

Nevada National Security Site Tour Booklet



Nevada Site Specific Advisory Board

November 14, 2012



EM *Environmental Management*

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Prohibited Articles On Nevada National Security Site Public Tours

The following items are prohibited within the boundaries of the Nevada National Security Site public tours. Tour escorts are required to do random checks.

- Cellular Phones
- Bluetooth Enabled Devices
- PDA, BlackBerry, etc.
- Computers
- Portable Data Storage Devices
- Global Positioning System (GPS)
- Cameras/Camcorders
- Binoculars
- Optical Instruments
- Recording Devices
- Pets and Animals
- Explosives
- Ammunition
- Incendiary Devices
- Chemical Irritants
- Alcoholic Beverages
- Controlled Substances
- Any Item Prohibited by Law

Possession of these items may delay the tour and prevent your participation.

If at any point during the tour these items are discovered, the tour may be terminated.



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Tour Agenda*

- | | | | |
|------------|---|------------|--|
| 7:30 a.m. | Depart for Mercury from McDonald's parking lot, Durango and Highway 95, Las Vegas | 11:40 a.m. | Depart for Sedan |
| 8:30 a.m. | Arrive at Mercury Badge Office | 11:50 a.m. | Arrive at Sedan Crater |
| 8:35 a.m. | Depart for Gate 100 | 12:15 p.m. | Depart for T2B atmospheric Test Diablo, CAU 105, Work Plan Item #1 |
| 8:40 a.m. | Arrive at Gate 100 for badge check | 12:30 p.m. | Arrive at T2B. Drive-by briefing. |
| 8:45 a.m. | Depart for Frenchman Flat | 12:45 p.m. | Depart for Stockade Wash Overlook |
| 9:00 a.m. | Arrive at Frenchman Flat. Briefing on Nonproliferation Test and Evaluation Complex (NPTEC) and weapons effects test structures. | 1:15 p.m. | Arrive at Stockade Wash Overlook. Rainier Mesa briefing, Work Plan Item #3 and #8. |
| 9:30 a.m. | Depart for Area 5 Radioactive Waste Management Complex (RWMC) | 2:00 p.m. | Depart for Apple II Houses |
| 9:40 a.m. | Arrive at Area 5 RWMC | 2:30 p.m. | Arrive at Apple II Houses |
| 10:15 a.m. | Depart for Area 3 Bunker 3-300, CAU 204, Work Plan Item # 2 | 2:45 p.m. | Depart for Mercury |
| 10:45 a.m. | Arrive at Bunker 3-300 | 3:30 p.m. | Arrive at Mercury Cafeteria. Rest stop. |
| 11:00 a.m. | Depart for Ice Cap | 4:00 p.m. | Depart for Gate 100 |
| 11:10 a.m. | Arrive at Ice Cap. Briefing inside tower. | 4:05 p.m. | Arrive at Gate 100 for badge check |
| | | 4:10 p.m. | Depart NNSS |
| | | 5:00 p.m. | Arrive at McDonald's parking lot in LV |

* *Subject to change*



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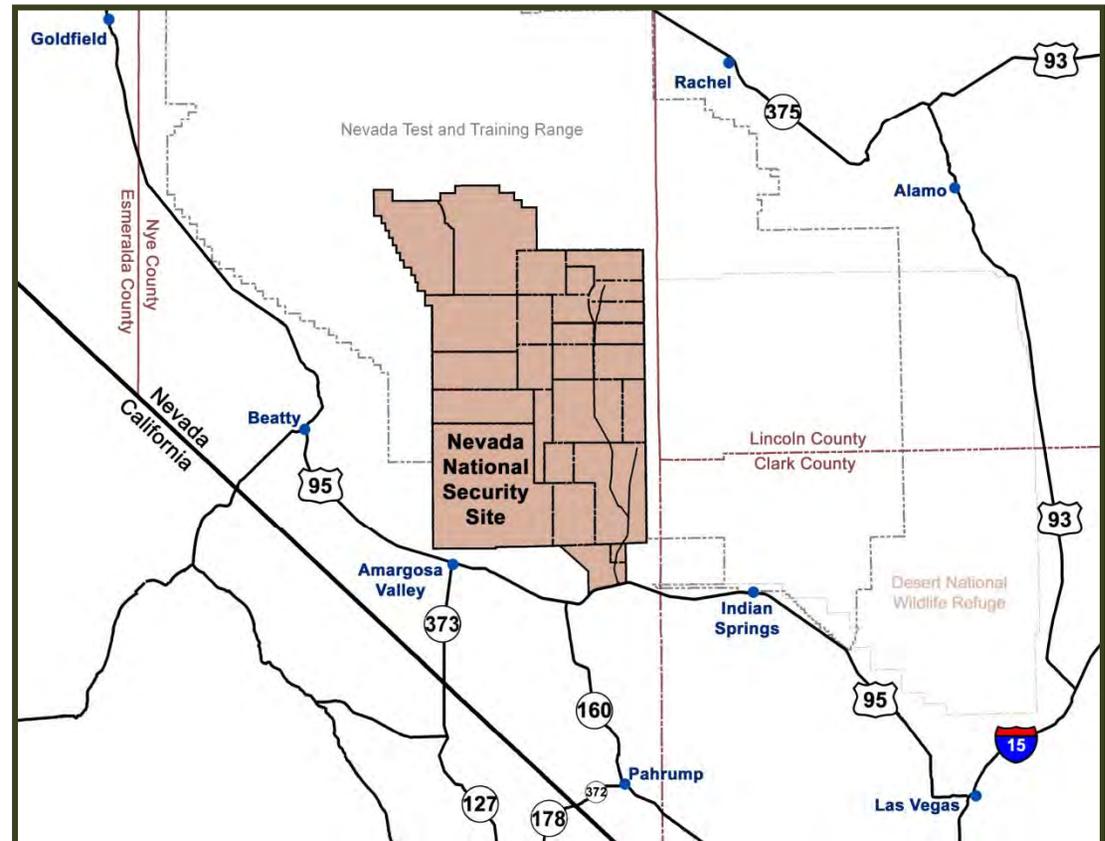
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Nevada National Security Site (NNSS)

- Approximately 1,360 square miles of U.S. Department of Energy (DOE)-controlled land
 - Surrounded by approximately 4,500 square miles of federally-controlled land
- Located approximately 65 miles northwest of Las Vegas, Nevada



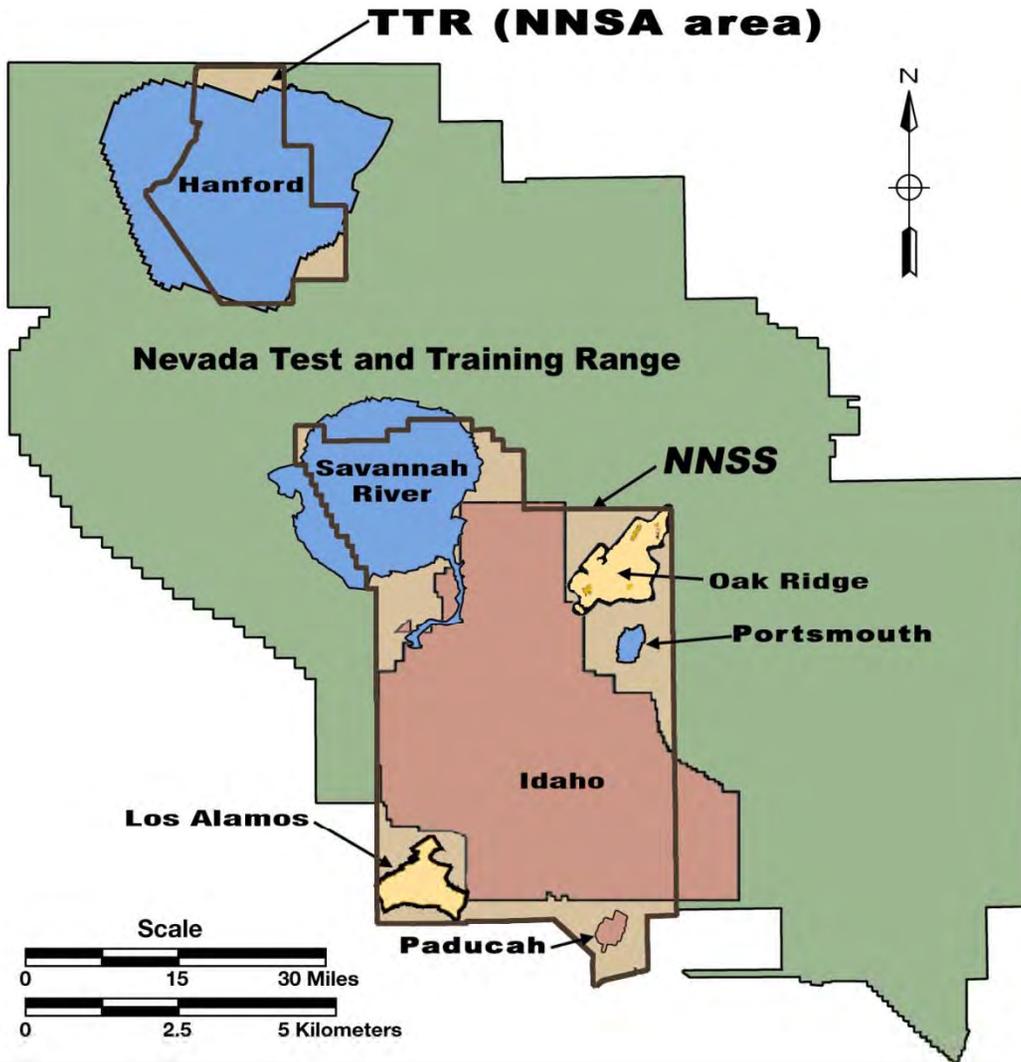
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DOE Site Comparisons



