



# Rulison, Colorado, Site



## FACT SHEET

*This fact sheet provides information about the Rulison, Colorado, Site.  
This site is managed by the U.S. Department of Energy Office of Legacy Management.*

### Site Description and History

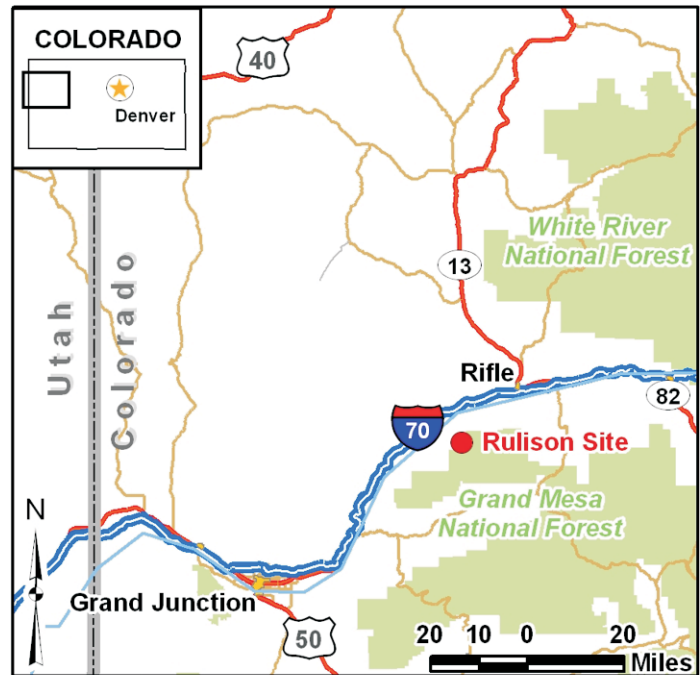
The Rulison Site is located 8,154 feet above sea level on the north flank of Battlement Mesa in western Colorado about 12 miles southwest of the town of Rifle and 8 miles southeast of the town of Parachute.

On September 10, 1969, the U.S. Atomic Energy Commission (AEC), a predecessor agency of the U.S. Department of Energy (DOE), detonated a 43-kiloton nuclear device 8,426 feet below the ground surface in an attempt to release commercially marketable quantities of natural gas from the fine-grained, low-permeability sandstone of the Williams Fork Formation of the Mesaverde Group. This was the second natural gas reservoir stimulation experiment in the Plowshare Program, which was designed to develop peaceful uses for nuclear energy. Austral Oil Company of Houston, Texas, and the nuclear engineering firm CER Geonuclear Corporation of Las Vegas, Nevada, proposed the project. Those two firms and AEC jointly sponsored Project Rulison.

The nuclear device was designed to release its energy in less than one one-millionth of a second. The explosion would melt and vaporize the nearby rock and would crush and fracture the rock beyond out to a horizontal diameter approximately 740 feet. In about one-tenth of a second, a spherical cavity containing melted and vaporized rock would grow to a diameter nearly 160 feet. As the cavity cooled, the vaporized and melted rock would collect in a puddle at the bottom. Most of the radioactivity would be trapped in this puddle as it cooled and formed into a glassy solid. Within a few minutes to a few hours, the roof of the cavity would collapse progressively upward to form a chimney of broken rock to a height of about 370 feet above the point of detonation.

The intent of the detonation was to stimulate flow of natural gas through the fractures created by the blast and use the chimney as a collection chamber. The blast created a roughly symmetrical cavity and a chimney of rubble above it. No radiation was released at the surface at the time of the blast.

Four natural-gas flaring events were conducted as part of the production testing and data evaluation that took

