PHOTOGRAPHY:
Red-tailed Hawk by
David Coleman

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U.S. DEPARTMENT of ENERGY

NNSA National Nuclear Security Administration

SANDIA NATIONAL LABORATORIES

2024

ANNUAL SITE ENVIRONMENTAL REPORT

TONOPAH NEVADA

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United States Department of Energy, National Nuclear Security Administration,
Sandia Field Office, Albuquerque, New Mexico

2024 Annual Site Environmental Report
for Sandia National Laboratories, Tonopah Test Range, Nevada

Prepared by
Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-1512

for
U.S. Department of Energy
National Nuclear Security Administration
Sandia Field Office

Abstract
Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration. The National Nuclear Security Administration's Sandia Field Office administers the contract and oversees contractor operations at Sandia National Laboratories, Tonopah Test Range. Activities at the site are conducted in support of U.S. Department of Energy weapons programs and have operated at the site since 1957.

The U.S. Department of Energy and its management and operating contractor are committed to fulfilling regulatory obligations, safeguarding the environment, assessing sustainability practices, and ensuring the validity and accuracy of the monitoring data presented in this annual site environmental report. This report summarizes the environmental protection, restoration, and monitoring programs in place at Sandia National Laboratories, Tonopah Test Range during calendar year 2024. Environmental topics include cultural resource management, chemical management, air quality, ecology, environmental restoration, oil storage, site sustainability, terrestrial surveillance, waste management, water quality, wastewater discharge, and implementation of the National Environmental Policy Act. This report is prepared in accordance with and as required by DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting*, and has been approved for public distribution.

Acknowledgments

The following individuals provided their time and expertise to support production of this annual report for Sandia National Laboratories, Tonopah Test Range, Nevada:

Sandia National Laboratories ASER Project Lead/Technical Reviewer
Amy Miller

Department of Energy Project Lead/Technical Reviewer
Janet Forestier

Document Production and Technical Editing
Shirley Coe, Coleen Maddy, Brittany Means, Casey Pirtle, Nancy White

Contributing Authors

Jacob Alexander
Penny Avery
Matt Baumann
Liane Blackburn
Kelly Bowles
Benito Casaus
Christina Chavez
Ashlee Edmonson
Danny Ferraro
Joe Fontana
William Forston
Morgan Gerard
Erin Greenlee
Stacy Griffith
Casey Hendricks
Benjamin Henning
John Kay
Andrez Leyva
Jun Li
Amy Miller
Wendy Palencia
Gwen Placencia
Sam Poli
Anita Reiser
Sherry Ricketson
Jane Romero Kotovsky
Tomas Sanchez
John Sandlin
Che Shu-Nyamboli
Ray Taylor
Lucy Tyler
Rebecca Ullrich
Doug Vetter
Mark Zuverink

Note to the Reader

This Annual Site Environmental Report for Sandia National Laboratories, Tonopah Test Range, Nevada, presents summary data regarding environmental performance and compliance with environmental standards and requirements. In addition, the U.S. Department of Energy views this document as a valuable tool for maintaining a dialogue with the community about the environmental health of these sites and a commitment to protect our nation's valuable resources. With the goal of continually improving the quality of this annual report and including information that is important to you, you are invited to provide feedback, comments, or questions to:

U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office
P.O. Box 5400
Albuquerque, NM 87185-5400
Attention: Tami Moore

The Sandia National Laboratories, Tonopah Test Range, Nevada, Annual Site Environmental Report can be found at the following website:
http://www.sandia.gov/news/publications/environmental/index.html

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Acronyms and Abbreviations

Term	Definition
A	
AD	anno Domini
ASER	annual site environmental report
B	
BCE	before the common era
C	
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DoD	United States Department of Defense
DOE	United States Department of Energy
DOECAP	DOE Consolidated Audit Program
DRI	Desert Research Institute
DU	duplicate sample
E	
EISA	Energy Independence and Security Act
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community-Right-to-Know Act
ES&H	Environment, Safety, and Health
F	
FDID	Fire Department Identification
I	
IOC	inorganic compound
ISO	International Organization for Standardization
M	
MCL	maximum contaminant level
MDA	minimal detectable activity or minimum measured activity
MDL	method detection limit
N	
NA	not available
N/A	not applicable
NAC	Nevada Administrative Code
ND	not detected
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
P	
PCB	polychlorinated biphenyl
pH	potential of hydrogen
PL	Public Law
pt-Co	Platinum-Cobalt color scale
R	
RCRA	Resource Conservation and Recovery Act
S	
SA	sample
Sandia	Sandia National Laboratories
SARA Title III	Superfund Amendments and Reauthorization Act
SNL/NM	Sandia National Laboratories, New Mexico
SNL/TTR	Sandia National Laboratories, Tonopah Test Range
SOC	synthetic organic compound
sp.	unknown species, singular
spp.	unknown species, plural
ssp.	subspecies
SU	standard unit
T	
TON	threshold odor number
TSDF	treatment, storage, and disposal facility
U	
U.S.	United States
USFWS	United States Fish and Wildlife Service
V	
var.	variety
VOC	volatile organic compound

Units of Measure

Unit	Definition
Btu	British thermal unit
kg	kilogram
µ	micron
µCi/mL	microcuries per milliliter
µg/L	micrograms per liter
µm	micrometer (micron)
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mrem	millirem
pCi/g	picocuries per gram
ppb	parts per billion

Executive Summary

Tonopah Test Range Area 3 Compound

Sandia National Laboratories (hereinafter referred to as Sandia) is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA). This annual site environmental report (ASER) was prepared in accordance with and as required by DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting*, and is approved for public release. DOE/NNSA and its management and operating contractor for Sandia are committed to fulfilling regulatory obligations, safeguarding the environment, continually assessing sustainability practices, and ensuring the validity and accuracy of the monitoring data presented here. This report summarizes the environmental protection, restoration, and monitoring programs in place for Sandia National Laboratories, Tonopah Test Range (SNL/TTR) during calendar year 2024.

Environmental Management System

Sandia management takes environmental stewardship seriously. A robust Environmental Management System was established in 2005 as part of this commitment. This Environmental Management System is Sandia's primary platform for implementing the environmental management programs that help achieve annual site sustainability goals. This system ensures a systematic approach to identifying environmental aspects, setting environmental objectives, and monitoring environmental performance. Designed to meet the requirements of the globally recognized International Organization for Standardization (ISO) 14001:2015 standard, Sandia's Environmental Management System is ISO 14001:2015 certified. Personnel, operations, products, and services at SNL/TTR conform to the system's requirements, as verified by an internal assessment in 2020. For fiscal year 2023, the

environmental aspects and impacts analysis found that hazardous materials, hazardous waste, radiological waste, release of explosives and combustion byproducts, and release of radionuclides were significant aspects for operations at SNL/TTR. An environmental aspects and impacts analysis is a process used to identify environmental aspects of Sandia activities and to score the associated environmental impacts. When significant aspects and negative impacts have been identified, environmental objectives—at all operating levels—are established to guide efforts toward minimizing those aspects and impacts where feasible. The significant aspects identified in 2023 were carried forward and used for fiscal year 2024.

Site Sustainability

A site sustainability plan for all Sandia primary locations, including SNL/TTR, is prepared annually and identifies contributions toward meeting DOE sustainability goals and the broader sustainability program. Sandia's most recent plan, *Fiscal Year 2025 Site Sustainability Plan* (Sandia, 2022b), describes the performance status for fiscal year 2024. Highlights for SNL/TTR in 2024 include (1) decreasing greenhouse gas emissions relative to the fiscal year 2008 baseline, (2) updating resiliency solutions in the vulnerability assessment and resilience plan, (3) and exceeding the goal for consumption of renewable electric energy. Materials Sustainability Program personnel successfully led an interdepartmental working group that focused on outreach and education related to the Sustainable Facilities Tool (SFTool+), which was deployed in 2023. In addition, program personnel ensured that the 350APR "green language" clause continued to be populated in applicable contract categories valued over $250,000. The 350APR clause states that a subcontractor shall "provide its services in a manner that promotes the expanded use of green products, reduces greenhouse gas emissions and protects the health and wellbeing of building occupants, service providers and visitors in the facility." Improvements to MAN-004, *Sandia National Laboratories/New Mexico Design Standards Manual*, promoted compliance with the *Guiding Principles for Sustainable Buildings*. In fiscal year 2024, energy intensity increased by 9.7 percent relative to the fiscal year 2021 baseline but decreased by 8.3 percent relative to fiscal year 2023. Additionally, potable water intensity decreased by 30.4 percent relative to the fiscal year 2021 baseline and decreased by 41.8 percent relative to fiscal year 2023.

Environmental Performance

DOE/NNSA assesses environmental performance through data measures and indicators and then reports on this as part of an annual performance evaluation. The performance evaluation is the DOE/NNSA report card that ascribes a rating for five key performance goals and an overall rating. During the most recent evaluation, Sandia earned a rating of "very good" for the Mission Enablement performance goal, which includes the objective of delivering effective, efficient, and responsive Environment, Safety, and Health quality. Sandia received an overall rating of "excellent" for fiscal year 2024.

Under DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (DOE O 232.2A, Chg 1 (MinChg) 2017), *occurrences* are defined as "events or conditions that adversely affect, or may adversely affect, DOE (including the National Nuclear Security Administration) or contractor personnel, the public, property, the environment, or the DOE mission." For this ASER, the Occurrence Reporting and Processing System database was queried for occurrences related to environmental programs and compliance. One DOE-reportable occurrence was reported at SNL/TTR in 2024.

All environmental monitoring in 2024 was conducted in accordance with program-specific plans that contain applicable quality assurance elements and meet appropriate federal, state, and local requirements for conducting sampling and analysis activities.

Environmental Programs at Sandia National Laboratories, Tonopah Test Range

Personnel at SNL/TTR conduct operations in support of DOE weapons programs. Sandia activities at the Tonopah Test Range involve research and development as well as testing weapon components and delivery systems. Many of these activities require a remote testing range with a long flight corridor for airdrops and rocket launches, which can be provided at SNL/TTR. Navarro Research and Engineering personnel perform most of the environmental program activities at SNL/TTR. DOE is responsible for all SNL/TTR and Nevada Test and Training Range environmental restoration sites.

Air Quality Compliance Program. Air Quality Compliance Program personnel ensure that operations comply with federal and state air quality regulations promulgated in accordance with the Clean Air Act and the Clean Air Act Amendments of 1990. Program personnel also confirm that operations are compliant with the SNL/TTR Class II Air Quality Operating Permit issued by the State of Nevada. In Nye County, the Nevada Department of Environmental Protection implements air quality regulations and standards established by the Environmental Protection Agency and the State of Nevada. During 2024, permitted sources emitted 0.015 tons of hazardous air pollutants, 0.19 tons of volatile organic compounds, 0.61 tons of carbon monoxide, 1.0 ton of nitrogen oxides, 0.07 tons of particulate matter with a diameter $\leq$ 10 μm, and 0.001 tons of sulfur dioxide. The permitted sources include a portable soil sorting system, facility maintenance shops, and generators. All emissions and operations complied with permitted limits and conditions.

Chemical Information System. The Chemical Information System for all Sandia locations is a comprehensive chemical information tool used to track workplace chemical and biological containers by location. The primary drivers for the Chemical Information System are state and federal regulations, including the Emergency Planning and Community Right-to-Know Act.

The information system provides the chemical or product name, its location and quantity, and information about who is responsible for the chemical. Chemical hazards are reported on safety data sheets, and the Chemical Information System currently contains more than 130,000 safety data sheets in its library for use at any Sandia site. This electronic inventory helps chemical users and their managers assess and manage workplace hazards. Easy access to this inventory facilitates availability searches. It also improves the ability to share chemicals and thus reduces sources, which minimizes chemical purchases and waste disposal expenses. In 2024, chemical containers at SNL/TTR were tracked along with information about any related chemical hazards.

Cultural Resources Program. The Cultural Resources Program is focused primarily on long-term preservation and protection of cultural resources and cultural resource compliance to ensure that the heritage of Sandia operating areas and their landscapes are maintained. Cultural resources are places and physical evidence of past human activity: a site, an object, a landscape, a structure, or a natural feature of significance to a group of people traditionally

associated with it. Archaeological staff reviewed 12 outdoor projects at SNL/TTR in 2024. No immediate archaeological concerns were found for any of the reviewed projects.

In 2022, DOE/NNSA and Sandia hosted representatives of the Nevada State Historic Preservation Division at SNL/TTR to review and discuss archaeological and historic building questions regarding a Programmatic Agreement. Additional discussions between DOE/NNSA and the Nevada State Historic Preservation Office in 2023 led to the decision to conduct a new historic buildings survey and assessment in 2024.

In 2022, DOE/NNSA and the Nevada State Historic Preservation Officer also completed a memorandum of agreement outlining mitigative actions for the demolition of Tower 02-00, which was part of the SNL/TTR historic district. All actions required prior to the tower's demolition were completed in 2022, and the tower was demolished in 2023. A final report on the tower's history along with architectural descriptions and photographs began in 2024 and is expected to be completed in 2025.

Ecology Program. Ecology Program personnel conduct project assessments to ensure compliance with wildlife regulations and laws and to support land use decisions. Ecological and wildlife awareness campaigns are conducted to ensure safe work environments and sustainable decision-making strategies. Migratory bird surveys were conducted in late-May 2024 in accordance with the new bird survey protocol that was developed in 2022 to better align with the North American Breeding Bird Survey. Five hundred and eight birds from at least 16 different species were recorded along the newly established survey routes. Horned larks (*Eremophila alpestris*) were the most recorded species during surveys. The second-most encountered species was the black throated sparrow (*Amphispiza bilineata*). In 2024, a single active common raven nest was reported on a piece of heavy equipment staged for a project. Due to timely communication and implemented mitigation, the nesting attempt was ultimately successful and several young fledged.

Several incidents involving birds occurred in 2024, including the report of an injured great horned owl, which was transferred to the Nevada Department of Wildlife for rehabilitation, and the reports of six deceased short-eared owls along the same stretch of highway on the North Range, all between the months of June and July. The short-eared owl mortalities were confirmed to be the result of vehicle collisions. Personnel at SNL/TTR and Nellis Air Force Base Natural Resource staff worked together to mitigate or prevent such events in the future.

Environmental Release, Response, and Reporting Team. In 2024, one release to the environment occurred that required reporting to the Nevada Department of Environmental Protection Bureau of Federal Facilities; approximately 15 gallons of JP-10 jet fuel was released on July 27, 2024. This release was assigned spill report #240729-02. A report of remediation and soil removal activities and a request for site closure was made on August 8, 2024. The Nevada Department of Environmental Protection Bureau accepted this request, and a letter requiring no further action was issued on January 13, 2025, to DOE/NNSA.

National Environmental Policy Act Program. National Environmental Policy Act (NEPA) Program personnel work alongside DOE/NNSA staff to ensure NEPA compliance at SNL/TTR. NEPA Program personnel use an internal checklist to document

compliance and verify whether proposed projects and activities and their associated environmental impacts have been evaluated in existing NEPA documentation. In 2024, program personnel reviewed five proposed projects at SNL/TTR. As part of ongoing coordination with the U.S. Air Force Nevada Test and Training Range, NEPA Program personnel submitted one Air Force 813 form to the Air Force on behalf of the DOE/NNSA Sandia Field Office.

Oil Storage Program. Oil Storage Program personnel support the management, operation, and maintenance of oil storage containers and equipment at SNL/TTR to prevent spills or releases of oil that could potentially damage water resources, impact soil, or otherwise affect the environment adversely. It was determined in 2019 that oil storage facilities at SNL/TTR are not subject to regulation under 40 CFR 112, *Oil Pollution Prevention*, because all the oil storage containers and equipment are located within a hydrologically closed basin with no potential to impact waters of the United States. However, as a best management practice, personnel at SNL/TTR routinely monitor and inspect oil storage containers and equipment to ensure safe and secure operating conditions and to prevent potential spills or releases to the environment. There were no reportable spills associated with oil storage containers and equipment maintained at SNL/TTR in 2024.

Terrestrial Surveillance Program. Terrestrial Surveillance Program personnel collect soil samples at on-site and perimeter locations. Soil samples are analyzed for modified Target Analyte List metals and gamma-emitting radionuclides. When the sample results at an on-site location are significantly different from and greater than the perimeter and historical off-site results and the sample results at the on-site location are trending upward, it is noted for further evaluation.

Analyses of 2024 results for select radionuclides revealed five statistically significant population differences with increasing trends in the on-site location sample results. Analysis results for metals identified four instances of statistical significance (population difference and increasing trend) at several locations. The results are below the U.S. Environmental Protection Agency regional screening level for residential use where applicable and are within Nevada regional soil concentrations.

Environmental dosimeters were used to measure the dose from ambient gamma radiation. The average annual dose rates in 2024 were higher than the established non-urban Nevada value of 71 mrem. The difference may be attributed to a variety of elevations, proximity to bedrock, and the spontaneous nature of radioactivity.

Waste Management Program. Navarro Research and Engineering manages all waste generated at SNL/TTR—which excludes any waste generated by environmental restoration activities—under the Waste Management Program. Waste categories include radioactive waste, Resource Conservation and Recovery Act hazardous waste, other chemical waste, and nonhazardous solid waste. Waste minimization and recycling efforts are integrated into Waste Management Program activities. In 2024, the following types and amounts of waste were generated at SNL/TTR:

- Hazardous waste regulated by the Resource Conservation and Recovery Act (445 kg)
- Recycled materials (107,802 kg)

- Regulated waste not controlled by the Resource Conservation and Recovery Act (767 kg)

Site personnel shipped hazardous waste and other regulated waste off-site to permitted facilities. Waste shipped in 2024 included 34,895 kg of construction debris sent to the U.S. Air Force Construction Landfill and 19,464 kg of sanitary landfill waste sent to the U.S. Air Force Sanitary Landfill.

Recyclables and used oil are sent for recycling or are disposed of through a waste disposal contractor. In 2024, 107,802 kg of material was recycled or energy-recovered and shipped off-site. There were no radioactive waste shipments in 2024.

Water Quality Programs. Water quality programs monitor drinking water, septic tank systems, stormwater, wastewater, and water conservation. The current water conservation plan for SNL/TTR was revised in November 2020 and was approved by the State of Nevada Department of Conservation and Natural Resources, Division of Water Resources on February 17, 2021. The water conservation plan for SNL/TTR provides education, conservation measures, and supply management guidance. The next plan revision is due by February 17, 2026.

Site personnel routinely sample the public water system. There were no exceedances of water quality standards in 2024. Four arsenic compliance samples were collected from the Area 3 distribution system for analysis in 2024. The maximum contaminant level for arsenic in drinking water is 10 ppb as a running annual average. The running annual average for arsenic in the drinking water at SNL/TTR during the fourth quarter of 2024 was 3.8 ppb. Two precautionary boil water notices were issued for the public water system at SNL/TTR in 2024.

The following water-related projects were planned and submitted to the Nevada Division of Environmental Protection for approval in 2024:

- Replace the Well 6 pumphouse piping
- Repair or replace Well 6 casing
- Upgrade the Water Treatment Facility's carbon dioxide injection system
- Install a temporary fire protection system for use during the elevated water storage tower maintenance project, including:
  - Add a cathodic protection system
  - Add a tank mixer
  - Repair and recoat the elevated water storage tank interior

In August 2024, the Nevada Division of Environmental Protection approved all the projects mentioned above except the casing project.

As a best management practice, personnel sample Area 3 wastewater annually at the point where wastewater leaves SNL/TTR property and enters the U.S. Air Force system. Twenty-four-hour composite wastewater samples are collected annually. There were no excursions or violations of concentration limits in 2024.

Chapter 1. Introduction to Tonopah Test Range

Tonopah Test Range telemetry

OVERVIEW ▪ Tonopah Test Range is located within the boundaries of the Nevada Test and Training Range. Sandia National Laboratories personnel conduct operations at Tonopah Test Range in support of U.S. Department of Energy weapons programs. The site has never been used for the detonation of nuclear weapons.

This annual site environmental report (ASER) was prepared in accordance with and as required by the U.S. Department of Energy (DOE) per DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting* (DOE O 231.1B, Admin Change 1 2012). This report describes the environmental protection programs currently in place at Sandia National Laboratories, Tonopah Test Range (SNL/TTR), located in Tonopah, Nevada, and is made available to the public in electronic form at Sandia Environmental Reports (Sandia n.d.).

Sandia National Laboratories (Sandia) is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the DOE National Nuclear Security Administration (DOE/NNSA). The DOE/NNSA Sandia Field Office in Albuquerque, New Mexico, administers the Prime Contract and oversees contractor operations.

While most 2024 program activities were performed continuously, they are reported on a calendar-year basis unless otherwise noted. Programs based on the fiscal year operate from October 1 through September 30, annually.

1.1 Purpose

Operating since 1949, Sandia's core purpose is to render exceptional service in the national interest. As a Federally Funded Research and Development Center, Sandia operates in the public interest with objectivity and independence, free from organizational conflicts of interest, and by maintaining core competencies in missions of national significance. Sandia's principal mission is to deliver on commitments to nuclear deterrent, nuclear nonproliferation, and critical work for the national security community. Sandia personnel anticipate and resolve emerging national security challenges and inform the national debate for which technology policy is critical to preserving security and freedom throughout the world. Information about new technologies and accomplishments can be found at Sandia News (Sandia n.d.).

1.2 History

A brief history of Sandia and of operations at SNL/TTR follows. For more details, see Chapter 2.

1.2.1 Sandia National Laboratories

On November 1, 1949, Sandia Corporation, a wholly owned subsidiary of Western Electric, began managing and operating Sandia Laboratory. In 1979, Congress recognized the facility as a national laboratory. From 1993 to mid-2017, Sandia Corporation was a wholly owned subsidiary of Martin Marietta (merging with Lockheed Corporation in 1995 to form Lockheed Martin Corporation). In May 2017, the management and operating contractor changed to National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc.

The Sandia workforce (for all sites) comprised approximately 16,915 employees and contractors in fiscal year 2024, with 43 employees located at SNL/TTR (Sandia n.d.).

1.2.2 Sandia National Laboratories, Tonopah Test Range

In the early 1950s, Sandia personnel used three ranges as test sites: the Los Lunas Test Site (Kirtland Air Force Base Practice Bombing Range) in New Mexico, the Salton Sea Test Site in California, and the Yucca Flat Test Site in Nevada. As testing parameters changed, these sites were deemed inadequate.

Sandia personnel then identified Cactus Flats, located in the northwest corner of the then-named Nellis Bombing and Gunnery Range near the town of Tonopah, Nevada, as a temporary site for testing ballistic and nonnuclear features of atomic weapons (Sandia 1996). In 1956, a land use permit was obtained from the U.S. Air Force. In 1957, Tonopah Test Range was established for the U.S. Atomic Energy Commission (now DOE) and became operational for testing weapon systems.

The U.S. Department of Defense (DoD) Nevada Test and Training Range is divided into the North Range and the South Range. SNL/TTR permitted land use areas are located in the northwest part of this site, and the DOE Nevada National Security Site is located between the North Range and South Range (Figure 1-1).

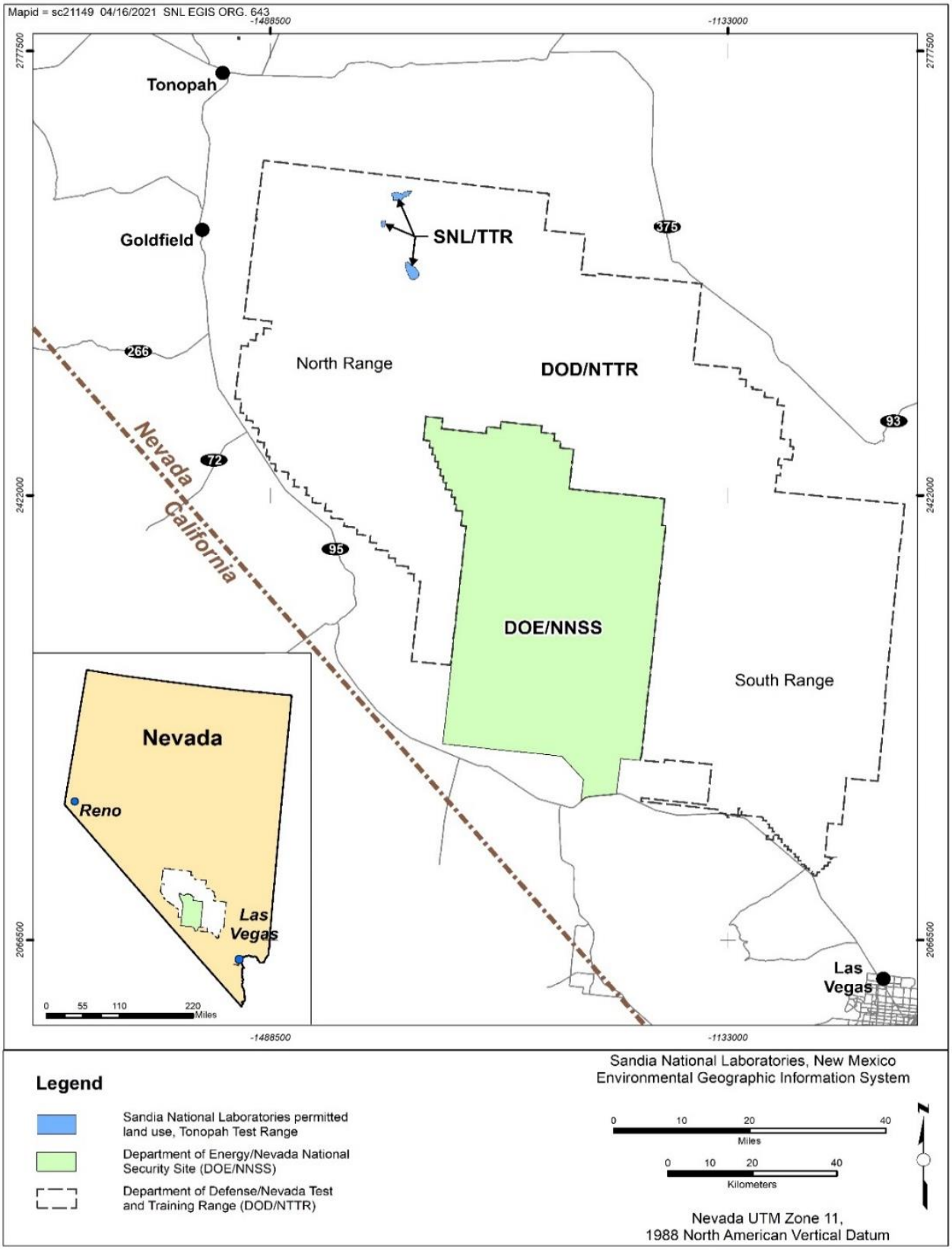

Figure 1-1. SNL/TTR location within the boundaries of the Nevada Test and Training Range

SNL/TTR includes facilities that are designed and equipped to gather data regarding aircraft-delivered inert test vehicles. As technologies changed, the facilities and capabilities at SNL/TTR were expanded to accommodate tests related to DOE weapons programs.

DOE/NNSA signed a land use permit in 2019 titled "Department of the Air Force Permit to National Nuclear Security Administration for Real Property Located on the Nevada Test and Training Range, Nevada" (U.S. Air Force/NNSA 2019), which is valid until November 2029. The permit is for the nonexclusive use, operation, and occupancy of an approximately 5.5-square-mile portion of the Nevada Test and Training Range.

Today, operations at SNL/TTR are conducted in support of DOE weapons programs. Principal activities performed at SNL/TTR include stockpile reliability testing; arming, fusing, and firing systems testing; and the testing of nuclear weapon delivery systems. The range also offers a unique test environment for use by other United States government agencies and their contractors.

1.3 Location Description

SNL/TTR is located on withdrawn land (withheld from the public domain) that is permitted from the U.S. Air Force within the boundaries of the Nevada Test and Training Range (Figure 1-1). Sandia personnel use the land to support DOE and U.S. Air Force activities and missions.

The area north of the SNL/TTR boundary is comprised of sparsely populated public lands jointly administered by the U.S. Bureau of Land Management and the U.S. Forest Service. Cattle graze this land in the winter and spring. There is also a substantial irrigated farming operation north of the range. SNL/TTR lies within a portion of the Nevada Wild Horse Range herd area, which is administered by the U.S. Bureau of Land Management (U.S. Air Force 1997).

1.4 Demographics

The nearest residents live in the towns of Goldfield, Nevada, population 225; and Tonopah, Nevada, population 2,179 (U.S. Census Bureau 2020). Goldfield and Tonopah are approximately 22 miles west and 32 miles northwest of the site boundary, respectively. Las Vegas, Nevada, with an estimated population of 678,922 (U.S. Census Bureau 2024), is the largest municipality in Nevada by population and is approximately 140 miles southeast of the site boundary.

1.5 Activities and Facilities

The SNL/TTR site offers a unique test environment for use by other government agencies and their contractors. The facilities, large land area, and site security are available for conducting a wide variety of tests. Activities involve conducting research and development as well as testing weapon components and delivery systems. As approved in *Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National*

Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (DOE/NNSA/Nevada Site Office 2013), capabilities could include the following:

- Conduct tests and experiments, including flight test operations for gravity weapons (i.e., bombs).
- Conduct ground- and air-launched rocket and missile operations.
- Conduct impact testing.
- Conduct passive testing of joint test assemblies and conventional weapons.
- Conduct fuel-air explosives testing.

The majority of test activities occur within Cactus Flat, a valley with almost no topographical relief flanked by mountains and hills. The remote range ensures public safety and national security.

On behalf of the management and operating contractor for Sandia, Navarro Research and Engineering personnel perform or support most environmental program functions and facility operation and maintenance at SNL/TTR, including National Environmental Policy Act (NEPA) compliance, spill response, waste management operations, and water quality monitoring. Navarro Research and Engineering personnel also support SNL/TTR personnel during tests by operating equipment and recovering test objects.

In 1963, the DOE (formerly the Atomic Energy Commission) implemented Operation Roller Coaster to evaluate the dispersal of radionuclides when nuclear devices were subjected to chemical explosions while in storage or transit (Chapman, et al. 2021 in progress). This operation resulted in radionuclide-contaminated soils (see Section 4.4).

1.5.1 Mission Control Center

The SNL/TTR Mission Control Center Tower is a four-story structure that affords a 360-degree view of the site. It houses mission critical systems that coordinate all test activities during testing operations. SNL/TTR is instrumented with a wide array of signal-tracking equipment, including high-speed cameras, telemetry, and radar tracking devices that are used to characterize ballistics, aerodynamics, and parachute performance of test units.

1.5.2 Environmental Restoration Project

The Environmental Restoration Project at SNL/TTR was initiated in 1980 to address contamination resulting primarily from the 1963 nuclear weapons destruction testing and related support activities. In late 1992 and early 1993, an agreement was reached between DOE headquarters and the Albuquerque and Nevada Field offices to designate the DOE Nevada Field Office as responsible for all environmental restoration sites at SNL/TTR. Upon completion of environmental restoration activities in 2020, long-term stewardship of the restoration sites was transferred to the DOE Office of Legacy Management. For more information on the sites closed under the Environmental Restoration Project, see Section 4.4.

1.6 Environmental Setting

The topography at SNL/TTR is characterized by a broad, flat valley bordered by two north- and south-trending mountain ranges: Cactus Range to the west (occurring mostly within the boundaries of SNL/TTR) and Kawich Range to the east. Cactus Flat is the valley floor, where the main operational area of SNL/TTR is located. An area of low hills outcrops in the south. Elevations range from 5,347 feet at the valley floor to 7,482 feet at Cactus Peak (U.S. Air Force 1997). The elevation of the town of Tonopah is 6,047 feet.

1.6.1 Geology and Hydrology

SNL/TTR is located in the western part of the Basin and Range geophysical province. This area is marked by horst and graben topography, a system of mountains and down-dropped fault valleys formed through regional extension. SNL/TTR is northeast of the Walker Lane lineament, a zone of transcurrent faulting and shear, and northwest of the Las Vegas Valley shear zone (Sandia 1982).

Cactus Range to the west of SNL/TTR is the remnant of a major volcanic center consisting of relatively young (six million years old) folded and faulted Tertiary volcanics. This range is one of at least five northwest-trending, raised structural blocks that lie along the Las Vegas Valley/Walker Lane lineaments (U.S. Energy Research and Development Administration Environmental Assessment, Tonopah Test Range).

1.6.1.1 Surface Water

No perennial streams flow from the Cactus Range or the Kawich Range into SNL/TTR. Ephemeral streams do occasionally carry spring runoff and thunderstorm runoff to a north–south string of playas in the central portion of Cactus Flat. Surface runoff within Cactus Flat evaporates from the playas within SNL/TTR (Desert Research Institute, Science Applications International Corporation 1991).

An *ephemeral stream* flows only briefly in the immediate locality in response to precipitation.

There are several small springs within the Cactus and Kawich ranges. Three occur within SNL/TTR boundaries: Cactus Spring, Antelope Spring, and Silverbow Spring. Water from these springs does not travel more than approximately 100 feet before it dissipates through evaporation and infiltration.

1.6.1.2 Groundwater

Personnel at SNL/TTR obtain water from local wells. U.S. Geological Survey personnel periodically check groundwater levels of SNL/TTR wells and have recorded groundwater depths from 21 to 481 feet below ground surface at the site. Approximate groundwater levels have been recorded as follows:

- Production Well 6 in Area 3 has a water depth of 347 feet below ground surface. It supplies the public water system (drinking water and Area 3 fire protection) and, at one time, supplied water for road maintenance, construction, and dust control.

- Roller Coaster Well at the Construction Water Pond has a water level depth of 481 feet below the surface and is used for road maintenance, construction, and dust control.
- Area 9 Well (Well Sandia 7) near the northern end of the site has water at 129 feet below ground surface. It was formerly used to provide non-potable water to the Building 9A restroom and for road maintenance, construction, and dust control. This well has not been used for many years, but it is being maintained and can be put into service if needed.

1.6.2 Ecology

An ecosystem is a network of living organisms and nonliving components that interact with one another to comprise an overall environment. The ecosystem at SNL/TTR includes the interactions among many living components (e.g., humans, animals, insects, plants, and fungi) within several habitat types. Nonliving components within the ecosystem include air, water, mineral soil, buildings, structures, roads, and paved surfaces. The habitats of the SNL/TTR ecosystem include dwarf shrub and saltbrush shrubland in the lower elevations, Great Basin mixed desert scrub in the intermediate elevations, and an abundance of Joshua trees (*Yucca brevifolia*) and junipers (*Juniperus* spp.) at higher elevations. This ecosystem is a dynamic entity that is impacted by external and internal factors. External factors include such influences as climate, time, topography, and biota. Internal factors include the introduction of non-native species to the ecosystem and human disturbance and interactions (through development) within the various habitats.

In general, the Nevada Test and Training Range land withdrawal has had a positive effect on local plant and animal life at SNL/TTR. Since much of the withdrawn area is undisturbed by human activity, large habitat areas are protected from the effects of public use. For more information on the ecology at SNL/TTR, see Chapter 3.

1.6.3 Climate

The climate at SNL/TTR is typical of high desert, midlatitude locations, with large diurnal and seasonal changes in temperature and little total rainfall. Temperature extremes at the test range vary from highs near 104°F in summer to lows approaching −22°F in winter. July and August are the hottest months, with highs generally around 90°F during the day and dropping to the 50s°F at night. January conditions vary from highs in the 40s°F to lows of around 20°F (Western Regional Climate Center 2020).

Average annual precipitation at the Tonopah Airport (the closest weather station with 30 or more years of data)—elevation 5,426 feet—is 5.08 inches. Typically, the months of May and July have the highest averages with 0.54 and 0.53 inches of precipitation respectively, and December has the lowest with 0.27 inches (Western Regional Climate Center 2020).

Climate is a description of an area's average weather conditions and the extent to which those conditions vary over long time intervals, generally decades or centuries.

Winds are generally from the northwest in winter and early spring, switching to southerly directions during summer. The mountain-and-valley system channels the wind such that the

wind seldom blows from eastern or southwestern directions. Dust storms are common in the spring when monthly average wind speeds reach 15 miles per hour. During the spring and fall, there may be a diurnal wind cycle, bringing northwest winds in the early hours and shifting to southerly winds by afternoon.

1.7 Overview of the Environmental Management System

Sandia integrates environmental protection with its missions through the Environmental Management System. The Environmental Management System is a set of interrelated elements used to establish policy and environmental objectives that enable Sandia personnel to reduce environmental impacts and increase operating efficiency through a continuing cycle of planning, implementing, evaluating, and improving processes. The scope of Sandia's Environmental Management System encompasses all activities, products, and services that have the potential to interact with the environment at all of Sandia's numerous locations.

Sandia has established environmental programs at SNL/TTR (listed in Section 1.8) that are instrumental in the implementation, maintenance, and continual improvement of the Environmental Management System at this site. For more information on the Environmental Management System, see Section 5.3.

1.8 Environmental Programs and Focus Areas

The current environmental programs and focus areas are shown in Figure 1-2.

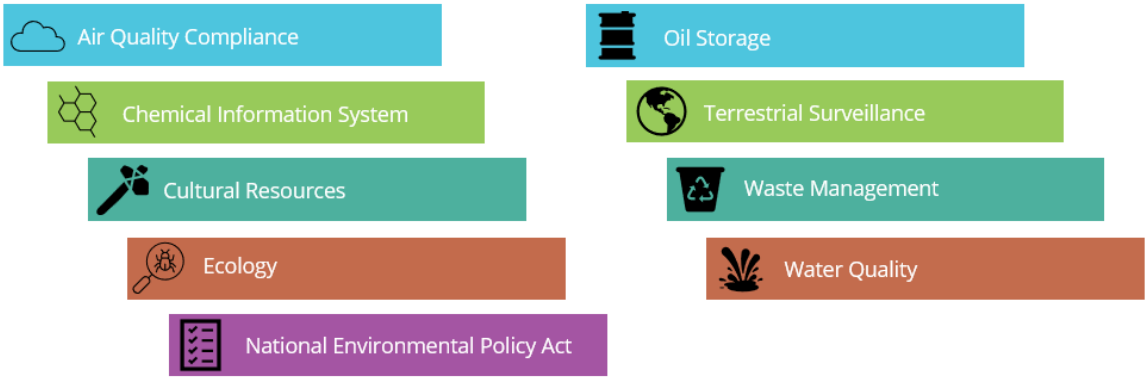

Figure 1-2. Environmental programs and focus areas at SNL/TTR

The following chapters and sections detail the current environmental programs and focus areas at SNL/TTR as follows:

- Cultural Resources Program (Chapter 2)
- Ecology Program (Chapter 3)
- Other Environmental Programs (Chapter 4)
  - National Environmental Policy Act (NEPA) Program (Section 4.1)
  - Chemical Information System (Section 4.2)
  - Waste Management Program (Section 4.3)
  - Air Quality Compliance Program (Section 4.4)
  - Oil Storage Program (Section 4.5)

- Terrestrial Surveillance Program (Section 4.6)
- Environmental Release, Response and Reporting Team (Section 4.7)
- Water Quality (Section 4.8)

In addition, a summary of compliance efforts is provided in Chapter 5, and Chapter 6 details how quality assurance is implemented for environmental monitoring and sampling.

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Chapter 2. Cultural Resources Program

Buildings 24-00 (Support Radar Antenna Building) and 24-01 (Support Radar Lab Building), contributing resources to the SNL/TTR historic district (Photo taken on August 11, 2004, by Joseph M. Bonaguidi)

OVERVIEW ▪ Cultural Resources Program personnel coordinate cultural resource compliance, including review of archaeological resources and historic buildings. Actions that could affect cultural resources adversely are analyzed initially in a NEPA checklist review. DOE/NNSA is responsible for ensuring that impacts on cultural resources are assessed and appropriate actions are taken to mitigate those impacts.