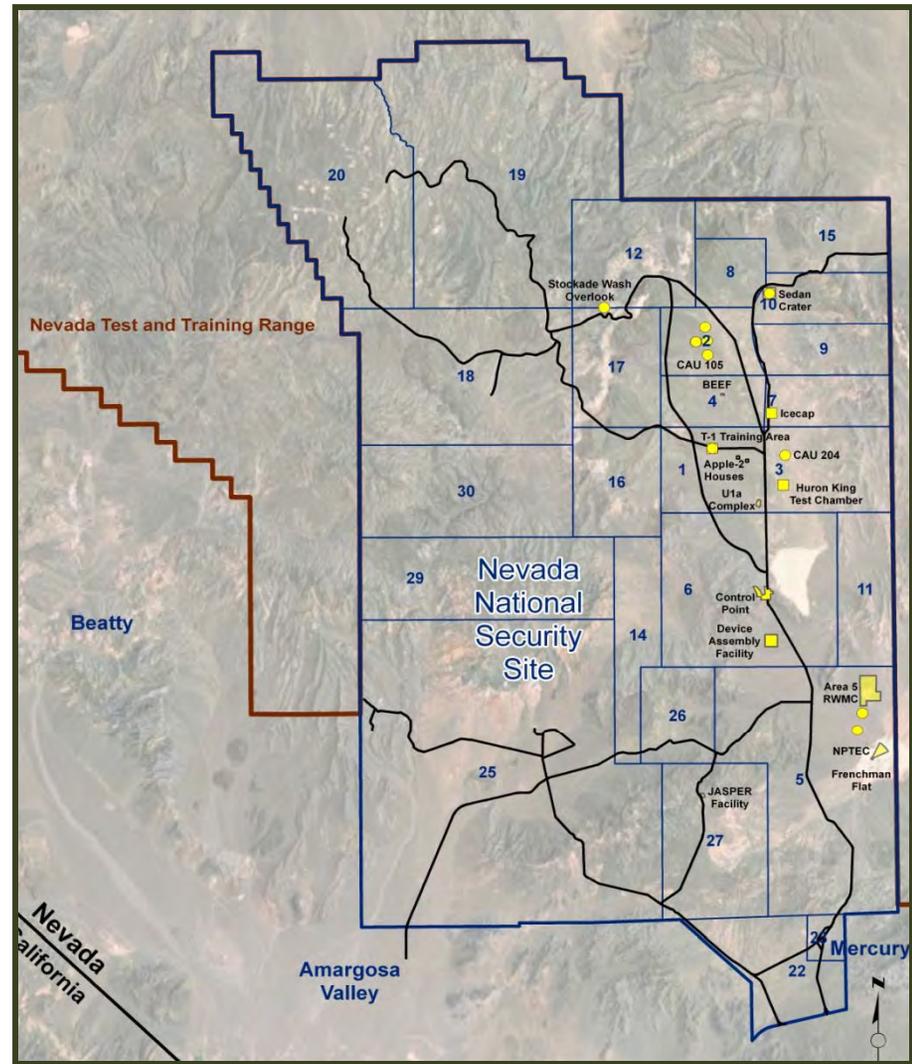
Site	Sq. Mi.
Hanford	560
Idaho	893
Los Alamos	43
Oak Ridge	53
Paducah	5
Portsmouth	6
Savannah River	310
TOTAL	1,870
NNTA	~1360
TNTA (NNTA area)	~280
TOTAL	~1640



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NNSS Tour Map



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Life in Mercury



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Life in Mercury



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Nuclear Testing Road to the NNSS

- U.S. enters World War II in 1941 after Japanese attack Pearl Harbor
- U.S. Manhattan Project begins developing first atomic bomb in 1942 to influence the outcome of the war
- Manhattan Project tests first atomic bomb in New Mexico on July 16, 1945, called “Trinity”
- U.S. drops two atomic bombs on two cities in Japan on August 6 and 9, 1945 – Japan surrenders August 14, 1945
- Nuclear testing begins in the South Pacific Ocean in 1946



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NNSS Established in 1950

- Atomic testing in the South Pacific presented challenges
 - Logistics
 - Weather
 - Security
 - Safety
- Urgent need for continental test site
 - Top secret feasibility study, code named *Nutmeg*, commenced to search for a continental test site
 - Study concluded arid, southwest section of U.S. as an ideal location
- President Truman officially established Nevada Proving Grounds, now the NNSS, on December 18, 1950



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Historic Activities

- First NNSS atmospheric nuclear test detonated on January 27, 1951
- 928 atmospheric and underground nuclear tests conducted between 1951 and 1992
- Development and testing of nuclear weapons generated radioactive waste



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United States Nuclear Tests

Location	Tests	Detonations
South Atlantic	3	3
Pacific	106	106
Alamogordo, NM	1	1
Amchitka, AK	3	3
Carlsbad, NM	1	1
Central, NV	1	1
Fallon, NV	1	1
Farmington, NM	1	1
Grand Valley, CO	1	1
Hattiesburg, MS	2	2
Nellis Range	5	5
Rifle, CO	1	3
NNSS Atmospheric	100	100
NNSS Underground – U.S.	804	
NNSS Underground – U.S./U.K.	24	921
	1,054	1,149

A test is defined in the Threshold Test Ban Treaty as either a *single underground nuclear explosion* (detonation) or *two or more underground nuclear explosions* (detonations) conducted within an area delineated by a circle having a diameter of two kilometers and conducted within a total period of time not to exceed 0.1 second.



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Source: NV-209 Rev 15

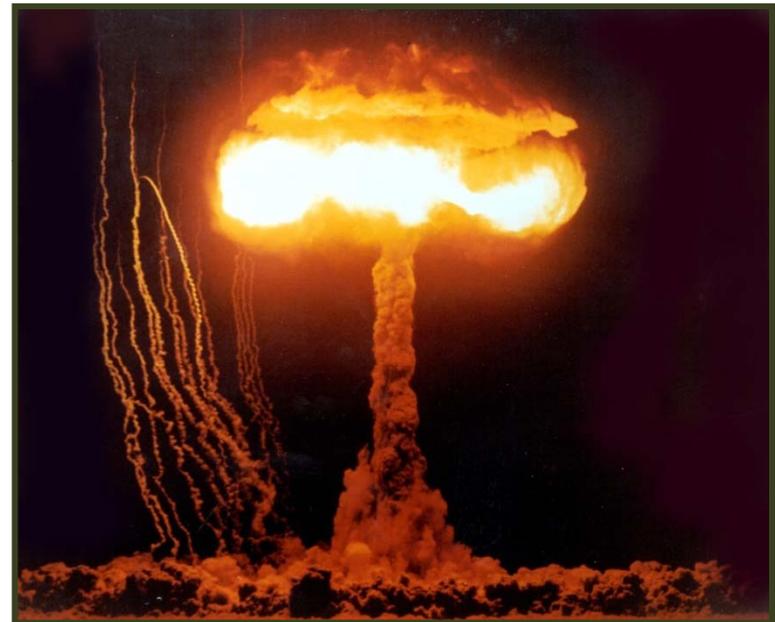
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Atmospheric Testing at the NNSS

- 100 atmospheric tests conducted at the NNSS from January 1951 through July 1962 to study weapons-related effects, as safety experiments, and to study peaceful effects of nuclear explosions
- Conducted aboveground in the atmosphere
 - Tower 43
 - Balloon 23
 - Airdrop 19
 - Surface 13
 - Rocket 1
 - Airburst 1



Climax – an airdrop test at the NNSS on June 4, 1953



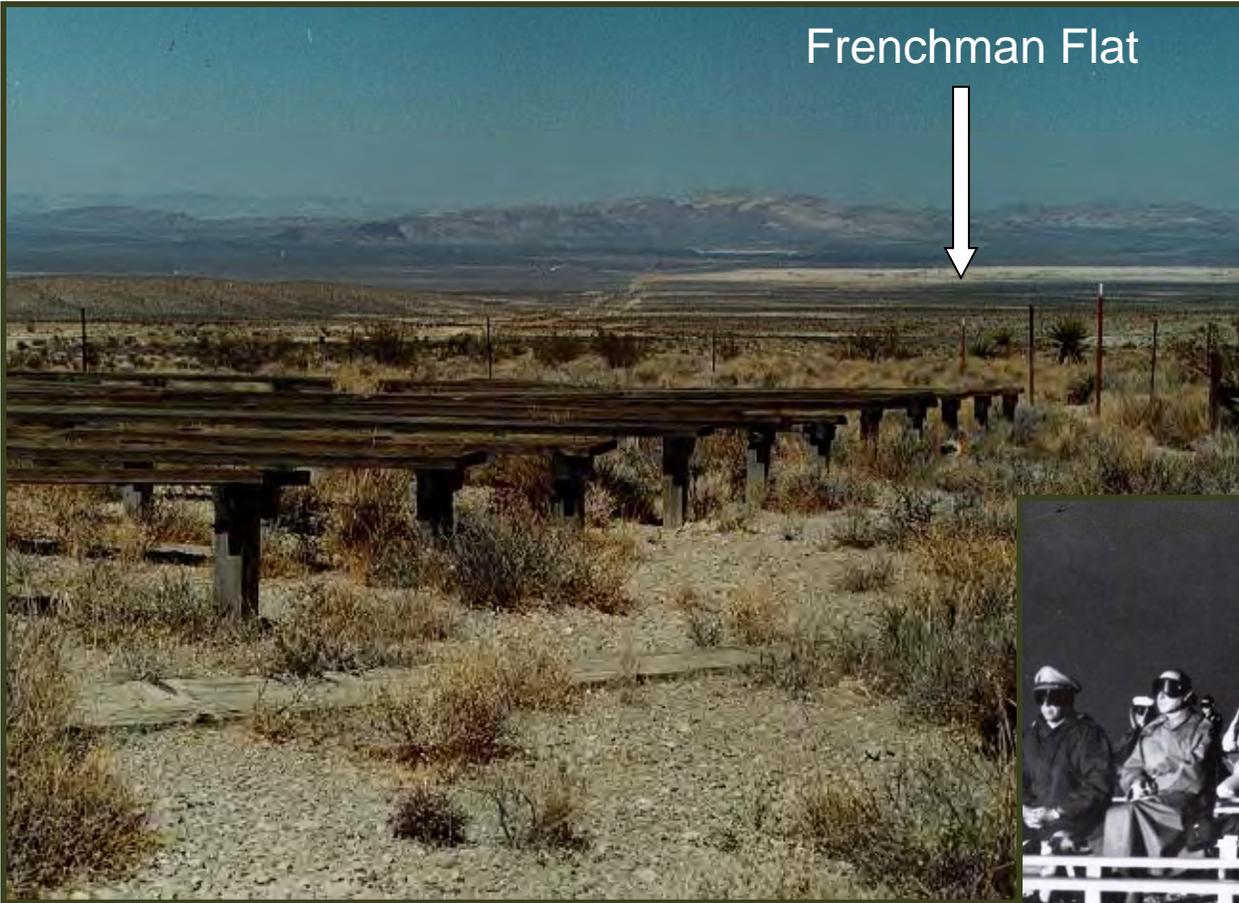
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Frenchman Flat



