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Title: WIPP 2-Year Investigation and LANL Underground Tests

Author(s): Reed, Donald T.

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Waste management
Reading Room
RCRA

WIPP 2-Year Investigation Focus and LANL Underground Tests

Donald Reed

Earth and Environmental Sciences Division

Los Alamos National Laboratory

Overview

1) WIPP 2-Year Program Plan Emphasis
2) Design and Chemistry Aspects of Proposed LANL Underground Test

WIPP 2-Year Program Plan: Overview of Schedule

- **2 and 7 year program plan is linked to the next two re-certifications: CRA 2014 and CRA-2019**
- **Key time points in the 2-Year Plan:**

January 2011: Write program plan and start new research activities

February 2012: Decision point on the need for a peer review

September 2012: Conduct peer review, if needed

December 2012: Data cutoff for CRA-2014

March 2013: Submit CRA-2014

Chemistry and Actinide Chemistry Issues Addressed: 2-Yr Program Plan

Chemistry (LANL and SNL):

- •Shift to EQ36 from FMT for actinide and brine chemistry thermodynamic calculations
- •Brine chemistry modeling and experiments to shift to a variable brine composition model from a “bracketing” approach
- •Pitzer model improvements: Fe, borate, organic solubilities, general updates
- •Fe gas generation rates and phase formation
- •Microbial characterization and biodegradation

Actinide Chemistry (LANL):

- •Thorium (+4 actinide) solubilities across a broad pH range
- •Further Pu(V/VI) and Am(VI) redox studies with Fe
- •U(VI) solubility in carbonate-containing brines
- •Actinide colloid enhancement factor measurements (intrinsic, mineral, and bio)
- •Borate and organic complexant effects

LANL Salt Disposal Interaction (SDI) Tests

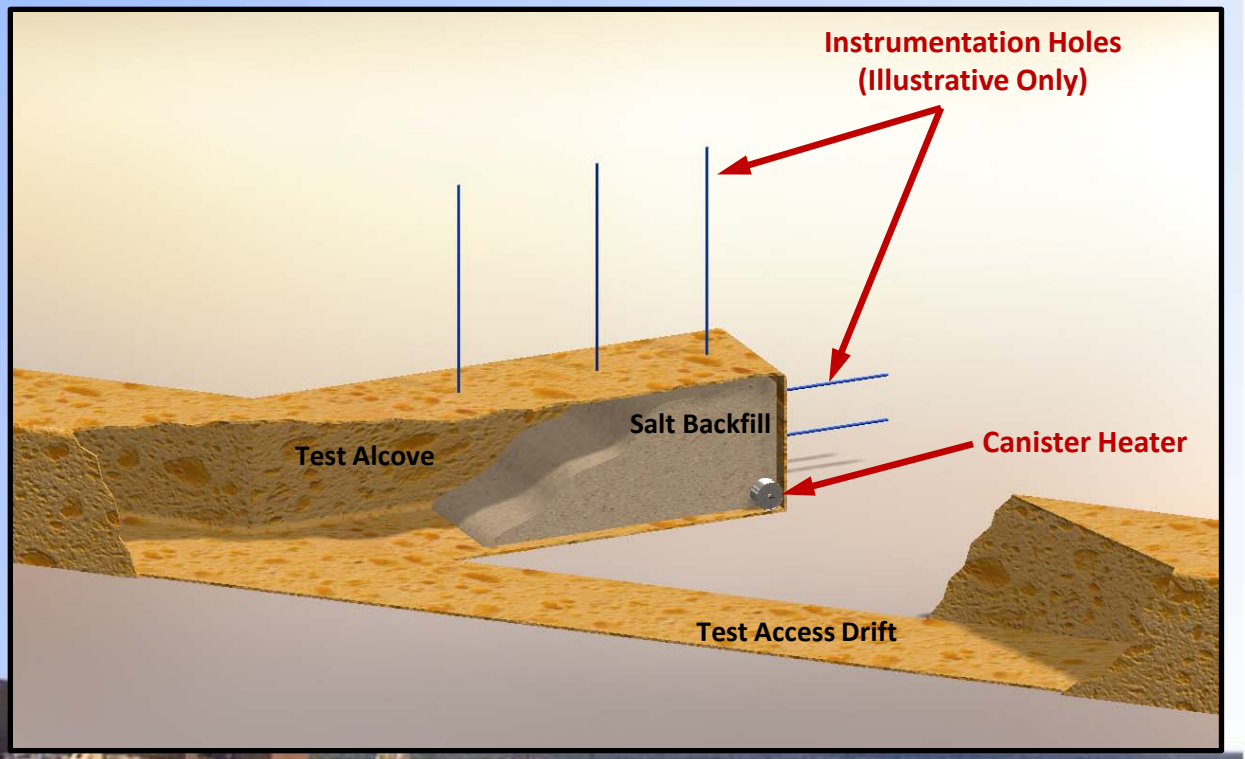
Goal: Perform integrated thermal, mechanical, hydrologic, and geochemical tests in a newly excavated experimental station in the WIPP underground