The Cultural Resources Program is focused primarily on long-term preservation and protection of cultural resources and cultural resource compliance to ensure that the heritage of Sandia operating areas and their landscapes are maintained. Long-term preservation and protection practices also ensure that data are available to make proper land use decisions and to assist with environmental planning. *Cultural resources* are places and physical evidence of past human activity: a site, an object, a landscape, a structure, or a natural feature of significance to a group of people traditionally associated with it. There are two main cultural resource categories: archaeological resources and historic buildings.

Between 1979 and 2024, 192 archaeological surveys—mostly linear surveys along roads and utility lines and multiple transect surveys on large blocks of land—have been conducted at SNL/TTR. Currently, 220 historic sites having cultural heritage value at SNL/TTR are recorded, and 12 sites have been recommended as eligible for inclusion in the National Register of Historic Places.

In 2003 and 2005, the Sandia historian conducted surveys of buildings and structures proposed for demolition at SNL/TTR. Following consultation with the Nevada State Historic Preservation Officer, DOE/NNSA determined that none of the properties were eligible for inclusion in the National Register of Historic Places. In 2005, a survey and

assessment of the built environment at the entire site resulted in a DOE/NNSA determination that 60 properties were contributing elements to the Tonopah Test Range Historic District. The Nevada State Historic Preservation Officer concurred with the findings in 2011. Fifty-seven of those buildings and structures are extant and contributing to the Historic District based on DOE/NNSA consultation with the Nevada State Historic Preservation Officer.

2.1 Cultural History

Through the years, several theoretical frameworks have been proposed to define traditions and value systems in southern Nevada. The framework for the prehistoric period covers the time from the earliest documented human occupation of the area (ca. 11,050 BCE) until the earliest European exploration of the area (circa AD 1600). This time range is divided into the following six periods:

- Lake Mohave Period (10,050–5050 BCE)
  - Paleoindian Period
  - Early Archaic Period
- Pinto Period (5550–2050 BCE)
  - Middle Archaic Period
- Gypsum Period (2050 BCE–AD 400)
  - Late Archaic Period
- Saratoga Springs Period (AD 400–1150)
- Late Prehistoric Period (AD 1150–1600)
- Protohistoric Period (AD 1600–circa 1830)

The Lake Mohave Period corresponds to the earliest known human occupation of the area, encompassing the terminal Pleistocene and early Holocene epochs. This includes the Paleoindian Period and the Early Archaic Period. The Lake Mohave Period, and the following Pinto and Gypsum periods, constitute the period of human occupation in North America before agriculture was adopted in the area.

The groups of humans present during the Paleoindian Period are generally described as small, highly mobile bands of hunter-gatherers adapted to a climate that was cooler and wetter than the present (Martin and Plog 1973). The Paleoindian Period is characterized by several distinct traditions of fluted projectile points, including Clovis, Folsom, Agate Basin, and Hell Gap arrowheads (Jennings, Anthropological Papers No. 104 1980).

The Early Archaic Period is generally characterized by an economy focusing on the exploitation of wild plant and animal resources. The Archaic tradition in the Great Basin was initially described as a time of relatively stable foraging referred to as the Desert Culture (Jennings and Norbeck 1955).

The Pinto Period is coterminous (occurring at the same time) with the Middle Archaic Period in southern Nevada, which was hallmarked by specialized stone tools (Ezzo 1996). The Gypsum Period, also referred to as the Late Archaic Period, was marked by warmer, more temperate conditions, which led to an increase in the availability of large game animals and increased plant resources (Roth 2012).

The Saratoga Springs Period (also known as the Virgin Anasazi occupation) corresponds to a time of significant and far-reaching cultural changes in southern Nevada (Ezzo 1996). The initial Virgin Anasazi occupation of the area is characterized by the presence of small, highly mobile groups occupying scattered, small sites on a temporary, perhaps seasonal, basis (Ezzo 1996). With the end of the Virgin Anasazi occupation in southern Nevada and the practice of small-scale agriculture, the area became the home of peoples who were more mobile and increasingly dependent on hunting and foraging (Ezzo 1996).

The Late Prehistoric Period saw the appearance of an identifiable Southern Paiute, or Numic-speaking, people in the Great Basin and southern Nevada who were later encountered by early explorers and immigrants (Fowler 1982); (Kelly and Fowler 1986).

The first Spanish explorers to see the Colorado River were members of Francisco de Coronado's expedition in the 1540s who sought out mineral wealth. Mining became an important activity in the region, and by 1910, small mining camps were established in the Kawich (Golden Arrow and Silverbow) and Cactus (Wellington, Antelope Springs, and Cactus Spring) ranges, as well as in the Trappman Hills (Wilson's Camp and Trappman's Camp). Older mining ventures at Nixon and Gold Reed are less than 12 miles away to the southeast of the Tonopah area. These early twentieth-century mining locales lie on opposing flanks of the Kawich Range at a pass just north of Quartzite Mountain.

Chert biface (Photo taken in 2018 from site 26NY16226)

2.2 Historical Context

Figure 2-1 displays a timeline of important historic events related to the creation of Tonopah Test Range. The timeline covers the establishment of the Tonopah Army Air Field in 1942, the naming of Tonopah Test Range as Sandia Laboratory's permanent test range in 1960, and continues to events taking place in the 2000s.

1940	A 69-by-90-mile area near Tonopah, Nevada was transferred to the War Department for development as a gunnery range.
1942	Tonopah Army Air Field opened as a training field – eight bombardment squadrons and twelve fighter squadrons trained there during the war.
1943	The Field was expanded to host B-24 Liberator training; it also hosted some guided bomb testing activities before the war ended.
1945	Los Alamos laboratory (part of the Manhattan Project) in New Mexico reorganized. Its ordnance engineering activities were gathered into Z Division, which moved to Sandia Base near Albuquerque.
1945	Tonopah Army Air Field was placed on inactive status.
1947	Z Division obtained use of a former U.S. Navy site near the Salton Sea in southern California for ballistic and weapon shape testing.
1947	Tonopah Army Air Field was declared excess. The airfield was turned over to the town of Tonopah as the Tonopah Airport, and the test and training space to the southeast was incorporated into the Las Vegas Bombing and Gunnery Range.
1948	Z Division was redesignated Sandia Laboratory, a branch of Los Alamos.
1949	Sandia Corporation, a subsidiary of Western Electric, took over management of Sandia Laboratory, which was separated from Los Alamos.
1954	Looking to replace the Salton Sea Test Base, Sandia began using a temporary site on Yucca Lake within the Nevada Test Site.
1956	In 1956, the site of the former Tonopah test and training space was selected as a new test site for Sandia. Range boundaries were surveyed and stations staked out.
1956	Construction began at the new range; temporary facilities consisted mostly of imported metal pre-fabricated buildings.
1957	Rocket testing began with the launch of six single-stage and seven two-stage rockets in the Doorknob series.
1957	Original Askania theodolites were brought from Salton Sea Test Base.
1958	ME-16 tracking telescopes were installed.
1959	The Area 9 complex included two rocket launchers and an observation control structure.
1959	The second phase of construction began in Area 3, the control point for the range.
1960	Tonopah Test Range was named Sandia Laboratory's permanent test range, and the Salton SeaTest Base was subsequently closed.
1960s	The priority in new facility construction was on a hard target, pads for cameras, instrument tracking stations, range maintenance structures, a balloon inflation building, and improving the central control building. Original range stations included four Mitchell, two 70-mm, three RO-10, and eight Contraves tracking cameras.
1962	155-mm guns and 155-mm howitzers from Fort Sill and Benecia Arsenal were brought to the range for shock testing; a gun area was established in Area 9.
1963	Plutonium dispersal tests (Operation Roller Coaster) were undertaken.
1957–1964	Testing at the Range included 680 bomb drops and 555 rocket tests.
1964	In conjunction with Project Plowshare, Sandia developed techniques to record cratering studies with high explosives and conducted some of that testing at Tonopah.
1964	The range was converted from a ballistics bombing range to an outdoor technical laboratory, broadening its mission and scope of testing activities.
1965	Three additional rocket launchers were installed at Area 9.
1968	Began converting from the fixed Contraves phototheodolites on towers to mobile units that could be placed at different tracking stations for particular tests (completed in 1980).
1975	Sandia's Davis Gun was moved to the Range and used in a variety of terradynamics tests.
1976	The rocket launcher complex in Area 9 was expanded.
1978	A 5-year modernization plan was articulated and launched.
1980s	The testing program was reduced to 300 tests per year.
1990s	Conducted testing associated with Desert Shield and Desert Storm.
2000s	Testing expanded in support of stockpile stewardship and the new life extension programs under development in the Nuclear Security Enterprise.

Figure 2-1. Timeline of historic events related to the establishment of SNL/TTR

2.3 Regulatory Criteria

Ensuring compliance with federal and state requirements supports the long-term preservation and protection of cultural resources, prevents mission delays, and maintains trust and a strong relationship with DOE/NNSA and the Nevada State Historic Preservation Officer. See Chapter 5 for details on state and federal requirements related to cultural resources.

2.4 Archaeological Resources

Sandia's archaeological staff assists Sandia personnel and DOE/NNSA in maintaining compliance with the National Historic Preservation Act Section 106 and Section 110 requirements. This ensures that cultural resources and their historic and cultural heritage are preserved and protected and that data are available to make appropriate land-use and environmental planning decisions at SNL/TTR.

The archaeological staff review construction activities and provide recommendations for avoidance measures and monitoring field activities so archaeological resources are not impacted inadvertently. The archaeological staff also make site eligibility recommendations for inclusion in the National Register of Historic Places, which is provided to DOE/NNSA for consultations.

2.4.1 Field Methods

Archaeological staff conduct pedestrian surveys (walking the natural landscape on foot) and record prehistoric and historic sites for all Sandia locations in accordance with Bureau of Land Management guidelines (Bureau of Land Management 2004) as required by the Nevada State Historic Preservation Officer along with the Cultural Resources Program's internal guidelines.

In addition, the archaeological staff advise on the potential effect of proposed undertakings on prehistoric and historic properties and make recommendations regarding a site's eligibility for nomination to the National Register of Historic Places for Cultural Properties and Historic Preservation and project mitigation. The archaeological staff prepare consultation letters and associated forms that are then submitted to DOE/NNSA to use in correspondence with the Nevada State Historic Preservation Officer.

A pedestrian survey lightly impacts surface soils. Survey transects are spaced 50 to 100 feet apart, with no more than 40 acres surveyed per person per day. All cultural resources that are at least 50 years old are recorded on field forms. Archaeological sites are defined by the presence of either a cultural feature or 10 or more artifacts that are at least 50 years old and are separated by no more than 66 feet. Areas where cultural materials are sparse (fewer than 10 items) and are at least 50 years old are recorded as isolated occurrences.

A *transect* is a sample area usually in the form a long, continuous strip.

The archaeological staff generate a Nevada Intermountain Antiquities Computer System form for archaeological sites in Nevada. Archaeological sites are mapped both manually on graph paper and digitally. Digital maps are created using a global positioning system unit

with sub-meter accuracy. Each map includes the site boundary, the locations of the datum, any features identified, artifact concentrations, important or diagnostic artifacts, drainages or other landscape features, and topographic contours. Each site, including any cultural features or tools, is photographed. All artifacts are analyzed in the field unless more than 50 artifacts of a given class (e.g., lithic [stone], prehistoric ceramic, or historic) are present, in which case a sample of at least 50 is analyzed. Lithic and prehistoric ceramic artifacts are analyzed using standard in-field techniques. Ceramics, projectile points, and other diagnostic artifacts are identified by type and cultural affiliation when sufficient attributes for a reliable determination are present. Isolated occurrences and their location are recorded and analyzed. The archaeological staff write all reports of findings and associated documentation.

—Program Activities and Results 2024: Archaeological Resources

In 2024, the archaeological staff reviewed 12 outdoor projects at SNL/TTR. Eleven of the reviewed projects included ongoing operational activities or facility improvements and maintenance. One review was for the proposed construction of a new station and associated access road improvements. The reviews included three pedestrian surveys of approximately 49 acres. No immediate archaeological concerns were found for any of the reviewed projects.

In 2024, DOE/NNSA consulted with the Nevada State Historic Preservation Officer on the proposed construction of a new station and access road improvements. The Nevada State Historic Preservation Officer concurred with the DOE/NNSA determination that the proposed work would have no adverse effects on any historic properties or historic districts.

In addition, Cultural Resources Program personnel presented at two annual meetings with Nevada Tribal Council Members (including 28 federally recognized Tribes); one meeting was led by Nellis Air Force Base personnel and the other was led by the Nevada Field Office.

2.5 Historic Buildings

The Sandia historian surveys and assesses the built environment in support of the National Historic Preservation Act, Section 106 and Section 110, for all properties owned by DOE/NNSA and used by personnel at SNL/TTR. This includes all elements of the built environment from the Historic Period, but is primarily focused on properties built for and used by Sandia since 1956.

2.5.1 Methods

Sandia's historian reviews a project's details, analyzes existing photographs of and documents about the facilities involved, conducts any additional research in the archives and building drawings collection to understand the property's past and current role in SNL/TTR operations, and evaluates the building's history within the themes (field testing and stockpile surveillance) provided by the 2005 context statement, which currently provides the framework for evaluating an SNL/TTR property for historic significance (Sandia 2005). Note is made of any previous surveys and resulting determinations regarding a property's eligibility for the National Register of Historic Places.

If there are any questions regarding proposed work and its potential impact on a property or properties, the historian discusses the matter with the project owner and the NEPA

specialist. The project owner may submit renderings of the anticipated appearance of the property after work is completed, and the historian may suggest alternate locations, materials, or methods to avoid adverse effects on the property.

The context statement completed in 2005 is used in historic building assessments and recommendations as the background against which properties are evaluated. Any recommendation that a property is historic includes the relevant established Nevada theme under which it falls as well as its period of significance.

Once a property is understood in context, the historian makes a recommendation regarding whether it is eligible for inclusion in the National Register of Historic Places, summarizing past determinations and any subsequent changes to the property. The historian also makes a recommendation regarding whether proposed work will have an adverse effect on any historic properties or districts, including the property where the work is occurring. Information on the property, photographs, maps, a description of the proposed work, any impacts, and the overall recommendation on eligibility as a historic property are captured on a Nevada Architectural Resource Assessment form. The Architectural Resource Assessment form and a consultation letter are submitted to DOE/NNSA to support consultation with the Nevada State Historic Preservation Officer. The historian's recommendation is also captured in the NEPA checklist subject matter expert review.

2.5.2 Previous Building Surveys, Assessments, and Determinations

In the spring of 2002, the Sandia historian began to assess properties at SNL/TTR, with an initial focus on buildings scheduled for demolition in 2003 and 2004. The assessments were completed and submitted to DOE/NNSA on Nevada Architectural Resource Assessment forms (Sandia 2003). In consultation with the Nevada State Historic Preservation Office, DOE/NNSA determined that none of the properties were historic, and Sandia proceeded with demolition.

The historian also prepared a context statement for the site (Sandia 2004). The context statement concentrated on the Cold War as the primary time period and focus for the built environment at SNL/TTR within the State of Nevada's established themes. The historian continued the historic building survey for the remaining properties at the site through 2005, including archival research, photo documentation, and preparation of Architectural Resource Assessment forms. Additional support and architectural evaluations were provided by a consulting firm, e^2M, which resulted in a revised context statement, survey document, and completed Architectural Resource Assessment forms (Sandia 2005); (Sandia 2005); (Sandia 2005).

In 2010, because of the age of the survey documents, the assessments were reviewed and the properties were reconsidered. The existing property lists and the building statuses remained unchanged. The survey conclusions were affirmed. The recommendation was to include key and representative facilities as contributing elements in an SNL/TTR historic district. The period of significance for the SNL/TTR Historic District was 1956 to 1989.

In 2011, DOE/NNSA completed consultation with the Nevada State Historic Preservation Office, reaching an agreement regarding the resources contributing to the SNL/TTR historic district. The district included 60 structures and represents the key functions included in

testing at the site during the Cold War (Table 2-1). In 2012, DOE/NNSA provided the Nevada State Historic Preservation Office with samples of the documentation created to mitigate the effects of future demolition of properties in the district. Nevada State Historic Preservation Office personnel reviewed the sample documentation and agreed with its suitability.

In 2016 and 2018, DOE/NNSA met with the Nevada State Historic Preservation Office to finalize details of a memorandum of agreement covering the SNL/TTR historic district and mitigative efforts for future demolition and renovation at the site. Agreement was not reached, and the document is considered defunct.

Table 2-1. Contributing elements to the SNL/TTR historic district

Historic Resource	Function	Construction	Location
02-00	Askania camera tower	1956	Station 2 (demolished; no longer a contributing element)
02-01	ME-16 tracking telescope	1958	Station 2
03-32	Water tank	1961	Station 3
03-33	Water tank	1962	Station 3
03-50	Engineering tag and physical security office	1956	Station 3
03-51	Administration building	1962	Station 3
03-53	Generator building	1965	Station 3 (no longer a contributing element due to renovations)
03-54	Machine shop	1960	Station 3
03-55	Photo optics building	1965	Station 3
03-56	Telescope repair and offices	1965	Station 3 (no longer a contributing element due to renovations)
03-57	Operations and control	1980	Station 3
03-62	Welding shop	1960	Station 3
03-65	Radio shop and offices	1960	Station 3
09-04	Camera tower	1970s	Station 9
09-10	Camera tower	1970	Station 9
09-11	Camera tower	1970	Station 9
09-19	Camera tower	1965	Station 9
09-22	Underground room	circa 1970	Station 9
09-25	Storage igloo	1960	Station 9
09-26	Storage igloo	1960	Station 9
09-27	Storage igloo	1960	Station 9
09-28	Storage igloo	1960	Station 9
09-29	Storage igloo	1960	Station 9
09-30	Storage igloo	1960	Station 9
09-31	Storage igloo	1960	Station 9
09-32	Storage igloo	1960	Station 9
09-33	Storage igloo	1960	Station 9
09-34	Storage igloo	1960	Station 9

Historic Resource	Function	Construction	Location
09-50	Fire control bunker	1957	Station 9
09-51	Fire control bunker	1964	Station 9
09-52	Assembly building (9A)	1956	Station 9
09-54	Assembly building	1960	Station 9
09-55	Assembly building	1964	Station 9
09-56	Explosive bunker	1960	Station 9
09-57	Explosive bunker	1960	Station 9
09-59	Explosive bunker	1960	Station 9
09-60	Gun control bunker	1971	Station 9
09-63	Special storage facility (bunker)	1986	Station 9
13-00	ME-16 tracking telescope	1977	Area 13
16-00	ME-16 tracking telescope	1960	Area 16
22-00	Contraves camera tower	1960	Area 22 (removed; no longer a contributing element to the historic district)
24-00	Radar antenna building	1971	Station 24
24-01	Radar laboratory and office	1961/1975	Station 24
24-02	LA-24 telescope	1970	Station 24
24-03	Teletrac antenna	1970	Station 24
24-04	Bore site tower	1962	Station 24
24-09	Rohn Tower	1962	Station 24
24-10	Antenna tower platform	1970	Station 24
24-11	Antenna support tower	1970	Station 24
24-52	Bore site storage	Date Unknown	Station 24
24-53	Communications building	1960	Station 24
32-01	Main gate guardhouse	1982	Main Gate
Contraves camera	Contraves camera	1960s	N/A
Hard target	Target	1960	Main target area
Launcher 2	Missile launcher	1956	Station 9
Launcher 3	Missile launcher	1956	Station 9
Launcher 4	Missile launcher	1956	Station 9
Launcher 5	Missile launcher	1956	Station 9
ME-16 tracking telescope	Tracking telescope	1958	N/A
Rocket sign	Tonopah Test Range sign	1960	Beyond main gate

N/A = not applicable

—*Program Activities and Results 2024: Historic Buildings*

In 2019, personnel at SNL/TTR proposed the demolition of Tower 02-00, which was no longer in use and was blocking the line of sight for other projects. The historian provided DOE/NNSA with updated Nevada Architectural Resource Assessment forms for the proposed demolition. In 2022, DOE/NNSA completed consultation with the Nevada State Historic Preservation Office regarding a memorandum of agreement for the demolition

of Tower 02-00. In addition, the first memorandum of agreement requirement was completed when the Nevada State Historic Preservation Officer approved the photographs documenting Tower 02-00. In 2023, Tower 02-00 was demolished. Also in 2023, the historian finalized a draft Historic American Building Survey/Historic American Engineering Record report documenting the property's history and architectural features. The draft was circulated for review, edits were absorbed, and DOE/NNSA submitted the document to the Nevada State Historic Preservation Officer in 2024.

The Nevada State Historic Preservation Officer has indicated that they will not review consultations regarding National Register of Historic Places eligibility for any properties at SNL/TTR until a new site survey and assessment are completed. The Sandia historian began a new historic building survey of SNL/TTR late in 2023 and drafted a new context statement in 2024. Also in 2024, Sandia personnel contracted with OCR Consulting to complete a survey of the roads in the permitted and common use area at SNL/TTR. The final context statement, survey, and assessment are expected to be completed in 2025. Consultation with the Nevada State Historic Preservation Officer on the assessments of historic buildings and roads is expected to be undertaken in 2025.

Personnel at SNL/TTR are planning to remove four structures from Station 24 (Radar Hill) and install a new radar trailer and dish in their place. Building 24-00 (Support Radar Antenna Building), Building 24-01 (Support Radar Laboratory Building), Structure 24-02 (LA-24 Telescope Tracking Dome), and Structure 24-03 (TELTRAC Antenna) are contributing resources to the SNL/TTR Historic District. In 2024, DOE/NNSA determined that their removal will have an adverse effect on the district and sent consultation correspondence to the Nevada State Historic Preservation Officer. The Nevada State Historic Preservation Officer chose not to respond to the consultation, which implies concurrence per the regulations. As required for undertakings that will have an adverse effect on a historic property or district, DOE/NNSA submitted e106 documentation to the Advisory Council on Historic Preservation regarding the demolition. The Advisory Council requested documentation of consultation with the State Historic Preservation Officer and with the Nevada Tribal Nations. DOE/NNSA plans to consult with the Nevada Tribes in 2025. Results of the consultation with the Nevada Tribes and copies of the original consultation letter to the State Historic Preservation Officer will then be sent to the Advisory Council. DOE/NNSA would then prepare a memorandum of agreement with the State Historic Preservation Officer outlining measures to mitigate the adverse effects of the demolition.

Chapter 3. Ecology Program

Dark kangaroo mouse (*Microdipodops megacephalus*)
(Photo taken by the Nevada Department of Wildlife outside SNL/TTR)

OVERVIEW ▪ Ecology Program personnel conduct biological evaluations and surveys in support of site activities to ensure compliance with wildlife regulations and laws. Ecological data is collected on plants and wildlife to support documentation, land use decisions, and ecological and wildlife awareness campaigns to ensure safe work environments.

Ecology Program personnel support site activity and project compliance with wildlife requirements by conducting biological evaluations and surveys. Ecological compliance promotes conservation through the protection of native wildlife and their habitats. Monitoring, primarily for birds, is conducted during the bird breeding months to measure species diversity, abundance, and land use patterns. Data collected through monitoring programs can be used to inform land management decisions. As part of the ecological compliance program for SNL/TTR, biological surveys are conducted in areas where Sandia activities are proposed to take place; areas surveyed include existing infrastructure and developed areas as well as undisturbed habitats. In addition, site personnel assist both with reporting nests found on utility poles and other infrastructure and with reporting and documenting wildlife electrocutions on utility poles.

Collectively, these data are used to support NEPA documentation, land use decisions, ecological and wildlife awareness campaigns, and to help ensure safe work environments.

3.1 Ecological Setting

SNL/TTR, in general, is situated within the Great Basin biogeographic province, as described by Brown (Brown (ed) 1982). A biogeographic province is a large region

characterized as distinct from other regions, mostly based on different dominant vegetation and wildlife habitat types.

See descriptions of the location and environmental setting in Section 1.3 and Section 1.6, respectively.

3.1.1 Vegetation

The Sierra Nevada and Cascade Mountains prevent moist air from the Pacific Ocean from reaching the inland region of the Great Basin. Even with dry conditions and rugged basin and range topography, the Great Basin has a wide variety of plants. Most of the vegetation at SNL/TTR can be subdivided into several general types. The vegetation of the lower elevation portions, such as Cactus Flat, is primarily dwarf shrub and saltbrush shrubland (with a vegetation height of less than or equal to 1.6 feet) and is typified by budsage (*Artemisia spinescens*), Indian ricegrass (*Achnatherum hymenoides*), shadscale (*Atriplex confertifolia*), and winterfat (*Krascheninnikovia lanata*). Intermediate elevation slopes are dominated by Great Basin mixed desert scrub, and the shrub cover tends to be taller (greater than or equal to 1.6 feet), with some grassland characterized by various species of budsage, hopsage (*Grayia spinosa*), horsebrush (*Tetradymia* spp.), rabbitbrush (*Chrysothamnus viscidiflorus* and *Ericameria nauseosa*), and shadscale. As the elevation increases, Joshua trees (*Yucca brevifolia*) and junipers (*Juniperus* spp.) start to increase in abundance. The understory becomes that of black sagebrush (*Artemisia nova*) and rabbitbrush. Surface water at Cactus Spring and Antelope Spring can support emergent vegetation and a few deciduous trees.

The abbreviation sp. is used when the actual specific name cannot or need not be specified, and spp. (plural) indicates several species. The abbreviation ssp. refers to a subspecies.

Weed abatement and brush control at SNL/TTR is used to discourage large animals from grazing adjacent to roadways, thereby reducing vehicle collision hazards. These actions also provide fire breaks and reduce wildland fire risk to Tonopah Test Range facilities. The U.S. Air Force is responsible for all wildland fire protection planning and wildland fire response at SNL/TTR.

3.1.2 Wildlife

Wildlife at SNL/TTR is typical of the Great Basin biogeographic province. As water is scarce in the Great Basin Desert, occurring naturally only at a few seeps and springs nearby, there are no sites with native fish at SNL/TTR. The Roller Coaster Construction Pond, a man-made structure on SNL/TTR property, was formerly stocked with goldfish (*Carassius* sp.) and mosquitofish (*Gambusia* sp.).

The bird species typically found in the valley floor are those associated with the sagebrush community and include common nighthawk (*Chordeiles minor*), common raven (*Corvus corax*), green-tailed towhee (*Pipilo chlorurus*), horned lark (*Eremophila alpestris*), mourning dove (*Zenaida macroura*), sagebrush sparrow (*Artemisiospiza nevadensis*), and sage thrasher (*Oreoscoptes montanus*).

From the valley floor, going up in elevation, the vegetation changes to include Joshua trees and junipers, and the bird diversity increases. Common birds in this zone include ash-throated flycatchers (*Myiarchus cinerascens*), black-throated sparrows (*Amphispiza bilineata*), loggerhead shrikes (*Lanius ludovicianus*), mourning doves, Scott's orioles (*Icterus parisorum*), and western kingbirds (*Tyrannus verticalis*). Several of these species can be observed nesting in the Joshua trees. At even higher elevations where there are steep rocky slopes, chukars (*Alectoris chukar*), which were introduced into the area, and rock wrens (*Salpinctes obsoletus*) may be encountered. Common ravens are widespread across SNL/TTR.

Dry areas that are free of vegetation are found at the lowest portion of closed desert basins. These arid areas, known as *playas*, form ephemeral lakes during periods of precipitation.

Although SNL/TTR is located on a high desert, the playas will have standing water if there is plenty of precipitation. During seasonal migrations—should the playas have water—ducks, geese, and water birds can be found at these playas and at man-made retention ponds. A few waterfowl and other water birds may breed at the small permanent man-made bodies of water. At Roller Coaster Construction Pond, the freshwater habitat attracts several bird species that would not otherwise be found at SNL/TTR. Bullock's orioles (*Icterus bullockii*) and common yellowthroats (*Geothlypis trichas*) are known to nest at this pond. Other bird species that have been encountered at this pond, and potentially could nest there, include red-winged blackbird (*Agelaius phoeniceus*), vermilion flycatcher (*Pyrocephalus rubinus*), western kingbird, and western wood-pewee (*Contopus sordidulus*).

Several raptor species are known to use the SNL/TTR area for hunting, roosting, and breeding. Some of these birds include American kestrels (*Falco sparverius*), barn owls (*Tyto alba*), ferruginous hawks (*Buteo regalis*), golden eagles (*Aquila chrysaetos*), great horned owls (*Bubo virginianus*), prairie falcons (*Falco mexicanus*), red-tailed hawks (*Buteo jamaicensis*), and Swainson's hawks (*Buteo swainsoni*).

Reptile species that have been observed include coachwhip (*Masticophis flagellum*), Great Basin gopher snake (*Pituophis catenifer deserticola*), Great Basin rattlesnake (*Crotalus oreganus lutosus*), long-nosed leopard lizard (*Gambelia wislizenii*), sagebrush lizard (*Sceloporus graciosus*), and western patch-nosed snake (*Salvadora hexalepis*).

Desert bighorn (*Ovis canadensis nelsoni*), mountain lions (*Puma concolor*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), and wild horses (*Equus ferus*) are the notable large mammal species that occur at SNL/TTR. In general, desert bighorn, mountain lions, and mule deer reside in the higher elevations of the mountain ranges. Pronghorn are usually seen in the open, short-grass and scattered brush habitat of the valley floor. A notable species is the wild horse, often called a mustang. Wild horses were brought onto Nellis Air Force Base in 1962 for the establishment of the Nevada Wild Horse Range. Wild horses are more opportunistic than other native wildlife and are found in practically all habitat types within the SNL/TTR area. Though wild horses compete with livestock and wildlife for limited forage and water resources, they are protected under the Wild Free-Roaming Horses and Burros Act (PL 92-195 1971) (16 U.S.C. 30 § 1331 et seq. 1971). Common medium-sized mammals found within the SNL/TTR area include American badgers (*Taxidea taxus*), black-

tailed jackrabbits (*Lepus californicus*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), and kit foxes (*Vulpes macrotis*).

Smaller mammals and rodents that are common at SNL/TTR include deer mice (*Peromyscus spp.*), desert cottontails (*Sylvilagus audubonii*), desert woodrats (*Neotoma lepida*), Merriam's kangaroo rats (*Dipodomys merriami*), and white-tailed antelope squirrels (*Ammospermophilus leucurus*). State-protected dark kangaroo mice (*Microdipodops megacephalus*) and pale kangaroo mice (*Microdipodops pallidus*) have been documented on adjacent DoD property. Both species are found in loose sands and gravel. These species typically are associated with alkali sink plant, sagebrush scrub, and shadscale scrub communities.

Six species of bats have been identified as occurring at the Nevada Test and Training Range (U.S. Air Force 1997). These bat species are likely to be found at SNL/TTR. All these bat species primarily use caves, abandoned mines, trees, and buildings for roosts. They include California myotis (*Myotis californicus*), canyon bat (*Parastrellus hespereus*), fringe myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), pallid bat (*Antrozous pallidus*), and Townsend's big-eared bat (*Corynorhinus townsendii*).

3.2 Migratory Bird Compliance and Wildlife Monitoring

Migratory bird surveys were established in 2004 to monitor patterns of bird richness, abundance, and distribution in the basic habitats found within the DOE/NNSA-controlled land at SNL/TTR. Native, migratory birds are the primary compliance and conservation concerns at SNL/TTR and act as reliable indicators of ecosystem health.

—Program Activities and Results 2024: Migratory Bird Concerns, Migratory Bird Surveillance, and Other Wildlife Concerns

Ecology Program activities and results for migratory bird compliance and wildlife monitoring in 2024 are presented in the following sections.

Migratory Bird Concerns

In 2024, a single active nest was reported on a piece of heavy equipment (i.e., roller) that was staged for a nearby project. Staff at SNL/TTR initially reported the nest in April, at which time it was confirmed to be an active common raven nest. Appropriate mitigations were put into place immediately along with a process for further coordination. Personnel at SNL/TTR provided regular status updates to Ecology Program personnel throughout the nesting season. Ultimately, the nesting attempt was successful, and multiple young ravens fledged. Once the nest was confirmed to no longer be active (i.e., the nest was empty), the nest was removed and the roller was moved to a different area.

Several surveys were completed in 2024 ahead of proposed projects. No active nests were found during any of the surveys. Following one survey, it was recommended that an empty common raven's nest be removed to deter birds from making any future nesting attempts there due to upcoming activities in that area.

In October 2024, an injured great horned owl was found in the Area 3 Compound. Upon coordination with the Ecology Program, personnel at SNL/TTR captured the injured owl and housed it in a box that was stored in a secure area to ensure the owl's safety. Ecology

Program personnel contacted the Nevada Department of Wildlife to coordinate the owl's transfer. The owl was transferred to the Nevada Department of Wildlife staff in Tonopah without incident.

Four reports of deceased birds were made in 2024, including a common nighthawk, a tree swallow, a common raven, and a red-tailed hawk. All reports were suspected as either power pole electrocutions or collisions with windows or buildings.

Ecology Program personnel were initially notified on June 11, 2024, of an avian incident that occurred on the North Range. A Sandia individual had collided with and killed a low-flying owl while driving near the main gate at night. The following morning, an Environmental, Safety, and Health (ES&H) specialist went to the site to fill out an incident report and found two additional owl mortalities nearby, also likely the result of vehicle strikes. Based on photos taken in the field, Ecology Program biologists identified the owls as short-eared owls and advised the management personnel at SNL/TTR to consider reduced vehicle operating speeds during night operations.

The following day, Ecology Program personnel received a second notification reporting two additional short-eared owl mortalities along the same stretch of roadway on the North Range. It was concluded in the second incident report that these additional mortalities were likely the result of recent vehicle collisions that were separate from the initial incident. On July 7, 2024, a third incident report notified Ecology Program personnel of yet another short-eared owl mortality due to a vehicle collision. In total, six short-eared owls were found deceased along the same stretch of roadway on the North Range, all determined to be consequences of collisions with vehicles. During this time, there were no reports of actual collisions, only reports of owl mortalities found along the roadway.

The unprecedented owl mortalities occurred along shared-use roadways, and the information was promptly shared with Nellis Air Force Base Natural Resource personnel. Ecology Program personnel also reported these incidents to the United States Fish and Wildlife Service (USFWS) using the Injury and Mortality Reporting system. In collaboration with the Nevada Department of Wildlife, the short-eared owl that was reported deceased on July 7, 2024, was collected and sent to the Washington Animal Disease Diagnostic Laboratory at Washington State University. Although the specimen's condition was poor due to injuries sustained from the collision, the final diagnostic report identified no histological abnormilities and avian influenza was not detected.

Migratory Bird Surveillance

The North American Breeding Bird Survey is a standardized protocol with roadside routes established across the continent. The bird survey protocol at SNL/TTR consists of three-minute point counts for migratory bird species. Points are spaced every half-mile along a 24.5-mile route. To capture dispersed operational areas at SNL/TTR and to encompass representative habitats, the North American Breeding Bird Survey route is split into two separate routes. See Figure 3-1 for route locations.

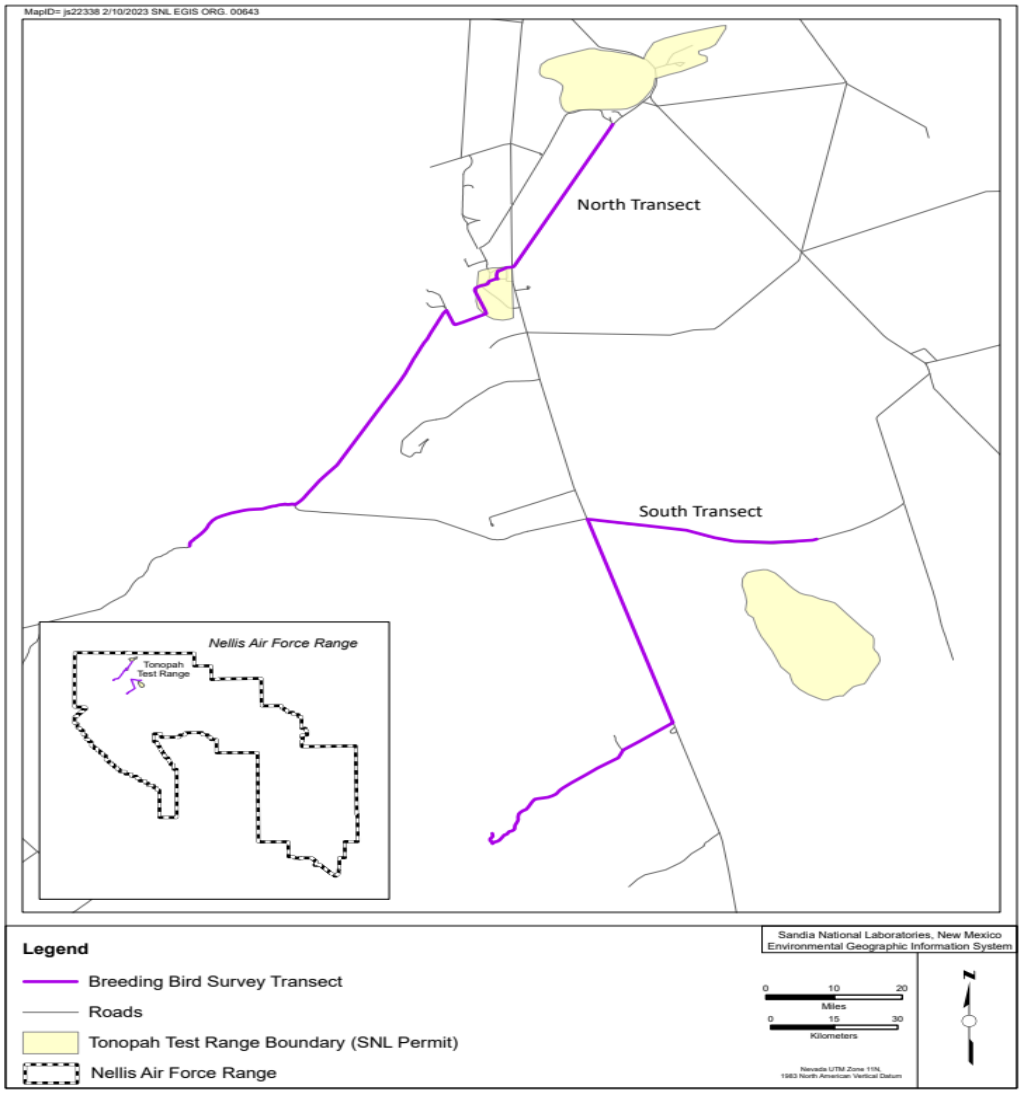


Figure 3-1. Bird survey routes

Bird surveys were conducted during 14 separate years from 2004 to 2024. The time frame for conducting surveys is during the typical breeding season for birds in the Great Basin region. In 2024, bird surveys were conducted in late May. Five hundred and eight birds from at least 16 different species were recorded along the newly established survey routes (see Table 3-1). Eight birds could not be identified to the species level. Overall, horned larks were the most recorded species during the 2024 surveys. The second-most encountered species was the black-throated sparrow followed by the northern mockingbird and then the loggerhead shrike. All other species counts were in the single digits.

Table 3-1. Breeding bird survey totals, 2024

Common name	Scientific name	Total
American white pelican	*Pelecanus erythrorhynchos*	1
Black-throated sparrow	*Amphispiza bilineata*	38
Chipping Sparrow	*Spizella passerina*	1
Common raven	*Corvus corax*	5

Common name	Scientific name	Total
Diurnal raptor sp.	*Accipitriformes/Falconiformes sp.*	1
Ferruginous hawk	*Buteo regalis*	1
Horned lark	*Eremophila alpestris*	401
House finch	*Haemorhous mexicanus*	4
Loggerhead shrike	*Lanius ludovicianus*	15
Northern mockingbird	*Mimus polyglottos*	19
Passerine sp.	*Passeriformes sp.*	4
Prairie falcon	*Falco mexicanus*	1
Red-tailed hawk	*Buteo jamaicensis*	1
Rock wren	*Salpinctes obsoletus*	7
Say's phoebe	*Sayornis saya*	3
Sparrow sp.	*Passerellidae sp.*	2
Spotted towhee	*Pipilo maculatus*	2
Swainson's hawk	*Buteo swainsoni*	1
Woodpecker sp.	*Picidae sp.*	1
Total		**508**

Bird surveys were established in 2004 to monitor patterns of species richness and abundance in the basic habitats found within the DOE/NNSA-controlled land at SNL/TTR.

