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2025 ANNUAL SITE ENVIRONMENTAL REPORT
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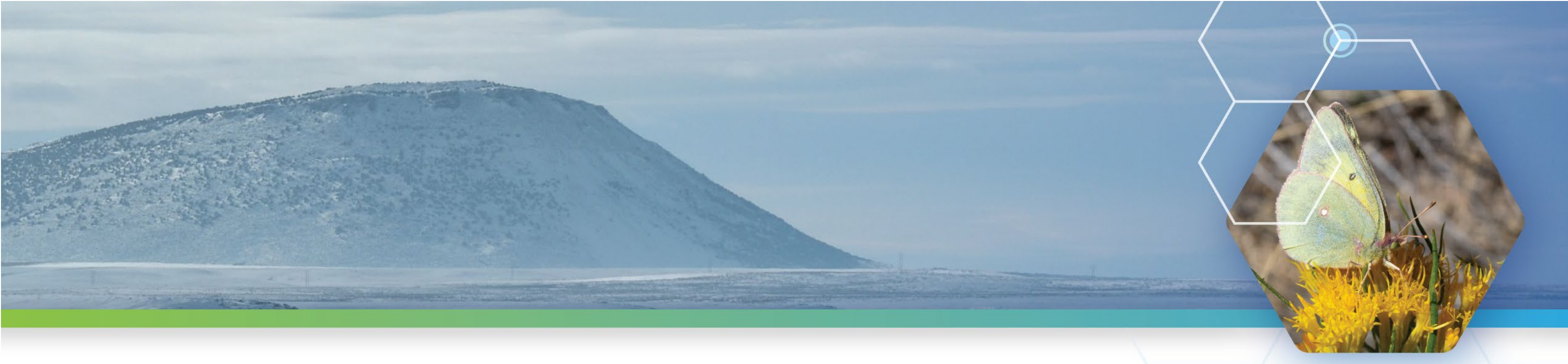

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September 2026

Prepared by

Battelle Energy Alliance
For the U.S. Department of Energy
Under Contract No. DE-AC07-05ID14517

Idaho National Laboratory
Idaho Falls, ID 83415

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Pronghorn with Big Southern Butte in background

Executive Summary:

Purpose of the Report

The U.S. Department of Energy - Idaho Operations Office (DOE-ID) oversees the Idaho National Laboratory (INL) Site. DOE-ID and its contractors remain committed to fulfilling regulatory obligations, protecting the environment, and ensuring the accuracy and integrity of environmental monitoring data. The INL contractor conducts work in accordance with NE O 458.1A, while the Idaho Cleanup Project (ICP) contractor operates under DOE O 458.1.

Beginning in 2025, INL operations transitioned to reporting under NE O 231.1, which applies specifically to facilities and activities managed by DOE's Office of Nuclear Energy (NE). As a result, the INL contractor prepares an Annual Site Environmental Report (ASER) in accordance with NE requirements. In parallel, because the ICP mission remains under DOE-wide oversight, the ICP contractor will prepare a supplemental report (DOE 2026) to accompany this ASER to meet the broader DOE O 231.1B reporting requirements. This dual-report structure reflects the separation of NE-specific oversight for INL operations from DOE-wide oversight for ICP cleanup activities. The combination of the two reports demonstrates compliance with the requirements for reporting for environmental activities conducted at the INL Site from January 1 through December 31, 2025.

This report describes the impact of INL Site operations on the public and the environment, with emphasis on radioactive contaminants and provides an overview of environmental management activities that:

- Demonstrate INL Site environmental performance by presenting
  - Effluent and environmental surveillance results for air, water, soil, vegetation, wild game, and agricultural products
  - Comparisons of historical data, background levels, and regulatory standards to verify that operations do not adversely impact the public or the environment
- Evaluate potential radiological dose to the public residing near the INL Site
- Document property clearance activities that ensure materials released from radiological areas meet DOE requirements.

Why This Report Matters

The ASER serves as more than a compliance requirement, it is a key transparency tool that provides regulators, stakeholders, and the public with a picture of environmental conditions at the INL Site. By compiling results from thousands of measurements and multiple monitoring programs, the report:

- Confirms that INL operations remain protective of public health and the environment
- Tracks long-term environmental trends and identifies potential issues
- Demonstrates the effectiveness of operational controls and cleanup actions
- Supports informed decision-making by DOE, regulatory agencies, and site managers
- Builds public trust by openly sharing environmental information in a clear and accessible format

A significant portion of the ASER focuses on measured radioactivity in environmental media such as air, water, soil, direct radiation, wildlife, and agricultural products. To support readers who may be less familiar with radiological terms or dose concepts, the report includes a user guide and glossary. Previous ASERs and reference materials are available under the Environmental Publications tab of the INL website.

The INL contractor develops and produces the ASER with contributions from the ICP contractor, DOE-ID, NOAA, and the U.S. Geological Survey (USGS). The term INL Site contractors, as used throughout the report, refers collectively to the INL and ICP contractors.

Links to contributor websites are as follows:

- INL
- ICP
- DOE-ID
- NOAA
- USGS.

Environmental activities for the Naval Reactors Facility fall outside the scope of this ASER and are documented separately in the Environmental Monitoring Report issued under the Naval Nuclear Propulsion Program (FMP 2026).

Organization of the Report

This report is organized into chapters that summarize the environmental monitoring and surveillance activities conducted at the INL Site. Each chapter describes the types of monitoring performed, the methods used, and the detected results for the reporting year, with comparisons to historical trends and regulatory standards as applicable.

Chapter 1 – Overview of the INL Site. Provides an overview of the INL Site's location on the upper Snake River Plain, nearby communities, natural features (such as the Big Lost River and the Eastern Snake River Plain Aquifer), and the semi-arid sagebrush-steppe environment. The chapter also summarizes the INL Site mission and outlines the roles of the INL and ICP contractors, and USGS in supporting operations and environmental monitoring.

Chapter 2 — Environmental Monitoring of Air. Describes airborne radionuclide emissions from INL Site operations and summarizes ambient air monitoring results. Airborne effluent releases reported under 40 CFR 61, Subpart H are presented along with particulate, charcoal, and atmospheric moisture sampling results. Monitoring data are compared with DOE radiation-protection standards and long-term historical trends.

Chapter 3 — Environmental Monitoring of Liquid Effluents. Summarizes monitoring results for liquid effluents, groundwater, and stormwater associated with wastewater discharges. Monitoring is conducted to meet state reuse permit requirements and DOE environmental protection standards. Results include evaluations of wastewater discharge locations at major facilities; assessments of groundwater quality and radiological conditions near these systems; and summaries of stormwater and surface-water runoff monitoring.

Chapter 4 — Environmental Monitoring of the Eastern Snake River Plain Aquifer. Summarizes groundwater, drinking water, and surface-water monitoring conducted onsite and offsite by the USGS and INL Site contractors. Results include radiological and chemical analyses, trend evaluations, and assessments of known contaminant plumes. The chapter also describes Big Lost River monitoring and compares results to Idaho groundwater standards, U.S. Environmental Protection Agency (EPA) drinking water maximum contaminant levels, and DOE Derived Concentration Standards (DCSs) (DOE 2022).

Chapter 5 — Environmental Surveillance of Agricultural Products, Wild Game, Soil, and Direct Radiation. Summarizes environmental surveillance conducted to evaluate potential ecological and agricultural pathway impacts. The chapter highlights results for milk, produce, grains, potatoes, alfalfa, big game animals, and waterfowl, along with evaluations of soil trends and environmental radiation levels. Results are compared to historical values and relevant DOE DCSs, with particular focus on identifying potential accumulation of radionuclides in biota and verifying that radiation exposures remain within expected background ranges.

Chapter 6 — Radiation Dose to the Public. Summarizes the estimated radiological dose to members of the public and to nonhuman biota from INL Site operations. Doses are calculated for the maximally exposed individual, the surrounding population, and specific locations where compliance modeling is required. It describes how potential exposures were evaluated using DOE- and EPA-approved models for airborne releases, external radiation, and ingestion pathways, and how results were compared to federal dose limits under NE O 458.1A and 40 CFR 61, Subpart H.

Summary of Results

The following sections summarize key environmental monitoring and surveillance results for 2025, including comparisons to historical conditions and applicable regulatory standards.

Environmental Monitoring of Air (Chapter 2)

Environmental air monitoring in 2025 showed that airborne radionuclide emissions from INL Site operations remained well within federal regulatory limits. Total potential releases to the atmosphere were estimated at 1,792 curies, primarily from the ATR Complex. Effluents included tritium, noble gases, and trace radionuclides, all below regulatory standards. The INL Site contractors' airborne-effluent and ambient air surveillance network verified compliance, documented routine emissions, and provided continuous oversight to detect any unexpected releases.

Ambient air samples contained only naturally occurring radionuclides and levels of uranium consistent with regional background conditions. Human-made radionuclides of concern (including cesium-137, strontium-90, americium-241, and iodine-131) were not detected in routine particulate samples. Tritium was detected in a small number of atmospheric moisture and precipitation samples, but all measured concentrations were far below DOE DCSs and consistent with long-term background conditions. No unplanned releases or exceedances occurred during the year, and results were consistent with long-term monitoring trends.

Environmental Monitoring of Liquid Effluents (Chapter 3)

Monitoring of liquid effluents, associated groundwater, and surface water runoff in 2025 demonstrated compliance with Idaho reuse permits and DOE environmental protection requirements. All monitored systems operated within permitted hydraulic and constituent limits. Wastewater discharges at the Advanced Test Reactor (ATR) Complex Cold Waste Ponds, the Idaho Nuclear Technology and Engineering Center (INTEC) Percolation Ponds and Sewage Treatment Plant, the Materials and Fuels Complex Industrial Waste Pond, and stormwater-related locations at the Radioactive Waste Management Complex remained consistent with long-term operational and monitoring trends.

At ATR, elevated chromium concentrations in a downgradient monitoring Well USGS-065 exceeded the primary constituent standard and continued to reflect legacy Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related legacy contamination, not current effluent discharges. Chromium in ATR effluent remained low and stable. At INTEC, chromium results exceeded the PCS in Well ICPP-MON-V-212, and the elevated levels were attributed to well corrosion. Following installation of a new pump, subsequent chromium concentrations returned to expected concentrations.

Radiological surveillance results across all facilities (gross alpha, gross beta, tritium, gamma-emitters, uranium isotopes, americium, and plutonium) remained well below health-based Idaho groundwater standards and DOE DCSs. Results were consistent with historical conditions, with no indication of impacts from ongoing operations.

Surface water runoff monitoring at RWMC showed radionuclide concentrations well below the DOE DCSs, and all results were consistent with historical observations.

Environmental Monitoring of the Eastern Snake River Plain Aquifer (Chapter 4)

Groundwater, drinking water, and surface water monitoring conducted across the Eastern Snake River Plain Aquifer in 2025 confirmed that INL Site operations did not adversely affect this critical regional resource. Comprehensive monitoring performed by the USGS and INL Site contractors showed that aquifer constituent concentrations remained consistent with long-term historical trends; however, several monitoring locations exhibited exceedances of applicable Idaho groundwater standards and EPA maximum contaminant levels associated with established CERCLA plumes.

Localized exceedances—such as strontium-90 at select INTEC wells, technetium-99 near the INTEC Tank Farm, and nitrate southeast of INTEC—were consistent with known CERCLA plumes and continued to display stable or declining trends. Chromium at USGS-065 and TRA-07 showed an increase but remains attributable to historical contamination. Tritium, once the most widespread aquifer contaminant at INL, continued its long-term downward trend and remained well below the MCL of 20,000 pCi/L.

Onsite drinking water systems remained in full compliance with the Safe Drinking Water Act. All radiological, inorganic, organic, and PFAS sample results were below regulatory limits, with many parameters not detected. Offsite drinking water samples contained no detectable tritium and gross alpha/gross beta levels consistent with historical results.

Due to zero surface water flow at all Big Lost River monitoring locations in 2025, no onsite Big Lost River samples were collected. Offsite surface water samples from downgradient springs showed background levels resulting from naturally occurring radionuclides and no detectable tritium.

Environmental Surveillance Monitoring of Agricultural Products, Wild Game, Soil, and Direct Radiation Measurements (Chapter 5)

Environmental surveillance of agricultural products, wild game, and direct radiation in 2025 found no evidence that INL Site operations adversely impacted surrounding food chains, wildlife, or radiation levels.

Agricultural products, including milk, lettuce, grains, potatoes, and alfalfa, collected on and around the INL Site showed no detectable human-made radionuclides except for low concentrations of tritium detected in two milk samples, far below applicable DCS values. A single cesium-137 detection in a waterfowl remainder subsample reflected historical background conditions observed in prior years. Big game animal tissues contained no detectable human-made radionuclides. All results were consistent with long-term patterns dominated by global fallout rather than INL sources.

Direct radiation monitoring showed that measurements from November 2024 to April 2025 were consistent with expected background conditions. However, optically stimulated luminescence dosimeter results for the May–October 2025 sampling period were determined to be invalid due to inadvertent exposure to an x-ray scanner during shipment. As a result, the

2025 external radiation assessment relied on established background estimates rather than a full set of measured values. Neutron dosimeters recorded no measurable neutron dose above detection limits.

Radiation Dose to the Public from INL Site Releases (Chapter 6)

Environmental dose assessments for 2025 show that INL Site operations continued to contribute only negligible radiation exposure to the public, with all estimated doses remaining far below federal and DOE regulatory limits. The maximally exposed individual received an estimated 0.025 mrem in 2025, an increase from the 2024 value of 0.015 mrem yet still only 0.25% of the Clean Air Act 40 CFR 61, Subpart H limit of 10 mrem/yr from airborne emissions. At the INL Research and Education Campus in Idaho Falls, the maximally exposed individual received an estimated 0.0045 mrem/yr, a slight decrease from the 2024 value of 0.0048 mrem/yr, which is less than 0.1% of the 10 mrem/yr federal standard and consistent with historical dose estimates.

The collective population dose within 80 km of the INL Site was calculated as 0.16 person-rem for an estimated population of 363,157 people—equivalent to only 0.0001% of the natural background radiation dose to that same population. This value is slightly higher than previous years due to improvements in atmospheric dispersion modeling (HYSPLIT-ASMD) rather than changes in INL emissions.

Ingestion pathways again contributed no measurable dose, as no human-made radionuclides were detected in edible tissues of waterfowl or big game animals collected in 2025.

Direct radiation monitoring along the INL boundary could not rely on a full-year dataset due to inadvertent x-ray exposure of dosimeters during shipment in the May–October 2025 period. However, valid measurements collected from November 2024 through April 2025 indicated an external dose of 60.4 mrem for that six-month period, consistent with background and historical environmental radiation levels.

Overall, the 2025 total dose from all pathways was 0.025 mrem, demonstrating that INL Site activities continued to pose no significant radiological impact to the public.

Summary of Conclusions

In 2025, surveillance and effluent monitoring, supported by detailed source characterization and comprehensive dose assessments, confirmed that radiological dose to the hypothetical maximally exposed individual remained far below typical background radiation levels. Estimated radiological dose to biota was also well below DOE screening thresholds, demonstrating that INL Site operations posed no measurable ecological risk. Monitoring programs verified full compliance with all permitted air and water discharge requirements, and evaluations of air, groundwater, surface water, agricultural products, wildlife, and direct radiation showed minimal contributions from INL Site activities to regional environmental conditions. Overall, environmental surveillance results indicated that the INL Site continued to operate in a manner that is protective of both human health and the environment. All laboratory data used in this report were reviewed and determined to be valid, reliable, and defensible.

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Acronyms:

ARIR	Administrative Record Information Repository
ASER	Annual Site Environmental Report
ATR	Advanced Test Reactor
BEA	Battelle Energy Alliance, LLC
CAP88-PC	Clean Air Act Assessment Package-1988 computer model, PC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CITRC	Critical Infrastructure Test Range Complex
CPS	counts per second
CTF	Contained Test Facility
CWP	Cold Waste Pond
DCS	Derived Concentration Standard
DEQ	Department of Environmental Quality (state of Idaho)
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
DOSEMM	dose multi-media
EFS	Experimental Field Station
EPA	U.S. Environmental Protection Agency
ESRPA	Eastern Snake River Plain Aquifer
FY	fiscal year
HYSPLIT	Hybrid Single-particle Lagrangian Integrated Trajectory
ICDF	Idaho CERCLA Disposal Facility
ICP	Idaho Cleanup Project
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
INL Site Contractors	INL contractor and ICP contractor
INTEC	Idaho Nuclear Technology and Engineering Center (formerly Idaho Chemical Processing Plant)
IRC	INL Research Center
ISB	in situ bioremediation
IWP	Industrial Waste Pond
MCL	maximum contaminant level
MEI	maximally exposed individual
MFC	Materials and Fuels Complex
ND	not detected
NE	Nuclear Energy
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NRF	Naval Reactors Facility
OSLD	optically stimulated luminescence dosimeter
PCS	primary constituent standard
PFAS	per- and polyfluoroalkyl substances
PFHxS	perfluorohexane sulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
RHLLW	Remote-Handled Low-level Waste Disposal Facility
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
SORD	Special Operations and Research Division
STP	Sewage Treatment Plant
TAN	Test Area North
TCE	trichloroethylene
TDS	total dissolved solids
USGS	U.S. Geological Survey
UTL	upper tolerance limit
VOC	volatile organic compound
WAG	waste area group

A Goldenrod Crab Spider.

Units:

Bq	becquerel
C	Celsius
cfm	cubic feet per minute
CFU	colony forming unit
Ci	curie
cm	centimeter
cps	counts per second
d	day
F	Fahrenheit
ft	feet
g	gram
gal	gallon
Gy	gray
ha	hectare
keV	kilo-electron-volts
kg	kilograms (10^3) gram
km	kilometer (10^3) meter
L	liter
lb	pound
m	meter
µCi	microcurie (10^{-6}) curies
µg	microgram (10^{-6}) grams
µR	microroentgen (10^{-6}) roentgen
µS	microsiemen (10^{-6}) siemen
µSv	microsievert (10^{-6}) sievert
Ma	million years
mCi	millicurie (10^{-3}) curies
MeV	mega electron volt
mg	milligram (10^{-3}) grams
MG	million gallons
mGy	milligray (10^{-3}) gray
Ml	million liters
mi	mile
min	minute
mL	milliliter (10^{-3}) liter
mR	milliroentgen (10^{-3}) roentgen
mrad	millirad (10^{-3}) rad
mSv	millisievert (10^{-3}) sievert
oz	ounce
pCi	picocurie (10^{-12} curies)
R	roentgen
rad	radiation absorbed dose
rem	roentgen equivalent man
Sv	sievert
yd	yard
yr	year

A sagebrush sheep moth on sagebrush.

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Chapter 1: Overview of the INL Site

1.1 Location and Surrounding Areas

The Idaho National Laboratory (INL) Site encompasses about 2,305 square kilometers (km^2) (890 square miles [mi^2]) of the upper Snake River Plain in southeastern Idaho. Over 60% of the INL Site is located in Butte County, while the rest is distributed across Bingham, Bonneville, Clark, and Jefferson counties. It extends 63 km (39 mi) from north to south and is approximately 58 km (36 mi) at its broadest east to west portion. By highway, the southeast entrance of the INL Site lies approximately 37 km (23 mi) west of Idaho Falls. Other towns surrounding the boundaries include Arco, Atomic City, Blackfoot, Rigby, Rexburg, Terreton, and Howe. Pocatello is approximately 66 km (41 mi) to the southeast.

The INL Site is surrounded by federal lands and natural areas, including Craters of the Moon National Monument, Salmon-Challis National Forest, and Targhee National Forest. Wildlife refuges such as Mud Lake, Camas, and Market Lake are within 32 km (20 mi), and the Fort Hall Reservation lies about 48 km (30 mi) southeast.

Information about the INL Site history can be found here.

