



Shoal, Nevada, Site

A Nevada Offsite

This fact sheet provides information about the **Shoal, Nevada, Site**. Long-Term stewardship responsibilities for this site are managed by the **U.S. Department of Energy Office of Legacy Management**.

Site Information and History

The Shoal site is on 2,560 acres of withdrawn federal lands within the north-central portion of the Sand Springs Range in Churchill County, Nevada. The town of Fallon is the largest populated area in the region and is about 30 miles northwest of the site. The region around the Shoal site is sparsely populated — military installations, recreation, ranching, and mining provide the dominant commercial interests.

The Project Shoal underground nuclear test was part of the Vela Uniform program sponsored jointly by the U.S. Department of Defense and U.S. Atomic Energy Commission (AEC), a predecessor agency of the U.S. Department of Energy (DOE). Vela Uniform was a research and development program directed toward locating, detecting, and identifying underground detonations. The objective of Project Shoal was to detonate a nuclear device underground, in an active seismic area, to improve the United States' ability to detect, identify, and locate underground nuclear detonations.

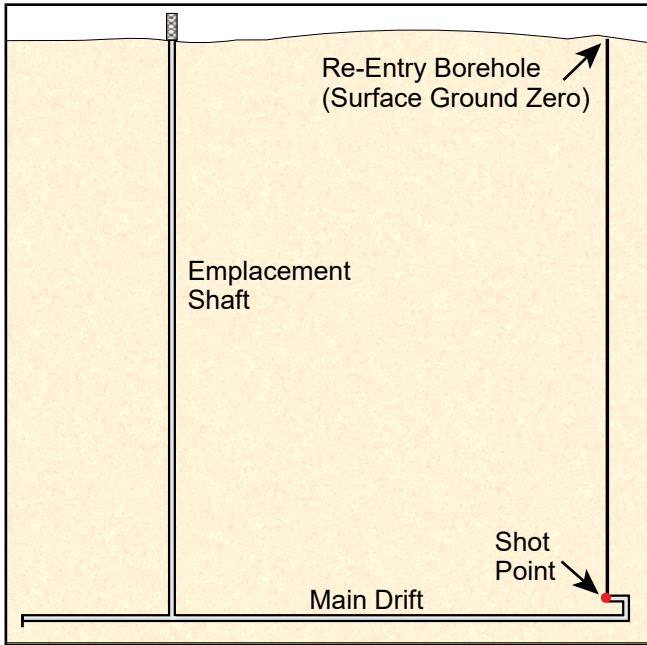
Performed on October 26, 1963, the Project Shoal test consisted of detonating a nuclear device in granitic rock at a depth of 1,211 feet. The device was emplaced through a shaft approximately 1,000 feet west of Surface Ground Zero. The shaft was mined to a depth of 1,315 feet below ground surface. At that depth, a drift (a nearly horizontal tunnel) was mined approximately 300 feet west and 1,050 feet east, ending in a 30-foot vertical “buttonhook” where the nuclear device was emplaced. Re-entry drilling directly over the blast cavity indicated that the Shoal device detonated as predicted. No radiation escaped to the surface during the underground

nuclear test, and no further underground nuclear testing was conducted at the site.

Groundwater is present beneath the site at depths of 965 to 1,375 feet. Groundwater moves primarily through fractures in the granite and it is recharged by infiltration of precipitation in the Sand Springs Range. Regional discharge occurs in the adjacent valleys.

Surface Conditions

Surface contamination resulted from pretest activities and post-test re-entry drilling. Contamination at the surface was identified as Corrective Action Unit (CAU) 416 and comprised three corrective action sites: a mud pit, a muckpile, and housekeeping area. The mud pit consisted of drilling mud that was contaminated with total petroleum hydrocarbons in excess of the state action level. Remediation of this location included excavating and transporting the hydrocarbon-contaminated material to the Nevada National Security Site (then known as the Nevada Test Site). The muckpile consisted of broken granite removed while the emplacement shaft and drifts were being mined in 1963. In 1996, a portion of muckpile material was used to backfill the emplacement shaft. Chemical analysis of the remaining muckpile detected no contaminants of concern above regulatory limits; consequently, the muckpile was not removed from the site. The housekeeping area consisted of approximately 20 rusted and empty 1-quart oil cans. Remediation activities included removal, disposal, and preparation of Housekeeping Closure Verification documentation. Surface restoration was completed in 1998 and remediation activities were summarized in the *Closure Report for CAU No. 416, Project Shoal Area*. The Nevada Division of Environmental Protection (NDEP) approved the closure report on February 13, 1998, stating that no post-closure monitoring is required and no land use restrictions apply at CAU 416.



Subsurface Layout of the Shoal Site Underground Nuclear Test.

Subsurface Conditions

Subsurface contamination that resulted from the underground nuclear test is identified as CAU 447. This CAU consists of the test cavity and the emplacement shaft. The original corrective action strategy for the subsurface used a numerical flow and transport model to help evaluate data and select a corrective action alternative. Model results were used to determine a contaminant boundary, or restricted region, surrounding the nuclear detonation. The contaminant boundary is a probabilistic, model-forecasted boundary that represents the maximum extent that groundwater, contaminated with test-related radionuclides exceeding Safe Drinking Water Act standards, is estimated to travel in 1,000 years.

