Chapter 1: Introduction

1. INTRODUCTION

This annual report is prepared in compliance with the following United States (U.S.) Department of Energy (DOE) orders:

- DOE O 231.1B, "Environment, Safety, and Health Reporting"
- DOE O 458.1, "Radiation Protection of the Public and the Environment."

The purpose of the report, as outlined in DOE O 231.1B, is to present summary environmental data to accomplish the following:

- Characterize the environmental performance at the Idaho National Laboratory (INL) Site
- Summarize the environmental occurrences and responses at the INL Site during the calendar year
- Confirm compliance with environmental standards and requirements
- Highlight significant facility programs and efforts
- Describe property clearance activities.

This report is the principal document that demonstrates compliance with the requirements in DOE O 458.1; therefore, it describes the impact the Idaho National Laboratory (INL) Site has on the public and the environment with an emphasis on radioactive contaminants.

1.1 Site Location

The 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.

Federal lands surround much of the INL Site, including U.S. Bureau of Land Management lands and Craters of the Moon National Monument and Preserve to the southwest, the Salmon-Challis National Forest to the west, and the Targhee National Forest to the north. Mud Lake Wildlife Management Area, Camas National Wildlife Refuge, and Market Lake Wildlife Management Area are within 32 km (20 mi) of the INL Site. The Fort Hall Reservation is located approximately 48 km (30 mi) to the southeast.

Information about the INL Site history can be found here.

1.2 Environmental Setting

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 plain. 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 but restricted to very small northeast and northwest portions of the INL Site.

The climate of the high-desert environment is characterized by sparse precipitation of about 20.7 cm/yr (8.16 in./yr), warm summers with a normal daily temperature of 18.9°C (66.1°F), and cold winters with a normal daily temperature of -7.4°C (18.6°F), based on observations at the Central Facilities Area (CFA) from 1994 through 2024 (NOAA 2025). 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 2024, no surface-water flow was measured at three U.S. Geological Survey (USGS) surface-water sites on the INL Site.

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.

1.3 Human Populations Near the INL Site

The population of the region within 80 km (50 mi) of the INL Site is estimated to be 358,426, based on the 2020 U.S. Census and projected growth. Over half of this estimated population (198,787) resides in the census divisions of Idaho Falls (121,578) and northern Pocatello (77,209). Another 41,321 are projected to live in the Rexburg census division. Approximately 22,542 are estimated to reside in the Rigby census division, with 15,464 in the Blackfoot census division. The remaining population resides in small towns and rural communities throughout southeastern Idaho.

1.4 INL Site Primary Program Missions and Facilities

The mission of the INL Site is to operate a multiprogram national research and development (R&D) laboratory and to complete environmental cleanup activities stemming from past operations. The U.S. Department of Energy, Idaho Operations Office (DOE-ID), receives implementing direction and guidance primarily from two DOE Headquarters offices—the Office of Nuclear Energy (DOE-NE) and the Office of Environmental Management (DOE-EM). DOE-NE is the Lead Program Secretarial Office for all DOE-ID-managed operations on the INL Site.

DOE-EM provides direction and guidance to DOE-ID for environmental cleanup on the INL Site and functions in the capacity of the Cognizant Secretarial Office. Operations conducted by the Naval Reactors organization on the INL Site report to the Pittsburgh Naval Reactors Office. These operations fall outside the purview of DOE-ID, and therefore, are not included in this report.

1.4.1 Idaho National Laboratory

The INL 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 secure our nation's critical infrastructure. To fulfill its assigned duties during the next decade, INL will work to transform itself into a laboratory leader in nuclear energy and homeland security research, development, and demonstration. This transformation will develop nuclear energy and NHS leadership as highlighted by recent achievements such as the demonstration of Generation IV reactor technologies; the creation of national user facilities, including the Advanced Test Reactor (ATR) National Scientific User Facility, the Wireless National User Facility, and the Biomass Feedstock National User Facility; the Critical Infrastructure Test Range Complex (CITRC); piloting advanced fuel cycle technology; the rise to prominence of the Center for Advanced Energy Studies; and recognition as a regional clean energy resource and world leader in safe operations.

