Fact Sheet

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U.S. DEPARTMENT of ENERGY | Office of Legacy Management

# Gnome-Coach, New Mexico

## A WEAPONS RELATED AND VELA UNIFORM SITE

This fact sheet provides information about the **Gnome-Coach site.** Long-term stewardship responsibilities for this site are managed by the **U.S. Department of Energy Office of Legacy Management** under the **Plowshare/Vela Uniform/Weapons Related Program.**

## Site Information and History

The Gnome-Coach, New Mexico, Site is about 25 miles southeast of Carlsbad in southern Eddy County. The site consists of two parcels of land covering about 680 acres.

In the early 1960s the U.S. Atomic Energy Commission (AEC), a predecessor agency of the U.S. Department of Energy (DOE), investigated and developed alternative sites, or "offsites," to the Nevada National Security Site (formerly known as the Nevada Test Site). It was during this time that the Gnome-Coach site was acquired through a land withdrawal from the U.S. Bureau of Land Management (BLM) for underground nuclear testing through the Plowshare Program. The Plowshare Program was a research and development project started in 1957 to find peaceful ways to use nuclear energy. The Gnome-Coach site was the first location chosen for underground nuclear testing under this program. The purposes of the underground nuclear test, called Project Gnome, were to:

- Study whether the energy from nuclear detonations could be converted into electricity.
- Investigate the production and retrieval of radioisotopes.
- Measure neutron activation cross sections of specific isotopes.
- Collect data on the characteristics of nuclear explosions in salt formations.
- Collect data to use in future Plowshare Program projects.

AEC personnel performed the nuclear test in the Salado Formation at a depth of 1,184 feet on Dec. 10, 1961. The Salado Formation is a 1,500-foot-thick bed of halite (salt) that is highly impermeable. The nuclear device was placed in the formation through a mined emplacement shaft and horizontal drift or tunnel (see cross section on Page 2). The underground nuclear detonation produced extremely high temperatures that vaporized the surrounding rock and created a cavity at the detonation depth. Immediately following the detonation, close-in stemming materials (used to contain explosion gases) failed, and gases from the detonation cavity vented to the atmosphere through the tunnel and emplacement shaft. A video taken five months after the test shows scientists accessing the cavity through the emplacement shaft and tunnel. The video is available at www.youtube.com/watch?v=Xh9eYitrLaM. Post-test drilling and preparations for another underground

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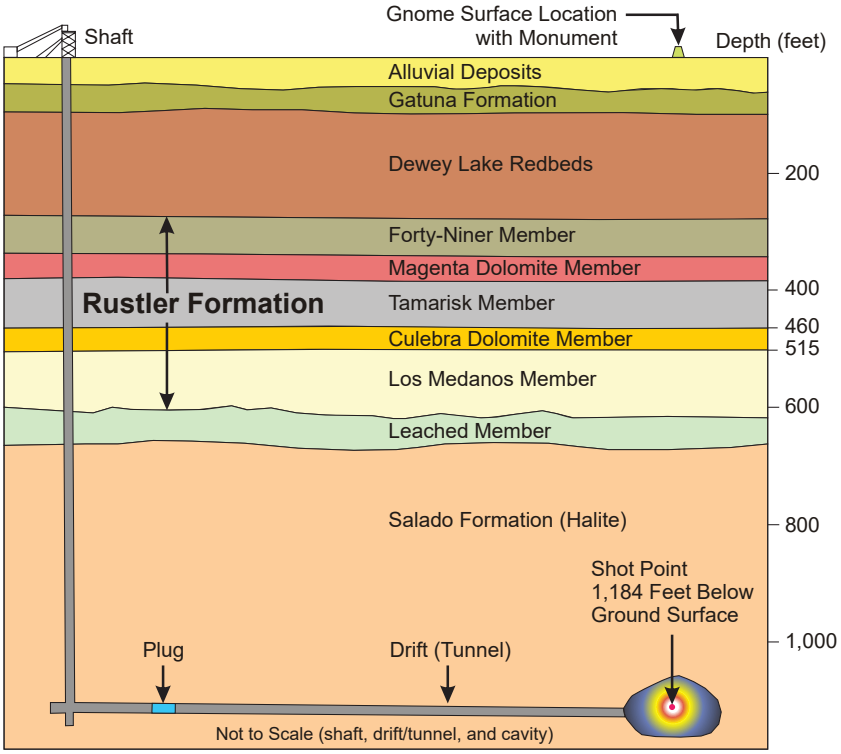


*Gnome-Coach, New Mexico, Site cross section.*

nuclear test, called Project Coach, began shortly after the Gnome test. AEC scheduled the Coach experiment for 1963, but later canceled the project before carrying it out. The site is still referred to as the Gnome-Coach site.