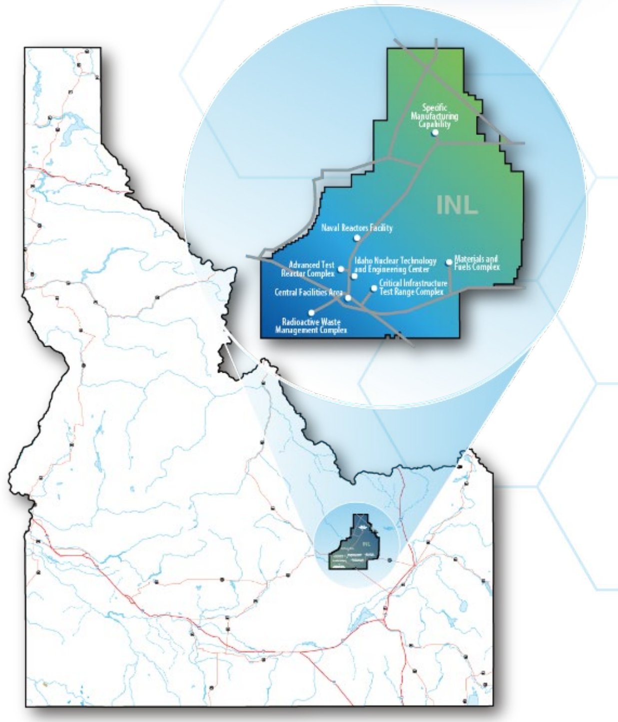

Figure 1-1. Regional location of the INL Site. Site.

1.2 Environment and Communities

The INL Site is located in a large, relatively undisturbed expanse of sagebrush steppe. Approximately 94% of the land is open and undeveloped. It has an average elevation of 1,500 m (4,900 ft) above sea level and is bordered on the north and west by mountain ranges and on the south by volcanic buttes and open plains. Lands immediately adjacent to the INL Site are open sagebrush steppe, foothills, or agricultural fields. Agriculture is concentrated in the northeast areas.

About 60% of the INL Site is open to livestock grazing. Controlled hunting is permitted and was expanded in 2025 to areas in the northeast and northwest portions of the INL Site as highlighted in the attached grazing and hunting map.

The climate of the high-desert environment is characterized by sparse precipitation of about 21.4 cm/yr (8.41 in./yr), warm summers with a normal daily temperature of 18.6°C (65.4°F), and cold winters with a normal daily temperature of -7.4°C (18.7°F), based on observations at the Central Facilities Area from 1950 through 2025 (NOAA 2026). The altitude, intermountain setting, and latitude of the INL Site combine to produce a semi-arid climate. Prevailing weather patterns are from the southwest, moving up the Snake River Plain. Air masses, which gather moisture over the Pacific Ocean, traverse several hundred miles of mountainous terrain before reaching southeastern Idaho. Frequently, the result is dry air with limited cloud cover. Solar heating can be intense, with extreme day-to-night temperature fluctuations.

Basalt flows cover most of the Snake River Plain, producing rolling topography. Over 400 different kinds of taxa plants have been recorded within the boundaries of the INL Site (Anderson et al. 1996). Vegetation is dominated by big sagebrush (*Artemisia tridentata*) with grasses and wildflowers beneath that have adapted to the harsh climate.

The INL Site is also home to many kinds of animals. Vertebrate animals found in this area include small burrowing mammals, snakes, birds, and several large mammals. Published species records include six types of fish, one amphibian, nine reptiles, 164 birds, and 39 mammals (Reynolds et al. 1986).

The Big Lost River that runs through the INL Site property is diverted, flowing northeast, ending in a playa area on the northwestern portion, called the Big Lost River Sinks. Here, the river evaporates or infiltrates to the subsurface, with no surface-water moving from the INL Site. The Big Lost River is diverted at the INL Diversion to avoid the potential for flooding. Normally, the riverbed is dry due to upstream irrigation and rapid infiltration into the desert soil and underlying basalt. In 2025, no surface-water flow was measured at three U.S. Geological Survey (USGS) surface-water sites on the INL Site (13132500, 13132520, and 13132535).

Fractured volcanic rocks under the INL Site form a portion of the eastern Snake River Plain Aquifer that stretches 320 km (199 mi) from Island Park to King Hill, which is 9.7 km (6 mi) northeast of Glenns Ferry, and stores one of the most bountiful supplies of groundwater in the nation. An estimated 247–370 billion m^3 (200–300 million acre/ft) of water is stored in the aquifer's upper portions. The aquifer is primarily recharged from Henry's Fork and the south fork of the Snake River, and to a lesser extent, the aquifer is recharged from the Big Lost River, Little Lost River, Birch Creek, and irrigation. Beneath the INL Site, the aquifer moves laterally southwest at a rate of 1.5 to 6 m/day (5–20 ft/day) (Lindholm 1996). The eastern Snake River Plain Aquifer emerges in springs along the Snake River between Milner and Bliss, Idaho. Crop irrigation is the primary use of both surface water and groundwater on the Snake River Plain.

The population of the region within 80 km (50 mi) of the INL Site is estimated to be 363,157, based on the 2020 U.S. Census and projected growth. Over half of this estimated population (201,187) resides in the census divisions of Idaho Falls (123,583) and northern Pocatello (77,604). Another 42,618 are projected to live in the Rexburg census division. Approximately 23,025 are estimated to reside in the Rigby census division, with 15,519 in the Blackfoot census division. The remaining population resides in small towns and rural communities throughout southeastern Idaho.

1.3 What Happens at the INL Site?

The INL Site serves two primary purposes:

- *Research and Development:* Operating a multiprogram national laboratory focused on energy innovation and national security.
- *Environmental Cleanup:* Addressing legacy waste from past operations to protect Idaho's environment and water resources.

The U.S. Department of Energy, Idaho Operations Office (DOE-ID) oversees these activities at the INL, with guidance from the DOE Office of Nuclear Energy (DOE-NE) and the Office of Environmental Management (DOE-EM). DOE-NE manages research and development programs and issues land lease and land use permits for research conducted at the laboratory. DOE-EM is responsible for directing environmental cleanup activities. Naval Reactors operations at the INL Site are managed independently and are not included in this report.

Most INL Site buildings and structures are located within developed areas that are typically less than a few square miles in size and separated by miles of undeveloped land. DOE controls all land within the INL Site boundary. In addition to the INL Site, DOE owns or leases laboratories and administrative offices in Idaho Falls, about 40 km (25 mi) east of the INL Site. An overview of the primary INL Site facilities can be found here.

The following subsections provide an overview of the major organizations operating at the INL Site and their respective roles in research, cleanup, monitoring, and environmental stewardship. Each organization contributes distinct capabilities that support DOE's mission and ensure safe, compliant, and scientifically robust operations across the INL Site.

1.3.1 Idaho National Laboratory

The INL Site, managed by Battelle Energy Alliance, is a leading center for nuclear energy research, clean energy innovation, and critical infrastructure protection. INL's mission is to discover, demonstrate, and secure innovative nuclear energy solutions, other clean energy options, and critical infrastructure. Its vision is to change the world's energy future and strengthen national security.

Key priorities include:

- *Advanced Reactor Development:* Demonstrating next-generation nuclear technologies to support clean energy goals
- *National User Facilities:* Operating specialized facilities such as the Advanced Test Reactor and Wireless Test Facility for research and industry collaboration

- *Critical Infrastructure Protection:* Developing and testing technologies to secure the nation's energy systems and *critical assets*
- *Fuel Cycle Innovation:* Advancing technologies for safer, more efficient nuclear fuel use and recycling
- *Clean Energy Integration*: Supporting renewable energy and grid modernization initiatives.

INL also leads the National Reactor Innovation Center, which partners with industry to accelerate the demonstration of advanced reactors.

The INL contractor's contributions to this report are included in Chapters 2–6, based on monitoring performed to ensure compliance with permits and DOE Orders.

1.3.2 Idaho Cleanup Project

The Idaho Cleanup Project, managed by Idaho Environmental Coalition, LLC, is focused on environmental cleanup, waste management, and safe deactivation and demolition of outdated facilities. These efforts reduce environmental risks and support INL's ongoing research mission.

Key priorities include:

- *Waste Treatment and Disposal:* Safely treating radioactive liquid waste and preparing waste for shipment to approved disposal facilities
- *Environmental Protection:* Removing legacy contamination to protect the Snake River Plain Aquifer, a critical drinking water source for eastern Idaho
- *Facility Decommissioning:* Demolishing legacy nuclear facilities, including work at the Naval Reactors Facility
- *Safety and Compliance:* Ensuring all actions align with the 1995 Idaho Settlement Agreement, Site Treatment Plan, and the Federal Facility Agreement and Consent Order.

The Idaho Cleanup Project contractor's contributions to this report are included in Chapters 2–5, based on monitoring performed to ensure compliance with permits and DOE Orders.

1.3.3 U.S. Geological Survey

The mission of the U.S. Geological Survey (USGS) at the Idaho National Laboratory Project Office is to implement a comprehensive groundwater monitoring and hydrogeologic studies program. This program focuses on evaluating the availability and movement of water within the eastern Snake River Plain aquifer, in alignment with the Department of Energy's (DOE) strategic goal of environmental protection and sustainability. Since 1949, USGS hydrologists and geologists have studied the hydrology and geology of the eastern Snake River Plain and the eastern Snake River Plain aquifer.

Key priorities include:

- *Monitoring Networks:* Maintaining groundwater and surface-water monitoring networks to sample wells, track water quality, and observe changes in groundwater levels and aquifer conditions.
- *Research Wells:* Drilling new wells, collecting geophysical data, and characterizing drill core to better understand subsurface geology, and aquifer dynamics.
- *Data Collection:* Collecting and publishing hydrologic and geologic data to support environmental protection and public transparency.

USGS contributions to this report are included in Chapter 4, based on monitoring activities that help track and understand groundwater conditions. Additional reports from these studies are available through the bibliography website.

1.3.4 National Oceanic and Atmospheric Administration

In partnership with the DOE-ID, the Special Operations and Research Division of the Air Resources Laboratory operates a network of 35 meteorological towers in southeastern Idaho. This meteorological monitoring network supports activities at the INL and is known as the NOAA/INL Mesonet. Each tower collects observations of winds, temperature, humidity, and other variables which are relayed in near real time back to Special Operations and Research Division by a radio link. In addition to supporting the INL, the Mesonet data are also widely used by the National Weather Service, local news organizations, and agricultural entities as a source of valuable meteorological data. A summary of the INL's climate conditions for 2025 is provided in Subsection 1.2. and the supplemental "Meteorological Monitoring" report (NOAA 2026).

1.4 References

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Native perennial grass.

Chapter 2: Environmental Monitoring Programs – Air

Although all Idaho National Laboratory (INL) Site facilities are carefully managed and controlled, the potential exists to release radioactive and nonradioactive hazardous constituents in amounts above the regulatory limits during an operational upset or emergency incident situation.

In such an event, pathway vectors, such as air (see Chapter 2); groundwater (see Chapters 3 and 4); soil, plants, and animals (see Chapter 5); may transport these constituents to nearby populations. A conceptual model showing routes of exposure/pathways for these potential environmental releases can be found here.

Reviews of historical environmental data and environmental transport modeling indicate that air is a key pathway from INL Site releases to members of the general public. The ambient air monitoring network operates constantly and is a critical component of the INL Site's environmental monitoring programs. It monitors routine and unforeseen releases, provides verification the INL Site complies with regulatory standards and limits, and can be used to assess impact to the environment over time. This chapter presents the INL Site contractors' results of radiological analyses of airborne effluents and ambient air samples collected both on and off the INL Site. Click here for an overview of the radiological air monitoring activities relative to INL's major radiological sources, as well as the minor onsite and offsite radiological sources. Details may be found in the INL Site Environmental Monitoring Plan (DOE-ID 2023).

2.1 Organization of Air Monitoring Programs

The INL Site contractors document airborne radiological effluents at all INL Site facilities in an annual report prepared in accordance with 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities." Subsection 2.2 summarizes the emissions reported in "National Emission Standards for Hazardous Air Pollutants—Calendar Year 2025 INL Report for Radionuclides" (DOE-ID 2026), referred to hereafter as the National Emission Standards for Hazardous Air Pollutants (NESHAP) Report. The report also documents the estimated potential dose received by the general public due to INL Site activities.

Ambient air monitoring is conducted by the INL contractor to ensure the INL Site remains in compliance with the requirements in NE O 458.1A, "Radiation Protection of the Public and the Environment." The INL contractor collects air samples primarily around the INL Site, encompassing a region of 23,390 km^2 (9,000 mi^2), extending as far as Jackson, Wyoming. Air moisture and precipitation samples are also collected for tritium analysis. Subsection 2.3 summarizes the results for ambient air monitoring conducted in 2025.

The Idaho Cleanup Project (ICP) contractor monitors air around waste management facilities to comply with DOE O 435.1, "Radioactive Waste Management" and DOE O 458.1, "Radiation Protection of the Public and the Environment." These facilities are the Subsurface Disposal Area (SDA) at Radioactive Waste Management Complex (RWMC) and the Idaho Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Disposal Facility (ICDF) near the Idaho Nuclear Technology and Engineering Center (INTEC). Subsection 2.4 discusses the air sampling process the ICP contractor performs in support of waste management activities.

The National Oceanic and Atmospheric Administration (NOAA) has collected meteorological data at the INL Site since 1950. The data historically have been tabulated, summarized, and reported in several climatography reports and used by scientists to evaluate atmospheric transport and dispersion. The latest report, "Climatography of the Idaho National Laboratory," Fourth Edition (Clawson et al. 2018), was prepared by the Special Operations and Research Division of the Air Resources Laboratory and presents over 20 years (1994–2015) of quality-controlled data from the NOAA INL mesonet meteorological monitoring network. More recent data are provided by the Special Operations and Research Division to scientists modeling the dispersion of INL Site releases (see Chapter 6 and the supplemental "Meteorological Monitoring" report).

2.2 Airborne Effluent Monitoring

Each regulated INL Site facility determines the airborne effluent concentrations from its regulated emission sources as required under state and federal regulations. Radiological air emissions from INL Site facilities also are used to estimate the potential dose to a hypothetical maximally exposed individual (MEI), who is a member of the public (Subsection 6.2.1). Radiological effluents and the resulting potential dose for 2025 are reported in "Idaho National Laboratory CY 2025

National Emission Standards for Hazardous Air Pollutants Analysis, Methodology and Results for Radionuclides" (INL 2026) and the NESHAP report (DOE-ID 2026). Potential radiation doses to the public are discussed in more detail in Chapter 6 of this report.

The NESHAP report includes three categories of airborne emissions:

- Sources that require continuous monitoring under the NESHAP regulation are primarily the stacks at the Materials and Fuels Complex (MFC), the Advanced Mixed Waste Treatment Project, and INTEC
- Releases from all other point sources (e.g., stacks and exhaust vents)
- Nonpoint—or diffuse—sources, otherwise referred to as fugitive sources, which include radioactive waste ponds, buried waste, contaminated soil areas, radiological test ranges, and decontamination and decommissioning operations.

INL Site emissions include all three airborne emission categories and are summarized in Table 2-1. During 2025, an estimated 1,792 Ci (6.62 × 10^{13} Bq) of radioactivity was potentially released to the atmosphere from all INL Site sources. The 2025 release is 13% higher than the estimated total of 1,588 Ci (5.88 × 10^{13} Bq) released in 2024 due to normal variations in facility operations (DOE-ID 2026). Figure 2-1 shows the facilities that were major contributors to the total emissions.

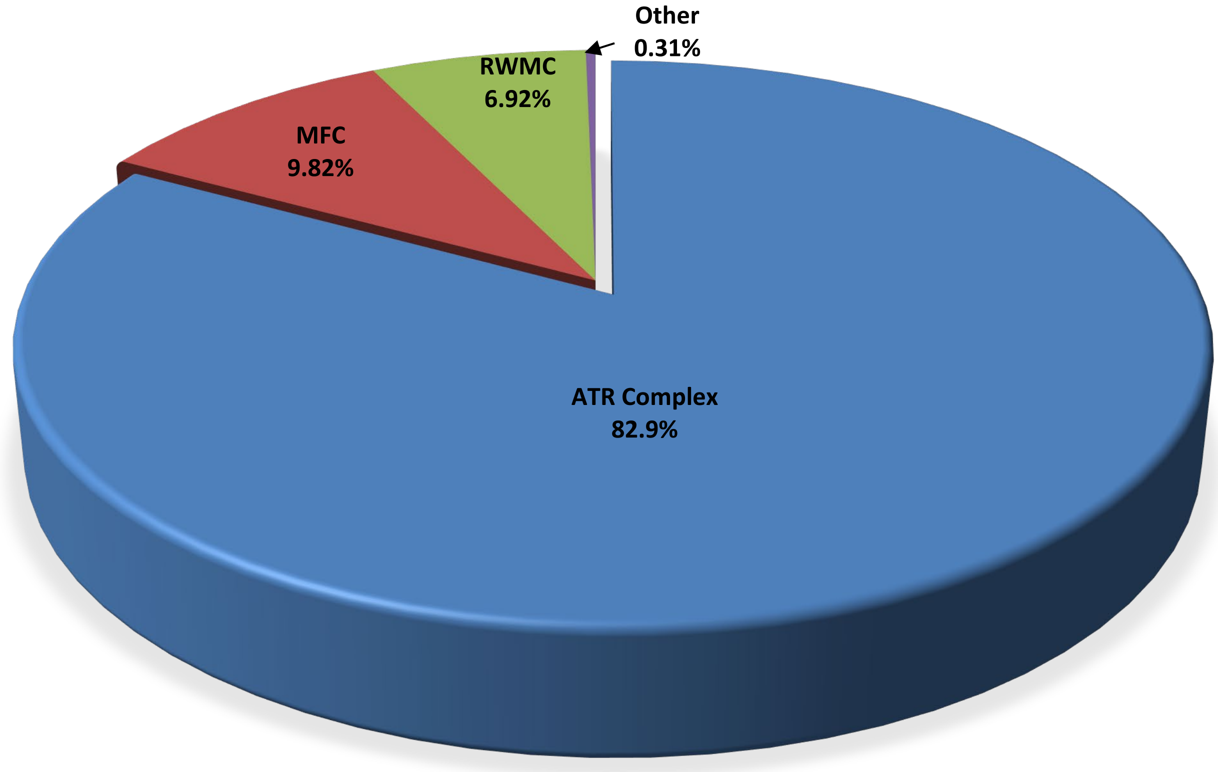

Figure 2-1. Percent contributions in Ci, by facility, to total INL Site airborne radiological releases (2025).

Table 2-1. Summary of potential radionuclide composition of INL Site airborne effluents (2025).

