



# Yucca Mountain Transportation Issues

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# Overview

- DOE Proposed Transportation System
- Transportation Risks and Impacts
- Nevada Recommendations for Managing Transportation Risks and Impacts
- Scorecard – Nevada Recommendations Largely Accepted by NAS & BRC, But Only Limited Acceptance by DOE



# Now-Terminated Yucca Mountain Transportation System (2008 SEIS)

- Ship 9,495 rail casks (2,800 trains) & 2,650 truck casks over 50 years [p.6-8]
- If No 2<sup>nd</sup> Repository: 21,909 rail casks (about 6,700 trains) & 5,025 truck casks [p.8-41]
- Average 1-3 trains (3-5 casks per train) & 1-2 trucks (1 cask per truck) per week for 50 years
- Every day, for 50 years, one or more loaded casks on rail or road, from 76 shipping sites to a single national repository or storage site

# National Transportation Impacts



The representative routes identified in the SEIS would traverse 955 counties with a 2010 Census population of 177 million persons, about 56% of the US total.

# NRC ASLB Admitted 46 Transportation NEPA Contentions (May 11, 2009 Order)

As California persuasively argues, “[w]ithout transportation of the waste to it, Yucca Mountain would be just a very large, fancy, and expensive hole in a mountain.” ...there can be no serious dispute that the NRC’s NEPA responsibilities do not end at the boundaries of the proposed repository, but rather extend to the transportation of nuclear waste to the repository. The two are closely interdependent. Without the repository, waste would not be transported to Yucca Mountain. Without transportation of waste to it, construction of the repository would be irrational. Under NEPA, both must be considered.

# Nevada NEPA Contentions

## Transportation Radiological Impacts

**The DOE 2008 FSEIS evaluates four major categories of transportation radiological impacts:**

- **incident-free exposures to members of the public residing near or traveling on transportation routes** (up to 0.016 rem to a person in a gridlock traffic jam); [Pp.6-20, 6-21, 8-41]
- **incident-free exposures to transportation workers** such as escorts, truck drivers, & inspectors (by administrative controls, DOE would limit individual doses to 0.5 rem per year; the allowable occupational dose is 5 rem per year); [Pp.6-21, 8-41]
- **release of radioactive material as a result of the maximum reasonably foreseeable transportation accident** (probability about 5 in one million per year), involving a fully engulfing fire, 34 rem dose to the maximally exposed individual, 16,000 person-rem population dose and 9.4 latent cancer fatalities in an urban area, and cleanup-costs of \$300,000 to \$10 billion; [Pp.6-15, 6-24, G-56]
- **release of radioactive material following a successful act of sabotage or terrorism**, using a high-energy density device, resulting in 27-43 rem dose to the maximally exposed individual, 32,000-47,000 person-rem population dose and 19-28 latent cancer fatalities in an urban area, and cleanup costs similar to a severe transportation accident. [Pp.6-27, CR-467]

**Nevada contentions specifically challenge the NEPA sufficiency of DOE's transportation radiological impact evaluations. These impacts will be further evaluated in great detail in the now restarted licensing proceeding.**

Source: Halstead and Dilger, ANS IHLRWMC 2011, Albuquerque, NM, April 10-14, 2011, Pp. 410-411.