From all survey and monitoring years, 124 species of birds have been recorded at SNL/TTR. Table 3-2 lists those bird species. It should be noted that some of the species listed were also seen in other places in the general SNL/TTR area that are not covered by the bird surveys, in locations that are no longer SNL/TTR permitted land use areas or were documented as mortalities. Bird data from these historical locations are valuable for monitoring changes in species composition, distribution, and habitat preferences. Many of the waterfowl and most of the water birds were seen on the various playas when precipitation events produced standing water or at man-made water sources. As most surveys were conducted in late spring and early summer, many of the species encountered were migrants.

Table 3-2. Bird species encountered at SNL/TTR, 2004–2024

Common Name	Scientific Name
American avocet	*Recurvirostra americana*
American coot	*Fulica americana*
American kestrel	*Falco sparverius*
American pipit	*Anthus rubescens*
American robin	*Turdus migratorius*
American white pelican	*Pelecanus erythrorhynchos*
Ash-throated flycatcher	*Myiarchus cinerascens*
Barn swallow	*Hirundo rustica*
Belted kingfisher	*Megaceryle alcyon*
Black phoebe	*Sayornis nigricans*
Black-crowned night-heron	*Nycticorax nycticorax*
Black-headed grosbeak	*Pheucticus melanocephalus*

Common Name	Scientific Name
Black-necked stilt	*Himantopus mexicanus*
Black-throated gray warbler	*Setophaga nigrescens*
Black-throated sparrow	*Amphispiza bilineata*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue grosbeak	*Passerina caerulea*
Bonaparte's gull	*Chroicocephalus philadelphia*
Brewer's blackbird	*Euphagus cyanocephalus*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Bufflehead	*Bucephala albeola*
Bullock's oriole	*Icterus bullockii*
Burrowing owl	*Athene cunicularia*
Calliope hummingbird	*Selasphorus calliope*
Canvasback	*Aythya valisineria*
Canyon wren	*Catherpes mexicanus*
Cassin's kingbird	*Tyrannus vociferans*
Cassin's sparrow	*Peucaea cassinii*
Cassin's vireo	*Vireo cassinii*
Chipping sparrow	*Spizella passerina*
Chukar	*Alectoris chukar*
Cinnamon teal	*Anas cyanoptera*
Cliff swallow	*Petrochelidon pyrrhonota*
Common nighthawk	*Chordeiles minor*
Common raven	*Corvus corax*
Common yellowthroat	*Geothlypis trichas*
Cooper's hawk	*Accipiter cooperii*
Dusky flycatcher	*Empidonax oberholseri*
Eared grebe	*Podiceps nigricollis*
Eurasian collared-dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Ferruginous hawk	*Buteo regalis*
Gadwall	*Anas strepera*
Golden eagle	*Aquila chrysaetos*
Gray catbird	*Dumetella carolinensis*
Gray flycatcher	*Empidonax wrightii*
Great egret	*Ardea alba*
Greater yellowlegs	*Tringa melanoleuca*
Great horned owl	*Bubo virginianus*
Great-tailed grackle	*Quiscalus mexicanus*
Green-tailed towhee	*Pipilo chlorurus*
Green-winged teal	*Anas crecca*
Hermit thrush	*Catharus guttatus*
Herring gull	*Larus argentatus*
Horned grebe	*Podiceps auritus*

Common Name	Scientific Name
Horned lark	*Eremophila alpestris*
House finch	*Carpodacus mexicanus*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Juniper titmouse	*Baeolophus ridgwayi*
Killdeer	*Charadrius vociferus*
Ladder-backed woodpecker	*Picoides scalaris*
Lark sparrow	*Chondestes grammacus*
Lazuli bunting	*Passerina amoena*
Least sandpiper	*Calidris minutilla*
Lincoln's sparrow	*Melospiza lincolnii*
Loggerhead shrike	*Lanius ludovicianus*
MacGillivray's warbler	*Geothlypis tolmiei*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Nashville warbler	*Leiothlypis ruficapilla*
Northern mockingbird	*Mimus polyglottos*
Northern pintail	*Anas acuta*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Northern shoveler	*Anas clypeata*
Northern waterthrush	*Parkesia noveboracensis*
Olive-sided flycatcher	*Contupus cooperi*
Orange-crowned warbler	*Leiothlypis celata*
Palm warbler	*Setophaga palmarum*
Pine siskin	*Carduelis pinus*
Prairie falcon	*Falco mexicanus*
Redhead	*Aythya americana*
Red-necked phalarope	*Phalaropus lobatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Rock wren	*Salpinctes obsoletus*
Ruby-crowned kinglet	*Regulus calendula*
Sagebrush sparrow	*Artemisiospiza nevadensis*
Sage thrasher	*Oreoscoptes montanus*
Savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
Scott's oriole	*Icterus parisorum*
Sharp-shinned hawk	*Accipiter striatus*
Short-eared owl	*Asio flammeus*
Snowy egret	*Egretta thula*
Sora	*Porzana carolina*
Spotted sandpiper	*Actitis macularius*
Spotted towhee	*Pipilo maculatus*

Common Name	Scientific Name
Summer tanager	*Piranga rubra*
Swainson's hawk	*Buteo swainsoni*
Townsend's warbler	*Setophaga townsendi*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Vermilion flycatcher	*Pyrocephalus rubinus*
Vesper sparrow	*Pooecetes gramineus*
Violet-green swallow	*Tachycineta thalassina*
Virginia rail	*Rallus limicola*
Virginia's warbler	*Oreothlypis virginiae*
Warbling vireo	*Vireo gilvus*
Western flycatcher	*Empidonax difficilis*
Western kingbird	*Tyrannus verticalis*
Western sandpiper	*Calidris mauri*
Western tanager	*Piranga ludoviciana*
Western wood-pewee	*Contopus sordidulus*
White-crowned sparrow	*Zonotrichia leucophrys*
White-faced ibis	*Plegadis chihi*
White-winged dove	*Zenaida asiatica*
Wilson's phalarope	*Phalaropus tricolor*
Wilson's warbler	*Cardellina pusilla*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Yellow-rumped warbler	*Setophaga coronata*
Yellow warbler	*Setophaga petechia*

Other Wildlife Concerns

In 2024, several surveys were conducted with the intention of also identifying and addressing any potential state of Nevada protected mammal species concerns. Where deemed necessary, appropriate mitigations were put in place ahead of planned projects and activities, including avoidance, re-siting, and alterations to proposed treatments.

A single report of a deceased mammal was reported in 2024. Ecology Program biologists identified the mammal as a bushy-tailed woodrat (*Neotoma cinerea*). The incident was confirmed to be the result of electrocution on a power pole.

3.3 Federally Listed and State-Listed Threatened and Endangered Species and Species of Concern

The purpose of the Endangered Species Act is to protect all animal, plant, and insect species that are federally listed as threatened or endangered. The State of Nevada has its own regulations for the protection of various species of plants and animals, including Nevada Administrative Code 503 (NAC 503 2018), Nevada Administrative Code 504 (NAC 504 2018), Administrative Code 527 (NAC 527 2012), and Nevada Administrative Code 501 (NAC 501 2018).

Currently, no federally listed threatened or endangered species are known to be found at SNL/TTR. The only federally listed species found at the Nevada Test and Training Range is the Mojave Desert tortoise (*Gopherus agassizii*) (U.S. Air Force 1997), which is not found at SNL/TTR. In December 2024, the USFWS proposed to list the Monarch butterfly (*Danaus plexippus*) as a threatened species under the Endangered Species Act. The USFWS is expected to announce a final ruling sometime in 2025. The Monarch may occasionally traverse SNL/TTR during certain times of the year, but there is limited suitable habitat for the species across the site. Ecology Program personnel will implement appropriate mitigations, as necessary, to protect the Monarch at SNL/TTR in accordance with future rulings.

Table 3-3 lists federally protected species under the Endangered Species Act that are known to occur in Nye County, Nevada. This list is used to reference federally protected species that could potentially occur at SNL/TTR, which is located near the center of Nye County. The golden eagle, protected under the Bald and Golden Eagle Protection Act, has occasionally been encountered at SNL/TTR during breeding bird point count surveys. To date, a golden eagle nest has not been located at SNL/TTR, but if one were found, appropriate protections and mitigation would be implemented to avoid disturbance to nesting eagles.

Table 3-3 also includes state-listed species that may potentially occur in Nye County, Nevada, and flags the species that have been observed at SNL/TTR. A few plant and animal species at SNL/TTR are protected by the State of Nevada, including several cacti and succulents, such as branched pencil cholla (*Cylindropuntia ramosissima*), cottontop cactus (*Echinocactus polycephalus*), and spinystar/beehive cactus (*Escobaria vivipara*). Both the dark kangaroo mouse (*Microdipodops megacephalus*) and the pale kangaroo mouse (*Microdipodops pallidus*) have been documented on the North Range of the Nevada Test and Training Range.

Ecology Program personnel review all projects with the potential to impact biological resources at SNL/TTR. This process identifies best management practices to ensure compliance with the Endangered Species Act, the Migratory Bird Treaty Act, and other associated federal, state, and local laws. Sandia personnel coordinate with state and/or federal officials and implement any requisite mitigation prior to initiating proposed activities.

Table 3-3. Federally listed and state-listed threatened and endangered species and State of Nevada protected species potentially occurring in Nye County, Nevada

Common Name	Scientific Name	Federal Endangered Species Act Status	Nevada Status	Observed at SNL/TTR
Animals				
Invertebrates				
Ash Meadows naucorid	*Ambrysus amargosus*	Threatened	No designation	
Monarch butterfly	*Danaus plexippus*	Proposed threatened	No designation	
Fishes				
Amargosa Speckled Dace	*Rhinichthys nevadensis nevadensis*	No designation	Endangered	
Ash Meadows amargosa pupfish	*Cyprinodon nevadensis mionectes*	Endangered	Endangered	
Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	Endangered	Endangered	

Common Name	Scientific Name	Federal Endangered Species Act Status	Nevada Status	Observed at SNL/TTR
Big Smoky Valley speckled dace	*Rhinichthys osculus lariversi*	No designation	Protected	
Big Smoky Valley tui chub	*Gila bicolor spp. 8*	No designation	Protected	
Bonytail	*Gila elegans*	Endangered	Endangered	
Devils Hole pupfish	*Cyprinodon diabolis*	Endangered	Endangered	
Hot Creek Valley tui chub	*Siphateles bicolor ssp. 5*	No designation	Protected	
Humpback Chub	*Gila cypha*	Threatened	No designation	
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Threatened	Game	
Moapa dace	*Moapa coriacea*	Endangered	Endangered	
Monitor Valley speckled dace	*Rhinichthys osculus spp. 5*	No designation	Protected	
Mormon White River springfish	*Crenichthys baileyi thermophilus*	No designation	Protected	
Oasis Valley speckled dace	*Rhinichthys osculus spp. 6*	No designation	Protected	
Pahranagat roundtail chub	*Gila robusta jordani*	Endangered	No designation	
Railroad Valley springfish	*Crenichthys nevadae*	Threatened	Threatened	
Railroad Valley tui chub	*Gila bicolor spp. 7*	No designation	Protected	
Warm Springs amargosa pupfish	*Cyprinodon nevadensis pectoralis*	Endangered	Endangered	
White River desert sucker	*Catostomus clarkii intermedius*	No designation	Protected	
White River speckled dace	*Rhinichthys osculus ssp. 7*	No designation	Protected	
White River spinedace	*Lepidomeda albivallis*	Endangered	Endangered	
White River springfish	*Crenichthys baileyi baileyi*	Endangered	No designation	
Reptiles and Amphibians				
Amargosa toad	*Anaxyrus nelsoni*	No designation	Protected	
Banded Gila monster	*Heloderma suspectum cinctum*	No designation	Protected	
Columbia spotted frog (Great Basin Distinct Population Segment)	*Rana luteiventris*	No designation	Protected	
Desert tortoise (Mojave population)	*Gopherus agassizii*	Threatened	Threatened	
Dixie Valley toad	*Anaxyrus williamsi*	Endangered	Protected	
Hot Creek toad	*Anaxyrus monfontanus*	No designation	Protected	
Northern leopard frog	*Lithobates pipiens*	No designation	Protected	
Railroad Valley toad	*Anaxyrus nevadensis*	Under review	Protected	
Sonoran mountain kingsnake	*Lampropeltis pyromelana*	No designation	Protected	
Mammals				
Allen's big-eared bat	*Idionycteris phyllotis*	No designation	Protected	
American pika	*Ochotona princeps*	No designation	Protected	
Ash Meadows montane vole	*Microtus montanus nevadensis*	No designation	Protected	
Big brown bat	*Eptesicus fuscus*	No designation	Protected	
California leaf-nosed bat	*Macrotus californicus*	No designation	Protected	
California myotis	*Myotis californicus*	No designation	Protected	
Canyon bat	*Parastrellus hesperus*	No designation	Protected	•
Dark kangaroo mouse	*Microdipodops megacephalus*	No designation	Protected	
Fringed myotis	*Myotis thysanodes*	No designation	Protected	
Hoary bat	*Lasiurus cinereus*	No designation	Protected	

Common Name	Scientific Name	Federal Endangered Species Act Status	Nevada Status	Observed at SNL/TTR
Little brown bat	*Myotis lucifugus*	Under review	Protected	
Long-eared myotis	*Myotis evotis*	No designation	Protected	
Long-legged myotis	*Myotis volans*	No designation	Protected	
Mexican free-tailed bat	*Tadarida brasiliensis*	No designation	Protected	
Pale kangaroo mouse	*Microdipodops pallidus*	No designation	Protected	
Pallid bat	*Antrozous pallidus*	No designation	Protected	•
Palmer's chipmunk	*Neotamias palmeri*	No designation	Protected	
Silver-haired bat	*Lasionycteris noctivagans*	No designation	Protected	
Spotted bat	*Euderma maculatum*	No designation	Threatened	
Townsend's big-eared bat	*Corynorhinus townsendii*	No designation	Protected	
Western jumping mouse	*Zapus princeps*	No designation	Protected	
Western red bat	*Lasiurus frantzii*	No designation	Protected	
Western small-footed myotis	*Myotis ciliolabrum*	No designation	Protected	
Birds				
American goshawk	*Accipiter atricapillus*	No designation	Sensitive	
Bald eagle	*Haliaeetus leucocephalus*	No designation	Sensitive	
Bendire's thrasher	*Toxostoma bendirei*	No designation	Threatened	
Brewer's sparrow	*Spizella breweri*	No designation	Sensitive	•
Golden eagle	*Aquila chrysaetos*	No designation	Sensitive	•
Greater sage-grouse	*Centrocercus urophasianus*	Proposed threatened	Protected	
Loggerhead shrike	*Lanius ludovicianus*	No designation	Sensitive	•
Peregrine falcon	*Falco peregrinus*	No designation	Sensitive	
Sage thrasher	*Oreoscoptes montanus*	No designation	Sensitive	•
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Endangered	
Yellow-billed cuckoo	*Coccyzus americanus*	Threatened	No designation	
Yuma Ridgeway's rail	*Rallus obsoletus yumanensis*	Endangered	Endangered	
Plants				
Amargosa niterwort	*Nitrophila mohavensis*	Endangered	Endangered	
Ash Meadows blazingstar	*Mentzelia leucophylla*	Threatened	Endangered	
Ash Meadows gumplant	*Grindelia fraxinopratensis*	Threatened	Endangered	
Ash Meadows ivesia (mousetail)	*Ivesia kingii var. eremica*	Threatened	Endangered	
Ash Meadows milkvetch	*Astragalus phoenix*	Threatened	Endangered	
Ash Meadows sunray	*Enceliopsis nudicaulis var. corrugata*	Threatened	Endangered	
Blaine pincushion	*Sclerocactus blainei*	No designation	Protected	
Desert pincushion	*Coryphantha chlorantha*	No designation	Protected	
Hermit cactus	*Sclerocactus polyancistrus*	No designation	Protected	•
Mojave barrel cactus	*Ferocactus cylindraceus var. lecontei*	No designation	Protected	
Mountain cactus	*Pediocactus simpsonii*	No designation	Protected	
Nye pincushion cactus	*Sclerocactus nyensis*	No designation	Protected	
Sand cholla or sagebrush cholla	*Grusonia pulchella*	No designation	Protected	•
Sodaville milkvetch	*Astragalus lentiginosus var. sesquimetralis*	No designation	Endangered	

Common Name	Scientific Name	Federal Endangered Species Act Status	Nevada Status	Observed at SNL/TTR
Spring-loving centaury	*Centaurium namophilum*	Threatened	Endangered	
Sunnyside green gentian	*Frasera gypsicola*	No designation	Endangered	
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened	Endangered	
Western Joshua tree	*Yucca brevifolia*	No designation	Protected	•
Williams combleaf	*Polyctenium williamsiae*	No designation	Endangered	

var. = variety
spp. = plural

Federal Endangered Species Act Status:
Endangered - Any species which is in danger of extinction throughout all or a significant portion of its range.
Threatened - Any species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Candidate - Any species for which the Service has sufficient information on its biological status and threats to propose it as endangered or threatened under the Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species are not protected by the take prohibitions of section 9 of the Endangered Species Act.

Nevada Status:
Endangered – Means when a species or subspecies is in danger of extinction throughout all or a significant portion of its range.
Threatened –Means when a species or subspecies is likely to become an endangered species in the near future throughout all or a significant portion of its range.
Sensitive – Means when a species or subspecies is classified as sensitive by the Commission pursuant to NAC 503.104 (NAC 503.104 2004).
Protected – Means when a species or subspecies is classified as protected by the Commission pursuant to NAC 503.103 (NAC 503.103 2004).

Chapter 4. Other Environmental Programs

Yellow flowering pricly pear cactus flower (*Opuntia* sp.)

OVERVIEW ▪ Sandia personnel take the responsibility of protecting the environment seriously. Numerous program teams monitor the air, water, and soil at SNL/TTR.

Sandia personnel collect data to determine and report the impact of existing operations on the environment. Environmental program activities comply with federal, state, and local environmental requirements as well as DOE directives in Sandia's prime contract. Presidential executive orders and DOE guidance documents are also used to establish program criteria.

4.1 National Environmental Policy Act Program

National Environmental Policy Act (NEPA) Program personnel provide technical assistance to ensure that Sandia operations and activities are reviewed for NEPA compliance at all Sandia sites, including Sandia New Mexico (SNL/NM); SNL/TTR; Sandia California; the Kauai Test Facility in Hawaii; and other remote locations. For all federally proposed projects and activities, project owners must complete an online NEPA checklist using the internal NEPA Module application. A NEPA checklist is an internal form that NEPA personnel use to review proposed projects and activities for compliance with NEPA.

As part of a NEPA checklist review, NEPA Program personnel verify whether proposed projects and activities and their associated environmental impacts have been evaluated in existing NEPA documentation. In addition, other relevant environmental program subject matter experts review proposed projects and activities to identify any applicable environmental permitting and other requirements and then communicate this to project

managers. Project managers are required to ensure that all environmental requirements are met.

A NEPA checklist is forwarded to the DOE/NNSA NEPA Compliance Officer for review and determination when a proposed project or activity reflects any of the following:

- The proposed project or activity is not covered by existing NEPA documentation.
- The proposed project or activity is outside the scope of an existing land use permit.
- The proposed project or activity is at a location that is not owned by DOE/NNSA or permitted to Sandia.

DOE/NNSA will review the NEPA checklist and make a NEPA determination. Projects or activities that have not been reviewed in existing NEPA documents or do not qualify for a categorical exclusion from NEPA requirements per 10 CFR 1021, *National Environmental Policy Act Implementing Procedures* (10 CFR 1021 2011), do require new or additional NEPA analyses, which may result in the need for a new environmental assessment, a new environmental impact statement, or documentation to supplement an existing environmental impact statement or environmental assessment.

The *Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada* (DOE/NNSA/Nevada Site Office 2013) analyzed the impacts of Sandia operations and ongoing activities at SNL/TTR.

—Program Activities and Results 2024: National Environmental Policy Act

NEPA Program activities and results for 2024 are presented in the following sections.

NEPA Compliance

In calendar year 2024, NEPA Program personnel continued to participate in process improvement activities with the DOE/NNSA Sandia Field Office, resulting in alignment between the Field Office and Sandia NEPA Program personnel on terminology, roles and responsibilities, and both short- and long-term process improvements.

NEPA Checklist Reviews

In 2024, NEPA Program personnel reviewed five NEPA checklists for new and ongoing activities at SNL/TTR. Of the checklists reviewed in 2024, four checklists were determined to describe activities and operations that had been analyzed in previously published NEPA documents or determinations (Table 4-1). One checklist reviewed by NEPA Program personnel described activities and/or operations that had not been previously analyzed in existing NEPA documents. This checklist was sent to the NEPA Compliance Officer at the DOE/NNSA Sandia Field Office for review and determination. The Sandia Field Office NEPA Compliance Officer's determination cited several categorical exclusions (Table 4-2).

Table 4-1. NEPA documents cited in four NEPA checklists for projects and activities reviewed in 2024

NEPA Document Title	Documents Cited in Sandia Determinations	Number of Citations
Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (2013)	SWEIS DOE/EIS-0426	3
Supplement Analysis for Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (2024)	SWEIS DOE/EIS-0426-SA-01	3
Quality Assurance Review of Previously Determined Activities	Various	1

Note: Some checklists cited multiple NEPA documents.

Table 4-2. Categorical exclusions cited by the DOE/NNSA NEPA Compliance Officer in determinations for activities at SNL/TTR in 2024

Categorical Exclusions	Number of Citations
B1.3 Routine maintenance/custodial services for buildings, structures, infrastructures, equipment	1
B1.15 Siting/construction/operation of support buildings/support structures	1
B4.7 Adding/burying fiber optic cable	1

Note: Determinations may cite multiple categorical exclusions to cover all activities.

Many maintenance activities performed at SNL/TTR are routine in nature, have minimal to no environmental impact and are consistent with activities described in the DOE/NNSA-approved Routine Maintenance NEPA checklist. These activities do not require separate NEPA checklists but are documented in the Routine Maintenance Criteria tool. In 2024, Sandia personnel documented six routine maintenance activities for SNL/TTR in the Routine Maintenance Criteria tool; NEPA Program personnel reviewed and verified these activities.

NEPA Program personnel coordinate with the DOE/NNSA Sandia Field Office and the U.S. Air Force Nevada Test and Training Range to submit Request for Environmental Analysis forms (Air Force Form 813) for activities that require Air Force approval. U.S. Air Force personnel use Air Force Form 813 to document the need for an environmental analysis, which helps narrow and focus the issues to potential environmental impacts. NEPA Program personnel submitted one Air Force Form 813 on behalf of the Sandia Field Office for work conducted on Nevada Test and Training Range land.

4.2 Chemical Information System

The Chemical Information System for all Sandia locations is a comprehensive chemical information tool used to track workplace chemical and biological containers by location. The primary drivers for the Chemical Information System are state and federal regulations, including the Emergency Planning and Community Right-to-Know Act. The Chemical Information System compiles information concerning chemical hazards and appropriate protective measures for Emergency Management Operations, other ES&H programs, and the workforce.

The information system provides the chemical or product name, its location and quantity, and information about who is responsible for the chemical. Chemical hazards are reported on safety data sheets, and the Chemical Information System currently contains more than 130,000 safety data sheets in its library for use by any Sandia site. This electronic inventory helps chemical users and their managers assess and manage workplace hazards. Easy access to this inventory facilitates availability searches. It also improves the ability to share chemicals and thus reduce sources, which minimizes chemical purchases and waste disposal expenses.

A pre-procurement module, ChemPro, is used to request permission for new chemical purchases. The system runs a series of queries, comparing the requested purchasing information to regulatory limits, and determines whether the requested chemical and quantity are approved for use and storage in the specified location. If approved, the requestor is given a chemical approval number, which must be provided to the chemical vendor as part of the purchasing process. ChemPro supports proactive environmental and safety planning.

4.3 Waste Management Program

Navarro Research and Engineering manages all waste generated at SNL/TTR—which excludes any waste generated by environmental restoration activities—under the Waste Management Program. Waste categories include radioactive waste, Resource Conservation and Recovery Act (RCRA) hazardous waste, other chemical waste, and nonhazardous solid waste. Personnel integrate waste minimization and recycling efforts into Waste Management Program activities.

Personnel at SNL/TTR are committed to achieving significant reductions in the amount of chemical and hazardous wastes generated on-site. Waste minimization includes recycling and recovering the following materials: antifreeze (on-site recycling unit); e-waste, including computers, monitors, radios, and electronics; fluorescent and sodium bulbs; freon (on-site recovery unit); fuels and oil; lead acid batteries; mercury-containing equipment; solvents; and tires.

—Program Activities and Results 2024: Waste Management

Waste Management Program activities and results for 2024 are presented in the following sections .

Waste Generated and Shipped

Waste generated and shipped from SNL/TTR to approved facilities in 2024 is presented in Table 4-3 and Table 4-4, respectively. All regulated waste was shipped off-site to permitted treatment, storage, and disposal facilities. The contracted off-site commercial waste vendor facilities that were used in 2024 are listed in Section 6.3.2.2, along with any associated audit information for those facilities.

Table 4-3. Waste generated, 2024

Waste Type	Weight (kilograms)
Radioactive waste	0
Total non-RCRA-regulated waste	767
Total recycled materials	107,802
Total RCRA hazardous waste	445
Toxic Substances Control Act waste (asbestos)	0
Toxic Substances Control Act waste (PCBs)	0

PCB = polychlorinated biphenyl

Table 4-4. Waste shipped, 2024

Waste Type (Facility)	Weight (kilograms)
Battery recycling (National Automotive Parts Association and Veolia)	3,485[a]
Construction debris (U.S. Air Force Construction Landfill)	34,895
Sanitary landfill (U.S. Air Force Sanitary Landfill)	19,464
Tires (Lunas Tire Recycling)	52,273[a]

[a] This quantity is also included in the "Total recycled materials" quantity located in Table 4-3.

Waste Minimization

Recyclables and used oil are sent for recycling or are disposed of through a waste disposal contractor. Recycled or energy-recovered quantities shipped off-site in 2024 are presented in Table 4-5.

Table 4-5. Material recycled or energy-recovered and shipped off-site, 2024

Recycled or Energy-Recovered[a] Waste	Shipped (kilograms)
Antifreeze	0
Automotive-type batteries	3,485
Circuit boards	0
Mercury-containing articles	0
Non-PCB light ballasts	37
Recycled metals (Desert Green Recycling)	50,909
Tires	52,273
Universal waste batteries	200
Universal waste lamps	106
Used oil	792
Total	107,802[b]

[a] Energy-recovery is the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes.
[b] Weights have been rounded to the nearest integer.
PCB = polychlorinated biphenyl

Radioactive Waste Management

There were no radioactive waste shipments from SNL/TTR in 2024.

4.4 Air Quality Compliance Program

Air Quality Compliance Program personnel ensure that operations comply with federal and state air quality regulations promulgated in accordance with the Clean Air Act and the Clean Air Act Amendments of 1990. Program personnel also confirm that operations are compliant with the Class II Air Quality Operating Permit issued by the State of Nevada for SNL/TTR. In Nye County, the Nevada Department of Environmental Protection implements air quality regulations and standards established by the U.S. Environmental Protection Agency (EPA) and the State of Nevada.

—Program Activities and Results 2024: Air Quality Compliance

Air Quality Compliance Program activities and results for 2024 are presented in the following sections.

Nonradiological Air Emissions

The Class II Air Quality Operating Permit for SNL/TTR requires emission reports from the following permitted sources: a portable soil sorting system, facility maintenance shops, and generators. Table 4-6 summarizes the permitted source emission data for 2024.

Table 4-6. Permitted source emission data, 2024

Carbon Monoxide	Hazardous Air Pollutant	Nitrogen Oxide	Particulate Matter with a Diameter ≤ 10 µm	Sulfur Dioxide	Volatile Organic Compound
0.61	0.015	1.00	0.07	0.0011	0.19

Note: All units are in tons per year.

Radionuclide Air Emissions

EPA tracks radionuclide air emissions in accordance with 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities" (40 CFR 61 2021), and has set a maximally exposed individual radiological dose limit of 10 mrem/year resulting from all radiological air emissions produced from any DOE facility.

Operations at SNL/TTR do not involve activities that release radioactive emissions from point sources (stacks and vents). However, diffuse radiological emissions historically were produced from the resuspension of americium, plutonium, and other radionuclides from the Clean Slate environmental restoration sites. The Office of Legacy Management assumed responsibility for the long-term surveillance and maintenance of these sites beginning September 30, 2020 (DOE/NNSA/Nevada Field Office 2020). As such, any future updates related to corrective action sites at SNL/TTR would be reported in the DOE Office of Legacy Management's ASER, which can be found on the DOE Environmental Management System Goals/Progress/Plans/Reports website (DOE Office of Legacy Management n.d.).

Non-Sandia Air Quality Monitoring Activities

Desert Research Institute (DRI), the environmental research arm of the Nevada System of Higher Education, trains and provides monitoring station managers through the Community Environmental Monitoring Program to collect samples from off-site air monitoring stations

at 23 locations in communities surrounding the Nevada National Security Site. These include the towns of Tonopah and Goldfield, which are near SNL/TTR. DRI personnel maintain the air-monitoring equipment and send a quarterly sample of collected air filters from each station for analysis. DRI also provides external quality assurance on samples collected at Community Environmental Monitoring Program stations through duplicate sampling of 10 percent of the station samples. None of these stations are located on SNL/TTR property.

A *mirage* in the desert is an optical illusion that occurs when light bends as it passes through layers of air with different temperatures, creating the appearance of water, lakes, or other distant objects on the ground.

4.5 Oil Storage Program

The Oil Storage Program supports management, operation, and maintenance of oil storage containers and equipment at SNL/TTR to prevent spills or releases of oil that could potentially damage water resources, impact soil, or otherwise affect the environment adversely.

It was determined in 2019 that oil storage facilities at SNL/TTR are not subject to regulation under 40 CFR 112, *Oil Pollution Prevention* (40 CFR 112 2011), because all the oil storage containers and equipment are located within a hydrologically closed basin with no potential to impact waters of the United States. However, as a best management practice, personnel at SNL/TTR continue to inspect oil storage containers and equipment monthly to ensure functional operating conditions and to monitor for potential spills or releases to the environment.

—Program Activities and Results 2024: Oil Storage

There were no reportable releases associated with oil storage containers and equipment maintained at SNL/TTR in 2024.

4.6 Terrestrial Surveillance Program

Terrestrial Surveillance Program personnel collect environmental media (soil) samples, which are analyzed for radiological constituents as required. As a best management practice, samples are also collected to analyze metals.

Soil is loose, unconsolidated mineral or organic materials on the immediate surface of the earth that support plant growth.

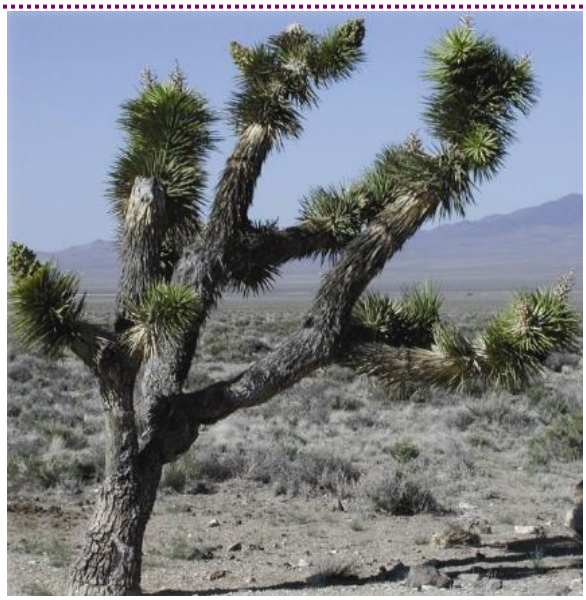
In addition to the environmental media samples collected, ambient external gamma radiation levels are measured using environmental dosimeters. These surveillance activities are conducted at designated locations that are on-site and around the perimeter of SNL/TTR.

Terrestrial surveillance began at SNL/TTR in 1992. Soil sampling is conducted annually, and the dosimeters are exchanged quarterly.

4.6.1 Regulatory Criteria

The Terrestrial Surveillance Program is designed and conducted to address DOE O 458.1, Change 4 (LtdChg), *Radiation Protection of the Public and the Environment* (DOE O 458.1, Change 4 (LtdChg) 2020), which establishes standards and requirements to protect the public and the environment from undue risk from radiation associated with radiological activities under DOE control.

The Terrestrial Surveillance Program is also conducted to satisfy implementation of Sandia's Environmental Management System. Reporting is done in accordance with DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting* (DOE O 231.1B, Admin Change 1 2012).



Joshua tree (*Yucca brevifolia*)

4.6.2 Sample Locations and Media

Terrestrial Surveillance Program personnel use two sample location classifications: on-site and perimeter. Sampling locations were selected based on locations of previous and ongoing activities. Soil samples are collected at the surface (less than two inches deep). Environmental dosimeters, deployed and collected quarterly, are used to measure the cumulative ambient external radiation dose and to approximate the dose potentially received from natural and man-made sources.

The on-site sample locations (Figure 4-1) are in areas of potential release (sites with past and current outdoor testing activities). Perimeter sample locations (Figure 4-2) are located around the boundaries of SNL/TTR. Table 4-7 and Table 4-8 list the sampling locations and type of media collected at the on-site and perimeter locations respectively.

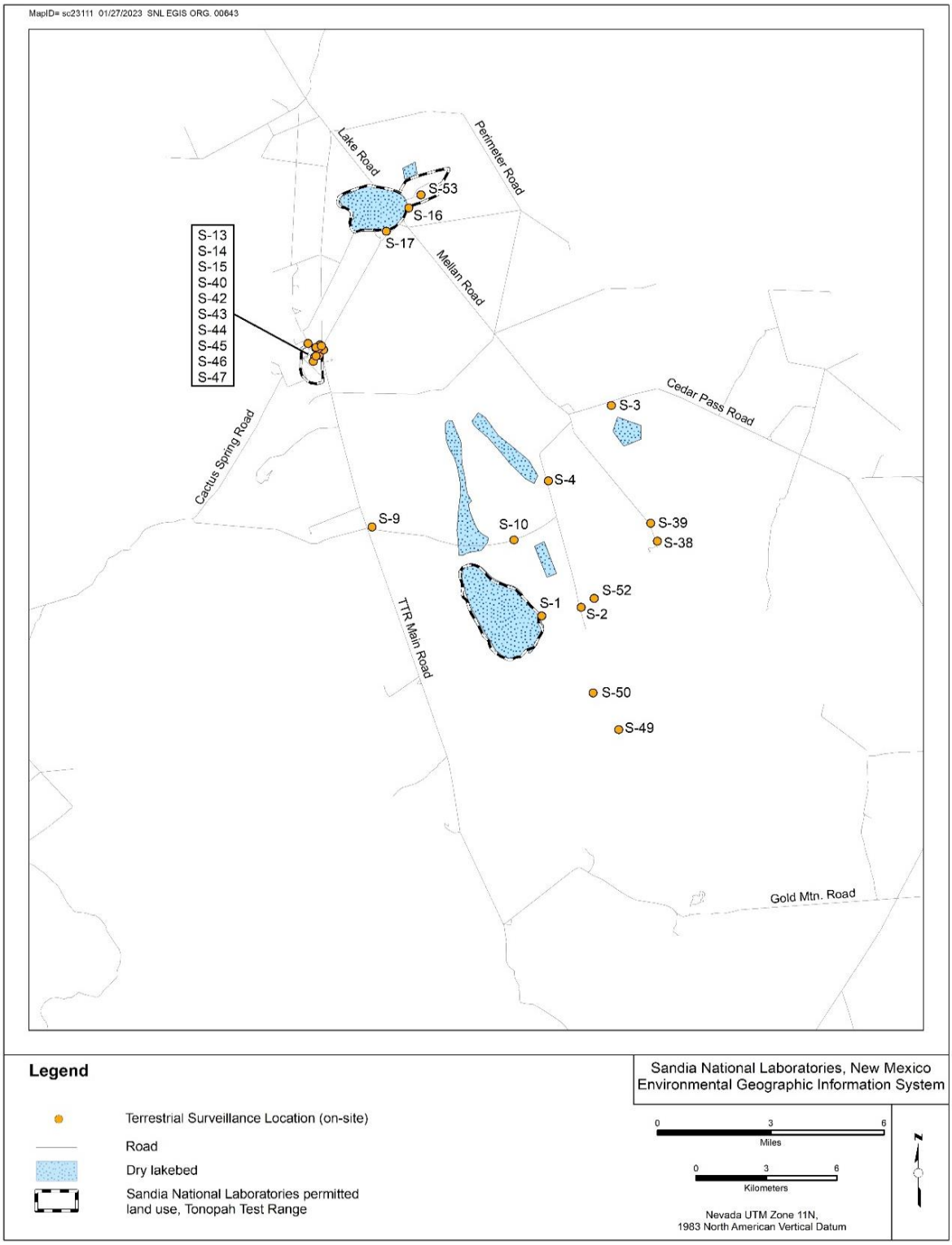


Figure 4-1. On-site terrestrial surveillance locations

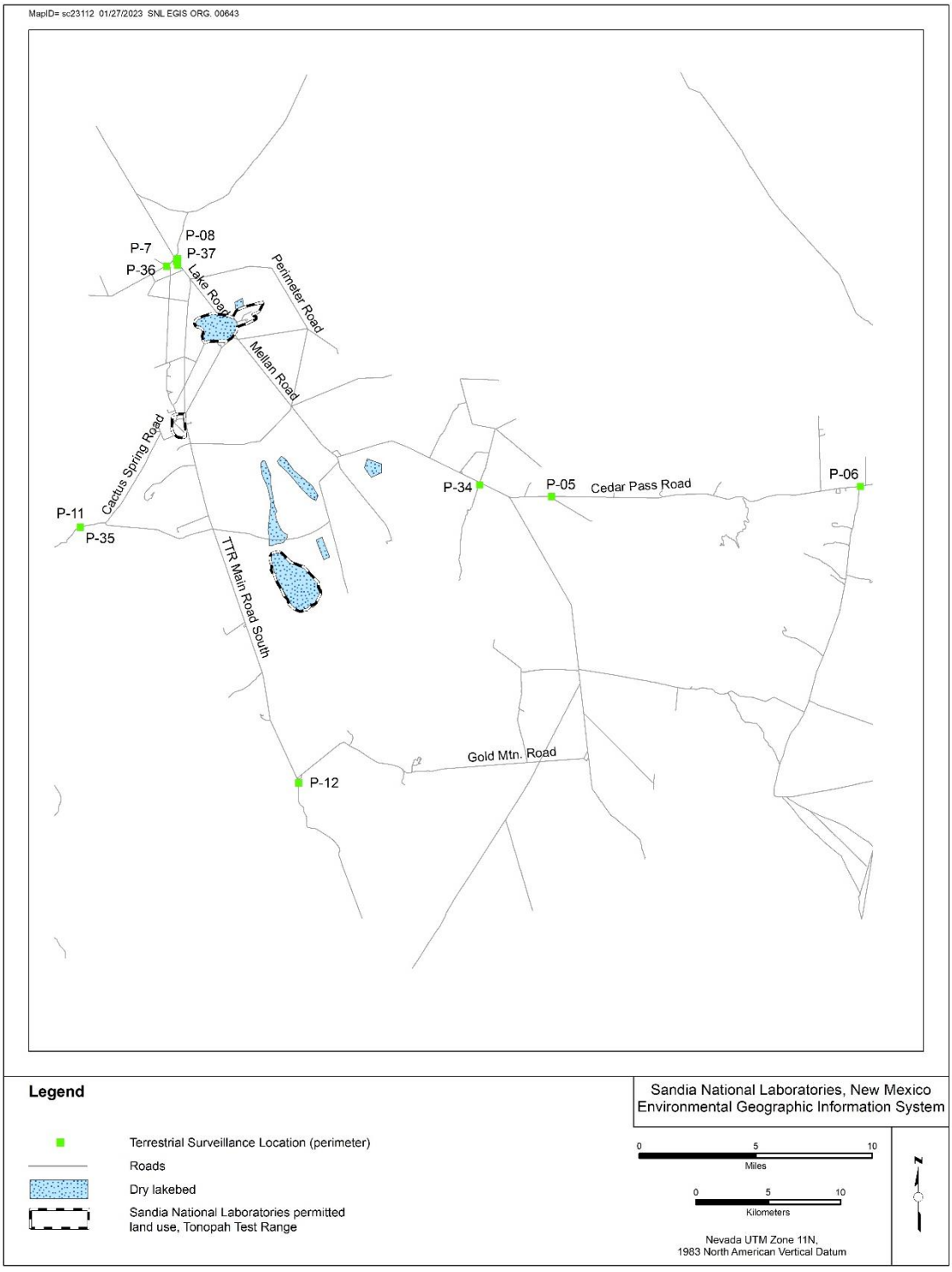


Figure 4-2. Perimeter terrestrial surveillance locations

Table 4-7. On-site terrestrial surveillance locations and sample media

Location Number	Sample Location	Soil	Dosimeter
S-01	Antelope Lake area fence, cultural area sign		X
S-02	North/south Mellan Airstrip (south fencepost)	X	X
S-03	Dosimeter at Clean Slate I	X	X
S-04	Dosimeter at Clean Slate III	X	X
S-09	Operation Roller Coaster Decontamination Area		X
S-10	Brownes Road/Denton Freeway	X	X
S-13	Area 3 between Building 100 and "Caution" sign		X
S-14	Area 3 control point southwest side of fence		X
S-15	Moody Avenue by cattle guard and entrance to chow hall and airport		X
S-16	Area 9, near Well 7		X
S-17	Main Lake (south, near Neutron Bunkers)		X
S-38	Mellan Hill (rock mound/orange block)	X	
S-39	Mellan Hill (north)	X	
S-40	Wastewater monitoring station	X	
S-42	Main Road/Edward's Freeway	X	
S-43	Range Operations Center (southwest corner)	X	
S-44	Range Operations Center (northeast corner)	X	
S-45	Storage shelters 03-38 and 03-39	X	
S-46	Sand Building	X	
S-47	Generator storage area	X	
S-49	North/south Mellan Airstrip (southwest of S-48)	X	
S-50	North/south Mellan Airstrip (signpost)	X	
S-52	Northeast of Mellan Airstrip	X	
S-53	Main Road/Lake Road southeast	X	

Table 4-8. Perimeter terrestrial surveillance locations and sample media

Location Number	Sample Location	Soil	Dosimeter
P-05	Operation and Maintenance Complex, Site 4 entrance gate		X
P-06	Cedar Pass Road Guard Station	X	X
P-07	On-base housing (south of Power Pole 55-11)		X
P-08	On-base housing (Main Guard Gate/Power Pole CP17)	X	X
P-11	Cactus Springs (dosimeter south of P-35)		X
P-12	Dosimeter at "U.S. Government Property" sign	X	X
P-34	Operation and Maintenance Complex, Owan Drive post	X	
P-35	Cactus Springs (north fencepost)	X	
P-36	On-base housing (northeast fence line)	X	
P-37	On-base housing (guard station)	X	

4.6.3 Field Methods, Analytical Parameters, and Quality Control Procedures

All samples were collected in accordance with applicable field operating procedures for soil sampling activities and with *Quality Assurance Project Plan for Terrestrial Surveillance at Sandia National Laboratories, New Mexico* (Sandia 2022).

