OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SPECIAL INSTRUCTION SHEET

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Drift Scale Test

Yucca Mountain Project

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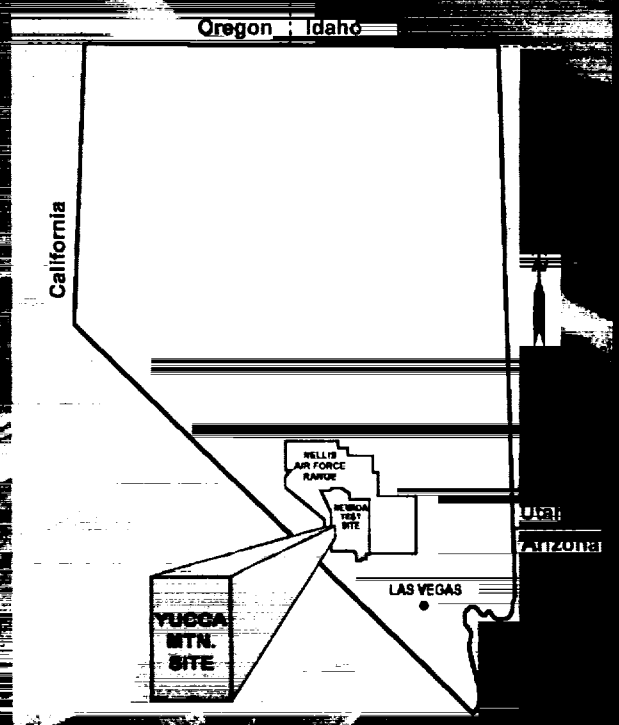


Introduction

YUCCA MOUNTAIN

The mission for Department of Energy's Office of Civilian Radioactive Waste Management is to safely manage and dispose of the nation's spent nuclear fuel and high level radioactive waste in a geologic repository. A potential site at Yucca Mountain in Nevada is being studied by the DOE. Nuclear waste is to be contained in packages which will be emplaced in the repository for thousands of years. After these manmade packages eventually degrade, the repository should continue to isolate nuclear waste from the environment. The repository is to comply with the 1982 Nuclear Waste Policy Act and its amendments. Also, the health and safety of the workers will not be compromised during the construction and operation of the repository.

To investigate important technical issues inherent with the construction, operation, closure, and performance of the repository, a series of in situ experiments have been planned for the Exploratory Studies Facility (ESF) located inside Yucca Mountain. The ESF Thermal Test is an integral part of the Site Characterization Plan developed in 1988 following the Congressional mandate to evaluate only Yucca Mountain as a potential repository. The planning documented in the Site Characterization Progam has evolved to include the construction of the ESF to accommodate changing needs and increased understanding of the Yucca Mountain Project. The recently updated ESF thermal testing strategy includes the Drift Scale Test (DST). The DST is more-complex, longer-duration, and larger-scale than its predecessor – the Single Heater Test.

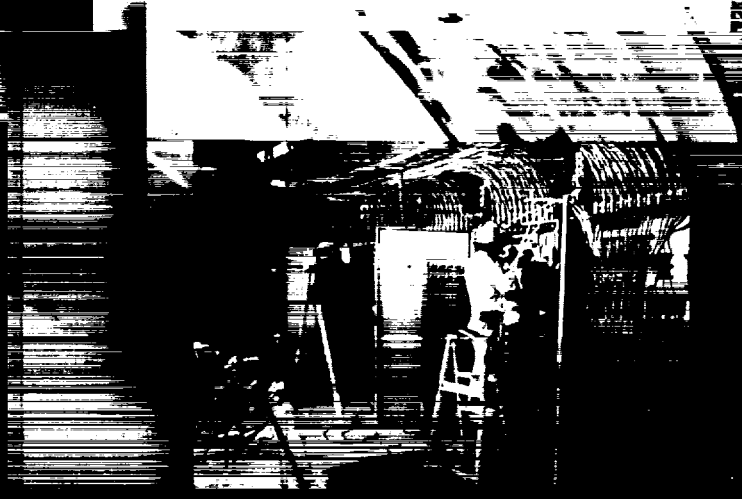
PURPOSE

The primary purpose of the DST is to acquire a more in-depth understanding of the coupled thermal-mechanical-hydrological-chemical processes anticipated in the rock mass surrounding the proposed repository.