# Shipping Cask Vulnerability in Severe Accident Fires – Ongoing Debate

**MacArthur Maze - 2007**

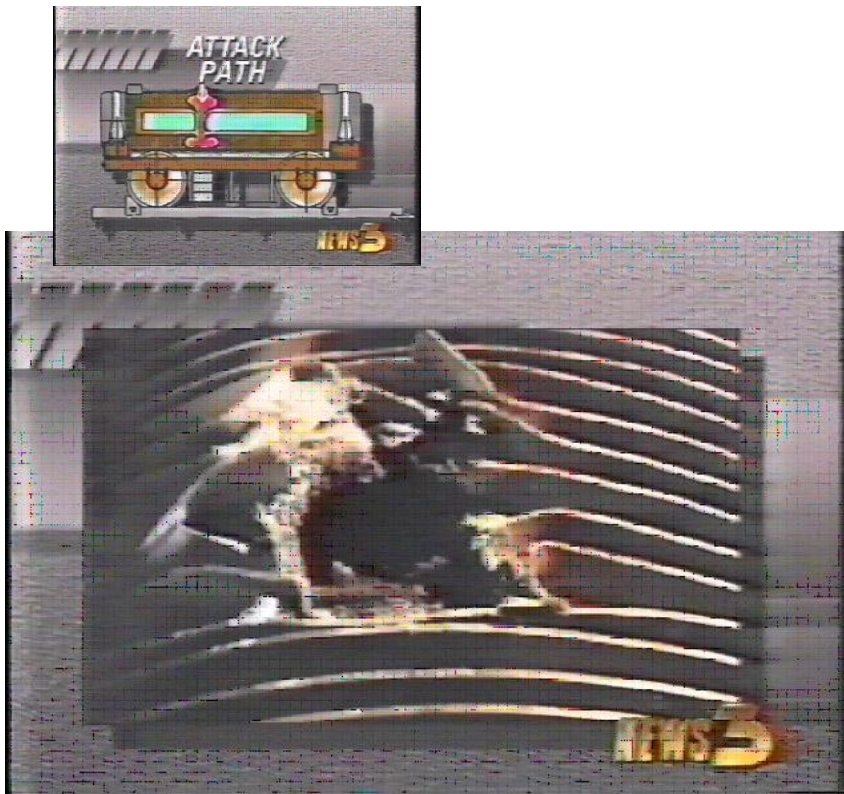


**Baltimore Rail Tunnel - 2001**



# Shipping Casks Are Vulnerable to Terrorist Attacks

Truck Cask Test, 1982



Rail Cask Test, 1998



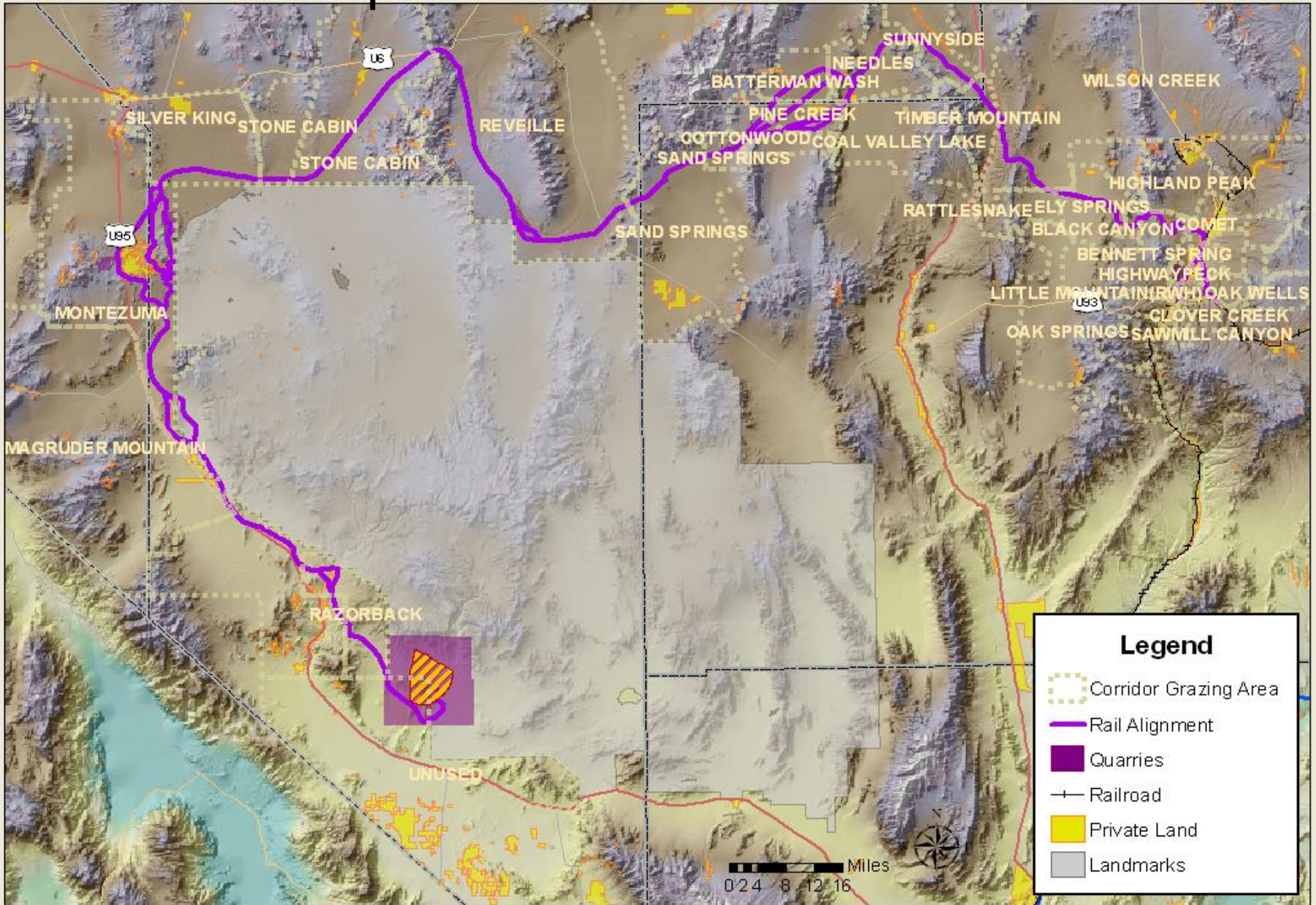