	TOTAL CURIES[a] RELEASED										
FACILITY[b]	TRITIUM	NOBLE GASES[c] ($T_{1/2}$ > 40 DAYS)	NOBLE GASES[d] ($T_{1/2}$ < 40 DAYS)	FISSION AND ACTIVATION PRODUCTS[e] ($T_{1/2}$ < 3 HOURS)	FISSION AND ACTIVATION PRODUCTS[f] ($T_{1/2}$ > 3 HOURS)	TOTAL RADIOIODINE[g]	TOTAL RADIOSTRONTIUM[h]	TOTAL URANIUM[i]	PLUTONIUM[j]	OTHER ACTINIDES[k]	OTHER[l]
ATR Complex	9.24E+01	–	1.39E+03	5.14E+00	1.75E-02	1.88E-06	2.98E-02	–	8.44E-06	3.23E-07	–
CFA	3.30E-01	1.07E-03	9.58E-02	8.00E-05	2.48E-01	9.55E-02	4.40E-10	7.09E-09	1.34E-10	5.50E-11	1.55E-02
CITRC	2.09E-04	–	–	2.86E-05	–	–	–	–	–	–	–
INTEC	2.27E-01	1.08E+00	–	–	2.61E+00	9.56E-05	1.37E-04	5.38E-07	8.38E-06	2.80E-06	–
MFC	2.45E+00	2.99E-01	1.62E+02	1.12E+01	1.63E-02	4.73E-06	1.37E-02	2.06E-01	2.78E-07	4.73E-12	–
NRF	4.40E-02	3.21E-01	–	–	5.01E-01	1.57E-05	3.73E-05	4.35E-10	1.82E-06	1.83E-07	–
RRTR	–	–	–	–	1.50E-05	–	–	–	–	–	–
RWMC	1.24E+02	–	–	–	3.66E-02	–	8.04E-11	3.46E-11	5.68E-06	1.89E-06	–
SMC	–	–	–	–	–	–	–	4.12E-08	–	–	–
TAN	1.45E-02	–	–	–	–	–	3.01E-05	–	–	–	–
Total	2.19E+02	1.70E+00	1.55E+03	1.63E+01	3.43E+00	9.56E-02	4.37E-02	2.06E-01	2.46E-05	5.19E-06	1.55E-02

a. One curie (Ci) = 3.7 × 10^{10} becquerels (Bq).

b. ATR Complex = Advanced Test Reactor Complex; CFA = Central Facilities Area; CITRC = Critical Infrastructure Test Range Complex; INTEC = Idaho Nuclear Technology and Engineering Center; MFC = Materials and Fuels Complex; NRF = Naval Reactors Facility; RRTR = Radiological Response Training Range; RWMC = Radioactive Waste Management Complex (including the Advanced Mixed Waste Treatment Project [AMWTP]); SMC = Specific Manufacturing Capability; and TAN = Test Area North.

c. Noble gases ($T_{1/2}$ > 40 days) released in 2025 = ^{39}Ar, ^{42}Ar, ^{81}Kr, and ^{85}Kr.

d. Noble gases ($T_{1/2}$ < 40 days) released in 2025 = ^{37}Ar, ^{41}Ar, ^{79}Kr, ^{83m}Kr, ^{85m}Kr, ^{87}Kr, ^{88}Kr, ^{89}Kr, ^{219}Rn, ^{220}Rn, ^{127}Xe, ^{131m}Xe, ^{133}Xe, ^{133m}Xe, ^{135}Xe, ^{135m}Xe, ^{137}Xe, and ^{138}Xe.

e. Fission products and activation products ($T_{1/2}$ < 3 hours) released in 2025 = ^{106}Ag, ^{109m}Ag, ^{110}Ag, ^{111m}Ag, ^{137m}Ba, ^{139}Ba, ^{83}Br, ^{84}Br, ^{117}Cd, ^{118}Cd, ^{134m}Cs, ^{138}Cs, ^{139}Cs, ^{140}Cs, ^{66}Cu, ^{165}Dy, ^{167m}Er, ^{68}Ga, ^{75}Ge, ^{78}Ge, ^{117}In, ^{117m}In, ^{118}In, ^{142}La, ^{27}Mg, ^{56}Mn, ^{101}Mo, ^{16}N, ^{97}Nb, ^{149}Nd, ^{65}Ni, ^{211}Pb, ^{111}Pd, ^{211}Po, ^{215}Po, ^{144}Pr, ^{144m}Pr, ^{88}Rb, ^{89}Rb, ^{90}Rb, ^{103m}Rh, ^{104}Rh, ^{106}Rh, ^{128m}Sb, ^{77m}Se, ^{81}Se, ^{81m}Se, ^{127}Sn, ^{128}Sn, ^{101}Tc, ^{129}Te, ^{131}Te, ^{133}Te, ^{133m}Te, ^{134}Te, ^{207}Tl, ^{89m}Y, ^{91m}Y, and ^{69}Zn.

f. Fission products and activation products ($T_{1/2}$ > 3 hours) released in 2025 = ^{108m}Ag, ^{110m}Ag, ^{111}Ag, ^{112}Ag, ^{113}Ag, ^{76}As, ^{77}As, ^{78}As, ^{140}Ba, ^{82}Br, ^{14}C, ^{41}Ca, ^{47}Ca, ^{109}Cd, ^{113m}Cd, ^{115}Cd, ^{115m}Cd, ^{117m}Cd, ^{141}Ce, ^{143}Ce, ^{144}Ce, ^{36}Cl, ^{38}Cl, ^{57}Co, ^{58}Co, ^{60}Co, ^{51}Cr, ^{134}Cs, ^{135}Cs, ^{136}Cs, ^{137}Cs, ^{64}Cu, ^{67}Cu, ^{166}Dy, ^{169}Er, ^{171}Er, ^{172}Er, ^{152}Eu, ^{154}Eu, ^{155}Eu, ^{156}Eu, ^{157}Eu, ^{55}Fe, ^{59}Fe, ^{72}Ga, ^{73}Ga, ^{159}Gd, ^{77}Ge, ^{175}Hf, ^{181}Hf, ^{203}Hg, ^{166}Ho, ^{167}Ho, ^{115m}In, ^{192}Ir, ^{194}Ir, ^{40}K, ^{42}K, ^{140}La, ^{141}La, ^{54}Mn, ^{99}Mo, ^{22}Na, ^{24}Na, ^{93m}Nb, ^{95}Nb, ^{95m}Nb, ^{96}Nb, ^{147}Nd, ^{59}Ni, ^{63}Ni, ^{66}Ni, ^{191}Os, ^{32}P, ^{107}Pd, ^{109}Pd, ^{112}Pd, ^{147}Pm, ^{149}Pm, ^{151}Pm, ^{143}Pr, ^{145}Pr, ^{86}Rb, ^{87}Rb, ^{186}Re, ^{188}Re, ^{189}Re, ^{105}Rh, ^{103}Ru, ^{105}Ru, ^{106}Ru, ^{122}Sb, ^{124}Sb, ^{125}Sb, ^{126}Sb, ^{127}Sb, ^{128}Sb, ^{129}Sb, ^{46}Sc, ^{47}Sc, ^{48}Sc, ^{79}Se, ^{151}Sm, ^{153}Sm, ^{156}Sm, ^{117m}Sn, ^{119m}Sn, ^{121}Sn, ^{121m}Sn, ^{123}Sn, ^{125}Sn, ^{126}Sn, ^{182}Ta, ^{183}Ta, ^{184}Ta, ^{161}Tb, ^{99}Tc, ^{99m}Tc, ^{127}Te, ^{127m}Te, ^{129m}Te, ^{131m}Te, ^{132}Te, ^{171}Tm, ^{181}W, ^{185}W, ^{187}W, ^{90}Y, ^{91}Y, ^{92}Y, ^{93}Y, ^{65}Zn, ^{71m}Zn, ^{72}Zn, ^{93}Zr, ^{95}Zr, and ^{97}Zr.

g. Radioiodine released in 2025 = ^{129}I, ^{130}I, ^{131}I, ^{132}I, ^{132m}I, ^{133}I, ^{134}I, and ^{135}I.

h. Radiostrontium released in 2025 = ^{89}Sr, ^{90}Sr, ^{91}Sr, and ^{92}Sr.

i. Uranium isotopes released in 2025 = ^{232}U, ^{233}U, ^{234}U, ^{235}U, ^{236}U, ^{237}U, and ^{238}U.

j. Plutonium isotopes released in 2025 = ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, and ^{242}Pu.

k. Other actinides released in 2025 = ^{227}Ac, ^{241}Am, ^{243}Am, ^{242}Cm, ^{243}Cm, ^{244}Cm, ^{237}Np, ^{230}Th, and ^{231}Th.

l. Other = radioisotopes of elements that are not noble gases, activation or fission products, radioiodine, radiostrontium, or actinides released in 2025. These are typically heavy elements that are decay chain members of actinides. They include ^{211}Bi, ^{223}Ra, and ^{35}S.

2.3 Ambient Air Surveillance Monitoring

Ambient air surveillance monitoring is conducted both onsite and offsite to identify regional and historical trends, detect accidental and unplanned releases, and verify that air concentrations are below the Derived Concentration Standards (DCSs) established by U.S. Department of Energy (DOE) for inhaled air (DOE 2022). Each radionuclide-specific DCS corresponds to a dose of 100 mrem for continuous exposure during the year. The Clean Air Act NESHAP regulatory standard is 10 mrem/yr (0.1 mSv/yr) (40 CFR 61, Subpart H).

2.3.1 INL Contractor Air Surveillance Monitoring

The INL contractor operates an extensive air monitoring network to detect potential radioactive releases and ensure protection of the public and environment. Samplers are strategically placed near INL facilities, in downwind directions, in predominant downwind directions, within nearby communities, and at background locations.

Air Monitoring Network

In 2025, the INL contractor maintained:

- 36 low-volume air samplers (including quality assurance units)
- 11 atmospheric moisture samplers
- 9 precipitation samplers

For emergency response, the contractor also maintains 16 high-volume event air samplers at NOAA weather towers, which are activated only during events such as wildfires or unplanned releases.

Air Particulates – Sampling and Analysis

Filters and charcoal cartridges are collected weekly. Initial screening for gross alpha and gross beta activity provides an overall indication of airborne radioactivity. Because gross alpha and beta measurements do not identify specific radionuclides, elevated results trigger targeted analyses. Gross beta is almost always detected, while gross alpha appears less often and can increase during wildfires or temperature inversions.

Quarterly, filters from each location are composited and analyzed for gamma-emitting radionuclides, including cesium-137 (from past INL activities and global fallout) and naturally occurring radionuclides (e.g., beryllium-7, potassium-40). Additional analyses target alpha- and beta-emitting radionuclides historically associated with INL operations or global fallout (e.g., americium-241, chlorine-36, plutonium and uranium isotopes, and strontium-90).

Air Particulates Monitoring Results

Weekly gross alpha and beta results primarily reflect naturally occurring radionuclides, but elevated readings can signal potential issues. Weekly results are reviewed for unusual patterns, and anomalies are investigated promptly. Overall, monitoring data provides valuable information for tracking trends and ensuring environmental safety.

Weekly results are reviewed for changes in patterns between locations and groups (i.e., onsite, boundary, and offsite locations) and for unusually elevated results. Anomalies are further investigated by reviewing sample or laboratory issues, meteorological events (e.g., inversions), and INL Site activities that are possibly related. If indicated, analyses for specific radionuclides may be performed. These data provide useful information for trending the total activity over time.

Results that detected gross alpha and gross beta through ambient air surveillance monitoring conducted by the INL contractor are summarized in Table 2-2.

Table 2-2. Gross alpha and gross beta detected in ambient air samples collected by the INL contractor (2025).

RADIONUCLIDE	NUMBER OF DETECTED RESULTS[a]	LOCATION OF MINIMUM DETECTED CONCENTRATION	MINIMUM CONCENTRATION (10^{-15} µCi/mL)[b]	LOCATION OF MAXIMUM DETECTED CONCENTRATION	MAXIMUM CONCENTRATION (10^{-15} µCi/mL)
Gross Alpha	1,257 of 1,614	Jackson, WY	0.48 ± 0.15	Howe	7.56 ± 1.72
Gross Beta	1,613 of 1,614	Craters of the Moon	7.58 ± 0.79	INTEC (west side)	92.5 ± 4.36

a. Excludes blanks and duplicates.
b. Results ± 1σ. Results shown are ≥ 3σ and below the DCS values for these radionuclides in air.

The highest detected gross alpha result for the air filter was collected at Howe (7.56 ± 1.72) × 10^{-15} µCi/mL on September 10, 2025. This maximum result is less than the DCS (DOE 2022) of 1.1 × 10^{-13} µCi/mL for $^{239/240}$Pu, which is the most conservative specific radionuclide DCS that could be applied to gross alpha activity. Gross alpha results are within the historical range, as shown in Figure 2-2.

The highest detected gross beta result for the air filter was collected at INTEC (west side) (92.5 ± 4.36) × 10^{-15} µCi/mL on July 2, 2025. The maximum weekly gross beta concentration is significantly below the DCS (DOE 2022) of 9.6 × 10^{-12} µCi/mL for the most restrictive beta-emitting radionuclide in the air, ^{90}Sr. Gross beta results are within the historical range, as shown in Figure 2-2.

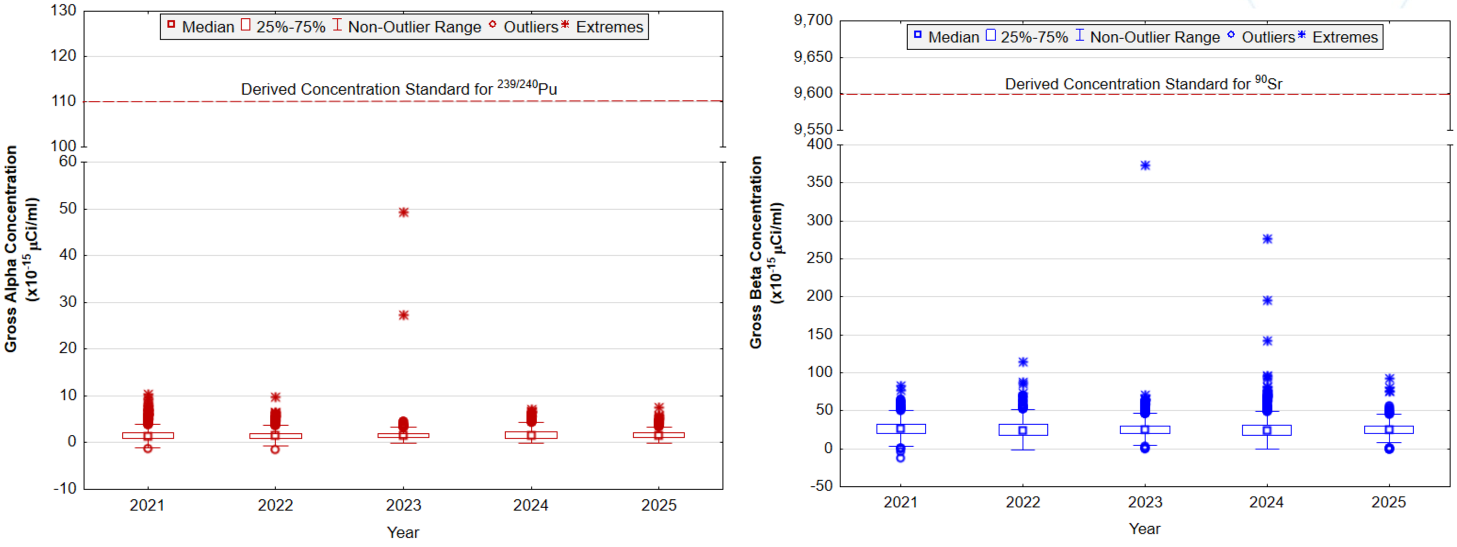

Figure 2-2. Gross alpha (left) and gross beta (right) 5-year trend.

Quarterly Composite of Air Filters Monitoring Results

The INL contractor observed no detectable concentrations of radionuclides of interest (^{137}Cs, ^{90}Sr, ^{65}Zn, ^{241}Am, ^{238}Pu, ^{239}Pu, and ^{36}Cl) in 2025 air filter composites at any location. In addition to the radionuclides discussed earlier, the INL contractor began surveillance monitoring for uranium during 2023. The detections of uranium radionuclides, as observed in Table 2-3, occur routinely at concentrations that suggest natural origin. Natural ^{7}Be was detected in numerous INL contractor composite samples at concentrations consistent with past concentrations. Levels of atmospheric ^{7}Be result from reactions of galactic cosmic rays and solar energetic particles with nitrogen and oxygen nuclei in Earth's atmosphere.

Table 2-3. Human-made radionuclides detected in ambient air samples collected by the INL contractor (2025).

RADIONUCLIDE	NUMBER OF DETECTED RESULTS[a,b]	LOCATION OF MINIMUM DETECTED CONCENTRATION	MINIMUM CONCENTRATION (µCi/mL)[a]	LOCATION OF MAXIMUM DETECTED CONCENTRATION	MAXIMUM CONCENTRATION (µCi/mL)
Uranium-233/234	8 of 132	Idaho Falls	(2.18 ± 0.66) E-17	INTEC	(28.5 ± 3.09) E-17
Uranium-238	14 of 132	Sugar City	(1.82 ± 0.56) E-17	INTEC	(27.5 ± 2.99) E-17

a. Results ± 1σ. Results are ≥ 3σ and below the DCS values.
b. Excludes blanks and duplicates

Charcoal Cartridges

Charcoal cartridges are analyzed weekly for iodine-131, (^{131}I), an isotope produced by nuclear fission that concentrates in the thyroid and has a short half-life of 8 days. Detecting ^{131}I would indicate a recent release of fission products.

Charcoal Cartridges Monitoring Results

The INL contractor collected and analyzed approximately 1,866 charcoal cartridges, including blanks and duplicates, in 2025. There were no statistically positive measurements of ^{131}I.

Precipitation and Atmospheric Moisture

The INL contractor monitors tritium, a radioactive form of hydrogen, because it combines with oxygen to form tritiated water, which behaves like normal water and can occur in air moisture and precipitation. Air moisture is collected using molecular sieve material and analyzed for tritium, while precipitation samples are routinely collected and tested using liquid scintillation counting. These two sampling methods provide a comprehensive picture of tritium in the environment.

Tritium occurs naturally in the atmosphere and has decreased globally since the 1963 Nuclear Test Ban Treaty. At INL, tritium detected in precipitation is primarily from natural sources, while tritium in air moisture may result from natural atmospheric production, past global fallout, and releases from INL facilities.

Precipitation Surveillance Monitoring Results

The INL contractor collects precipitation samples weekly, when available, from Atomic City, CPP, Experimental Field Station (EFS), Howe, IRC, Remote-Handled Low-Level Waste (RHLLW) Facility, SMC, and Van Buren Blvd. Precipitation is also collected monthly at Idaho Falls for Environmental Protection Agency (EPA) RadNet monitoring and a subsample is taken by the INL contractor for analysis. A total of 228 precipitation samples, including blanks and duplicates, were collected during 2025. Tritium was detected in three of the samples. The concentrations ranged from 96.7 ± 29.6 pCi/L from a sample collected at EFS on 8/27/2025 to 592 ± 67.2 pCi/L for a sample collected at RHLLW facility. For comparison, the DCS value is 2.6×10^6 pCi/L for tritium in water. The results were compared with tritium concentrations reported by the EPA for precipitation during the 10-year period from 2002–2011 (measurements discontinued after 2011) based on the query of available data. Concentrations reported by EPA for Idaho Falls during that period ranged from -84 to 1,718 pCi/L and averaged 35.1 pCi/L.

Annual tritium concentrations in atmospheric moisture and precipitation have no discernible statistical distribution, so non-parametric statistical methods were used to assess both datasets (see "Statistical Methods Used in the Idaho National Laboratory Annual Site Environmental Report," a supplement to this annual report). To summarize these results, box plots were constructed illustrating the annual tritium concentrations measured in atmospheric moisture (as water) and precipitation samples collected by the INL contractor for the past 10 years, as observed in Figure 2-3. The results appear

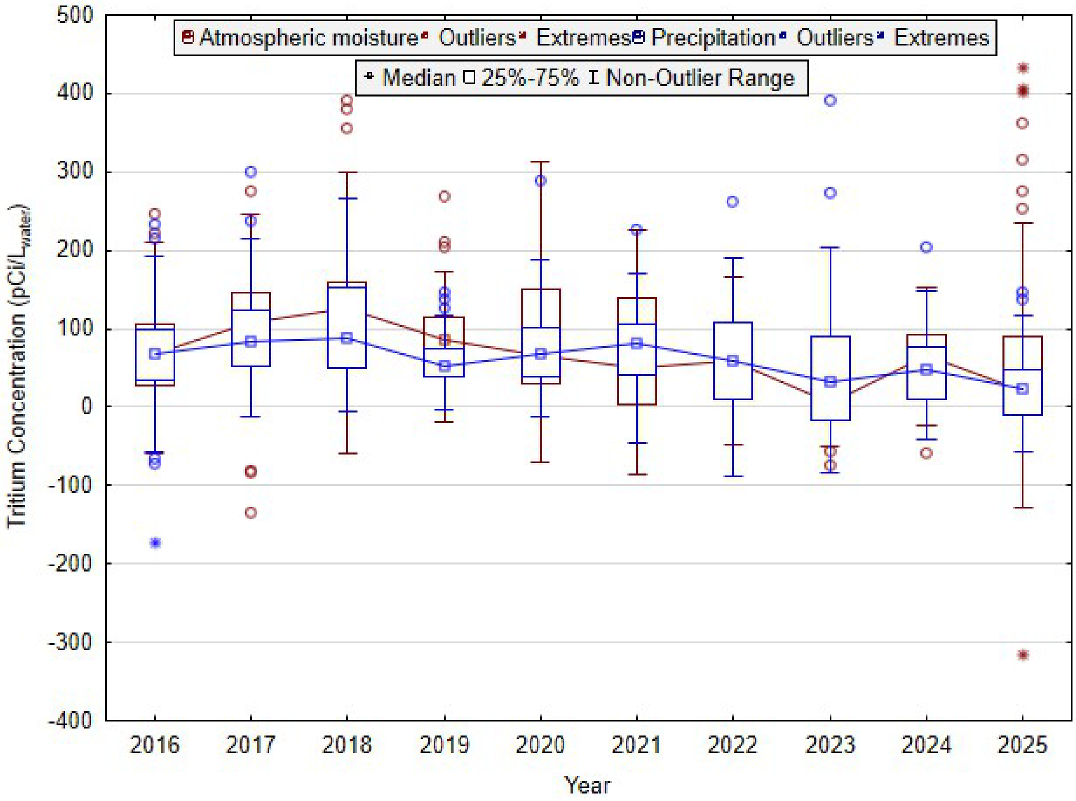

Figure 2-3. Box plots of tritium concentrations measured in atmospheric moisture and in precipitation from 2015–2025.

to be similar for each year. A statistical comparison of both datasets shows there are no differences between the median annual tritium concentrations measured in atmospheric moisture and in the precipitation samples. Because low levels of tritium exist in the environment at all times as a result of cosmic ray reactions with atmospheric gases in the upper atmosphere and the decreasing influence of fallout from nuclear weapons testing in the atmosphere and because tritium concentrations do not appear to differ between precipitation and atmospheric moisture samples, the source of tritium measured in precipitation and atmospheric moisture is most likely of natural origin and past nuclear tests and not from INL Site releases.