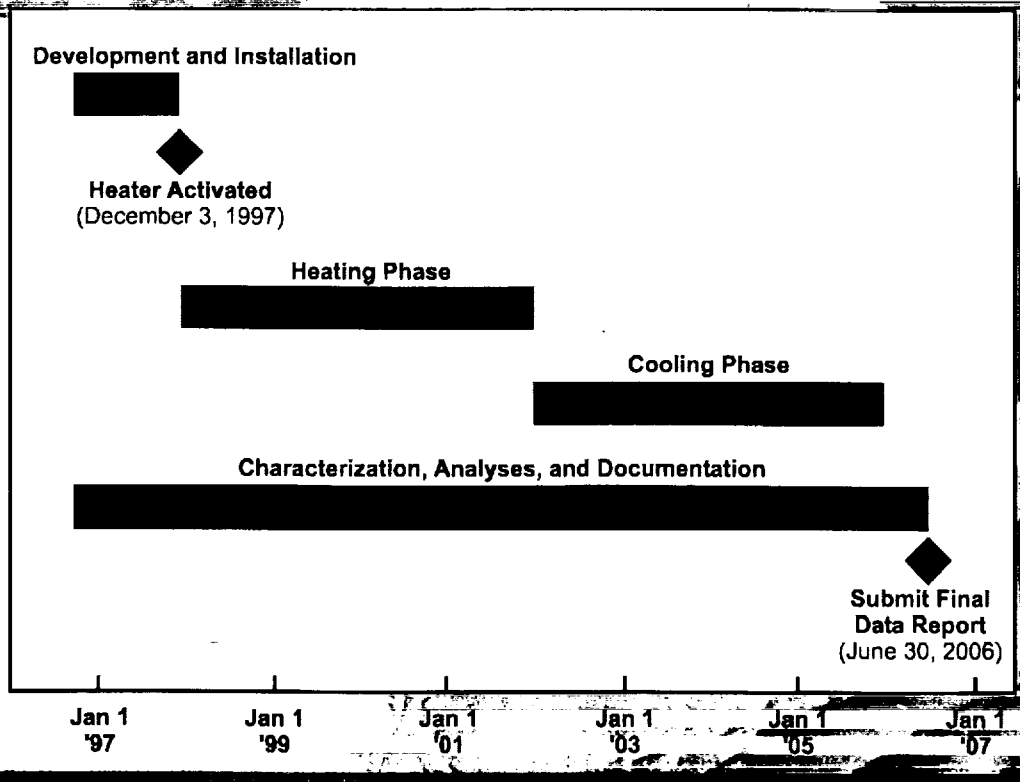
Description

OVERVIEW

The DST centers around a nearly 50-meter-long, 5-meter-diameter heated drift. Heat released from emplaced nuclear waste is simulated with 9 floor and 50 wing electrical heaters. These heaters have a combined maximum power output of 280 kW which should heat more than 200,000 cubic meters of rock over a four-year period. A four-year cooling phase will follow the heating phase. Less than three-hundredths of one percent of the local rock mass have been perforated with the 147 boreholes. These boreholes will house the wing heaters and approximately 4000 sensors. Sensors are strategically positioned to measure representative components of the thermal, mechanical, hydrological responses. A data collection system, consisting of 30,000 connections and 125 miles of wiring, records sensor measurements hourly. The heating phase of the DST began in early December 1997.