Contract laboratories analyze all samples in accordance with applicable EPA analytical methods. All chemical data is reviewed and qualified in accordance with *Data Validation Procedure for Chemical and Radiochemical Data* (Sandia 2023). Soil samples were analyzed for modified Target Analyte List metals and gamma-emitting radionuclides. A select list of radionuclides compiled from process knowledge of operations at SNL/TTR includes the following: actinium-228, americium-241, cesium-137, plutonium-238, plutonium-239/240, uranium-235, and uranium-238. Due to past explosives testing, plutonium is present in some limited areas. One indicator of the presence of weapons-grade plutonium is the radionuclide americium-241. Isotopic plutonium analysis is performed on any sample for which gamma spectroscopy identified americium-241 in concentrations greater than its minimum detectable activity.

In 2024, dosimeters using optically stimulated luminescence technology were employed to measure ionizing radiation. An accredited contract laboratory issues and analyzes the dosimeters. Optically stimulated luminescence dosimeters have been used since 2018.

Field-quality control samples were collected and included duplicate environmental samples. These samples are prepared in accordance with applicable field operating procedures. Laboratory-quality control samples were prepared and analyzed in accordance with established methods specified in Chapter 6.

4.6.4 Data Analysis and Methodology

Terrestrial Surveillance Program personnel reviewed the 2024 analytical results. Summary statistics, population comparisons, and trend analysis were performed and evaluated. Additional comparisons were made with selected reference values.

4.6.4.1 Statistical Analysis

The statistical analysis methodology was used in 2024 to (1) compare on-site location sample results with perimeter and historical off-site location sample results and (2) examine trends in on-site location results. Soil sampling at off-site locations was discontinued in 2023; however, the historical off-site dataset is used in the statistical analyses. Nonparametric tests of population comparison (modified Wilcoxon and logrank) were used to compare the on-site sample results with the perimeter and historical off-site sample results. Both the Wilcoxon and the logrank tests are significant at a p-value of less than or equal to 0.05 and are of concern when the on-site results are greater than the perimeter and historical off-site sample results. The nonparametric Kendall's Tau was used to determine whether there is an increasing trend in the on-site location results over time (significant at a p-value less than or equal to 0.05).

The statistical analysis results are used to identify sample results for possible follow-up actions, such as resampling or additional investigation. When the sample results at an on-site location are significantly different from and greater than the perimeter and historical off-site

results and the sample results at the on-site location are trending upward, it is noted for further evaluation. A discussion of these results below includes location, analyte, sample matrix, and summary statistics (number of samples, mean, median, standard deviation, maximum and minimum for the on-site location dataset, and the value for the current year).

Samples collected since 2010 were used for the statistical analyses, as the same contract laboratory analyzed these samples following a standard data quality control process specified by the contract, and the analytical results have been through the third-party data validation process in accordance with standard data qualification protocol.

4.6.4.2 Other References Comparisons

Analytical results for metals in soil samples may also be compared to values in the following references (presented in (Table 4-9):

- Local and regional soil concentrations (Dragun and Chekiri 2005)
- EPA regional screening levels (EPA 2024)
- Trace elements in soil (Kabata-Pendias 2000)

Table 4-9. Comparison reference values for metals in soil

Analyte	Nevada Soil Concentrations[a]		EPA Regional Screening Levels[b]		Trace Elements in Soil[c]	
	Lower Limit (mg/kg)	Upper Limit (mg/kg)	Residential (mg/kg)	Industrial (mg/kg)	Lower Limit (mg/kg)	Upper Limit (mg/kg)
Aluminum	5,000	100,000	77,000	1,100,000	4,500	100,000
Antimony	< 1.0	1.0	31	470	0.25	0.60
Arsenic	2.9	24	0.68	3.0	1	93
Barium	150	3,000	15,000	220,000	20	1,500
Beryllium	ND	5.0	160	2,300	0.04	2.54
Cadmium	ND	11	NA	NA	0.41	0.57
Calcium	600	320,000	NA	NA	NA	NA
Chromium (III)	7.0	150	120,000	1,800,000	7	1,500
Cobalt	ND	20	23	350	3	50
Copper	7.0	150	3,100	47,000	3	300
Iron	1,000	100,000	55,000	820,000	5,000	50,000
Lead	ND	70	200	800	10	70
Magnesium	300	100,000	NA	NA	NA	NA
Manganese	30	5,000	1,800	26,000	20	3,000
Nickel (soluble salts)	5.0	50	1,400	17,000	5	150
Potassium	1,900	63,000	NA	NA	NA	NA
Selenium	< 0.1	1.1	390	5,800	0.10	4.0
Silver	0.5	5.0	390	5,800	0.20	3.2
Sodium	500	100,000	NA	NA	NA	NA
Strontium	100	1,500	47,000	700,000	7	1,000
Thallium (soluble salts)	NA	NA	0.78	12	0.02	2.8
Uranium (total)	1.9	4.2	16	230	0.30	10.7

Analyte	Nevada Soil Concentrations[a]		EPA Regional Screening Levels[b]		Trace Elements in Soil[c]	
	Lower Limit (mg/kg)	Upper Limit (mg/kg)	Residential (mg/kg)	Industrial (mg/kg)	Lower Limit (mg/kg)	Upper Limit (mg/kg)
Vanadium	30	150	390	5,800	0.7	98
Zinc	25	128	23,000	350,000	13	300

[a] Source: Dragun and Chekiri 2005
[b] Source: EPA 2024 (target hazard quotient = 1.0)
[c] Source: Kabata-Pendias 2000
NA = not available
ND = not detected

There are no regulatory limits with which to compare concentrations of radiological constituents found in surface soils.

Environmental dosimeter data are compared to established natural background (terrestrial and cosmic) radiation levels in the non-urban areas of Nevada. Levels in these areas are elevated when compared to much of the United States due to the higher elevation and the presence of radionuclides in the soil and bedrock. The annual radiation dose from natural background sources (indoor radon not included) in non-urban areas of Nevada is 71 mrem (Mauro and Briggs 2005).

—Program Activities and Results 2024: Terrestrial Surveillance

The following Terrestrial Surveillance Program activities occurred in 2024:

- Sampling in 2024 was conducted with the following variances from past years: all off-site environmental dosimeters were discontinued at the end of 2023, and no off-site environmental dosimeters were deployed in 2024.
- The annual soil sampling was conducted in June 2024.
- Environmental dosimeters were deployed and collected at designated on-site and perimeter locations and analyzed quarterly. The results are reported as an estimated annual dose rate.

The full analytical results for soil samples and environmental dosimeters are provided in Appendix A.

Radiological Results

Radiological analyses were performed on soil samples. Statistical analyses of the 2024 results for the selected radionuclides identified five instances of statistically significant population differences with increasing trends in the on-site location sample results. Table 4-10 presents the results and summary statistics for the statistically significant radionuclides.

Table 4-10. Statistically significant radionuclides in soil summary, 2024

Radionuclide	Location	Number of Samples	Historical Dataset					2024 Result (pCi/g)
			Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)	
Actinium-228	S-03	14	2.068	2	0.158	1.88	2.47	2.06
Actinium-228	S-04	14	1.888	1.87	0.188	1.69	2.06	1.94
Actinium-228	S-38	14	1.934	1.91	0.107	1.79	2.11	2.11
Actinium-228	S-46	14	1.782	1.76	0.062	1.7	1.91	1.91
Actinium-228	S-47	14	1.705	1.66	0.088	1.59	1.88	1.88

Actinium-228

An on-site soil location (S-03) was identified as statistically significant for actinium-228 with a result of 2.06 pCi/g. The result is within the historical range for the dataset at this location.

An on-site soil location (S-04) was identified as statistically significant for actinium-228 with a result of 1.94 pCi/g. The result is within the historical range for the dataset at this location.

An on-site soil location (S-38) was identified as statistically significant for actinium-228 with a result of 2.11 pCi/g. The result represents a maximum for the dataset at this location; however, it is within the historical range for the dataset at SNL/TTR (including perimeter and historical off-site locations).

An on-site soil location (S-46) was identified as statistically significant for actinium-228 with a result of 1.91 pCi/g. The result represents a maximum for the dataset at this location; however, it is within the historical range for the dataset at SNL/TTR (including perimeter and historical off-site locations).

Another on-site soil location (S-47) was identified as statistically significant for actinium-228 with a result of 1.88 pCi/g. The result represents a maximum for the dataset at this location; however, it is within the historical range for the dataset at SNL/TTR (including perimeter and historical off-site locations).

All other results for selected radionuclides in 2024 are not statistically significant in both tests (population comparison and trend). No further investigation is warranted. Sampling will continue in the next calendar year.

Isoptopic Plutonium

In 2024, isotopic plutonium analysis was performed on five samples for which gamma spectroscopy identified americium-241 in concentrations greater than its minimum detectable activity. Statistical analysis was not performed on the results as there was insufficient data to perform the analysis. Plutonium-238 results were U (analyte was absent or below the method detection limit) in samples from P-37, S-03, S-04, S-39, and S-49. Plutonium-239/240 results included U (analyte was absent or below the method detection limit) in the sample from P-37, 0.866 pCi/g in S-03, 0.165 pCi/g in S-04, 0.604 pCi/g in S-39, and 0.22 pCi/g and 0.526 pCi/g in S-49 (sample and duplicate, respectively). The 2024 plutonium-238 and plutonium-239/240 results were within the historical range for the

dataset at SNL/TTR. There are no regulatory limits for isotopic plutonium against which to compare concentrations of radiological constituents found in surface soils.

Dosimeter Results

Analysis of dosimeter data was performed to determine the average dose rates for the two location classifications, on-site and perimeter.

Table 4-11 shows the average dose rate summary statistics for 2024. The average annual dose rates are higher than the established non-urban Nevada value of 71 mrem (Mauro and Briggs 2005). The difference may be attributed to a variety of elevations, proximity to bedrock, and the spontaneous nature of radioactivity.

Table 4-11. Dosimeter dose rate summary statistics by location classification, 2024

Location Classification	Number of Observations	Average (mrem/year)	Median (mrem/year)	Standard Deviation (mrem/year)	Minimum (mrem/year)	Maximum (mrem/year)
On-site	11	83	87	8	69	93
Perimeter	6	83	84	5	76	89

Nonradiological Results

Nonradiological parameters include Target Analyte List metals. The results of the statistical analysis for metals identified four instances of statistical significance (population difference and increasing trend in the on-site sample results). The 2024 metals results were also compared to values from the references listed in Section 4.6.4 and provided in Table 4-9 and to results from previous years. Table 4-12 presents the metals results and summary statistics for the statistically significant metal.

Table 4-12. Statistically significant metals in soil summary, 2024

Analyte	Location	Number of Samples	Historical Dataset					2024 Result (mg/kg)
			Mean (mg/kg)	Median (mg/kg)	Standard Deviation (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	
Barium	S-49	11	229.364	228	18.332	193 J	253 J	246 J
Beryllium	S-10	14	0.558	0.51	0.117	0.472	0.89	0.51
Sodium	S-10	11	456.545	406	172.931	260	813	346
Sodium	S-39	11	414.091	433	107.216	254	573	448

Note: Historical data is for 2010 to 2024.
J = The associated numerical value was an estimated quantity.

One on-site soil location (S-49) was identified as statistically significant for barium with a result of 246 J mg/kg. The J qualifier indicates the result was an estimated quantity. The result is below the EPA regional screening level for residential use (Table 4-9), within the range of Nevada soil concentrations for barium (Table 4-9), and within the historical range for the dataset at this location (Table 4-12).

One on-site soil location (S-10) was identified as statistically significant for beryllium with a result of 0.51 mg/kg. The result is below the EPA regional screening level for residential use

(Table 4-9), within Nevada soil concentrations for beryllium (Table 4-9), and within the historical range for the dataset at this location (Table 4-12).

Two on-site soil location (S-10 and S-39) were identified as statistically significant for sodium with a result of 346 mg/kg for S-10 and 448 mg/kg for S-39. The results are within Nevada soil concentrations for sodium (Table 4-9) and within the historical range for the dataset at these locations (Table 4-12).

All other metals results for 2024 were not statistically significant in both tests (population and trend). No EPA regional screening levels for metals were met or exceeded where applicable. No further investigation is warranted. Sampling will continue in the next calendar year.

4.7 Environmental Release, Response, and Reporting Team

Sandia's Environmental Release, Response, and Reporting Team personnel are contacted in the event of any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of material into the environment, which may include (but is not limited to) soil, water, air, and drain systems. A set of procedures provides specific instructions for reporting an environmental release and for developing an accurate report. Environmental Release, Response, and Reporting Team personnel implement the procedures for and document all aspects of an environmental release and report on chemical use to ensure compliance with federal, state, and local reporting requirements.

—Program Activities and Results 2024: Environmental Release, Response and Reporting Team

Environmental Release, Response and Reporting Team activities and results for 2024 are presented in the following sections.

Release Event Reported to the Nevada Department of Environmental Protection

In 2024, one release to the environment occurred that required reporting to the Nevada Department of Environmental Protection (NDEP) Bureau of Federal Facilities. Approximately 15 gallons of JP-10 jet fuel were released to the Antelope Lake dry lakebed on July 27, 2024, during a mission test. During soil excavation operations on July 28, 2004, it was determined that the release resulted in soil contamination in excess of NDEP reporting limits under NAC 445A.347(2). The spill was reported to the NDEP Bureau of Federal Facilities on July 29, 2024, pursuant to NAC 445A.227(2), and the spill was assigned Spill ID #240729-2. A report of remediation and soil removal activities and a request for site closure was submitted to NDEP on August 8, 2024. NDEP accepted this request, and DOE/NNSA issued a letter requiring no further action at the site on January 13, 2025.

Release Event Categorized as a DOE Reportable Occurrence

In 2024, one release met the criteria for DOE-reportable occurrences under DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (DOE O 232.2A, Chg 1 (MinChg) 2017), and was reported to an outside agency. This was NDEP Spill ID #24072-2), which is described above.

4.8 Water Quality Programs

Water quality programs focus on monitoring potable water, conserving water, sampling wastewater effluent, and implementing stormwater pollution prevention plan requirements.

4.8.1 Drinking Water

Personnel at SNL/TTR control three water wells: Production Well 6, the Roller Coaster Well, and Well 7. Production Well 6 is a public water system well that supplies drinking water to the Main Compound in Area 3 and water for the Area 3 Fire Protection Distribution System. The Roller Coaster Well, which is located approximately five miles south of the Area 3 Compound, supplies water to a 0.35-acre construction water pond. Well 7 is currently inactive and is located in Area 9, approximately five miles northeast of the Area 3 Compound. Outlying areas and buildings without water service use bottled water.

The Area 3 public water system is permitted by NDEP as a non-transient, non-community water system under identification number NV003014. The well water is sampled and analyzed routinely per NDEP requirements to demonstrate conformance with primary drinking water standards.

The State of Nevada provides information on the public water system at SNL/TTR—including water system details, sample schedules, analytical data, and any violation or enforcement actions—at NDEP Drinking Water Branch Water System Details (Nevada Division of Environmental Protection n.d.).

Sampling parameters include (but are not limited to) arsenic, coliform (total), lead and copper, nitrates, phthalate, secondary inorganic compounds (aluminum, copper [free], iron, magnesium, manganese, methylene blue active substances foaming agent [surfactant], odor, potential of hydrogen [pH], silver, total dissolved solids, and zinc), and total trihalomethanes and haloacetic aids. Analytes are sampled at different intervals, as shown in Table 4-13.

Table 4-13. Production well analytes with sampling frequency

Analyte	Sampling Frequency
Arsenic	Quarterly
Coliform, total	Quarterly
Dioxin	As required by NDEP, usually every three years
Disinfectant, residual	Quarterly (checked daily)
Di(2-ethylhexyl) phthalate *also known as* Bis(2-ethylhexyl) phthalate	As required by NDEP, usually every three years
Ethyl benzene	Annually
• IOCs Phase II, IOCs Phase V, nitrite, nitrate and nitrite (total) • SOCs Phase II, SOCs Phase V, VOCs Phase I and II, VOCs Phase V	As required by NDEP, usually every three years
Lead and copper	As required by NDEP, usually every three years
Nitrate	Annually
Secondary (13) drinking water standards	As required by NDEP, usually every three years

Analyte	Sampling Frequency
Total trihalomethanes and haloacetic acids (5)	Annually
Total xylene	Annually

IOC = inorganic compound
SOC = synthetic organic compound
VOC = volatile organic compound

An NDEP-permitted treatment system for arsenic removal (permit number NV 3014 TP-11-12NTNC) is used at SNL/TTR. The arsenic removal system manufactured by AdEdge Water Technologies uses an adsorption process where contaminants break their bond with the water molecules and chemically adhere to the granular ferric oxide filter media. The filter media reduces total arsenic levels by up to 99 percent, including both arsenic (III) and arsenic (V). The system uses carbon dioxide to lower the pH of the incoming raw well water from approximately 9.2 on the pH scale to between 6.5 and 7.0 on the pH scale for efficient and effective operation of the arsenic removal system.

—Program Activities and Results 2024: Drinking Water

In 2024, two precautionary Boil Water Notices were issued for the public water system at SNL/TTR (Table 4-14).

Table 4-14. Boil water notices, 2024

Location	Precautionary Boil Water Order Date	Reason	First Test Date	Second Test Date	Rescind Notice
Building 03-69 only	November 5, 2024	Weld failed on a domestic line	November 6, 2024	November 7, 2024	November 18, 2024
Building 03-75 only	December 2, 2024	Loss of pressure	December 3, 2024	December 4, 2024	December 11, 2024

All drinking water sample results collected during 2024 were below the NDEP maximum contaminant levels established for the substances monitored. These results are presented in Table 4-15. Coliform, total trihalomethanes, and haloacetic acids were sampled in Building 03-70, and all other samples were taken in Building 03-150, the Water Treatment Facility.

Table 4-15. Public water system monitoring activities and results, 2024

Analyte	Sample Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Regulatory Limit (MCL)
Arsenic and Coliform Results (Quarterly Sampling)						
Arsenic	Building 03-150	3.46 ppb	4.15 ppb	3.83 ppb	3.9 ppb	10 ppb
Coliform	Building 03-70	Absent	Absent	Absent	Absent	Present
Total Trihalomethanes and Haloacetic Acids Results (Annual Sampling Performed in Third Quarter)						
Total trihalomethanes	Building 03-70	N/A	N/A	23.9 µg/L	N/A	80.0 µg/L
Haloacetic acids	Building 03-70	N/A	N/A	11.8 µg/L	N/A	60.0 µg/L

Analyte	Sample Location	Sample Results (µg/L)	Regulatory Limit (MCL) (µg/L)
Secondary Inorganic Compounds (Sampling Performed Every Three Years)			
Aluminum	Building 03-150	< 50	200
Chloride	Building 03-150	20,400	400,000
Color result	Building 03-150	1 (Pt-C0)	15 (Pt-Co)
Copper, free	Building 03-150	3.7	1,000
Fluoride	Building 03-150	1,500	4,000
Iron	Building 03-150	190	600
Magnesium	Building 03-150	< 1,000	150,000
Manganese	Building 03-150	2.910	100
Nitrate	Building 03-150	864	10,000
Odor result	Building 03-150	1.4 (TON)	3 (TON)
pH[a]	Building 03-150	7.09	> 8.5
Silver	Building 03-150	< 1.0	100
Sulfate	Building 03-150	33,400	500,000
TDS	Building 03-150	294,000	1,000,000
Zinc	Building 03-150	5.69	5,000
Total Xylene and Ethyl Benzene Results (Sampling Performed Annually)			
Ethyl benzene	Building 03-150	0.61	700
Xylene, Total	Building 03-150	6.40	10,000

[a] pH is a unitless value
N/A = not applicable
Pt-Co = Platinum-Cobalt color scale
TON = threshold odor number

During 2024, Well 6 produced 404,400 gallons of water that was chlorinated and sent to the elevated water storage tower. This equals an average daily production of approximately 1,123 gallons and an average monthly production of approximately 33,700 gallons in 2024.

In October 2021, NDEP conducted a sanitary survey of the public water system at SNL/TTR. On December 30, 2021, one significant deficiency related to corrosion on piping in the well pumphouse and five other deficiencies related to administrative or system design considerations were noted. In 2024, personnel at SNL/TTR continued to work with engineers as per the proposed path forward that the DOE/NNSA Sandia Field Office sent to NDEP.

Sandia and Navarro completed the lead service line inventory in March 2024, and it was subsequently transmitted to the NDEP by DOE/NNSA. The survey indicated that there are no lead service lines at SNL/TTR because all service lines were replaced in 2005 with high-density polyethylene. After submission, the NDEP requested a map of the SNL/TTR main compound for clarification on the main line's connections to the buildings. The map was transmitted to NDEP in March of 2025.

Public Water System Challenges in 2024

During 2024, there were two Public Water System distribution system leaks, resulting in a water loss of approximately 72,162 gallons. Both leaks occurred on welded joints. The system leaks were repaired with heavy-duty band clamps, which allowed repairs to be conducted without shutting off the water in many instances.

Upcoming maintenance of the 200,000-gallon elevated water storage tank will require a temporary fire protection water system. Two out-of-service water storage ground tanks (50,000 gallons each) will serve this purpose. Both tanks were filled in 2023 to check for leaks, and one tank was found to be leaking. It was drained completely, repaired, and then refilled with another 50,000 gallons after which no further leaks were found.

In December 2023, a loss of production was noted at Well 6. Throughout 2024, the production at Well 6 continued to drop. A well-drilling company was consulted. The drilling contractor suspects that a hole has developed on the well's inner casing, which is allowing water to escape from the pipe and casing. A quote was obtained for replacing the well casing and lining with a recommendation to replace the pump at the same time since it is approaching the end of its expected lifetime. NDEP was contacted and worked with personnel at SNL/TTR to get the rehabilitation project moving quickly when well production dropped another 50 percent by the end of 2024. The well piping project is on a slight delay while engineering designs are being redrafted to meet new needs without delaying NDEP approval.

Throughout 2024, personnel at SNL/TTR worked with engineers on a project to paint the interior of the water tower and add a water mixer and cathodic protection system. Design also began on a project to upgrade the Water Treatment Facility's (Building 03-150) carbon dioxide injection system to lower the incoming well water's pH prior to entering the elevated water storage tank. The carbon dioxide system is used to adjust the water's pH from around 9.2 to 7.0 for optimal arsenic removal. The existing carbon dioxide system design was based on a maximum well water flow rate of 50 gallons per minute, but current flow rates between 80 to 126 gallons per minute exceed the system's abilities.

4.8.2 Septic Tank Systems

Three of the five septic tanks located at SNL/TTR have been under U.S. Air Force control for several years. They are located at Station 36, the old Point Able Guard Station, and the Firing Range. Personnel at SNL/TTR are responsible for the remaining two septic tanks. The septic tank at Station 24 has been out of service for several years, and the septic tank located at Building 09-52 was never placed in service after its installation.

—Program Activities and Results 2024: Septic Tank Systems

On October 6, 2022, NDEP Bureau of Water Pollution Control personnel inspected the Area 9, Building 09-52 septic tank and verified that it was inactive, not in use, and had not been used since it was installed and initially permitted in January 2006. At the time of the inspection in October 2022, NDEP personnel stated that they did not believe any further action would be needed. However, in July 2023, an invoice from NDEP was received to permit the Building 09-52 septic tank (Permit No.: NEVOSDS09S0158). The permit fee was paid in November 2023. Management personnel at SNL/TTR decided to maintain the permit in case future projects could require its use. The annual permit invoice was paid in 2024. Personnel at SNL/TTR are considering reactivating the non-potable water system for Building 09-52 in 2025. If activated, the septic system will also be activated for usage.

4.8.3 Stormwater

SNL/TTR is located almost entirely within a closed basin, with runoff evaporating or infiltrating into the ground. There are no Waters of the United States within the closed basin, and, therefore, federal stormwater permitting is not required. The State of Nevada has determined that there are no industrial activities at SNL/TTR that require permitting. Currently, stormwater sampling is not required at SNL/TTR.

—Program Activities and Results 2024: Stormwater

New construction activities that exceed one acre of soil disturbance and lie outside the boundaries of the closed basin require permitting under the Construction General Permit. During 2024, no construction projects required Construction General Permit coverage at SNL/TTR.

4.8.4 Wastewater

Wastewater discharges from activities conducted at facilities in the Main Compound at Area 3 are conveyed to the U.S. Air Force facultative sewage lagoon for treatment. The U.S. Air Force is responsible for the National Pollutant Discharge Elimination System permit for wastewater discharges. The U.S. Air Force takes samples from the headwater end of the lagoon. In the past, Sandia personnel provided quarterly sampling results to the U.S. Air Force for inclusion in their U.S. Air Force Discharge Monitoring Report. However, the National Pollutant Discharge Elimination System permit was modified in 1997, and quarterly data is no longer required.

Wastewater is the spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter. Wastewater can be either sanitary wastewater (from home or personal care use) or industrial wastewater (from industrial categorical processes.) Industrial wastewater discharges are regulated in the United States under the Clean Water Act of 1972 and subsequent reauthorizations.

As a best management practice, personnel from SNL/NM sample Area 3 wastewater annually at the point where wastewater leaves SNL/TTR property and enters the U.S. Air Force system. All sampling and quality assurance practices completed in 2024 were conducted in accordance with program-specific sampling and analysis plans and quality assurance plans (see Chapter 6).

—Program Activities and Results 2024: Wastewater

In 2024, there were no excursions or violations of concentration limits. Twenty-four-hour composite wastewater samples are collected annually, and the following parameters are analyzed:

- Chemical oxygen demand
- Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc)
- Oil and grease
- pH
- Phenolic compounds (phenol-containing compounds are not used at SNL/TTR)
- Semivolatile organic compounds

- Total cyanide (cyanide-containing compounds are not used at SNL/TTR)
- Total petroleum hydrocarbons
- Total suspended solids
- Tritium, gamma spectroscopy, and gross alpha and gross beta
- Volatile organic compounds

Analytical results for wastewater sampled at Area 3 are provided in Appendix B.

4.8.5 Water Conservation

The State Water Resources Division regulations, Nevada Revised Statutes Chapter 540, 540.131 through 540.151, require a water conservation plan for permitted water systems and major water users in Nevada (DOE/NV 1992). The water conservation plan for SNL/TTR provides education, conservation measures, and supply management guidance. The plan states that when the average annual consumption is significantly greater than 37 gallons per capita per day, plan revisions will be considered to include additional conservation measures. The current plan was revised in November 2020 and was approved by the State of Nevada Department of Conservation and Natural Resources, Division of Water Resources on February 17, 2021. The plan must be updated every five years; the next revision is due by February 17, 2026.

—Program Activities and Results 2024: Water Conservation

In 2024, the average daily per capita consumption from the Public Water System was approximately 17 gallons per day. Personnel at SNL/TTR conserved water through the summer, lowering per capita usage by more than 8 gallons per day compared to last year. Based on a workday population of 65 people, 10,400 gallons of potable water a month was conserved compared to monthly usage last year.

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Chapter 5. Compliance Summary and Environmental Permits

Bighorn sheep (*Ovis canadensis*)

OVERVIEW ▪ Sandia operations at SNL/TTR are required to comply with federal, state, and local environmental statutes, regulations, executive orders, and DOE directives. Regular audits, appraisals, and inspections identify areas for improvement as well as noteworthy practices.

Sandia operations are required to comply with federal, state, and local environmental requirements, including DOE directives and presidential executive orders. As part of this compliance, personnel adhere to reporting and permitting requirements.

All operations and activities, including those that are part of environmental programs, are performed in accordance with Sandia's ES&H policy, which includes the following statement:

> Sandia integrates environmental, safety, and health throughout the lifecycle of its operations to ensure the:
>
> - Protection of Members of the Workforce by providing a safe and healthful workplace.
> - Protection of the environment by preventing or minimizing pollution and waste, pursuing sustainable resource use, and protecting biodiversity and ecosystems.
> - Protection of the public through the prevention or minimization of releases of hazardous materials.

- Compliance with applicable ES&H requirements, including contractual requirements.
- Establishment, measurement, and monitoring of ES&H objectives to enhance performance and drive continual improvement.

An integrated safety management system is used to incorporate safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public, and the environment. Thus management of safety functions becomes an integral part of mission accomplishment and meets requirements outlined by DOE. The following five core functions guide the integration of safety into all work practices: define the scope of work, analyze the hazards, develop and implement hazard controls, perform work within controls, and provide feedback for continuous improvement.

The integrated safety management system incorporates the Environmental Management System, which is described in detail in Section 5.2.

5.1 Environmental Compliance

The management and operating contract, also referred to as the Prime Contract, for Sandia serves as the overarching agreement between DOE/NNSA and the management and operating contractor. The Prime Contract requires the management and operating contractor to comply with specific DOE directives as well as applicable federal, state, and local requirements for the management and operation of Sandia.

5.1.1 Federal Requirements

The Prime Contract requirements include compliance with federal laws and regulations that pertain to environmental protection and management. The following sections present these requirements and Sandia compliance activities in 2024.

5.1.1.1 Environmental Planning

Environmental planning requirements and compliance activities are presented in Table 5-1.

Table 5-1. Environmental planning requirements and compliance activities

Requirements	Compliance Activities
National Environmental Policy Act of 1969	
The National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 1969) is a law that requires federal agencies to assess the impacts of proposed actions on the human and natural environment prior to making decisions. The Council on Environmental Quality is the agency responsible for implementing NEPA through issuing guidance. DOE codified its NEPA implementing procedures in 10 CFR 1021, *National Environmental Policy Act* (10 CFR 1021 2011). Personnel use the NEPA module (an online tool that uses a checklist format) to document proposed actions and activities and assesses them for potential environmental consequences and impacts. When projects or activities appear to be outside the scope of existing NEPA documentation, a NEPA checklist is prepared and forwarded to DOE/NNSA for review and determination. Section 4.1 provides information on NEPA activities in 2024.	• Ensure that potential environmental impacts have been assessed adequately. • Verify NEPA coverage. • Coordinate NEPA assessments with DOE personnel. • Inform project owners of environmental requirements.

5.1.1.2 Site Sustainability

Site sustainability requirements and compliance activities are presented in Table 5-2.

Table 5-2. Site sustainability requirements and compliance activities

Requirements	Compliance Activities
Energy Independence and Security Act of 2007, Section 527	
The Energy Independence and Security Act (EISA) of 2007 (42 U.S.C. § 17001 2007), Section 527, requires federal agencies to submit an annual government efficiency status report to the Office of Management and Budget on compliance with the implementation of initiatives to improve energy efficiency, reduce energy costs, lower greenhouse gas emissions, and increase savings to United States taxpayers resulting from mandated improvements. The DOE Sustainability Performance Office uses data from Sandia's site sustainability plan to produce a DOE annual energy management report.	• Establish and implement an annual site sustainability plan for Sandia locations, including SNL/TTR.
Disaster Resiliency Planning Act of 2022	
Under the Disaster Resiliency Planning Act (PL 117-221 2022), each agency head is required to incorporate natural disaster resilience into real property asset management and investment decisions made by the agency.	• Establish and implement a vulnerability assessment and resilience plan to meet this requirement.

5.1.1.3 Hazardous Waste and Inactive Remediation Sites

Hazardous waste and inactive remediation site requirements and compliance activities are presented in Table 5-3.

Table 5-3. Hazardous waste and inactive remediation site requirements and compliance activities

Requirements	Compliance Activities
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and amended in 1986	
The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. § 9601 1980), and amended in 1986, establishes liability compensation, cleanup, and emergency response requirements for inactive hazardous waste sites. In addition, CERCLA requires federal facilities to respond and report hazardous substance spills to the National Response Center and perform any necessary response action. DOE personnel performed a preliminary assessment and site inspection in 1988 at SNL/TTR. This inspection confirmed that no sites qualify for the National Priorities List. Therefore, with respect to inactive hazardous waste sites, there are no CERCLA remediation requirements nor CERCLA-related assessments for natural resource damages. The Superfund Amendments and Reauthorization Act (SARA) Title III of 1986 (42 U.S.C. § 9601 1986) establishes additional reporting requirements that are addressed under "Chemical Management."	• See "Chemical Management" for compliance activities.
Federal Facility Agreement and Consent Order	
The Federal Facility Agreement and Consent Order is an ongoing action with DoD, DOE, and the State of Nevada (State of Nevada, DOE, and DoD 1996). DOE has assumed responsibility for the following environmental restoration sites that are subject to this agreement: Nevada National Security Site, areas within SNL/TTR, areas within the Nevada Test and Training Range, Central Nevada Test Area, and Project Shoal Area (east of Carson City in Churchill County). Section 0 provides information on environmental restoration sites.	• Report site post-closure inspection activities.

Requirements	Compliance Activities
Resource Conservation and Recovery Act, enacted in 1976, as amended	
The Resource Conservation and Recovery Act (RCRA of 1976, enacted in 1976, as amended (42 U.S.C. § 6901 et seq. 1976) sets forth the framework for managing nonhazardous and hazardous solid waste, including the hazardous waste component of mixed waste. Operations at SNL/TTR generate less than 1,000 kg of hazardous waste through normal operations each month, which equates to small-quantity generator status subject to manifest and pre-transport requirements in 40 CFR 262, *Standards Applicable to Generators of Hazardous Waste* (40 CFR 262 2021). Under the small-quantity generator designation, hazardous waste can only be stored on-site for a maximum of 270 days at this location before it must be shipped off-site for treatment and disposal at an EPA-permitted facility. Small-quantity generators and conditionally exempt small-quantity generators of RCRA hazardous waste are no longer required to file a biennial hazardous waste report. Nonhazardous municipal solid waste, such as office and food refuse, is disposed of at the SNL/TTR Class II sanitary landfill (operated by a U.S. Air Force operations and maintenance contractor). Section 4.3 provides information on waste management activities.	• Minimize waste via recycling and material recovery. • Collect and screen material and waste in preparation for shipment to off-site facilities for recycling, storage, treatment, or disposal.

5.1.1.4 Radiation Protection

Radiation protection requirements and compliance activities are presented in Table 5-4.

Table 5-4. Radiation protection requirements and compliance activities

Requirements	Compliance Activities
Atomic Energy Act of 1954	
The Atomic Energy Act of 1954 (42 U.S.C. § 2011 1954) specifies proper management of source, special nuclear, and byproduct material. DOE has the authority to manage operations based on applicable statutes, federal regulations, and DOE directives. Sandia personnel achieve compliance through adherence to these directives and applicable regulations in 10 CFR 830, *Nuclear Safety Management* (10 CFR 830 2016), and 10 CFR 835, *Occupational Radiation Protection* (10 CFR 835 2021). The regulations include radiation protection standards, limits, and program requirements for protecting individuals from radiation exposure as a result of DOE activities.	• Manage materials and facilities in accordance with DOE requirements and oversight, including appropriate documentation. • Ensure that training requirements are met. • The DOE implements quality assurance programs to ensure that operations at its facilities meet regulatory standards
DOE O 435.1 Change 1, Radioactive Waste Management	
DOE O 435.1, Change 1, *Radioactive Waste Management* (DOE O 435.1, Change 1 2001), ensures that all DOE radioactive waste is managed in a manner that is protective of worker and public health and safety and of the environment. Personnel examine the lifecycle of radioactive waste, radioactive mixed waste, transuranic waste, and transuranic mixed waste before waste is generated to ensure appropriate management. DOE authorization is requested before generating radioactive waste streams with no identified disposal path. Information about the characteristics of each waste is used to manage the waste in a manner that is consistent with applicable law. Section 4.3 provides information on waste management activities.	• Characterize and manage on-site waste. • Support inspections and audits. • Ensure that training requirements are met.

