

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

**NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING**

**SUBJECT: HYDROLOGY AND CLIMATOLOGY
INTEGRATED STRATEGY**

PRESENTER: RUSSELL L. PATTERSON

**PRESENTER'S TITLE
AND ORGANIZATION: STAFF, ASSISTANT MANAGER SCIENTIFIC PROGRAMS
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE
LAS VEGAS, NV**

TELEPHONE NUMBER: (702)794-5469

JULY 9-10, 1996
DENVER, CO

Overview

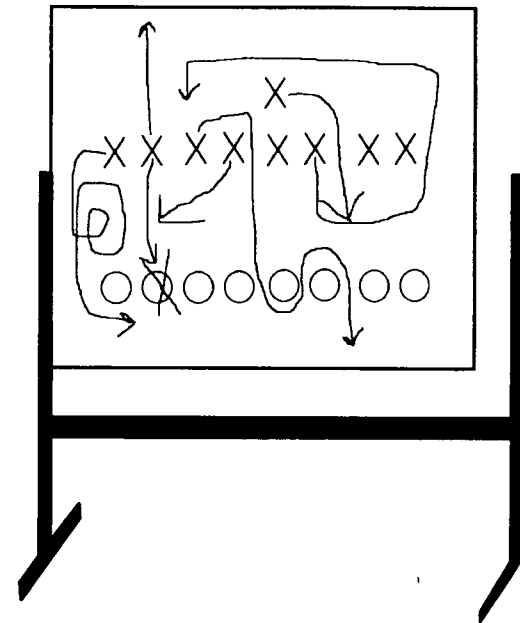
- **Address hydrology and climatology strategy for addressing waste isolation attribute on seepage**

Overall Objectives

- **Determine spatial and temporal variability, as well as magnitude of infiltration and percolation flux**
- **Determine factors that influence infiltration and percolation**
- **Obtain adequate bounds on influencing factors**
- **Determine likely impacts on saturated zone flow and ultimately on radionuclide transport**

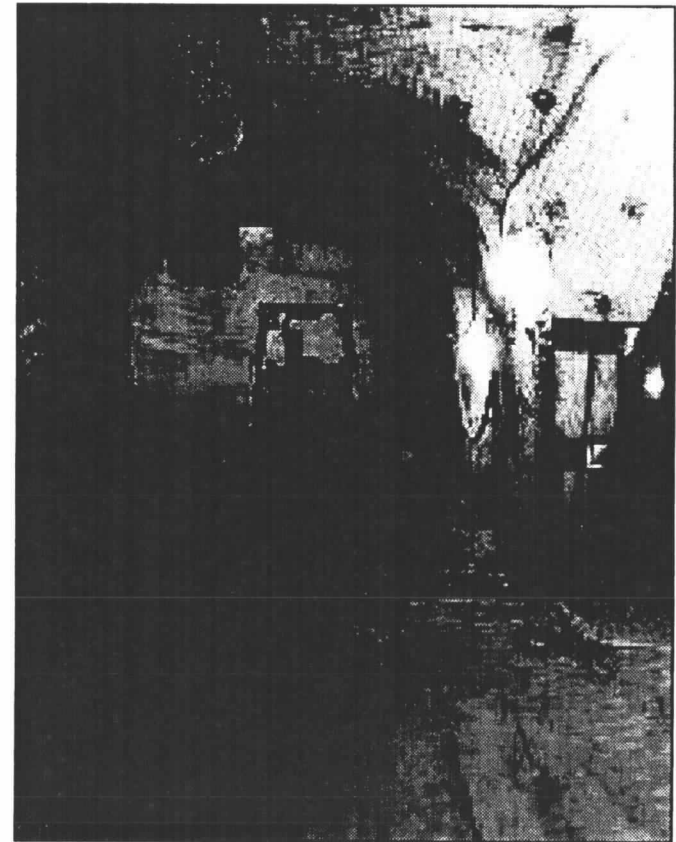
Strategy

- **Use geologic framework as a basis**
- **Understand present-day hydrologic response to present-day climatic conditions**
- **Understand past hydrologic responses to past climatic conditions**
- **Building on climatic conditions “observed” to date, provide future climatic conditions that could affect repository performance**
- **Model hydrologic responses to future climatic conditions**



