U.S. Department of Energy National Nuclear Security Administration
Nevada Site Office Environmental Management

Topics to be Covered

- Key Players/Regulations/Qualifications
- Low-Level Waste (LLW)/Mixed LLW Shipments and Nevada Test Site (NTS) Preferred Routes
- NTS Transuranic (TRU) Waste
- Community Outreach

Key Players

- Many entities have a vested interest in the transportation of U.S. Department of Energy (DOE) radioactive waste
  - Waste Generators are DOE and U.S. Department of Defense sites involved in environmental cleanup activities
  - Carriers are trucking companies chosen by the Generators to transport containerized waste to the disposal facility
  - U.S. Department of Transportation (DOT) is regulatory authority on how shipments are to be conducted
  - Disposal facilities and Generators are held accountable by stakeholders to ensure waste is appropriately and safely shipped

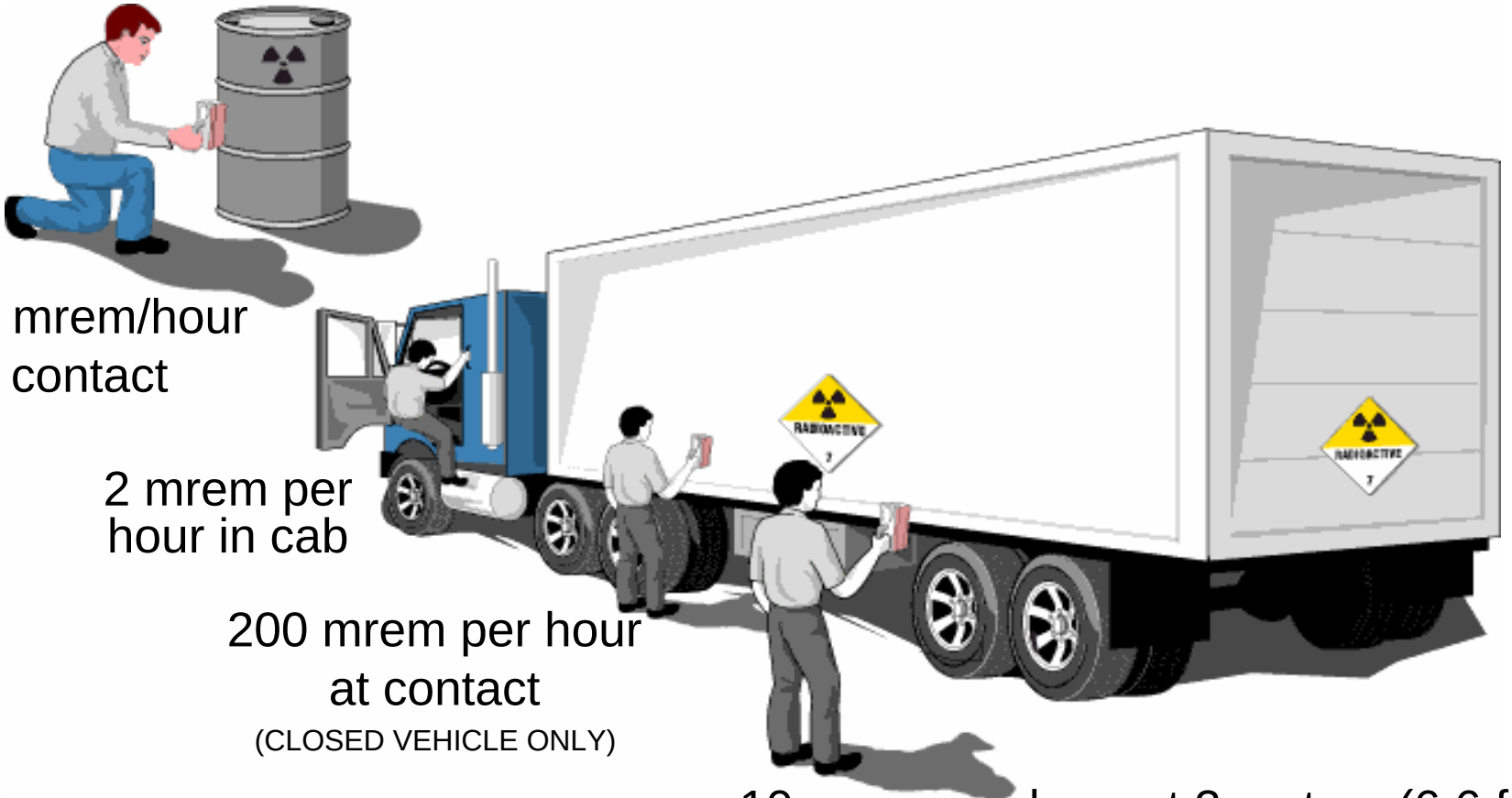
Applicable Regulations / Commitments

- DOT regulations direct *Carriers* to choose routes <u>not</u> DOE
  - Requires Carriers to consider information on accident rates, transit time, population density and activities, and the time of day and day of week during which transportation will occur
- DOE negotiated the use of NTS preferred routes (see *Transporting Low-Level and Mixed Low-Level Waste to the Nevada Test Site* brochure) with the Nevada Governor's office and other stakeholders in calendar year 2000
- Generators can suggest to their Carriers the use of preferred routes
- Drivers complete/sign routing questionnaires and are interviewed upon arrival at the NTS disposal facility

Applicable Regulations / Commitments
(continued)

- Nevada Site Office may suspend a Generator from shipping waste to the NTS if waste is transported through the Las Vegas “Spaghetti Bowl” (violation of NTS Waste Acceptance Criteria Section 6.4)