Seated at these bleachers, located alongside the Mercury Highway, official observers viewed the detonation of 14 atmospheric tests in Frenchman Flat



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37-kiloton *Priscilla*
test detonated on
June 24, 1957 on
the NNSS
Frenchman Flat



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Nonproliferation Test and Evaluation Complex (NPTEC)



- Unique 67-acre facility equipped to test sensors using a variety of release methods, including chemical releases, wind tunnel releases, and portable release systems
- Provides sensor arrays for ground truth data, an explosives pad, weather data instrumentation, calibrated release systems, and 24-hour release capability
- Environmental Impact Statement allows release of hazardous materials for training, field-testing of detectors, plume dispersion experimentation, and equipment and materials testing
- Includes activities at various other locations on the NNSS



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Soils

- Atmospheric nuclear weapons tests, nuclear safety experiments, and evaluation tests for peaceful uses of nuclear explosives conducted at the NNSS and Nevada Test and Training Range (operated by the U.S. Air Force) resulted in the radioactive contamination of surface soils
- Soils responsible for 129 Corrective Action Sites (approximately one-third closed)
 - Characterizing and/or remediating surface soil contamination
 - Ensuring appropriate controls (i.e. postings, barriers, etc.) are in place at the sites and conducting long-term site monitoring, as needed



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Atmospheric Test Relics



Concrete shelter domes prior to the 1957 *Priscilla* test



Effect of the test on the concrete shelter dome





900-square foot underground dual purpose garage and mass shelter built and tested for *Priscilla* in 1957

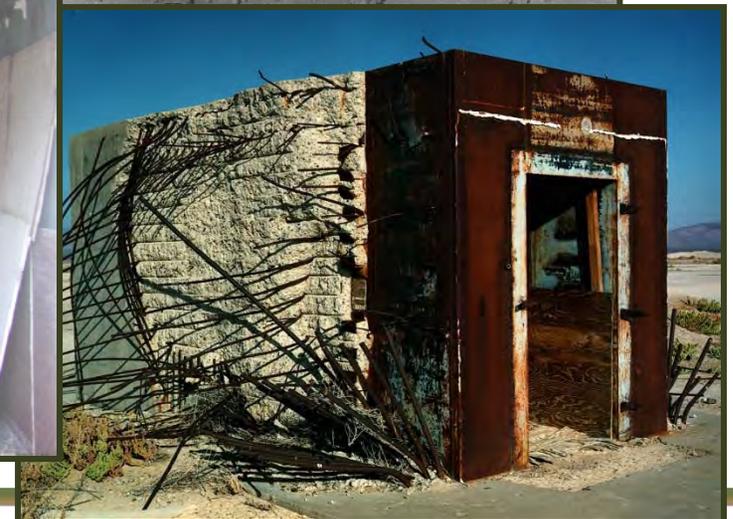
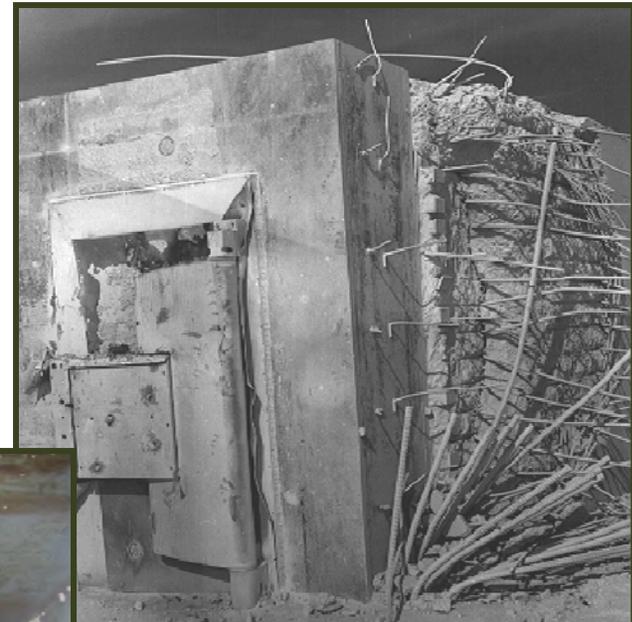
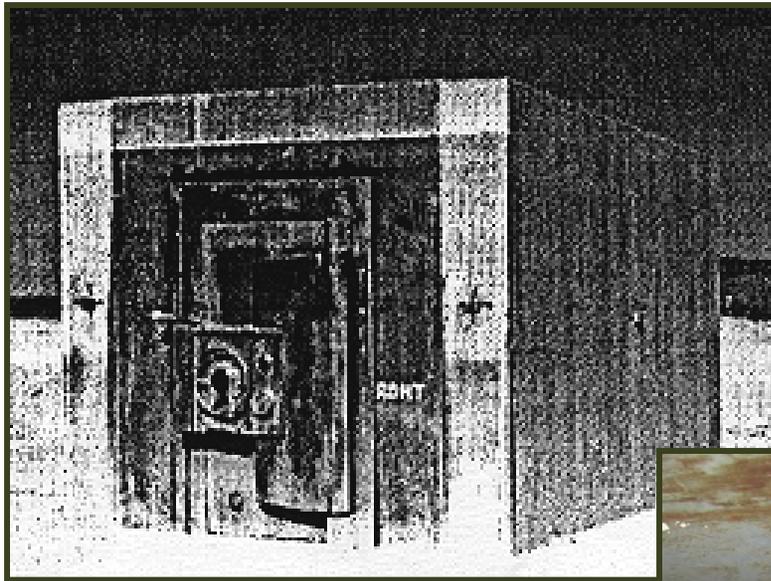


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Mosler Safe Company designed a 12-foot by 8-foot reinforced concrete vault for the *Priscilla* test in 1957; trim on the steel door was loosened by the blast, but the door itself was not damaged – contents placed within the safe remained intact



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Four railroad trestles constructed for *Operation Plumbbob* in 1953 – only one structure remains in place today with visible significant bowing of the steel “I” beams



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The End of Atmospheric Testing

- U.S. agreed to observe Limited Test Ban Treaty in October 1963, effectively ending atmospheric testing



Little Feller I test location
46 years after the last
atmospheric test on the
NNSS was detonated on
July 17, 1962



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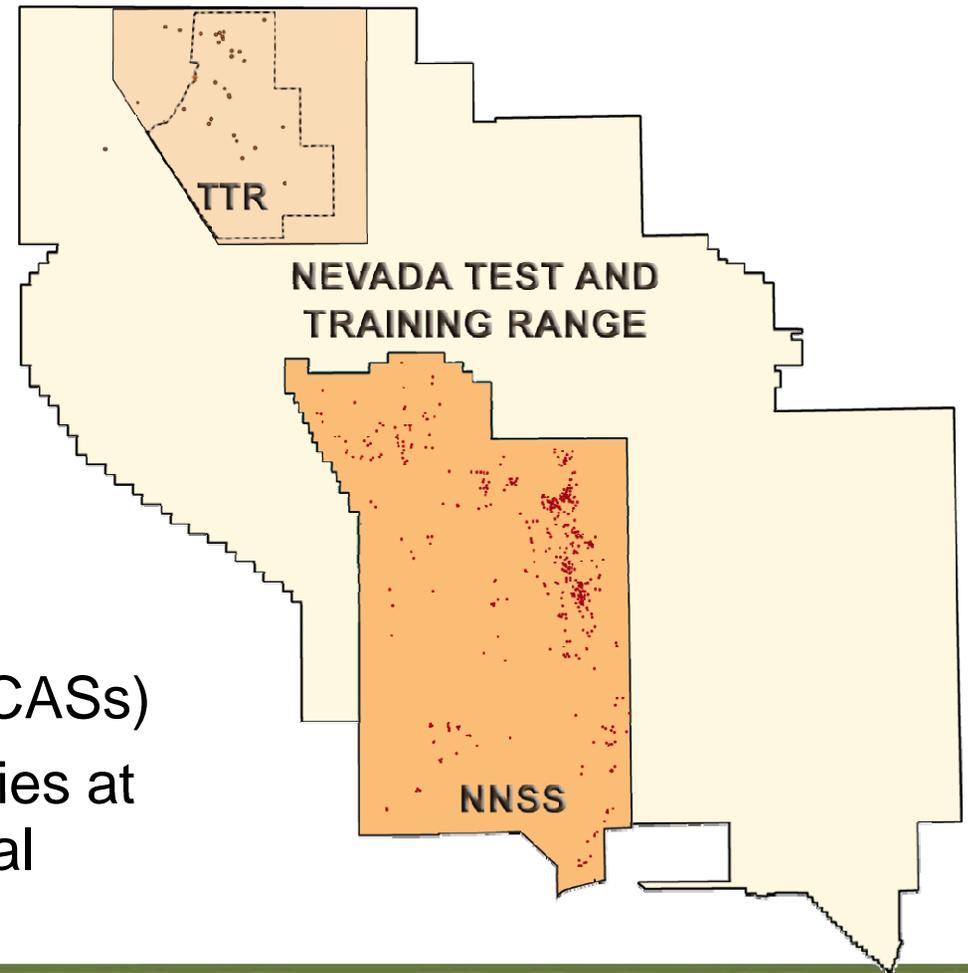
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Industrial Sites

- Industrial Sites are facilities and land used in direct support of historic nuclear testing which resulted in environmental contamination
 - Sites include leach fields, sumps, disposal wells, tanks, contaminated waste piles, ordnance sites, etc.
- 1,113* Corrective Action Sites (CASs)
 - Completed remediation activities at 1,111* sites with state approval

* Does not include Defense Program funded sites



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Area 5 Radioactive Waste Management Complex (RWMC)

- Low-level radioactive waste disposal began in 1961
- DOE and Department of Defense waste generator sites across the complex ship packaged low-level and mixed low-level waste (MLLW) for disposal
- In addition to disposal, MLLW may be stored at the RWMC in accordance with a Resource Conservation and Recovery Act permit