# Nevada NEPA Contentions

## Other Transportation Impacts

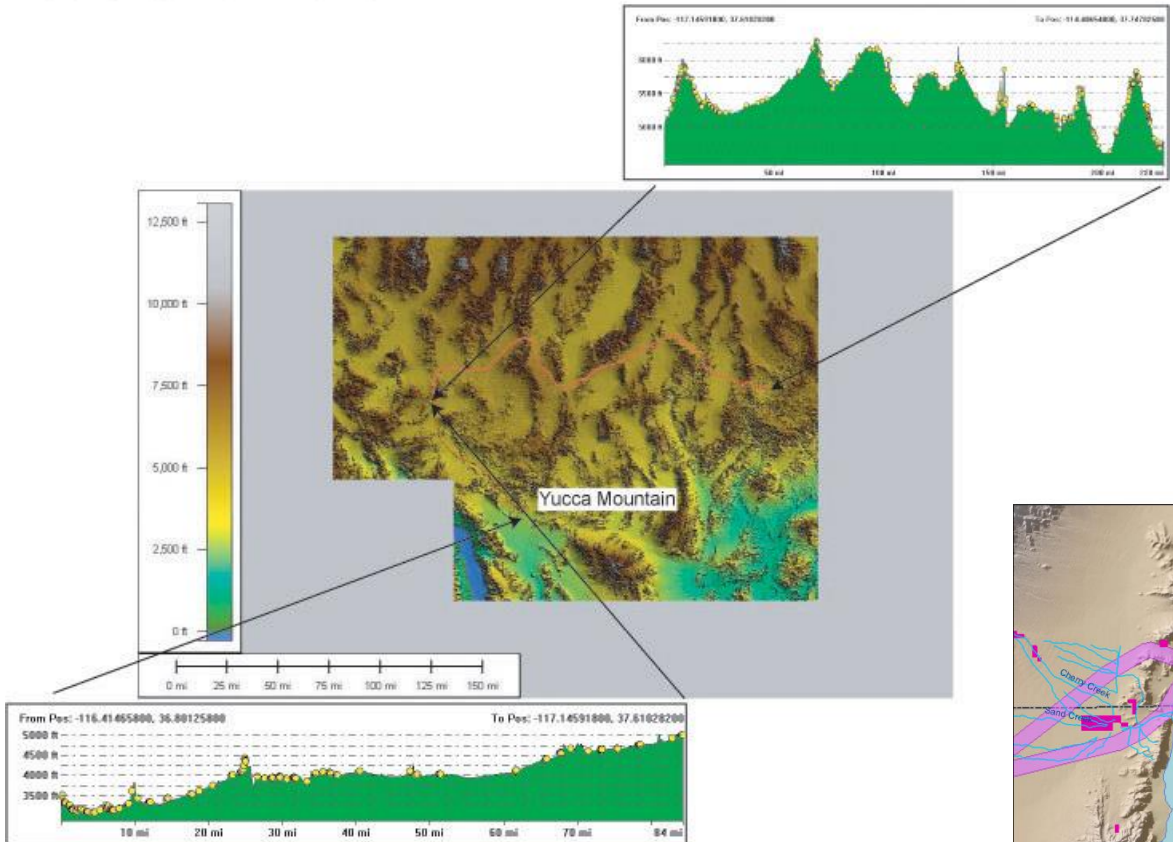
- Construction and operation of the Caliente Rail Alignment (RA EIS is part of LA)
- Las Vegas Transportation Impacts
- Representative Routes Nationally and Impacts on Highly Populated Areas
- Use of TAD Canisters and Modal Mix
- Region of Influence for Transportation Impacts

