)[a]	
	GROSS ALPHA[b]	
	SPRING	FALL
Atomic City	ND	1.09 ± 0.31
Craters of the Moon	2.53 ± 0.69	ND
Howe	1.89 ± 0.61	ND

a. Results ≥ 3σ are considered to be statistically positive.
b. EPA MCL = 15 pCi/L.
c. ND = not detected.

Gross beta activity was detected in all offsite drinking water samples, except for the control samples and a sample collected from Howe on May 14, 2025. The concentrations were similar to previous results from offsite drinking water sampling. Natural levels of radioactive decay products of thorium and uranium exist in the Snake River Plain Aquifer and are likely the source of the measured concentrations. The highest reported gross beta result for offsite drinking water was 6.00 ± 0.80 pCi/L in the sample collected from Mud Lake on May 13, 2025.

Tritium was not detected in any offsite drinking water samples.

4.9 Surface Water Sampling

Two primary water sources could potentially be affected by activities on the INL Site: (1) the eastern Snake River Plain Aquifer (ESRPA) and (2) the Big Lost River. The ESRPA serves as the region's primary source of drinking water and irrigation supply, supporting municipal, agricultural, and aquaculture uses. In alignment with NE O 458.1A, INL's environmental monitoring program places elevated importance on these waters because the Order requires DOE activities to protect groundwater resources, to ensure that liquid effluents are managed in a manner that prevents contamination, and to verify that radionuclides from DOE operations do not cause public or private drinking-water systems to exceed MCLs established in 40 CFR 141. Monitoring of the ESRPA, downgradient springs, and surface waters such as the Big Lost River provides the necessary data to demonstrate that current operations do not degrade water quality and that these vital water resources remain fully protective of public health and the environment.

The Big Lost River is an intermittent, ephemeral body of water that flows only during periods of high-spring runoff and when the Mackay dam, which impounds the river upstream of the INL Site, releases water. The river flows through the INL Site and enters a depression where the water flows into the ground, which is called the Big Lost River Sinks. The river then mixes with other water in the eastern Snake River Plain Aquifer and emerges about 100 miles (160 km) away at Thousand Springs near Hagerman and at other springs downstream of Twin Falls.

4.9.1 Surface Water Monitoring Results

The Big Lost River channel is typically dry because upstream irrigation reduces flow and remaining water rapidly infiltrates the desert soils and underlying basalt. As a result, no Big Lost River samples were collected in 2025 due to the absence of surface water.

Offsite surface water monitoring was conducted semiannually at three locations downgradient of the INL Site: (1) Alpheus Springs near Twin Falls, (2) Clear Springs near Buhl, and (3) a trout farm near Hagerman. These locations were co-sampled with the DEQ-INL Oversight Program in May and November 2025. A total of 16 samples, including duplicates, were collected and analyzed for gross alpha, gross beta, and tritium during 2025.

Gross alpha activity was detected in one of the surface water samples (1.52 ± 0.55 pCi/L) collected near Hagerman on May 12, 2025.

Gross beta activity was detected in all surface water samples. The concentrations were similar to previous results from surface water sampling. Natural levels of radioactive decay products of thorium and uranium exist in the Snake River Plain Aquifer and are likely the source of the measured concentrations. The highest concentration was 9.06 ± 0.94 pCi/L collected from Alpheus Springs on May 12, 2025.

Tritium was not detected in any surface water sample. The DCS for tritium in water is 2.6 x 10^6 pCi/L.

4.10 Quality Assurance

4.10.1 INL Contractor Quality Assurance

In 2025, the INL contractor implemented its quality control program to ensure environmental monitoring results were accurate and trustworthy. Quality assurance activities included the use of blanks, duplicates, and performance evaluation samples to verify the performance of the contracted analytical laboratory. When discrepancies were identified, the contractor collaborated with the laboratory to refine processes, procedures, and methods. Field sampling, laboratory measurements and performance evaluation samples were thoroughly reviewed. These measures ensure that monitoring data used to protect public health and the environment are valid, reliable, and defensible. All laboratory data presented by the INL contractor in this chapter meet these standards.

4.10.2 ICP Contractor Quality Assurance

The ICP contractor followed a similar approach in 2025 to maintain data integrity and reliability. Its quality assurance activities also included blanks, duplicates, and performance evaluation samples to assess laboratory performance and identify discrepancies. Corrective actions were implemented as needed to strengthen processes and ensure accuracy. By adhering to these rigorous quality control measures, the ICP contractor ensures that all reported data are accurate, defensible, and compliant with regulatory requirements for protecting public health and the environment. All laboratory data presented in this chapter by the ICP contractor meet these standards.

4.10.3 USGS Quality Assurance

In 2025, the USGS continued to implement a long-standing water-quality quality assurance program at the INL by collecting and analyzing quality control samples including field blanks, equipment blanks, and replicates. The successful implementation of the USGS quality assurance function ensures that water-quality data collected are reliable and reproducible, compatible with data collected by other oversight organizations at INL, and applicable to the programmatic needs of the DOE, DOE contractors, and the scientific and regulatory communities.

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