U.S. Geological Survey (USGS) personnel conducted a groundwater tracer test in 1963 using four dissolved radionuclides — tritium, iodine-131, strontium-90, and cesium-137 — as tracers. They injected these isotopes into groundwater through a well in the Culebra Dolomite Member of the Rustler Formation (see cross section on Page 2). The purpose of the tracer test was to evaluate the potential movement of radionuclides through the Culebra Dolomite aquifer.

## Surface Conditions

Cleanup of the surface and shallow subsurface contamination from the underground nuclear test and associated activities took place in 1968, 1969, and from 1977 to 1979. During these phases of cleanup, liquid waste was pumped into the detonation cavity through existing drill holes. Contaminated material was placed in the shaft and tunnel through existing drill holes.

Uncontaminated equipment was moved off-site, and drill holes were plugged, except those retained for use as groundwater-monitoring wells. The shaft was also reinforced with a concrete plug. The DOE National Nuclear Security Administration Nevada Site Office conducted a third cleanup in 2002 and 2003. During this phase of cleanup, soil contaminated with petroleum hydrocarbons was excavated and transported off-site for disposal followed by completion of a post-remediation surface radiological survey. DOE submitted the results from the cleanup to the state of New Mexico Voluntary Remediation Program and the site surface was approved for closure.

## Subsurface Conditions

Contamination remains in the detonation cavity, tunnel, and shaft and in the Culebra Dolomite where the USGS conducted the tracer test. Properties of the Salado Formation make it nearly impermeable, which makes any continuous movement of water through the formation highly unlikely. The Culebra Dolomite is a widespread, laterally continuous, fractured carbonate aquifer. Although groundwater within the Culebra is of poor quality because of naturally high concentrations of dissolved solids (salt), it is a

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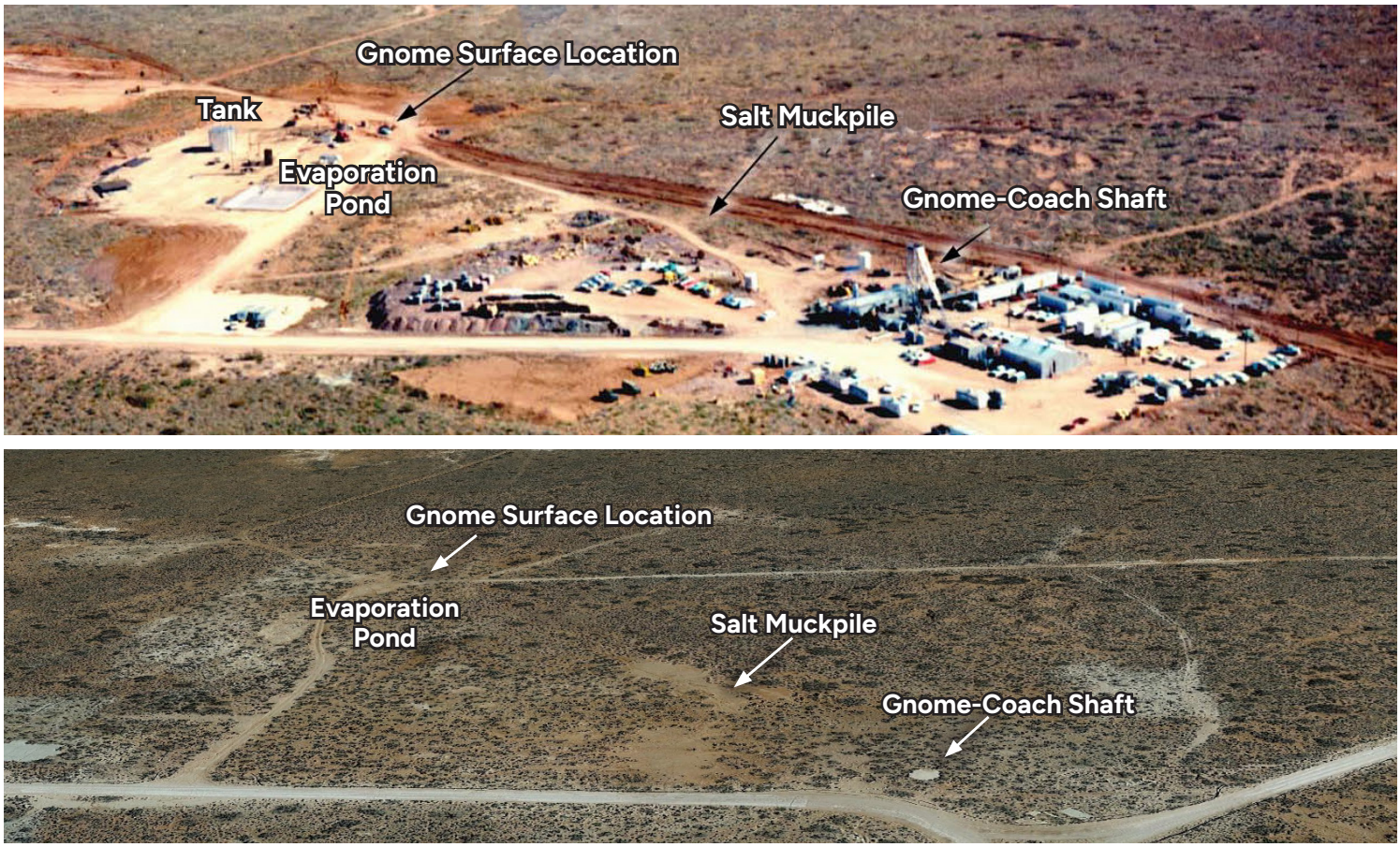