On February 22, 2021, an addendum to the 2019 memorandum of understanding between DOE and the U.S. Nuclear Regulatory Commission (NRC) formalized the coordination between these two federal agencies in regard to National Reactor Innovation Center (NRIC) projects. This addendum specifically focuses on research, development, and demonstration projects. It also solidifies a partnership to deliver successful nuclear reactor demonstrations. NRIC is a national DOE program led by INL in allowing collaborators to harness the world-class capabilities of the U.S. National Laboratory System. The center is charged with and committed to demonstrating advanced reactors by the end of calendar year 2025. BEA is responsible for the management and operation of INL.

1.4.2 Idaho Cleanup Project

The ICP involves the safe environmental cleanup of the INL Site, which was contaminated with waste generated during World War II-era conventional weapons testing, government-owned research and defense reactor operations, laboratory research, fuel reprocessing, and defense missions at other DOE sites. The ICP focuses on meeting the Idaho Settlement Agreement (DOE 1995) and other environmental cleanup milestones while reducing risks to workers. Protection of the Snake River Plain Aquifer, the sole drinking water source for more than 350,000 residents in eastern Idaho, was the principal concern addressed in the Settlement Agreement. IEC is responsible for ICP management and operation.

Most of the cleanup work under the contract is driven by regulatory compliance agreements. The two foundational agreements are: (1) the 1991 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-based Federal Facility Agreement and Consent Order (DOE 1991), which governs the cleanup of contaminant releases to the environment; and (2) the 1995 Idaho Settlement Agreement (DOE 1995), which governs the removal of transuranic waste, spent nuclear fuel (SNF), and high-level radioactive waste from the State of Idaho. Other regulatory drivers include the Federal Facility Compliance Act-Based Site Treatment Plan for the treatment of hazardous wastes and other environmental permits, closure plans, federal and state regulations, Records of Decision, and other implementing documents.

The ICP mission involves treating about 900,000 gallons of sodium-bearing liquid waste; preparing the Subsurface Disposal Area (SDA) for the construction of an evapotranspiration barrier; managing SNF in dry storage; retrieving and treating high-level waste calcine; treating both remote- and contact-handled transuranic waste for disposal at the Waste Isolation Pilot Plant (WIPP) in the state of New Mexico; and the demolition and disposal of more than 200 contaminated structures, including reactors, storage basins for SNF, and laboratories used for radioactive experiments.

1.4.3 Primary INL Site Facilities

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 the 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.

Advanced Test Reactor (ATR) Complex. The ATR Complex was established in the early 1950s and has been the primary operations location for three major test reactors: (1) the Materials Test Reactor (1952–1970); (2) the Engineering Test Reactor (1957–1982); and (3) the ATR (1967–present). The primary mission at the ATR Complex is the operation of the ATR, the world's premier test reactor used to study the effects of radiation on materials. This reactor also produces rare and valuable medical and industrial isotopes. The ATR is a Nuclear Scientific User Facility. The ATR Complex also features the ATR Critical Facility, the Test Train Assembly Facility, the Radiation Measurements Laboratory, the Radiochemistry Laboratory, and the Safety and Tritium Applied Research Facility, which also serves as a National Scientific User Facility. The ATR Complex is operated by the INL contractor.

Central Facilities Area (CFA). CFA is the main service and support center for the Site's desert facilities. Activities at CFA support transportation, maintenance, medical, construction, radiological monitoring, security, fire protection, warehouse storage, and instrument calibration activities. It is operated by the INL contractor.

Critical Infrastructure Test Range Complex (CITRC). The CITRC area is located in the south-central section of the INL Site and supports the National and Homeland Security missions of the laboratory, including program and project testing (e.g., critical infrastructure resilience, nonproliferation testing and demonstration). Wireless test-bed operations, power line and grid testing, unmanned aerial vehicle testing, accelerator testing, explosives detection and training, and radiological counter-terrorism emergency response take place at the CITRC area. It is operated by the INL contractor.