- Interstate Commerce Law does not prevent designating a route, but rather prevents excluding a route due to unjustified opposition (i.e. protects Carriers’ business interest)

Maximum DOT Dose Limits For “Closed” Exclusive Use Vehicle



1,000 mrem/hour at contact

2 mrem per hour in cab

200 mrem per hour at contact
(CLOSED VEHICLE ONLY)

10 mrem per hour at 2 meters (6.6 feet)

Potential Dose to Service Attendants

SCENARIO: Attendant Changing Tire or Fueling Truck

	TIME	DISTANCE	DOSE RATE	TOTAL DOSE
CASE 1 (MAX DOT ALLOWED)	15 MIN	CONTACT	200 MREM/HR	50 MREM
CASE 2 (ACTUAL NTS SHIPMENT)	15 MIN	CONTACT	1 MREM/HR	0.25 MREM

TIME x DOSE RATE = TOTAL DOSE

NOTE: A SINGLE DOSE OF 0.25 MREM IS FAR BELOW WHAT CAN BE MEASURED BY A PERSONNEL DOSIMETER

Dose to Passer-By

SCENARIO:
Truck Stopped in Traffic, Pedestrian Walks By Trailer on Sidewalk

	TIME	DISTANCE	DOSE RATE	TOTAL DOSE
CASE 1 (MAX DOT ALLOWED)	15 SEC	2 M (6.6 FT)	10 MREM/HR	0.04 MREM
CASE 2 (ACTUAL NTS SHIPMENT)	15 SEC	2 M (6.6 FT)	0.05 MREM/HR	0.0002 MREM

TIME x DOSE RATE = TOTAL DOSE

NOTE: THE TOTAL DOSED NOTED ABOVE ARE FAR BELOW WHAT CAN BE MEASURED BY A PERSONNEL DOSIMETER

Possible Annual Doses from Common Sources of Radiation*

Where You Live

- Living in Las Vegas, NV (natural background) – 60 mrem
- House construction (stone, concrete, or brick) – 10 mrem
- Radon (U.S. Average) – 200 mrem

What You Eat, Drink, Breathe

- Food, water, and air (U.S. average) – 40 mrem
- Using salt substitute (potassium chloride) and eating potassium-rich foods (i.e. bananas, Brazil nuts) – 10 mrem
- Human body (radiation from radioactive elements and minerals in the body) – 25 mrem

Medical

- One chest or dental X-ray – 10 mrem
- One lumbar spine X-ray – 130 mrem
- One lower gastrointestinal tract X-ray – 400 mrem