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Area 5 RWMC

(continued)

- Total disposed volume since inception is more than 22 million cubic feet
- Available capacity in existing cells is greater than 4.3 million cubic feet
- Disposal Cell 21 under construction will add approximately 2.3 million cubic feet of disposal capacity



- Seven (7) active disposal cells (yellow highlight)
- Twenty-nine (29) closed disposal cells
- Closure cover re-vegetation of historic 92-acre disposal area completed February 2012



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Area 5 RWMC

(continued)

Monitoring Locations

- Air (2)
- Groundwater (3)
- Meteorology (1)
- Radon Flux (1)
- Evapotranspiration(2)
- Soil Moisture (6)
- Soil Temperature (7)
- Thermoluminescent Dosimeters (12)



Depth to groundwater is approximately 800 feet



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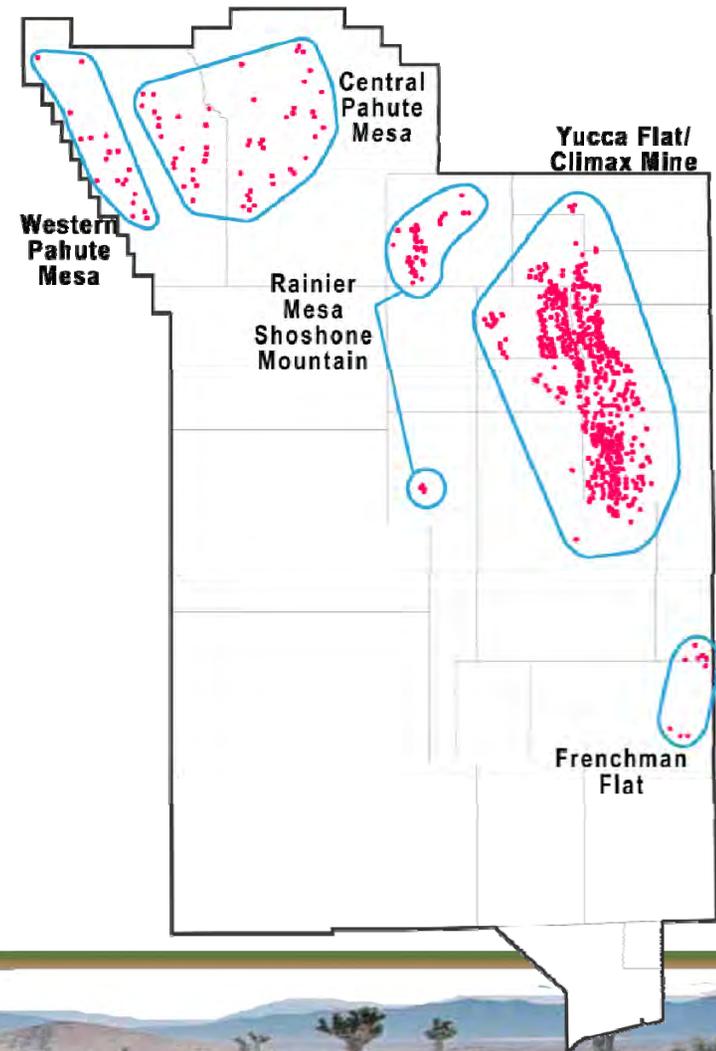
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Underground Test Area (UGTA)

- 828 underground nuclear tests conducted at depths ranging from approximately 90 to 4,800 feet below the ground surface
- About one-third of tests occurred in, near, or below the water table, which resulted in some groundwater contamination



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Underground Testing at the NNSS

- First underground nuclear test was *Uncle* on November 29, 1951
- Last underground nuclear test, *Divider*, detonated on September 23, 1992
- Underground nuclear testing occurred at depths of 90 to 4,800 feet
- 828 underground nuclear tests conducted at NNSS



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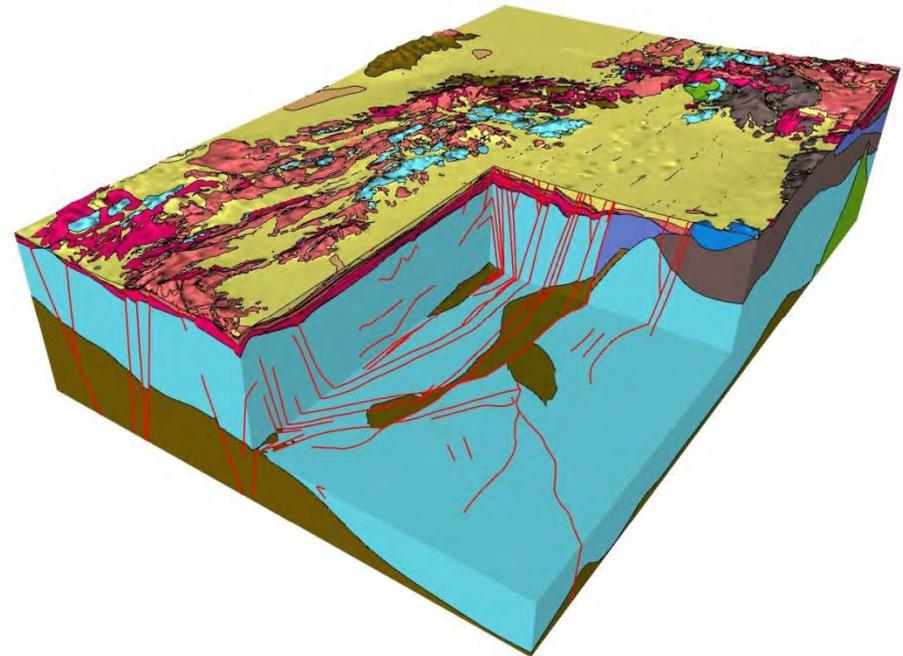
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UGTA Groundwater Characterization

- UGTA evaluates historic testing impacts on groundwater resources and studies the extent of contaminant migration
- Groundwater characterization scope includes collection of multiple sources of field data in order to create 3-D computer models
 - Models include groundwater, flow and transport parameters
- Models will be used to aid in the selection of monitoring well locations



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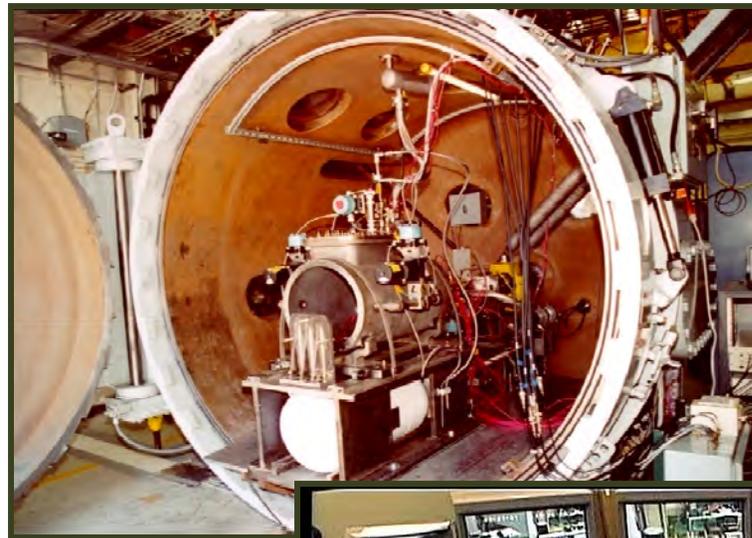
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Joint Actinide Shock Physics Experimental Research (JASPER)

- Study properties and responses of special nuclear materials under high pressure
- 101 shots to date (42 plutonium [Pu] shots)*
 - First shot: JAS001
March 19, 2001
 - First Pu shot: JAS021
July 8, 2003



*as of October 30, 2012



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Homeland Security Increasing Activity at the NNSS



- Radiological / Nuclear Countermeasures Test and Evaluation Complex
 - National test bed for radiation detectors/sensors
 - Realistic operational environment allows use of significant quantities of nuclear material
- Advanced Spectroscopic Portal (ASP monitoring)
- Aerial radiological surveys



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Device Assembly Facility (DAF)

- 100,000 square-foot facility
- Assembly cells designed to withstand effects of explosions
- Glovebox for JASPER and U1a target assembly
- Current location for National Criticality Experiments Research Center



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Control Point-1 (CP-1)

- Command post used for conducting nuclear tests



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News Nob



Soldiers pose by News Nob, a vantage point for atmospheric tests established for the media



Journalists set up on News Nob to witness an atmospheric test in March 1953



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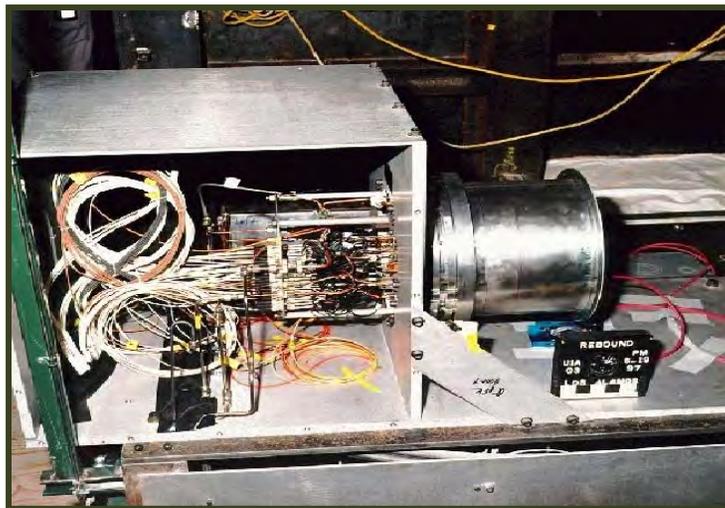
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U1a

- Underground laboratory for subcritical experiments
- Data for National Laboratories
- Safety and reliability of stockpile



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Huron King Test Chamber

- Visual line of sight underground nuclear test (yield less than 20 kilotons) conducted June 24, 1980
- Tested effects of a system generated electromagnetic pulse on a full-scale operating military Defense Satellite Communications System