Atmospheric Moisture Surveillance Monitoring Results

During 2025, the INL contractor collected 87 atmospheric moisture samples at Atomic City, Craters of the Moon, EFS, Howe, Idaho Falls, RHLLW, and Van Buren. Table 2-4 shows a total of 12 tritium detections in 2025. The observed tritium concentrations are far below the DCS of 1.3 × 10^{-7} µCi/mL_{air} for tritium in air (as water vapor).

Table 2-4. Tritium detected in atmospheric moisture samples collected by the INL contractor (2025).

RADIONUCLIDE	NUMBER OF DETECTED RESULTS	LOCATION OF MINIMUM DETECTED CONCENTRATION	MINIMUM CONCENTRATION (pCi/mL_{air})[a]	LOCATION OF MAXIMUM DETECTED CONCENTRATION	MAXIMUM CONCENTRATION (pCi/mL_{air})
Tritium	12 of 87	Craters of the Moon	(5.03 ± 1.54) E-13	RHLLW	(115 ± 21.2) E-13

a. Results ± 1σ. Results are below the DCS value of 1.3 x 10^{-7} uCi/mL_{air} for tritium in air (as water vapor).

The source of tritium measured in atmospheric moisture samples collected on and around the INL Site is probably of cosmogenic origin and, to some extent, global fallout. Tritium releases from non-fugitive sources are highly localized and, although they may be detected immediately adjacent to the facility, they are unlikely to be detected at current air surveillance monitoring stations because of atmospheric dispersion.

2.3.2 ICP Contractor Air Surveillance Monitoring

Air Monitoring Network

ICP waste management monitoring operations are performed in the SDA at RWMC and ICDF at INTEC. These operations have the potential to emit radioactive airborne particulates. In 2025, the ICP contractor maintained:

- 9 low-volume air samplers (including quality assurance units).

Air Particulates Monitoring Results

The ICP contractor collected samples of airborne particulate material from the perimeters of these waste management areas in 2025. Also, samples were collected at a control location in Howe to compare with the results of the SDA and ICDF.

Samples were obtained using suspended particulate monitors similar to those used by the INL contractor. The 4-in.-diameter air filters are collected on the closest working day to the first and the fifteenth of each month. Gross alpha and gross beta activity were determined on all suspended particulate samples. Table 2-5 shows the range of detected gross alpha and beta concentrations for 2025.

Table 2-5. Gross alpha and gross beta detected in ambient air samples collected by the ICP contractor (2025).

RADIONUCLIDE	NUMBER OF DETECTED RESULTS	LOCATION OF MINIMUM DETECTED CONCENTRATION	MINIMUM CONCENTRATION (µCi/mL)[a]	LOCATION OF MAXIMUM DETECTED CONCENTRATION	MAXIMUM CONCENTRATION (µCi/mL)
Gross Alpha	145 of 182	SDA 6.3B	(16.1 ± 5.29) E-17	SDA 2.3	(8.78 ± 1.25) E-16
Gross Beta	145 of 182	SDA 9.3A	(19.5 ± 1.37) E-16	SDA 4.2C	(124 ± 3.40) E-16

a. Results ± 1σ. Results are ≥ 3σ and below the DCSs for $^{239/240}Pu$ in air and ^{90}Sr in air for gross alpha and gross beta, respectively.

The 2025 gross alpha results for the SDA and ICDF are well below the DCS (DOE 2022) of 1.1 × 10-13 µCi/mL for $^{239/240}Pu$, which is the most conservative specific radionuclide DCS that could be applied to gross alpha activity. The 2025 gross beta results for the SDA and ICDF are well below the DCS of 9.6 × 10-12 µCi/mL for the most restrictive beta-emitting radionuclide in the air (^{90}Sr). Results from the SDA and ICDF were compared with the results collected from the background monitoring location in Howe. The ranges of concentrations measured at the SDA and ICDF were aligned with the range measured at the background monitoring location in Howe.

Quarterly Composite of Air Filters Monitoring Results

Air filters are collected by the ICP contractor, composited in a laboratory, and analyzed for human-made, gamma-emitting radionuclides and specific alpha-emitting and beta-emitting radionuclides. Gamma spectroscopy analyses are performed monthly, and radiochemical analyses are performed quarterly.

In 2025, no human-made, beta-emitting, gamma-emitting, or alpha-emitting radionuclides were detected in air samples at ICDF at INTEC or at the SDA at RWMC.

Table 2-6 shows specific radionuclides detected in the SDA in 2025. These detections are consistent with levels measured in the air at the SDA in the last 5 years. All detections for radionuclides were three to four orders of magnitude below the DCS, as stipulated in DOE 2022. Statistically, false positives at the 95% confidence error are possible. The detections of uranium radionuclides occur routinely at concentrations that suggest a natural origin.

Table 2-6. Specific radionuclides detected in ambient air samples collected by the ICP contractor (2025).

RADIONUCLIDE	NUMBER OF DETECTED RESULTS	LOCATION OF MINIMUM DETECTED CONCENTRATION	MINIMUM CONCENTRATION (µCi/mL)[a]	LOCATION OF MAXIMUM DETECTED CONCENTRATION	MAXIMUM CONCENTRATION (µCi/mL)
Uranium 233/234	10 of 32	SDA 6.3B	(22.5 ± 6.16) E-18	INT 100.3	(4.75 ± 1.04) E-17
Uranium 238	9 of 32	SDA 6.3B	(19.4 ± 5.28) E-18	SDA 2.3	(5.50 ± 1.21) E-17

a. Results ± 1σ. Results are ≥ 3σ and below the DCS values for these radionuclides in air.

2.4 Unplanned Releases

Unplanned releases are unexpected discharges of hazardous or radioactive materials into the environment that occur outside normal operations. These events can result from equipment failures, accidents, natural events such as wildfires, or other unforeseen circumstances. While rare, they require immediate attention to protect workers, the public, and the environment. The INL Site contractors maintain monitoring systems and emergency response capabilities to quickly detect, assess, and mitigate any potential impacts.

2.4.1 Wildland Fires

There were no wildland fires on the INL Site in 2025, and therefore wildland fire did not result in a detected release of radionuclides.

2.4.2 Hazardous Substances and Regulatory Emissions

INL Site contractors had no unplanned releases of hazardous substances or any events resulting in emissions exceeding reporting thresholds that would require notification to be made to regulatory agencies in 2025.

2.4.3 Radiological Emissions

All radiological emissions were accounted for in the dose received by the MEI (Chapter 6).

2.5 Public Notification of Clearance of Property

The INL contractor complies with NE O 458.1A, while the ICP contractor follows DOE O 458.1. Both directives establish a public radiation dose limit of 100 mrem per year (1 mSv per year) above background. For 2025 INL Site releases, the potential MEI dose was evaluated using the CAP-88 PC model (Chapter 6, Subsection 6.2).

The “Derived Concentration Technical Standard” (DOE 2022) defines the quantities (DCSs) used in the design and conduct of radiological environmental protection programs. The DCSs are concentrations of radionuclides in water, milk, or air that would result in a 100-mrem (1-mSv) annual effective dose via ingestion, air submersion, or inhalation. All environmental measurements around the INL Site were below applicable DCSs.

Program requirements establish limits for the unrestricted release of property to the public. INL Site contractors apply a graded approach to property clearance, allowing administrative release of certain categories of controlled-area items (e.g., personal items, office materials, recyclables, non-radiological housekeeping waste, medical and bioassay samples, and items with approved release plans) without a radiological survey. Items originating from radiological areas that do not fall within these categories are subject to radiological surveys, process knowledge evaluation, or both prior to release.

Items advertised for public auction are surveyed before shipment to the INL property/excess warehouse, where additional random surveys are performed to ensure items are not released with inadvertent contamination.

All INL Site contractors survey materials prior to release and disposal at the state-permitted landfill located onsite. Items with potential internal contamination are instead sent to Waste Generator Services for disposal through approved offsite treatment, storage, and disposal facilities capable of accepting low-level contamination. DOE – Idaho Operations Office provides oversight of these clearance processes using a graded approach.

On May 15, 2025, DOE rescinded the Moratorium on Free Release of Volumetrically Contaminated Metals, allowing sites to pursue metal recycling consistent with applicable requirements.

2.5.1 INL Contractor Clearance of Property

For 2025, the INL contractor performed approximately 952 release surveys of personal property items with approximately 95% of these releases being for reuse at INL (i.e., instruments being sent for calibration, miscellaneous tools, shielding, heavy equipment, and scientific equipment). Those that were not released for reuse were released for appropriate disposal. All releases were performed using pre-authorized limits and were below the "Surface Contamination Values" (10 CFR 835, Appendix D). The INL contractor did not release any items using the pre-authorized volumetric radioactivity screening levels for clearance of personal property in 2025. As of the end of 2025, the INL contractor has not yet updated program requirements to allow metals to be released.

There were no releases of real property in 2025.

2.5.2 ICP Contractor Clearance of Property

The ICP contractor had 355 release surveys of personal property items. Those that were not released for reuse were released for appropriate disposal. The ICP contractor diverted 3,526,753 lbs. of mixed-metal scrap from onsite landfills in 2025 by sending it to an offsite recycling facility. The scrap metal was accumulated during the deactivation and decommissioning of the Submarine First Generation Westinghouse, Aircraft Carrier First Generation Westinghouse prototypes, and Submarine Fifth Generation GE Prototypes at Naval Reactors Facility. Before their release, these materials were characterized to ensure they were not hazardous waste and were deemed free of radioactive contamination based on surveys performed by radiological protection personnel.

There were no releases of real property in 2025.

2.6 Quality Assurance

2.6.1 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 meet these standards.

2.6.2 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 by the ICP contractor meet these standards.

2.7 References

10 CFR 835, Appendix D. 2026. "Surface Contamination Values." Code of Federal Regulations, Office of the Federal Register, National Archives and Records Administration, Washington, DC.

40 CFR 61, Subpart H. 2026. "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities." Code of Federal Regulations, Office of the Federal Register, National Archives and Records Administration, Washington, DC.

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DOE. 2022. "Derived Concentration Technical Standard." DOE-STD-1196-2022, December 2022. U.S. Department of Energy, Washington, DC.

DOE O 435.1. 2021. "Radioactive Waste Management." Change 2. U.S. Department of Energy, Washington, DC.

DOE O 458.1, 2025. "Radiation Protection of the Public and the Environment." Administrative Change 5. U.S. Department of Energy, Washington, DC.

DOE-ID. 2023. "Idaho National Laboratory Site Environmental Monitoring Plan." DOE/ID-11088, Rev. 6, September 2023. U.S. Department of Energy, Idaho Operations Office, Idaho Falls, ID.

DOE-ID. 2026. "National Emissions Standards for Hazardous Air Pollutants—Calendar Year 2025 INL Report for Radionuclides." DOE/ID-11441. U.S. Department of Energy, Idaho Operations Office, Idaho Falls, ID.

INL. 2026. "Idaho National Laboratory CY 2025 National Emission Standards for Hazardous Air Pollutants Analysis, Methodology and Results for Radionuclides." INL/RPT-26-93660. Idaho National Laboratory, Idaho Falls, ID.

NE O 458.1A. 2025. "Radiation Protection of the Public and the Environment." U.S. Department of Energy, Office of Nuclear Energy, Washington, DC.

Chapter 3: Environmental Monitoring Programs – Liquid Effluents Monitoring

Some Idaho National Laboratory (INL) Site operations retain wastewater in lined, total containment evaporative ponds constructed to eliminate liquid effluent discharges to the environment. Other INL Site operations discharge liquid effluents to unlined infiltration basins or ponds that may potentially contain nonhazardous levels of radioactive, or nonradioactive, contaminants. Effluent discharges are subject to specified discharge limits, permit limits, or maximum contaminant levels. INL Site contractor personnel conduct liquid effluent monitoring through liquid effluent and surface water runoff sampling and surveillance programs to ensure compliance with applicable permits, limits, and maximum contaminant levels. These programs also sample groundwater to evaluate the potential for groundwater impacts from current effluent discharges and operations.

Table 3-1 presents requirements for liquid effluent monitoring and surveillance performed at the INL Site. Maps and a comprehensive discussion of environmental monitoring, including liquid effluent monitoring and surveillance programs performed by various organizations within and around the INL Site, can be found in the "INL Environmental Monitoring Plan" (DOE-ID 2023a) and the "Technical Basis for Environmental Monitoring and Surveillance at the Idaho National Laboratory Site" (DOE-ID 2023b).

Table 3-1. Liquid effluent monitoring and surveillance at the INL Site.

	MONITORING REQUIREMENTS			
AREA/FACILITY	**IDAHO REUSE PERMIT[a]**	**NE O 458.1A[b] LIQUID EFFLUENT MONITORING**	**DOE O 458.1[c] LIQUID EFFLUENT MONITORING**	**DOE O 435.1[d] SURFACE RUNOFF SURVEILLANCE**
IDAHO NATIONAL LABORATORY CONTRACTOR				
Advanced Test Reactor Complex Cold Waste Pond	•	•		
Materials and Fuels Complex Industrial Waste Pond	•	•		
IDAHO CLEANUP PROJECT CONTRACTOR				
Idaho Nuclear Technology and Engineering Center Percolation Ponds and Sewage Treatment Plant	•		•	
Radioactive Waste Management Complex Subsurface Disposal Area surface water runoff			•	•

a. Required by permits issued according to IDAPA 58.01.17, "Recycled Water Rules." This includes wastewater effluent and related groundwater monitoring.

b. Paragraphs 4(f) and Paragraph 4(g) of NE O 458.1A establishes specific requirements related to the control and management of radionuclides from U.S. Department of Energy (DOE) activities in liquid discharges, including protection of groundwater and drinking water. Radiological liquid effluent monitoring recommendations in DOE Handbook Environmental Radiological Effluent Monitoring and Environmental Surveillance (DOE 2015) are followed to ensure quality. "Derived Concentration Technical Standard" (DOE 2022) supports the implementation of NE O 458.1A and provides the Derived Concentration Standards (DCSs) as reference values to control effluent releases from DOE facilities.

c. Paragraph 4(g) of DOE O 458.1, establishes specific requirements related to the control and management of radionuclides from DOE activities in liquid discharges, including protection of groundwater and drinking water. Radiological liquid effluent monitoring recommendations in DOE-HDBK-1216-2015 (DOE 2015) are followed to ensure quality. DOE-STD-1196-2022 (DOE 2022) supports the implementation of DOE O 458.1 and provides the DCSs as reference values to control effluent releases from DOE facilities.

d. The objective of DOE O 435.1 is to ensure that all DOE radioactive waste is managed in a manner that is protective of worker and public health, as well as safety and the environment. This order requires that radioactive waste management facilities, operations, and activities meet the environmental monitoring requirements of DOE O 458.1. DOE-HDBK-1216-2015 (DOE 2015) suggests that potential impacts of stormwater runoff as a pathway to humans or biota should be evaluated.

3.1 Liquid Effluent and Related Groundwater Compliance Monitoring

The discharge of liquid effluent to the land surface for treatment or disposal is known as "reuse" in the state of Idaho and is regulated by the Idaho Department of Environmental Quality (DEQ) "Recycled Water Rules" (IDAPA 58.01.17), "Wastewater Rules" (IDAPA 58.01.16), and the "Ground Water Quality Rule" (IDAPA 58.01.11). The Idaho DEQ issues reuse permits for the operation of these reuse systems. Reuse permits require the monitoring of nonradioactive constituents in the effluent and groundwater in accordance with the monitoring requirements specified within each permit. The reuse permits may specify annual discharge volumes, application rates, and effluent quality limits. Annual reports (ICP 2026a and 2026b; INL 2026a, 2026b, 2026c, and 2026d) were prepared and submitted to the Idaho DEQ.

During 2025, the INL Site contractors monitored the following reuse facilities as required by the permits, as shown in Table 3-2.

Table 3-2. 2025 status of INL Site contractors reuse permits.

FACILITY	PERMIT STATUS AT END OF 2025	PERMIT EXPIRATION DATE	EXPLANATION
Advanced Test Reactor Complex Cold Waste Ponds	Active	October 29, 2029	Idaho Department of Environmental Quality issued Reuse Permit I-161-03 on October 30, 2019 (DEQ 2019).
Idaho Nuclear Technology and Engineering Center Percolation Ponds	Active	June 25, 2034	Idaho Department of Environmental Quality issued Permit M-130-07 on June 25, 2024 (DEQ 2024).
Materials and Fuels Complex Industrial Waste Pond	Active	January 25, 2027	Idaho Department of Environmental Quality issued Reuse Permit I-160-02 on January 26, 2017 (DEQ 2017).

Effluent and groundwater radiological constituents are monitored at these facilities to comply with the environmental protection objectives of NE O 458.1A and DOE O 458.1 and are discussed in Subsection 3.2. Surface water monitoring at RWMC is presented in Subsection 3.3.

3.1.1 Advanced Test Reactor Complex Cold Waste Ponds

Description. The Cold Waste Ponds (CWP) are located near the southeast corner of the Advanced Test Reactor (ATR) Complex compound, approximately 1.2 km (0.75 mi) northwest of the Big Lost River channel. The CWP was excavated in 1982 and consists of two unlined cells that function as percolation basins for the infiltration of nonhazardous industrial liquid effluent. This effluent consists primarily of noncontact cooling tower blowdown, once-through cooling water for air conditioning units, coolant water from air compressors, and wastewater from secondary system drains and other nonradioactive drains throughout the ATR Complex. Chemicals used in the cooling tower and other effluent streams discharged to the CWP include commercial biocides and corrosion inhibitors. The cold waste effluent reports through collection piping to a monitoring location where flow rates to the CWP are measured and effluent samples are collected using an automated composite sampler.

Effluent Monitoring Results for the Reuse Permit. Reuse Permit I-161-03 requires monthly sampling of the effluent to the CWP (DEQ 2019). The CWP effluent is sampled for chromium, iron, Nitrate+nitrite as nitrogen, sulfate, and total dissolved solids (TDS), Filtered and un-filtered metals samples are analyzed to monitor system performance and provide better comparison to groundwater monitoring results. Field measurements for pH, conductivity and temperature are obtained at the time of sample collection using calibrated instruments. The 2025 permit reporting year monitoring results are presented in the 2025 annual reuse report (INL 2026c). When the ATR is operating, hydraulic discharge rates to the CWP are typically low while the evaporative cooling process in the cooler tower concentrates constituents in the effluent. During ATR outages, the cooling tower is not required and remains out of service. Consequently, once-through noncontact cooling water, which is normally directed to the ATR cooling tower basin as makeup water, is instead routed to the CWP collection system. In addition, because the cooling tower basin blowdown is not generated during outages, no blowdown water is discharged to the CWP system. This operational change reduces effluent concentrations of chromium, nitrate+nitrite as nitrogen, sulfate, and TDS during outage. Due to the composition and characteristics of the effluent, the reuse permit does not require pretreatment or specify maximum constituent loading limits or concentration limits for the cold waste effluent discharged to the CWP. During the 2025 permit reporting year total chromium ranged from 0.00152 to 0.0272 mg/L, Nitrate+nitrite as nitrogen ranged from 0.895 to 6.77 mg/L, sulfate from 20.8 to 1090 mg/L, and TDS from 187 to 1870 mg/L. During the summer and fall of 2025, a cold waste drain line carrying air compressor cooling water to the CWP was damaged, requiring temporary rerouting of this wastewater to the sewage lagoons. As a result, this stream no longer mixed with ATR cooling tower blowdown, causing the cold waste effluent to the reuse ponds to exhibit a lower flow rate and higher than normal constituent concentrations. Corrections were implemented in January 2026 to restore the line and return the flows to the CWP, resulting in a return to normal flows and concentration ranges. Except for the anomalously low flows and higher concentrations during the loss of the air compressor drainage, the constituent concentrations during the 2025 permit reporting year continued to remain stable and consistent with the historical results with no observable increasing or decreasing trends.