# Proposed Caliente Rail Corridor

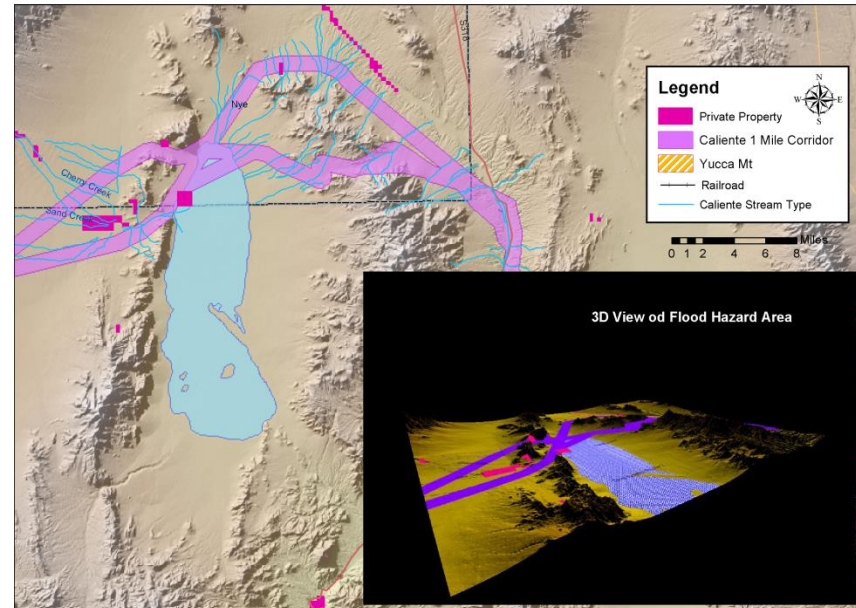


# Caliente Corridor Terrain Challenges

## Caliente Rail Profile



## Caliente Corridor Water Features



# Caliente Corridor NEPA Issues



**Mountains = Cuts, Fills, Grades, Curves**



**Land Use Conflicts**

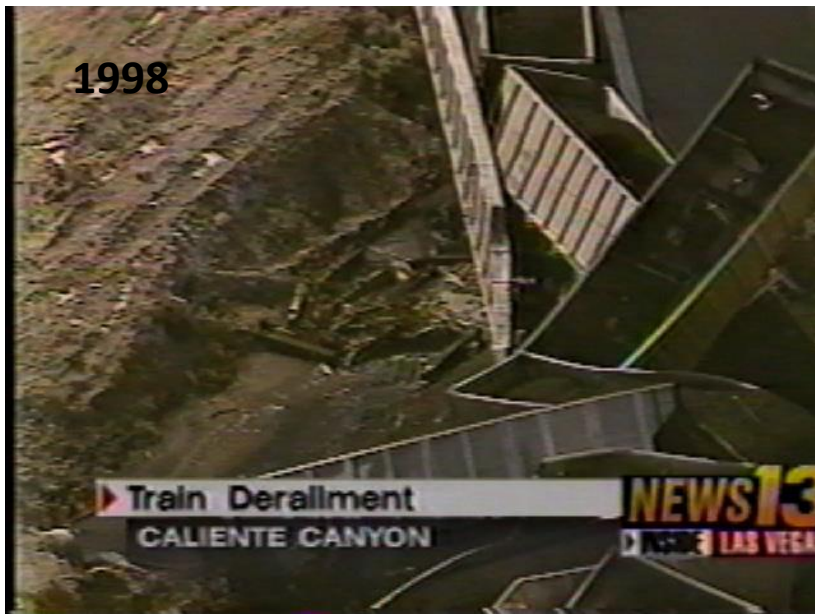
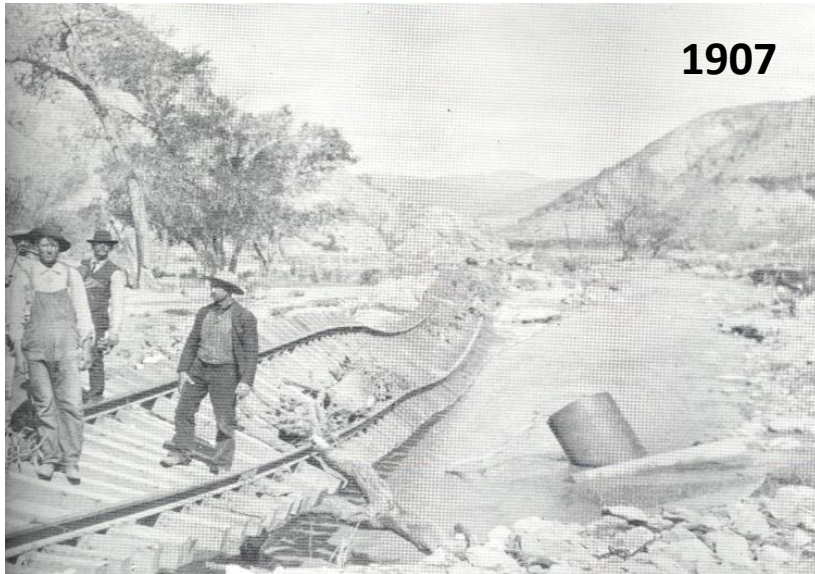