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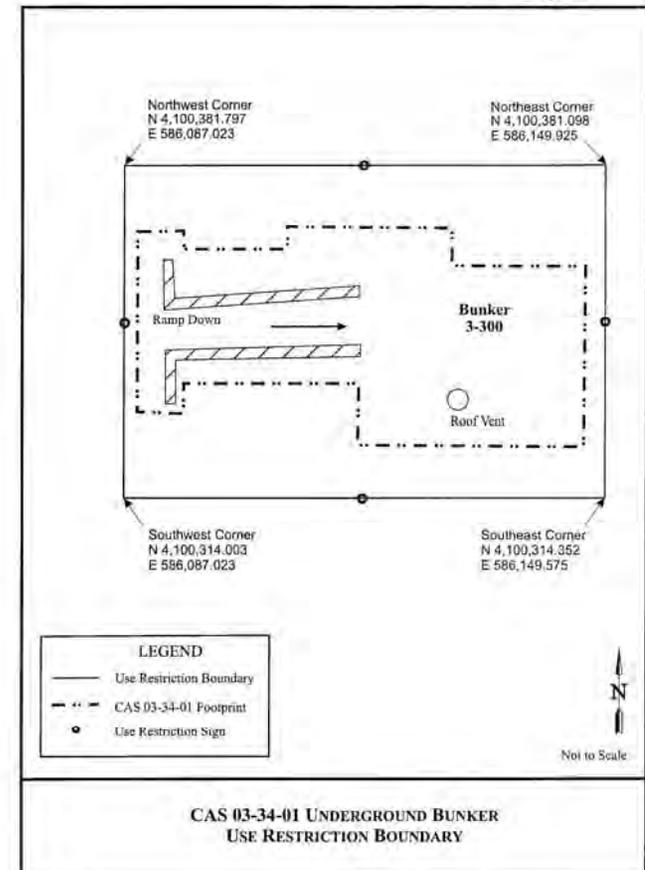
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Corrective Action Site 03-34-01 Underground Bunker (CAU 204)

Class: Report - CAU 204
Section: Appendix D
Revision: 0
Date: April 2006

- Closed under the Federal Facility Agreement and Consent Order in 2006
- Subsurface concrete structure
- Potential contaminants of concern: radionuclides, metals, organics
- Use restricted (closed in place with administrative controls)
- NSSAB Work Plan Item to determine if Use Restrictions should be considered for removal at this and two other similar bunkers



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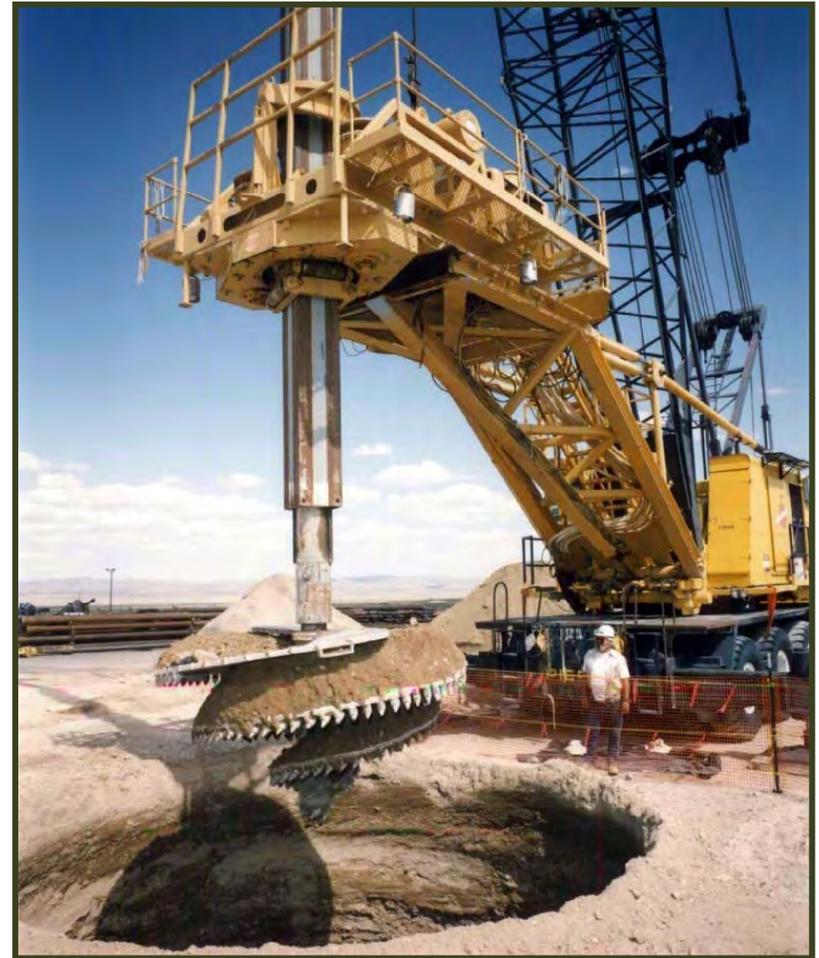
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Underground Testing at the NNSS

- Holes were three to 12 feet in diameter
- A large hole required the removal of more than 4,280 cubic yards of soil
- If the depths of holes drilled for underground nuclear tests since 1961 were combined, it would total about 280 miles
- Drilling techniques developed at the NNSS continue to be used throughout the world



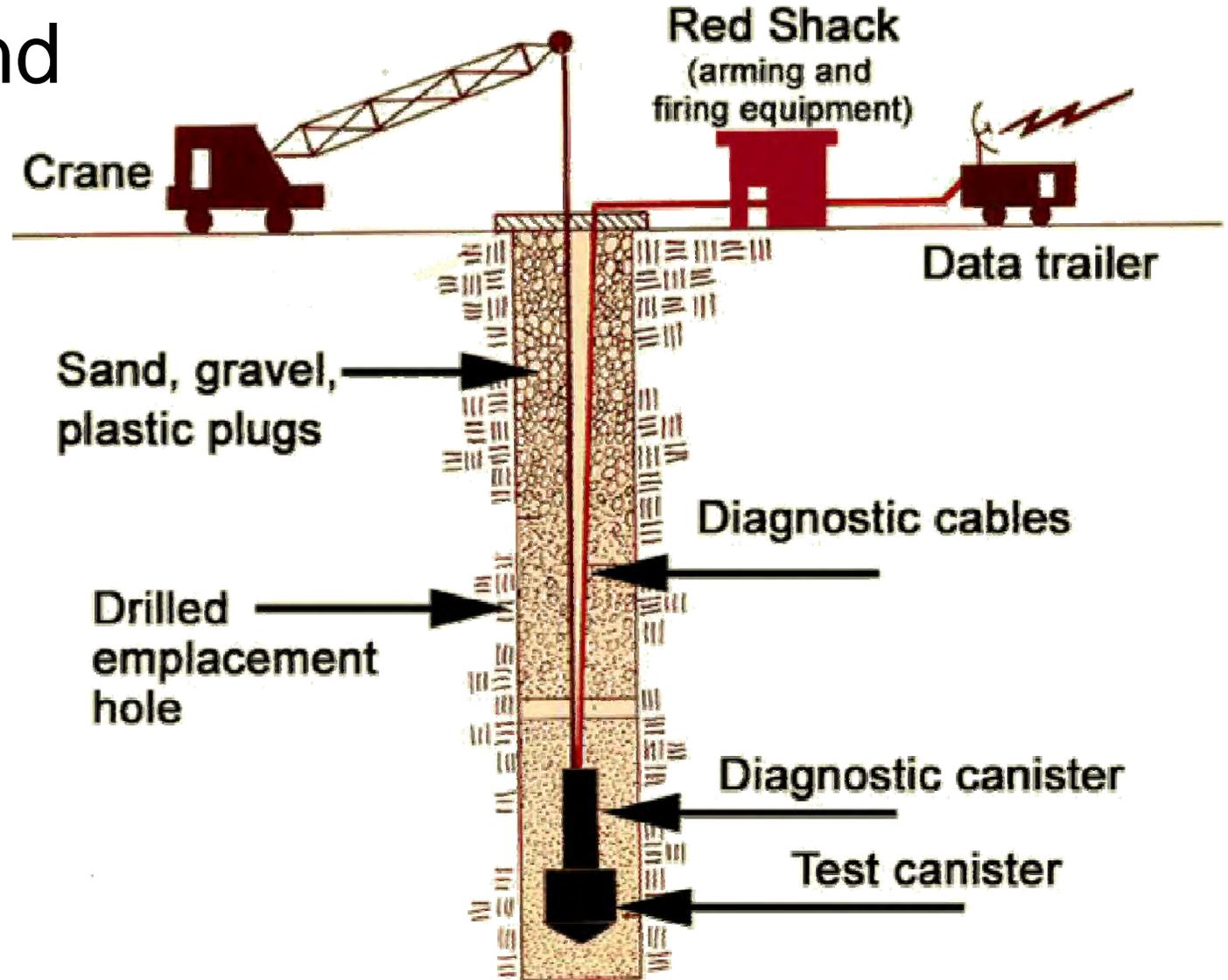
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Underground Test