The permit specifies the maximum annual and 5-year moving average hydraulic loading rate limits of 375 million gallons per year (MG/yr) and 300 MG/yr, respectively, based on the annual reporting year of the permit. The 2025 annual reporting year flow of 148.48 MG did not exceed either of these hydraulic loading limits.

Groundwater Monitoring Results for the Reuse Permit. The permit requires groundwater monitoring twice annually in April/May and September/October at seven groundwater wells to measure potential impacts from the CWP. Groundwater is sampled for the same constituents of concern in the CWP effluent including chromium, iron, nitrate+nitrie as nitrogen, sulfate, and TDS. Both filtered and un-filtered metals are analyzed to provide better comparison to CWP effluent monitoring results. The 2025 permit reporting year groundwater monitoring results are presented in the 2025 annual reuse report (INL 2026c). During the 2025 permit reporting year all constituents, except for chromium, remained below their respective primary or secondary constituent standards. Well USGS-065 is the closest downgradient well to the CWP and has historically had the highest concentrations for the constituents of interest, including chromium, nitrate+nitrite as nitrogen, sulfate, and TDS. Nitrate+nitrite as nitrogen continues to show a minor increasing trend in the upgradient wells USGS-098 and USGS-058 but remains well below the primary constituent standard (PCS). All downgradient wells continue to show stable nitrate+nitrite as nitrogen concentrations well below the PCS with no observable trends. Sulfate and TDS are below their applicable secondary constituent standards and remain stable or are gradually trending downward in all wells. Iron concentrations continue to remain at low levels and are consistent with the historical ranges with no observable trend. Chromium is a constituent of concern being addressed under the Comprehensive Environmental Response, Compensation, and Liability Act due to historical discharges that have been discontinued at the ATR Complex (see Chapter 4, Subsection 4.5.2 for more information).

Chromium results in Well USGS-65 decreased from approximately 0.500 mg/L in the early 1970s to less than the PCS of 0.100 mg/L, starting in 2009, then remained relatively stable in the range of approximately 0.070 to 0.090 mg/L from 2010 through April 2024.

In September 2024 total and filtered chromium results collected from Well USGS-065 increased to 0.0979 mg/L and 0.0974 mg/L, respectively. During the 2025 reporting year total and filtered chromium increase to 0.114 and 0.111 mg/L, respectively, then to 0.120 and 0.117 mg/L during the September 2025 sampling event. A comparison of the total and filtered chromium concentrations in the CWP effluent, which historically have remained less than 0.02 mg/L, and Well USGS-065 suggests the source of these elevated chromium levels is unlikely to be a result of current effluent discharges to CWP, but rather is due to other factors, such as historical contamination being addressed by the Comprehensive Environmental Response, Compensation, and Liability Act program. Additional details and discussion can be found in the 2025 annual reuse report (INL 2026c). Chromium concentrations will continue to be monitored closely in the effluent and all permit monitoring wells.

3.1.2 Idaho Nuclear Technology and Engineering Center Percolation Ponds and Sewage Treatment Plant

Description. The INTEC Percolation Ponds are composed of two rapid infiltration ponds excavated into the surficial alluvium and surrounded by bermed alluvial material. The rapid infiltration system uses the soil ecosystem to treat wastewater. Each pond is 93 m × 93 m (305 ft × 305 ft) at the top of the berm and is approximately 3 m (10 ft) deep. Each pond is designed to accommodate a continuous wastewater discharge rate of 11.36 mL (3 mg) per day.

The INTEC Percolation Ponds receive a discharge of only industrial and municipal wastewater. Industrial wastewater (i.e., service waste) from INTEC operations consists of steam condensates, noncontact cooling water, water treatment effluent, boiler blowdown wastewater, stormwater, and small volumes of other nonhazardous/nonradiological liquids. Municipal wastewater (i.e., sanitary waste) is treated at the INTEC Sewage Treatment Plant (STP).

The STP is located east of INTEC, outside the INTEC security fence, and treats and disposes of sewage, septage, and other nonhazardous industrial wastewater at INTEC. The sanitary waste is treated by natural biological and physical processes (e.g., digestion, oxidation, photosynthesis, respiration, aeration, and evaporation) in four lagoons. After treatment in the lagoons, the effluent is combined with the service waste and discharged to the INTEC Percolation Ponds.

The INTEC Percolation Ponds were permitted by Idaho DEQ to operate as a reuse facility under Reuse Permit M-130-07 (DEQ 2024).

Wastewater Monitoring Results for the Reuse Permit. Monthly samples were collected from CPP-769 (influent to STP), CPP-773 (effluent from STP), and CPP-797 (effluent to the INTEC Percolation Ponds). As required by the permit, all samples are collected as 24-hour composites, except pH, fecal coliform, and total coliform, which are collected as grab samples. The permit specifies the constituents that must be monitored at each location. The permit does not specify any wastewater discharge limits at these three locations. During the 2025 reporting year, across all 3 sample locations biochemical oxygen demand results ranged from 8.96 to 189 mg/L, nitrate+nitrite as nitrogen results ranged from 0.069 to 6.48 mg/L, total kjeldahl nitrogen ranged from 3.04 to 123 mg/L, total phosphorus ranged from 1.57 to 10.3 mg/L, total suspended solids ranged from 4.5 to 195 mg/L, total coliform ranged from 10.2 to 2,419.2 most probable number, and TDS ranged from 178 to 389 mg/L. Monitoring results are provided in the 2025 Wastewater Reuse Report (ICP 2026a).

Percolation Ponds Flow Volumes. The INTEC wastewater permit specifies daily (3,000,000 gallons) and annual (1,095 million gallons) hydraulic loading limits for the recycled water discharged to the north and south percolation ponds. The maximum daily volume recorded during the 2025 reporting period was 955,000 gallons. The total annual volume discharged to the percolation ponds for the 2025 reporting year was 161,122,450 gallons, which was below the permitted annual hydraulic loading limit of 1,095,000,000 gallons.

Groundwater Monitoring Results for the Reuse Permit. To measure the potential impact on groundwater from wastewater discharges to the INTEC Percolation Ponds, the permit requires that groundwater samples are collected from six monitoring wells.

The permit requires that groundwater samples are collected semiannually during April/May and September/October and lists which constituents must be analyzed. Contaminant concentrations in the monitoring wells are limited by PCSs and secondary constituent standards as specified in IDAPA 58.01.11.

The 2025 water table elevations and depth-to-water table, determined prior to purging and sampling, and the analytical results for all constituents specified by the permit for the aquifer wells can be found in the 2025 Wastewater Reuse Report (ICP 2026a).

The chromium sample results were above groundwater PCS from Well ICPP-MON-V-212 (GW-0130-10) for the April/May sampling event. It was presumed that well corrosion contributed to the elevated chromium levels. A new pump was installed on the well September 29, 2025. The monitoring results for all samples collected from Well ICPP-MON-V-212 (GW-0130-10) after the pump replacement were within expected concentrations. All other wells under this project were below the constituent standards for both the spring and fall sampling events.

3.1.3 Materials and Fuels Complex Industrial Waste Pond

Description. The Materials and Fuels Complex (MFC) Industrial Waste Pond (IWP) is an unlined basin that was first excavated in 1959. The industrial wastewater discharged to the IWP consists of primarily noncontact cooling water, cooling tower drains, and air wash flows. Small volumes of MFC-768 power plant cooling water system blowdown, intermittent reverse osmosis blowdown, and floor drain and laboratory sink discharges are also sent to IWP. On occasion, with pre-approval, industrial wastewater from the MFC facility process holdup tanks discharges to the pipeline. IWP functions as a percolation basin for the infiltration of nonhazardous industrial effluent. The effluent reports through collection piping to a monitoring location where flow rates to IWP are measured and the effluent samples are collected using an automated composite sampler.

Wastewater Monitoring Results for the Reuse Permit. Reuse Permit I-160-02 requires monthly sampling of effluent discharging into IWP (DEQ 2017). The 2025 permit reporting year monitoring results are presented in the 2025 annual reuse report (INL 2026d). Based on the composition of the industrial effluent, the reuse permit does not require pretreatment or specify maximum constituent loading limits or concentration limits. The effluent is analyzed for iron, manganese, sodium, chloride, nitrate+nitrite as nitrogen, and TDS. Total and filtered metals were analyzed to monitor system performance and provide better comparison to groundwater monitoring results. Chloride and sodium are monitored for operational purposes and are not required by the permit. Field parameters including pH, conductivity and temperature are measured at the time of sample collection using calibrated instruments. During the 2025 permit reporting year, concentrations of iron and manganese continued to be at or near the minimum detection levels. TDS ranged from 217 to 388 mg/L. The 2025 metals and TDS concentrations continue to be within historical ranges and remain stable with no observable trends. Effluent nitrate+nitrite as nitrogen concentrations continue to gradually trend upward at approximately the same rate and concentrations as the upgradient background groundwater concentration in Well ANL-MON-A-012. The aquifer is the source of water from which the industrial effluent is generated, and it is likely that the upgradient aquifer nitrogen concentrations are passing through the system to the effluent. As shown in the 2025 annual reuse report (INL 2026d), there are no discernible impacts or changes between upgradient and downgradient groundwater quality. The lack of a significant difference from upgradient to downgradient indicates the reuse system is not impacting the groundwater.

The permit specifies an annual reporting year hydraulic loading limit of 17 MG/yr. During the 2025 permit reporting year the effluent flow of 7.729 MG/yr was well below the permit limit.

Groundwater Monitoring Results for the Reuse Permit. The reuse permit requires groundwater monitoring twice per year, in April/May and September/October, at one upgradient well and two downgradient wells, to measure potential impacts from the pond. Groundwater samples were collected in April 2025 and September 2025. And analyzed for iron, manganese, sodium, potassium, calcium, magnesium, alkalinity, chloride, sulfate, conductivity, and TDS. Total and filtered metals were analyzed to meet permit requirements and to monitor system performance and provide better comparison to groundwater monitoring results. Chloride, sulfate, sodium, potassium, calcium, magnesium, and alkalinity are only required by the reuse permit during April/May of the first and last year of the permit; however, they were also sampled in 2025 including both total alkalinity and bicarbonate alkalinity The analytical results are presented in the 2025 annual reuse report (INL 2026d). In 2025, nitrate+nitrite as nitrogen continued to gradually trend up in the upgradient and downgradient wells to a high of 3.46 mg/L but remains well below the primary groundwater constituent standard of 10 mg/L. None of the constituents exceeded their respective primary or secondary constituent standards, and the analyte concentrations in the downgradient wells remained consistent with the background levels in the upgradient well. There appears to be no discernible groundwater impacts from MFC operations.

3.2 Liquid Effluent Radiological Surveillance Monitoring

The following subsections discuss the results of liquid effluent radiological surveillance monitoring performed at each wastewater reuse-permitted facility.

3.2.1 Advanced Test Reactor Complex

Effluent discharged to CWP is a combination of process water from various ATR Complex facilities. Radiological surveillance of CWP effluent is performed monthly for gross alpha, gross beta, gamma spectrometry, and tritium. In 2025, gross alpha and gross beta were the only surveillance constituents that were detected, with gross alpha concentrations ranging from 4.03 ± 1.32 to 8.49 ± 1.89 pCi/L and gross beta concentrations ranging from 3.95 ± 0.99 to 15.0 ± 1.36 pCi/L. These concentrations were within the historical ranges with no observable trends. When gross alpha levels exceed a threshold of 5 pCi/L, additional analysis for radium-226 and radium-228 are performed as well. Radium-226 and radium-228 analyses were conducted in November 2025 following a sample that exceeded the gross alpha threshold; neither radionuclide was positively detected.

Additionally, seven groundwater monitoring wells are sampled twice per year for radiological surveillance and analyzed for gross alpha, gross beta, gamma spectrometry, strontium-90, and tritium. The 2025 groundwater radionuclide surveillance monitoring results are presented in INL (2026a). All detected constituents—including tritium (326 ± 107 to 777 ± 136 pCi/L), gross alpha (0.54 ± 0.17 to 1.67 ± 0.29 pCi/L), and gross beta (1.72 ± 0.34 to 5.43 ± 0.43 pCi/L)—were well below the Idaho groundwater PCSs (IDAPA 58.01.11) and "Derived Concentration Standard" (DOE 2022). Gross alpha and gross beta measurements remain stable within the historical ranges and show no observable trends. Tritium continues to trend downward in the monitoring wells that have positive detections.

3.2.2 Idaho Nuclear Technology and Engineering Center

In addition to the permit-required monitoring summarized in Subsection 3.1.3, surveillance monitoring was conducted at CPP-797 (effluent to the Idaho Nuclear Technology and Engineering Center [INTEC] Percolation Ponds), and groundwater monitoring was conducted at the INTEC Percolation Ponds. Radiological monitoring was also conducted at CPP-797, and in Wells ICPP-MON-A-165, ICPP-MON-A-166, ICPP-MON-V-200, and ICPP-MON-V-212.

Twenty-four-hour flow proportional samples were collected from the CPP-797 wastewater effluent and composited daily into a monthly sample. Each monthly composite sample was analyzed for specific gamma-emitting radionuclides, gross alpha, gross beta, and total strontium activity. Gross alpha was detected in one sample, and gross beta was detected in all 12 samples collected in 2025. Gross alpha detection was 4.80 ± 1.22 pCi/L, gross beta ranged from 3.88 ± 0.715 to 14.8 ± 1.49 pCi/L. All detected constituents were below the Idaho groundwater PCSs in IDAPA 58.01.11. Historical trends are steady with only minor fluctuations in activity results.

Groundwater samples were collected from the aquifer from Wells ICPP-MON-A-165 and ICPP-MON-A-166 and from perched water from Wells ICPP-MON-V-200 and ICPP-MON-V-212 in April 2025 and September 2025 and were analyzed for gross alpha and gross beta. Throughout all the wells, gross alpha results ranged from 2.89 ± 0.951 pCi/L to 3.43 ± 1.13 pCi/L, and gross beta results throughout all the wells ranged from 2.69 ± 1.16 pCi/L to 24.0 ± 1.58 pCi/L. All detected constituents, gross alpha, and gross beta, were below the Idaho groundwater PCSs in IDAPA 58.01.11. Historical trends are steady with only minor fluctuations in activity results. The aquifer radiological results can be found in the "2025 Radiological Monitoring Results Associated with the INTEC Percolation Ponds" (ICP 2026b).

3.2.3 Materials and Fuels Complex

Radiological surveillance of the effluent in the IWP is performed three times per year and analyzed for gross alpha, gross beta, gamma spectrometry, and tritium. Annual samples also are collected and analyzed for select isotopes of americium, strontium, plutonium, and uranium. In 2025, gross alpha, gross beta, uranium-233/234, and uranium-238 were the only surveillance constituents detected in the IWP. Detected gross alpha concentrations ranged from 3.22 ± 0.97 pCi/L to 3.74 ± 1.12 pCi/L, gross beta concentrations from 5.74 ± 0.68 pCi/L to 7.37 ± 1.17 pCi/L, a detected concentration of 1.14 ± 0.15 pCi/L for uranium-233/234, and 0.62 ± 0.10 pCi/L for uranium-238. These concentrations are all well below the applicable DCS (DOE 2022) and remain within historical ranges.

Additionally, three ground water monitoring wells are sampled twice per year for radiological surveillance and analyzed for gross alpha, gross beta, alpha spectrometry, gamma spectrometry, and tritium. The 2025 groundwater radionuclide surveillance monitoring results are presented in INL (2026b). In 2025, gross alpha, gross beta, uranium-233/234, and uranium-238 were the only surveillance constituents detected in the wells. Gross alpha concentrations ranged from 0.64 ± 0.19 to 1.41 ± 0.32 pCi/L, and gross beta ranged from 2.90 ± 0.22 to 5.26 ± 0.32 pCi/L. Uranium-233/234 concentrations ranged from 1.00 ± 0.28 to 1.46 ± 0.17 pCi/L, and uranium-238 ranged from 0.48 ± 0.09 to 0.69 ± 0.12 pCi/L. Overall, the detected results were below the Idaho groundwater PCSs (IDAPA 58.01.11), applicable DCS (DOE 2022), and remain within the historical ranges and show no discernible impact from MFC operations.

3.3 Surface Water Runoff Surveillance Water Sampling

Radionuclides could be transported outside the Radioactive Waste Management Complex (RWMC) boundaries via surface water runoff. Surface water runs off the Subsurface Disposal Area (SDA) during periods of rapid snowmelt or heavy precipitation. The canal also carries runoff from outside RWMC that has been diverted around the SDA. In addition, water sheet flows across asphalt surfaces and infiltrates around/under door seals at Waste Management Facility (WMF)-636 at the Advanced Mixed Waste Treatment Project. The resulting surface water inflow accumulates in the WMF-636 Firewater Catch Tanks A, B, C, and D. If the level of surface water in the Firewater Catch Tanks reaches a predetermined level, the water is pumped into aboveground holding tanks, where it can be sampled, prior to discharge into the drainage canal surrounding the SDA.

In compliance with DOE O 435.1, the Idaho Cleanup Project (ICP) contractor collects surface water runoff samples at RWMC SDA from the WMF-636 Firewater Catch Tanks. Surface water is collected to determine whether radionuclide concentrations exceed the administrative control levels or if concentrations have increased significantly, as compared with the historical data. A field blank is also collected for comparison.

On August 11, 2025, Firewater Catch Tank B (WMF-636) at Advanced Mixed Waste Treatment Project was sampled. The sample underwent radionuclide analysis for gross alpha, gross beta, radium-226, and strontium-90. All maximum concentrations measured were below their respective DCSs. The analytical results were consistent with historical data and remained well within all applicable DCS limits.

A water sample was collected from the SDA lift station in 2025. This sample was analyzed for a suite of radionuclides that included americium-241, strontium-90, and plutonium and uranium isotopes. There were 13 positive three sigma (3σ) detections between americium-241, plutonium-238, plutonium-239/240, and strontium-90 in the samples taken in 2025 The maximum concentrations detected for americium-241, plutonium-238, plutonium-239/240, and strontium-90 were each well below their respective DCS. In addition to sampling for these nuclides, uranium isotopes were detected at levels consistent with historical results, which were below any applicable DCS.

Table 3-3 summarizes the specific alpha and beta results of human-made radionuclides. No human-made gamma-emitting radionuclides were detected in the surface water runoff sample. Review of the available data indicates that results remain consistent with historical trends, with no deviations observed. ICP temporarily ceased sample collection since teardown of the Accelerated Retrieval Project V facility removed electrical facilities to the SDA lift station. The ICP contractor has revised their sampling procedure to allow for continued sampling at the SDA lift station considering the changes resulting from these closure activities.

Table 3-3. Radionuclides detected in surface water runoff at the RWMC SDA (2025).

LOCATION	PARAMETER	MAXIMUM CONCENTRATION[a] (pCi/L)	% DCS[b]
Subsurface Disposal Area Lift Station	Americium-241	0.07 ± 0.01	0.01
	Plutonium-239/240	0.04 ± 0.01	0.01
	Uranium-234	0.40 ± 0.04	0.03
	Uranium-238	0.36 ± 0.03	0.03

a. Result ±1s. Results shown are greater than 3σ.
b. See DOE-STD-1196-2022, Table A-6 (DOE 2022).

3.4 Quality Assurance

3.4.1 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 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 in this chapter by the INL contractor meet these standards.

3.4.2 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.