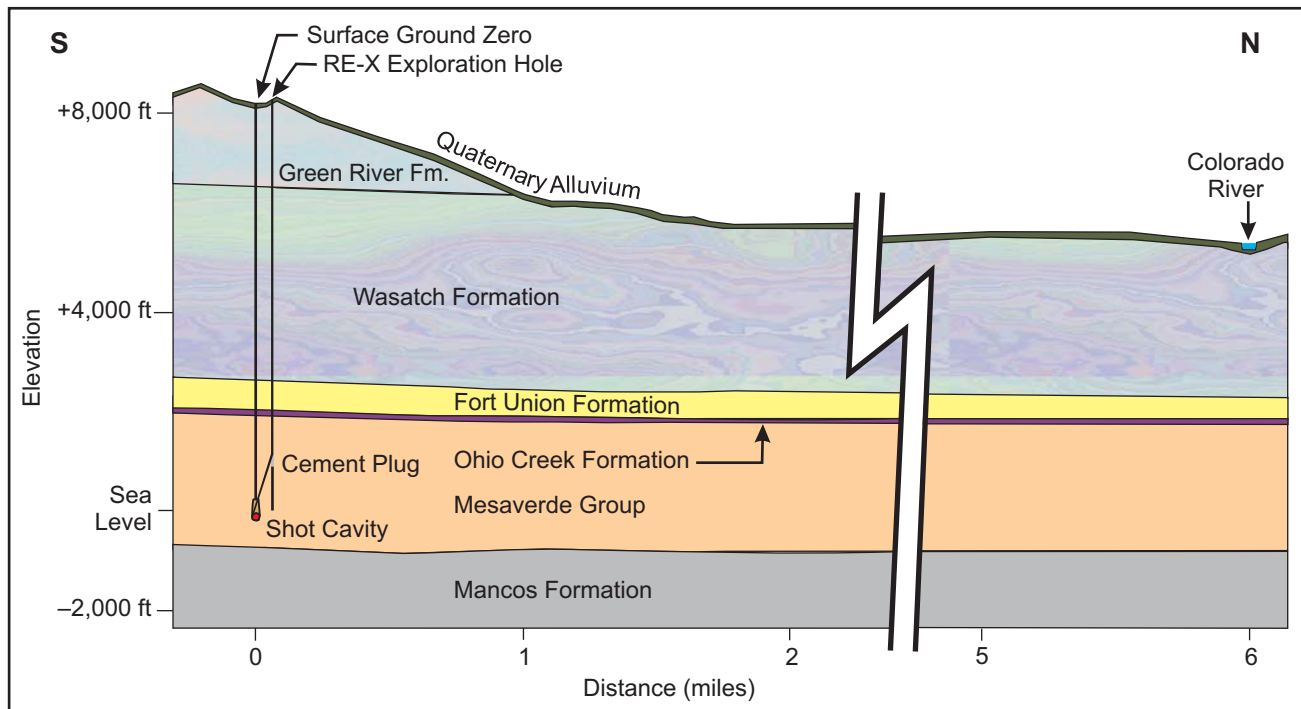


*Location of the Rulison, Colorado, Site*

place between October 1970 and April 1971. The first flaring event was a calibration flare lasting for 3 days. The U.S. Public Health Service used this test to calibrate its network of off-site equipment to monitor the production testing for the health and safety of the surrounding population. Three intermittent production test-flaring periods followed. Measured dose from the production flaring was 50,000 times less than the annual dose standard for the general public set by the government. Although approximately 455 million cubic feet of natural gas was produced, elevated levels of radioactivity in the gas made it unacceptable for use.

### Regulatory Setting

The federal government holds title to, and DOE is responsible for, radioactive and other hazardous materials generated by DOE and predecessor agencies at the Rulison Site. The Rulison Site is not a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site because it is not listed on the National Priorities List.



*Cross Section of the Rulison, Colorado, Site*

The surface property within the Rulison Site is privately owned, although the federal government retains control of the subsurface rights beginning at a depth of 6,000 feet within a 40-acre area. The radiological contamination is managed under the authority of DOE.

As of October 1, 2006, the DOE Office of Legacy Management has responsibility for long-term management of the Rulison Site and for enforcement of institutional controls at the site.

### **Surface Cleanup at the Rulison Site**

In July 1972, equipment not needed for production purposes was decontaminated and removed from the site. The site was left in standby condition. In 1976, the remaining equipment was decontaminated and removed, and the emplacement well was plugged and decommissioned. Drilling fluid in the effluent pond was removed, and the impoundment structure was left at the request of the landowner. Remaining surface facilities were dismantled, inspected, surveyed for radiation, decontaminated if necessary, and removed to an off-site location.