**Bridges & Flood Hazards**



**Limited Economic Benefits**

# UP Mainline to Caliente Safety Issues

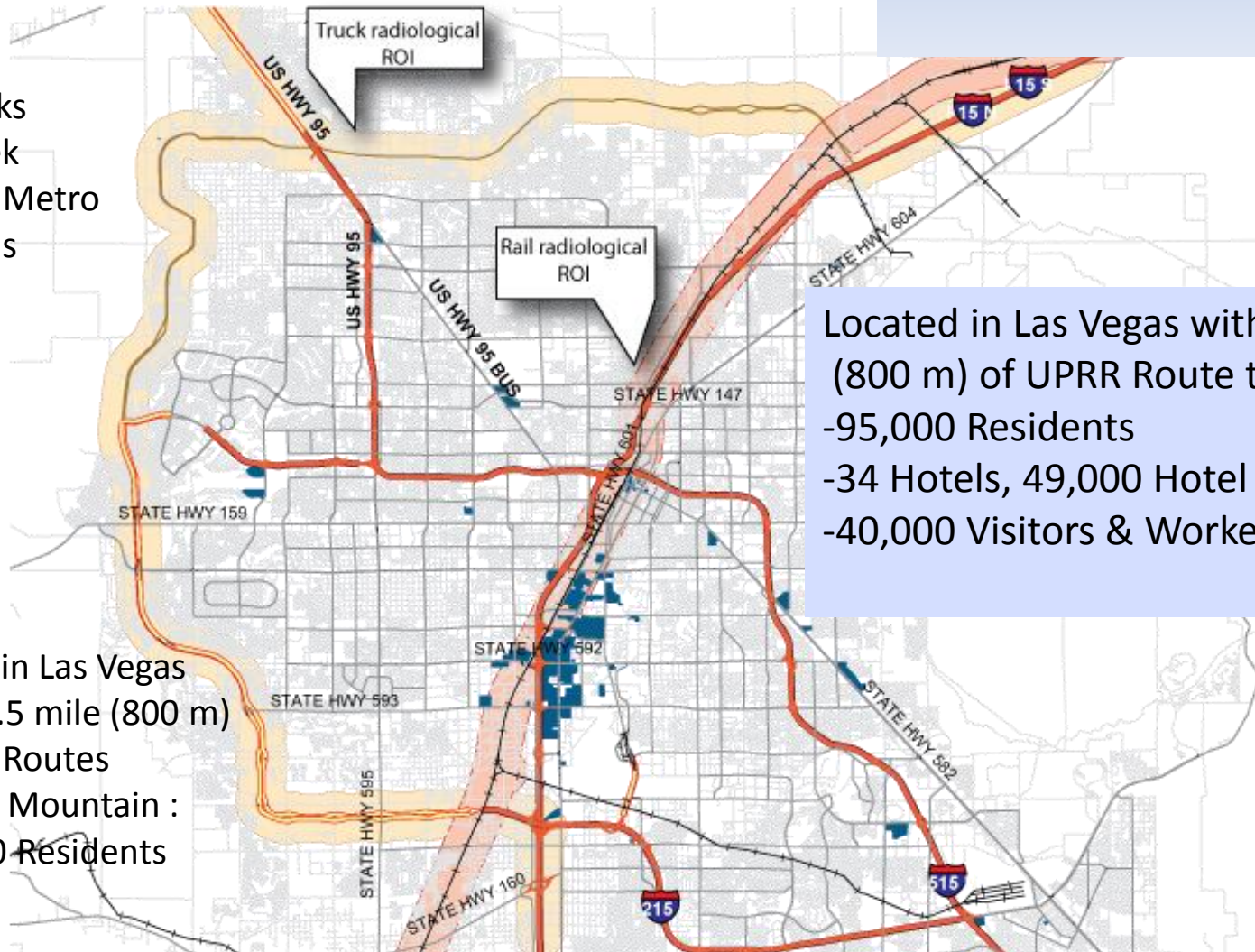


# Las Vegas

## Transportation Impacts

Rail Casks through Las Vegas  
to Yucca Mountain via Caliente  
Minimum – 8% Maximum – 79%  
4 - 110 trainloads per year