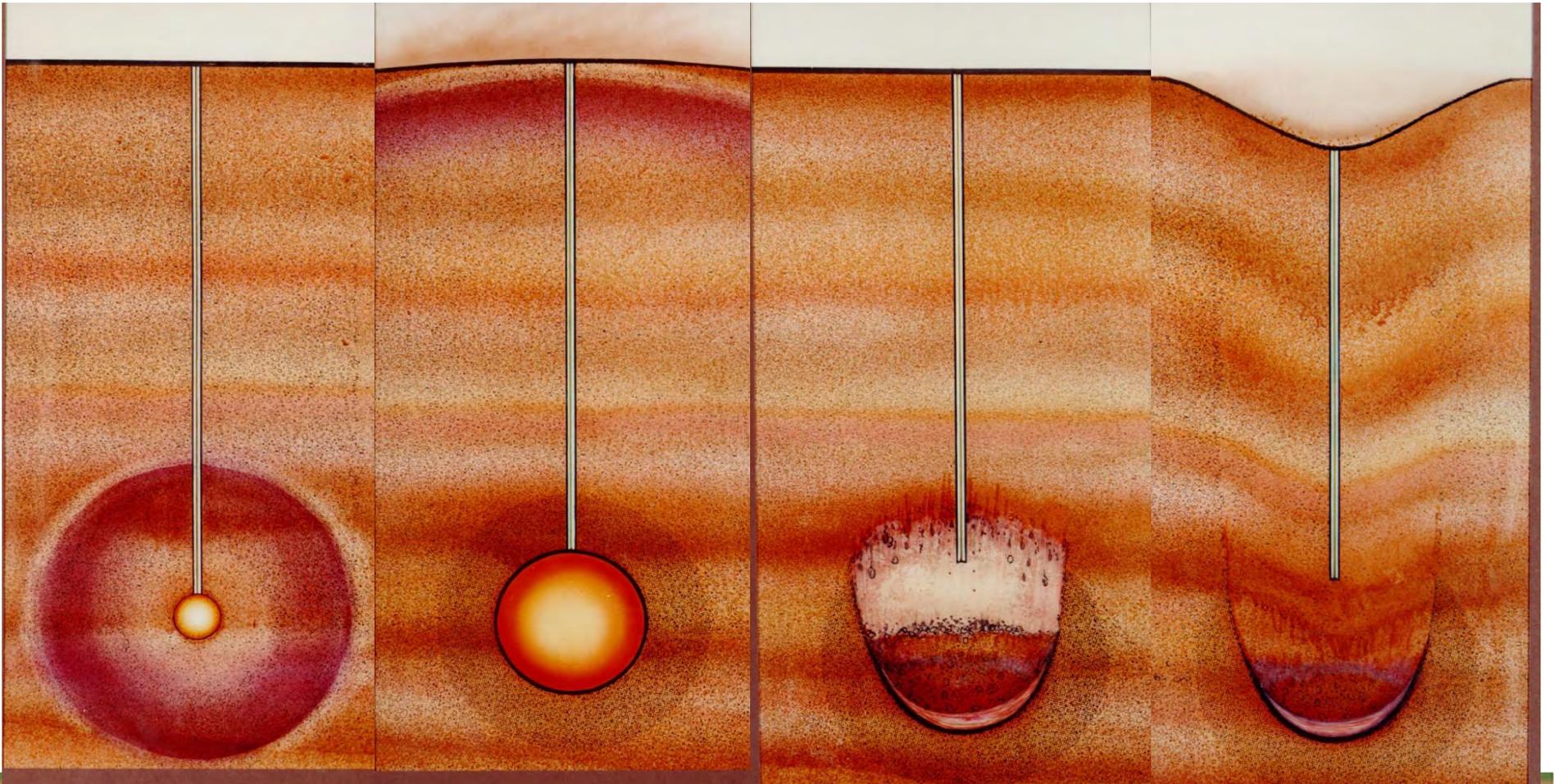
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Underground Testing at the NNSS – Subsidence Crater Formation



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Icecap Ground Zero

- Location for underground nuclear test scheduled for Spring 1993
 - Moratorium on nuclear weapons testing on September 23, 1992
- Planned test range was 20 - 150 kilotons and would have been conducted 1,550 feet underground
- Tower is 157-feet tall
- Inside is a 300,000 pound diagnostic canister suspended from the top of the tower



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Big Explosive Experimental Facility (BEEF)



- Non-nuclear high- explosive tests
- Capable of 70,000 pounds of explosives



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Smoky – tower soars 700 feet into the air above Yucca Flat at the NNSS; first atomic tower test of this height (*Smoky* detonation below)



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Balloon used in the detonation of *Charleston* on September 28, 1957

Fireball of *Charleston* lights Yucca Flat at the NNSS; 12-kiloton device was suspended by a balloon at a height of 1,500 feet



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Sedan Crater

- Excavation experiment using a 104-kiloton thermonuclear device (part of the Plowshare Program)
- Conducted July 6, 1962
- Detonated 635 feet underground



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Sedan Crater

(continued)

- Displaced 12 million tons of earth
- Crater is 1,280 feet in diameter and 320 feet deep
- Released seismic energy equivalent to a 4.75 magnitude earthquake
- Listed on the National Register for Historic Places on April 1, 1994
- Completion of remediation activities approved by the State July 2011



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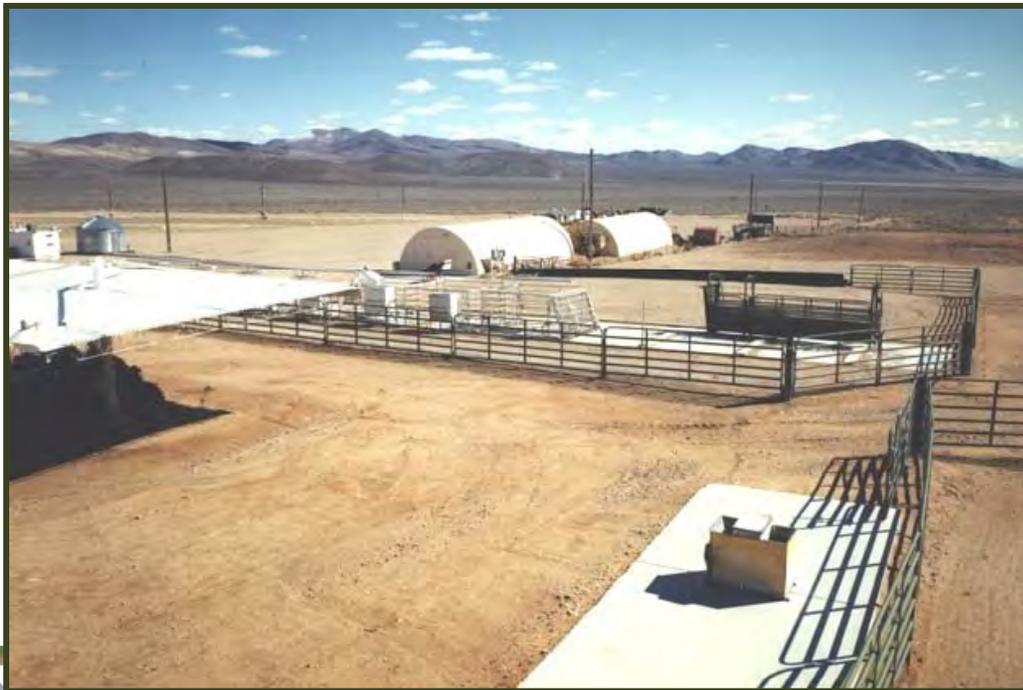
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EPA Farm

- Operated 16 years
- Studied radionuclide uptake in cows, horses, pigs, goats, chickens and crops
- Closed in December 1981



AEC had its own brand



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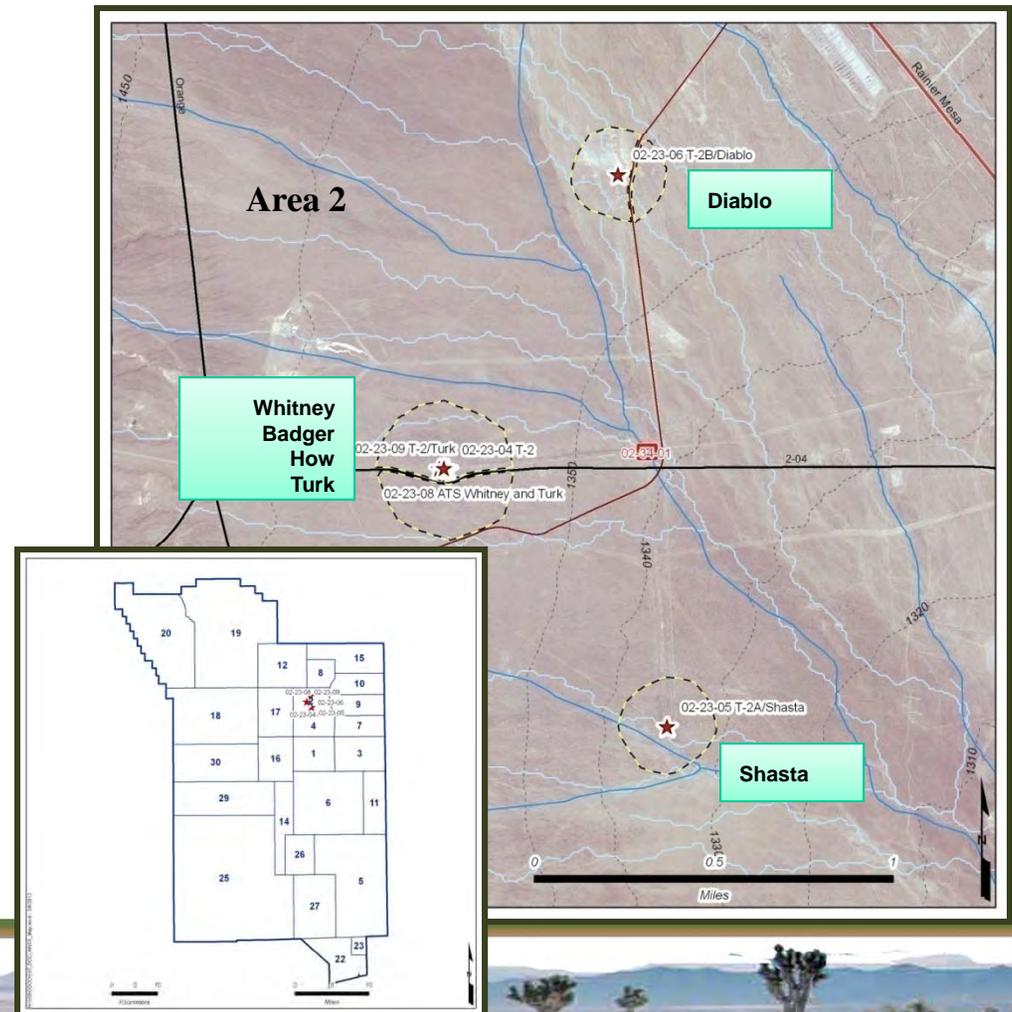
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Corrective Action Unit (CAU) 105

Area 2 Yucca Flat Atmospheric Test Sites

Five Atmospheric Test Corrective Action Sites:

- 02-23-04, Atmospheric Test Site (Whitney)
- 02-23-05, Atmospheric Test site T-2A (Shasta)
- 02-23-06, Atmospheric Test Site T-2B (Diablo)
- 02-23-08, Atmospheric Test Site T-2 (Badger, How)
- 02-23-09, Atmospheric Test Site (Turk)



