A New Role for the Nevada Test Site

The moonscape that is part of the NTS today. The saucer-shaped craters (pockmarks) are caused by subsidence. This is the north end of Yucca Flat on the site, where most underground tests were conducted in the Cold War era.

By Richard G. Telfer

The brilliant glow that illuminated the night skies some 60 miles north of Las Vegas on January 27, 1951, thrust Nevada into the nuclear age and changed the economy, the thinking, and the demographics for those living in the state and for the many thousands that have arrived since that aboveground nuclear blast. Little could those early nuclear pioneers of Nevada have visualized the importance of their work at the Nevada Test Site (NTS) in the years that have followed.

Original Mission

During the Cold War era, the basic function of the NTS was to validate the reliability of the nuclear weapons stockpile. Between 1951 and 1992, a total of 928 tests were conducted. Evidence of many of these tests can be seen today in the form of pockmarks in the desert floor, buildings and equipment no longer usable, and remaining signs posted to warn of contaminated areas. Because a majority of the tests were conducted underground, concern regarding groundwater contamination has prompted extensive well drilling and sampling projects. Results of these tests are sent to state agencies and presented at town hall–type meetings to inform people living west of the test areas about the movement of potential contaminants. This activity remains a significant part of work related to the years of testing.

The New Challenge

Since weapons testing was suspended at the end of the Cold War, a new and possibly more challenging role has emerged for the NTS: managing radioactive waste. Many nuclear weapons production and related facilities around the nation, under mandate, ceased operations. In many cases machines containing radioactive substances were shut down while still on the production line. Regardless of the status of the assembly line and the end product of the facility, the chore at once became a question of "How shall we do it?" By directive, sites were to be returned to a condition as near as possible to what they were before the facility was constructed.

Since weapons testing was suspended at the end of the Cold War, a new and possibly more challenging role has emerged for the Nevada Test Site: managing radioactive waste.

Characteristics of the Area

- **A mammoth piece of geography, located in the southern portion of the state, consisting of approximately 1375 square miles.**
- **Elevations ranging from 3080 ft at Frenchman Flat to more than 7600 ft at Rainier Mesa at the most northern part of the site.**
- **Temperature will range from zero to more than 100 degrees Fahrenheit.**
- **Rainfall in the southern region or lower elevation averages four to six inches yearly.**
- **Surrounded by Air Force and Bureau of Land Management lands, the site is secure from intrusion by unauthorized personnel.**
- **Depth to groundwater in Area 3 is 1600 ft; in Area 5, it is 772 ft.**

This "Survival Town" house remains standing on the site. Survival Town was built for a Civil Defense exercise and to test items not previously subjected to a nuclear blast. It consisted of houses, office buildings, fallout shelters, power systems, communication equipment, a radio broadcasting station, and trailer homes. A 29-kiloton nuclear detonation a little over a mile from the town site was conducted in 1955.

Today, many are asking such questions as, What must be removed from the site? What is the degree of radioactivity at the site? Can any of the material be left in place? Is it possible to reprocess any of the materials? These and many other questions must be answered as new situations enter the picture.

Because sites were of different sizes and because each had a unique mission, the problems each faced are varied. Public concern became an immediate issue at most locations, and recognizing the importance of both keeping the public informed and gaining public input, the U.S. Department of Energy sponsored community advisory boards (CABs), also known as site-specific advisory boards. Those serving on these boards have provided and continue to provide invaluable service to their communities as well as to the site contractors and the DOE. Because of the untiring work of these volunteers in serving on study committees, touring sites, and making recommendations, the cleanup, waste removal, and site restorations have progressed smoothly, with a strong degree of public acceptance.

The removal of radioactive waste has taken center stage at many sites. Classifying the waste has been an integral and vitally important process in determining where the waste will be sent for disposal. The DOE has identified more than 20 nuclear facilities as "generators" of radioactive waste. These differ in size greatly. Fernald with just above 1000 acres and Oak Ridge with more than 60 000 acres are just two examples where cleanup activities must take on different approaches.

Risk Factors

Factored into decisions regarding the handling and movement of contaminated waste is the risk associated with such activities. To assist with risk determination is the Center for Risk Excellence, with a goal of helping the DOE make credible decisions regarding risk to human health, especially as related to waste management issues.

The following are considered as potential risks in surface and subsurface areas at the NTS:

- Groundwater in regions of underground tests.
- Subsurface soils.
- Structures and other on-the-surface solids.
- Vadose zone—soil and blast debris.

Potential risks related to waste disposal areas at NTS include these:

- Shallowness of land disposal.
- Crater disposal.
- Trucks carrying waste on the limited Nevada highway system.

Constant evaluations of these and other risk factors are conducted by the generators as well as the waste management personnel at the NTS, with modifications implemented on an ongoing basis. Ensuring the safety of the population and the environment is the primary goal of the waste management program.

Risk reduction is not only an immediate concern of waste managers, but is also being looked at on a long-term basis. How can shipping risk factors be reduced? Can

modifications of the disposal process be made to reduce risk? These and countless other questions must be addressed as more materials arrive at the NTS for disposal.