Focus in this Presentation:

- Experimental Design
- Geochemistry and Actinide Aspects

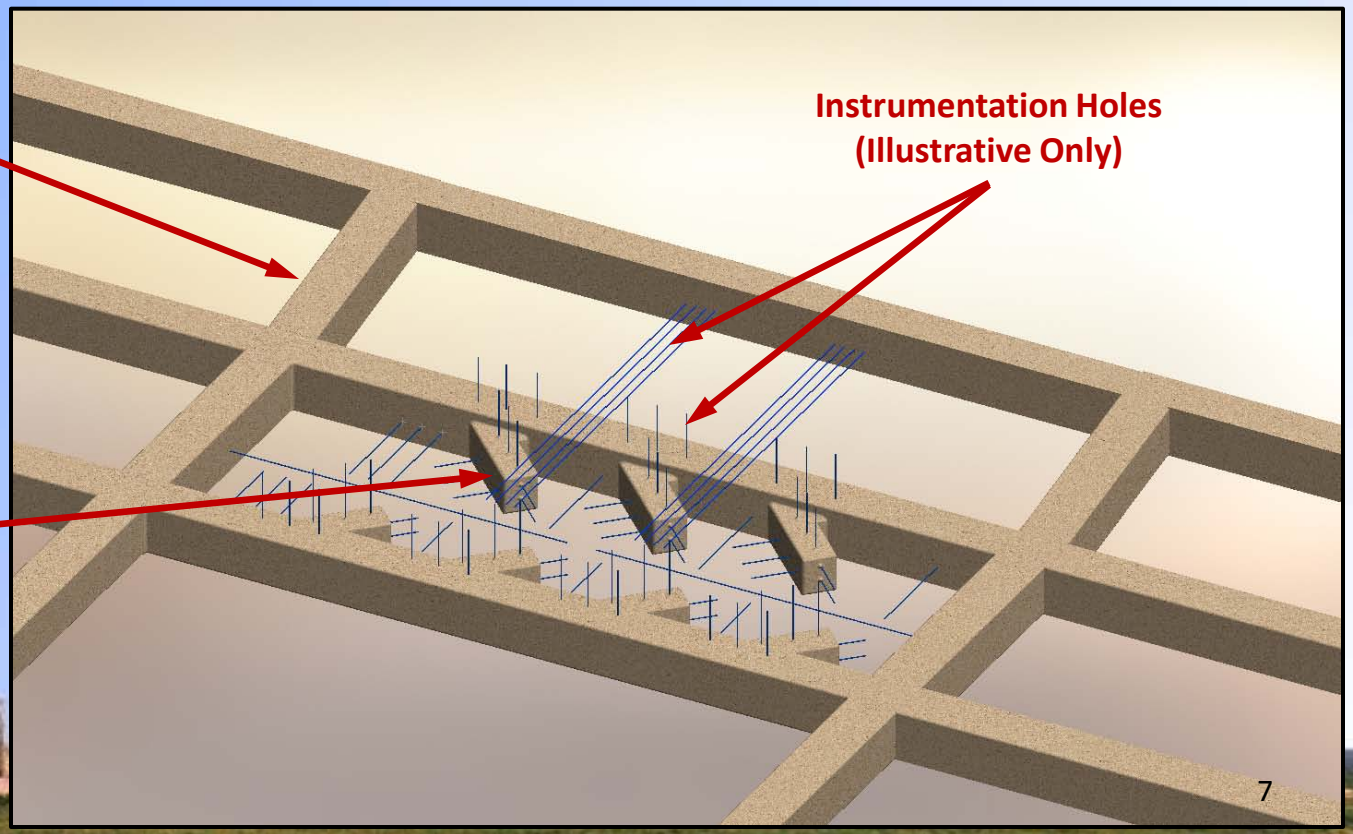
What Will the Field Test Look Like?