Requirements	Compliance Activities
DOE O 458.1 Chg 4 (LtdChg), Radiation Protection of the Public and the Environment	
DOE O 458.1, Chg 4 (LtdChg), *Radiation Protection of the Public and the Environment* (DOE O 458.1, Change 4 (LtdChg) 2020), establishes requirements to protect the public from undue radiation exposure, demonstrate compliance with public dose limits from air pathways, control releases of radioactive discharges, control radioactive waste, protect drinking water and groundwater, protect biota, control the release of property with residual radioactivity, and manage radiation-related records. DOE issued a moratorium in January 2000 that prohibited the clearance of volume-contaminated metals, and subsequently in July 2000 suspended the clearance of metals from DOE radiological areas for recycling purposes.	• Monitor emissions and provide dose assessments. • Adhere to regulations when operating and maintaining the drinking water system. • Monitor biota. • Perform property clearances. In 2024, no property (real or personal) was cleared, and no metals subject to the moratorium or the suspension were cleared.

5.1.1.5 Air Quality

Air quality requirements and compliance activities are presented in Table 5-5.

Table 5-5. Air quality requirements and compliance activities

Requirements	Compliance Activities
Clean Air Act of 1970, as amended	
The Clean Air Act of 1970, as amended (42 U.S.C. § 7401 1970), governs the management of nonradiological emissions with compliance achieved through adherence to the conditions of permits and applicable regulations. Section 4.4 provides information on air quality compliance.	• Confirm that planned stationary sources of air pollutants (e.g., equipment) and potential emission from operations meet applicable local and federal requirements. • Maintain documentation that demonstrates that sources are in compliance with regulations and permitted operating conditions. • Submit monitoring reports, annual emissions inventories, and other compliance assurance documentation to regulatory agencies.

5.1.1.6 Water Quality

Water quality requirements and compliance activities are presented in Table 5-6.

Table 5-6. Water quality requirements and compliance activities

Requirements	Compliance Activities
Clean Water Act of 1972 and amendments	
The Clean Water Act of 1972 (33 U.S.C. § 1251 1972) and amendments establishes a permitting structure and regulatory direction to protect the "waters of the United States" by restoring and maintaining the chemical, physical, and biological integrity of United States waters; protecting fish, wildlife, and recreation; and reducing pollutant discharges. Compliance is achieved through adherence with NDEP requirements. Section 4.8 provides information on drinking water.	• Monitor all wastewater discharges. • Sample wastewater discharge annually. • Develop and update stormwater pollution prevention plans, including control measures, site inspections, and annual reporting.

Requirements	Compliance Activities
Energy Independence and Security Act of 2007, Section 438	
The Energy Independence and Security Act (EISA) of 2007 (42 U.S.C. § 17001 2007), Section 438 requires federal agencies to manage stormwater runoff from federal development projects for the protection of water resources. Proposed projects undergo a review and may identify the need to further address stormwater runoff under EISA 438 applicability. Site planning, design, construction, and maintenance strategies are applied to maintain or restore predevelopment site hydrology. Section 4.8.3 provides information on the Stormwater Program.	• Implement stormwater pollution prevention plan steps to prevent unpermitted discharges. • Conduct inspections.
Oil Pollution Act of 1990 (33 U.S.C. § 40 1990)	

Originally published in 1973 under the authority of Section 311 of the Clean Water Act, the Oil Pollution Prevention regulation sets forth requirements for prevention of, preparedness for, and response to oil discharges at specific facilities. In 1990, the Oil Pollution Act amended the Clean Water Act to require some oil storage facilities to implement additional measures. The Oil Pollution Prevention regulations are set forth in 40 CFR 112, *Oil Pollution Prevention* (40 CFR 112 2011).
 	
Oil storage facilities at SNL/TTR are not subject to regulation under 40 CFR 112, *Oil Pollution Prevention* (40 CFR 112 2011), due to all the oil storage containers and equipment being located within a hydrologically closed basin with no potential to impact waters of the United States. However, personnel implement best management practices to prevent potential oil spills or releases to the environment.
 	
Section 4.5 provides information on the Oil Storage Program.
	• Not applicable. However, the following best management practices are performed routinely:
	  • Inspect aboveground oil storage containers.
	  • Train oil-handling personnel.
	  • Maintain an oil storage container inventory.

Safe Drinking Water Act of 1974, as amended	
The Safe Drinking Water Act of 1974, as amended (42 U.S.C. § 300f 1974), was established to protect the quality of drinking water in the United States, focusing on all waters actually or potentially designed for drinking use, whether from aboveground or underground sources. NDEP issued two drinking water permits for SNL/TTR. One is to operate a public water system, and one is to operate a treatment plant for arsenic reduction and chlorination. NDEP characterizes this public water system as a non-transient non-community water system. Section 4.8.1 provides information on drinking water.	• Adhere to permit requirements. • Sample drinking water for quality parameters.
America's Water Infrastructure Act of 2018	
The America's Water Infrastructure Act of 2018 (33 U.S.C. § 2201 2018) improves drinking water and water quality, deepens infrastructure investments, enhances public health and quality of life, increases jobs, and bolsters the economy. The act provisions represent changes to the Safe Drinking Water Act. Section 4.8.1 provides information on drinking water.	• No activities are associated with this requirement.

5.1.1.7 Chemical Management

Chemical management requirements and compliance activities are presented in Table 5-7.

Table 5-7. Chemical management requirements and compliance activities

Requirements	Compliance Activities
Emergency Planning and Community Right-to-Know Act of 1986	
The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (42 U.S.C. § 11001 et seq. 1986), also known as Title III of the Superfund Amendments and Reauthorization Act (SARA Title III) requires the reporting of toxic chemicals used and released by federal, state, and local governments and industry. Per EPCRA, chemical hazard information is provided to the community for awareness and enhancement of emergency planning efforts. In Nevada, the Nevada State Fire Marshal and State Emergency Response Commission use the Nevada Combined Hazardous Materials Reporting System to satisfy state requirements for hazardous materials reporting and chemical inventory reporting under EPCRA. These are submitted as a single report. See Table 5-14 for more details.	• Maintain and report on a chemical inventory using the Nevada Combined Hazardous Materials Reporting System. • Report qualifying releases.
Federal Insecticide, Fungicide, and Rodenticide Act, enacted in 1910 and amended in 1972	
The Federal Insecticide, Fungicide, and Rodenticide Act, enacted in 1910 and amended in 1972 (7 U.S.C. § 136 1910), regulates the use of herbicides, rodenticides, and insecticides. EPA regulations and applicable label guidelines are followed.	• Contract state-licensed subcontractors to supply, handle, and apply covered products.
Toxic Substances Control Act, enacted in 1976 and later amended	
The Toxic Substances Control Act, enacted in 1976 and later amended (15 U.S.C. § 2601 et seq. 1976), regulates the manufacture, processing, distribution, use, and disposal of specific chemical substances and/or mixtures. Compliance with this act includes managing asbestos and PCBs. There are no PCB-contaminated transformers at SNL/TTR. Chapter 4 provides information related to managing toxic substances.	• Conduct asbestos abatement in accordance with applicable regulatory requirements.

5.1.1.8 Pollution Prevention

Pollution prevention requirements and compliance activities are presented in Table 5-8.

Table 5-8. Pollution prevention requirements and compliance activities

Requirements	Compliance Activities
Pollution Prevention Act of 1990	
The Pollution Prevention Act of 1990 (42 U.S.C. § 133 1990) declares as national policy that pollution should be prevented or reduced at the source wherever feasible, and disposal or other release into the environment should only be done as a last resort. A toxic chemical source reduction and recycling report is required for facilities that meet the reporting requirements under EPCRA, Section 313. See the previous EPCRA discussion under "Chemical Management."	• Conduct database queries for chemical purchases annually. • Compare environmental releases with EPCRA reporting thresholds. • Prepare annual reports and submit them to federal, state, and local regulatory agencies. • Follow green purchasing practices.

EPCRA = Emergency Planning and Community Right-to-Know Act

5.1.1.9 Natural Resources

Natural resources requirements and compliance activities are presented in Table 5-9.

Table 5-9. Natural resources requirements and compliance activities

Requirements	Compliance Activities
Bald and Golden Eagle Protection Act (16 USC § 668-668d), enacted in 1940	
The Bald and Golden Eagle Protection Act, enacted in 1940 (16 U.S.C. § 668-668d 1940), prohibits the taking, harassment, or possession of and commerce in bald and golden eagles, with limited exceptions. Chapter 3 provides more information on the Ecology Program.	• Conduct biological evaluations and inventory surveys. • Consult with the USFWS as appropriate
Endangered Species Act of 1973, amended in 1982	
The Endangered Species Act of 1973, amended in 1982 (16 U.S.C. 1531 et. seq. 1973) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing the act are the USFWS and the National Marine Fisheries Service. The USFWS maintains a worldwide list of endangered species; species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. Chapter 3 provides more information on threatened and endangered species that may occur at SNL/TTR.	• Collect ecological data. • Provide ecological surveillance. • Consult with the USFWS as appropriate.
Executive Order 11988 of 1977, Floodplain Management, as amended	
Executive Order 11988, Floodplain Management, (EO 11988 1977), requires federal agencies to consider impacts associated with the occupancy and modification of floodplains; reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Chapter 3 provides more information on the Ecology Program.	• Review NEPA checklists to identify impacts on floodplains. • Preserve and protect ecological resources.
Executive Order 11990 of 1977, Protection of Wetlands, as amended	
Executive Order 11990, Protection of Wetlands, as amended (EO 11990 1977), requires federal agencies to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. Chapter 3 provides more information on the Ecology Program.	• Review NEPA checklists to identify impacts on wetlands. • Preserve and protect ecological resources.
Executive Order 13112 of 1999, Invasive Species	
Executive Order 13112, Invasive Species (EO 13112 1977) called upon executive departments and agencies to take steps to prevent the introduction and spread of invasive species, and to support efforts to eradicate and control invasive species that are established. It also created a coordinating body—the Invasive Species Council, also referred to as the National Invasive Species Council—to oversee implementation of the order, encourage proactive planning and action, develop recommendations for international cooperation, and take other steps to improve the federal response to invasive species. Chapter 3 provides more information on the Ecology Program.	• Monitor biota. • Collect ecological data. • Produce mitigation strategies as necessary.
Executive Order 13751 of 2016, Safeguarding the Nation from the Impacts of Invasive Species	
Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species (EO 13751 2016), amended Executive Order 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. Chapter 3 provides more information on the Ecology Program.	• Monitor biota. • Collect ecological data. • Produce mitigation strategies as necessary.

Requirements	Compliance Activities
Fish and Wildlife Conservation Act and the Lacey Act Amendments of 1981	
The Fish and Wildlife Conservation Act (16 U.S.C. 49 1980), enacted in 1980, and the Lacey Act Amendments of 1981 (16 U.S.C. 3371-3378 1981), were established so that wildlife will receive equal consideration with other natural resources regarding maintenance of the ecosystem. Relevancy to an ecological program is stated in 16 USC 661, *Conservancy*, which states that purpose as follows: "(1) to provide assistance to, and cooperate with, Federal, State, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species . . . (2) to make surveys and investigations of the wildlife of the public domain." Chapter 3 provides more information on the Ecology Program.	• Review NEPA checklists to identify impacts on fish and wildlife.
Migratory Bird Treaty Act of 1918 (and amendments)	
The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703 et seq. 1918) implemented the 1916 convention for the protection of migratory birds. The original statute implemented the agreement between the United States and Great Britain (for Canada) and later amendments implemented treaties between the United States and Mexico, the United States and Japan, and the United States and Russia. The act prevents the taking, possession, killing, transportation, and importation of migratory birds or their eggs, parts, and nests. Chapter 3 provides more information on the Ecology Program.	• Collect ecological data. • Provide ecological surveillance. • Consult with the USFWS as appropriate.
EO 13186 of 2001, Responsibilities of Federal Agencies to Protect Migratory Birds	
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (EO 13186 2001) directs Federal agencies to take certain actions to further implement the Migratory Bird Treaty Act and promote the conservation of migratory bird populations. The executive order 13186 outlines Federal agency responsibilities and establishes an interagency Council for the Conservation of Migratory Birds (Council) to oversee the implementation of the Order. It requires agencies to avoid or minimize the adverse impact of their actions on migratory birds and ensure that environmental analyses under the National Environmental Policy Act evaluates the effects of proposed Federal actions on such species. Chapter 3 provides more information on the Ecology Program.	• Collect ecological data. • Provide ecological surveillance for maintenance of regulatory compliance. • Consider migratory birds when evaluating NEPA documents
Sikes Act of 1960 (PL 86-97), enacted in 1960, and the amendments of 1986 (PL 99-561) and 1997 (PL 105-85 Title XXIX), reauthorized in 2013	
The Sikes Act, as amended (PL 105-85 1997), was reauthorized in 2013. The act protects and enhances fish, wildlife, and other natural resources that exist on and are associated with military lands in the United States. Chapter 3 provides more information on the Ecology Program.	• Review NEPA checklists to identify impacts on natural resources on lands associated with military lands.
Wild Free-Roaming Horses and Burros Act (PL 92-195), enacted in 1971, and amendments	
The Wild Free-Roaming Horses and Burros Act (PL 92-195 1971), enacted in 1971, and amendments (16 U.S.C. 30 § 1331 et seq. 1971), declares that wild free-roaming horses and burros are living symbols of the historic and pioneer spirit of the West, that they contribute to the diversity of life forms within the nation, and that they enrich the lives of the American people. The policy states that wild free-roaming horses and burros shall be protected from capture, branding, harassment, or death. To accomplish this, areas where they are presently found are to be considered an integral part of the natural system of the nation's public lands. The Bureau of Land Management's Las Vegas District is responsible for management of wild horses at SNL/TTR. Chapter 3 provides more information on the Ecology Program.	• Coordinate with the Bureau of Land Management as appropriate.

5.1.1.10 Cultural Resources

Cultural resources requirements and compliance activities are presented in Table 5-10.

Table 5-10. Cultural resources requirements and compliance activities

Requirements	Compliance Activities
American Indian Religious Freedom Act, enacted in 1978 and amended in 1994	
The American Indian Religious Freedom Act of 1978, as amended in 1994 (PL 103-344 1994), is a federal law and joint resolution of Congress, which protects and preserves the traditional religious rights and cultural practices of American Indians, Eskimos, Aleuts, and native Hawaiians. Chapter 2 provides more information on the Cultural Resources Program.	• Conduct cultural resource surveys and monitor construction activities. • Prepare documentation to support planning activities and decisions. • Review NEPA checklists to identify impacts on cultural resources. • Support consultation with American Indian tribes.
Archaeological Resources Protection Act, enacted in 1979 and amended in 1988	
The Archaeological Resources Protection Act of 1979 (PL 96-95 1979) secures, for the present and future benefit of the American people, the protection of archaeological resources and sites that are on public lands and Indian lands, and it fosters increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals. Section 4 of the statute and Sections 16.5–16.12 of the regulations describe the requirements that must be met before federal authorities can issue a permit to excavate or remove any archaeological resource on federal or Indian Lands. The curation requirements of artifacts, other materials excavated or removed, and the records related to the artifacts and materials are described in Section 5 of the act. These regulations affect all federally owned or administered archaeological collections. Chapter 2 provides information on the Cultural Resources Program.	• Develop internal management plans. • Conduct cultural resource surveys and monitor construction activities. • Prepare documentation to support planning activities and decisions. • Review NEPA checklists to identify impacts on cultural resources.
DOE O 144.1, Department of Energy American Indian Tribal Government Interactions and Policy	
DOE O 144.1, *Department of Energy American Indian Tribal Government Interactions and Policy* (DOE O 144.1 2009), sets forth the principles to be followed by DOE to ensure an effective implementation of a government-to-government relationships with American Indian and Alaska Native tribal governments. This order provides direction to all DOE officials, staff, and contractors regarding fulfillment of trust obligations and other responsibilities arising from DOE actions that may potentially impact American Indian and Alaska Native traditional, cultural, and religious values and practices; natural resources; and treaty and other federally recognized and reserved rights. Chapter 2 provides information on the Cultural Resources Program.	• Develop internal management plans. • Conduct cultural resource surveys and monitor construction activities. • Prepare documentation to support planning activities and decisions. • Review NEPA checklists to identify impacts on cultural resources. • Support consultation with American Indian Tribes.

Requirements	Compliance Activities
DOE O 430.1C, Real Property Asset Management	
DOE O 430.1C, *Real Property Asset Management* (DOE O 430.1C 2019), establishes an integrated corporate-level, performance-based approach to the life-cycle management of real property assets. It links real property asset planning, programming, budgeting, and evaluation to the multifaceted DOE missions. Successful implementation of this order will enable DOE to carry out stewardship responsibilities and will ensure that facilities and infrastructure are properly sized and in a condition to meet mission requirements today and in the future. See Chapter 2 for information on the Cultural Resources Program.	• Develop internal management plans. • Conduct cultural resource surveys and monitor construction activities. • Survey property to determine eligibility for inclusion in the National Register of Historic Places. • Prepare documentation to support planning activities and decisions. • Review NEPA checklists to identify impacts on cultural resources.
DOE P 141.1, Management of Cultural Resources	
The purpose of DOE P 141.1, *Management of Cultural Resources* (DOE P 141.1 2011), is twofold: to ensure that all DOE programs and field elements integrate cultural resources management into their missions and activities and to raise the level of awareness and accountability among DOE contractors concerning the importance of DOE cultural resource-related legal and trust responsibilities. Chapter 2 provides information on the Cultural Resources Program.	• Develop internal management plans. • Conduct cultural resource surveys and monitor construction activities. • Survey property to determine eligibility for inclusion in the National Register of Historic Places. • Prepare documentation to support planning activities and decisions. • Review NEPA checklists to identify impacts on cultural resources.
National Historic Preservation Act, enacted in 1966 and amended in 2000, Section 106	
The National Historic Preservation Act of 1966 (PL 89-665 1966), as amended, and codified in 16 U.S.C. (16 U.S.C. 2016), is legislation intended to preserve historical and archaeological sites in the United States. The act sets federal policy for preserving our nation's heritage by establishing a federal government and tribal government partnership, establishing the National Register of Historic Places and National Historic Landmarks Programs, mandating the selection of qualified State Historic Preservation Officers, establishing the Advisory Council on Historic Preservation, charging federal agencies with responsible stewardship, and establishing the role of certified local governments within the states. The National Register of Historic Places (36 CFR 60 2012) is authorized by the National Historic Preservation Act of 1966. It is the federal government's official list of districts, sites, buildings, structures, and objects deemed worthy of preservation for their historical significance at the national level. Chapter 2 provides information on the Cultural Resources Program.	• Develop internal management plans. • Conduct cultural resource surveys and monitor construction activities. • Conduct cultural resource surveys to determine eligibility for inclusion in the National Register of Historic Places. • Prepare documentation to support planning activities, decisions, and consultations. • Review NEPA checklists to identify impacts on cultural resources.

Requirements	Compliance Activities
Native American Graves Protection and Repatriation Act, enacted in 1990	
The Native American Graves Protection and Repatriation Act (PL 101-601 1990) developed a systematic process for determining the rights of Indian tribe and Native Hawai'ian lineal descendants and their representative organizations to protect certain Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony with which they are affiliated. Chapter 2 provides information on the Cultural Resources Program.	• Develop internal management plans. • Conduct cultural resource surveys and monitor construction activities. • Prepare documentation to support planning activities and decisions. • Review NEPA checklists to identify impacts on cultural resources.

5.1.1.11 Wildland Fire Management

Reporting requirements and compliance activities are presented in Table 5-11.

Table 5-11. Wildland Fire Management requirements and compliance activities

Requirements	Compliance Activities
DOE O 420.1C Chg3 (LtdChg), Facility Safety	
DOE O 420.1C Chg3 (LtdChg), *Facility Safety* (DOE O 420.1C Chg 3 (LtdChg) 2019), outlines DOE requirements for fire protection and wildland fire management. The order requires the development of an integrated site-wide wildland fire management plan, consistent with Federal Wildland Fire Management Policy. The plan must be submitted to the DOE Head of Field Element for approval and executed in accordance with the applicable sections of NFPA 1143, *Standard for Wildland Fire Management*.	• Because SNL/TTR exists on Air Force permitted land, the Air Force is responsible for all wildland fire protection, wildland fire planning, and wildland fire response.
EO 13728, Wildland-Urban Interface Federal Risk Mitigation	
EO 13728, Wildland-Urban Interface Federal Risk Mitigation (EO 13728 2016), outlines requirements for federal agencies concerning wildfire risk management for existing buildings over 5,000 gross square feet located in wildland-urban interface areas with moderate or greater fire hazard severity. Agencies are encouraged to comply with the International Wildland-Urban Interface Code or an equivalent code. The International Wildland-Urban Interface Code provides additional guidance on the necessary distance for defensible space around buildings in wildland-urban interface areas.	• Wildfire risk assessments would be performed for buildings over 5,000 gross square feet to evaluate surrounding ignition hazards and to create and maintain a defensible space.

5.1.1.12 Reporting

Reporting requirements and compliance activities are presented in Table 5-12.

Table 5-12. Reporting requirements and compliance activities

Requirements	Compliance Activities
DOE O 231.1B, Admin Change 1, Environment, Safety and Health Reporting	
DOE O 231.1B, Admin Change 1 *Environment, Safety and Health Reporting* (DOE O 231.1B, Admin Change 1 2012), ensures that DOE receives information about events that have affected or could adversely affect the health, safety, and security of the public or workers, the environment, the operation of DOE facilities, or DOE credibility. It enhances mission safety and promotes the sharing of effective practices to support continuous improvement and adaptation to change. See DOE O 458.1 Chg 4 (LtdChg), *Radiation Protection of the Public and the Environment*, for information on property clearance activities.	• Produce an ASER. • Report on environmental program activities, monitoring results, accidental releases, and waste management operations.

Requirements	Compliance Activities
DOE O 232.2A, Chg1 (MinChg) Occurrence Reporting and Processing of Operations Information	
DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (DOE O 232.2A, Chg 1 (MinChg) 2017), requires timely notification to DOE about events that could adversely affect the health and safety of the public or workers, the environment, DOE missions, or DOE credibility. Sandia personnel promote organizational learning through investigation and analysis of reported events and conditions that adversely affect or may adversely affect personnel, the public, property, the environment, or the DOE mission. Section 5.3.2 provides further information.	• Track all environmental events.

5.1.1.13 Quality Assurance

Quality assurance requirements and compliance activities are presented in Table 5-13.

Table 5-13. Quality assurance requirements and compliance activities

Requirements	Compliance Activities
DOE O 414.1E, Quality Assurance	
DOE O 414.1E, *Quality Assurance* (DOE O 414.E 2024), is intended to achieve quality in all work and ensure that products and services meet or exceed customer requirements and expectations. Environmental sampling and analyses at SNL/TTR conform to applicable quality assurance plans, sampling plans, and field operations. Chapter 6 provides information on quality assurance.	• Develop quality assurance plans, operating plans, and sampling plans for all Sandia locations. • Provide a statement of work for contract laboratories for all Sandia locations. • Participate in quality assurance audits of all contract laboratories that provide services for all Sandia locations.

5.1.2 Chemical Inventory and Toxic Release Inventory Reporting

The chemical inventory report and the toxic release inventory report (if required) for SNL/TTR are submitted annually to EPA and the Nevada State Fire Marshal's Office and support compliance with the Emergency Planning and Community Right-to-Know Act (EPCRA). The chemical inventory report documents toxic chemicals in use and all chemical purchases. Table 5-14 lists the EPCRA reporting requirements.

Table 5-14. SNL/TTR applicable EPCRA reporting requirements

Section	EPCRA Section Title	Description	Reporting Required in 2024
301–303	Emergency Planning	Sections 301–303 of EPCRA require an annual report that lists inventories of chemicals that are above the reportable threshold planning quantities, including the location of the chemicals and the emergency contacts.	Yes
304	Emergency Notification	Section 304 of EPCRA requires an immediate notification following the accidental release of a reportable quantity of extremely hazardous substances.	No
311–312	Community-Right-to-Know: Toxic Chemical Release Inventory Reporting	Sections 311–312 of EPCRA provide requirements for maintaining safety data sheets for hazardous chemicals and for submitting inventory forms for these chemicals.	Yes

Section	EPCRA Section Title	Description	Reporting Required in 2024
313	Toxic Release Inventory	Section 313 of EPCRA requires that a Toxic Release Inventory report be submitted for facilities that release toxic chemicals listed in SARA Title III over a threshold value.	No

—Environmental Reporting 2024: Chemical Inventory and Toxic Release Inventory Reporting

The chemical inventory report for SNL/TTR was submitted to EPA and the Nevada State Fire Marshal and State Emergency Response Commission for 2024; there were no reportable quantity releases of extremely hazardous substances requiring notification under Section 304 of EPCRA. A Toxic Release Inventory report was not required under Section 313 of EPCRA for 2024.

5.1.3 Nevada State Environmental Requirements

The State of Nevada administers most of the environmental requirements applicable to Sandia operations at SNL/TTR (Table 5-15).

Table 5-15. Applicable State of Nevada Administrative Code requirements

Chapter and Provisions
NAC-444, Sanitation
NAC- 444.570 to NAC- 444.7499, Solid Waste Disposal
NAC-444A, Programs for Recycling
NAC-444A.005 to NRS-444A.655, Programs for Recycling
NAC-445A, Water Controls
NAC-445A.228 to NAC-445A.263, Discharge Permits
NAC-445A.450 to NAC-445A. 6731, Public Water Systems
NAC-445A.9656 to NAC-445A.9706, Septic Tanks
NAC-445B, Air Controls
NAC-445B.001 to NAC-445B.3477, Air Pollution
NAC-445B.400 to NAC-445B.846, Emissions from Engines
NAC-477, State Fire Marshal
NAC-477.323, Permit to Store Hazardous Material
NAC-501, Administration and Enforcement of Wildlife Laws
NAC-503, Hunting, Fishing and Trapping; Miscellaneous Protective Measures
NAC-504, Wildlife Management and Propagation
NAC-527, Protection and Preservation of Timbered Lands, Trees and Flora
NAC-534, Underground Water and Wells
NAC-534.010 to NAC-534.500, Underground Water and Wells

Sources:
Nevada Administrative Code (Nevada Administrative Code n.d.)

5.2 Environmental Management System

The Environmental Management System is a continuing cycle of planning, implementing, evaluating, and improving processes to achieve environmental goals. This system facilitates identification of the environmental aspects and impacts of Sandia's activities, products, and services; identification of risks and opportunities that could impact the environment; evaluation of applicable compliance obligations; establishment of environmental objectives; and creation of plans to achieve those objectives and monitor their progress. The scope of the Environmental Management System includes all personnel, operations, products, and services performed at all Sandia sites.

Sandia personnel manage sustainability practices through an ISO 14001-certified Environmental Management System. Sandia National Laboratories pursued and received initial ISO 14001:2004 certification in June 2009. In 2015, the Sandia site-specific certifications for primary operating locations in New Mexico and California were integrated into a multisite ISO 14001:2004 certification. In 2018, the Environmental Management System was recertified under the new ISO 14001:2015 (ISO 14001:2015 2015). To maintain this certification, audits by a third-party registrar are required annually to ensure continued conformance with the standard. Sandia was most recently recertified in March 2024. Operations at SNL/TTR are required to conform to the Environmental Management System requirements via internal Sandia procedures but have not been included in the ISO 14001:2015 certification due to the limited scale of operations there. An internal Environmental Management System assessment conducted in January 2020 verified that operations at SNL/TTR follow the system's requirements and conform with the ISO 14001:2015 standard.

The Environmental Management System provides the following benefits:

- Improved environmental performance
- Enhanced compliance with environmental regulations
- Strengthened pollution prevention efforts
- Improved resource conservation
- Increased environmental efficiencies and reduced costs
- Enhanced image with the public, regulators, and potential new hires
- Heightened awareness of environmental issues and responsibilities

During fiscal year 2023, an environmental aspects and impacts analysis found that hazardous materials, hazardous waste, radiological waste, release of explosives and combustion byproducts, and release of radionuclides were significant aspects for operations at SNL/TTR. An environmental aspects and impacts analysis is a process used to identify environmental aspects of Sandia activities and to score the associated environmental impacts. When significant aspects and negative impacts have been identified, environmental objectives—at all operating levels—are established to guide efforts toward minimizing those aspects and impacts where feasible. The significant environmental aspects established in fiscal year 2023 were carried forward and used in fiscal year 2024. A new environmental aspects and impacts analysis is expected to be completed in 2025.

Aspects are any elements of activities, products, or services that can interact with the environment, and *impacts* are any changes in the environment, whether adverse or beneficial, wholly or partially resulting from activities, products, or services.

5.2.1 Site Sustainability Plan

Sandia personnel prepare an annual site sustainability plan for all Sandia locations that identifies contributions toward meeting DOE sustainability goals and the broader sustainability program. The most recent plan, *Fiscal Year 2025 Site Sustainability Plan* (Sandia, 2024); describes the performance status for fiscal year 2024 at all primary Sandia locations, including SNL/TTR.

Table 5-16 presents the performance status for selected key areas for all Sandia primary sites (except as noted). The data are from the DOE Sustainability Dashboard.

Table 5-16. Site sustainability plan performance status, 2024

DOE Goal/Sandia Objective	Sandia Performance Status in Fiscal Year 2024
Renewable Energy	
Increase consumption of renewable electric energy.	Exceeded this goal. Used purchased renewable energy credits.
Greenhouse Gas Reduction	
Reduce Scope 1 and Scope 2 greenhouse gas emissions.	Decreased Scope 1 and Scope 2 greenhouse gas emissions relative to fiscal year 2008 baseline and fiscal year 2023.
Organizational Resilience	
Implement adaptation and resilience measures.	Updated the implementation status of the vulnerability assessment and resilience plan resiliency solutions.
Acquisition and Procurement	
Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring that all sustainability clauses are included as appropriate.	Led an interdepartmental working group to focus on SFTool+ outreach and education. The 350APR "green language" clause continued to be populated in applicable contract categories valued over $250,000.[a]
Energy Management	
Reduce energy use intensity (Btu per gross square foot) in goal-subject buildings.	Increased energy intensity by 9.7 percent relative to fiscal year 2021 baseline, but decreased year-over-year by 8.3 percent relative to fiscal year 2023.[b]
Water Management	
Reduce potable water use intensity (gallons per gross square foot).	Decreased potable water intensity by 30.4 percent relative to fiscal year 2021 baseline, and decreased year-over-year by 41.8 percent relative to fiscal year 2023.[b]

Note: Scope 1 greenhouse gas emissions are direct, occurring from sources that are controlled or owned by an organization. Scope 2 greenhouse gas emissions are indirect, associated with the purchase of electricity, steam, heat, or cooling (EPA n.d.)
Btu = British thermal unit
Guiding Principles = *Guiding Principles for Sustainable Federal Buildings* (Council on Environmental Quality 2020)
[a] = The 350APR clause states that a subcontractor shall "provide its services in a manner that promotes the expanded use of green products, reduces greenhouse gas emissions and protects the health and wellbeing of building occupants, service providers and visitors in the facility."
[b] = Performance status is specific to SNL/TTR. Other objectives were achieved Sandia-wide and, therefore, apply to SNL/TTR.

5.2.2 Sustainability Awards in 2024

The DOE Sustainability Performance Division sponsors the DOE Sustainability Awards, which recognize outstanding sustainability contributions by individuals and teams at DOE facilities across the country. The awards celebrate excellence in energy, water, and fleet management projects and practices. Each year, Environmental Management System personnel select nominees from that year's Environmental Excellence Awards winners. In 2024, Sandia personnel had no nominations from the internal Environmental Excellence Awards that met the DOE criteria, and thus had no sustainability awards nominations. While personnel at SNL/TTR are encouraged to participate, no nominations were received in 2024.

5.2.3 Vulnerability Assessment and Resilience Plan

In fiscal year 2022, Sandia personnel completed a vulnerability assessment and resilience plan focused on site infrastructure. The plan assessed potential changes in long-term weather conditions by the year 2050 and the natural hazards that could result from such changes (Table 5-17). The following natural hazards were projected to be "almost certain" at SNL/TTR: drought, heat wave, riverine flooding, increase in the mean number of days with a maximum temperature greater than or equal to 95°F, and increase in winter weather.

Table 5-17. Natural hazards and projected annual likelihood and frequencies at SNL/TTR

Regional Hazards Impacting Site Infrastructure	Hazard Description	Current Hazard Likelihood	Projected Effect	Projected Hazard Likelihood
Cold wave	A three-day period where the temperatures do not get above 32°F	Anticipated	No change	Anticipated
Strong wind	Wind gusts that are greater than or equal to 58 miles per hour; this includes thunderstorm and non-thunderstorm winds	Anticipated	No change	Anticipated
Drought		Almost certain	Increase	Almost certain
Wildfire	Wildfires where response is needed for fires greater than 100 acres	Extremely Unlikely	Increase	Unlikely
Heat wave	A three-day period where the average high is greater than or equal to 100°F	Likely	Increase	Almost certain
Precipitation	For arid locations, a 1-inch day is 10 to 20 percent of annual rainfall	Anticipated	Increase	Likely
Riverine flooding	Streams and rivers exceed the capacity of their natural or constructed channels to accommodate water flow	Likely	Increase	Almost certain
Other	Mean number of days with a minimum temperature below 32°F	Almost certain	Decrease	Likely
Other	Mean number of days with a maximum temperature greater than or equal to 95°F	Almost certain	Increase	Almost certain

Regional Hazards Impacting Site Infrastructure	Hazard Description	Current Hazard Likelihood	Projected Effect	Projected Hazard Likelihood
Winter weather		Almost certain	No change	Almost certain

The vulnerability assessment and resilience plan also evaluated risks posed by the potential natural hazards and recommends solutions to increase resilience at SNL/TTR. Details on natural hazard risks by asset and infrastructure type at SNL/TTR can be found in Appendix C. Table 5-18 displays the resilience solution portfolio identified in the plan. These solutions are focused on addressing resilience planning gaps for extreme temperatures, increased precipitation and flooding, and increased winds. The next revision to the site infrastructure vulnerability assessment and resilience plan is due in September 2026.

Table 5-18. Resilience solutions portfolio for SNL/TTR

Solution	Hazards Addressed	Priority Rank (High, Medium, or Low)	Implementation Status[a]
Install high-efficiency redundant heating, ventilation, and air-conditioning systems	Rise in temperature, drop in temperature	High	Identified
Inspect, repair, and replace roofs	Precipitation, strong winds	High	Identified
Change the grade of the area surrounding the generator building	Precipitation, flooding	High	Identified
Review road systems and flooding pathways	Flooding, rise in temperature, drop in temperature	Medium	Identified
Upgrade telecommunications and IT systems (install underground lines where feasible)	Drop in temperature, rise in temperature, strong winds	Low	Identified
Upgrade the electrical infrastructure	Drop in temperature, rise in temperature, strong winds	High	Identified

[a] Implementation status is defined per the DOE Sustainability Dashboard as follows: identified = needs reliable estimates; funded = funds authorized; operational = in place and fully functional (DOE n.d.).

5.3 Environmental Performance

Environmental performance is measured for all Sandia locations as progress toward achieving site environmental objectives, meeting or exceeding compliance, and contributing to corporate and contract performance goals. Results are tracked and reported internally through the ES&H Assurance Dashboard, the management review process, and management reports.

Additionally, criteria for Sandia's overall performance evaluation in 2024 were set forth in the *Fiscal Year 2024 DOE/NNSA Strategic Performance Evaluation Measurement Plan (PEMP)* (DOE/NNSA/SFO 2024). Subsequently, the DOE/NNSA Sandia Field Office prepared the *FY2024 Performance Evaluation Summary* report (DOE/NNSA/SFO 2024), assessing the management and operating contractor's performance, including environment, health, and safety for October 1, 2023, through September 30, 2024. The performance evaluation is the annual DOE/NNSA report card that ascribes a rating for five performance goals and an overall rating. Sandia received a rating of "excellent" in the following three goals: Mission

Delivery: Global Nuclear Security; Mission Innovation: Advancing Science and Technology; and Mission Leadership. A rating of "very good" was received for all Sandia locations in the two remaining categories: Mission Delivery: Nuclear Weapons, and Mission Enablement. ES&H compliance is evaluated under the Mission Enablement goal; this goal includes the objective of delivering effective, efficient, and responsive ES&H quality.

Sandia received an overall rating of "excellent" for fiscal year 2024. This was achieved by meeting overall cost, schedule, and technical performance requirements with accomplishments that significantly outweighed issues.

5.3.1 Audits, Appraisals, and Inspections

Sandia environmental programs are subjected to routine audits, appraisals, inspections, and verifications by external agencies and authorities. The Sandia internal audit group also conducts assessments, including reviews of the implementation of applicable policies, processes, or procedures; evaluations of corrective action validation assessments; and surveillances and walkthroughs. Self-assessments evaluate performance and compliance and identify deficiencies and opportunities for improvement as well as noteworthy practices and lessons learned.

5.3.2 ES&H Operating Experience and Lesson Share Program

Sandia corporate Lessons Learned Program personnel and ES&H Operating Experience and Lesson Share Program personnel develop and share lessons learned throughout Sandia in accordance with the DOE O 210.2A, *DOE Corporate Operating Experience Program* (DOE O 210.2A 2011), purpose and objectives. Lessons learned summarize ES&H events or issues and associated key lessons, presenting the information as thought-provoking statements and questions to promote learning and facilitate dialogues among workers.

E&SH Operating Experience and Lesson Share Program personnel champion the creation of lesson share materials by ES&H Assurance personnel and other staff interested in identifying and communicating lessons learned from ES&H events or issues. All lesson share materials are made available to Sandia personnel through multiple internal databases and websites. Selected lessons learned materials are also shared through tier meetings and *Sandia Daily News* emails. Lessons Learned and ES&H Minutes are available on Sandia's internal LiveSafe website, a digital storehouse for ES&H information and resources that help Sandia personnel live safe and healthy lives. Environmentally focused ES&H Minutes in fiscal year 2024 included lessons focused on spill reporting and wildlife interactions.

5.3.3 Occurrence Reporting

Under DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (DOE O 232.2A, Chg 1 (MinChg) 2017), *occurrences* are defined as "events or conditions that adversely affect, or may adversely affect, DOE (including the National Nuclear Security Administration) or contractor personnel, the public, property, the environment, or the DOE mission." Events or conditions meeting the criteria thresholds identified in this order are occurrences. Whereas some environmental releases may not meet DOE O 232.2A Chg 1 (MinChg) reporting thresholds, they may still be reportable to outside agencies.

Occurrences that met DOE O 232.2A Chg 1 (MinChg) criteria were entered into the DOE Occurrence Reporting and Processing System database (DOE O 232.2A, Chg 1 (MinChg) 2017). For this ASER, the Occurrence Reporting and Processing System database was queried for occurrences in the following reporting criteria groups (as defined by DOE O 232.2A Chg 1 [MinChg]):

- Group 5, Environmental
- Group 9, Noncompliance Notifications
- Group 10, Management Concerns and Issues (with identified environmental impact)
- Any occurrence that involved a Sandia environmental program

—Environmental Reporting 2024: Environmental Performance

Audits, Appraisals, and Inspections

On October 22, 2024, the NDEP Bureau of Sustainable Materials Management conducted a RCRA hazardous waste compliance inspection of the facilities at SNL/TTR. The auditor noted that the hazardous waste operations appeared to be in compliance with all applicable federal and state hazardous waste regulations.

Occurrence Reporting

In 2024, one occurrence at SNL/TTR met the query criteria for reporting in the ASER (Table 5-19).

Table 5-19. Occurrence reports per DOE O 232.2A, 2024

Reporting Criteria	Discovery Date	Report Level	Report Number and Title	Response
Group 5 – Environmental A(2) - Any release (onsite or offsite) of a pollutant from a DOE facility that is above levels or limits specified by outside agencies in a permit, license, or equivalent authorization, when reporting is required in a format other than routine periodic reports.	July 30, 2024	Informational	NA--SS-SNL-2000-2024-0003, *TTR Jet Fuel Release*	The spill was reported to the NDEP Bureau of Federal Facilities on July 29, 2024. A report of remediation and soil removal activities and a request for site closure was made to NDEP on August 8, 2024. NDEP accepted this request, and DOE/NNSA issued a letter requiring no further action at the site on January 13, 2025. For more details, see Section 0.