How You Live

- Jet plane travel (one U.S. round-trip coast-to-coast flight) – 5-12 mrem
- Watching TV (viewing four hours of TV every day for a year) – 2 mrem
- Cooking (with natural gas) – 10 mrem
- Smoking cigarettes (one pack every day for a year) – 4,000 mrem

Additional Doses of Interest

- Airline flight crew per year – 500-1,200 mrem
- Maximum allowable per radiation worker per year – 5,000 mrem
- Maximum allowable per astronaut per mission – 25,000 mrem

*Information from BEIR Report IV, Health Risks of Radon and Other Internally Deposited Alpha-emitter, National Academy of Sciences

Safety First!
Carrier and Driver Qualifications

- Carriers and their drivers must comply with numerous DOT requirements in order to transport radioactive waste
- In addition to DOT regulations, DOE Order 460.2A requires that Carriers be approved through its Motor Carrier Evaluation Program
  - Uses information from DOT inspections
  - DOE also conducts on-site inspections at Carrier facilities and evaluates performance based on numerous criteria
  - Continuously monitors performance monthly after approval

Transporting Radioactive Waste to the NTS

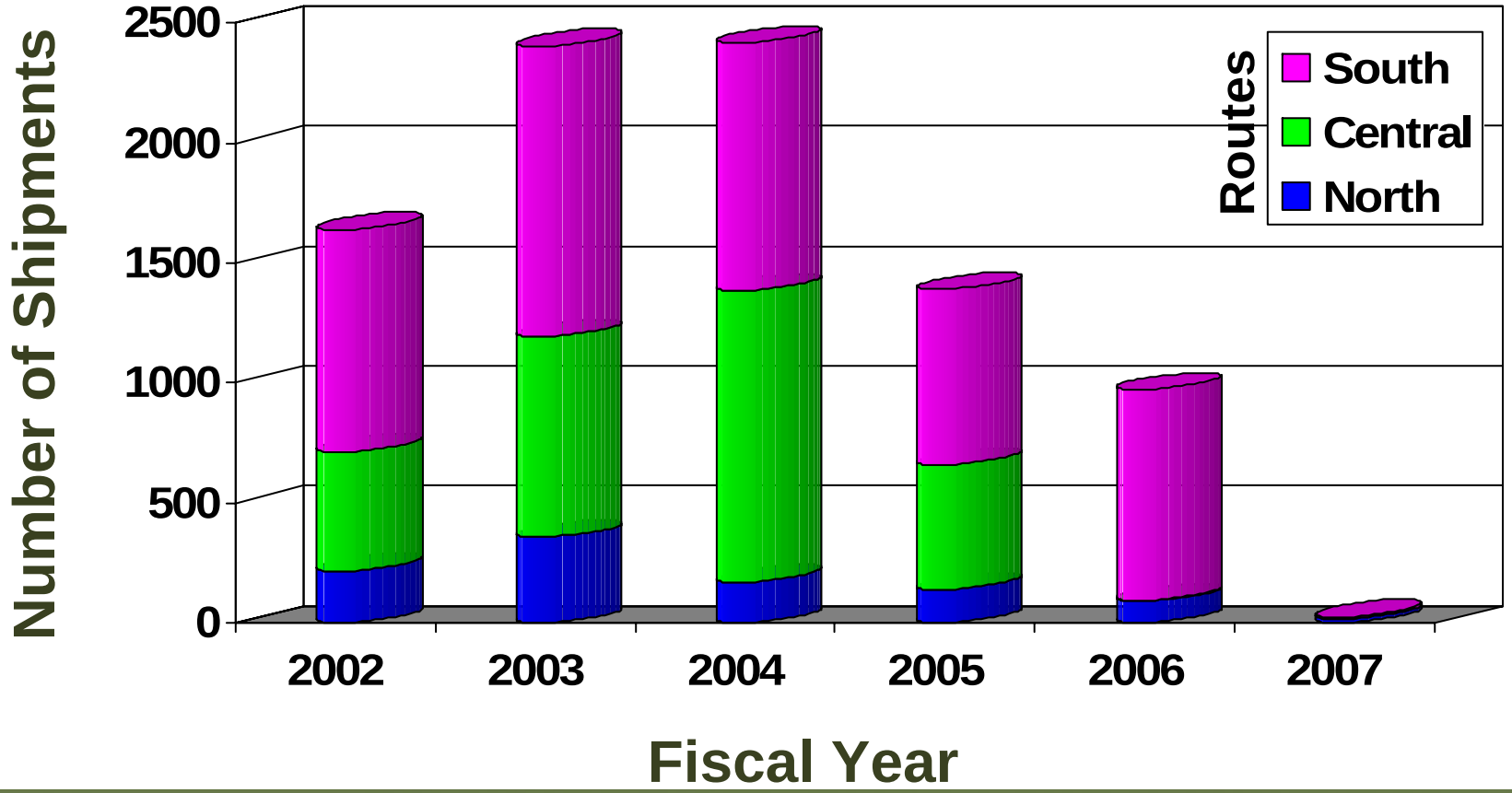
- NTS only disposes LLW and mixed LLW from Generators that comply with NTS Waste Acceptance Criteria
  - Waste must be packaged in approved DOT containers
- Generators make arrangements with Carriers to ship waste
  - Truck shipments
  - Intermodal shipments (rail shipments transferred to trucks prior to entering Nevada) are allowed if pre-arranged
  - Carriers responsible for following DOT regulations regarding radioactive waste shipments – radioactive placard requirements based upon dose readings and packaging
- Generators enter shipment information into the NTS inbound shipment reporting system *