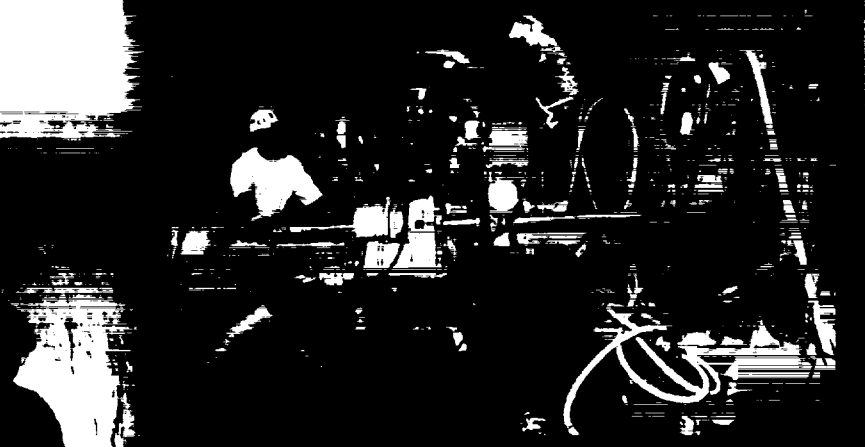


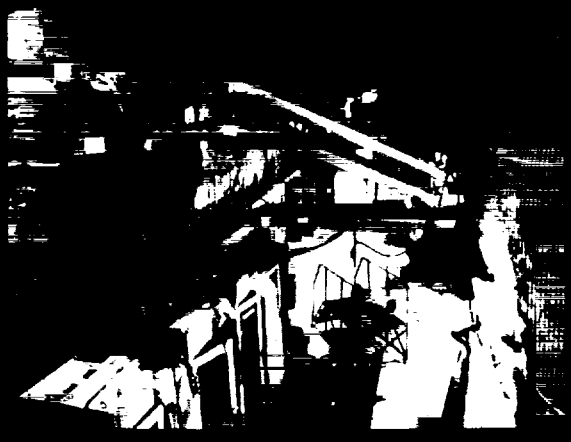
Schedule


Development and Installation
Heater Activated
(December 3, 1997)
Heating Phase
Cooling Phase
Characterization, Analyses, and Documentation
Submit Final
Data Report
(June 30, 2006)
Jan 1
'97
Jan 1
'99
Jan 1
'01
Jan 1
'03
Jan 1
'05
Jan 1
'07

Construction

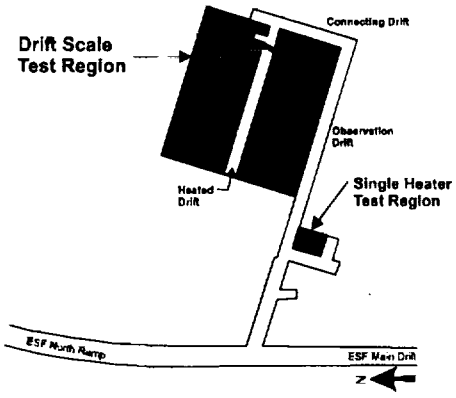
The construction of the Yucca Mountain Site Characterization Project included the Calico Hills repository rock layer included