5.4 Environmental Permit Status

Environmental permits for SNL/TTR include those for hazardous materials storage, public water supply, stormwater, RCRA, and air quality compliance. The State of Nevada issues permits for these activities directly to DOE/NNSA, and Navarro Research and Engineering administers them on behalf of the Sandia management and operating contractor. Sandia and Navarro Research and Engineering ensure that all permit conditions are met.

—Environmental Reporting 2024: Environmental Permit Status

Table 5-20 lists permits and registrations in effect at SNL/TTR in 2024.

Table 5-20. Environmental permits, 2024

Permit Type	Permit Number	Issue Date	Expiration Date	Comments
Air Quality				
Class II Air Quality Operation Permit	• AP8733-0680.05 • FIN A0025, Air Case 10804 and 10805	• July 23, 2021, issuance of revision • January 4, 2024, Amended	July 23, 2026	• Welding operation • Carpenter area • Paint booth • Generators (five logged systems) • Surface area disturbance (less than five acres) • Portable soil sorting system
Hazardous Waste (Nevada State Fire Marshal)				
Hazardous Materials Permit	• FDID Number: 13007 • Permit Number: 120806	February 28, 2024	February 28, 2025	State of Nevada
Hazardous Waste (RCRA)				
Hazardous Waste Generator	NV1890011991[a]	January 7, 1993	Indefinite	State of Nevada
Natural Resources				
Special Purpose for Bird Live-Trapping and Relocation	MBPER9619966	March 24, 2024	March 23, 2025	United States Fish and Wildlife Service
Production Well (Drinking Water)				
Permit to Operate a Treatment Plant	NY-3014-TP11-12NTNC	September 29, 2024	September 30, 2025	State of Nevada
Production Well 6	NY-3014-12-NTNC[b]	September 29, 2024	September 30, 2025	State of Nevada
Water Conservation Plan	Reviewed and approved by Nevada Department of Conservation and Natural Resources, Division of Water Resources	February 17, 2021	February 17, 2026	State of Nevada Required by NRS540.131

[a] Generator identification number (not a permit number).
[b] The State of Nevada renews the permit for Production Well 6 (NV-3014-12NTNC) annually.
FDID = Fire Department Identification

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Chapter 6. Quality Assurance

Pronghorn (*Antilocapra americana*) at TTR (Photo by Jim Galli)

OVERVIEW ▪ Personnel in various programs collect environmental samples, which are analyzed for radiological and nonradiological constituents. Quality control samples are sent to contract laboratories to ensure that the samples meet statistically established control criteria for monitoring environmental data.

Sandia personnel are responsible for implementing quality assurance for operations—as specified in ISO 9001, *Quality Management Systems–Requirements* (ISO 9001:2015 2015); DOE O 414.1D Change 2 (LtdChg), *Quality Assurance*, Attachment 1, "Contractor Requirements Document" (DOE O 414.1D, Change 2 (LtdChg) 2020); 10 CFR 830, *Nuclear Safety Management*, Subpart A, "Quality Assurance Requirements" (10 CFR 830 2016) and QA001, *Quality Assurance Policy* (Sandia 2024)—via policy statements and processes, and by executing the actions specified in those policies and processes. Sandia management is responsible for ensuring the quality of the company's products; for assessing its operations, programs, projects, and business systems; and for identifying deficiencies and effecting continuous improvements. This chapter focuses on how quality assurance is implemented for environmental monitoring data.

6.1 Introduction

Quality assurance refers to guidelines, criteria, specifications, and methods for conducting work in a way that generates data of a desired quality, whereas *quality control* refers to the means employed to test and document the quality of data.

The quality of environmental monitoring data is assured as required by DOE O 414.1D Chg 2 (LtdChg) *Quality Assurance* (DOE O 414.1D, Change 2 (LtdChg) 2020).

Environmental monitoring (which includes sampling) is conducted in accordance with program-specific sampling and analysis plans, work plans, or quality assurance plans. These plans meet applicable federal, state, and local requirements for conducting sampling and analysis activities, including procedures for collecting samples, preserving and handling samples, controlling samples, controlling laboratory quality, setting required limits of detection, controlling field quality, ensuring health and safety, setting schedules and frequency for sampling, reviewing data, determining data acceptability, and reporting.

Environmental samples for various programs are collected and submitted for analysis of radiological and nonradiological constituents on a calendar-year basis unless noted otherwise.

6.2 Sample Management Office

The Sample Management Office is located at SNL/NM. The Sample Management Office's mission is to provide centralized management of samples and analyses performed by contract laboratories, and its primary quality assurance objective is to ensure that data are of adequate technical quality and content to meet programmatic data quality objectives.

Sample Management Office personnel are responsible for quality assurance and quality control of samples relinquished from field team members. They also provide guidance and sample management support for field activities. However, program leads are responsible for each program's overall adherence to, and compliance with, any sampling and analysis activity performed.

In some instances, personnel at SNL/TTR ship samples directly to off-site laboratories rather than to the Sample Management Office at SNL/NM. For example, Terrestrial Surveillance Program soil samples collected annually are shipped from SNL/TTR directly to an off-site laboratory. Sample Management Office personnel are still responsible for processing data from these samples.

6.2.1 Sample Handling and Analyses

Sample Management Office activities in 2024 included (1) packaging and shipping samples and tracking their delivery to off-site contracted laboratories, and (2) reviewing all data deliverables for compliance with contract and data quality requirements.

In 2024, Sample Management Office personnel processed 131 samples in support of the Terrestrial Surveillance Program. Of the 131 samples, 7 were submitted as field and analytical quality control samples to assist with data validation and decision-making.

During 2024, General Engineering Laboratories in Charleston, South Carolina, was employed to analyze soil samples, and Landauer, Inc., in Glenwood, Illinois, was employed to analyze environmental dosimeters.

6.2.2 Contract Laboratory Selection

All off-site commercial laboratories under contract are selected based on performance objectives, licenses and accreditations, and appraisals (pre-award assessments) as described in the *Quality Assurance Project Plan for the Sample Management Office* (Sandia 2022). All laboratories

must employ EPA test procedures whenever possible. When these are not available, other suitable and validated test procedures are applied. Laboratory instruments must be calibrated in accordance with established procedures, methods, and the *Sandia National Laboratories/New Mexico Sample Management Office Statement of Work for Analytical Laboratories* (Sandia 2023). All calibrations and detection limits must be verified before analyzing samples and reporting data. Once a laboratory has passed an initial appraisal and has been awarded a contract, Sample Management Office personnel are responsible for monitoring laboratory performance continuously to ensure that the laboratory meets its contractual requirements during annual audits.

Contract laboratories perform work in compliance with the *Sandia National Laboratories/New Mexico Sample Management Office Statement of Work for Analytical Laboratories* (Sandia 2023). Contract laboratories are required to participate in applicable DOE and EPA programs for blind audit check sampling to monitor the overall accuracy of analyses routinely performed on samples from SNL/TTR. These contract laboratories are required to participate in the DOE Mixed Analyte Performance Evaluation Program. Contract laboratories also participate in commercial vendor programs designed to meet the evaluation requirements given in the proficiency testing section (Chapter II) of the National Environmental Laboratory Accreditation Conference Standard (NELAC Institute, The 2009).

6.3 Quality Assurance Activities

The quality assurance project plan for the Sample Management Office addresses each of the ten DOE O 414.1D criteria and documents those activities vital to assuring the quality of work performed.

6.3.1 Laboratory Quality Assurance Assessments and Validation

Sample Management Office personnel participate in third-party independent assessments and validation of National Environmental Laboratory Accreditation Conference-approved laboratories used by program and project personnel. Specific checks were made for documentation completeness, proper equipment calibration, proper laboratory practices, and batch quality control data.

6.3.2 Department of Energy Consolidated Audit Program

The DOE Consolidated Audit Program (DOECAP) seeks to reduce DOE environmental program management risk and assist DOE Program Offices and contractors. This is done by conducting audits and assessments that are designed to assure commercial environmental analytical laboratories and treatment, storage, and disposal facilities (TSDFs) used by DOE entities are operating in compliance with applicable federal, state, and local environmental, safety, health, and transportation regulations.

6.3.2.1 DOECAP Laboratory Audits

The DOECAP program ensures that subcontracted commercial analytical environmental laboratories are audited on their ability to provide data results that are valid, reliable, and defensible. Commercial laboratories are to use the assessment process provided by one of four approved third-party accrediting bodies unless separate arrangements are made with

DOECAP. The accrediting bodies conduct assessments using the requirements of the *DOD/DOE Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* (DoD/DOE, 2023), which guides DOECAP audits.

In 2024, DOECAP and/or the accrediting bodies conducted assessments at six contracted laboratories, including one that processed samples from SNL/TTR, using *Quality Systems Manual* requirements. The audit reports, laboratory responses, and closure letters are all posted on and tracked through the DOECAP website. Decisions regarding sample distribution to contract laboratories were based on audit information, including corrective actions if needed.

No findings for SNL/TTR samples were issued in 2024 in DOECAP assessment reports or other applicable DOE programs. A DOECAP finding would be a factual statement from the audit documenting deviation from a requirement (regulatory or procedural).

6.3.2.2 DOECAP Treatment, Storage, and Disposal Facility Audits

Navarro Research and Engineering personnel send waste off-site for treatment and/or disposal to contracted commercial waste vendor facilities. Wastes received at these facilities are expected to be managed in a regulatory compliant manner and in conformance with DOE procurement contract stipulations and requirements. The following list identifies recycling facilities and TSDFs used by personnel at SNL/TTR in 2024:

- US Ecology (Beatty NV)
  Highway 95, 11 Mi. S of Beatty
  Beatty, NV 89003
- Veolia ES Technical Solutions LLC
  5736 West Jefferson
  Phoenix, AZ 85043
- Veolia ES Technical Solutions LLC
  9131 East 96th Avenue
  Henderson, CO 80640
- Stericycle
  1920 1st Street NW
  Albuquerque, NM 87102
- Steve's Auto
  368 N. Main St
  Tonopah, NV 89049
  Note: Automotive batteries recycler
- Desert Green Disposal and Industrial LLC
  142 Bogy Aly
  Round Mountain, NV 89045
  Note: Scrap metals recycler
- Luna's Tire Recycling
  4830 E. Cartier Ave.
  Las Vegas, NV 89115
  Note: Tire recycler

The DOECAP TSDF Audit Program conducts audits of commercial TSDFs while representing the DOE National Laboratory Complex to evaluate the audited facility's ability to treat, store, and dispose of DOE waste in a manner that is protective of human health and the environment. The audits assess the management systems and operational activities to verify the facility's ability to meet the applicable requirements for storing, handling, transporting, processing, and final disposition of DOE waste and material.

None of the TSDFs listed in Section 6.3.2.2 were subject to DOECAP auditing in 2024.

6.4 Quality Control Activities

Quality control typically consists of additional data analyses to test the accuracy, precision, and representativeness of the data generated.

6.4.1 Quality Control Sampling

Project-specified quality control samples are submitted to contract laboratories in order to meet project data quality objectives and sampling and analysis plan requirements. Various field quality control samples may be collected to assess the data quality and final usability. Errors, some of which are unavoidable, can be introduced into the sampling process, including potential contamination of samples in the field or during transportation. In addition, sample results can be affected by the variability present at each sample location.

With each sample batch, laboratory quality control samples are prepared concurrently at defined frequencies and analyzed in accordance with established methods. Contract laboratory personnel determine the analytical accuracy, precision, contamination, and matrix effects associated with each analytical measurement.

Quality control sample results are compared either to control criteria that is established statistically or to prescribed acceptance control limits. Analytical results generated concurrently with quality control sample results within established limits are considered acceptable. If quality control analytical results exceed control limits, the results are qualified and corrective action is initiated if warranted as defined in the *Sandia National Laboratories/ New Mexico Sample Management Office Statement of Work for Analytical Laboratories* (Sandia 2023). Reanalysis is then performed for samples in the analytical batch as specified in the statement of work and contract laboratory procedures. Quality control sample summaries are included in analytical reports prepared by contract laboratory personnel.

Environmental dosimetry is provided by optically stimulated luminescence technology. Dosimeters are issued and analyzed by an accredited off-site laboratory and measure X-ray, gamma, and beta radiation. Quality control dosimeters are used, and standard laboratory procedures are followed for processing all dosimeters.

6.4.2 Data Validation

Sample collection, analysis request and chain of custody documentation, and measurement data are reviewed and validated for each sample collected. Analytical data reported by contract laboratories are reviewed to assess laboratory and field precision, accuracy, completeness, representativeness, and comparability with respect to each program's method of compliance and data quality objectives.

The data are validated at a minimum of three levels, as follows:

- The analytical laboratory validates data according to the laboratory's quality assurance plan, standard operating procedures, and client-specific requirements.
- Sample Management Office personnel review the analytical reports, corresponding sample collection, and analysis request and chain of custody documentation for completeness and laboratory contract compliance.

- A program lead reviews program objectives, regulatory compliance, and project-specific data quality requirements, and then makes the final decision regarding the data's usability and reporting.

In addition to the three minimum validation levels, a technical assistance contractor may validate analytical data under direction of Sample Management Office personnel in accordance with applicable procedures and requirements. The purpose is to identify, through evaluation of supporting documentation, those monitoring results that do not meet the expected precision and accuracy of an analytical method. Terrestrial Surveillance Program data are validated by a technical assistance contractor providing this additional level of quality assurance.

6.5 Records Management

All analytical data packages, analysis request and chain of custody documents, and data validation reports are submitted to a Sandia record depository for cataloging and storage in accordance with internal procedures, DOE requirements, and the document control requirements of ISO 9001, *Quality Management* (ISO 9001:2015 2015), and ISO 14001, *Environmental Management Systems* (ISO 14001:2015 2015).

Appendix A. Terrestrial Surveillance Analytical Results in 2024

Evening primrose (*Oenothera* sp.)

Table A-1. Radiological results in soil, 2024

Location	Analyte	Activity (pCi/g)	Total Propagated Uncertainty (pCi/g)	Minimum Detectable Activity (pCi/g)	Critical Level (pCi/g)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-06	Actinium-228	2.22	±0.281	0.0912	0.0439		None	SA	DOE HASL 300
P-06	Americium-241	0.103	±0.182	0.191	0.0941	U	BD	SA	DOE HASL 300
P-06	Cesium-137	0.53	±0.0531	0.0255	0.0124		None	SA	DOE HASL 300
P-06	Uranium-235	0.24	±0.151	0.139	0.0685		J	SA	DOE HASL 300
P-06	Uranium-238	0.792	±1.56	1.33	0.655	U	BD	SA	DOE HASL 300
P-08	Actinium-228	1.67	±0.227	0.0812	0.0386		None	SA	DOE HASL 300
P-08	Americium-241	0.0385	±0.0852	0.164	0.0803	U	BD	SA	DOE HASL 300
P-08	Cesium-137	0.068	±0.0258	0.0241	0.0116		J	SA	DOE HASL 300
P-08	Uranium-235	0.107	±0.136	0.129	0.0632	U	BD	SA	DOE HASL 300
P-08	Uranium-238	0.904	±1.42	1.26	0.615	U	BD	SA	DOE HASL 300
P-12	Actinium-228	2.28	±0.287	0.0842	0.0404		None	SA	DOE HASL 300
P-12	Actinium-228	2.14	±0.336	0.109	0.052		None	DU	DOE HASL 300
P-12	Americium-241	0.00336	±0.0217	0.0366	0.0181	U	BD	SA	DOE HASL 300
P-12	Americium-241	0.00262	±0.0168	0.0299	0.0148	U	BD	DU	DOE HASL 300
P-12	Cesium-137	0.0751	±0.0267	0.0242	0.0117		None	SA	DOE HASL 300
P-12	Cesium-137	0.127	±0.047	0.0281	0.0136		None	DU	DOE HASL 300
P-12	Uranium-235	0.123	±0.103	0.122	0.0597		J	SA	DOE HASL 300
P-12	Uranium-235	0.149	±0.133	0.105	0.0515		J	DU	DOE HASL 300
P-12	Uranium-238	1.62	±0.632	0.38	0.188		None	SA	DOE HASL 300
P-12	Uranium-238	1.69	±0.577	0.293	0.144		None	DU	DOE HASL 300
P-34	Actinium-228	2.34	±0.314	0.0764	0.0371		None	SA	DOE HASL 300
P-34	Americium-241	-0.00565	±0.131	0.222	0.11	U	BD	SA	DOE HASL 300
P-34	Cesium-137	0.11	±0.0293	0.0225	0.011		None	SA	DOE HASL 300
P-34	Uranium-235	-0.0513	±0.103	0.157	0.0776	U	BD	SA	DOE HASL 300
P-34	Uranium-238	1.7	±1.84	1.65	0.815		J	SA	DOE HASL 300
P-35	Actinium-228	2.14	±0.255	0.11	0.0529		None	SA	DOE HASL 300
P-35	Americium-241	0.0541	±0.0984	0.0839	0.0412	U	BD	SA	DOE HASL 300
P-35	Cesium-137	0.376	±0.0487	0.0265	0.0127		None	SA	DOE HASL 300

Location	Analyte	Activity (pCi/g)	Total Propagated Uncertainty (pCi/g)	Minimum Detectable Activity (pCi/g)	Critical Level (pCi/g)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-35	Uranium-235	0.0427	±0.0837	0.137	0.0672	U	BD	SA	DOE HASL 300
P-35	Uranium-238	1.57	±0.938	0.745	0.367		J	SA	DOE HASL 300
P-36	Actinium-228	1.57	±0.248	0.104	0.0501		None	SA	DOE HASL 300
P-36	Americium-241	0.034	±0.0881	0.15	0.0736	U	BD	SA	DOE HASL 300
P-36	Cesium-137	0.104	±0.0349	0.0287	0.0138		None	SA	DOE HASL 300
P-36	Uranium-235	0.0599	±0.132	0.146	0.0719	U	BD	SA	DOE HASL 300
P-36	Uranium-238	0.585	±1.66	1.19	0.586	U	BD	SA	DOE HASL 300
P-37	Actinium-228	1.68	±0.216	0.0756	0.0362		None	SA	DOE HASL 300
P-37	Americium-241	0.148	±0.128	0.0911	0.0446		J	SA	DOE HASL 300
P-37	Cesium-137	0.02	±0.0165	0.0236	0.0114	U	BD	SA	DOE HASL 300
P-37	Plutonium-238	0.00014	±0.00531	0.0222	0.00957	U	BD	SA	DOE HASL 300
P-37	Plutonium-239/240	0.00135	±0.00652	0.0199	0.0084	U	BD	SA	DOE HASL 300
P-37	Uranium-235	0.115	±0.115	0.118	0.0581	U	BD	SA	DOE HASL 300
P-37	Uranium-238	1.03	±0.913	0.811	0.398		J	SA	DOE HASL 300
S-02	Actinium-228	2.09	±0.316	0.0916	0.0439		None	SA	DOE HASL 300
S-02	Americium-241	0.0259	±0.0721	0.121	0.0596	U	BD	SA	DOE HASL 300
S-02	Cesium-137	0.135	±0.0357	0.0262	0.0127		None	SA	DOE HASL 300
S-02	Uranium-235	-0.0615	±0.0952	0.154	0.0756	U	BD	SA	DOE HASL 300
S-02	Uranium-238	1.99	±1.45	1.03	0.507		J	SA	DOE HASL 300
S-03	Actinium-228	2.06	±0.321	0.0973	0.0465		None	SA	DOE HASL 300
S-03	Actinium-228	2.34	±0.335	0.0903	0.0437		None	DU	DOE HASL 300
S-03	Americium-241	0.14	±0.0872	0.0758	0.0372		J	SA	DOE HASL 300
S-03	Americium-241	0.0238	±0.0937	0.166	0.0817	U	BD	DU	DOE HASL 300
S-03	Cesium-137	0.26	±0.0362	0.0259	0.0125		None	SA	DOE HASL 300
S-03	Cesium-137	0.152	±0.0316	0.0252	0.0123		None	DU	DOE HASL 300
S-03	Plutonium-238	0.0183	±0.0131	0.0249	0.0107	U	BD	SA	DOE HASL 300
S-03	Plutonium-239/240	0.866	±0.0945	0.0222	0.00939		None	SA	DOE HASL 300
S-03	Uranium-235	0.144	±0.126	0.135	0.0659		J	SA	DOE HASL 300
S-03	Uranium-235	0.115	±0.183	0.151	0.0741	U	BD	DU	DOE HASL 300

Location	Analyte	Activity (pCi/g)	Total Propagated Uncertainty (pCi/g)	Minimum Detectable Activity (pCi/g)	Critical Level (pCi/g)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-03	Uranium-238	1.5	±0.794	0.65	0.319		J	SA	DOE HASL 300
S-03	Uranium-238	2.67	±2.04	1.28	0.627		J	DU	DOE HASL 300
S-04	Actinium-228	1.94	±0.318	0.119	0.0565		None	SA	DOE HASL 300
S-04	Americium-241	0.293	±0.133	0.141	0.0688		J	SA	DOE HASL 300
S-04	Cesium-137	0.156	±0.0388	0.0322	0.0154		None	SA	DOE HASL 300
S-04	Plutonium-238	0.00093	±0.0123	0.0248	0.0107	U	BD	SA	DOE HASL 300
S-04	Plutonium-239/240	0.165	±0.0318	0.0222	0.00937		None	SA	DOE HASL 300
S-04	Uranium-235	-0.113	±0.112	0.18	0.0882	U	BD	SA	DOE HASL 300
S-04	Uranium-238	1.04	±1.28	1.24	0.608	U	BD	SA	DOE HASL 300
S-10	Actinium-228	2.04	±0.295	0.108	0.0515		None	SA	DOE HASL 300
S-10	Americium-241	0.000285	±0.0548	0.0919	0.0451	U	BD	SA	DOE HASL 300
S-10	Cesium-137	0.0731	±0.0248	0.0305	0.0147		J	SA	DOE HASL 300
S-10	Uranium-235	0.0777	±0.178	0.152	0.0745	U	BD	SA	DOE HASL 300
S-10	Uranium-238	1.92	±1.22	0.805	0.395		J	SA	DOE HASL 300
S-38	Actinium-228	2.11	±0.318	0.0893	0.0431		None	SA	DOE HASL 300
S-38	Americium-241	-0.0055	±0.0155	0.0233	0.0115	U	BD	SA	DOE HASL 300
S-38	Cesium-137	0.122	±0.0276	0.0237	0.0115		None	SA	DOE HASL 300
S-38	Uranium-235	0.0995	±0.096	0.0821	0.0404		J	SA	DOE HASL 300
S-38	Uranium-238	1.2	±0.396	0.23	0.114		None	SA	DOE HASL 300
S-39	Actinium-228	2.29	±0.268	0.099	0.0475		None	SA	DOE HASL 300
S-39	Americium-241	0.12	±0.0894	0.0807	0.0397		J	SA	DOE HASL 300
S-39	Cesium-137	0.294	±0.04	0.0256	0.0123		None	SA	DOE HASL 300
S-39	Plutonium-238	0.0135	±0.00925	0.0238	0.0102	U	BD	SA	DOE HASL 300
S-39	Plutonium-239/240	0.604	±0.0711	0.0213	0.00898		None	SA	DOE HASL 300
S-39	Uranium-235	0.0468	±0.13	0.128	0.0629	U	BD	SA	DOE HASL 300
S-39	Uranium-238	1.51	±0.866	0.724	0.357		J	SA	DOE HASL 300
S-40	Actinium-228	1.79	±0.259	0.102	0.0488		None	SA	DOE HASL 300
S-40	Americium-241	0.0517	±0.0687	0.111	0.0547	U	BD	SA	DOE HASL 300
S-40	Cesium-137	0.0585	±0.0297	0.0262	0.0126		J	SA	DOE HASL 300

Location	Analyte	Activity (pCi/g)	Total Propagated Uncertainty (pCi/g)	Minimum Detectable Activity (pCi/g)	Critical Level (pCi/g)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-40	Uranium-235	0.114	±0.137	0.139	0.0682	U	BD	SA	DOE HASL 300
S-40	Uranium-238	2.14	±1.2	0.881	0.433		J	SA	DOE HASL 300
S-42	Actinium-228	1.81	±0.263	0.0926	0.0446		None	SA	DOE HASL 300
S-42	Americium-241	-0.0159	±0.157	0.259	0.128	U	BD	SA	DOE HASL 300
S-42	Cesium-137	0.212	±0.0462	0.0248	0.012		None	SA	DOE HASL 300
S-42	Uranium-235	0.0976	±0.168	0.186	0.0915	U	BD	SA	DOE HASL 300
S-42	Uranium-238	1.8	±2.24	1.9	0.937	U	BD	SA	DOE HASL 300
S-43	Actinium-228	1.6	±0.285	0.105	0.0503		None	SA	DOE HASL 300
S-43	Americium-241	0.0329	±0.045	0.0748	0.0367	U	BD	SA	DOE HASL 300
S-43	Cesium-137	0.0549	±0.0307	0.0273	0.0131		J	SA	DOE HASL 300
S-43	Uranium-235	0.158	±0.153	0.136	0.0667		J	SA	DOE HASL 300
S-43	Uranium-238	2.11	±1.04	0.664	0.326		None	SA	DOE HASL 300
S-44	Actinium-228	1.77	±0.269	0.0976	0.0471		None	SA	DOE HASL 300
S-44	Americium-241	-0.0201	±0.0924	0.158	0.0773	U	BD	SA	DOE HASL 300
S-44	Cesium-137	0.0269	±0.0257	0.0259	0.0126		J	SA	DOE HASL 300
S-44	Uranium-235	0.0484	±0.154	0.142	0.0695	U	BD	SA	DOE HASL 300
S-44	Uranium-238	1.52	±1.57	1.2	0.588		J	SA	DOE HASL 300
S-45	Actinium-228	1.97	±0.313	0.101	0.048		None	SA	DOE HASL 300
S-45	Americium-241	0.0104	±0.0797	0.137	0.0675	U	BD	SA	DOE HASL 300
S-45	Cesium-137	0.0156	±0.0369	0.028	0.0134	U	BD	SA	DOE HASL 300
S-45	Uranium-235	0.21	±0.181	0.166	0.0814		J	SA	DOE HASL 300
S-45	Uranium-238	2.46	±1.71	1.12	0.552		J	SA	DOE HASL 300
S-46	Actinium-228	1.91	±0.252	0.0984	0.0471		None	SA	DOE HASL 300
S-46	Americium-241	-0.017	±0.0667	0.119	0.0583	U	BD	SA	DOE HASL 300
S-46	Cesium-137	0.0603	±0.0265	0.0242	0.0116		J	SA	DOE HASL 300
S-46	Uranium-235	0.0403	±0.124	0.132	0.0645	U	BD	SA	DOE HASL 300
S-46	Uranium-238	1.32	±1.24	0.95	0.466		J	SA	DOE HASL 300
S-47	Actinium-228	1.88	±0.3	0.111	0.0533		None	SA	DOE HASL 300
S-47	Americium-241	-0.000969	±0.0159	0.0282	0.0139	U	BD	SA	DOE HASL 300

Location	Analyte	Activity (pCi/g)	Total Propagated Uncertainty (pCi/g)	Minimum Detectable Activity (pCi/g)	Critical Level (pCi/g)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-47	Cesium-137	0.0785	±0.0339	0.0307	0.0149		J	SA	DOE HASL 300
S-47	Uranium-235	0.0914	±0.0787	0.103	0.0508	U	BD	SA	DOE HASL 300
S-47	Uranium-238	1.5	±0.505	0.286	0.141		None	SA	DOE HASL 300
S-49	Actinium-228	2.03	±0.277	0.0961	0.0458		None	SA	DOE HASL 300
S-49	Actinium-228	2.16	±0.293	0.11	0.0526		None	DU	DOE HASL 300
S-49	Americium-241	0.28	±0.25	0.19	0.0931		J	SA	DOE HASL 300
S-49	Americium-241	0.448	±0.206	0.155	0.0762		J	DU	DOE HASL 300
S-49	Cesium-137	0.152	±0.0318	0.0277	0.0133		None	SA	DOE HASL 300
S-49	Cesium-137	0.214	±0.0371	0.0313	0.0151		None	DU	DOE HASL 300
S-49	Plutonium-238	0.00893	±0.00877	0.0245	0.0105	U	BD	SA	DOE HASL 300
S-49	Plutonium-238	0.02	±0.0124	0.033	0.0142	U	BD	DU	DOE HASL 300
S-49	Plutonium-239/240	0.22	±0.0374	0.0219	0.00924		None	SA	DOE HASL 300
S-49	Plutonium-239/240	0.526	±0.0738	0.0295	0.0125		None	DU	DOE HASL 300
S-49	Uranium-235	0.0795	±0.151	0.16	0.0787	U	BD	SA	DOE HASL 300
S-49	Uranium-235	0.0625	±0.172	0.159	0.0779	U	BD	DU	DOE HASL 300
S-49	Uranium-238	1.83	±1.89	1.43	0.701		BD	SA	DOE HASL 300
S-49	Uranium-238	0.889	±1.72	1.25	0.612	U	BD	DU	DOE HASL 300
S-50	Actinium-228	2.22	±0.318	0.0987	0.0477		None	SA	DOE HASL 300
S-50	Americium-241	-0.0354	±0.0908	0.166	0.0811	U	BD	SA	DOE HASL 300
S-50	Cesium-137	0.247	±0.0419	0.0256	0.0124		None	SA	DOE HASL 300
S-50	Uranium-235	0.0902	±0.141	0.147	0.072	U	BD	SA	DOE HASL 300
S-50	Uranium-238	1.54	±1.47	1.29	0.63		J	SA	DOE HASL 300
S-52	Actinium-228	1.98	±0.276	0.101	0.0483		None	SA	DOE HASL 300
S-52	Americium-241	0.0615	±0.0555	0.0914	0.0449	U	BD	SA	DOE HASL 300
S-52	Cesium-137	0.115	±0.0308	0.0283	0.0136		None	SA	DOE HASL 300
S-52	Uranium-235	0.106	±0.141	0.14	0.0687	U	BD	SA	DOE HASL 300
S-52	Uranium-238	0.821	±0.997	0.776	0.381		BD	SA	DOE HASL 300
	Actinium-228	1.71	±0.274	0.107	0.0511		None	SA	DOE HASL 300
S-53	Americium-241	0.0105	±0.0755	0.131	0.0645	U	BD	SA	DOE HASL 300

Location	Analyte	Activity (pCi/g)	Total Propagated Uncertainty (pCi/g)	Minimum Detectable Activity (pCi/g)	Critical Level (pCi/g)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-53	Cesium-137	0.142	±0.0382	0.0288	0.0139		None	SA	DOE HASL 300
S-53	Uranium-235	0.0769	±0.1	0.176	0.0864	U	BD	SA	DOE HASL 300
S-53	Uranium-238	1.64	±1.67	1.12	0.548		BD	SA	DOE HASL 300

[a] Blank cells indicate that the laboratory did not qualify the data.

Laboratory Data Qualifier
U = The analyte was absent or below the method detection limit.

Data Validation Qualifier
BD = The associated value was below the detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated numerical value was an estimated quantity.
None = There was no data validation assigned.

Sample Type
DU = duplicate sample
SA = sample

Analytical Method
HASL 300 (DOE 1997)

Table A-2. Environmental dosimeter measurements, 2024

Location Number	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	Exposure (ambient dose mrem)	Exposure (ambient dose mrem)	Exposure (ambient dose mrem)	Exposure (ambient dose mrem)
P-05	21.8	9.9	20.3	31.2
P-06	22.9	9.7	26.5	21.2
P-07	23.1	10.7	18.3	23.5
P-08	23.7	6.7	23	30.5
P-11	23	10.3	24.3	29.3
P-12	23.3	9.6	21	35.2
S-01	28.2	12.2	20.3	30.5
S-02	25.1	9.5	20.5	32.8
S-03	27	11.8	24.1	30.2
S-04	20.1	12.7	20.8	28.3
S-09	24.1	8.3	19.5	18.5
S-10	24.2	11.6	24.4	27.2
S-13	26.5	13	19.9	30.3
S-14	17.8	7.6	17.2	26.7
S-15	25.2	16.4	24.7	22.9
S-16	20.8	14.3	20	26.9
S-17	21.5	15.3	18.6	20

