



8 October 1985

Contract No. NRC-02-85-002
Task Order No. 1

David Tiktinsky - SS623
U.S. Nuclear Regulatory Commission
Division of Waste Management
Washington, D.C. 20555

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Dear David:

Transmitted with this letter are trip reports for the two meetings:

- (1) NNWSI Review Meeting at Las Vegas, Nevada, on 16-18 September 1985; and
- (2) "International Symposium on Coupled Processes Affecting the Performance of a Nuclear Waste Repository" at Lawrence Berkeley Laboratories, 18-20 September 1985.

Please call me if you have any questions concerning these reports.

Sincerely,


Roger D. Hart
Program Manager

cc: J. Greeves, Engineering Branch
Office of the Director, NMSS
E. Wiggins, Division of Contracts
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ITASCA TRIP REPORT

DATE: 16-18 September 1985

LOCATION: NRC Field Office
Las Vegas, Nevada

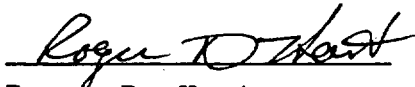
PURPOSE: NNWSI Review Meeting

ATTENDEES: P. Aamodt (Los Alamos National Laboratory)
S. Bhathacharya (Engineering International, Inc.)
J. Daemen (Itasca Consulting Group, Inc.)
D. Gupta (NRC Site Representative)
K. Hanna (U.S. Bureau of Mines)
D. Irby (U.S. Department of Energy - Nevada)
P. Prestholt (NRC Site Representative)
D. Tiktinsky (NRC Site Representative)

PREPARED BY: J. Daemen

Summary — The review meeting was attended at the request of NRC, WMEG. The main focus of the meeting was a broad-ranging overview of available documents describing tests which DOE-Nevada intends to perform at the Yucca Mountain Exploratory Shaft Test Facility. Although time limitations did not allow a detailed review of the extensive testing program, on which a wealth of information is available, the meeting provided an excellent opportunity for the NRC team to gain an overall perspective on the tests planned, on the rationale behind the tests, on the objectives to be accomplished by the tests, and the experimental implementation to be used.

An informal but wide-ranging and highly informative briefing on ES status and plans was given by Paul L. Aamodt, of Los Alamos National Laboratories, in the presence of Dennis H. Irby, of DOE - Nevada.


Roger D. Hart
Program Manager
8 October 1985

COST BREAKOUT

Time

Jaak Daemen	24 hours @ \$55.00/hr	\$ 1,320.00
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Actual Expenses

Travel	Airfare - Daemen	118.00
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Lodging	2 nights - Daemen (\$40.66/night)	81.32
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Meals	9/16 - Daemen	21.45
	9/17 - Daemen	21.00
	9/18 - Daemen	21.00

\$ 262.77

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ITASCA TRIP REPORT

DATES: 18 - 20 September 1985

LOCATION: Lawrence-Berkeley Laboratory
University of California
Berkeley, California

PURPOSE: International Symposium on Coupled Processes
Affecting the Performance of a Nuclear Waste
Repository

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ATTENDEE: R. Hart (a list of all attendees is included
as Attach. 1)

Summary — This symposium provided a forum for scientists and engineers to discuss their research and assess the state of the current knowledge of problems posed by the coupling of physical and chemical processes related to the performance of nuclear waste repositories in geologic formations. The symposium was sponsored by the Office of Civilian Waste Management of the U.S. Department of Energy, the Office of Nuclear Regulatory Research of the U.S. Nuclear Regulatory Commission, in co-operation with the OECD Nuclear Energy Agency and the Commission of the European Communities. A copy of the symposium program is attached (Attach. 2).

This symposium was an excellent time to gain background on the nuclear waste isolation programs outside the United States. Overviews were presented for French, Swedish, Canadian, Belgian, and Swiss programs. In addition, field testing plans were presented by all three of the U.S. programs (NNSWI, BWIP, and SRPO).

During the first day of the symposium, reviews of current field projects were presented by investigators both inside and outside the U.S. Noticeably missing from the presentations (particularly those given by DOE representatives for the three U.S. programs) was any reference to field investigations of coupled processes.

During the second day, overviews were presented on coupled processes with emphasis on geohydrology, geomechanics, and geochemistry. This was followed by general reviews of all contributed papers.

Of the presentations given, in my opinion, the most provocative question was raised by G. de Marsily of Ecoles des Mines, Paris. He posed the question "Will the waste disposal decision wait for the testing of effects of coupled processes?" In his opinion, there are three factors affecting this question:

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- (1) Some coupled processes are not minor—but synergistic.
- (2) Time is not running out, and an economic coupled test in the field can be performed.
- (3) Problems have occurred to warrant such testing—e.g., Rocky Mountain Arsenal.