Idaho Nuclear Technology and Engineering Center (INTEC). The Idaho Chemical Processing Plant was established in the 1950s to recover usable uranium from SNF used in DOE and U.S. Department of Defense (DOD) reactors. Over the years, the facility recovered more than $1 billion worth of highly enriched uranium that was returned to the government fuel cycle. In addition, an innovative high-level liquid-waste-treatment process, known as calcining, was developed at INTEC. Calcining reduced the volume of liquid-radioactive waste generated during reprocessing and placed it in a more-stable granular-solid form. In the 1980s, the facility underwent a modernization, and safer, cleaner, and more efficient structures replaced most major facilities. SNF reprocessing was discontinued in 1992. In 1998, the plant was renamed INTEC. Current operations include the Integrated Waste Treatment Unit, designed to treat approximately 3,406,871 L (900,000 gal) of sodium-bearing liquid waste for closure of the remaining liquid-waste storage tanks, SNF storage, environmental remediation, the disposal of excess facilities, and the expansion and management of the Idaho CERCLA Disposal Facility. The Idaho CERCLA Disposal Facility is the consolidation point for CERCLA-generated wastes within the INL Site boundaries. INTEC is operated by the ICP contractor.

Materials and Fuels Complex (MFC). MFC is located in the southeastern corner of the INL Site and is the foundation for nuclear research, development, and demonstration testing of advanced reactors. This complex is the nexus of R&D for new reactor fuels and related materials. As such, it will contribute to increasingly efficient reactor fuels and the important work of nonproliferation—harnessing more energy with less risk. Certain facilities at MFC also support the manufacturing and assembling of components for use in space applications. It is operated by the INL contractor.

Transient Reactor Test Facility (TREAT). TREAT is a Nuclear Scientific User Facility that provides transient testing of nuclear fuels and materials. It is an air-cooled, thermal spectrum test facility specifically designed to evaluate the response of reactor fuels and structural materials to accident conditions ranging from mild upsets to severe accidents. TREAT is used to study fuel melting behavior, interactions between fuel and coolant, and the potential for propagation of failure to adjacent fuel pins. TREAT has an open core design that allows for ease of experiment instrumentation and real-time imaging of fuel motion during irradiation, which also makes TREAT an ideal platform for understanding the irradiation response of materials and fuels on a fundamental level. It is operated by the INL contractor.

Naval Reactors Facility (NRF). The NRF is operated by Fluor Marine Propulsion, LLC. As established in Executive Order 12344 (1982), the Naval Nuclear Propulsion Program is exempt from the DOE O 458.1, and DOE O 414.1D requirements. Therefore, activities conducted at NRF are excluded from this report. The director of the Naval Nuclear Propulsion Program establishes reporting requirements and methods implemented within the program, including those necessary to comply with appropriate environmental laws. The NRF program is documented in the NRF Environmental Monitoring Report (FMP 2025).

Radioactive Waste Management Complex (RWMC). Established in the 1950s, DOE used RWMC to manage, store, and dispose of waste contaminated with radioactive elements generated in national defense and research programs. RWMC currently provides treatment, temporary storage, and transportation of transuranic waste destined for WIPP. Cleanup of RWMC is managed by the ICP contractor.

Subsurface Disposal Area (SDA). The SDA is a 39-ha (96-acre) radioactive-waste landfill at the RWMC that was used for more than 50 years. Approximately 14 of the 39 ha (35 of the 96 acres) contain waste, including radioactive elements, organic solvents, acids, nitrates, and metals from historical operations, such as reactor research at the INL Site and weapons production at other DOE facilities. A CERCLA Record of Decision (OU-7-13/14) was signed in 2008 (DOE-ID 2008) and included offsite disposition of targeted waste and construction of an evapotranspiration surface barrier. Targeted buried waste exhumation at the SDA was completed in 2022 and construction of the surface cover over the SDA will be completed in the near future. SDA cleanup is managed by the ICP contractor.