Table A-3. Nonradiological results in soil, 2024

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-06	Aluminum	11,300	39.2	86.2		J	SA	SW846 3050B/6020B
P-06	Antimony	0.295	0.295	1.79	U	1.79UJ	SA	SW846 3050B/6010D
P-06	Arsenic	4.51	0.291	0.862		None	SA	SW846 3050B/6020B
P-06	Barium	102	0.0862	0.69		J	SA	SW846 3050B/6020B
P-06	Beryllium	0.546	0.0172	0.0862		None	SA	SW846 3050B/6020B
P-06	Cadmium	0.268	0.0172	0.172		None	SA	SW846 3050B/6020B
P-06	Calcium	17,800	116	345		None	SA	SW846 3050B/6020B
P-06	Chromium	5.42	0.172	0.517		None	SA	SW846 3050B/6020B
P-06	Cobalt	2.89	0.0517	0.172		None	SA	SW846 3050B/6020B
P-06	Copper	5.45	0.0569	0.345		None	SA	SW846 3050B/6020B
P-06	Iron	7,410	5.69	17.2		J	SA	SW846 3050B/6020B
P-06	Lead	10.2	0.0862	0.345	N	J	SA	SW846 3050B/6020B
P-06	Magnesium	4,640	1.72	5.17		None	SA	SW846 3050B/6020B
P-06	Manganese	312	1.72	8.62		J	SA	SW846 3050B/6020B
P-06	Nickel	4.7	0.0862	0.345	B	None	SA	SW846 3050B/6020B
P-06	Potassium	3,740	13.8	51.7		None	SA	SW846 3050B/6020B
P-06	Selenium	0.692	0.31	0.862	JN	J	SA	SW846 3050B/6020B
P-06	Silver	0.0893	0.0893	0.446	U	None	SA	SW846 3050B/6010D
P-06	Sodium	220	13.8	43.1		None	SA	SW846 3050B/6020B
P-06	Thallium	0.148	0.121	0.345	J	None	SA	SW846 3050B/6020B
P-06	Uranium	0.585	0.0114	0.0345		None	SA	SW846 3050B/6020B
P-06	Vanadium	12	0.259	3.45	N	J	SA	SW846 3050B/6020B
P-06	Zinc	31.3	0.69	3.45		J	SA	SW846 3050B/6020B
P-08	Aluminum	4,890	4.07	8.94		J	SA	SW846 3050B/6020B
P-08	Antimony	0.284	0.284	1.72	U	1.72UJ	SA	SW846 3050B/6010D
P-08	Arsenic	1.47	0.302	0.894		None	SA	SW846 3050B/6020B
P-08	Barium	69.9	0.0894	0.716		J	SA	SW846 3050B/6020B
P-08	Beryllium	0.232	0.0179	0.0894		None	SA	SW846 3050B/6020B
P-08	Cadmium	0.0846	0.0179	0.179	J	None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-08	Calcium	1,570	12	35.8		None	SA	SW846 3050B/6020B
P-08	Chromium	2.53	0.179	0.537		None	SA	SW846 3050B/6020B
P-08	Cobalt	1.29	0.0537	0.179		None	SA	SW846 3050B/6020B
P-08	Copper	2.9	0.059	0.358		None	SA	SW846 3050B/6020B
P-08	Iron	4,510	5.9	17.9		J	SA	SW846 3050B/6020B
P-08	Lead	4.24	0.0894	0.358	N	J	SA	SW846 3050B/6020B
P-08	Magnesium	1,460	1.79	5.37		None	SA	SW846 3050B/6020B
P-08	Manganese	123	0.179	0.894		J	SA	SW846 3050B/6020B
P-08	Nickel	2	0.0894	0.358	B	None	SA	SW846 3050B/6020B
P-08	Potassium	1,840	14.3	53.7		None	SA	SW846 3050B/6020B
P-08	Selenium	0.449	0.322	0.894	JN	J	SA	SW846 3050B/6020B
P-08	Silver	0.0859	0.0859	0.43	U	None	SA	SW846 3050B/6010D
P-08	Sodium	129	14.3	44.7		None	SA	SW846 3050B/6020B
P-08	Thallium	0.125	0.125	0.358	U	None	SA	SW846 3050B/6020B
P-08	Uranium	0.587	0.0118	0.0358		None	SA	SW846 3050B/6020B
P-08	Vanadium	6.83	0.268	3.58	N	J	SA	SW846 3050B/6020B
P-08	Zinc	18.8	0.716	3.58		J	SA	SW846 3050B/6020B
P-12	Aluminum	11,800	43.3	95.2		J	SA	SW846 3050B/6020B
P-12	Aluminum	11,200	45.5	100		J	DU	SW846 3050B/6020B
P-12	Antimony	0.278	0.278	1.68	U	1.68UJ	SA	SW846 3050B/6010D
P-12	Antimony	0.289	0.289	1.75	U	1.75UJ	DU	SW846 3050B/6010D
P-12	Arsenic	5.59	0.322	0.952		None	SA	SW846 3050B/6020B
P-12	Arsenic	7.05	0.338	1		None	DU	SW846 3050B/6020B
P-12	Barium	143	0.0952	0.762		J	SA	SW846 3050B/6020B
P-12	Barium	134	0.1	0.8		J	DU	SW846 3050B/6020B
P-12	Beryllium	0.577	0.019	0.0952		None	SA	SW846 3050B/6020B
P-12	Beryllium	0.57	0.02	0.1		None	DU	SW846 3050B/6020B
P-12	Cadmium	0.19	0.019	0.19	J	None	SA	SW846 3050B/6020B
P-12	Cadmium	0.167	0.02	0.2	J	None	DU	SW846 3050B/6020B
P-12	Calcium	5,630	12.8	38.1		None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-12	Calcium	6,930	13.4	40		None	DU	SW846 3050B/6020B
P-12	Chromium	5.89	0.19	0.571		None	SA	SW846 3050B/6020B
P-12	Chromium	5.86	0.2	0.6		None	DU	SW846 3050B/6020B
P-12	Cobalt	4.05	0.0571	0.19		None	SA	SW846 3050B/6020B
P-12	Cobalt	4.18	0.06	0.2		None	DU	SW846 3050B/6020B
P-12	Copper	6.42	0.0629	0.381		None	SA	SW846 3050B/6020B
P-12	Copper	6.52	0.066	0.4		None	DU	SW846 3050B/6020B
P-12	Iron	9,070	6.29	19		J	SA	SW846 3050B/6020B
P-12	Iron	9,100	6.6	20		J	DU	SW846 3050B/6020B
P-12	Lead	13.9	0.0952	0.381	N	J	SA	SW846 3050B/6020B
P-12	Lead	11.6	0.1	0.4	N	J	DU	SW846 3050B/6020B
P-12	Magnesium	4,270	1.9	5.71		None	SA	SW846 3050B/6020B
P-12	Magnesium	4,510	2	6		None	DU	SW846 3050B/6020B
P-12	Manganese	545	1.9	9.52		J	SA	SW846 3050B/6020B
P-12	Manganese	497	2	10		J	DU	SW846 3050B/6020B
P-12	Nickel	6.05	0.0952	0.381	B	None	SA	SW846 3050B/6020B
P-12	Nickel	5.84	0.1	0.4	B	None	DU	SW846 3050B/6020B
P-12	Potassium	3,920	15.2	57.1		None	SA	SW846 3050B/6020B
P-12	Potassium	3,770	16	60		None	DU	SW846 3050B/6020B
P-12	Selenium	0.915	0.343	0.952	JN	J	SA	SW846 3050B/6020B
P-12	Selenium	0.963	0.36	1	JN	J	DU	SW846 3050B/6020B
P-12	Silver	0.0842	0.0842	0.421	U	None	SA	SW846 3050B/6010D
P-12	Silver	0.438	0.438	2.19	U	None	DU	SW846 3050B/6010D
P-12	Sodium	410	15.2	47.6		None	SA	SW846 3050B/6020B
P-12	Sodium	336	16	50		None	DU	SW846 3050B/6020B
P-12	Thallium	0.156	0.133	0.381	J	None	SA	SW846 3050B/6020B
P-12	Thallium	0.149	0.14	0.4	J	None	DU	SW846 3050B/6020B
P-12	Uranium	0.539	0.0126	0.0381		None	SA	SW846 3050B/6020B
P-12	Uranium	0.651	0.0132	0.04		None	DU	SW846 3050B/6020B
P-12	Vanadium	14.5	0.286	3.81	N	J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-12	Vanadium	14.5	0.3	4	N	J	DU	SW846 3050B/6020B
P-12	Zinc	32.6	0.762	3.81		J	SA	SW846 3050B/6020B
P-12	Zinc	32	0.8	4		J	DU	SW846 3050B/6020B
P-34	Aluminum	10,300	41.3	90.7		J	SA	SW846 3050B/6020B
P-34	Antimony	0.324	0.324	1.96	U	1.96UJ	SA	SW846 3050B/6010D
P-34	Arsenic	2.6	0.307	0.907		None	SA	SW846 3050B/6020B
P-34	Barium	105	0.0907	0.726		J	SA	SW846 3050B/6020B
P-34	Beryllium	0.446	0.0181	0.0907		None	SA	SW846 3050B/6020B
P-34	Cadmium	0.121	0.0181	0.181	J	None	SA	SW846 3050B/6020B
P-34	Calcium	2,440	12.2	36.3		None	SA	SW846 3050B/6020B
P-34	Chromium	5.63	0.181	0.544		None	SA	SW846 3050B/6020B
P-34	Cobalt	3.04	0.0544	0.181		None	SA	SW846 3050B/6020B
P-34	Copper	5.53	0.0599	0.363		None	SA	SW846 3050B/6020B
P-34	Iron	7,620	5.99	18.1		J	SA	SW846 3050B/6020B
P-34	Lead	8.41	0.0907	0.363	N	J	SA	SW846 3050B/6020B
P-34	Magnesium	3,150	1.81	5.44		None	SA	SW846 3050B/6020B
P-34	Manganese	359	1.81	9.07		J	SA	SW846 3050B/6020B
P-34	Nickel	5.15	0.0907	0.363	B	None	SA	SW846 3050B/6020B
P-34	Potassium	3,320	14.5	54.4		None	SA	SW846 3050B/6020B
P-34	Selenium	0.735	0.327	0.907	JN	J	SA	SW846 3050B/6020B
P-34	Silver	0.098	0.098	0.49	U	None	SA	SW846 3050B/6010D
P-34	Sodium	339	14.5	45.4		None	SA	SW846 3050B/6020B
P-34	Thallium	0.131	0.127	0.363	J	None	SA	SW846 3050B/6020B
P-34	Uranium	0.682	0.012	0.0363		None	SA	SW846 3050B/6020B
P-34	Vanadium	12	0.272	3.63	N	J	SA	SW846 3050B/6020B
P-34	Zinc	27.6	0.726	3.63		J	SA	SW846 3050B/6020B
P-35	Aluminum	6,260	4.38	9.63		J	SA	SW846 3050B/6020B
P-35	Antimony	0.311	0.311	1.89	U	1.89UJ	SA	SW846 3050B/6010D
P-35	Arsenic	1.19	0.326	0.963		None	SA	SW846 3050B/6020B
P-35	Barium	62.8	0.0963	0.771		J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-35	Beryllium	0.421	0.0193	0.0963		None	SA	SW846 3050B/6020B
P-35	Cadmium	0.0672	0.0193	0.193	J	None	SA	SW846 3050B/6020B
P-35	Calcium	3,330	12.9	38.5		None	SA	SW846 3050B/6020B
P-35	Chromium	2.1	0.193	0.578		None	SA	SW846 3050B/6020B
P-35	Cobalt	2.94	0.0578	0.193		None	SA	SW846 3050B/6020B
P-35	Copper	2.85	0.0636	0.385		None	SA	SW846 3050B/6020B
P-35	Iron	6,020	6.36	19.3		J	SA	SW846 3050B/6020B
P-35	Lead	8	0.0963	0.385	N	J	SA	SW846 3050B/6020B
P-35	Magnesium	2,550	1.93	5.78		None	SA	SW846 3050B/6020B
P-35	Manganese	364	1.93	9.63		J	SA	SW846 3050B/6020B
P-35	Nickel	2.53	0.0963	0.385	B	None	SA	SW846 3050B/6020B
P-35	Potassium	1,980	15.4	57.8		None	SA	SW846 3050B/6020B
P-35	Selenium	0.637	0.347	0.963	JN	J	SA	SW846 3050B/6020B
P-35	Silver	0.0943	0.0943	0.472	U	None	SA	SW846 3050B/6010D
P-35	Sodium	65.2	15.4	48.2		None	SA	SW846 3050B/6020B
P-35	Thallium	0.135	0.135	0.385	U	None	SA	SW846 3050B/6020B
P-35	Uranium	0.336	0.0127	0.0385		None	SA	SW846 3050B/6020B
P-35	Vanadium	5.15	0.289	3.85	N	J	SA	SW846 3050B/6020B
P-35	Zinc	20.9	0.771	3.85		J	SA	SW846 3050B/6020B
P-36	Aluminum	5,380	4.17	9.17		J	SA	SW846 3050B/6020B
P-36	Antimony	0.297	0.297	1.8	U	1.80UJ	SA	SW846 3050B/6010D
P-36	Arsenic	1.53	0.31	0.917		None	SA	SW846 3050B/6020B
P-36	Barium	82.2	0.0917	0.734		J	SA	SW846 3050B/6020B
P-36	Beryllium	0.242	0.0183	0.0917		None	SA	SW846 3050B/6020B
P-36	Cadmium	0.0563	0.0183	0.183	J	None	SA	SW846 3050B/6020B
P-36	Calcium	1,750	12.3	36.7		None	SA	SW846 3050B/6020B
P-36	Chromium	2.46	0.183	0.55		None	SA	SW846 3050B/6020B
P-36	Cobalt	1.21	0.055	0.183		None	SA	SW846 3050B/6020B
P-36	Copper	2.89	0.0606	0.367		None	SA	SW846 3050B/6020B
P-36	Iron	4,360	6.06	18.3		J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-36	Lead	3.41	0.0917	0.367	N	J	SA	SW846 3050B/6020B
P-36	Magnesium	1,520	1.83	5.5		None	SA	SW846 3050B/6020B
P-36	Manganese	119	0.183	0.917		J	SA	SW846 3050B/6020B
P-36	Nickel	2.08	0.0917	0.367	B	None	SA	SW846 3050B/6020B
P-36	Potassium	2,450	14.7	55		None	SA	SW846 3050B/6020B
P-36	Selenium	0.44	0.33	0.917	JN	J	SA	SW846 3050B/6020B
P-36	Silver	0.0901	0.0901	0.45	U	None	SA	SW846 3050B/6010D
P-36	Sodium	140	14.7	45.9		None	SA	SW846 3050B/6020B
P-36	Thallium	0.128	0.128	0.367	U	None	SA	SW846 3050B/6020B
P-36	Uranium	0.644	0.0121	0.0367		None	SA	SW846 3050B/6020B
P-36	Vanadium	6.46	0.275	3.67	N	J	SA	SW846 3050B/6020B
P-36	Zinc	13.4	0.734	3.67		J	SA	SW846 3050B/6020B
P-37	Aluminum	5,070	4.09	8.99		J	SA	SW846 3050B/6020B
P-37	Antimony	0.295	0.295	1.79	U	1.79UJ	SA	SW846 3050B/6010D
P-37	Arsenic	1.62	0.304	0.899		None	SA	SW846 3050B/6020B
P-37	Barium	75.1	0.0899	0.719		J	SA	SW846 3050B/6020B
P-37	Beryllium	0.254	0.018	0.0899		None	SA	SW846 3050B/6020B
P-37	Cadmium	0.0424	0.018	0.18	J	None	SA	SW846 3050B/6020B
P-37	Calcium	2,440	12.1	36		None	SA	SW846 3050B/6020B
P-37	Chromium	2.54	0.18	0.54		None	SA	SW846 3050B/6020B
P-37	Cobalt	1.27	0.054	0.18		None	SA	SW846 3050B/6020B
P-37	Copper	2.88	0.0594	0.36		None	SA	SW846 3050B/6020B
P-37	Iron	4,720	5.94	18		J	SA	SW846 3050B/6020B
P-37	Lead	3.26	0.0899	0.36	N	J	SA	SW846 3050B/6020B
P-37	Magnesium	1,670	1.8	5.4		None	SA	SW846 3050B/6020B
P-37	Manganese	105	0.18	0.899		J	SA	SW846 3050B/6020B
P-37	Nickel	2.09	0.0899	0.36	B	None	SA	SW846 3050B/6020B
P-37	Potassium	2,490	14.4	54		None	SA	SW846 3050B/6020B
P-37	Selenium	0.458	0.324	0.899	JN	J	SA	SW846 3050B/6020B
P-37	Silver	1.67	0.0893	0.446		J+	SA	SW846 3050B/6010D

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-37	Sodium	105	14.4	45		None	SA	SW846 3050B/6020B
P-37	Thallium	0.126	0.126	0.36	U	None	SA	SW846 3050B/6020B
P-37	Uranium	0.589	0.0119	0.036		None	SA	SW846 3050B/6020B
P-37	Vanadium	6.85	0.27	3.6	N	J	SA	SW846 3050B/6020B
P-37	Zinc	15.8	0.719	3.6		J	SA	SW846 3050B/6020B
S-02	Aluminum	10,900	40	87.9		J	SA	SW846 3050B/6020B
S-02	Antimony	0.289	0.289	1.75	U	1.75UJ	SA	SW846 3050B/6010D
S-02	Arsenic	4.22	0.297	0.879		None	SA	SW846 3050B/6020B
S-02	Barium	97.9	0.0879	0.703		J	SA	SW846 3050B/6020B
S-02	Beryllium	0.547	0.0176	0.0879		None	SA	SW846 3050B/6020B
S-02	Cadmium	0.0807	0.0176	0.176	J	None	SA	SW846 3050B/6020B
S-02	Calcium	2,710	11.8	35.1		None	SA	SW846 3050B/6020B
S-02	Chromium	4.83	0.176	0.527		None	SA	SW846 3050B/6020B
S-02	Cobalt	2.61	0.0527	0.176		None	SA	SW846 3050B/6020B
S-02	Copper	4.31	0.058	0.351		None	SA	SW846 3050B/6020B
S-02	Iron	7,480	5.8	17.6		J	SA	SW846 3050B/6020B
S-02	Lead	8.93	0.0879	0.351	N	J	SA	SW846 3050B/6020B
S-02	Magnesium	2,900	1.76	5.27		None	SA	SW846 3050B/6020B
S-02	Manganese	297	1.76	8.79		J	SA	SW846 3050B/6020B
S-02	Nickel	4.43	0.0879	0.351	B	None	SA	SW846 3050B/6020B
S-02	Potassium	3,420	14.1	52.7		None	SA	SW846 3050B/6020B
S-02	Selenium	0.731	0.316	0.879	JN	J	SA	SW846 3050B/6020B
S-02	Silver	0.0876	0.0876	0.438	U	None	SA	SW846 3050B/6010D
S-02	Sodium	236	14.1	43.9		None	SA	SW846 3050B/6020B
S-02	Thallium	0.149	0.123	0.351	J	None	SA	SW846 3050B/6020B
S-02	Uranium	0.834	0.0116	0.0351		None	SA	SW846 3050B/6020B
S-02	Vanadium	11.1	0.264	3.51	N	J	SA	SW846 3050B/6020B
S-02	Zinc	27.4	0.703	3.51		J	SA	SW846 3050B/6020B
S-03	Aluminum	7,480	4.13	9.07		J	SA	SW846 3050B/6020B
S-03	Aluminum	8,370	4.43	9.75		J	DU	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-03	Antimony	0.279	0.279	1.69	U	1.69UJ	SA	SW846 3050B/6010D
S-03	Antimony	0.307	0.307	1.86	U	1.86UJ	DU	SW846 3050B/6010D
S-03	Arsenic	3.18	0.307	0.907		None	SA	SW846 3050B/6020B
S-03	Arsenic	2.87	0.329	0.975		None	DU	SW846 3050B/6020B
S-03	Barium	90.1	0.0907	0.726		J	SA	SW846 3050B/6020B
S-03	Barium	95.9	0.0975	0.78		J	DU	SW846 3050B/6020B
S-03	Beryllium	0.355	0.0181	0.0907		None	SA	SW846 3050B/6020B
S-03	Beryllium	0.381	0.0195	0.0975		None	DU	SW846 3050B/6020B
S-03	Cadmium	0.112	0.0181	0.181	J	None	SA	SW846 3050B/6020B
S-03	Cadmium	0.109	0.0195	0.195	J	None	DU	SW846 3050B/6020B
S-03	Calcium	2,030	12.2	36.3		None	SA	SW846 3050B/6020B
S-03	Calcium	2,120	13.1	39		None	DU	SW846 3050B/6020B
S-03	Chromium	4.25	0.181	0.544		None	SA	SW846 3050B/6020B
S-03	Chromium	4.49	0.195	0.585		None	DU	SW846 3050B/6020B
S-03	Cobalt	2.75	0.0544	0.181		None	SA	SW846 3050B/6020B
S-03	Cobalt	2.74	0.0585	0.195		None	DU	SW846 3050B/6020B
S-03	Copper	4.43	0.0599	0.363		None	SA	SW846 3050B/6020B
S-03	Copper	4.77	0.0643	0.39		None	DU	SW846 3050B/6020B
S-03	Iron	6,540	5.99	18.1		J	SA	SW846 3050B/6020B
S-03	Iron	6,970	6.43	19.5		J	DU	SW846 3050B/6020B
S-03	Lead	7.92	0.0907	0.363	N	J	SA	SW846 3050B/6020B
S-03	Lead	8.47	0.0975	0.39	N	J	DU	SW846 3050B/6020B
S-03	Magnesium	2,300	1.81	5.44		None	SA	SW846 3050B/6020B
S-03	Magnesium	2,430	1.95	5.85		None	DU	SW846 3050B/6020B
S-03	Manganese	349	1.81	9.07		J	SA	SW846 3050B/6020B
S-03	Manganese	370	1.95	9.75		J	DU	SW846 3050B/6020B
S-03	Nickel	3.8	0.0907	0.363	B	None	SA	SW846 3050B/6020B
S-03	Nickel	4	0.0975	0.39	B	None	DU	SW846 3050B/6020B
S-03	Potassium	2,390	14.5	54.4		None	SA	SW846 3050B/6020B
S-03	Potassium	2,570	15.6	58.5		None	DU	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-03	Selenium	0.758	0.327	0.907	JN	J	SA	SW846 3050B/6020B
S-03	Selenium	0.75	0.351	0.975	JN	J	DU	SW846 3050B/6020B
S-03	Silver	0.0846	0.0846	0.423	U	None	SA	SW846 3050B/6010D
S-03	Silver	0.0931	0.0931	0.466	U	None	DU	SW846 3050B/6010D
S-03	Sodium	221	14.5	45.4		None	SA	SW846 3050B/6020B
S-03	Sodium	250	15.6	48.7		None	DU	SW846 3050B/6020B
S-03	Thallium	0.127	0.127	0.363	U	None	SA	SW846 3050B/6020B
S-03	Thallium	0.136	0.136	0.39	U	None	DU	SW846 3050B/6020B
S-03	Uranium	0.787	0.012	0.0363		None	SA	SW846 3050B/6020B
S-03	Uranium	0.822	0.0129	0.039		None	DU	SW846 3050B/6020B
S-03	Vanadium	10.4	0.272	3.63	N	J	SA	SW846 3050B/6020B
S-03	Vanadium	10.9	0.292	3.9	N	J	DU	SW846 3050B/6020B
S-03	Zinc	20.4	0.726	3.63		J	SA	SW846 3050B/6020B
S-03	Zinc	21.2	0.78	3.9		J	DU	SW846 3050B/6020B
S-04	Aluminum	6,600	4.33	9.51		J	SA	SW846 3050B/6020B
S-04	Antimony	0.29	0.29	1.76	U	1.76UJ	SA	SW846 3050B/6010D
S-04	Arsenic	2.86	0.321	0.951		None	SA	SW846 3050B/6020B
S-04	Barium	99.9	0.0951	0.76		J	SA	SW846 3050B/6020B
S-04	Beryllium	0.358	0.019	0.0951		None	SA	SW846 3050B/6020B
S-04	Cadmium	0.13	0.019	0.19	J	None	SA	SW846 3050B/6020B
S-04	Calcium	2,950	12.7	38		None	SA	SW846 3050B/6020B
S-04	Chromium	2.68	0.19	0.57		None	SA	SW846 3050B/6020B
S-04	Cobalt	1.81	0.057	0.19		None	SA	SW846 3050B/6020B
S-04	Copper	3.51	0.0627	0.38		None	SA	SW846 3050B/6020B
S-04	Iron	6,120	6.27	19		J	SA	SW846 3050B/6020B
S-04	Lead	5.36	0.0951	0.38	N	J	SA	SW846 3050B/6020B
S-04	Magnesium	2,380	1.9	5.7		None	SA	SW846 3050B/6020B
S-04	Manganese	372	1.9	9.51		J	SA	SW846 3050B/6020B
S-04	Nickel	2.41	0.0951	0.38	B	None	SA	SW846 3050B/6020B
S-04	Potassium	2,810	15.2	57		None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-04	Selenium	0.744	0.342	0.951	JN	J	SA	SW846 3050B/6020B
S-04	Silver	0.088	0.088	0.44	U	None	SA	SW846 3050B/6010D
S-04	Sodium	336	15.2	47.5		None	SA	SW846 3050B/6020B
S-04	Thallium	0.133	0.133	0.38	U	None	SA	SW846 3050B/6020B
S-04	Uranium	0.833	0.0125	0.038		None	SA	SW846 3050B/6020B
S-04	Vanadium	8.68	0.285	3.8	N	J	SA	SW846 3050B/6020B
S-04	Zinc	21.2	0.76	3.8		J	SA	SW846 3050B/6020B
S-10	Aluminum	10,400	40.3	88.5		J	SA	SW846 3050B/6020B
S-10	Antimony	0.319	0.319	1.93	U	1.93UJ	SA	SW846 3050B/6010D
S-10	Arsenic	3.17	0.299	0.885		None	SA	SW846 3050B/6020B
S-10	Barium	104	0.0885	0.708		J	SA	SW846 3050B/6020B
S-10	Beryllium	0.51	0.0177	0.0885		None	SA	SW846 3050B/6020B
S-10	Cadmium	0.115	0.0177	0.177	J	None	SA	SW846 3050B/6020B
S-10	Calcium	4,410	11.9	35.4		None	SA	SW846 3050B/6020B
S-10	Chromium	4.76	0.177	0.531		None	SA	SW846 3050B/6020B
S-10	Cobalt	2.73	0.0531	0.177		None	SA	SW846 3050B/6020B
S-10	Copper	5.4	0.0584	0.354		None	SA	SW846 3050B/6020B
S-10	Iron	7,930	5.84	17.7		J	SA	SW846 3050B/6020B
S-10	Lead	7.05	0.0885	0.354	N	J	SA	SW846 3050B/6020B
S-10	Magnesium	3,370	1.77	5.31		None	SA	SW846 3050B/6020B
S-10	Manganese	358	1.77	8.85		J	SA	SW846 3050B/6020B
S-10	Nickel	4.25	0.0885	0.354	B	None	SA	SW846 3050B/6020B
S-10	Potassium	3,640	14.2	53.1		None	SA	SW846 3050B/6020B
S-10	Selenium	0.755	0.319	0.885	JN	J	SA	SW846 3050B/6020B
S-10	Silver	0.0967	0.0967	0.484	U	None	SA	SW846 3050B/6010D
S-10	Sodium	346	14.2	44.2		None	SA	SW846 3050B/6020B
S-10	Thallium	0.128	0.124	0.354	J	None	SA	SW846 3050B/6020B
S-10	Uranium	0.797	0.0117	0.0354		None	SA	SW846 3050B/6020B
S-10	Vanadium	11.6	0.265	3.54	N	J	SA	SW846 3050B/6020B
S-10	Zinc	27.6	0.708	3.54		J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-38	Aluminum	11,200	44.8	98.4		J	SA	SW846 3050B/6020B
S-38	Antimony	0.297	0.297	1.8	U	1.80UJ	SA	SW846 3050B/6010D
S-38	Arsenic	3.61	0.333	0.984		None	SA	SW846 3050B/6020B
S-38	Barium	100	0.0984	0.787		J	SA	SW846 3050B/6020B
S-38	Beryllium	0.514	0.0197	0.0984		None	SA	SW846 3050B/6020B
S-38	Cadmium	0.105	0.0197	0.197	J	None	SA	SW846 3050B/6020B
S-38	Calcium	15,600	132	394		None	SA	SW846 3050B/6020B
S-38	Chromium	5.57	0.197	0.591		None	SA	SW846 3050B/6020B
S-38	Cobalt	2.61	0.0591	0.197		None	SA	SW846 3050B/6020B
S-38	Copper	5.66	0.065	0.394		None	SA	SW846 3050B/6020B
S-38	Iron	7,860	6.5	19.7		J	SA	SW846 3050B/6020B
S-38	Lead	8.33	0.0984	0.394	N	J	SA	SW846 3050B/6020B
S-38	Magnesium	3,880	1.97	5.91		None	SA	SW846 3050B/6020B
S-38	Manganese	229	1.97	9.84		J	SA	SW846 3050B/6020B
S-38	Nickel	5.39	0.0984	0.394	B	None	SA	SW846 3050B/6020B
S-38	Potassium	3,790	15.7	59.1		None	SA	SW846 3050B/6020B
S-38	Selenium	0.694	0.354	0.984	JN	J	SA	SW846 3050B/6020B
S-38	Silver	0.0899	0.0899	0.45	U	None	SA	SW846 3050B/6010D
S-38	Sodium	351	15.7	49.2		None	SA	SW846 3050B/6020B
S-38	Thallium	0.141	0.138	0.394	J	None	SA	SW846 3050B/6020B
S-38	Uranium	0.691	0.013	0.0394		None	SA	SW846 3050B/6020B
S-38	Vanadium	11.3	0.295	3.94	N	J	SA	SW846 3050B/6020B
S-38	Zinc	24.1	0.787	3.94		J	SA	SW846 3050B/6020B
S-39	Aluminum	7,810	4.08	8.98		J	SA	SW846 3050B/6020B
S-39	Antimony	0.315	0.315	1.91	U	1.91UJ	SA	SW846 3050B/6010D
S-39	Arsenic	6.48	0.303	0.898		None	SA	SW846 3050B/6020B
S-39	Barium	154	0.0898	0.718		J	SA	SW846 3050B/6020B
S-39	Beryllium	0.403	0.018	0.0898		None	SA	SW846 3050B/6020B
S-39	Cadmium	0.175	0.018	0.18	J	None	SA	SW846 3050B/6020B
S-39	Calcium	4,460	12	35.9		None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-39	Chromium	4.05	0.18	0.539		None	SA	SW846 3050B/6020B
S-39	Cobalt	2.75	0.0539	0.18		None	SA	SW846 3050B/6020B
S-39	Copper	4.89	0.0592	0.359		None	SA	SW846 3050B/6020B
S-39	Iron	6,250	5.92	18		J	SA	SW846 3050B/6020B
S-39	Lead	8.02	0.0898	0.359	N	J	SA	SW846 3050B/6020B
S-39	Magnesium	3,240	1.8	5.39		None	SA	SW846 3050B/6020B
S-39	Manganese	588	1.8	8.98		J	SA	SW846 3050B/6020B
S-39	Nickel	4.1	0.0898	0.359	B	None	SA	SW846 3050B/6020B
S-39	Potassium	2,960	14.4	53.9		None	SA	SW846 3050B/6020B
S-39	Selenium	0.818	0.323	0.898	JN	J	SA	SW846 3050B/6020B
S-39	Silver	0.0954	0.0954	0.477	U	None	SA	SW846 3050B/6010D
S-39	Sodium	448	14.4	44.9		None	SA	SW846 3050B/6020B
S-39	Thallium	0.138	0.126	0.359	J	None	SA	SW846 3050B/6020B
S-39	Uranium	0.739	0.0118	0.0359		None	SA	SW846 3050B/6020B
S-39	Vanadium	9.61	0.269	3.59	N	J	SA	SW846 3050B/6020B
S-39	Zinc	22.5	0.718	3.59		J	SA	SW846 3050B/6020B
S-40	Aluminum	8,080	4.49	9.86		J	SA	SW846 3050B/6020B
S-40	Antimony	0.329	0.329	1.99	U	1.99UJ	SA	SW846 3050B/6010D
S-40	Arsenic	3.76	0.333	0.986	*	None	SA	SW846 3050B/6020B
S-40	Barium	99.2	0.0986	0.789		J	SA	SW846 3050B/6020B
S-40	Beryllium	0.428	0.0197	0.0986		None	SA	SW846 3050B/6020B
S-40	Cadmium	0.139	0.0197	0.197	J	None	SA	SW846 3050B/6020B
S-40	Calcium	6,860	13.2	39.4		None	SA	SW846 3050B/6020B
S-40	Chromium	4.49	0.197	0.592		None	SA	SW846 3050B/6020B
S-40	Cobalt	3.14	0.0592	0.197		None	SA	SW846 3050B/6020B
S-40	Copper	5.25	0.0651	0.394		None	SA	SW846 3050B/6020B
S-40	Iron	7,400	6.51	19.7		J	SA	SW846 3050B/6020B
S-40	Lead	7.69	0.0986	0.394		None	SA	SW846 3050B/6020B
S-40	Magnesium	3,140	1.97	5.92		None	SA	SW846 3050B/6020B
S-40	Manganese	276	1.97	9.86		J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-40	Nickel	4.57	0.0986	0.394		None	SA	SW846 3050B/6020B
S-40	Potassium	3,070	15.8	59.2		None	SA	SW846 3050B/6020B
S-40	Selenium	0.616	0.355	0.986	J	None	SA	SW846 3050B/6020B
S-40	Silver	0.498	0.498	2.49	U	None	SA	SW846 3050B/6010D
S-40	Sodium	328	15.8	49.3	N	J	SA	SW846 3050B/6020B
S-40	Thallium	0.138	0.138	0.394	U	None	SA	SW846 3050B/6020B
S-40	Uranium	0.569	0.013	0.0394		None	SA	SW846 3050B/6020B
S-40	Vanadium	14.1	0.296	3.94	N	J	SA	SW846 3050B/6020B
S-40	Zinc	34.1	0.789	3.94		J	SA	SW846 3050B/6020B
S-42	Aluminum	11,100	39.4	86.7		J	SA	SW846 3050B/6020B
S-42	Antimony	0.306	0.306	1.85	U	1.85UJ	SA	SW846 3050B/6010D
S-42	Arsenic	4.41	0.293	0.867	*	None	SA	SW846 3050B/6020B
S-42	Barium	145	0.0867	0.693		J	SA	SW846 3050B/6020B
S-42	Beryllium	0.499	0.0173	0.0867		None	SA	SW846 3050B/6020B
S-42	Cadmium	0.138	0.0173	0.173	J	None	SA	SW846 3050B/6020B
S-42	Calcium	8,530	11.6	34.7		None	SA	SW846 3050B/6020B
S-42	Chromium	5.61	0.173	0.52		None	SA	SW846 3050B/6020B
S-42	Cobalt	3.98	0.052	0.173		None	SA	SW846 3050B/6020B
S-42	Copper	6.39	0.0572	0.347		None	SA	SW846 3050B/6020B
S-42	Iron	10,400	57.2	173		J	SA	SW846 3050B/6020B
S-42	Lead	9.87	0.0867	0.347		None	SA	SW846 3050B/6020B
S-42	Magnesium	4,130	1.73	5.2		None	SA	SW846 3050B/6020B
S-42	Manganese	349	1.73	8.67		J	SA	SW846 3050B/6020B
S-42	Nickel	5.65	0.0867	0.347		None	SA	SW846 3050B/6020B
S-42	Potassium	3,560	13.9	52		None	SA	SW846 3050B/6020B
S-42	Selenium	0.584	0.312	0.867	J	None	SA	SW846 3050B/6020B
S-42	Silver	0.463	0.463	2.31	U	None	SA	SW846 3050B/6010D
S-42	Sodium	698	13.9	43.3	N	J	SA	SW846 3050B/6020B
S-42	Thallium	0.127	0.121	0.347	J	None	SA	SW846 3050B/6020B
S-42	Uranium	0.582	0.0114	0.0347		None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-42	Vanadium	19.3	0.26	3.47	N	J	SA	SW846 3050B/6020B
S-42	Zinc	31.8	0.693	3.47		J	SA	SW846 3050B/6020B
S-43	Aluminum	7,920	4.06	8.93		J	SA	SW846 3050B/6020B
S-43	Antimony	0.328	0.328	1.99	U	1.99UJ	SA	SW846 3050B/6010D
S-43	Arsenic	7.19	0.302	0.893	*	None	SA	SW846 3050B/6020B
S-43	Barium	107	0.0893	0.714		J	SA	SW846 3050B/6020B
S-43	Beryllium	0.406	0.0179	0.0893		None	SA	SW846 3050B/6020B
S-43	Cadmium	0.201	0.0179	0.179		None	SA	SW846 3050B/6020B
S-43	Calcium	16,500	120	357		None	SA	SW846 3050B/6020B
S-43	Chromium	3.92	0.179	0.536		None	SA	SW846 3050B/6020B
S-43	Cobalt	2.58	0.0536	0.179		None	SA	SW846 3050B/6020B
S-43	Copper	5.02	0.0589	0.357		None	SA	SW846 3050B/6020B
S-43	Iron	6,870	5.89	17.9		J	SA	SW846 3050B/6020B
S-43	Lead	10.3	0.0893	0.357		None	SA	SW846 3050B/6020B
S-43	Magnesium	2,620	1.79	5.36		None	SA	SW846 3050B/6020B
S-43	Manganese	197	1.79	8.93		J	SA	SW846 3050B/6020B
S-43	Nickel	3.35	0.0893	0.357		None	SA	SW846 3050B/6020B
S-43	Potassium	2,340	14.3	53.6		None	SA	SW846 3050B/6020B
S-43	Selenium	0.598	0.321	0.893	J	None	SA	SW846 3050B/6020B
S-43	Silver	0.0994	0.0994	0.497	U	None	SA	SW846 3050B/6010D
S-43	Sodium	426	14.3	44.6	N	J	SA	SW846 3050B/6020B
S-43	Thallium	0.125	0.125	0.357	U	None	SA	SW846 3050B/6020B
S-43	Uranium	0.746	0.0118	0.0357		None	SA	SW846 3050B/6020B
S-43	Vanadium	16.2	0.268	3.57	N	J	SA	SW846 3050B/6020B
S-43	Zinc	106	0.714	3.57		J	SA	SW846 3050B/6020B
S-44	Aluminum	9,750	41.1	90.4		J	SA	SW846 3050B/6020B
S-44	Antimony	0.299	0.299	1.81	U	1.81UJ	SA	SW846 3050B/6010D
S-44	Arsenic	4.97	0.306	0.904	*	None	SA	SW846 3050B/6020B
S-44	Barium	109	0.0904	0.723		J	SA	SW846 3050B/6020B
S-44	Beryllium	0.51	0.0181	0.0904		None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-44	Cadmium	0.186	0.0181	0.181		None	SA	SW846 3050B/6020B
S-44	Calcium	8,650	12.1	36.2		None	SA	SW846 3050B/6020B
S-44	Chromium	5.24	0.181	0.542		None	SA	SW846 3050B/6020B
S-44	Cobalt	3.09	0.0542	0.181		None	SA	SW846 3050B/6020B
S-44	Copper	5.6	0.0597	0.362		None	SA	SW846 3050B/6020B
S-44	Iron	8,230	5.97	18.1		J	SA	SW846 3050B/6020B
S-44	Lead	12.1	0.0904	0.362		None	SA	SW846 3050B/6020B
S-44	Magnesium	3,050	1.81	5.42		None	SA	SW846 3050B/6020B
S-44	Manganese	260	1.81	9.04		J	SA	SW846 3050B/6020B
S-44	Nickel	4.04	0.0904	0.362		None	SA	SW846 3050B/6020B
S-44	Potassium	2,890	14.5	54.2		None	SA	SW846 3050B/6020B
S-44	Selenium	0.611	0.325	0.904	J	None	SA	SW846 3050B/6020B
S-44	Silver	0.454	0.454	2.27	U	None	SA	SW846 3050B/6010D
S-44	Sodium	292	14.5	45.2	N	J	SA	SW846 3050B/6020B
S-44	Thallium	0.14	0.127	0.362	J	None	SA	SW846 3050B/6020B
S-44	Uranium	0.685	0.0119	0.0362		None	SA	SW846 3050B/6020B
S-44	Vanadium	18.3	0.271	3.62	N	J	SA	SW846 3050B/6020B
S-44	Zinc	132	0.723	3.62		J	SA	SW846 3050B/6020B
S-45	Aluminum	8,570	4.06	8.93		J	SA	SW846 3050B/6020B
S-45	Antimony	0.302	0.302	1.83	U	1.83UJ	SA	SW846 3050B/6010D
S-45	Arsenic	3.14	0.302	0.893	*	None	SA	SW846 3050B/6020B
S-45	Barium	100	0.0893	0.714		J	SA	SW846 3050B/6020B
S-45	Beryllium	0.496	0.0179	0.0893		None	SA	SW846 3050B/6020B
S-45	Cadmium	0.388	0.0179	0.179		None	SA	SW846 3050B/6020B
S-45	Calcium	4,180	12	35.7		None	SA	SW846 3050B/6020B
S-45	Chromium	11.4	0.179	0.536		None	SA	SW846 3050B/6020B
S-45	Cobalt	4.89	0.0536	0.179		None	SA	SW846 3050B/6020B
S-45	Copper	7.12	0.0589	0.357		None	SA	SW846 3050B/6020B
S-45	Iron	9,900	58.9	179		J	SA	SW846 3050B/6020B
S-45	Lead	11.6	0.0893	0.357		None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-45	Magnesium	3,540	1.79	5.36		None	SA	SW846 3050B/6020B
S-45	Manganese	344	1.79	8.93		J	SA	SW846 3050B/6020B
S-45	Nickel	7.68	0.0893	0.357		None	SA	SW846 3050B/6020B
S-45	Potassium	2,820	14.3	53.6		None	SA	SW846 3050B/6020B
S-45	Selenium	0.691	0.321	0.893	J	None	SA	SW846 3050B/6020B
S-45	Silver	0.458	0.458	2.29	U	None	SA	SW846 3050B/6010D
S-45	Sodium	309	14.3	44.6	N	J	SA	SW846 3050B/6020B
S-45	Thallium	0.141	0.125	0.357	J	None	SA	SW846 3050B/6020B
S-45	Uranium	0.734	0.0118	0.0357		None	SA	SW846 3050B/6020B
S-45	Vanadium	16.3	0.268	3.57	N	J	SA	SW846 3050B/6020B
S-45	Zinc	409	0.714	3.57		J	SA	SW846 3050B/6020B
S-46	Aluminum	7,270	4.49	9.86		J	SA	SW846 3050B/6020B
S-46	Antimony	0.306	0.306	1.85	U	1.85UJ	SA	SW846 3050B/6010D
S-46	Arsenic	3.12	0.333	0.986	*	None	SA	SW846 3050B/6020B
S-46	Barium	111	0.0986	0.789		J	SA	SW846 3050B/6020B
S-46	Beryllium	0.371	0.0197	0.0986		None	SA	SW846 3050B/6020B
S-46	Cadmium	0.267	0.0197	0.197		None	SA	SW846 3050B/6020B
S-46	Calcium	6,880	13.2	39.4		None	SA	SW846 3050B/6020B
S-46	Chromium	4.88	0.197	0.592		None	SA	SW846 3050B/6020B
S-46	Cobalt	3.01	0.0592	0.197		None	SA	SW846 3050B/6020B
S-46	Copper	6	0.0651	0.394		None	SA	SW846 3050B/6020B
S-46	Iron	7,360	6.51	19.7		J	SA	SW846 3050B/6020B
S-46	Lead	12.4	0.0986	0.394		None	SA	SW846 3050B/6020B
S-46	Magnesium	2,990	1.97	5.92		None	SA	SW846 3050B/6020B
S-46	Manganese	255	1.97	9.86		J	SA	SW846 3050B/6020B
S-46	Nickel	4.55	0.0986	0.394		None	SA	SW846 3050B/6020B
S-46	Potassium	2,790	15.8	59.2		None	SA	SW846 3050B/6020B
S-46	Selenium	0.575	0.355	0.986	J	None	SA	SW846 3050B/6020B
S-46	Silver	0.463	0.463	2.31	U	None	SA	SW846 3050B/6010D
S-46	Sodium	322	15.8	49.3	N	J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-46	Thallium	0.138	0.138	0.394	U	None	SA	SW846 3050B/6020B
S-46	Uranium	0.549	0.013	0.0394		None	SA	SW846 3050B/6020B
S-46	Vanadium	14.1	0.296	3.94	N	J	SA	SW846 3050B/6020B
S-46	Zinc	292	0.789	3.94		J	SA	SW846 3050B/6020B
S-47	Aluminum	9,010	4.42	9.71		J	SA	SW846 3050B/6020B
S-47	Antimony	1.52	1.52	9.21	U	None	SA	SW846 3050B/6010D
S-47	Arsenic	3.2	0.328	0.971	*	None	SA	SW846 3050B/6020B
S-47	Barium	117	0.0971	0.777		J	SA	SW846 3050B/6020B
S-47	Beryllium	0.449	0.0194	0.0971		None	SA	SW846 3050B/6020B
S-47	Cadmium	0.179	0.0194	0.194	J	None	SA	SW846 3050B/6020B
S-47	Calcium	7,060	13	38.8		None	SA	SW846 3050B/6020B
S-47	Chromium	5.14	0.194	0.583		None	SA	SW846 3050B/6020B
S-47	Cobalt	3.34	0.0583	0.194		None	SA	SW846 3050B/6020B
S-47	Copper	6.68	0.0641	0.388		None	SA	SW846 3050B/6020B
S-47	Iron	8,660	6.41	19.4		J	SA	SW846 3050B/6020B
S-47	Lead	9.41	0.0971	0.388		None	SA	SW846 3050B/6020B
S-47	Magnesium	3,630	1.94	5.83		None	SA	SW846 3050B/6020B
S-47	Manganese	327	1.94	9.71		J	SA	SW846 3050B/6020B
S-47	Nickel	4.83	0.0971	0.388		None	SA	SW846 3050B/6020B
S-47	Potassium	4,320	15.5	58.3		None	SA	SW846 3050B/6020B
S-47	Selenium	0.643	0.35	0.971	J	None	SA	SW846 3050B/6020B
S-47	Silver	0.46	0.46	2.3	U	None	SA	SW846 3050B/6010D
S-47	Sodium	617	15.5	48.5	N	J	SA	SW846 3050B/6020B
S-47	Thallium	0.136	0.136	0.388	U	None	SA	SW846 3050B/6020B
S-47	Uranium	0.526	0.0128	0.0388		None	SA	SW846 3050B/6020B
S-47	Vanadium	15.4	0.291	3.88	N	J	SA	SW846 3050B/6020B
S-47	Zinc	37	0.777	3.88		J	SA	SW846 3050B/6020B
S-49	Aluminum	14,600	45	98.8		J	SA	SW846 3050B/6020B
S-49	Aluminum	13,400	39.4	86.7		J	DU	SW846 3050B/6020B
S-49	Antimony	0.294	0.294	1.78	U	1.78UJ	SA	SW846 3050B/6010D