Nevada Test Site Waste Management Areas

Both Areas 3 and 5 are considered and authorized as radiological facilities. Each has different features that lend themselves to specific types of disposal containers.

Area 3 has approximately 120 acres available, with a disposal capacity of 19.5 million cubic feet. Waste is placed in subsidence craters, the results of underground tests, with depths of between 45 and 90 ft. This unit accepts all kinds of things—from large cargo containers and uncontainerized large equipment considered waste to burrito wraps and supersacks—all of which is covered by what is referred to as "layer-cake geometry," meaning that up to 3-ft-thick layers of compacted soil are placed between layers of deposited waste.

Area 5 disposal capacity is 100 million ft^3. The disposal areas, called cells, are between 83 and more than 1000 ft long, range in width from 30 to 336 ft, and are from 12 to 48 ft deep. Various types of low-level waste containers are placed side by side and on top of each other in the cells. Containers include steel drums with capacities up to 110 gallons, or approximately 19 ft^3, wooden boxes holding as many as 160 ft^3, and various metal boxes. Once the waste is located in place and stacked, native soil is used to cover the containers. Placement of each labeled container is recorded as to exact location, and those data are kept with the container manifest regarding contents of the package.

In the designated sites—Areas 3 and 5—it is estimated that the remaining disposal capacity is in the range of 133 million ft^3. Future expansion into currently undesignated craters or land does not figure into this stated capacity.

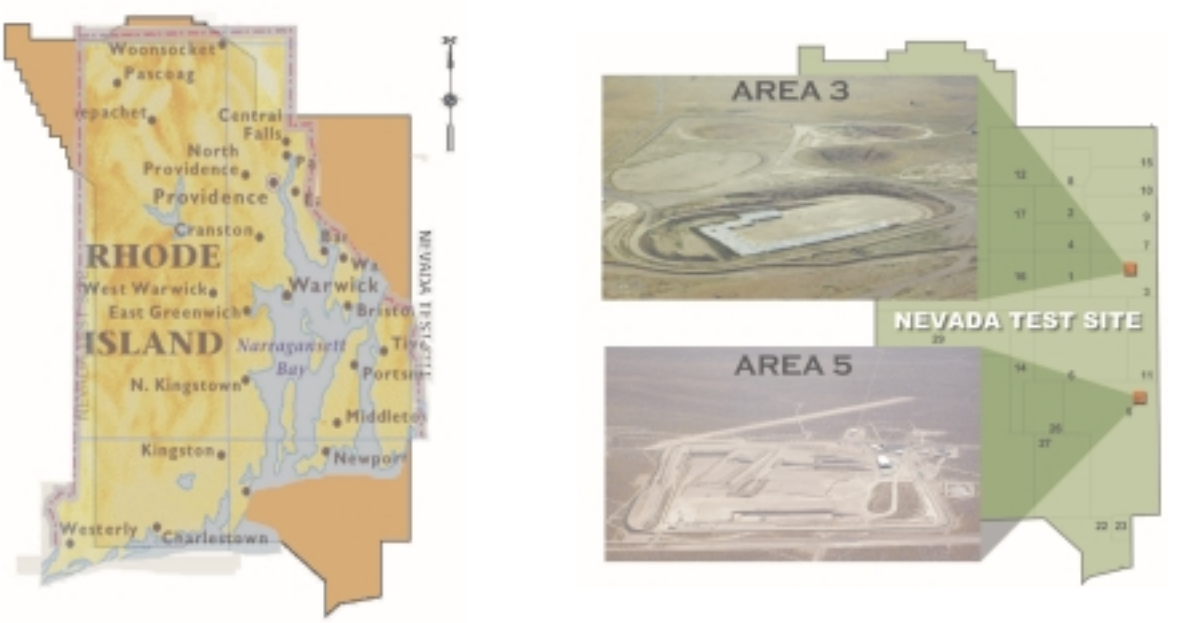
Because of the radiological nature of the LLW currently being deposited at the NTS, workers are generally not required to wear protective equipment other than typical worker hard hats and hard-toe shoes.

Waste Acceptance Criteria

Prior to shipping any LLW to the NTS, the generator must meet established guidelines contained in an approximately 100-page document developed by the Waste Management Division of the DOE at its Nevada Operations Office. This document, titled "Nevada Test Site Waste Acceptance Criteria," provides the generator with specific regulations and procedures with the following purposes:

- To protect both personnel and the environment.
- To maintain radiation standards.
- To establish a quality assurance program.
- To ensure safe storage and disposal of radiological waste.
- To be in keeping with federal, state, and local regulations.

Often public concern is expressed in the form of protests regarding the safety of handling and shipping nuclear waste. Such questions as "How do we know it is safe?" or



The NTS compares in area to the state of Rhode Island. The Area 3 and Area 5 LLW disposal facilities are in the eastern portion of the site.

