

# Environmental Restoration

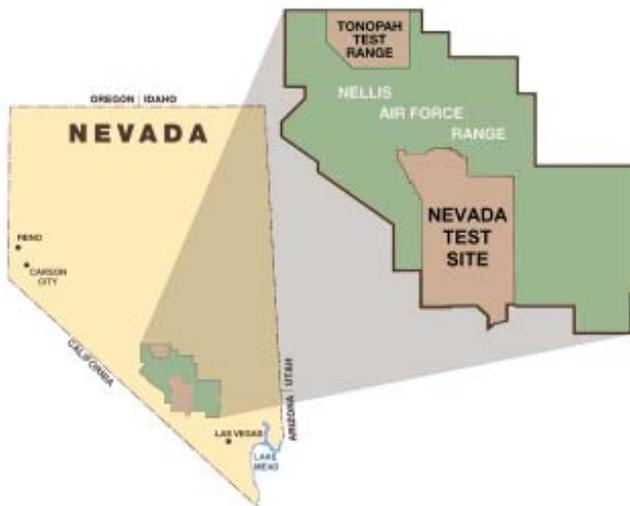
...an Overview

## Introduction

For more than 40 years, the primary mission of the U.S. Department of Energy (DOE) was to conduct testing of nuclear and conventional materials to support the research and development of nuclear weapons. Much of this field testing was done at the Nevada Test Site (NTS). Approximately 1,375 square miles in size, it is larger than the state of Rhode Island and is one of the largest restricted access areas in the nation.

The Environmental Management (EM) Program was established in 1989 at DOE offices around the country to address the environmental impacts associated with more than 50 years of nuclear weapons production in the United States. The EM Environmental Restoration Division is specifically charged with assessing the nature and degree of contamination at these testing areas as well as developing appropriate cleanup strategies or corrective actions.

The Environmental Restoration Division at the DOE Nevada Site Office (NSO) is responsible for corrective actions at approximately 800 former underground test sites, more than 100 atmospheric test locations, and other sites that have been identified for potential corrective actions. These sites are located on the NTS, the adjacent Nellis Air Force Range, the Tonopah Test Range, and at nine off-site test locations in five states, including Nevada. Many types of contaminants require corrective action, including



radioactive materials, oils, solvents, gasoline, heavy metals (such as lead), and unexploded ordnance. Corrective actions are required by federal and state regulations.

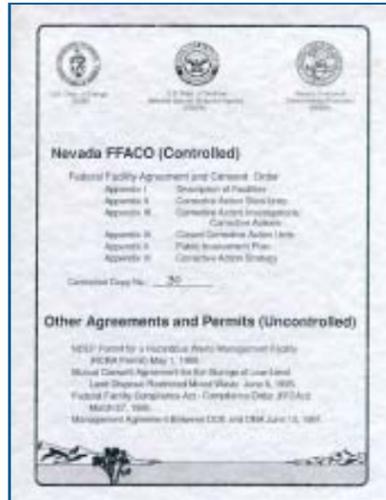
## Laws and Regulations

All environmental restoration work must comply with the following laws and regulations established to reduce risk, control pollution, ensure the health and safety of workers and the public, and protect diverse ecosystems:

- The **Resource Conservation and Recovery Act (RCRA)** is a comprehensive program for regulating and managing hazardous wastes, nonhazardous solid wastes, underground storage tanks, and promoting the use of recycled and recovered materials. It also encourages solid waste management practices that promote environmentally sound disposal methods, maximizes the reuse of recoverable resources, and fosters resource conservation.
- The **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)**, as amended by the Superfund Amendments and Reauthorizing Act, provides for remediation of, and emergency response for, hazardous substances released into the environment and for remediation of hazardous waste sites that present a substantial danger to public health and welfare.

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- The **Federal Facility Agreement and Consent Order (FFACO)** is an agreement among the NSO, the State of Nevada's Division of Environmental Protection, and the U.S. Department of Defense (DoD). It is the dominant regulatory driver for DOE environmental restoration activities in Nevada and covers all DOE administered sites within Nevada and DoD sites at the NTS. The FFACO establishes a framework for identifying, prioritizing, investigating, remediating, and monitoring the contaminated sites covered by the agreement. It also establishes a technical strategy for corrective actions, maximizes the opportunity to complete multiple corrective actions, and provides for public involvement activities.



- The **National Environmental Policy Act (NEPA)** requires federal agencies to fully consider and document all environmental consequences before beginning new programs or constructing new facilities. This law applies to any activity that affects the environment and is funded or approved by a federal agency. The NEPA process also ensures that information is readily available to both federal offices and citizens and provides opportunities for input from the community before decisions are made.

## Environmental Restoration Processes

Typically, environmental restoration specialists perform a variety of activities that are grouped under one of two categories: **characterization and corrective action** and **deactivation and decommissioning**.