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-49	Antimony	0.301	0.301	1.82	U	None	DU	SW846 3050B/6010D
S-49	Arsenic	3.43	0.334	0.988	*	None	SA	SW846 3050B/6020B
S-49	Arsenic	3.67	0.293	0.867	*	None	DU	SW846 3050B/6020B
S-49	Barium	246	0.988	7.91		J	SA	SW846 3050B/6020B
S-49	Barium	225	0.867	6.93		J	DU	SW846 3050B/6020B
S-49	Beryllium	0.607	0.0198	0.0988		None	SA	SW846 3050B/6020B
S-49	Beryllium	0.553	0.0173	0.0867		None	DU	SW846 3050B/6020B
S-49	Cadmium	0.214	0.0198	0.198		None	SA	SW846 3050B/6020B
S-49	Cadmium	0.206	0.0173	0.173		None	DU	SW846 3050B/6020B
S-49	Calcium	5,670	13.2	39.5		None	SA	SW846 3050B/6020B
S-49	Calcium	7,000	11.6	34.7		None	DU	SW846 3050B/6020B
S-49	Chromium	6.36	0.198	0.593		None	SA	SW846 3050B/6020B
S-49	Chromium	6.06	0.173	0.52		None	DU	SW846 3050B/6020B
S-49	Cobalt	3.87	0.0593	0.198		None	SA	SW846 3050B/6020B
S-49	Cobalt	3.73	0.052	0.173		None	DU	SW846 3050B/6020B
S-49	Copper	7.34	0.0652	0.395		None	SA	SW846 3050B/6020B
S-49	Copper	6.96	0.0572	0.347		None	DU	SW846 3050B/6020B
S-49	Iron	9,660	6.52	19.8		J	SA	SW846 3050B/6020B
S-49	Iron	10,200	57.2	173		J	DU	SW846 3050B/6020B
S-49	Lead	11	0.0988	0.395		None	SA	SW846 3050B/6020B
S-49	Lead	10.5	0.0867	0.347		None	DU	SW846 3050B/6020B
S-49	Magnesium	5,200	1.98	5.93		None	SA	SW846 3050B/6020B
S-49	Magnesium	4,930	1.73	5.2		None	DU	SW846 3050B/6020B
S-49	Manganese	559	1.98	9.88		J	SA	SW846 3050B/6020B
S-49	Manganese	515	1.73	8.67		J	DU	SW846 3050B/6020B
S-49	Nickel	6.36	0.0988	0.395		None	SA	SW846 3050B/6020B
S-49	Nickel	6.18	0.0867	0.347		None	DU	SW846 3050B/6020B
S-49	Potassium	6,620	15.8	59.3		None	SA	SW846 3050B/6020B
S-49	Potassium	6,420	13.9	52		None	DU	SW846 3050B/6020B
S-49	Selenium	0.809	0.356	0.988	J	None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-49	Selenium	0.831	0.312	0.867	J	None	DU	SW846 3050B/6020B
S-49	Silver	0.445	0.445	2.22	U	None	SA	SW846 3050B/6010D
S-49	Silver	0.0911	0.0911	0.455	U	None	DU	SW846 3050B/6010D
S-49	Sodium	1,230	15.8	49.4	N	J	SA	SW846 3050B/6020B
S-49	Sodium	1,500	13.9	43.3	N	J	DU	SW846 3050B/6020B
S-49	Thallium	0.159	0.138	0.395	J	None	SA	SW846 3050B/6020B
S-49	Thallium	0.159	0.121	0.347	J	None	DU	SW846 3050B/6020B
S-49	Uranium	0.64	0.013	0.0395		None	SA	SW846 3050B/6020B
S-49	Uranium	0.672	0.0114	0.0347		None	DU	SW846 3050B/6020B
S-49	Vanadium	15.5	0.296	3.95	N	J	SA	SW846 3050B/6020B
S-49	Vanadium	15.1	0.26	3.47	N	J	DU	SW846 3050B/6020B
S-49	Zinc	36.2	0.791	3.95		J	SA	SW846 3050B/6020B
S-49	Zinc	35.1	0.693	3.47		J	DU	SW846 3050B/6020B
S-50	Aluminum	13,100	39.5	86.8		J	SA	SW846 3050B/6020B
S-50	Antimony	1.62	1.62	9.82	U	None	SA	SW846 3050B/6010D
S-50	Arsenic	3.55	0.293	0.868	*	None	SA	SW846 3050B/6020B
S-50	Barium	167	0.0868	0.694		J	SA	SW846 3050B/6020B
S-50	Beryllium	0.53	0.0174	0.0868		None	SA	SW846 3050B/6020B
S-50	Cadmium	0.162	0.0174	0.174	J	None	SA	SW846 3050B/6020B
S-50	Calcium	5,280	11.6	34.7		None	SA	SW846 3050B/6020B
S-50	Chromium	6.59	0.174	0.521		None	SA	SW846 3050B/6020B
S-50	Cobalt	3.69	0.0521	0.174		None	SA	SW846 3050B/6020B
S-50	Copper	7.22	0.0573	0.347		None	SA	SW846 3050B/6020B
S-50	Iron	11,500	57.3	174		J	SA	SW846 3050B/6020B
S-50	Lead	10.4	0.0868	0.347		None	SA	SW846 3050B/6020B
S-50	Magnesium	4,420	1.74	5.21		None	SA	SW846 3050B/6020B
S-50	Manganese	402	1.74	8.68		J	SA	SW846 3050B/6020B
S-50	Nickel	6.06	0.0868	0.347		None	SA	SW846 3050B/6020B
S-50	Potassium	5,510	13.9	52.1		None	SA	SW846 3050B/6020B
S-50	Selenium	0.816	0.313	0.868	J	None	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-50	Silver	0.491	0.491	2.46	U	None	SA	SW846 3050B/6010D
S-50	Sodium	1,570	13.9	43.4	N	J	SA	SW846 3050B/6020B
S-50	Thallium	0.147	0.122	0.347	J	None	SA	SW846 3050B/6020B
S-50	Uranium	0.626	0.0115	0.0347		None	SA	SW846 3050B/6020B
S-50	Vanadium	17.2	0.26	3.47	N	J	SA	SW846 3050B/6020B
S-50	Zinc	37.7	0.694	3.47		J	SA	SW846 3050B/6020B
S-52	Aluminum	6,850	4.48	9.84		J	SA	SW846 3050B/6020B
S-52	Antimony	0.306	0.306	1.85	U	1.85UJ	SA	SW846 3050B/6010D
S-52	Arsenic	3.3	0.333	0.984	*	None	SA	SW846 3050B/6020B
S-52	Barium	85.6	0.0984	0.787		J	SA	SW846 3050B/6020B
S-52	Beryllium	0.346	0.0197	0.0984		None	SA	SW846 3050B/6020B
S-52	Cadmium	0.114	0.0197	0.197	J	None	SA	SW846 3050B/6020B
S-52	Calcium	2,260	13.2	39.4		None	SA	SW846 3050B/6020B
S-52	Chromium	3.18	0.197	0.591		None	SA	SW846 3050B/6020B
S-52	Cobalt	2.15	0.0591	0.197		None	SA	SW846 3050B/6020B
S-52	Copper	3.89	0.065	0.394		None	SA	SW846 3050B/6020B
S-52	Iron	5,720	6.5	19.7		J	SA	SW846 3050B/6020B
S-52	Lead	6.65	0.0984	0.394		None	SA	SW846 3050B/6020B
S-52	Magnesium	2,170	1.97	5.91		None	SA	SW846 3050B/6020B
S-52	Manganese	326	1.97	9.84		J	SA	SW846 3050B/6020B
S-52	Nickel	3.05	0.0984	0.394		None	SA	SW846 3050B/6020B
S-52	Potassium	2,300	15.7	59.1		None	SA	SW846 3050B/6020B
S-52	Selenium	0.667	0.354	0.984	J	None	SA	SW846 3050B/6020B
S-52	Silver	0.463	0.463	2.31	U	None	SA	SW846 3050B/6010D
S-52	Sodium	137	15.7	49.2	N	J	SA	SW846 3050B/6020B
S-52	Thallium	0.138	0.138	0.394	U	None	SA	SW846 3050B/6020B
S-52	Uranium	0.796	0.013	0.0394		None	SA	SW846 3050B/6020B
S-52	Vanadium	8.68	0.295	3.94	N	J	SA	SW846 3050B/6020B
S-52	Zinc	21.3	0.787	3.94		J	SA	SW846 3050B/6020B
S-53	Aluminum	6,140	4.24	9.33		J	SA	SW846 3050B/6020B

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-53	Antimony	0.292	0.292	1.77	U	1.77UJ	SA	SW846 3050B/6010D
S-53	Arsenic	2.82	0.315	0.933	*	None	SA	SW846 3050B/6020B
S-53	Barium	146	0.0933	0.746		J	SA	SW846 3050B/6020B
S-53	Beryllium	0.283	0.0187	0.0933		None	SA	SW846 3050B/6020B
S-53	Cadmium	0.0961	0.0187	0.187	J	None	SA	SW846 3050B/6020B
S-53	Calcium	6,080	12.5	37.3		None	SA	SW846 3050B/6020B
S-53	Chromium	2.9	0.187	0.56		None	SA	SW846 3050B/6020B
S-53	Cobalt	1.66	0.056	0.187		None	SA	SW846 3050B/6020B
S-53	Copper	3.46	0.0616	0.373		None	SA	SW846 3050B/6020B
S-53	Iron	5,170	6.16	18.7		J	SA	SW846 3050B/6020B
S-53	Lead	5.1	0.0933	0.373		None	SA	SW846 3050B/6020B
S-53	Magnesium	2,320	1.87	5.6		None	SA	SW846 3050B/6020B
S-53	Manganese	170	0.187	0.933		J	SA	SW846 3050B/6020B
S-53	Nickel	2.45	0.0933	0.373		None	SA	SW846 3050B/6020B
S-53	Potassium	2,790	14.9	56		None	SA	SW846 3050B/6020B
S-53	Selenium	0.556	0.336	0.933	J	None	SA	SW846 3050B/6020B
S-53	Silver	0.0883	0.0883	0.442	U	None	SA	SW846 3050B/6010D
S-53	Sodium	569	14.9	46.6	N	J	SA	SW846 3050B/6020B
S-53	Thallium	0.131	0.131	0.373	U	None	SA	SW846 3050B/6020B
S-53	Uranium	0.535	0.0123	0.0373		None	SA	SW846 3050B/6020B
S-53	Vanadium	9.07	0.28	3.73	N	J	SA	SW846 3050B/6020B
S-53	Zinc	17.5	0.746	3.73		J	SA	SW846 3050B/6020B

[a] Blank cells indicate that the laboratory did not qualify the data.

Laboratory Data Qualifier
* = A replicate was outside limits.
B = The analyte was detected in the blank.
J = An estimated value, the analyte concentration was above the effective MDL and below the effective practical quantitation limit.
N = A spike was outside limits.
U = The analyte was absent or below the method detection limit.

Data Validation Qualifier
J = The associated numerical value was an estimated quantity.
J+ = The associated numerical value is an estimated quantity with a suspected positive bias.
None = There was no data validation assigned.
UJ = The analyte was analyzed for but was not detected. The associated value was an estimate and might be inaccurate or imprecise.

Sample Type
DU = duplicate sample
SA = sample

Analytical Method
SW-846 (EPA 1986)

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Appendix B. Sanitary Outfalls Monitoring Results in 2024

View from Antelope Peak

Table B-1. Sanitary outfalls of general chemistry and metals analyses, June 2024

Station	Date Collected	Analyte	Result	MDL	Laboratory Data Qualifiers[a]	Units	Analytical Method
TTR	12-Jun-2024	Aluminum	0.112	0.0193		mg/L	EPA 200.8
TTR	12-Jun-2024	Ammonia	109	17		mg/L	EPA 350.1
TTR	12-Jun-2024	Arsenic	0.00522	0.002		mg/L	EPA 200.8
TTR	12-Jun-2024	Boron	0.505	0.026		mg/L	EPA 200.8
TTR	12-Jun-2024	Cadmium		0.0003	U	mg/L	EPA 200.8
TTR	12-Jun-2024	Chemical oxygen demand	382	8.95		mg/L	EPA 410.4
TTR	12-Jun-2024	Chromium		0.003	U	mg/L	EPA 200.8
TTR	12-Jun-2024	Copper	0.114	0.0003		mg/L	EPA 200.8
TTR	12-Jun-2024	Cyanide, total	0.00676	0.00167		mg/L	EPA 335.4
TTR	12-Jun-2024	Fluoride	1.53	0.033		mg/L	EPA 300.0
TTR	12-Jun-2024	Lead	0.00367	0.0005		mg/L	EPA 200.8
TTR	12-Jun-2024	Mercury		0.000067	U	mg/L	EPA 245.1/245.2
TTR	12-Jun-2024	Molybdenum	0.00797	0.0002		mg/L	EPA 200.8
TTR	12-Jun-2024	Nickel	0.00777	0.0006		mg/L	EPA 200.8
TTR	12-Jun-2024	Oil and grease	5.35	1.41	N	mg/L	EPA 1664A/1664B
TTR	12-Jun-2024	pH	8.65	0.01	H	SU	SM 4500-H B
TTR	12-Jun-2024	Phenols, total	0.0537	0.00167	B	mg/L	SW846 9066
TTR	12-Jun-2024	Phosphorus, total as P	14.6	0.8	*N	mg/L	EPA 365.4
TTR	12-Jun-2024	Selenium		0.0015	U	mg/L	EPA 200.8
TTR	12-Jun-2024	Silver		0.0003	U	mg/L	EPA 200.8
TTR	12-Jun-2024	Solids, total suspended	137	8.14	*	mg/L	SM 2540D
TTR	12-Jun-2024	Total petroleum hydrocarbons		1.44	U*N	mg/L	EPA 1664A/1664B
TTR	12-Jun-2024	Zinc	0.164	0.0033		mg/L	EPA 200.8

[a] Blank cells indicate that the data did not require a data qualifier.
MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific.

Laboratory Data Qualifier
* = A replicate was outside limits.
B = The analyte was detected in the blank.
H = Analytical holding time was exceeded.
N = A spike was outside limits.
U = The analyte was absent or below the method detection limit.

Analytical Method
EPA 200.8 (EPA 1994)
EPA 245.1/245.2 (EPA 1994)/ (EPA 1974)
EPA 300.0 (EPA 1993)
EPA 335.4 (EPA 1993)
EPA 350.1 (EPA 1993)
EPA 365.4 (EPA 1974)
EPA 410.4 (EPA 1993)
EPA 1664A/1664B (EPA 1999)/ (EPA 2010)
SM 4500-H B (American Public Health Association 2016)
SM 2540D (Standard Methods Committee of the American Public Health Association, American Water Works Association, and Water Environment Federation 2018)
SW846 (EPA 1986)

Table B-2. Sanitary outfalls of radiological analyses, June 2024

Station	Date Collected	Analyte	Activity (pCi/L)	MDA (pCI/L)	Laboratory Data Qualifiers	Analytical Method
TTR	12-Jun-2024	Actinium-228	−8.2 ± 9.34	11.6	U	EPA 901.1
TTR	12-Jun-2024	Alpha, gross	1.53 ± 1.89	3.2	UN	EPA 900.0/SW846 9310
TTR	12-Jun-2024	Americium-241	−0.451 ± 3.52	6.25	U	EPA 901.1
TTR	12-Jun-2024	Beryllium-7	4.2 ± 11.8	21.8	U	EPA 901.1
TTR	12-Jun-2024	Beta, gross	43.5 ± 3.82	4.52		EPA 900.0/SW846 9310
TTR	12-Jun-2024	Bismuth-212	−32.9 ± 41.1	39	U	EPA 901.1
TTR	12-Jun-2024	Bismuth-214	6.16 ± 7.52	5.32		EPA 901.1
TTR	12-Jun-2024	Cesium-137	0.407 ± 1.45	2.66	U	EPA 901.1
TTR	12-Jun-2024	Cobalt-60	0.0833 ± 1.66	3.03	U	EPA 901.1
TTR	12-Jun-2024	Lead-212	−4.46 ± 5.99	5.52	U	EPA 901.1
TTR	12-Jun-2024	Lead-214	−2.41 ± 5.28	5.64	U	EPA 901.1
TTR	12-Jun-2024	Neptunium-237	−1.5 ± 2.75	4.32	U	EPA 901.1
TTR	12-Jun-2024	Potassium-40	63.7 ± 44.8	26.1		EPA 901.1
TTR	12-Jun-2024	Radium-223	−15.4 ±- 28	43.7	U	EPA 901.1
TTR	12-Jun-2024	Radium-224	−84.8 ± 48	40.8	U	EPA 901.1
TTR	12-Jun-2024	Radium-226	8.76 ± 59.2	57.6	U	EPA 901.1
TTR	12-Jun-2024	Radium-228	−8.2 ± 9.34	11.6	U	EPA 901.1
TTR	12-Jun-2024	Sodium-22	−0.441 ± 1.5	2.55	U	EPA 901.1
TTR	12-Jun-2024	Thorium-227	8.9 ± 11.2	18.3	U	EPA 901.1
TTR	12-Jun-2024	Thorium-231	−31.1 ± 28.2	25.3	U	EPA 901.1
TTR	12-Jun-2024	Thorium-234	−40.5 ± 68.5	70.5	U	EPA 901.1
TTR	12-Jun-2024	Tritium	−5.85 ± 107	192	U	EPA 906.0 Modified
TTR	12-Jun-2024	Uranium-235	2.32 ± 13.5	12.3	U	EPA 901.1
TTR	12-Jun-2024	Uranium-238	−40.5 ± 68.5	70.5	U	EPA 901.1

MDA = minimal detectable activity or minimum measured activity in a sample required to ensure a 95 percent probability that the measured activity is accurately quantified above the critical level

Laboratory Data Qualifier:
U = The analyte was absent or below the method detection limit.
N = A spike was outside limits

Analytical Method:
EPA 900.0/SW846 9310 (EPA 1980) (EPA 1986)
EPA 901.1 (EPA 1980)
EPA 906.0 Modified (EPA 1980)

Table B-3. Sanitary outfalls of semivolatile organic compounds, June 2024

Station	Date Collected	Analyte	Result (µg/L)[a]	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
TTR	12-Jun-2024	Acenaphthene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Acenaphthylene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Anthracene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Benzidine		3.9	U*N	EPA 625.1
TTR	12-Jun-2024	Benzo(a)anthracene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Benzo(a)pyrene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Benzo(b)fluoranthene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Benzo(ghi)perylene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Benzo(k)fluoranthene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Bromophenyl phenyl ether, 4-		3	U*	EPA 625.1
TTR	12-Jun-2024	Butylbenzyl phthalate		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Chloro-3-methylphenol, 4-		3	U*	EPA 625.1
TTR	12-Jun-2024	Chloroethoxy)methane, bis(2-		3	U*	EPA 625.1
TTR	12-Jun-2024	Chloroethyl)ether, bis(2-		3	U*	EPA 625.1
TTR	12-Jun-2024	Chloroisopropyl ether, bis-		3	U*	EPA 625.1
TTR	12-Jun-2024	Chloronaphthalene, 2-		0.41	U*	EPA 625.1
TTR	12-Jun-2024	Chlorophenol, 2-		3	U*	EPA 625.1
TTR	12-Jun-2024	Chlorophenyl phenyl ether, 4-		3	U*	EPA 625.1
TTR	12-Jun-2024	Chrysene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Di-n-butyl phthalate	0.51	0.3	J*	EPA 625.1
TTR	12-Jun-2024	Di-n-octyl phthalate		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Dibenz[a,h]anthracene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Dichlorobenzidine, 3,3'-		3	U*N	EPA 625.1
TTR	12-Jun-2024	Dichlorophenol, 2,4-		3	U*	EPA 625.1
TTR	12-Jun-2024	Diethylphthalate	0.35	0.3	J*	EPA 625.1
TTR	12-Jun-2024	Dimethylphenol, 2,4-		3	U*N	EPA 625.1
TTR	12-Jun-2024	Dimethylphthalate		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Dinitro-o-cresol		3	U*	EPA 625.1
TTR	12-Jun-2024	Dinitrophenol, 2,4-		5	U*	EPA 625.1
TTR	12-Jun-2024	Dinitrotoluene, 2,4-		3	U*	EPA 625.1

Station	Date Collected	Analyte	Result (µg/L)[a]	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
TTR	12-Jun-2024	Dinitrotoluene, 2,6-		3	U*	EPA 625.1
TTR	12-Jun-2024	Diphenyl amine		3	U*	EPA 625.1
TTR	12-Jun-2024	Diphenylhydrazine, 1,2-		3	U*	EPA 625.1
TTR	12-Jun-2024	Ethylhexyl)phthalate, bis(2-	0.61	0.3	J*	EPA 625.1
TTR	12-Jun-2024	Fluoranthene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Fluorene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Hexachlorobenzene		3	U*	EPA 625.1
TTR	12-Jun-2024	Hexachlorobutadiene		3	U*	EPA 625.1
TTR	12-Jun-2024	Hexachlorocyclopentadiene		3	UN	EPA 625.1
TTR	12-Jun-2024	Hexachloroethane		3	U*	EPA 625.1
TTR	12-Jun-2024	Indeno(1,2,3-c,d)pyrene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Isophorone		3.5	U*	EPA 625.1
TTR	12-Jun-2024	Naphthalene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Nitro-benzene		3	U*	EPA 625.1
TTR	12-Jun-2024	Nitrophenol, 2-		3	U*	EPA 625.1
TTR	12-Jun-2024	Nitrophenol, 4-		3	U*	EPA 625.1
TTR	12-Jun-2024	Nitrosodimethylamine, n-		3	U*	EPA 625.1
TTR	12-Jun-2024	Nitrosodipropylamine, n-		3	U*	EPA 625.1
TTR	12-Jun-2024	Pentachlorophenol		3	U*	EPA 625.1
TTR	12-Jun-2024	Phenanthrene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Phenol		3	U*	EPA 625.1
TTR	12-Jun-2024	Pyrene		0.3	U*	EPA 625.1
TTR	12-Jun-2024	Trichlorobenzene, 1,2,4-		3	U*	EPA 625.1
TTR	12-Jun-2024	Trichlorophenol, 2,4,6-		3	U*	EPA 625.1

[a] Blank cells indicate a non-detect for the analyte.
MDL= method detection limit

Laboratory Data Qualifier
* = A replicate was outside limits.
J = An estimated value, the analyte concentration was above the effective MDL and below the effective practical quantitation limit.
N = A spike was outside limits
U = The analyte was absent or below the method detection limit.

Analytical Method
EPA 625.1 (EPA 2016)

Table B-4. Sanitary outfalls of volatile organic compounds, June 2024

Station	Date Collected	Analyte	Result (µg/L)[a]	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
TTR	12-Jun-2024	Acrolein		1.67	UN	EPA 624.1
TTR	12-Jun-2024	Acrylonitrile		1.67	U	EPA 624.1
TTR	12-Jun-2024	Benzene		0.333	U	EPA 624.1
TTR	12-Jun-2024	Bromodichloromethane		0.333	U	EPA 624.1
TTR	12-Jun-2024	Bromoform		0.333	U	EPA 624.1
TTR	12-Jun-2024	Bromomethane		0.337	U	EPA 624.1
TTR	12-Jun-2024	Carbon tetrachloride		0.333	U	EPA 624.1
TTR	12-Jun-2024	Chlorobenzene		0.333	U	EPA 624.1
TTR	12-Jun-2024	Chloroethane		0.333	U	EPA 624.1
TTR	12-Jun-2024	Chloroethyl vinyl ether, 2-		1.67	U	EPA 624.1
TTR	12-Jun-2024	Chloroform		0.333	U	EPA 624.1
TTR	12-Jun-2024	Chloromethane		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dibromochloromethane		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichlorobenzene, 1,2-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichlorobenzene, 1,3-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichlorobenzene, 1,4-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichlorodifluoromethane		0.355	U	EPA 624.1
TTR	12-Jun-2024	Dichloroethane, 1,1-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichloroethane, 1,2-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichloroethene, 1,1-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichloroethene, trans-1,2-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichloropropane, 1,2-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichloropropene, cis-1,3-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Dichloropropene, trans-1,3-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Ethyl benzene		0.333	U	EPA 624.1
TTR	12-Jun-2024	Methylene chloride		0.5	U	EPA 624.1
TTR	12-Jun-2024	Tetrachloroethane, 1,1,2,2-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Tetrachloroethene		0.333	U	EPA 624.1
TTR	12-Jun-2024	Toluene		0.333	U	EPA 624.1
TTR	12-Jun-2024	Trichloroethane, 1,1,1-		0.333	U	EPA 624.1

Station	Date Collected	Analyte	Result (µg/L)[a]	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
TTR	12-Jun-2024	Trichloroethane, 1,1,2-		0.333	U	EPA 624.1
TTR	12-Jun-2024	Trichloroethene		0.333	U	EPA 624.1
TTR	12-Jun-2024	Trichlorofluoromethane		0.333	U	EPA 624.1
TTR	12-Jun-2024	Vinyl chloride		0.333	U	EPA 624.1

[a] Blank cells indicate a non-detect for the analyte.
MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific

Laboratory Data Qualifier
N = A spike was outside limits
U = The analyte was absent or below the method detection limit.

Analytical Method
EPA 624.1 (EPA 2016)

Appendix C. Vulnerability Assessment and Resilience Plan Natural Hazard Risks

Western fence lizard (*Sceloporus occidentalis*)

Table C-1. Natural hazard risks by asset and infrastructure type at SNL/TTR

Asset and Infrastructure System Type	Asset or Infrastructure Name/Identifier	Cold Wave	Strong Wind	Drought	Wildfire	Heat Wave	Precipita-tion	Riverine Flooding	Mean No. of Days with a Min. Temp. below 32°F	Mean No. of Days with a Max. Temp. ≥ to 95°F	Winter Weather
Workforce (e.g., outdoor workers, researchers, or office staff)	Members of the Workforce	8.3	5.5	6.0	7.3	9.8	7.0	9.8	8.3	9.8	7.0
Buildings, may be broken down by type (e.g., those with critical functions or office buildings)	1	7.0	4.5	6.0	7.5	10.0	8.0	6.0	7.0	10.0	6.0
Energy generation and distribution systems	2	7.0	4.5	6.0	7.5	10.0	8.0	6.0	7.0	10.0	6.0
Energy generation and distribution systems	3	7.0	4.5	6.0	7.5	10.0	8.0	8.0	7.0	10.0	6.0
Other	4	2.5	2.5	4.0	5.5	5.5	6.0	4.0	3.5	5.5	4.0
IT and telecommunication systems	5	3.5	3.5	5.0	6.5	6.5	7.0	5.0	None	6.5	5.0
Ecology and land preservation	Site flora and fauna	7.5	5.5	9.0	6.5	9.0	6.0	9.0	8.5	9.0	6.5
Energy generation and distribution systems	On-site powerlines, transformers, compressor stations	4.5	4.5	None	7.5	7.5	5.5	6.0	None	7.5	6.0
IT and telecommunication systems	On-site phones, radios, fiberoptic, internet	4.5	4.5	None	7.5	None	5.5	6.0	5.5	6.0	None
Transportation and fleet infrastructure	On-site roads and bridges	2.5	None	None	5.5	4.0	3.5	4.0	3.5	4.0	4.0
Water and wastewater systems	On-site septic tanks, drinking and wastewater transmission and distribution system	5.0	None	5.0	6.5	6.5	4.5	5.0	7.0	6.5	5.0
On-site waste disposal facility	On-site hazardous waste storage	None	None	None	5.5	None	3.5	4.0	None	None	None

Risk Score and Color Key	
High	≥ 7
Medium	3.5 ≤ 7
Low	< 3.5
None	Zero calculated risk

Glossary

Red-tailed hawk (*Buteo jamaicensis*)

A

abatement The act of reducing the degree or intensity of, or eliminating, pollution.

aboveground storage tank A fixed, stationary, or otherwise permanently installed storage tank that is wholly or partially above the ground surface and used to contain oil of any kind (petroleum, non-petroleum, synthetic, animal, or vegetable).

ambient air Any unconfined portion of the atmosphere (open air or surrounding air).

analyte A substance or chemical constituent undergoing analysis.

appraisal A documented activity performed according to written procedures and specified criteria to evaluate an organization's compliance and conformance with programs, standards, and other requirements contained in orders, laws, and regulations or in other requirements.

asbestos A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled. Uses for asbestos-containing material include, but are not limited to, electrical and heat insulation, paint filler, reinforcing agents in rubber and plastics (e.g., tile mastic), and cement reinforcement.

aspect Any element of activities, products, or services that can interact with the environment.

audit (1) An examination of records or financial accounts to check their accuracy. (2) An adjustment or correction of accounts. (3) An examined and verified account.

B

background radiation Relatively constant low-level radiation from environmental sources such as building materials, cosmic rays, and ingested radionuclides in the body.

basin (1) A low-lying area, wholly or largely surrounded by higher land, which ranges from a small, nearly enclosed valley to an extensive, mountain-rimmed depression. (2) An entire area drained by a given stream and its tributaries. (3) An area in which the rock strata are inclined downward from all sides toward the center. (4) An area in which sediment accumulates.

best management practice The preferred method or practice for managing operations.

biogeographic province A large region characterized as distinct from other regions, mostly on the basis of different dominant vegetation and wildlife habitat types.

biota The animal and plant life of a given region.

biotic Relating to or resulting from living organisms.

built environment The human-made space (including structures, features, and facilities) in which people live, work, and recreate.

C

climate A description of an area's average weather conditions and the extent to which those conditions vary over long time intervals, generally decades or centuries.

contamination The introduction into water, air, or soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to the surfaces of objects, buildings, and various household use and agricultural use products.

corrective action (1) Steps taken to clean up spills resulting from the failure to follow hazardous waste management procedures or from other mistakes. The process includes designing cleanup procedures to guide hazardous waste treatment, storage, and disposal. (2) An action identified to correct a problem or prevent its recurrence.

D

data quality objective A strategic, systematic process for planning scientific data-collection efforts.

decontamination The removal of adverse substances such as noxious chemicals, harmful bacteria or other organisms, or radioactive material from exposed individuals, rooms and furnishings in buildings, or the exterior environment.

demolition The act or process of wrecking or destroying, especially destruction by explosives.

discharge Any liquid or solid that flows or is placed onto any land or into any water. This includes precipitation discharges to storm drains, accidental or intentional spilling, and leaking, pumping, pouring, emitting, emptying, or dumping any material or substance onto any land or into any water.

diurnal (1) Relating to or occurring in a 24-hour period; daily. (2) Occurring or active during the daytime rather than at night (e.g., diurnal animals).

dosimeter A device used to measure the dose of ionizing radiation.

E

ecology The relationship of living things to one another and their environment, or the study of such relationships.

ecosystem A network of living organisms (e.g., humans, animals, plants, and fungi) and nonliving components (e.g., air, water, mineral soil, buildings, and roads) that interact to comprise an overall environment.

effluent Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

environment The sum of all external conditions affecting an organism's life, development, and survival.

environmental assessment An analysis prepared pursuant to NEPA to determine whether a federal action would affect the environment significantly and thus require a more detailed environmental impact statement.

environmental impact statement A document required of federal agencies by NEPA for major projects or legislative proposals that affect the environment significantly. A tool for decision-making, it describes an undertaking's positive and negative effects and cites alternative actions.

environmental management A program designed to maintain compliance with federal, state, and local requirements.

environmental management system A continuing cycle of planning, evaluating, implementing, and improving processes and actions undertaken to achieve environmental performance goals.

environmental monitoring The collection and analysis of samples or direct measurements of environmental media (e.g., air, water, and soil).

environmental release Any spilling, leaking, pouring, emitting, emptying, discharging,

injecting, pumping, escaping, leaching, dumping, or disposing of material into the environment, which may include (but is not limited to) soil, air, and drain systems.

Environmental Restoration A project chartered with assessing and, if necessary, remediating inactive waste sites.

environmental restoration site Any location on the environmental restoration site list that has been identified as an area that is (or may be) contaminated—either on or beneath the land surface—as a result of operations. Contaminants may be chemicals, radioactive material, or both.

environment, safety, and health program A program designed to protect and preserve the environment and to ensure the safety and health of an organization's employees, contractors, visitors, and the public.

ephemeral spring A spring that flows only briefly in the immediate locality in response to precipitation.

exceedance In relation to water quality, a compliance monitoring result that does not meet (exceeds) an applicable water quality standard.

F

fault A fracture in the continuity of a rock formation caused by the earth's crust shifting or dislodging, after which adjacent surfaces are displaced relative to one another and parallel to the plane of fracture.

fungicide An agent that destroys fungi or inhibits their growth.

G

gamma radiation Very high-energy and high-frequency electromagnetic radiation that is emitted by the nuclei of radioactive substances during decay, or by the interactions of high-energy electrons with matter. They are similar to but have a shorter wavelength than X-rays.

geology The scientific study of the Earth's origin, history, and structure.

greenhouse gas emission An air pollutant comprised of an aggregate group of six greenhouse gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride measured as carbon dioxide equivalent.

groundwater The water found beneath the earth's surface in pore spaces and in fractures of rock formations.

H

habitat The place or environment where a plant or animal naturally or normally lives and grows.

hazardous waste A waste with chemical or physical properties that meets the definitions in federal and state regulations and may cause harm to human health or the environment if not managed properly.

hazardous substance (1) Any material that poses a threat to human health and/or the environment by virtue of possessing one or more hazardous characteristics as defined by RCRA, its amendments, and related regulations. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. (2) Any substance that EPA requires to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

herbicide A chemical pesticide designed to control or destroy plants, weeds, or grasses.

human environment The natural and physical environment, and the relationship of present and future generations of people with that environment.

I

impact Any change in the environment, whether adverse or beneficial, wholly or partially resulting from activities, products, or services.

insecticide A pesticide compound specifically used to kill or prevent the growth of insects.

integrated safety management system A set of guidelines that systematically integrates safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public, and the environment.

isolated occurrence An area where cultural materials are sparse (fewer than 10 items) and are at least 50 years old.

L

lagoon (1) A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storing wastewater. (2) A shallow body of water, often separated from the sea by coral reefs or sandbars.

M

maximally exposed individual A member of the public who is located in an area that receives or has the potential to receive the maximum radiological dose from air emissions of a National Emissions Standards for Hazardous Air Pollutants radionuclide source. The dose estimates are based on realistic, yet conservative, input parameters.

migratory birds All birds listed in the Migratory Bird Treaty Act, 50 CFR 10.13, or which are a mutation or hybrid of any such species, including any part, nest, or egg.

mirage an optical illusion in the desert that occurs when light bends as it passes through layers of air with different temperatures, creating the appearance of water, lakes, or other distant objects on the ground.

Mixed Analyte Performance Evaluation Program A DOE quality assurance tool for environmental analytical services. It includes radiological, stable inorganic, and organic constituents (i.e., mixed analytes) in the same single-blind sample for analytical performance evaluation. The samples use various matrices, including soils, water, vegetation, and air filters. Program samples are not a mixed waste.

mixed waste Waste that contains both hazardous waste (as defined by RCRA and its amendments) and radioactive waste (as defined by the Atomic Energy Act and its amendments).

N

National Emission Standards for Hazardous Air Pollutants Emission standards set by EPA for air pollutants not covered by National Ambient Air Quality Standards that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health; secondary standards are designed to protect public welfare (e.g., building facades, visibility, crops, and domestic animals).

National Environmental Policy Act The basic national charter for protecting the environment. It establishes policy, sets goals, and provides the means for carrying out the act.

National Pollutant Discharge Elimination System A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, a tribal government, or a territorial government.

natural resource A resource (actual or potential) supplied by nature.

nitrate A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illnesses in infants and domestic animals. A plant nutrient and inorganic fertilizer, nitrate is found in septic systems, animal feedlots, agricultural fertilizers, manure, industrial wastewaters, sanitary landfills, and garbage dumps.

nitrite (1) An intermediate in the process of nitrification. (2) Nitrous oxide salts used in food preservation.

O

occurrence Events or conditions that adversely affect, or may adversely affect, DOE (including the National Nuclear Security Administration) or contractor personnel, the public, property, the environment, or the DOE mission.

optically stimulated luminescence dosimeter A device used to measure ionizing radiation.

outfall The place where effluent is discharged into receiving waters.

P

pollutant Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

polychlorinated biphenyl A family of highly toxic organic chlorine compounds. Because of their persistence, toxicity, and ecological damage via water pollution, the manufacture of PCBs was discontinued in the United States in 1976.

potable water Water that is free from impurities in quantities that would be sufficient to cause disease or harmful physiological effects.

Q

quality assurance A system of procedures, checks, audits, and corrective actions to ensure that research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

quality control A system used to determine analytical accuracy, precision, and contamination when samples are collected and to assess the data's quality and usability.

R

radioactive waste Any waste that emits energy as rays, waves, streams, or energetic particles. Radioactive materials are often mixed with hazardous waste from nuclear reactors, research institutions, or hospitals.

radiological contaminant A radioactive material deposited in any place where it is not desired, particularly where its presence may be harmful.

radionuclide A radioactive particle, man-made or natural, with a distinct atomic weight number.

radon A colorless, naturally occurring, radioactive, inert gas formed by the radioactive decay of radium atoms in soil or rocks.

reportable quantity A quantity of material, product compound, or contaminant that is reportable to a regulatory agency when released to the environment.

rodenticide A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food or crops.

S

Sample Management Office A Sandia office where personnel manage environmental analytical laboratory contracts and assist with processing and tracking samples undergoing chemical and radiochemical analyses performed at these laboratories.

sampling and analysis plan A plan that contains criteria required for conducting sampling activities.

sediment Transported and deposited particles or aggregates derived from rocks, soil, or biological material.

soil All loose, unconsolidated mineral or organic materials on the immediate surface of the earth that support plant growth.

solid waste (1) Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility. (2) Any discarded material—including solid, liquid, semisolid, or contained gaseous material—resulting from industrial, commercial, mining, or agricultural operations or from community activities.

stormwater Water runoff from rainfall or snowmelt, including that discharged to the sanitary sewer system.

surface water Water that has not penetrated much below the surface of the ground.

sustainability Those actions taken to maximize energy and water efficiency; minimize chemical toxicity and harmful environmental releases, particularly greenhouse gas; promote renewable and other clean energy development; and conserve natural resources while sustaining assigned mission activities.

T

threatened or endangered species A species present in such small numbers that it is at risk of extinction.

topography The physical features of a surface area, including relative elevations and the position of natural and man-made features.

toxic chemical Any chemical listed in EPA regulations under the *Emergency Planning and Community Right-to-Know Act of 1986*, Section 313, "Guidance for Reporting Toxic Chemicals."

transect A sample area (i.e., vegetation) usually in the form of a long, continuous strip.

treatment, storage, and disposal facility A facility at which waste management operations include treatment, storage, or disposal of hazardous wastes as defined by federal and state laws and regulations.

tritium A radioactive hydrogen isotope with an atomic mass of 3 and a half-life of 12.5 years, prepared artificially for use as a tracer and as a constituent of hydrogen bombs.

U

underground storage tank A storage tank installed completely below the ground surface, covered with earth, and used to contain oil of any kind (petroleum, non-petroleum, synthetic, animal, or vegetable).

V

vegetation Plant life or the total plant cover of an area.

volatile organic compound An organic chemical compound with a high vapor, causing it to evaporate.

W

waste management A method for dealing with the waste from humans and organisms, including minimizing, handling, processing, storing, recycling, transporting, and final disposal.

wastewater The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

water pollution The presence in water of enough harmful or objectionable material to damage the water's quality.

wetland An area that is saturated by surface water or groundwater, having vegetation adapted for life under those soil conditions, such as swamps, bogs, fens, marshes, and estuaries.

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