On the final day of the symposium, the meeting was opened to general discussion and questions. I believe the real concerns were aired on this last day. A principal concern was the issue of model validation. Some of the questions raised were:

- Have models been validated for evaluating coupled processes?
- What aspects of the model should be validated? Have these aspects been weighted with respect to priority?
- At what threshold level should a model be considered to be validated?

On the final afternoon, a panel discussion was held by several recognized authorities in the areas of geohydrology, geomechanics, and geochemistry. A summary of the most thought-provoking comments raised by the panel members is given below.

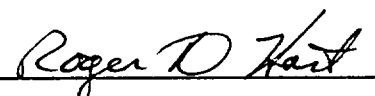
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|--------------------------|---|
| <u>C. Fairhurst</u> | Concern should be given to public credibility of results presented from coupled process evaluations. |
| <u>K. Kovari</u> | A concerted effort should be made to improve flow of information between all levels of the nuclear waste isolation program. Large-scale coupled testing should not be conducted until all available information is collected and evaluated. |
| <u>S. P. Newman</u> | Large-scale permeability tests should be carefully evaluated for effects of lower permeability induced by stress-concentration around the excavation. Flow rates based on flow into a large excavation may not indicate the actual permeability of the rock mass. |
| <u>P. A. Witherspoon</u> | The field experiment at WIPP, 20 years after the Project Salt Vault Experiment, should be carefully investigated for new information on coupled processes. |

A primary topic of the symposium, particularly emphasized on the last day, was whether or not large-scale coupled field tests are needed for coupled model validation. A case for large-scale tests was presented principally by LBL, led by Dr. Witherspoon. The primary concerns in these tests are the expense and long time-frame required. In my opinion, a strong enough case was not presented for the usefulness of the tests. It is not obvious that the tests, once completed, would provide significant new information on the effect of coupled processes. It appears to me that these scientists have not taken advantage of the numerical techniques presently available to assess the relevance of tests of various coupled processes. Numerical experiments could be performed to provide insight for designing large-scale tests and estimating the conditions for which effects of coupling processes may be important. Work in this regard was not presented and, apparently, has not been performed.

An important issue was raised by Professor Pigford, who suggested that coupled process assessment in a repository environment should be performed using a systems analysis approach. This analysis should provide a basis for incorporating all available information and for identifying areas where information is lacking. There is a specific need to show why a coupled process is important in the overall repository performance. Prof. Pigford cited, as an example, his disbelief that the permeability of basalt immediately around the emplaced waste is an important parameter in the evaluation of repository performance for BWIP. He does not believe that a near-field analysis of this parameter would be of concern in the evaluation process. Through a systems analysis procedure, parameters such as permeability should be assessed and weighed for importance based on available information.

It is my opinion that this was the most sensible point raised at the symposium because it specifically addressed the question of defining the importance of coupled processes. The general theme of the majority of the presentations centered on the work of the individual presenters, and attempts to put the work into a general perspective for dealing with coupled processes were not successful. I did not feel that, by the end of the symposium, any consensus was reached on an approach to evaluate coupled processes affecting the performance of a repository.

A final report on this symposium will be prepared by LBL.


Roger D. Hart
Program Manager
7 October 1985

rdh/ks
Attach.

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COST BREAKOUT

Labor

R. Hart	30 hrs @ \$44.96/hr	\$ 1,348.80
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Actual Expenses

Travel	Airfare (MSP - SFO)	390.00
	Taxi	20.00
Lodging	4 nights @ \$60.50/night	242.00
Meals	9/17	10.65
	9/18	13.50
	9/19	14.59
	9/20	17.00
Registration		75.00
		<hr/>
		\$ 782.74

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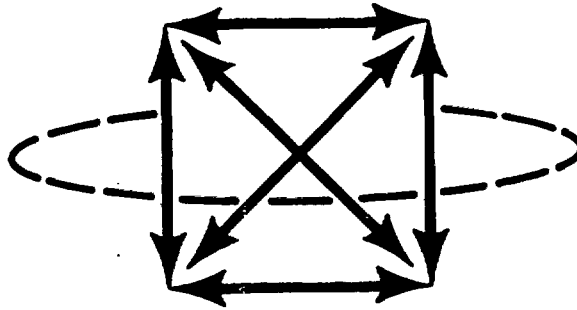
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**INTERNATIONAL SYMPOSIUM ON COUPLED
PROCESSES AFFECTING THE PERFORMANCE
OF A NUCLEAR WASTE REPOSITORY**