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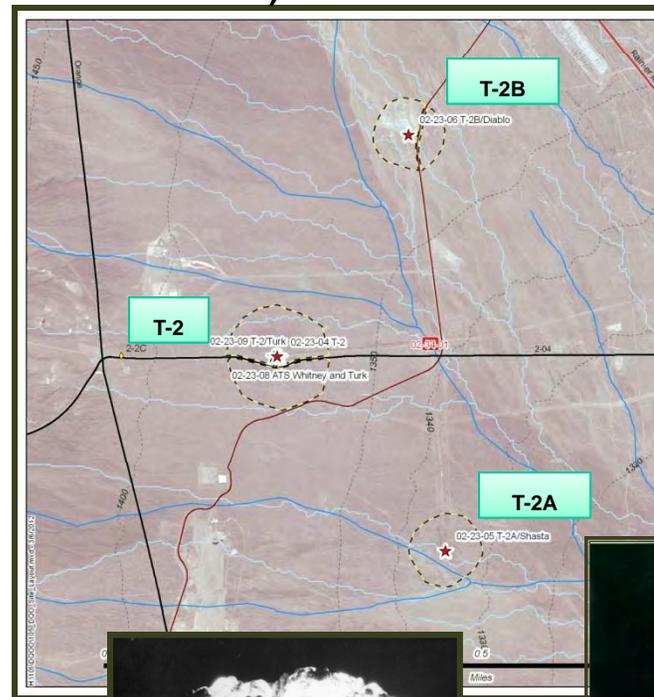
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CAU 105: Area 2 Yucca Flat Atmospheric Test Sites

- 3 physical site locations: (continued)
 - **T-2**, Whitney, Badger, How, and Turk
 - **T-2A**, Shasta
 - **T-2B**, Diablo
- Previously unidentified waste trench found in area
- All within Area 2
- NSSAB Work Plan Item to provide recommendation on a corrective action alternative



Diablo



Whitney



Shasta

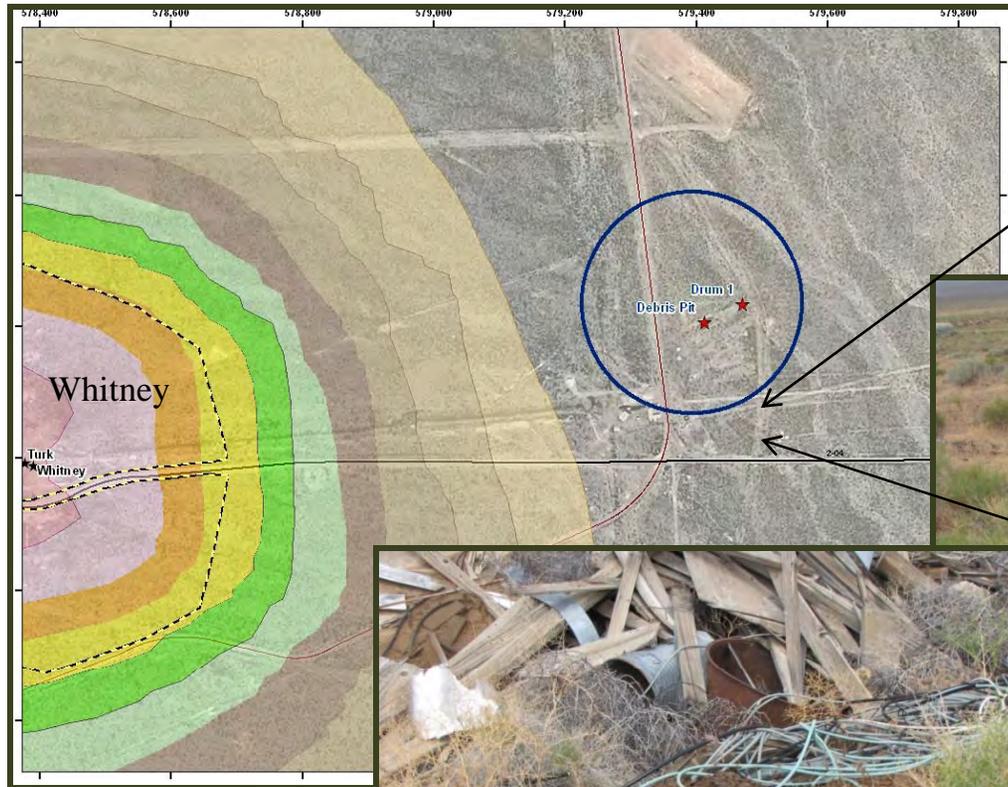


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Previously Unidentified Waste Trench and Drum



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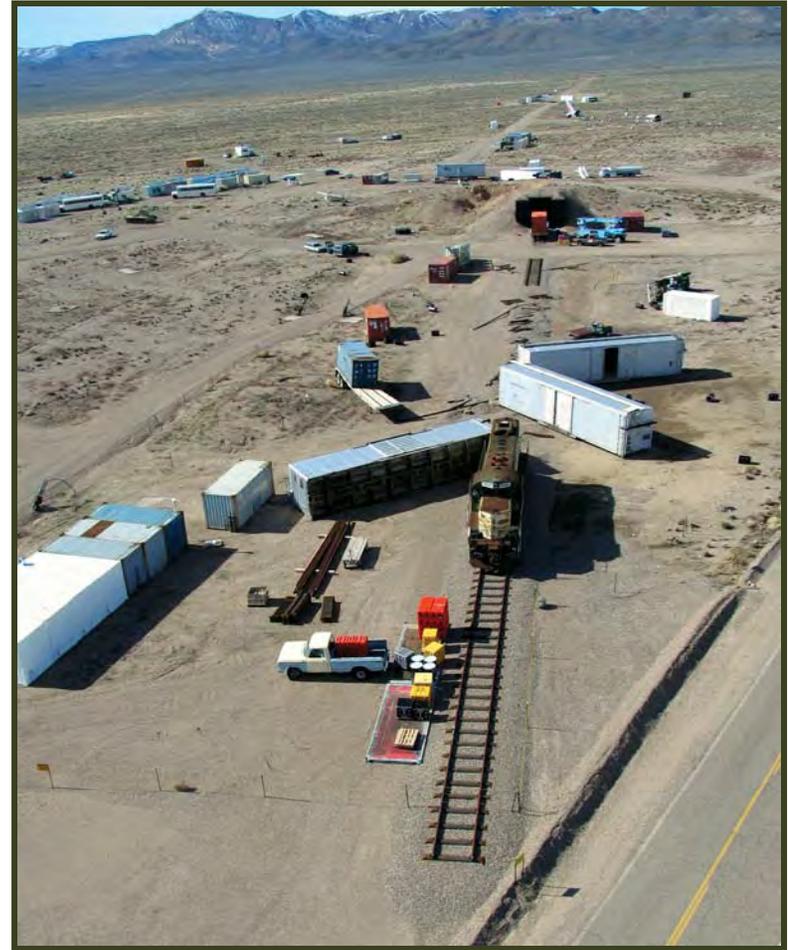
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T-1 Training Area

- Counter Terrorism Operations Support (CTOS)/Center for Radiological Nuclear Training
- Includes more than 10 acres with more than 20 separate training venues
- First responder training to take action in preventing or mitigating terrorist use of radiological or nuclear devices
- More than 120,000 first responders trained since 1999



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Apple II Houses

- 29-kiloton test was detonated from a 500-ft tower on May 5, 1955
- 7,800 ft to the east of the tower are the remains of a wooden two-story house
- Part of a Civil Defense exercise



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Located 7,800 feet from *Apple-2* ground zero, this existing two-story wooden house was one of two identical structures erected for civil effects tests; the other one, located 5,500 feet from ground zero, was severely damaged



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Located 10,500 feet from *Apple-2* ground zero, this existing two-story brick house was one of two identical structures erected for civil effects tests; the other house located 4,700 feet from ground zero was demolished beyond repair



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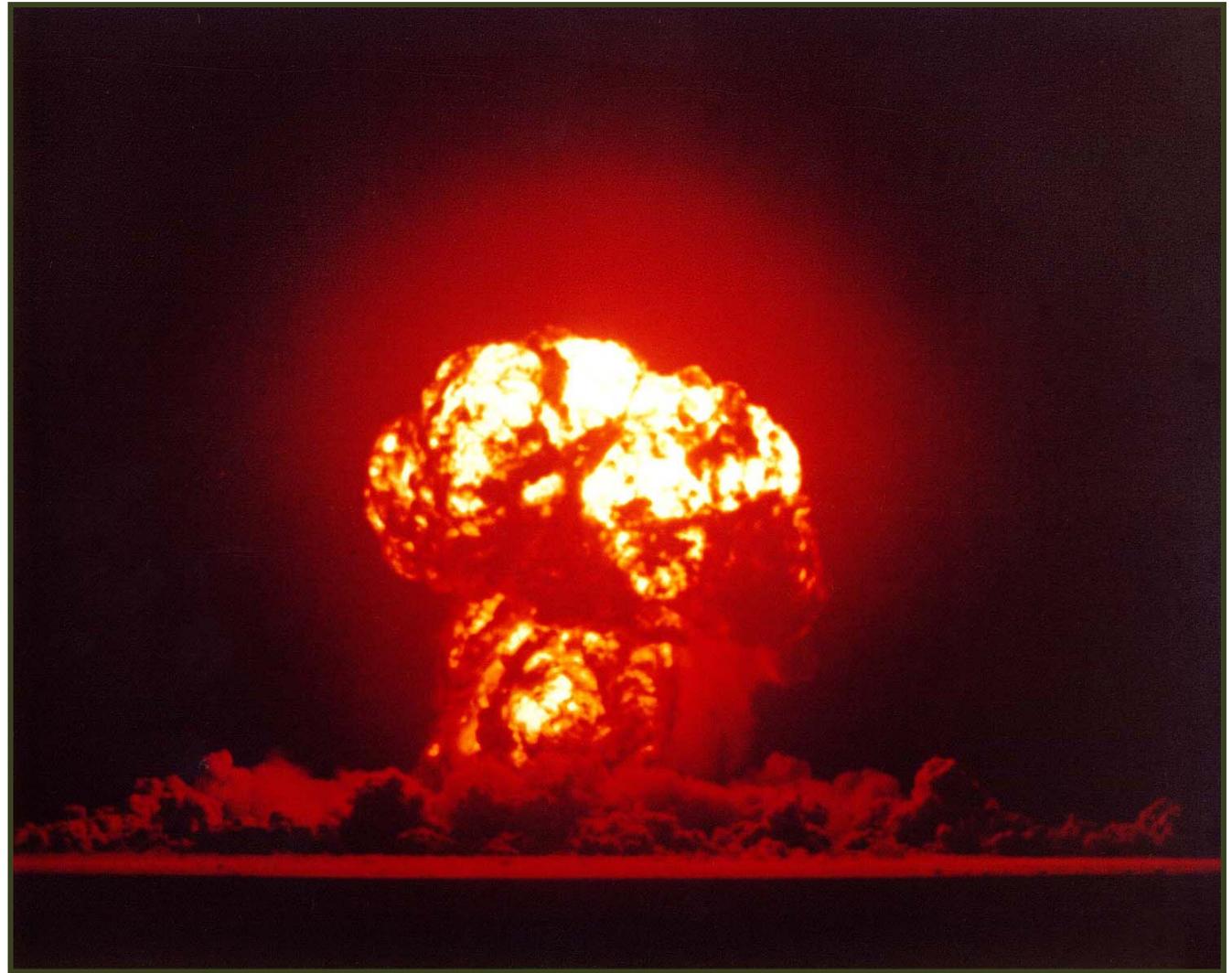
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Apple-2 – 29-kiloton nuclear test detonated from the top of a 500-foot tower at the NNSS on May 5, 1955