1-2 Trucks  
per Week  
through Metro  
Las Vegas



Located in Las Vegas within 0.5 mile  
(800 m) of UPRR Route to Caliente :  
-95,000 Residents  
-34 Hotels, 49,000 Hotel Rooms  
-40,000 Visitors & Workers

Located in Las Vegas  
within 0.5 mile (800 m)  
of Truck Routes  
to Yucca Mountain :  
-113,000 Residents

# STATE OF NEVADA SAFETY AND SECURITY RECOMMENDATIONS

1. Oldest fuel first
2. Mostly rail (65-75%)
3. Dual-purpose casks
4. Dedicated trains
5. Full-scale cask testing
6. NEPA process for rail spur selection
7. WIEB “straw man” routing process
8. Section 180c program rulemaking
9. State regulatory enhancements
10. Terrorism and sabotage concerns

# Older fuel first



Nevada has recommended that DOE ship the oldest fuel first, or at least ship older fuel first. Shipping fuel 50 years out of reactor, compared to shipping 5-year-cooled fuel, could reduce radiological hazards 65-85 percent.



# Dose Rate Reduction Over Time

Age (years)	Activity (curies/assembly)	Surface Dose Rate (rem/hr)	Lethal Exposure (time to 450 rem)
1	2,500,000	234,000	7 seconds
5	600,000	46,800	35 seconds
10	400,000	23,400	70 seconds
50	100,000	8,640	188 seconds
100	50,000	2,150	750 seconds

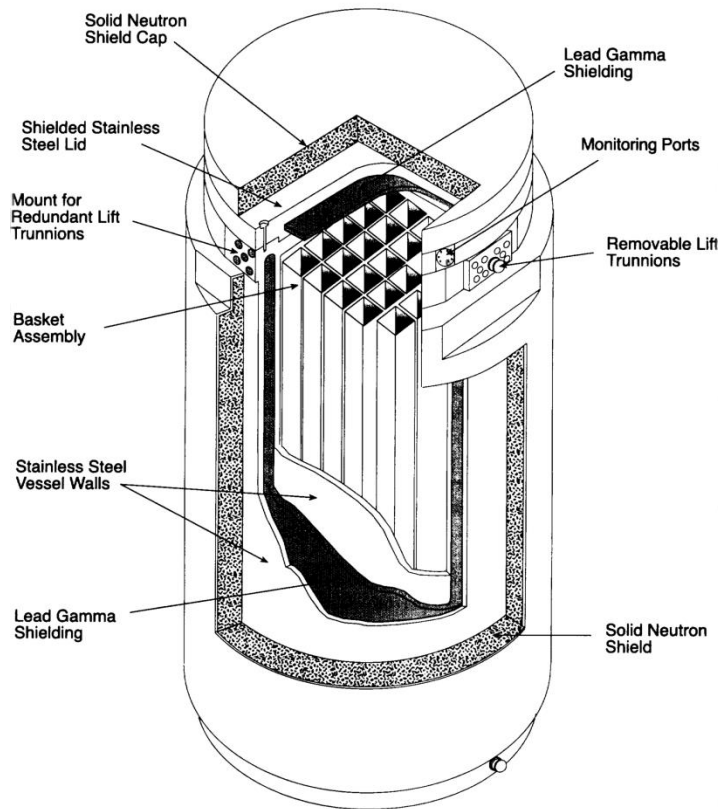
Source: Waste Confidence Rulemaking, DOE/NE-0007 (April 15, 1980) Table II-4, p. II-56; NRC Glossary, <http://www.nrc.gov/reading-rm/basic-ref/glossary/lethal-dose-ld.html>

# Mostly Rail



- Nevada has recommended that DOE select rail as the preferred mode of transportation
- Based on shipping site current capabilities, the share of SNF that could realistically be shipped by rail may be 65-75 percent.