Soil and sediment sampling in 2000 and 2002 in the areas around the former effluent pond area, the flaring stack, and the reentry well detected organic drilling additives (petroleum hydrocarbons) in the former effluent pond sediments. The corrective action consisted of dewatering the pond and removing the sediments containing petroleum hydrocarbons that exceeded the threshold established with the State of Colorado. A pond liner was installed before the pond refilled. Eight wells were drilled to monitor ground water quality to verify

that no contamination was moving into the ground water from the pond sediments that remained below the liner and the reentry well area. After eight consecutive quarters of sampling, no migration of petroleum hydrocarbons above risk-based trigger levels was detected. The eight wells were plugged and decommissioned, and DOE recommended closure of the Rulison Site surface with no further action. The Colorado Department of Public Health and Environment agreed and approved the closure activities.

### **Subsurface Conditions**

DOE does not plan to remove subsurface radioactive contamination in or around the test cavity because no feasible technology exists to do so. The detonation occurred in low-permeability sedimentary rock that extends several thousand feet above and below the test cavity. Aquifers in the area of the Rulison Site are generally limited to alluvium and terrace deposits because the underlying rock is typically nearly impermeable and produces little, if any, water.

The main contaminants in the area of the test cavity are expected to be the radioactive fission products plutonium, tritium, and uranium. The gaseous radionuclides carbon-14, krypton-85, and tritium are the most mobile in the environment. The primary radionuclide of concern today is tritium.

### **Long-Term Hydrologic Monitoring Program**

Since 1972, the U.S. Environmental Protection Agency (EPA) has annually monitored ground water at and near the Rulison Site as part of a long-term hydrologic monitoring program. No radioactive

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contamination associated with the Rulison test has been detected in EPA samples taken from the nearby municipal drinking water supply springs, the water supply wells on five local ranches, or the spring and three wells on the test site. EPA will continue ground water monitoring through 2007.

### ***Institutional Controls***

An increase in drilling for natural gas and the number of residents in the area has raised public concern about new gas wells intercepting Rulison-related radioactivity in the subsurface. After the detonation, drilling was prohibited within the 40-acre site surrounding the device emplacement well, known as surface ground zero, and below 6,000 feet. The Colorado Oil and Gas Conservation Commission (COGCC) established two wider boundaries around the site. When a company applies for a permit to drill within a 3-mile radius of surface ground zero, COGCC provides notice to DOE and the opportunity to comment on the application or request for sampling and analysis to be conducted as part of the permit. In February 2004, COGCC also established a 0.5-mile radius around surface ground zero. An application to drill within 0.5 mile requires a full hearing before the commission. The 40-acre at-depth drilling restriction that DOE maintains is a considerably smaller area than the 0.5-mile radius established for a hearing.

DOE will conduct a subsurface modeling study to assess the adequacy of the exclusion boundary. The modeling will simulate the current subsurface conditions in the horizon of the test cavity, apply hypothetical gas production stresses to the formation (such as fracturing the rock at target depths to release natural gas), and define a probable contaminant boundary. Depending on modeling results and designation of a contaminant boundary, DOE may establish a new drilling exclusion zone. The model is expected to be completed and released to the public in 2007.

Subsurface use restrictions within the Rulison Site boundary will remain in place in perpetuity. A permanent monument erected at surface ground zero bears a plaque with an inscription denoting the historical significance of the site and states that excavation, drilling, and removal of subsurface materials below a depth of 6,000 feet is prohibited without permission of the U.S. Government.

### **Legacy Management Activities**

Responsibility for the Rulison Site transferred from the DOE Office of Environmental Management to the DOE Office of Legacy Management on October 1, 2006. The DOE Office of Legacy Management will manage the Rulison Site in accordance with the site-specific Long-Term Surveillance and Maintenance Plan to ensure that conditions at the site continue to be protective of human health and the environment. While this plan is still under development, it is anticipated that DOE will conduct annual inspections of the site to verify that no drilling has taken place within the exclusion boundary and that DOE will conduct long-term monitoring of surface water, ground water, and/or natural gas.

### **Contacts**

Documents related to the Rulison Site are available on the DOE Office of Legacy Management website at <http://www.LM.doe.gov/land/sites/co/rulison/rulison.htm>.

For more information about DOE Office of Legacy Management activities at the Rulison Site, contact

U.S. Department of Energy  
Office of Legacy Management  
2597 B<sup>3</sup>/<sub>4</sub> Road, Grand Junction, CO 81503  
E-mail: [Rulison@LM.doe.gov](mailto:Rulison@LM.doe.gov)

(970) 248-6070 (monitored continuously), or  
(877) 695-5322 (toll-free)