65 associated experiments conducted at various distances from ground zero, including 48 civil effects tests on different types of typical American homes



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Two colonial,
two-story
homes were
erected at
3,500 feet and
7,500 feet
from *Annie*
ground zero

House at
3,500 feet was
completely
destroyed

House at
7,500 feet was
badly
damaged

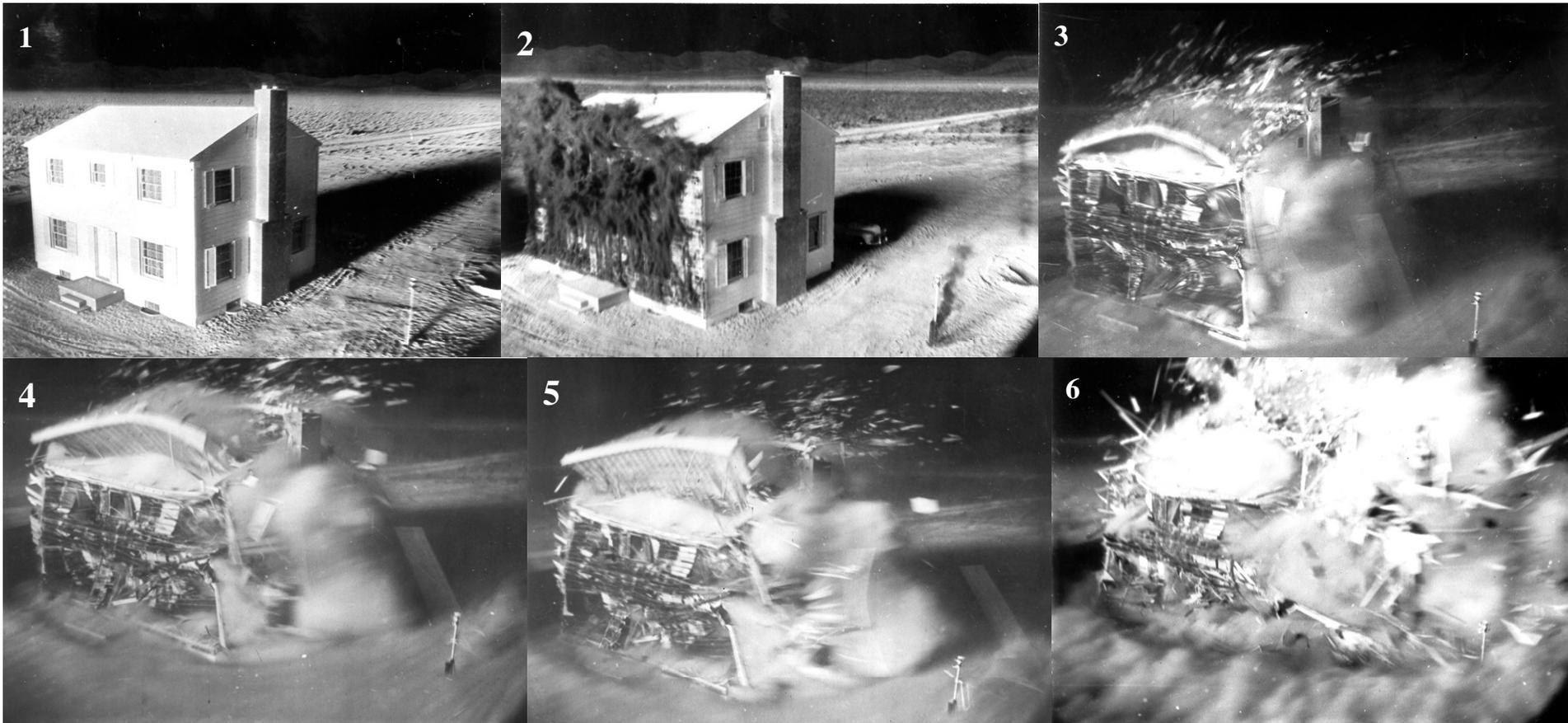


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Sequential photos show the complete destruction of the colonial style house located 3,500 feet from *Annie* ground zero

Nuclear Rocket Development at the NNSS – Project Rover

- U.S. launched nuclear rocket development program in 1955
- Ground tests conducted at facilities in southwest corner of NNSS
- Four basic segments:
 - KIWI tested non-flyable nuclear test reactors
 - PHOEBUS Extension of KIWI, designed to produce higher power levels and longer duration operations than KIWI reactors



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Nuclear Rocket Development at the NNSS – Project Rover

(continued)



PHOEBUS 2A was the most powerful, non-flyable nuclear rocket reactor ever built. Reactor operated for about 32 minutes; 12 minutes at power levels more than a million watts



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Nuclear Rocket Development at the NNSS – Project Rover

(continued)

- NERVA (Nuclear Engine for Rocket Vehicle Applications) developed the first nuclear rocket engine suitable for space flight; and
- RIFT (Reactor In-Flight Test) objectives were to design, develop, and flight-test a NERVA-powered vehicle as an upper stage for a Saturn V launch vehicle

Project Rover, a technical success, terminated in 1973 as a result of the cancellation of Saturn V launch vehicle program in 1969



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March 1963

President Kennedy visits Nuclear
Rocket Development Station in
Area 25

Engine Test Stand 1



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Nuclear Rocket Development at the NNSS – Project Pluto

- Code name for the project to develop a nuclear powered ramjet for a Supersonic Low-Altitude Missile (SLAM)
- Principle was to draw in air at the front of the vehicle under ram (great pressure), heat it to make it expand, and then exhaust it out the back, providing thrust
- Reactor designed for experiment named *Tory* and was capable of 35,000 pounds of thrust
- Testing conducted at the Pluto Facility in NNSS Area 26



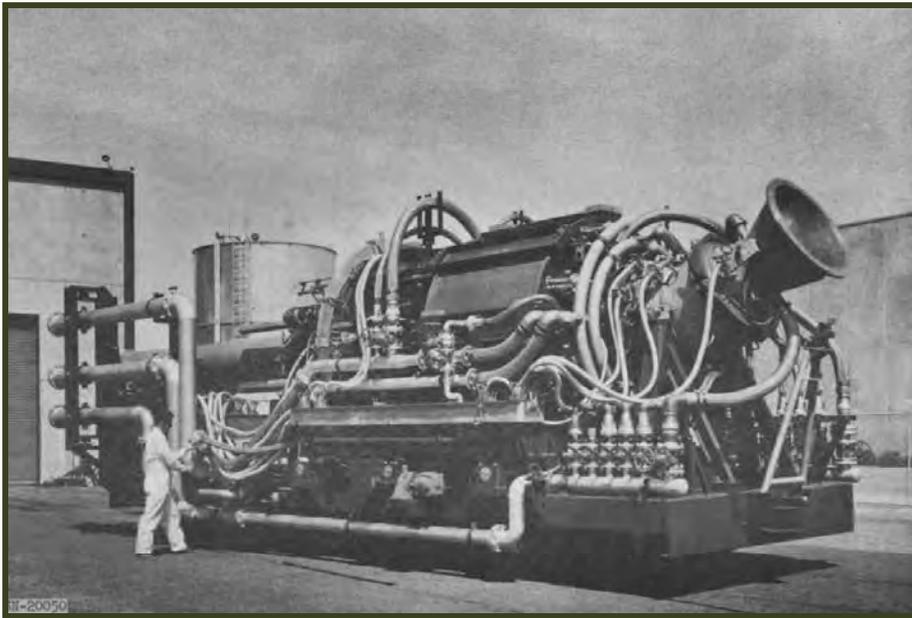
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On May 14, 1961, the world's first nuclear ramjet engine, Tory II-A, mounted on a railroad car, roared to life for just a few seconds



Three years later, Tory II-C was tested for 5 minutes. Despite its success, the Pentagon and Pluto sponsors had second thoughts about the project and on July 1, 1964, seven years after its inception, Project Pluto was cancelled.



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Homeland Security and Defense



- Train responders in prevention/ response to terrorist radiological/ nuclear material
- Unique NNS training complexes and capabilities simulate realistic scenarios in radiation and chemical environment
 - More than 120,000 responders trained since 1999



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NNSS Plays Central Role in National Emergency Response



- Remote Sensing Laboratory (RSL) provides technologies, equipment, and national response teams to search for improvised nuclear devices and radiation dispersal devices (“dirty bombs”)
 - RSL-Andrews provides the national capital region response
 - RSL-Nellis provides other national response
- Also provides consequence management teams if a device were to detonate
- Provides support during other emergencies including response to the Nuclear Power Plant disaster in Fukushima, Japan



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For More Information

For more information on
U.S. Department of Energy,
National Nuclear Security Administration
Nevada Site Office programs and activities:
visit our website at www.nv.energy.gov
or call the
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(702) 295-3521



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