"Why is that awful stuff coming through our town?" are not uncommon. It may well be that not enough attention has been directed to informing the public regarding the countless checks and balances that are in place before radioactive waste even leaves the generator site.

The approval process for dispatching LLW to the NTS is extensive and includes many approval documents that the generator must complete prior to the movement of any waste to the NTS. The following is a partial list of those documents:

- Waste profiles to identify the waste stream to be shipped.
- A quality assurance plan to demonstrate compliance.
- A certification personnel list to identify those autho-

Area 3 has approximately 120 acres available, with a disposal capacity of 19.5 million ft³. Waste is placed in subsidence craters resulting from underground tests.

rized to certify waste.

Waste not certified by authorized persons on the list will not be accepted at the NTS.

Each section of the waste acceptance criteria is written in such a way as to avoid misinterpretation—as far as humanly possible—either by the generator or by waste management personnel. The regulatory sections include the following:

- Approval process.
- Waste criteria.
- Waste characterization.
- Quality assurance requirements for waste certification.
- Radioactive waste management at the NTS.
- Waste transportation and receipt information.

Workers take water samples from an offsite well located in Beatty, Nev.

The many requirements provide the generator with a significant degree of certainty that their shipments will be accepted upon arrival at the NTS. Although the requirements are extensive and take much time to document, both the generators and waste management personnel have been pleased with the smoothness of the operations.

Generator Site Cleanup

Managing cleanup activities at the many generator locations across the nation typically involves the following areas:

- Building decontamination.
- Aquifer restoration.
- Soil remediation.
- Dismantlement of buildings and equipment.
- Arranging for onsite storage facilities.
- Maintaining public relations.
- Packaging and shipping waste.
- Cooperating with health and safety workers and labor unions.
- Interacting with transportation organizations.

Waste disposal operations in Area 3.

- Training employees.

Because of the many areas of potential involvement, the task of site restoration can well become a major company and community effort. According to the size of the facility, its location, and the nature of its original work, each of the tasks can take on a particular importance. For example, many sites are able to handle onsite disposal in specifically designed pits for contaminated soils; thus, their need to ship large volumes of waste may be greatly reduced.

An Effective Training Program for Waste Shipping

Fluor Fernald, just northwest of Cincinnati, is a generator sending LLW to the NTS. In preparation for shipments, they have undertaken an extensive program to ensure that each shipment meets the criteria set forth by the DOE. Fernald uses several approaches in its training program: classroom lectures, computer-based instruction, and on-the-job training. The program includes information dealing with Fernald site procedures, NTS, and U.S. Department of Transportation (DOT) requirements. Some examples of classes offered give an indication of the importance management places on doing the job well:

- Radiological Worker Training.
- Materials Handling Principles and Techniques.

Waste disposal operations in Pit 5 of the Area 5 radioactive waste management site.

Dismantling a building at Fernald.

- Awareness of NTS Waste Acceptance Criteria.
- Advanced Radiological Shipping Certification.
- Hazardous Material Spill Cleanup.

In fiscal year 2001, Waste Generator Services at Fluor Fernald shipped more than 300 000 ft^3 of LLW to the NTS. In addition to shipping, workers handled waste characterization, sampling, inspection, verification of stored waste, and other necessary activities to ensure successful shipments.

Each generator establishes its own program to successfully meet the acceptance criteria for the shipments of LLW it plans to send to the NTS.

LLW Transportation

The DOT regulations are very specific for the movement of LLW over the nation's highways. DOE Nevada, working with generators, requests that shippers avoid heavily congested and populated areas as much as possible. Two areas of concern in Nevada are Hoover Dam and the Interstate 15 and U.S. 95 interchange in Las Vegas.

Checking the waste acceptance manifest.

To assist in managing route selection, each carrier heading to the NTS completes a route disclosure form. This form outlines the planned route for each individual shipment. Failure to abide by the planned route could be cause for the carrier's approval to be suspended.

Generators need to carefully evaluate the carriers they consider using. Certain background information can give clues to the ability of the carriers to safely complete the trip to the NTS:

- Driver: Experience, accident record, moving violations, and on-time record.
- Equipment: Maintenance record, breakdowns, and condition.
- Experience: What other generators have they served?

Loading shipments for transport from Fernald to the NTS.

The NTS has received approximately 11 500 shipments of LLW since 1976. Addressing stakeholder concerns regarding LLW shipments, the DOE, working in close cooperation with carriers, has been able to see a significant reduction in these shipments over Hoover Dam and through the city of Las Vegas. Every possible effort is at work to protect populations along routes over which nuclear waste will be moved.

Valuable Resources

It is evident that the NTS, with its changed role from that of testing nuclear devices to one of storing LLW generated by government agencies and the former weapons production facilities of the Cold War era, continues to serve the nation as a valuable resource. As in the past, the dedication of NTS workers and DOE staff having responsibility for LLW management activities is further testament that they, too, are an invaluable resource. ■

Richard Telfer is a former chair of the NTS's CAB and an occasional contributor to Radwaste Solutions*; a retired career educator, he consults on nuclear issues.*