Scientific Studies

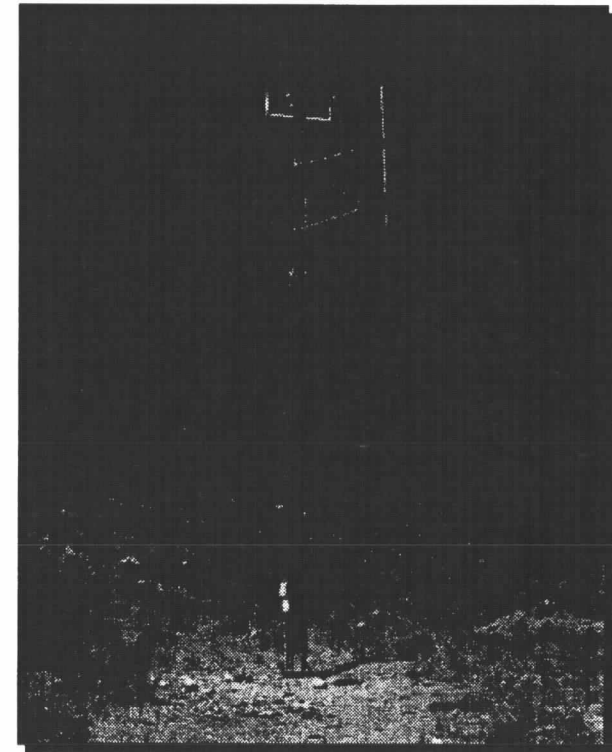
- **Use geologic framework as a basis**
 - “Geologic structure at Yucca Mountain” - Warren Day, Steve Beason
- **Present-day hydrologic response**
 - “Fracture pathways and flux through the unsaturated zone in the North Ramp area” - Edward Kwicklis
 - » Evidence for fracture flow
 - » Percolation flux analysis



Scientific Studies

(Continued)

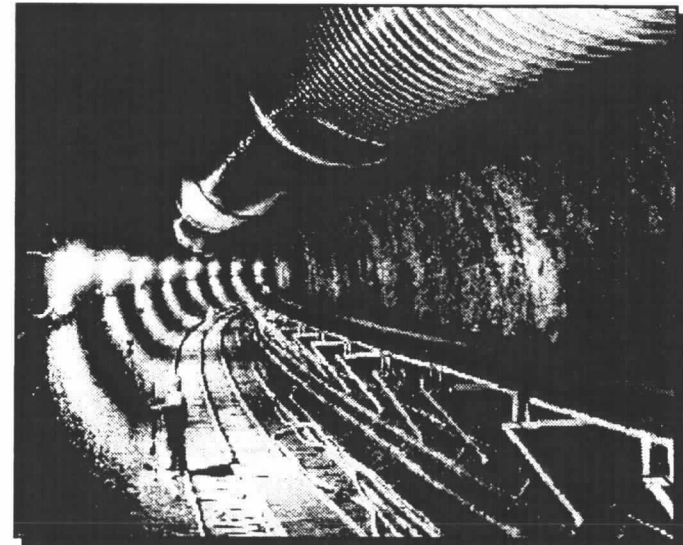
- **Present-day climatic conditions**
 - **“Present day climate and infiltration” - Alan Flint**
 - » Determine present-day relationship between climate/meteorologic factors and infiltration
- **Past climatic conditions**
 - **“Paleoclimate records: implications for future climate change” - Rick Forester**
 - » Provide dates, amplitude, periodicity and paleoclimate mechanisms
 - » Link global and local paleoclimate conditions



Scientific Studies

(Continued)

- **Past hydrologic responses**
 - **“Paleohydrology - age control from U-series and ^{14}C dating of calcite and opal in the ESF” - Zell Peterman, James Paces**
 - » **Paleoclimate and paleohydrology correlations**
 - » **Determine timing of past percolation events**



Scientific Studies

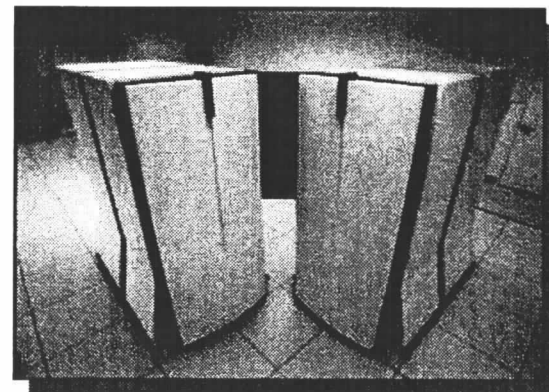
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- **Past and present hydrologic response**
 - **“Hydrologic flow paths and rates inferred from the distribution of ^{36}Cl in the ESF” - June Fabryka-Martin, Andrew Wolfsburg**
 - » Chlorine-36
 - » Tritium
 - » Fast flow path detection
 - » Estimated age of *in situ* water



Modeling Efforts

- **Provide future climatic conditions**
 - **“Future climate modeling” - Starley Thompson**
 - » Incorporate anthropogenic factors into climate conditions
 - » Provide probable scenarios based on mechanisms identified by paleoclimate studies
- **Model hydrologic responses**
 - **“TSPA insights into impacts of climate and ^{36}Cl ” - Michael Wilson**
 - » ^{36}Cl observations
 - » Impacts of different scenarios
 - » Relationship between data gathering, process models, and TSPA



Summary

- **Paleoclimate study determines climatic conditions**
- **Isotopic studies identify the mountain's hydrologic response to those climatic conditions**
- **Present-day climate/infiltration studies identify effects of temporal and spatial variability of climate conditions on hydrology**
- **Future climate models provide climate scenarios that could affect future hydrology**
- **TSPA examines impacts of future hydrology on waste containment and isolation**