- Electrical heaters placed in the back of the alcoves are used to simulate waste packages
- This thermal loading will produce temperatures in excess of 160°C in the nearby undisturbed salt (temperatures well above other existing salt data and beyond temperatures achieved in the Drift Scale Heater Test at Yucca Mountain)
- The alcoves will be instrumented to measure:
  - water movement
  - temperature
  - deformation
  - alcove closure
  - crushed salt pressure
  - ventilation conditions
- Two years heating (planned)
- Two years cooling
- Post-test forensics will confirm measured data



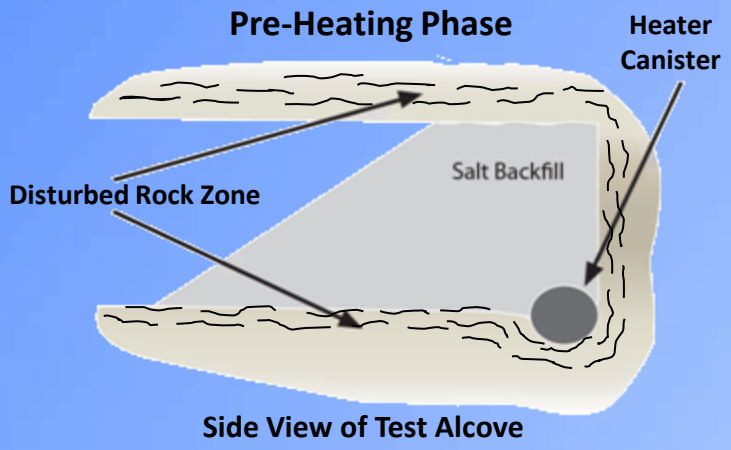
What Will the Field Test Look Like?