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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

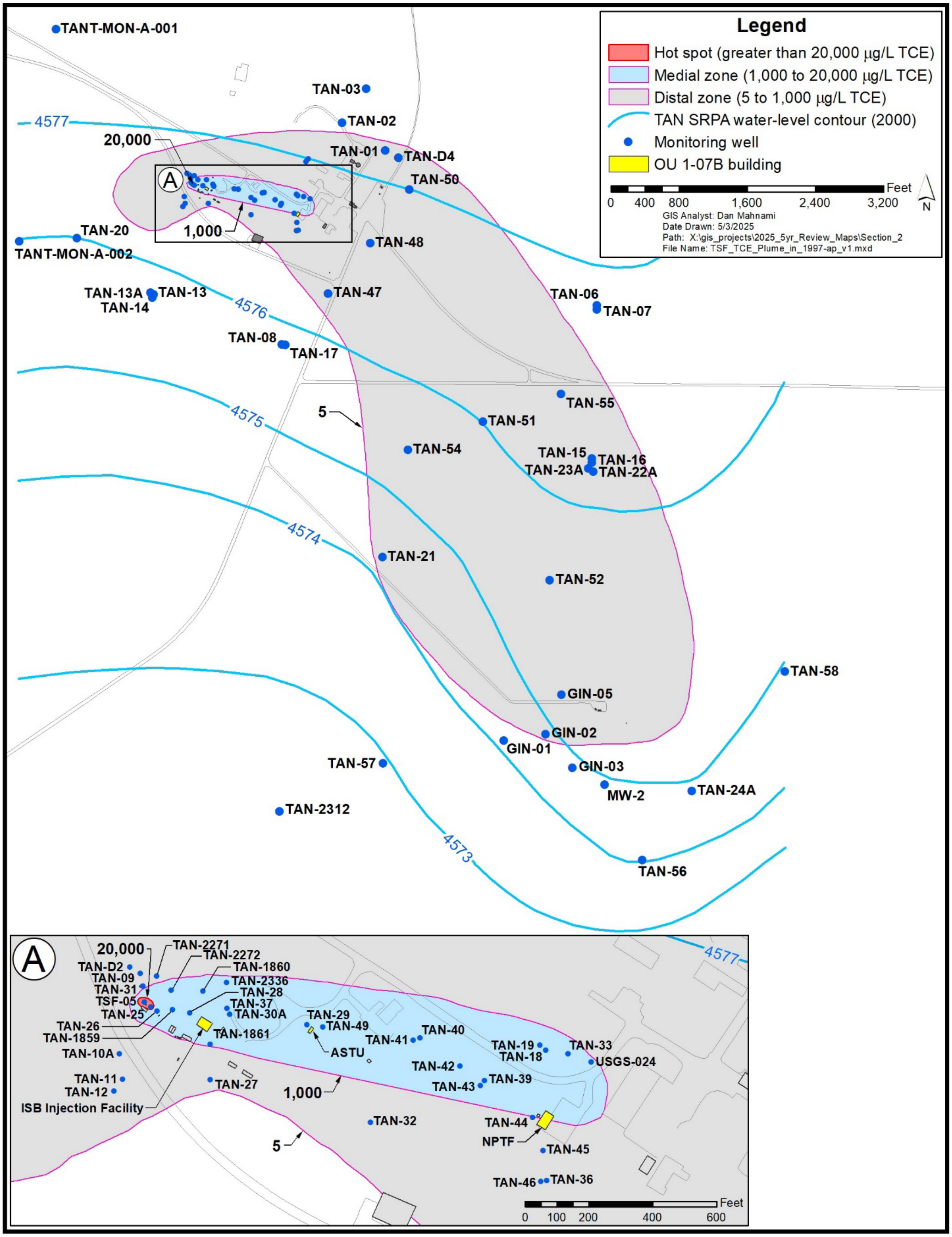

Figure 4-1. TCE plume at TAN in 1997.

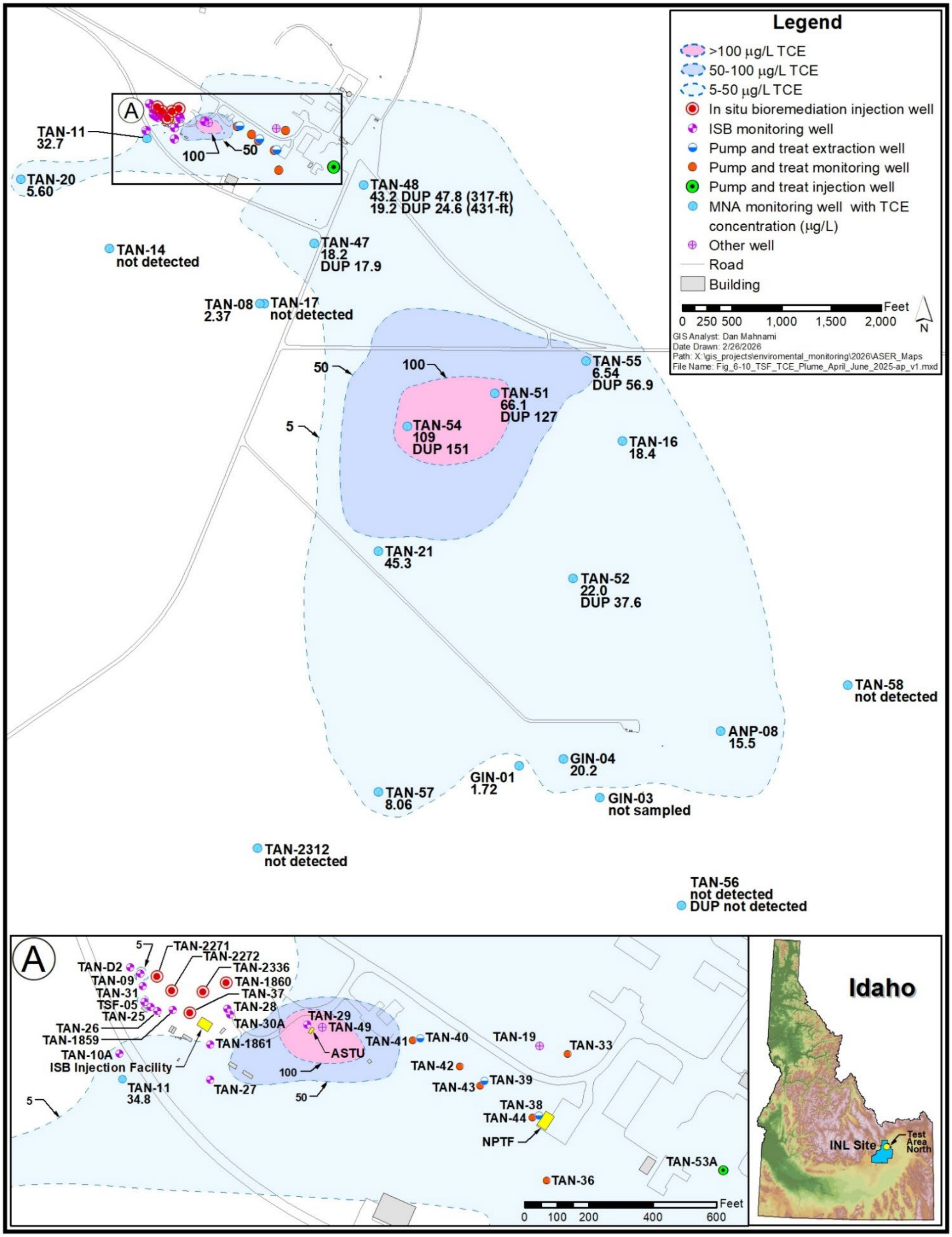

Figure 4-2. Distribution of TCE in the Snake River Plain Aquifer from April to June 2025.

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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Chapter 5: Environmental Surveillance Monitoring Programs – Agricultural Products, Wild Game, Soil, and Direct Radiation

This chapter summarizes the results of the environmental surveillance monitoring of agricultural products, wild game, soil, and direct radiation on and around the INL Site during 2025. Program details are provided in the “Idaho National Laboratory Site Environmental Monitoring Plan” (DOE-ID 2023). Surveillance of soil, vegetation, biota, and direct radiation is conducted both onsite and offsite to meet applicable U.S. Department of Energy (DOE) requirements. These media have the potential to accumulate contaminants released from INL Site operations. To improve readability, only data exceeding three sigma (3σ) thresholds or background upper tolerance limits (UTLs) are included in tables.

5.1 Agricultural Products and Biota Sampling

Agricultural products and game animals are monitored by the INL contractor because they represent a potential pathway for radionuclides to reach the public through food chains. In accordance with NE O 458.1A requirements to evaluate ingestion pathways, sampling includes milk, leafy greens (such as lettuce), alfalfa, potatoes, grains, and select wild game.

5.1.1 Sampling Design

Agricultural products may be impacted by radionuclides transported offsite by wind and deposited on soil and vegetation. Approximately 45% of land surrounding the INL Site is agricultural (DOE-ID 1995), and many residents maintain home gardens. Animals may also consume contaminated vegetation and transfer radionuclides to humans through meat and milk.

Agricultural product sampling began in the vicinity of the INL Site in the 1960s with milk and wheat as part of the routine environmental surveillance monitoring program. Currently, the program focuses on milk, leafy greens, alfalfa, potatoes, and grains.

As specified in DOE-HDBK-1216-2015 (DOE 2015), representative samples of the pathway-significant agricultural products grown within 16 km (10 miles) of the INL Site should be collected and analyzed for radionuclides that potentially could be present from INL Site operations. These samples should be collected in at least two locations: (1) the place of expected maximum radionuclide concentrations, and (2) a “background” location unlikely to be affected by radionuclides released from the INL Site.

Sample design was primarily guided by wind direction and frequencies, as well as from farming practices. Using CALPUFF and INL Site meteorological data measured from 2006 through 2008, air-dispersion modeling was performed to develop data quality objectives for radiological air surveillance monitoring for the INL Site using the methodology documented in Rood and Sondrup (2014). Then, this same methodology was used to discern the dispersion and deposition patterns resulting from these sources, which reflect wind patterns typical of the INL Site. Prevailing winds at most INL Site locations are from the southwest during daytime hours. During evening hours, the winds will sometimes shift direction and blow from the north or northeast but at a lower velocity. Model results show the maximum offsite deposition location is between the southwest INL Site boundary and the Big Southern Butte. Because there are no agricultural activities in this region, sampling is focused on other agricultural areas west and northeast of the INL Site. In addition, the sampling design considers locations of interest to the public, as well as those of historical interest, which is why some samples are collected at extended distances from the INL Site.

5.1.2 Sampling Methods

Fresh produce and milk are purchased from local farmers when available. In addition, lettuce is grown by the INL contractor in several locations where local gardens are not feasible.

5.1.3 Sampling and Analysis

Milk

Milk is sampled to monitor the pathway from potentially contaminated, regionally grown feed to cows, and then to milk, which is afterward ingested by humans. During 2025, the INL contractor collected 207 milk samples, including duplicates and controls, at various locations off the INL Site and purchased milk commercially produced outside the state of Idaho, which served as the control sample. The number and location of the dairies can vary from year to year as farmers enter and leave their businesses. Milk samples were collected weekly from dairies in Rigby and Terreton, Idaho, as well as monthly at other locations around the INL Site.

Milk Monitoring Results

All milk samples were analyzed for gamma-emitting radionuclides, including iodine-131 (^{131}I) and cesium-137 (^{137}Cs). During the second and fourth quarters, samples were analyzed for strontium-90 (^{90}Sr) and tritium as well. Iodine is an essential nutrient and is readily assimilated by cows or goats eating plants containing the element. Iodine-131 (^{131}I) is of particular interest because it is produced by reactor operations or nuclear weapons testing, is readily detectable, and, along with ^{134}Cs and ^{137}Cs, can dominate the ingestion dose regionally after a severe nuclear event, such as what occurred after the Chernobyl accident (Kirchner 1994) in Ukraine and the 2011 accident in Fukushima, Japan. The ingestion pathway of milk is the main route of internal ^{131}I exposure for people. Iodine-131 has a short half-life of just 8 days; therefore, it does not persist in the environment. Past releases from experimental reactors at the INL Site and fallout from atmospheric nuclear weapons tests and the Chernobyl accident are no longer present. Iodine-131 was not detected in any of the air samples collected at or beyond the INL Site boundary (see Chapter 2), nor was it detected in any milk sample collected during 2025.

Cesium-137 is chemically analogous to potassium in the environment and behaves similarly by accumulating in many types of tissue, most notably in muscle tissue. With a half-life of about 30 years, ^{137}Cs tends to persist in soil. If in a soluble form, it can readily enter the food chain through plants. It is widely distributed throughout the world from historic nuclear weapons detonations, which occurred between 1945 and 1980, and has been detected in all environmental media at the INL Site. Potential sources of ^{137}Cs include releases from INL Site facilities and the resuspension of previously contaminated soil particles. Cesium-137 was not detected in any milk sample collected in 2025.

Strontium-90 is an important radionuclide because it behaves like calcium and can deposit in bones. Like ^{137}Cs, ^{90}Sr is produced in high yields either from nuclear reactors or from the detonation of nuclear weapons. It has a half-life of about 29 years and can persist in the environment. Strontium tends to form compounds that are more soluble than ^{137}Cs and, therefore, are comparatively mobile in ecosystems. Strontium was not detected in any milk sample collected in 2025.

Tritium is a radioactive isotope of hydrogen with a half-life of approximately 12 years. Because it readily combines with oxygen to form tritiated water, it behaves similarly to ordinary water in the environment. As a result, tritium can be found in surface water, precipitation, and atmospheric moisture. It is produced naturally in the upper atmosphere and can also be generated through reactor operations and historical nuclear weapons testing.

Tritium enters the food chain primarily through surface water consumed by people and animals, as well as through plants that naturally contain water. Tritium concentrations were detected in samples collected on November 17, 2025, measuring 115.0 ± 27.6 pCi/L in Deitrich, Idaho, and 83.0 ± 24.9 pCi/L in Terreton, Idaho. For comparison, the derived concentration standard for tritium in milk is 12,000,000 pCi/L.

Lettuce

Lettuce is sampled as part of environmental monitoring because radionuclides present in the air can settle onto soil and plant surfaces, where they may be ingested by people. Plants can take up radionuclides in two ways: through their roots from the soil and through material deposited directly on their leaves. For many radionuclides, contamination of foliage is the primary pathway (Amaral et al. 1994). As a result, leafy greens such as lettuce often show higher soil-to-plant concentration ratios compared with other types of plants.

Each year, the INL contractor collects lettuce samples from locations on and near the INL Site. Because the availability of lettuce from home gardens varied from year to year, portable lettuce planters have replaced traditional gardens at several monitoring locations. These planters allow sampling in areas where public gardening is not feasible, including on the INL Site and near air sampling stations. The planters remain in place throughout the growing season, enabling natural deposition of airborne radionuclides on the soil and plant surfaces. In the spring, the planters are filled with locally sourced soil mixed with potting soil, seeded with lettuce, and maintained using a self-watering reservoir.

Lettuce Monitoring Results

During 2025, nine lettuce samples were collected from southeast Idaho, including a duplicate from Howe, Idaho. For comparison, a control sample was also purchased outside the state of Idaho from a local grocery store. Eight of the nine samples were grown in portable planters located in Atomic City, Blackfoot, the Experimental Field Station, Howe, Idaho Falls, Monteview, and Sugar City. One sample was collected from a farm in Pocatello. Collection of samples at Atomic City and the Experimental Field Station yielded insufficient amounts of lettuce for analysis. The remaining samples were analyzed for the gamma-emitting radionuclide ^{137}Cs and for ^{90}Sr.

Strontium-90 was not detected in any of the lettuce samples collected in 2025. This radionuclide persists in the environment from historic above-ground nuclear weapons testing conducted between 1945 and 1980. Cesium-137 was also not detected in the 2025 samples. Although ^{137}Cs from the past fallout can be measured in soils, its uptake into lettuce and other vegetation is generally much lower than that of strontium (Fuhrmann et al. 2003; Ng, Colsher, and Thompson 1982; Schulz 1965). The movement of ^{137}Cs into plants depends strongly on soil characteristics, including clay content and alkalinity. Soils in southeast Idaho tend to be moderately to highly alkaline, which can further limit the availability of ^{137}Cs for plant uptake. No other human-made radionuclides were detected in any lettuce samples.

Grain

Grain, including wheat and barley, are sampled because they are widely grown in the region and serve as an important local food and feed source.

Grain Monitoring Results

In 2025, the INL contractor collected grain samples at eleven locations from areas surrounding the INL Site, including a duplicate sample from Arco, Idaho. A control sample was purchased from outside the state of Idaho for comparison. Sampling locations may vary from year to year as growers rotate their crops, but they are generally chosen from areas that are part of the air surveillance monitoring network.

No human-made radionuclides were detected in any of the grain samples collected. Agricultural products, such as fruits and grains, typically contain lower levels of radionuclides than leafy greens, which more readily accumulate airborne deposition (Pinder et al. 1990).

Potato

Potatoes are collected for monitoring because they are one of the primary crops grown in the region and are of particular interest to the public. Since potatoes grow underground and are not exposed to airborne contaminants, they typically play a lesser role in the ingestion pathway.

Potato Monitoring Results

In 2025, the INL contractor collected nine potatoes samples from eight locations near the INL Site, along with a duplicate sample from American Falls, Idaho. A control sample was purchased from outside the state of Idaho. None of the potato samples collected during 2025 contained detectable concentrations of human-made radionuclides. Similar to grain crops, potatoes are generally less-efficient at taking up radioactive materials from the soil than leafy greens, such as lettuce, which can more readily accumulate airborne disposition.

Alfalfa

In addition to analyzing milk, the INL contractor began collecting alfalfa data in 2010 because alfalfa is an important feed source for dairy cows and can serve as an indicator of potential radionuclide deposition.

Alfalfa Monitoring Results

In 2025, the INL contractor collected fifteen alfalfa samples from four locations in areas surrounding the INL Site, including duplicate samples from Howe, Idaho Falls, and Mud Lake, Idaho. Mud Lake is an agricultural area with a relatively high potential for offsite airborne deposition. (Note: The highest offsite air concentration used for estimating public dose was detected southeast of the INL Site's east entrance; however, there is limited agriculture near that location.) No ^{90}Sr or gamma-emitting radionuclides were detected in the alfalfa samples collected during 2025.

Big Game Animals

Since big game historically have been documented to uptake some level of radioactive contaminants, the opportunistic sampling of road-killed game animals is important to ascertain the potential impacts of these contaminants on the animals, as well as the humans potentially consuming them (INL 2022a).

Big Game Monitoring Results

Various tissue samples were collected from three elk and a pronghorn under a scientific collection permit. Muscle, liver, and thyroid samples were collected from two of the elk. Only muscle samples were collected from the remaining elk and the pronghorn because the livers were damaged due to vehicular strikes. The muscle and liver samples were analyzed for ^{137}Cs because it is an analog of potassium and is readily incorporated into muscle and organ tissues. Thyroids are analyzed for ^{131}I because the isotope accumulates selectively in the thyroid gland of many animals when ingested, making them an ideal bio-indicator of atmospheric releases. Iodine-131 was not detected in the thyroid samples. No ^{137}Cs or other human-made, gamma-emitting radionuclides were found in any of the muscle or liver samples.

Because no human-made radionuclides were detected in big game tissues, an evaluation using the maximum radionuclide concentrations at the INL Site was completed, and the result was below the DOE-STD-1153-2019 (DOE-2019) criteria.

Waterfowl

Waterfowl are collected each year from ponds on the INL Site and from offsite locations under scientific collection permits issued by the Idaho Department of Fish and Game and the U.S. Fish and Wildlife Service. Samples are collected only when waterfowl are present, and additional opportunistic salvage of deceased birds may occur elsewhere on the INL Site when conditions allow. Results from these samples are used to estimate the potential radiation dose to the waterfowl and to individuals who may consume them.

Waterfowl Monitoring Results

Three waterfowl samples were collected from wastewater ponds located at the Sewage Lagoons, two control waterfowl samples were collected from the South Fork of the Snake River. These samples were analyzed for gamma-emitting radionuclides (^{90}Sr) and actinides (americium-241, plutonium-238, plutonium-239/240). These radionuclides were selected because they have been measured historically in liquid effluents from some INL Site facilities. Each sample was divided into the following three subsamples: (1) edible tissue (e.g., muscle, gizzard, heart, liver); (2) the external portion (e.g., feathers, feet, head); and (3) all remaining tissue.