# Dual Purpose Casks



- Nevada has recommended that DOE base its transportation system on use of dual-purpose (transportable storage) casks of a standardized design, with a range of capacities resulting in loaded cask weights of about 125, 100, and 70 tons.
- In 1995, Nevada endorsed the DOE proposal for a similar approach using a multi-purpose canister (MPC) system for storage and transport.

# Dedicated Trains

- A train that transports only spent fuel or high-level waste and no other cargo.
- The NAS found that there were: “clear operational, safety, security, communications, planning, programmatic, and public preference advantages that favor the use of dedicated trains,”



# Cask Testing



Progress on this issue has been uneven and difficult, yet substantial. The NAS 2006 report “strongly endorses the use of full-scale testing to determine how packages will perform under both regulatory and credible extra-regulatory conditions.”

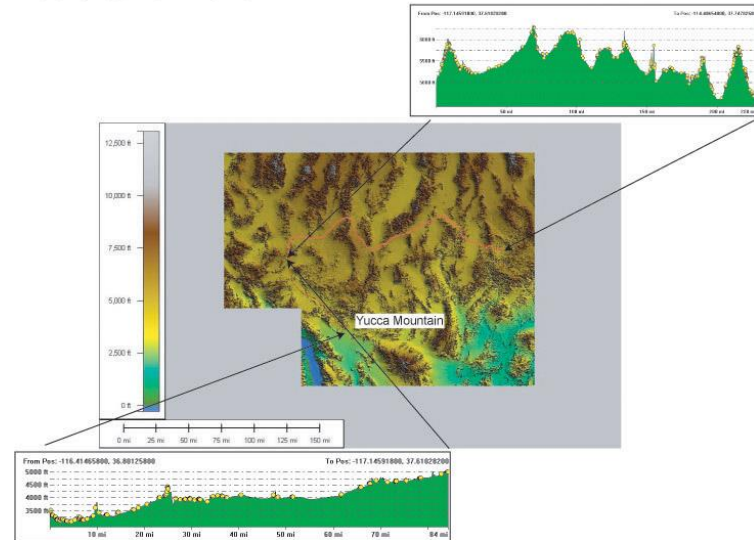
Nevada views the “Operation Smash Hit” testing as a possible approach combining regulatory and demonstration testing

# Rail Access

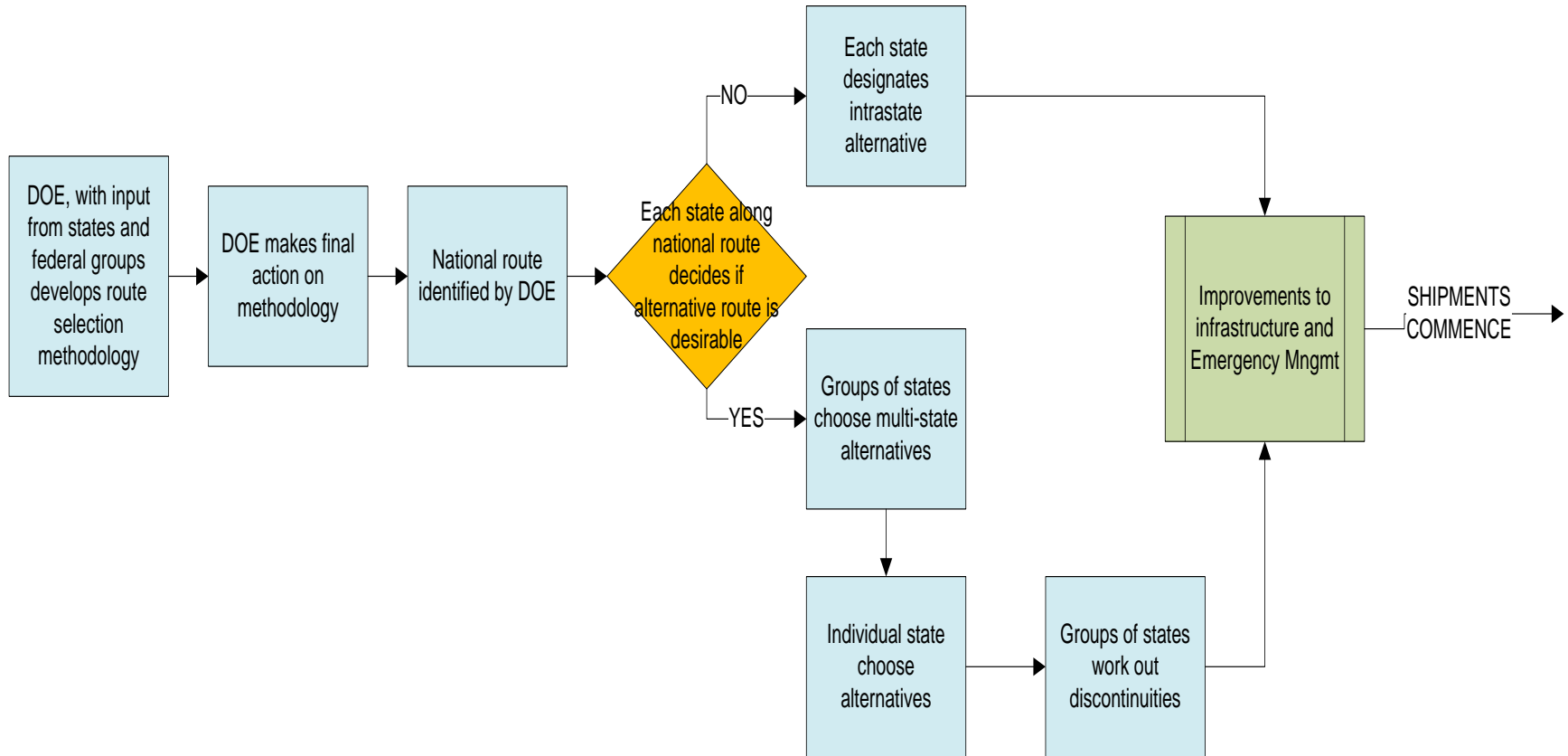
The State of Nevada filed a lawsuit challenging the process used by DOE to select a rail route as part of the 2002 FEIS for to the now defunct Yucca Mountain site. The court order in that case would allow Nevada to resume its objection to the selection of the Caliente rail alignment at a future date.