Remote-Handled Low-Level Waste-Disposal Facility. The Remote-Handled Low-Level Waste-Disposal Facility is a Hazard Category 2 nuclear facility providing a below-grade, permanent radioactive-waste-disposal capability critical for nuclear research and Naval Reactors missions at the INL Site. Remote-handled low-level waste is generated from nuclear programs conducted at INL Site facilities, including the ATR Complex, NRF, and MFC. The facility began operations in 2018 and will support an anticipated 20 years of waste-disposal operations with an expansion capability for up to 50 years. The facility comprises an administration building, a maintenance building, and a 175,000-ft^2 vault yard that includes monitoring wells, a robust drainage system, and 446 below-grade concrete waste-disposal vaults sized to accommodate 939 stainless steel waste canisters of various configurations depending on the waste type and waste generator facility. It is operated by the INL contractor.

Research and Education Campus (REC). The REC is the collective name for the administrative, technical support, and computer facilities of INL in Idaho Falls, Idaho, as well as for the in-town laboratories where researchers work on a wide

variety of advanced scientific R&D projects. The REC also hosts the Biomass Feedstock National User Facility. As the name implies, the REC uses both basic science research and engineering to apply new knowledge to products and processes that improve the quality of life. This reflects the emphasis INL is placing on strengthening its science base and increasing the commercial success of its products and processes. Two laboratory facilities—the Energy Systems Laboratory and Energy Innovation Laboratory—were constructed in 2013 and 2014. In 2019, the Idaho Board of Education and INL completed the construction of two new research facilities: (1) the Cybercore Integration Center, and the (2) Collaborative Computing Center. The Cybercore Integration Center leads national efforts to secure critical infrastructure control systems from cybersecurity threats, while the Collaborative Computing Center will advance the computational science needs of INL and provide academia and industry with unprecedented access to high-performance computing. These and other facilities are integral to transforming INL into a world-renowned research laboratory. It is operated by the INL contractor.

DOE Radiological and Environmental Sciences Laboratory (RESL). RESL is located within the REC and provides a technical component to DOE oversight of contractor operations at DOE facilities and sites. As a reference laboratory, RESL conducts cost-effective measurement quality assurance programs that help ensure key DOE missions are completed in a safe and environmentally responsible manner. By ensuring the quality and stability of key laboratory measurement systems throughout DOE and by providing expert technical assistance to improve those systems and programs, RESL ensures the reliability of data on which decisions are based. The core scientific capabilities conducted at RESL are in analytical chemistry and radiation calibrations and measurements. The DOE Laboratory Accreditation Program (DOELAP) is performed by RESL as well, which provides irradiation instruments for the testing and accreditation of dosimetry programs across the DOE Complex.

Test Area North (TAN). TAN is located in the northern portion of the INL Site. Initially, TAN consisted of facilities built between 1954 and 1961 by the U.S. Air Force and the AEC Aircraft Nuclear Propulsion Program to handle, store, examine, research, and develop SNF for nuclear-powered aircraft research. After the termination of this research in 1961, the primary program at TAN became the Loss-of-Fluid Test, which focused on reactor-safety testing and behavior studies until it ended in 1985. Additionally, starting in 1980, TAN was used to work with material from the Three Mile Island reactor accident, a project that concluded in 2001. Remedial actions at TAN were completed in 2007, followed by the decontamination and decommissioning of non-operational facilities in 2008. Since 1961, TAN buildings have been repurposed for various programs, including the operations at the North Radiological Response Training Range and the work being conducted at the New Pump-and-Treat Facility. The Specific Manufacturing Capability Project, which is also located at TAN, is operated by the INL contractor for the DOD and manufactures protective armor for the Army M1-A1 and M1-A2 Abrams tanks. It is operated by the INL contractor.

1.5 Independent Oversight and Public Involvement and Outreach

DOE encourages information exchange and public involvement in discussions and decision-making processes regarding INL Site activities. Active participants include the public; Native American tribes; local, state, and federal government agencies; advisory boards; and other entities in the public and private sectors. The roles and involvement of selected organizations are described in the following sections.