Cesium-137 was detected in a remainder subsample collected at the Sewage Lagoons on October 31, 2025. The concentration was similar to historical results for waterfowl subsamples. No additional human-made, gamma-emitting radionuclides were found in the collected edible, external, or remainder subsamples.

Tissue data was evaluated in conjunction with maximum radionuclide concentrations measured in soil and water across the INL Site to estimate dose to waterfowl. The resulting dose estimate was well below the criteria established in DOE-STD-1153-2019 (DOE 2019).

5.2 Soil Sampling

Soil sampling provides long-term insight into the accumulation of radionuclides in the environment and is recommended in DOE-HDBK-1216-2015 (DOE 2015) for evaluating deposition trends over time. As an integrating medium, soil reflects contaminants introduced through atmospheric deposition, resuspension of onsite materials, or irrigation with impacted water. Although soil sampling is valuable for assessing long-term accumulation of airborne radionuclides, it typically plays a supplementary role in environmental surveillance programs because large natural variability and sampling uncertainties limit its usefulness for detecting small, short-term changes in deposition (Gallegos 1995; Hardy and Krey 1971; EML 1997).

NE O 458.1A supports this type of monitoring by requiring environmental surveillance programs to include direct measurements, where practical, to characterize exposures and potential pathways, ensuring that radionuclide deposition and long-term environmental conditions are adequately assessed. This provides regulatory value and justification for maintaining soil sampling as part of the INL environmental monitoring program.

The INL contractor conducts soil sampling on a five-year rotation, with the next sampling scheduled for 2027. Historical results show declining concentrations of human-made radionuclides such as ^{137}Cs, with no evidence of detectable deposition from ongoing INL Site releases (INL 2017).

5.3 Environmental Direct Radiation

Environmental direct radiation is monitored across the INL Site and within the surrounding 50-mile area to document potential external exposure to the public and non-involved workers. This monitoring aligns with NE O 458.1A, which requires the use of direct measurements, where practical, to characterize exposures and to ensure that radiological conditions are adequately assessed to demonstrate compliance.

5.3.1 Sampling Design

An array of optically stimulated luminescent dosimeters (OSLDs) are distributed throughout the eastern Snake River Plain and on the INL Site) to measure environmental radiation. Neutron dose monitoring is also conducted in areas where neutron radiation may be present, including around facilities and buildings. On the INL Site, OSLDs are positioned at facility perimeters, particularly in locations most likely to detect elevated gamma readings, as well as near radioactive material storage areas and along roadways. Neutron dosimeters are similarly placed at facility perimeters and in locations where neutron emissions could occur.

5.3.2 Sampling Methods

Environmental OSLDs and neutron dosimeters are deployed in the field for six months, after which each dosimeter is collected and returned to the supplier for analysis. Dosimeter exchanges occur twice annually, corresponding to the November 2024–April 2025 and May 2025–October 2025 sampling periods. Background radiation levels are highly variable; therefore, historical information establishes localized regional trends to identify variances. If a single measurement is greater than the background dose, it does not necessarily mean that an unusually high amount of radiation exists in that area. When a measurement exceeds the background dose, the measurement is compared to other values in the area and to historical data to determine whether the results may require further action as described in the report, "Data Quality Objectives Supporting the Environmental Direct Radiation Monitoring Program for the Idaho National Laboratory" (INL 2022b). The method for computing the background value as the UTL is described in EPA (2009) and EPA (2016). ProUCL Version 5.1 software (EPA 2016) has been used to compute the OSLD UTL for these locations, given all available data in the area since 2012. The UTL is the value such that 95% of all the doses in the area are less than that value with 95% confidence. It is anticipated that 5% of the measurements will exceed the background dose. For neutron doses, the background is considered to be zero, and the dosimeters currently in use have a detection threshold of 10 mrem. Therefore, any measured neutron dose is considered present due to sources located within the facility or building.

5.3.3 Sampling and Analysis

The OSLD measured values at these field locations were primarily below the historic 6-month background UTL for the period from November 2024 to April 2025, except IF-675S O-34, which was slightly higher (64.7 ± 3.2 mrem) than the background UTL (63.0 mrem). This result showed similarity to historical data, suggesting that no further action was required.

A review of OSLD readings from dosimeters deployed across the eastern Snake River Plain and on the INL Site revealed measurements that were higher than anticipated for the May 2025 through October 2025 period.

When compared to historical data collected from these locations in previous years, the May 2025 through October 2025 data demonstrated a noticeable increase. Historically, OSLD measurements at these same monitoring locations have remained within typical background levels, exhibiting minimal variability. The sudden rise observed during this period was inconsistent with past data trends and prompted further evaluation. The investigation determined that the OSLDs were inadvertently exposed to an x-ray scanner during shipment, resulting in elevated readings unrelated to actual environmental conditions. This exposure led to artificially inflated dose values, rendering them invalid for reporting purposes.

The neutron dosimeters deployed from May 2025 through October 2025 were confirmed to be unaffected by x-ray scanning during shipment. This was determined based on the control dosimeter, which was reported as an "M" result. All neutron dosimeters collected in 2025 were also reported as "M," which denotes that the dose equivalents are below the minimum measurable quantity of 10 mrem.

Table 5-1 summarizes the calculated effective dose a hypothetical individual would receive on the Snake River Plain from various sources of natural background radiation (e.g., cosmic and terrestrial). This table includes the latest recommendations of the National Council of Radiation Protection and Measurements (NCRP) in "Exposure of the Population in the United States and Canada from Natural Background Radiation" (NCRP 2009).

The terrestrial natural background radiation exposure estimate is based on the concentrations of naturally occurring radionuclides found in soil samples collected from 1976 to 1993, as summarized by Jessmore, Lopez, and Haney (1994).

Table 5-1. Calculated effective dose from natural background sources (2025).

SOURCE OF RADIATION DOSE	TOTAL AVERAGE ANNUAL DOSE	
	CALCULATED (mrem)	MEASURED[a] (mrem)
EXTERNAL IRRADIATION		
Terrestrial	72[b]	NA[c]
Cosmic	57[d]	NA
Subtotal	**129**	—[e]
INTERNAL IRRADIATION (PRIMARILY INGESTION)[f]		
Potassium-40	15	NM[g]
Thorium-232 and uranium-238	13	NM
Others (carbon-14 and rubidium-87)	1	NM
INTERNAL IRRADIATION (PRIMARILY INHALATION)[f]		
Radon-222 (radon) and its short-lived decay products	212	NM
Radon-220 (thoron) and its short-lived decay products	16	NM
TOTAL	**386**	

a. Calculated from the average annual external exposure at all offsite locations measured using OSLDs.
b. Estimated using concentrations of naturally occurring radionuclide concentrations in soils in the Snake River Plain.
c. NA indicates terrestrial and cosmic radiation parameters were not measured individually but were measured collectively using dosimeters located offsite and at the boundary of the INL Site.
d. Estimated from Figure 3.4 of NCRP Report No. 160 (2009).
e. — = Value not calculated due to OSLD readings for May–October 2025 being deemed invalid due to inadvertent x-ray exposure during shipment (See Subsection 5.3.3).
f. Values reported for the average American adult in Table 3.14 of NCRP Report No. 160 (2009).
g. NM = not measured.

Concentrations of naturally occurring radionuclides in the soil do not change significantly over this relatively short period. Data indicates the average concentrations of uranium-238 (^{238}U), thorium-232 (^{232}Th), and potassium-40 (^{40}K) were 1.5, 1.3, and 19 pCi/g, respectively. The calculated external dose equivalents received by a member of the public from ^{238}U plus decay products, ^{232}Th plus decay products, and ^{40}K based on the above-average area soil concentrations were 21, 28, and 27 mrem/yr, respectively, for a total of 76 mrem/yr (Mitchell et al. 1997). Because snow cover can reduce the effective dose that Idaho residents receive from the soil, a correction factor must be made each year to the estimated 76 mrem/yr. In 2025, this resulted in a reduction in the effective dose from the soil to a value of 72 mrem/yr.

The cosmic component varies primarily with increasing altitude. Using Figure 3.4 in NCRP Report No. 160 (NCRP 2009), it was estimated that the annual cosmic radiation dose near the INL Site is approximately 57 mrem. Cosmic radiation may vary slightly because of solar cycle fluctuations and other factors.

Based on this information, the sum of the terrestrial and cosmic components of external radiation dose to a person residing on the Snake River Plain in 2025 was estimated to be 129 mrem/yr. Because the monitoring results for the May–October 2025 interval were deemed invalid, a definitive measured external radiation dose could not be established. Consequently, a comparison between the estimated external radiation dose and the measured external radiation dose was not possible.

The component of background dose that varies the most is inhaled radionuclides. According to NCRP, the major contributor of effective dose received by a member of the public from ^{238}U plus decay products are short-lived decay products of radon (NCRP 2009). The amount of radon in buildings and groundwater depends, in part, upon the natural radionuclide content of soil and rock in the area. The amount of radon also varies among buildings of a given geographic area depending on the materials each contains, the amount of ventilation and air movement, and other factors. The U.S. average of 212 mrem/yr was used in Table 5-1 for this component of the total background dose. NCRP also reports that the average dose received from thoron, a decay product of ^{232}Th, is 16 mrem.

Individuals also receive an internal dose from ingestion of ^{40}K and other naturally occurring radionuclides in environmental media. The average ingestion dose to an adult living in the U.S. was 29 mrem/yr (NCRP 2009).

With all these contributions, the total background dose to an average person living in southeast Idaho was estimated to be approximately 386 mrem/yr, as identified in Table 5-1. This value was used to calculate the background radiation dose to the population living within 50 miles of INL Site facilities (Table 6-2).

5.4 Waste Management Direct Surface Radiation Sampling

In compliance with DOE O 435.1, "Radioactive Waste Management," direct surface radiation was measured by the Idaho Cleanup Project (ICP) contractor at the Radioactive Waste Management Complex (RWMC) and the Idaho Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Disposal Facility (ICDF).

5.4.1 Surface Radiation Survey at the Radioactive Waste Management Complex and the Idaho CERCLA Disposal Facility

Surface radiation surveys were performed at ICDF and RWMC on July 24, 2025. These surveys aimed to characterize gamma radiation levels near the ground surface at each facility and to monitor changes related to ongoing waste management activities.

At ICDF, the gamma readings fluctuated from year to year. These variations are associated with disposal and burial of new CERCLA remediation wastes as prescribed by the ICDF waste placement plan. In 2025, the gross gamma measurements were found to be either at background levels or slightly above background levels, with readings averaging approximately 3,200 counts per second (CPS). This result is considered typical and is expected to persist until the facility undergoes closure and capping.

Measurements at RWMC indicated that gross gamma readings have remained consistently below 3,000 CPS, with a mean background value of 2,875 CPS. This stability in gamma readings reflects ongoing waste management operations and the effectiveness of control measures at the INL Site.

5.5 Quality Assurance

5.5.1 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.

5.5.2 ICP Contractor Quality Assurance

The ICP contractor followed a similar approach in 2025 to maintain data integrity and reliability. Quality assurance activities associated with surface radiation readings included manufacturer-recommended calibration intervals and instrument maintenance to ensure accurate readings are collected.

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Chapter 6: Dose to the Public

NE O 458.1, “Radiation Protection of the Public and the Environment,” contains requirements for protecting the public and the environment against undue risk from radiation associated with radiological activities conducted under U.S. Department of Energy (DOE) control. In addition to requiring environmental monitoring to ensure compliance with the order, NE O 458.1 establishes a public dose limit. DOE sites must perform dose evaluations using mathematical models that represent various environmental pathways to demonstrate compliance with the public dose limit and to assess collective (population) doses.

Title 40 CFR Part 61, Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities,” establishes federal radiation dose limits for the maximally exposed member of the public from all airborne emissions and pathways. It requires that doses to members of the public from airborne releases are calculated using U.S. Environmental Protection Agency (EPA)-approved sampling procedures, computer models, or other methods and procedures.

This chapter describes the estimated potential dose to members of the public from operations at the Idaho National Laboratory (INL) Site, based on 2025 environmental monitoring measurements or calculated emissions.

6.1 Possible Exposure Pathways to the Public

Air, soil, groundwater, agricultural products, and biota are routinely sampled to document the amount of radioactivity in these media and to determine whether radioactive materials have been transported off the INL Site. The air pathway is the primary way people living beyond the INL Site boundary could be exposed to releases from INL Site operations.

Airborne radioactive materials are carried from the source and dispersed by winds. The concentrations from routine releases are too small to measure at locations around the INL Site, so atmospheric dispersion models were used to estimate the downwind concentration of air pollutants and the potential doses from these projected offsite concentrations. Also, conservative doses were calculated from the ingestion of meat from wild game animals that access the INL Site. Ingestion doses were calculated from the concentrations of radionuclides measured in game animals killed by vehicles on INL Site roads and waterfowl harvested from INL Site wastewater ponds that had detectable levels of human-made radionuclides. External exposure to radiation in the environment—primarily from naturally occurring radionuclides—was measured directly using optically-stimulated luminescence dosimeters.

Water pathways were not considered major contributors to dose, because no surface water flows off the INL Site and radionuclides associated with INL Site releases have not been measured in public drinking water wells.

6.2 Dose to the Public from INL Site Air Emissions

The potential doses from INL Site air emissions were estimated using the amounts reported to be released or could be released by the facilities. The 2025 INL National Emission Standards for Hazardous Air Pollutants (NESHAP) evaluation (DOE-ID 2026) reported potential radionuclide releases from 62 source locations at the INL Site. However, many of the sources resulted in doses that were insignificant, and many of these sources are located relatively close together, such that the sampling network response from a release would be the same for all nearby sources. Therefore, insignificant sources were not explicitly modeled, and some sources were consolidated with nearby sources. Emissions from five large operating stacks were modeled explicitly and included the Advanced Test Reactor (ATR) main stack (TRA-770), the Materials Test Reactor stack (TRA-710), the Idaho Nuclear Technology and Engineering Center (INTEC) main stack (CPP-708), the Materials and Fuels Complex (MFC) Fuel Conditioning Facility stack (MFC-764), and the Transient Reactor Test Facility (TREAT) stack (MFC-720). All other releases within a facility were assigned as near ground-level releases from a single location within that facility. These other releases include other non-fugitive releases from stacks, ducts, and vents, as well as fugitive releases from ponds, soil, or other sources. Click here to see the location of all sources modeled in the dose assessment.

The radionuclide groupings and associated activity used in the dose calculations are provided in Table 2-1 of Chapter 2. Noble gases comprised the largest emission quantity but only contributed slightly to the dose. Radionuclides in the form of noble gases tend to have short half-lives and are not typically incorporated into the food supply. Radionuclides that contributed the most to the overall maximally exposed individual (MEI) estimated dose were uranium-238 (^{238}U), uranium-234 (^{234}U), chlorine-36 (^{36}Cl), tritium (^{3}H), cesium-137 (^{137}Cs), and strontium-90 (^{90}Sr). These radionuclides are a very small fraction of the total amount of radionuclides reported.

The following two kinds of dose estimates were made using the release data:

- ***The effective dose to the hypothetical MEI, as defined by the NESHAP regulations.*** The CAP88-PC model Version 4.1.1 (EPA 2020) was used to predict the maximum concentration and dose at offsite receptor locations. The receptor location with the highest estimated dose is the MEI location.
- ***The collective effective dose (population dose) for the population within 80 km (50 mi) of any INL Site facility.*** For this calculation, the HYSPLIT model (Stein et al. 2015) was used to model atmospheric transport, dispersion, and deposition of radionuclides released to the air from the INL Site. The population dose was estimated using the Dose Multi-Media (DOSEMM) model (Rood 2019) using dispersion and deposition factors calculated by HYSPLIT to comply with NE O 458.1.

The dose estimates considered all exposure pathways. The CAP88-PC computer model uses dose and risk tables developed by the EPA. Population dose calculations were made using: (1) DOE effective dose coefficients for inhaled radionuclides (DOE 2022), (2) EPA dose conversion factors for ingested radionuclides (EPA 2002), and (3) EPA dose conversion factors for external exposure to radionuclides in the air and deposited on the ground surface (EPA 2002).

Because INL operations occur both at the desert Site and at facilities within Idaho Falls, NESHAP evaluations require separate MEI dose calculations for each location. The first MEI corresponds to offsite receptors near the INL Site (Section 6.2.1), while a second MEI is evaluated for the Idaho Falls facilities (Section 6.2.2).

6.2.1 Estimated Dose to the Maximally Exposed Individual Based on INL Site Emissions

The EPA NESHAP regulation requires a demonstration that radionuclides other than radon released to the air from any DOE nuclear facility do not result in a dose to the public of greater than 10 mrem/yr (0.1 mSv/yr) (40 CFR 61, Subpart H). The EPA requires the use of an approved computer model, such as CAP88-PC, to demonstrate compliance with 40 CFR 61, Subpart H. CAP88-PC uses a modified Gaussian plume model to estimate the average dispersion of radionuclides released from up to six sources. It uses average annual wind files based on the data collected at multiple locations on the INL Site by National Oceanic and Atmospheric Administration (NOAA).

The MEI that was calculated in 2024 remains at the same location as in previous years; however, it is now identified as Receptor 26 instead of Receptor 54. References to the MEI prior to 2019 (e.g., Receptor 1) continue to be referred to as Receptor 1 in the new arrangement (INL 2023).

The dose to the MEI from INL Site airborne releases of radionuclides was calculated to demonstrate compliance with NESHAP and is published in DOE-ID 2026. To identify the MEI, the doses at 31 offsite locations were calculated and screened for the maximum potential dose to an individual who might live at one of these locations. The highest potential dose location was determined to be Receptor 26, which is a farmhouse and cattle operation located 3.1 km south of Highway 20 and 3 km from the east entrance of the INL Site. An effective annual dose of 0.025 mrem (0.25 µSv) was calculated for a hypothetical person living at Receptor 26 during 2025. Figure 6-1 compares the MEI doses calculated for years 2016–2025. All the doses are well below the whole-body dose limit of 10 mrem/yr (0.1 mSv/yr) for airborne releases of radionuclides established by 40 CFR 61, Subpart H. The highest dose estimated during the past ten years was in 2021.

Although noble gases were the radionuclides that were released in the largest quantities in 2025, they accounted for less than 2.5% of the cumulative MEI dose from all pathways largely because of their relatively short half-lives and because they only affect the immersion dose (i.e., they are excluded from the food supply). For example, about 80% of the total INL activity released was argon-41 (^{41}Ar), yet ^{41}Ar accounted for less than 2% of the estimated MEI dose. In contrast, radionuclides typically associated with airborne particulates, such as ^{238}U, ^{234}U, ^{36}Cl, ^{137}Cs, and ^{90}Sr, comprised only a small fraction (e.g., less than 0.014%) of the total amount of radionuclides reported to be released, yet the radionuclides resulted in approximately 90.3% of the estimated MEI dose, as shown in Figure 6-2.