*A summary report of scheduled shipments is available on the Internet at http://www.nv.doe.govemprograms/environment/wastemanagement/haztrak.htm

Other Radioactive Waste Shipments

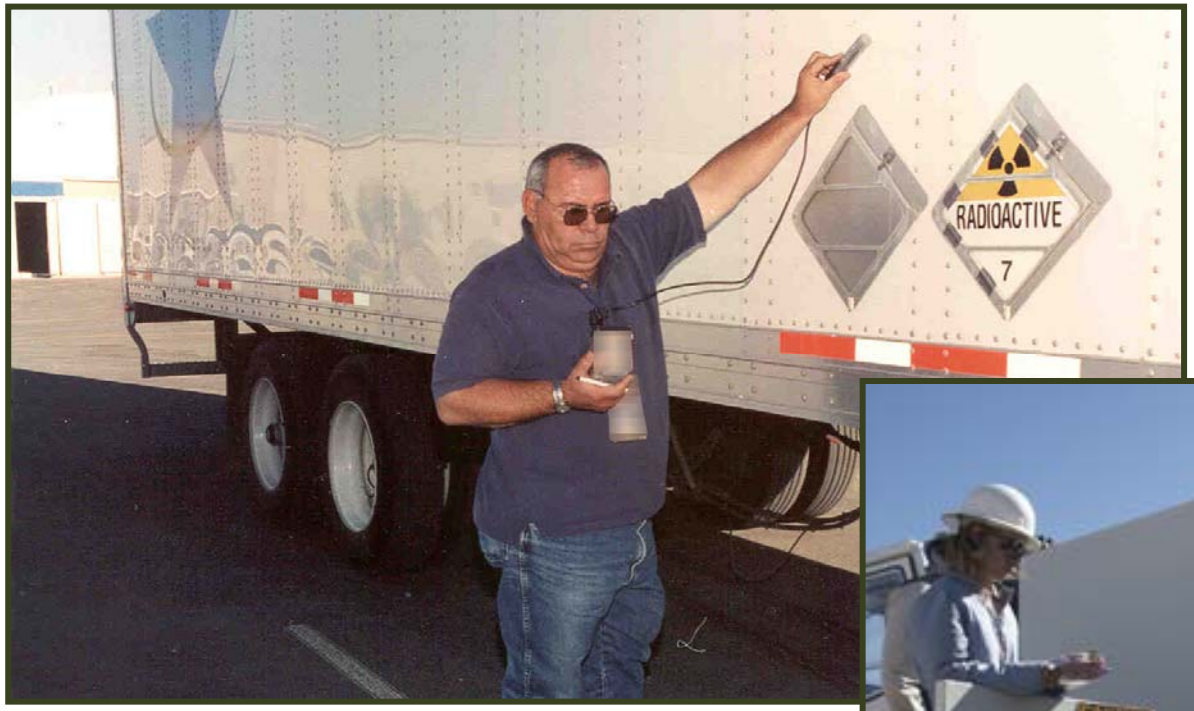
- Non-DOE radioactive material/waste shipments traveling through Southern Nevada must also comply with U.S. DOT regulations
  - Shipments to a commercial disposal facility in Utah
  - Medical material/waste shipments
  - Construction materials