The original corrective action strategy for CAU 447 required the installation of three wells for the dual purpose of monitoring and validating the numerical model. Monitoring data and modeling results were compared as part of the validation process. Based on the evaluation, it was concluded that the model did not accurately predict water levels or a prevailing lateral flow direction. This indicated that the model

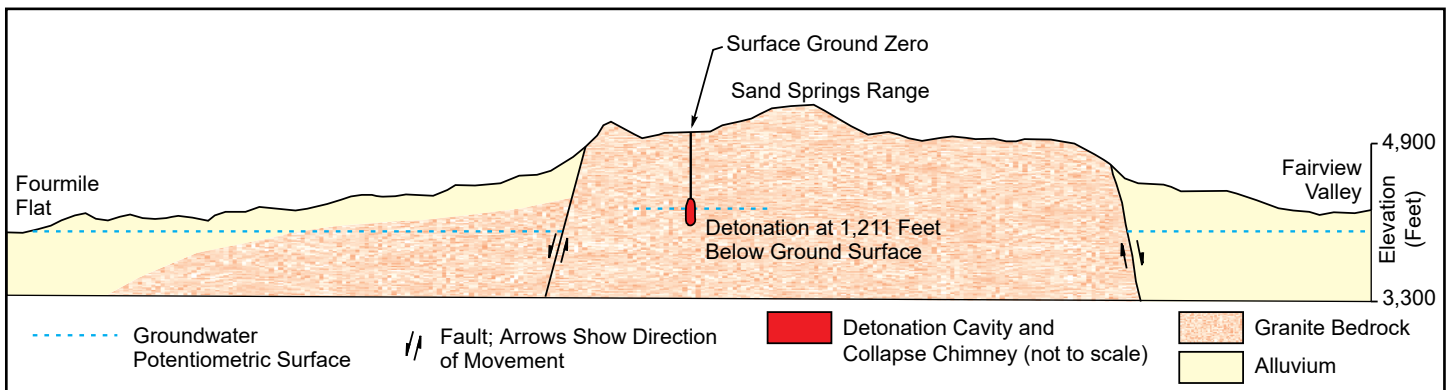
could not be validated. This led to a revised corrective action strategy designed to validate the compliance boundary through monitoring and institutional controls (ICs), rather than relying predominantly on the numerical flow and transport model. The revised approach included enhancements to the monitoring well network, updates to the site conceptual model, and five years of monitoring to confirm that monitoring data were sufficient to proceed to closure. It also included a revision to the contaminant boundary and expansion of the compliance boundary so it aligns with the subsurface use restriction boundary stated on the monument at Surface Ground Zero. These changes were included in the Closure Report for CAU 447, approved by NDEP in 2020. The Closure Report outlines the long-term postclosure monitoring requirements for the site.

Long-Term Hydrologic Monitoring Program

The U.S. Environmental Protection Agency monitored groundwater quality at and near the site annually from 1972 until 2008 as part of its Long-Term Hydrologic Monitoring Program. Samples were collected from 11 on-site monitoring wells and six off-site sample locations (three wells, two windmills, and one spring). No radionuclides related to the nuclear test were ever detected in any of the samples collected from the off-site locations. Subsequently, DOE developed a more refined monitoring network for the site that focuses on monitoring the on-site wells. The on-site wells were monitored annually from 2009 through 2019, and are now monitored in accordance with the Closure Report for CAU 447.

Land Use

The Shoal site was withdrawn from the U.S. Bureau of Land Management in September 1962 for all forms of appropriation — including mining and mineral exploration — and was reserved to the AEC for the Project Shoal experiment. In Title XXX of the National Defense Authorization Act of 2000, the surface of the Shoal site, along with the surrounding area, was reserved to the U.S. Navy for tactical maneuvering and air support testing and training. Under this same act, DOE retained responsibility and liability for subsurface interests.



Schematic Geologic Cross Section of the Shoal Site Area.

The region around the Shoal site is sparsely populated — military installations, recreation, ranching, and mining are the dominant activities in the region. No residences or habitable structures are on the site.

Institutional Controls

No ICs are required for the surface of the Shoal site.

A monument near Surface Ground Zero gives notice of restrictions associated with the subsurface of the Shoal site. The monument defines restrictions for excavation, drilling, and removal of material between elevations of 5,050 feet and 3,530 feet above mean sea level, and extending to a horizontal distance of 3,300 feet in any direction from Surface Ground Zero.

Regulatory Setting

Environmental restoration at the site is regulated by Federal Facility Agreement and Consent Order (FFACO 1996, as amended) requirements. FFACO is a three-party compliance agreement for Nevada sites between DOE, the state of Nevada, and the U.S. Department of Defense. NDEP has regulatory oversight of cleanup operations. Through FFACO, the DOE Office of Legacy Management (LM) is responsible for maintaining the site in a manner that is protective of human health and the environment.

Legacy Management Activities

LM is responsible for implementing the long-term postclosure monitoring program, inspecting the site and maintaining the ICs, evaluating and reporting the groundwater monitoring data, and documenting the records and data management processes. These activities are performed according to the Closure Report for CAU 447.



CONTACT INFORMATION

**IN CASE OF AN EMERGENCY AT THE SITE,
CONTACT 911**

**LM TOLL-FREE EMERGENCY HOTLINE:
(877) 695-5322**

Site-specific documents related to the **Shoal, Nevada, Site**, are available on the LM website at www.energy.gov/lm/shoal-nevada-site

For more information about LM activities at the **Shoal, Nevada, Site**, contact:

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