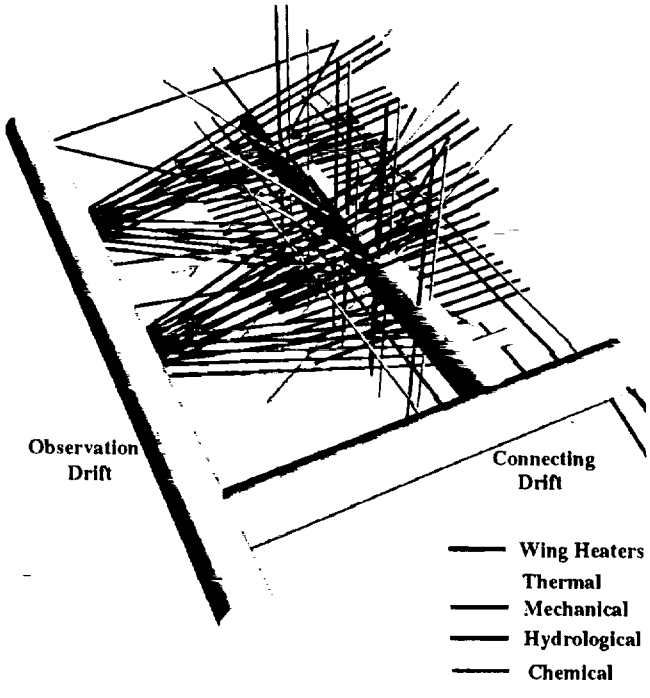


Construction

Thermal Test Facility



Borehole Perspective



of sensors

mechanical,

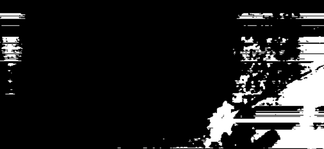
hydrological,

Thermal

Mechanical

Thermocouple

Multi-Point Extensometers

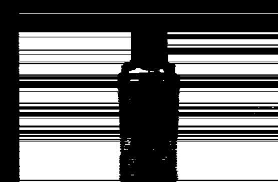


Strain Gauges

REKA

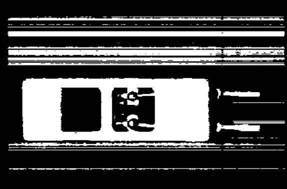
Resistance Temperature Detector

Plate Loading Test

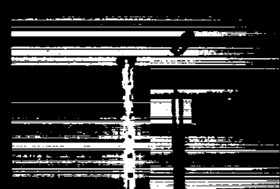


Acoustic Emission

Hydrological



Humidity Sensors

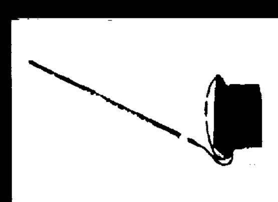