LLW and Mixed LLW Off-Site Shipments to the NTS



*Bar colors coordinate with route colors on *Transporting Low-Level and Mixed Low-Level Waste to the Nevada Test Site* brochure

LLW Shipment Arrival and Radiological Surveys at the NTS



LLW Shipment Disposal and Post-Offloading Radiological Survey at the NTS

TRU Waste Shipments to WIPP

- 1,860 drums (48 shipments) of NTS TRU waste transported to WIPP for disposal between January 2004 and November 2005
- Remaining TRU waste requires repackaging, characterization or a DOT approved shipping container
  - 151 drums
  - 58 oversize boxes
  - 2 spheres
- Anticipate shipping the remaining waste to a Central Characterization Facility (CCF) or WIPP by December 2007

NTS TRU Waste Routing to WIPP

- Routing of 48 NTS TRU waste shipments to WIPP

Possible Routing to a CCF

- Remaining NTS TRU waste requiring additional characterization will be shipped to a CCF (has not yet been identified)

Community Concern: Potential Exposure from LLW Shipments

- LLW and mixed LLW shipments must not exceed DOT regulations on radioactive dose rates
- Containers and “closed” trailers are used to minimize exposure to drivers, the public, and environment
- Radiological surveys are conducted before a shipment departs a Generator site, upon arrival at the NTS disposal facility, during offloading and before the empty truck trailers are released from the disposal facility
- Potential doses from LLW and mixed LLW shipments are comparable to common doses from natural and other man-made radiation

Community Support / Outreach

- DOE grant funding for community emergency response initiated in 2000 to assist counties in reaching operations-level preparedness
  - Generators are charged an additional $.50 per cubic foot of LLW and mixed LLW disposed at NTS
  - State of Nevada Division of Emergency Management administers funding
  - Clark, Elko, Esmeralda, Lincoln, Nye and White Pine counties submit grant applications to fund emergency response resources (i.e. equipment, facilities, training, planning, etc.)
- Active Community Advisory Board
  - Members include citizens of Nye and Clark counties and representatives from the State of Nevada and Nye county

Community Support / Outreach
(continued)

- Informational materials and exhibits are continually updated and available to the public
  - LLW Transportation to NTS exhibit rotated to libraries in Pahrump, Amargosa Valley, Beatty, Caliente, and Ely
  - Briefings and meetings with local officials
  - Quarterly transportation reports distributed to local and regional officials
  - Transportation information, fact sheets and reports posted to the DOE Nevada website at http://www.nv.doe.gov/emprograms/environment/wastemanagement/transportation.htm

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Overview

- Background: TRU Definitions and Disposition
- TRU Waste in the Trenches
  - Where is it?
  - How much is there…and why?
  - What are the issues?
  - What steps have been taken to address the issues?
  - What are the remediation options?
  - What are the recommendations / path forward?