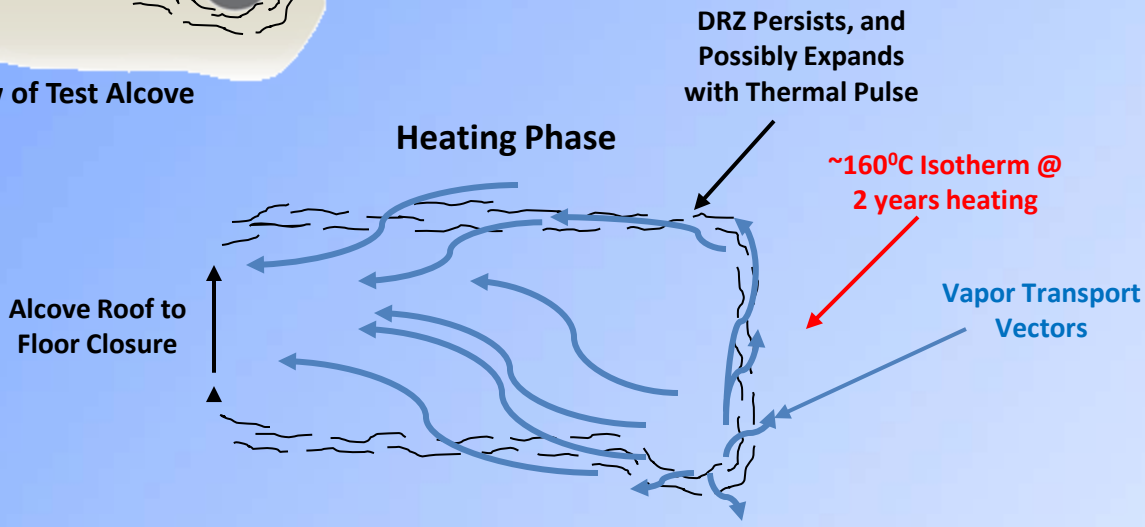
- The test design is modeled after a proof-of-principle layout and operational strategy for a repository in salt
- The design consists of an array of alcoves with access and ventilation drifts
- Boreholes will be drilled to contain monitoring instrumentation



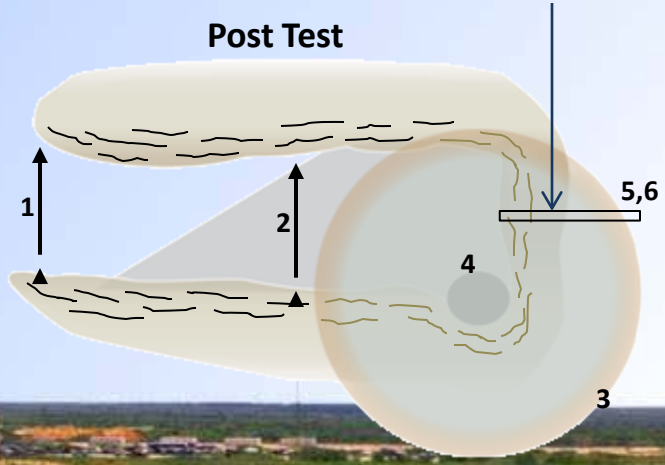
Expectations of the Field Test

In this series of simple illustrations, a side view of a test alcove is shown. The heater is on the floor at the back of the alcove. The alcove is heated for at least two years.





Post test examination of core will look at:
(5) deformation, and
(6) inclusion migration



Post test forensics will confirm (1) alcove closure, (2) porosity distribution , (3) extent of the dry halo, and (4) coupon corrosion

Planned Geochemistry Studies

Expected scenario in an HLW repository in salt is a "dry' environment. Brine inundation is a low-probability event that addresses the range of scenarios expected to be needed to fulfill the regulatory requirements

Key geochemistry issues proposed for study (WIPP-related research also applies) :

- **Thermal effects on brine chemistry (up to 200 C)**
- **Actinide solubilities as f(temp) in brine**
- **Fission product chemistry in brine as f(temp)**
- **Radiolysis effects on actinide solubility as f(temp)**

Future Plans and Directions

2-Yr WIPP Program Plan:

- **Decisions on peer review (early 2012)**
- **Summary reports (Now through December 2012)**
- **Write and submit CRA-2014 by March 2013**

LANL SDI Tests (Plans pending funding approvals)

FY12

Develop and review the detailed field test plan

Begin mining the underground access drifts (EPA approval expected in the next month

FY13

Procure test equipment and instrumentation

Complete mining of the underground access drifts

Mine the test bed

Initiate supporting chemistry studies

FY14/15

Install instruments, and initiated Heater tests (2-year durations proposed)

Outyears

Begin Cool down period in FY17/18

Post-test forensics, mine-back and post-test coring in FY 19 and FY 20

Complete the final test and data reports

Develop calibrated, coupled TM(H) model