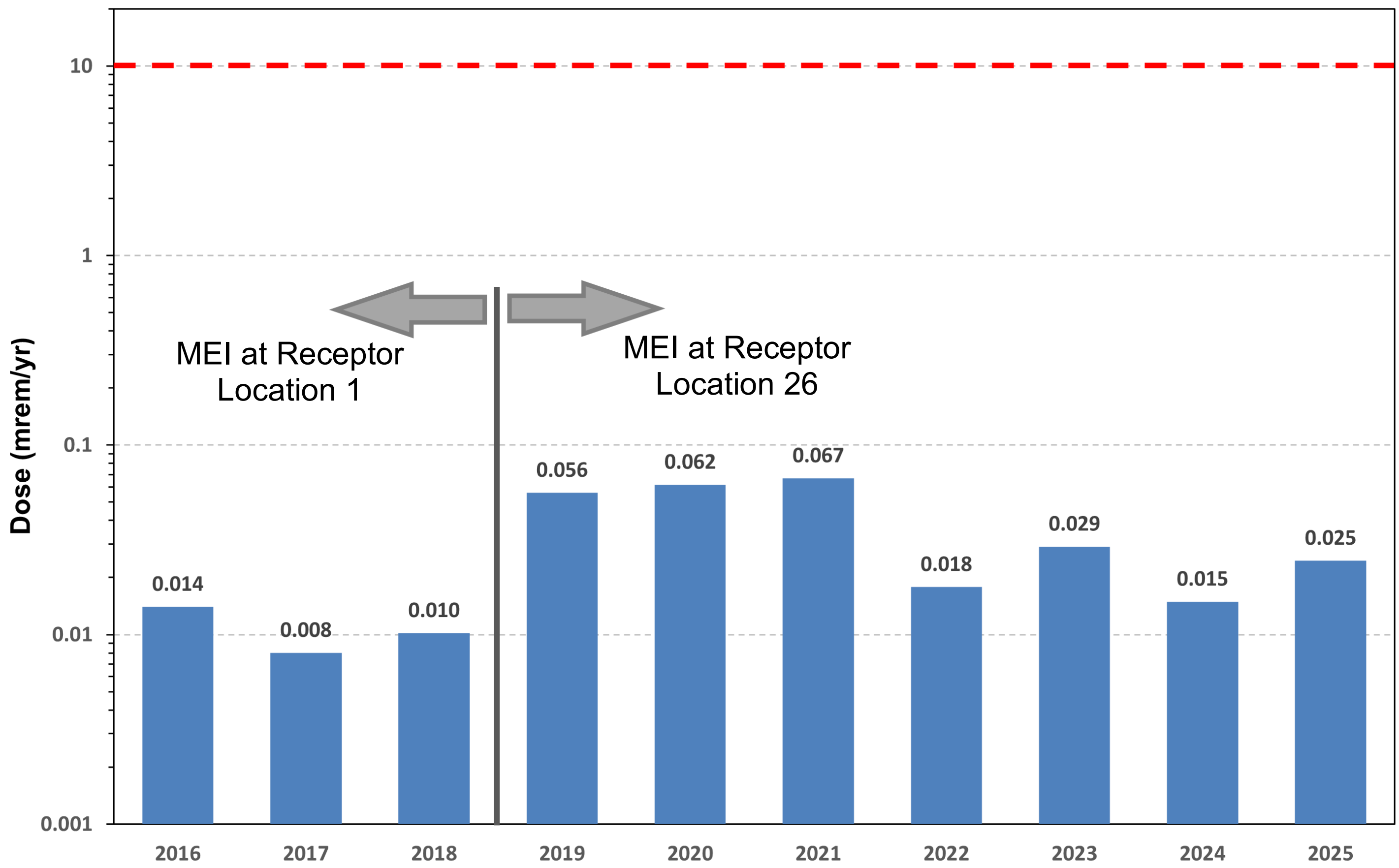

Figure 6-1. MEI dose from INL Site airborne releases estimated for 2016–2025. *<u>See INL Site receptor locations.</u>*

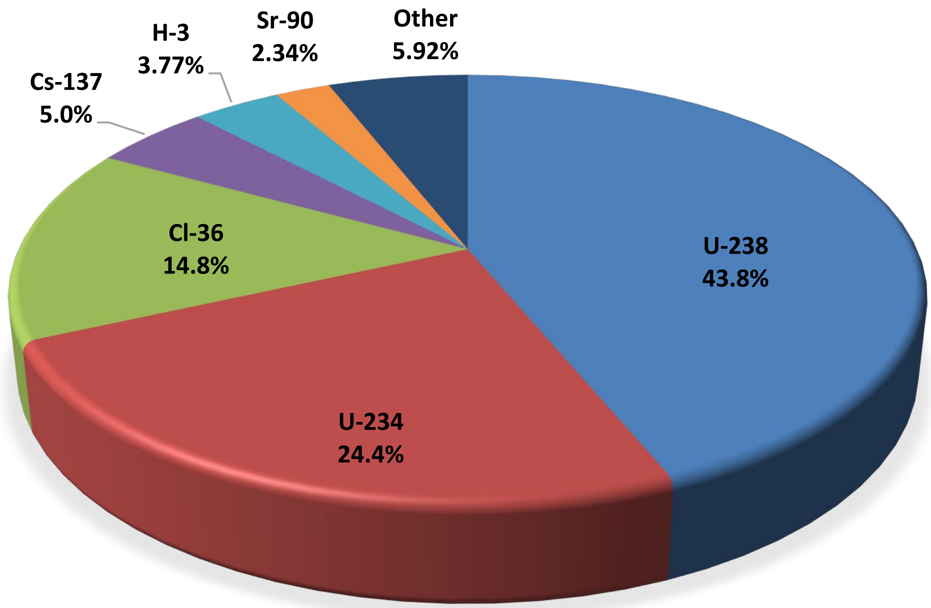

Figure 6-2. Radionuclides contributing to the MEI dose from INL Site airborne effluents as calculated using the CAP88-PC Model (2025).

Primary sources of the major radionuclides used to estimate the dose to the MEI, as indicated in Figure 6-2, were identified during the preparation of the annual NESHAP report (DOE-ID 2026) as follows:

- Amounts of ^{238}U and ^{234}U account for 43.8% and 24.4% of the MEI dose, respectively; the majority of which came from the Advanced Fuels Facility (MFC-784) at MFC.
- The second largest dose contribution was from ^{36}Cl, accounting for 14.8%, most of which originated at the Electron Microscopy Laboratory (MFC-774) at MFC.
- Tritium accounts for 3.8% of the MEI dose (92.5% coming from the beryllium blocks buried at the RWMC Subsurface Disposal Area, and 3.2% coming from MFC-774).
- Amounts of ^{137}Cs and ^{90}Sr contributed 5.0% and 2.3%, respectively. The remaining 5.9% came from other radionuclides.

The largest contribution by facility to the MEI dose overwhelmingly came from MFC at 91.9%, followed by RWMC at 3.52%, and the ATR Complex at 2.81%, as shown in Figure 6-3. This is expected for Receptor 26 given its proximity to MFC. Additionally, primary wind directions at the INL Site are from the southwest and northeast; thus, emissions from TAN, the NRF, INTEC, the ATR Complex, and RWMC are off axis from a receptor near MFC.

The dose to the MEI is higher than in 2024 at 0.025 mrem/year but remains far below the regulatory standard of 10 mrem/yr (0.1 mSv/yr) (40 CFR 61, Subpart H).

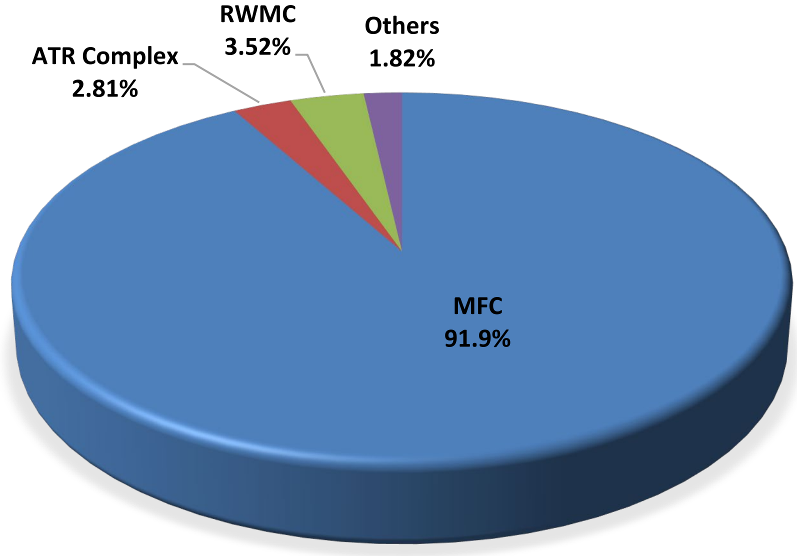

Figure 6-3. Percent contributions, by facility, to MEI dose from the INL Site airborne effluents as calculated using the CAP88-PC Model (2025).

6.2.2 Estimated Dose to the Maximally Exposed Individual Based on Idaho Falls Facilities

Facilities in Idaho Falls that reported potential radionuclide emissions for inclusion in the 2025 NESHAP report (DOE-ID 2026) include the INL Research Center (IRC) Laboratory (IF-603), DOE Radiological and Environmental Sciences Laboratory (IF-683), and the National Security Laboratory (IF-611). These facilities are located contiguously at IRC, which is part of the INL Research and Education Campus on the north side of Idaho Falls. Though programs and operations at IRC are affiliated with INL, IRC is located within the city limits of Idaho Falls and is not contiguous with the INL Site. The nearest boundary of the INL Site is about 35 km (22 mi) west of Idaho Falls. Each of the IRC buildings were modeled as separate sources in 2023. Due to radionuclide tracking limitations, IF-603 and IF-611 were modeled as one source in 2024 and now 2025. The MEI at IRC for 2025 is approximately 147 meters south-southeast of IF-683. Using CAP88-PC, the MEI effective dose equivalent was conservatively calculated to be 0.0045 mrem/yr (0.045 µSv/yr), which is less than 0.1% of the 10-mrem/yr federal standard. This represents a slight decrease from last year's value of 0.0048 mrem/yr (0.048 µSv/yr). Calculated doses from 2021–2025 have been consistently low, varying only from 0.0040 mrem/yr to 0.0062 mrem/yr.

6.2.3 Eighty Kilometer (50 Mile) Population Dose

Total effective radiation dose from airborne releases was calculated using air dispersion modeling utilizing the HYSPLIT model (Stein et al. 2015; Draxler et al. 2013) and performed by the NOAA Atmospheric Sciences Modeling Division on their cluster server in College Park Maryland (HYSPLIT-ASMD) and the DOSEMM v 250619 (Rood 2019) dose assessment model. These calculations aimed to provide a grid of total effective doses within an 80-km (50-mi) radius from any INL Site source, including Idaho Falls facilities. The data was used with geographic information system software to compute population doses. The HYSPLIT model and its capabilities are described on the NOAA Air Resources Laboratory website.

Key contributing facilities and radionuclides were modeled, selecting those that contributed more than 0.001% of the total dose at the INL Site or more than 0.01% in Idaho Falls. The HYSPLIT-ASMD model is initialized using three-dimensional meteorological data from the Weather Research Forecasting model utilizing high-resolution rapid response data assimilation. The high-resolution rapid response-Weather Research Forecasting simulation uses a 3-km grid spacing and updates the simulation every hour with surface and upper air observations. Terrain effects on wind vectors are also included in the simulation. The HYSPLIT model predicted dispersion and deposition from releases at each facility across 17,877 grid points around the INL Site, including 31 boundary receptor locations representing actual residences or places of business.

The model outputs, which included radionuclide air concentrations and deposition amounts, were converted to dispersion and deposition factors for use in DOSEMM (Rood 2019). These factors were used to estimate air concentrations and the deposition at each grid point for the year. Then, the effective dose via inhalation, ingestion, and external exposure pathways were calculated. The radionuclide source term for radionuclide-facility combinations that were used for the INL Site and in-town population dose assessment can be found in Overin (2026).

To estimate the population dose within an 80-km (50-mi) radius, data from the 2020 census was gathered and then projected to 2025. This was done by calculating the population change rate from 2010 to 2020 and then applying that same rate to the 2020 figures. Then, a geographical information system was used to import the dose values from DOSEMM and average those values within each census division. These average doses were multiplied by the estimated populations and summed to get the total population dose.

The estimated potential population dose for 2025 was 0.16 person-rem (0.0016 person-Sv) for about 363,157 people. This represents a very small 0.0001% increase as compared to the natural background radiation dose of approximately 140,179 person-rem (1,402 person-Sv). The estimated population dose for 2025 was greater than population doses estimated for 2021–2024 (Figure 6-4). Population dose calculations for 2024 and prior years used a customized version of HYSPLIT run by the NOAA Special Operations and Research Division (SORD) office in Idaho Falls. This version of HYSPLIT (HYSPLIT-SORD) utilized only the surface stations from the NOAA/INL Mesonet and no terrain data. The version used for 2025 calculations (HYSPLIT-ASMD) incorporates broader meteorological data resulting in a less compact plume and more terrain influence. Due to the wider reach of the plume modeled, population doses would be expected to be higher than those that would be calculated using HYSPLIT-SORD (Rood 2026). Additional information regarding the higher 2025 population dose relative to prior years is provided in a technical memorandum (Rood 2026).

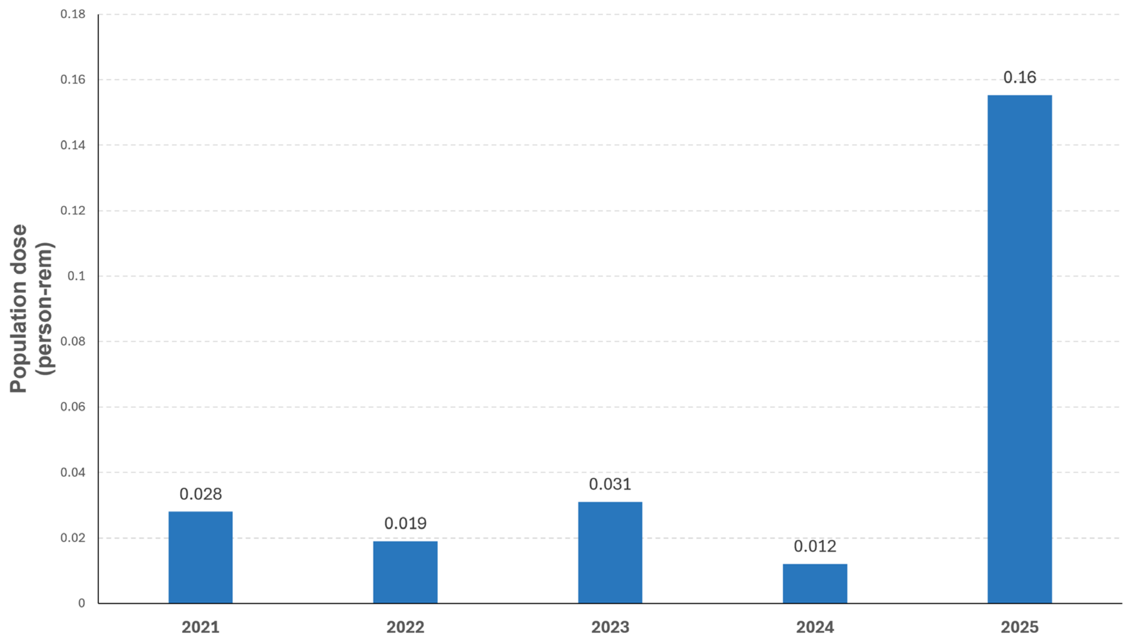

Figure 6-4. Population dose estimated for 2021–2025.

6.3 Dose to the Public from Ingestion of Wild Game from the INL Site

The potential dose that an individual may receive from occasionally ingesting meat from waterfowl or big game animals continues to be studied at the INL Site. These studies estimate the potential dose to individuals who may eat waterfowl that may briefly reside at wastewater disposal ponds at the ATR Complex and big game animals that may reside on or migrate through the INL Site.

6.3.1 Waterfowl

Waterfowl samples collected in 2025 did not have detectable concentrations of human-made radionuclides in any edible subsample (see Subsection 5.1.3). As a result, no dose from human-made radionuclides would be associated with the consumption of these animals. As in the past, the 2025 samples were not collected directly from the warm wastewater evaporation ponds at the ATR Complex but from sewage lagoons adjacent to them.

6.3.2 Big Game Animals

A study on the INL Site from 1972–1976 conservatively estimated the potential whole-body dose that could be received from an individual eating the entire muscle (27,000 g [952 oz]) and liver mass (500 g [17.6 oz]) of an antelope with the highest levels of radioactivity found in these animals. This dose was 2.7 mrem (27 µSv) (Markham et al. 1982). Game animals collected at the INL Site during the past few years have generally shown much lower concentrations of radionuclides. In 2025, none of the game samples collected from three elk and a pronghorn had a detectable concentration of ^{137}Cs or other human-made radionuclides (see Subsection 5.1.3). Therefore, no dose from human-made radionuclides would be associated with the consumption of these animals.

The contribution of game animal consumption to the population dose is calculated because only a limited percentage of the population hunts game, few deceased animals have spent time on the INL Site, and most animals that migrate from the INL Site would have reduced concentrations of radionuclides in their tissues by the time they were harvested (Halford, Markham, and White 1983). The total population dose contribution from these pathways would realistically be less than the sum of the population doses from the inhalation of air, submersion in air, vegetable ingestion, and soil deposition.

6.4 Dose to the Public from Drinking Groundwater from the INL Site

Tritium has previously been detected in three U.S. Geological Survey wells located on the INL Site along the southern boundary (Mann and Cecil 1990; Bartholomay, Hopkins, and Maimer 2015; Twining et al. 2021). These wells, located in an uninhabited area, have shown a historical downward trend in tritium detections. The maximum concentration from all wells on the INL Site (3,400 ± 100 pCi/L) in 2025 is considerably less than the maximum contaminant level established by the EPA for drinking water (20,000 pCi/L). An individual drinking water from a well with the maximum concentration would hypothetically receive a dose of 0.142 mrem (0.00142 mSv) in one year. Because these wells are not used for drinking water, this is an unrealistic scenario, and the groundwater ingestion pathway is not included in the total dose estimate to the MEI.

6.5 Dose to the Public from Direct Radiation Exposure along INL Site Borders

The direct radiation exposure pathway from gamma radiation to the public is monitored annually using optically stimulated luminescent dosimeters. The annual external radiation dose for 2025 could not be established because results for the May–October 2025 monitoring interval were invalidated following inadvertent x-ray exposure during shipment (see Chapter 5, Subsection 5.3.3). However, dosimeters deployed along the INL Site boundary and at offsite locations from November 2024–April 2025 indicated a six-month external dose of 60.4 mrem.

6.6 Dose to the Public from All Pathways

NE O 458.1A establishes a public radiation dose limit to 100 mrem/yr (1 mSv/yr) above natural background for all exposure pathways combined. This limit encompasses air transport, ingestion (e.g., water, agricultural products, and wild game), and direct-exposure pathways. For 2025, the only probable pathways from INL Site activities to a realistic MEI include the air transport pathway.

The hypothetical MEI is assumed to reside at a farmhouse, and cattle operation located 3.1 km south of Highway 20 and 3 km east of the INL Site entrance. At this location, the dose from airborne radionuclides released in 2025 was calculated in accordance with Subsection 6.2.1. No dose was attributed to the ingestion of waterfowl or big game animals, as described in Subsections 6.3.1 and 6.3.2, because no human-made radionuclides were detected in edible tissues during 2025.

Click here to see a comparison of common radiation dose sources. The total dose from all INL Site pathways in 2025 was extremely low. The combined dose to the MEI was conservatively estimated at 0.025 mrem (0.25 µSv), as summarized in Table 6-1, which remains far below the DOE public dose limit of 100 mrem/yr (1 mSv/yr). As noted in "Helpful Information," this regulatory limit is itself well below levels associated with any acute health effects.

The dose received by the entire population within an 80-km (50-mi) radius of INL Site facilities was calculated to be 0.16 person-rem (0.00165 person-Sv), as shown in Table 6-1. This is approximately 0.0001% of the 140,179 person-rem (1,402 person-Sv) dose given to be expected from exposure to regional natural background radiation.

Table 6-1. Contribution to estimated annual dose from INL Site facilities by pathway (2025).

PATHWAY	ANNUAL DOSE TO MEI		PERCENT OF DOE 100 mrem/yr LIMIT[a]	ESTIMATED POPULATION DOSE		POPULATION WITHIN 80 km	ESTIMATED BACKGROUND RADIATION POPULATION DOSE (PERSON-rem)[b]
	(mrem)	(µSv)		(PERSON -rem)	(PERSON -Sv)		
Air	0.025	0.25	0.025	0.16	0.0016	363,157	140,179
TOTAL, ALL PATHWAYS	**0.025**	**0.25**	**0.025**	**0.16**	**0.0016**	**NA[c]**	**NA**

a. The DOE public dose limit from all sources of ionizing radiation and exposure pathways that could contribute significantly to the total dose is 100 mrem/yr (1 mSv/yr) total effective dose equivalent. It does not include dose from background radiation.

b. The individual background dose was estimated to be 386 mrem or 0.386 rem in 2025, as shown previously in Table 5-1. The background population dose is calculated by multiplying the individual background dose by the population within an 80 km (50 mi) radius of the INL Site.

c. NA = Not applicable.

6.7 References

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