**Characterization and corrective action** activities encompass the following:

- Identifying and surveying the site, conducting preliminary assessments, and inspecting the site to determine the extent and nature of contamination
- Developing Corrective Action Investigation Plans that guide characterization activities
- Developing corrective action alternatives and selecting the preferred alternative
- Developing Correction Action Plans that identify how the selected corrective action will be performed
- Conducting the necessary activities to complete closure of the site
- Conducting monitoring to ensure the site is in compliance with closure requirements

**Deactivation and decommissioning** provides for the safe dismantling and removal of inactive nuclear facilities, including hot cells, processing plants, and storage tanks. Several tasks are part of this process:

- Surveillance and maintenance to prevent human exposure to potential hazards
- Assessment of the type, extent, and nature of contamination
- Extensive review of regulations to assure compliance with environmental, health, and safety laws
- Development of an engineering design to reach facility end points
- Facility decontamination, dismantlement, or demolition
- Removal of wastes for storage or treatment
- Facility closure

## Environmental Restoration Projects

NSO environmental restoration activities are best understood by examining the functions of the four related projects: the Underground Test Area Project, the Industrial Sites Project, the Offsites Project, and the Soils Project. Under these projects, experts group sites according to location and physical/geological characteristics and begin the challenging process of identifying and carrying out the appropriate corrective actions.

### Underground Test Area Project

Within the Underground Test Area Project, scientists study the effects of underground nuclear detonations on the groundwater at the NTS and surrounding areas. Investigations focus on the geology and hydrology of the NTS to determine how contaminants are transported by groundwater flow. A regional three-dimensional computer groundwater model



has been developed to identify any immediate risk and to provide a formulation for developing site-specific models. Groundwater models of these individual test areas will be used to identify contaminant boundaries based on the maximum extent of contaminant migration. Results of the site-specific groundwater models will be used to refine a monitoring network, which is maintained both on and off the NTS to ensure public health and safety. Groundwater monitoring is expected to continue in perpetuity.



### Industrial Sites Project

Industrial Sites are locations on the NTS, the Tonopah Test Range, and the Nellis Air Force Range that were used in support of historic nuclear testing activities. Sites that fall under this project include disposal wells, inactive tanks, contaminated waste sites, inactive ponds, muck piles, spill sites, drains and sumps, and ordnance sites. After

experts have completed the characterization process and determined the extent of contamination (if any), many of these sites may be "closed in place," which simply entails the removal and disposal of debris such as old batteries and paint containers. Other sites may require a higher level of corrective action, which may include the complete excavation of the site, deactivation and decommissioning activities, and/or subsequent monitoring.

### Offsites Project

In addition to locations at the NTS and Tonopah Test Range, the NSO is responsible for corrective actions at nine sites in five states, including Nevada (not located within the NTS perimeter), where DOE conducted underground nuclear tests and experiments. Sites and facilities with surface contamination will be characterized to determine an appropriate corrective action. Upon completion of the correction action, any generated waste will be appropriately managed. The strategy will be to characterize groundwater and contaminated areas, assess risk, and develop models that predict the movement of contaminants. At areas with subsurface contamination, experts will conduct monitoring activities to ensure compliance with all aspects of approved closure documentation. Subsurface monitoring will continue in perpetuity.



### Soils Project

Surface soils at various sites on the NTS, the Nellis Air Force Range, and the Tonopah Test Range were contaminated with radioactivity as a result of three types of tests: approximately 100 atmospheric weapons tests that involved nuclear reactions; a series of tests designed to determine the safety of devices by simulating various accident situations; and a group of tests conducted under the Plowshare Program, which aimed to find peaceful uses for nuclear explosives. The surface soils were contaminated, to varying degrees, by these atmospheric nuclear tests, or by uranium and plutonium oxides from both the safety and Plowshare Program tests. Sites identified for corrective action under the Soils Project must undergo characterization, soil excavation, waste disposition, and monitoring.



### The nine Offsite locations include:

- Project Chariot Site, Alaska
- Amchitka Island, Alaska
- Project Rulison, Colorado (Grand Valley)
- Rio Blanco Site, Colorado (Rifle)
- Salmon Site, Mississippi (Hattiesburg)
- Project Faultless, Nevada (Central Nevada Test Area)
- Project Shoal Area, Nevada (Fallon)
- Gnome Site, New Mexico (Carlsbad)
- Gasbuggy Site, New Mexico (Farmington)

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## Public Participation

The NSO Environmental Management program encourages members of the public to participate in its environmental reastoration activities and offers a variety of opportunities for public involvement and education, including:

- Public meetings and outreach programs sponsored by the NSO
- The Speakers' Bureau program, which responds to community, academic, civic, or professional group requests for NSO speakers
- The NSO stakeholder mailing list, which provides timely meeting notices and infomation on environmental restoration projects to interested stakeholders
- Environmental Management fact sheets and informational materials
- The Community Advisory Board for Nevada Test Site Programs
- The NSO website at: <http://www.nv.doe.gov>



*The Nevada Site Office briefs the Community Advisory Board on the basics of radiation.*

## Summary

By using a systematic remediation strategy, NSO's Environmental Restoration Division is addressing environmental contamination at the NTS and other sites remaining from past weapons testing. The strategy includes: identifying the nature and extent of the contamination; determining its potential risk to the public and the environment; and performing the necessary corrective actions in compliance with applicable regulatory guidelines and requirements. The individual Environmental Restoration projects, while having separate functions, work together to achieve these objectives.

***For more information, please contact:***

***U.S. Department of Energy  
Nevada Site Office  
Office of Public Affairs  
P.O. Box 98518  
Las Vegas, NV 89193-8518  
(702) 295-3521  
[nevada@nv.doe.gov](mailto:nevada@nv.doe.gov)  
<http://www.nv.doe.gov>***

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