Pressure Transducers

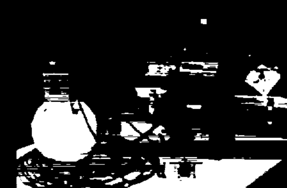
Air-Permeability

SEAMIST

Electrical Resistivity Tomography



Ground Penetrating Radar



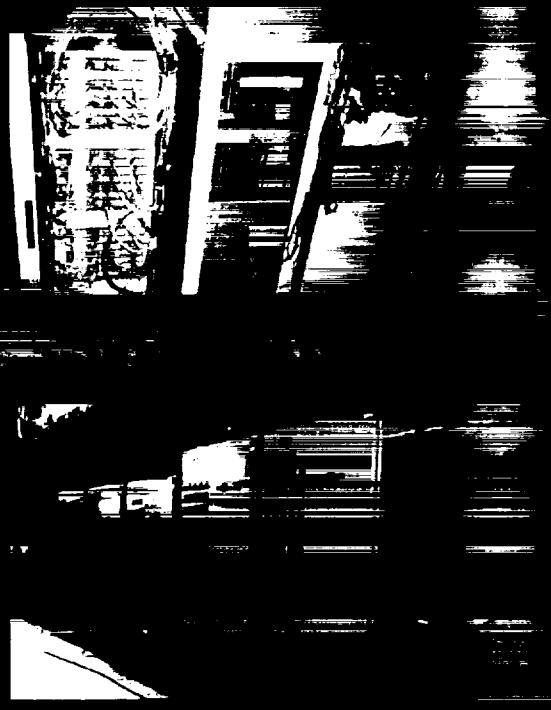
Neutron Logging

Chemistry Lab

Components

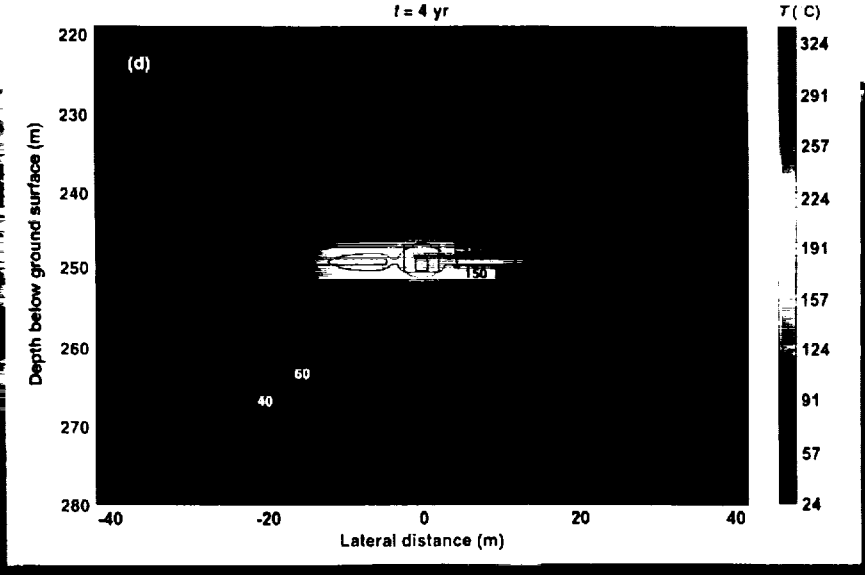
Electrical Heaters

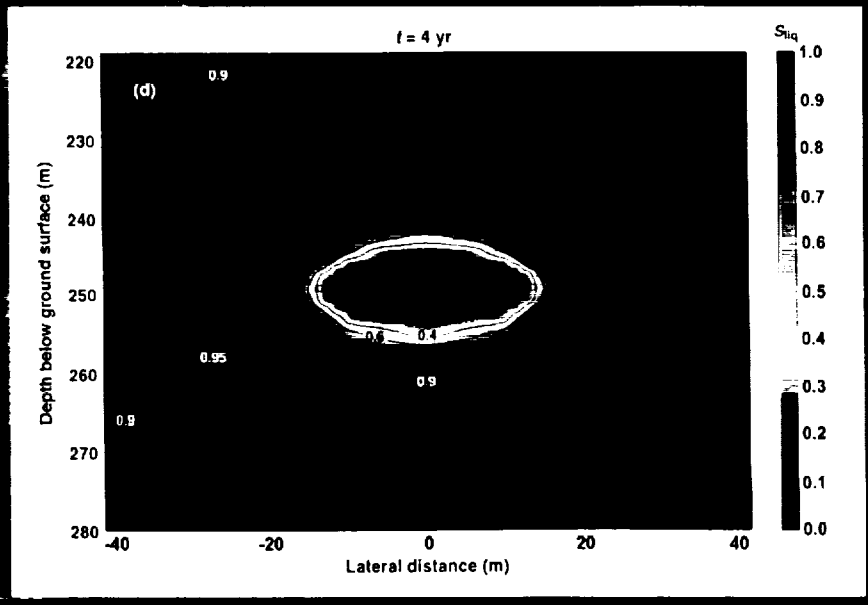
Data Collection System



Vertical Slice Through Midlength of the Heated Drift

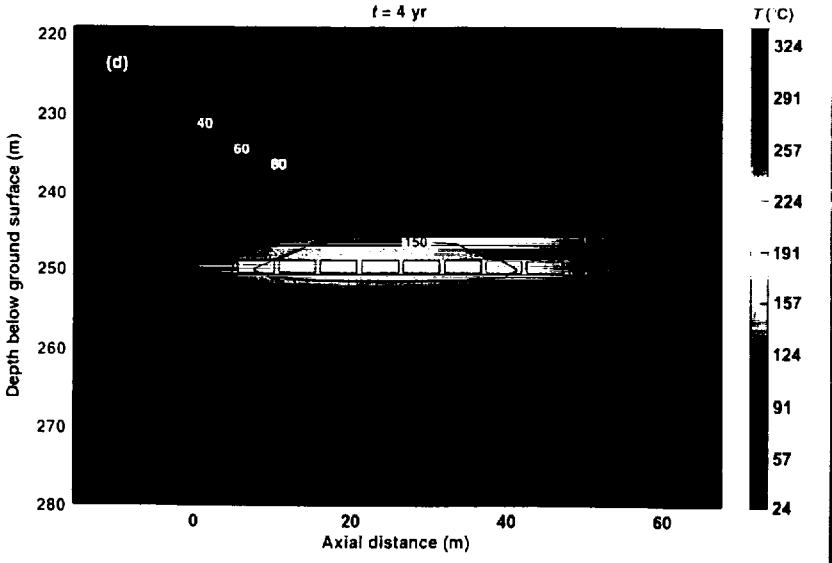
Predictions of the anticipated temperature distribution and water saturation after four years