Background…
TRU Definitions and Disposition

- 1969-1970 Atomic Energy Commission definition
  - Greater than 10 nano curies per gram (nCi/g)
  - Unsuitable for shallow-land disposal
- Post-1970: retrievable storage of TRU
- DOE Order 5820.2A: ***revised*** definition of TRU
  - Atomic number greater than 92; half-life greater than 20 years; concentration greater than 100 nCi/g

Background…
TRU Definitions and Disposition
(continued)

- Regulations for TRU: U.S. EPA 40 CFR 191 (1993 version)
  - Containment, Individual Protection, Assurance and Groundwater protection requirements
  - Regulations for a TRU geologic disposal facility
- Disposal site: Waste Isolation Pilot Plant (WIPP) located near Carlsbad, New Mexico
  - Characterization, certification, shipment to WIPP

Background… TRU Definitions and Disposition

(continued)

- DOE complex: what to do with TRU waste “disposed” in shallow trenches?
- DOE asked the National Academy of Sciences (NAS) to evaluate issues for both high-level waste (HLW) and TRU waste
  - Recommended a risk-informed process (cost-benefit trade-offs)
- For reference: DOE LLW is regulated by the Low-Level Waste Disposal Facility Federal Review Group (LFRG)
  - DOE Order 435.1

TRU Waste in the Trenches

Where Is It?

How Much TRU is in the Trenches… and Why?

- Approximately 102, 55-gallon steel drums with classified TRU materials inadvertently disposed at Area 5 Radioactive Waste Management Site in a classified material trench
  - Two shipments in 1986 from Rocky Flats
  - Likely intended for Greater Confinement Disposal (GCD)
- Approximately 30 m^3; 229 curies, including isotopes of Plutonium (Pu), Americium (Am), and Uranium (U)

What are the Issues?

- Shallow-land disposal not fully consistent with requirements for geologic disposal
  - What must be done for final disposition?
  - New performance assessments required specific to TRU in the trenches (e.g., what regulations apply?)
- TRU inventory currently included in composite analysis
  - Meets all requirements of DOE Order 435.1
- Regulatory intent vs. safety issue
  - Leave in place vs. ship to WIPP?
  - Cost-benefit trade-offs?

What are the Issues…Why Now?

- Closure plan, 92-acre portion of the Area 5 Radioactive Waste Management Site
  - Requires resolution of TRU in the Trenches
- Trench is adjacent to the Pit 3 Mixed Waste Disposal Unit
  - Five-year operational phase and closure per agreement with the State of Nevada

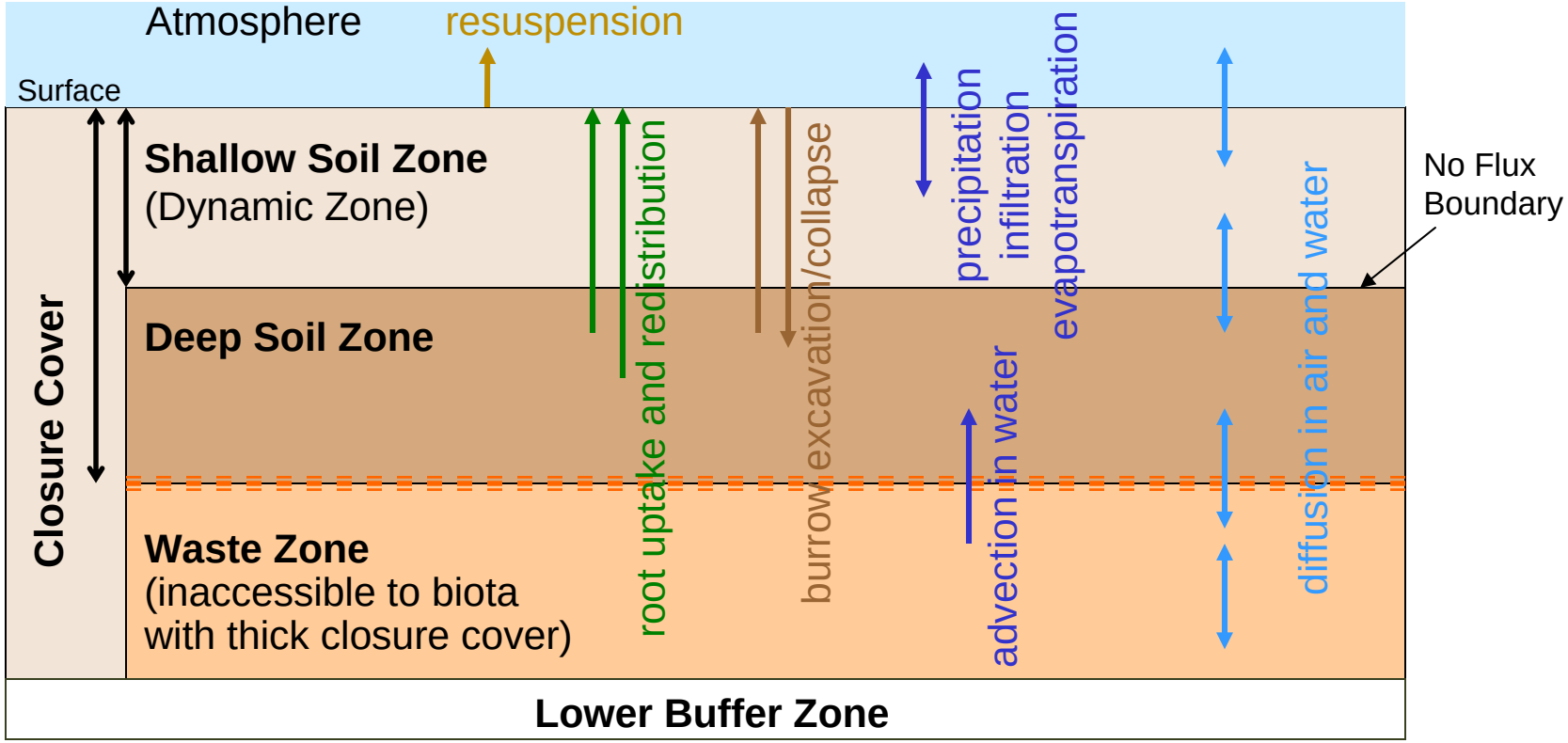
What Steps have been Taken?