NRC accepted Nevada contentions on rail access in the Yucca Mountain licensing proceeding.

Caliente Rail Profile



# Shipment Routes: WIEB Straw man



# Section 180c

Nevada has recommended that DOE implement the transportation planning and emergency response training program, required under Section 180c of the NWPAA, through formal rulemaking.





# State, Local, & Tribal Regulation

- Nevada recommends that DOE support state regulatory enhancements to manage transportation risks and address public perception of transportation risks.
- These would include, but not be limited to:
  - port-of-entry inspections
  - state escorts
  - seasonal, day-of-week, and time-of-day restrictions



# Terrorism and Sabotage

DOE shipments would not be subject to NRC physical protection regulations (10 CFR 73.37), and therefore DOE needs to fully address terrorism issues.

In many cases the NRC has satisfactorily responded to the specific requests made in Nevada's 1999 petition for rulemaking (Docket PRM 73-10).

The NAS and BRC reports acknowledge the threat of terrorism and sabotage, but fell short of making specific recommendations for managing terrorism and sabotage risks



# The Scorecard

Organization Issue	Endorsement by National Academy of Sciences	Endorsement by Blue Ribbon Commission	Adoption by Dept. of Energy (FSEIS)	Adoption by NRC
<b>Oldest fuel first</b>	Satisfactory	Satisfactory	Unsatisfactory	N/A
<b>Dual Purpose Casks</b>	Incomplete	Incomplete	Incomplete	N/A
<b>Mostly rail</b>	Satisfactory	Satisfactory	Satisfactory	N/A
<b>Dedicated Trains</b>	Satisfactory	Satisfactory	Satisfactory	Incomplete
<b>Cask Testing</b>	Satisfactory	Satisfactory	Incomplete	Satisfactory
<b>Rail Access/NEPA</b>	Unsatisfactory	Incomplete	Unsatisfactory	Satisfactory
<b>Shipment Routes</b>	Satisfactory	Satisfactory	Unsatisfactory	N/A
<b>Section 180(c)</b>	Satisfactory	Satisfactory	Incomplete	N/A
<b>State, Local, &amp; Tribal Regulation</b>	Satisfactory	Satisfactory	Incomplete	N/A
<b>Terrorism and Sabotage</b>	Incomplete	Incomplete	Incomplete	Satisfactory

# Conclusion

- State of Nevada's ten recommendations for safety and security in 1986 have proved durable
- The majority have been endorsed by the BRC and the NAS
- Several have been adopted by NRC (cask testing, rail access, & sabotage) and by AAR (dedicated trains)
- Limited progress in adoption by DOE
- Full range of transportation impacts will be addressed in the NRC licensing proceeding

# Question & Answers

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