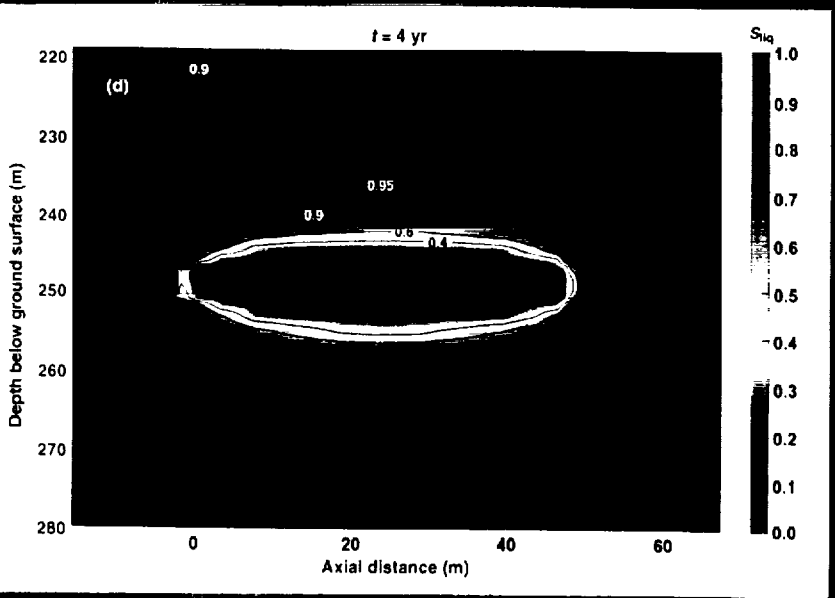


Predictions

Vertical Slice Through Longitudinal Axis of the Heated Drift



Thermal

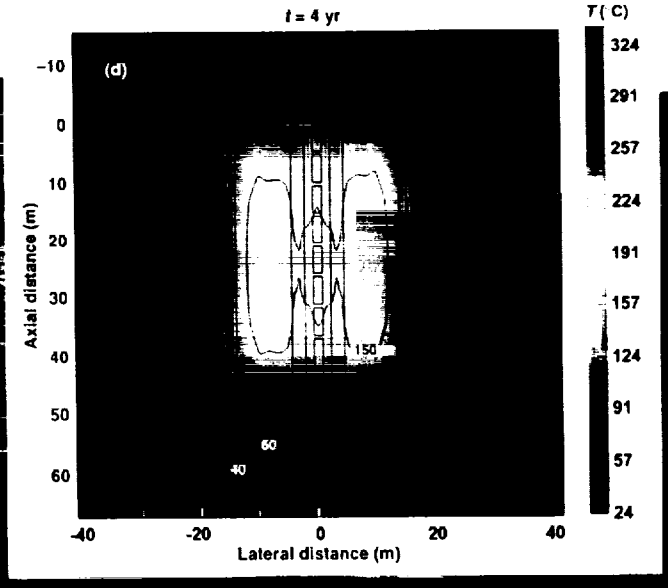


Hydrological

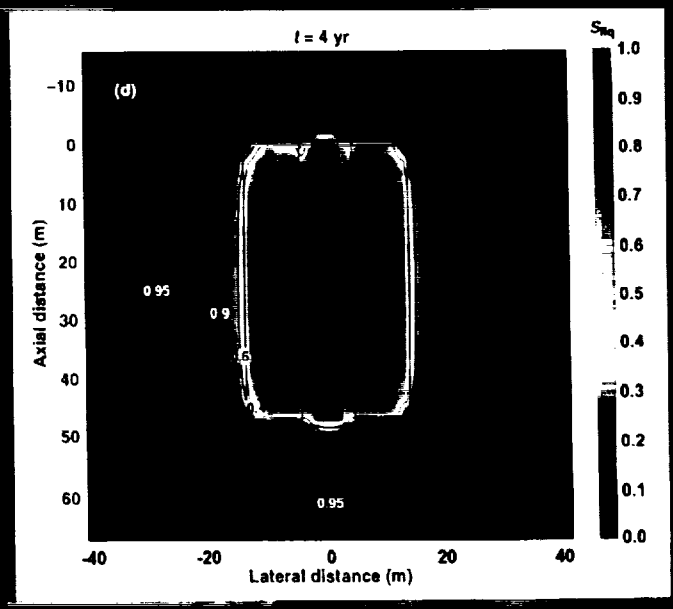
Predicted...

Horizontal Slice Through Midheight of the Heated Drift

Predicted ... the drift wall ... temperature distribution and water saturation after four years



...thermal...



...hydrological...

Scope

Drift Scale Test	Power (kW)	Duration (Years)	Processes (TMHC)
	280	8.0	TMHC

Other Thermal Tests

Yucca Mountain: Nevada (Single Heater Test)	6.0	1.5	TMHC
Yucca Mountain: Nevada (Large Block Test)	2.3	1.3	TMHC
G-Tunnel: Nevada (Small Diameter Experiments)	2.4	0.3	TMH
G-Tunnel: Nevada (Heated Block Experiment)	0.8	1.0	TM
G-Tunnel: Nevada (T-H Experiment)	3.3	1.0	TH
Climax: Nevada (Spent Fuel Test)	19.5	3.0	TM
Waste Isolation Pilot Plant: New Mexico (Room A)	57.3	4.0	TM
Waste Isolation Pilot Plant: New Mexico (Room B)	58.6	4.0	TM
Waste Isolation Pilot Plant: New Mexico (Room H)	81.6	9.0	TM
Underground Research Laboratory: Canada (Buffer Container Experiment)	1.2	2.5	TMH
Underground Research Laboratory: Canada (Heated Failure Tests)	10.0	0.5	TM
Underground Research Laboratory: Canada (Thermal Hydraulic Experiment)	1.0	1.0	TMH
Basalt Waste Isolation Plant: Washington (FS-1)	5.0	2.0	TM
Basalt Waste Isolation Plant: Washington (FS-2)	5.0	2.0	TM
STRIPA: Sweden (3 Experiments)	6.1	4.5	TM
Avery Island: Louisiana (Site A)	6.0	1.5	TM

Contributors