1.6 Citizens Advisory Board

The Citizens Advisory Board is a federally appointed citizen panel formed in 1994 that provides advice and recommendations on ICP activities to Idaho Cleanup Project. The Citizens Advisory Board consists of 12 to 15 members who represent a wide variety of key perspectives on issues of relevance to Idaho citizens. Board members comprise a variety of backgrounds and viewpoints, including environmentalists, natural resource users, previous INL Site workers, members of the Shoshone-Bannock Tribes, representatives of local government, health care, higher education, business, and the general public. These diverse backgrounds assist the ICP Environmental Management program in making decisions and having a greater sense of how cleanup efforts are perceived by the public. Members are appointed by the DOE Environmental Management Assistant Secretary and serve voluntarily without compensation. Three additional nonvoting liaisons include representatives from DOE-ID, Environmental Protection Agency Region 10, and the Idaho Department of Environmental Quality (DEQ). These liaisons provide information to the Citizens Advisory Board on the policies and views of their respective agencies.

The Citizens Advisory Board is chartered by DOE through the Federal Advisory Committee Act. The charter for the Citizens Advisory Board is to provide input and recommendations to DOE on topics such as cleanup standards and environmental restoration, waste management and disposition, stabilization and disposition of non-stockpile nuclear

materials, excess facilities, future land use and long-term stewardship, risk assessment and management, and cleanup science and technology activities.

1.7 Sitewide Monitoring Committees

Sitewide monitoring committees include the INL Site Monitoring and Surveillance Committee and the INL Site Water Committee. The INL Site Monitoring and Surveillance Committee was formed in March 1997 and meets at least quarterly, or as often as needed, to coordinate activities among groups involved in environmental monitoring activities both on and off the INL Site. This standing committee includes representatives from DOE-ID, INL Site contractors, the Shoshone-Bannock Tribes, the State of Idaho DEQ-INL Oversight Program, the National Oceanic and Atmospheric Administration, the NRF, and the USGS. The INL Site Monitoring and Surveillance Committee has served as a valuable forum to review monitoring, analytical, and quality assurance methodologies; coordinate efforts; and avoid unnecessary duplication.

The INL Site Water Committee was established in 1994 to coordinate drinking-water-related activities across the INL Site and to provide a forum for exchanging information related to drinking water systems. In 2007, the INL Site Water Committee expanded to include all Sitewide water programs—drinking water, wastewater, storm water, and groundwater. The committee includes monitoring personnel, operators, scientists, engineers, management, data entry, and validation representatives of DOE-ID, INL Site contractors, the USGS, and the NRF. The committee serves as a forum for coordinating water-related activities across the INL Site and exchanging technical information, expertise, regulatory issues, data, and training. The INL Site Water Committee interacts on occasion with other committees that focus on water-related topics or programs, such as the INL Site Monitoring and Surveillance Committee.

1.8 Environmental Oversight and Monitoring Agreement

A new five-year Environmental Oversight and Monitoring Agreement (DOE-ID 2021) consisting of DOE-ID, the Naval Reactors Laboratory Field Office/Idaho Branch Office, and the Idaho DEQ was signed in March 2021. The 2021 version is the latest in a succession of agreements that was first implemented in 1990. The Environmental Oversight and Monitoring Agreement governs the activities of the DEQ-INL Oversight Program and DOE-ID's cooperation in providing access to facilities and information for non-regulatory, independent oversight of the impact to public health and the environment at the INL Site. The first agreement established in 1990 created the state of Idaho INL Oversight Program. The main activities for the DEQ-INL Oversight Program include environmental surveillance, emergency response, and public information. More information can be found on the DEQ-INL Oversight Program website.

1.9 Environmental Education Outreach

The K-12 environmental educational outreach for 2024 by the INL Site contractors included the following:

- *Bring Idaho Alive*
- *East Idaho Science Bowl*
- *Museum Summer Camps*
- *My Amazing Future*
- *Rocky Mountain Adventures summer workshops*
- *Roaring Youth Jam*
- *weSTEAM classroom visits*.

Community outreach efforts during 2024 by the Site contractors' education programs included the following:

- *Bat Night at the Zoo and State Parks*
- *Earth Day*
- *Family Nuclear Night*
- *Idaho Falls Water Festival Day*
- *Science, Technology, Engineering, Arts, and Mathematics (STEAM) Day at the Zoo*.

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