*Top: View of Gnome-Coach, New Mexico, Site in 1961; Bottom: View in 2014.*

source of water for ranchers who maintain livestock throughout the area. Wells on-site monitor the detonation cavity and tunnel in the Salado Formation and groundwater of the Culebra Dolomite. Subsurface activities have consisted of annual groundwater sampling of the on-site wells and several off-site wells as part of the Long-Term Hydrologic Monitoring Program (LTHMP). The U.S. Environmental Protection Agency (EPA) began the LTHMP in 1972 and conducted the sampling until 2008, when the DOE Office of Legacy Management (LM) assumed responsibility for sampling. Laboratory results from when the monitoring began in 1972 show that groundwater at the off-site sample locations had not been impacted by contamination related to nuclear tests. For this reason, monitoring is focused on the on-site wells. DOE continues to conduct investigations to obtain data that will enhance the monitoring of the subsurface.

## Regulatory Setting

DOE has responsibility for radioactive material at the Gnome-Coach site under authority of the Atomic Energy Act of 1954, as amended under Title 42 *United States Code*, Section 2011. DOE has conducted cleanup activities through a Voluntary Remediation Agreement with the state of New Mexico, which granted DOE a Conditional Certificate of Completion for the site surface cleanup in 2015. The certificate documents that the surface remediation has been completed in accordance with the state of New Mexico requirements. It also specifies long-term management requirements.

## Institutional Controls and Land Use

The Gnome-Coach site is withdrawn from all forms of appropriation associated with mining laws and leasing through Public Land Order 2526 (*Federal Register*, 61-10429, Nov. 1, 1961), which prohibits future oil and gas leasing or mineral claims at the site. BLM has the surface rights, and the designated surface use is grazing and nonresidential land use. The land in this remote, nonresidential area is mostly used for livestock grazing, oil and gas exploration and production, and public land use.

Institutional controls are the documents and physical features that ensure the long-term protectiveness of a site. Surface cleanup activities have been completed at the Gnome-Coach site, but subsurface contamination is still in the emplacement shaft, tunnels, detonation cavity, and

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Culebra Dolomite near the wells used for the tracer test. The surface restrictions prohibit excavation within 40 lateral feet of the concrete cap that protects the emplacement shaft. The subsurface restrictions prohibit drilling, excavating, or other activities that would disturb materials deeper than 20 feet below ground. The monument and signs around the emplacement shaft and perimeter of the site notify the public of these institutional controls.

## Legacy Management Activities

LM is responsible for implementing the annual groundwater monitoring program, inspecting the site, maintaining the institutional controls, evaluating and reporting the groundwater monitoring data, and documenting the records and data management processes for the site. LM personnel do this according to the site-specific Long-Term Surveillance and Maintenance Plan. Groundwater-monitoring and site-inspection results are documented in annual reports.

## 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 **Gnome-Coach site** are available on the LM website at **www.energy.gov/lm/gnome-coach-new-mexico-site**.

For more information about LM activities at the **Gnome-Coach site**, contact:

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