- Performance Assessment completed and accepted for Nevada Test Site disposal facilities – included TRU in the trenches
  - A Performance Assessment is an estimation of the behavior of a waste disposal system (Area 5 and Area 3 Radioactive Waste Management Sites) used for evaluating compliance (1,000 years) and for long-term facility management
  - A Performance Assessment traces processes that can disperse waste after burial (fate and transport) and the resulting radiological effects (human health effects for receptor scenarios)

Performance Assessment Model:

Area 5 Radioactive Waste Management Site Shallow Land Burial

Receptor scenarios



Not to scale

Figure denotes the upper approx. 10 meters of the disposal unit

[no groundwater pathway]

What Steps have been Taken?
(continued)

- Does the current disposal configuration meet the requirements of 40 CFR 191?
  - Revised Performance Assessment analyzes TRU requirements: PASS
- Still need to assess the impact of climate change
  - 1,000 versus 10,000 years (*natural* climate change)
- Nevada Site Office (NSO) working cooperatively with the Savannah River site on similar TRU disposal issues
- NSO has identified a range of remediation options
- Use a risk-based perspective to evaluate and select a preferred remediation option

What are the Remediation Options?

Option 1	Excavation, certification, shipment to WIPP
Option 2	40 CFR 191 performance assessment Low-Level Waste Disposal Facility Federal Review Group (LFRG); leave in place if safe
Option 3	Exemption and risk-informed process recommended by the National Academy of Sciences
Option 4	EPA Federal Register notice to approve alternative disposal requirements
Option 5	Leave trench unclosed until regulatory issues with non-geologic disposal of TRU waste are resolved (national level decision)

What are the Remediation Options?
(continued)

- June 2005: Remediation options presented to the LFRG
  - LFRG agrees with Option 2
  - Consistent with regulatory authority: DOE Order 435.1

- NSO Preference: Option 2 -- but develop risk/benefit analysis for all options
  - Follow National Academy of Sciences risk-informed process

What are the Recommendations / Path Forward?

- Complete final Performance Assessment revisions and assess options risk/cost
  - Engineered barriers for assurance requirements
  - Climate change
- September 2007: Recommendations to the LFRG
  - Joint presentation with Savannah River Site
- LFRG will implement regulatory review process
- Anticipated Resolution: fiscal year 2008