Lawrence Berkeley Laboratory

September 18-20, 1985

PROGRAM

Wednesday, September 18

9:00 am

**D.A. Shirley
Lawrence Berkeley
Laboratory**

Welcoming remarks

**F.A. Costanzi
U.S. Nuclear Regulatory
Commission**

**C. Klingsberg
U.S. Department of Energy**

**S.G. Carlyle
OECD Nuclear Energy Agency**

**P. Venet
Commission of the
European Communities**

**P.A. Witherspoon
Lawrence Berkeley
Laboratory**

**Introduction to Coupled
Processes in Nuclear
Waste Isolation**

(continued)

Wednesday, September 18

(continued)

Review of Current Field Projects

10:30 am

D.H. Dahlem
U.S. Department of Energy,
Richland

Field Investigations at the
Basalt Waste Isolation
Program

H.N. Kalia, W.J. Roberds,
and R.J. Byrne
ONWI and Golder Associates

Coupled Processes Addressed by
Underground Testing for the
Salt Repository Project

M.B. Blanchard, J.L. Younker,
C.D. Myers, and P.L. Aamodt
U.S. Department of Energy,
Las Vegas, SAI, and LANL

In Situ Testing from the
Exploratory Shaft at Yucca
Mountain, Nevada Test
Site

12:30 pm

Lunch

1:30 pm

A. Barbreau, S. Derlich,
B. Come, P. Peaudecerf,
E. Durand, and G. de Marsily
CEA, France, CEC, Belgium,
BRGM, and Ecoles des Mines

French Field Investigations
in the Underground Research
Laboratory at Fanay-Augeres

S.G. Carlyle and H.S. Carlsson
OECD NEA and KBS, Sweden

Recent Progress of the NEA Stripa
Project on In Situ Experiments in
Granite Associated with the Disposal
of Radioactive Wastes

K.W. Dormuth
AECL, Canada

An Overview of Some Geotechnical
Experiments within the Canadian
Nuclear Fuel Waste Management
Program

R.H. Heremans and L.H. Baetsle
ONDRAF-NIRAS
and SCK/CEN, Belgium

Geological Disposal in the
Belgian Context

C. McCombie, A.L. Nold,
and M. Thury
NAGRA, Switzerland

Overview of the
Swiss Program

6:00 pm

Symposium Banquet at
Lawrence Hall of Science

G.T. Seaborg
Lawrence Berkeley
Laboratory

The New Elements

(continued)

Thursday, September 19

**Coupled Thermomechanical-Hydrochemical Processes
for a Nuclear Waste Repository**

9:00 am	G. de Marsily Ecoles des Mines, Paris	Overview of Coupled Processes with Emphasis in Geohydrology
	N.G.W. Cook U.C. Berkeley	Coupled Processes in Geomechanics
	D. Langmuir Colorado School of Mines	Overview of Coupled Processes with Emphasis in Geochemistry
12:00 noon	Lunch	
1:00 pm	Film: Progress of Stripa Project	
1:30 pm	Review of Contributed Papers	
	Rapporteurs:	
	K. Pruess, Lawrence Berkeley Laboratory	
	B.R. Clark, Leighton and Associates	
	C.L. Carnahan, Lawrence Berkeley Laboratory	
3:30 - 5:00 pm	Poster Session for all Contributed Papers	

Friday, September 20

9:00 am	Discussion of Contributed Papers
	Discussion Leaders:
	K. Pruess, Lawrence Berkeley Laboratory
	B.R. Clark, Leighton and Associates
	C.L. Carnahan, Lawrence Berkeley Laboratory
12:00 noon	Lunch

(continued)

Friday, September 20 (continued)

1:00 - 5:00 pm

**Panel Discussion
on Coupled Processes
for a Nuclear Waste Repository**
(including short presentations by
the panel members)

Panel Members

C. Fairhurst
University of Minnesota
Minneapolis, Minnesota

S.P. Neuman
University of Arizona
Tucson, Arizona

R.O. Fournier
U.S. Geological Survey
Menlo Park, California

T.H. Pigford
University of California
Berkeley, California

K. Kovari
Federal Institute of
Technology
Zurich, Switzerland

P.A. Witherspoon
Lawrence Berkeley
Laboratory
Berkeley, California

I. Neretnieks
Royal Institute of
Technology
Stockholm, Sweden

Chin-Fu Tsang, Moderator
Lawrence Berkeley
Laboratory
Berkeley, California

5:00 pm

Chin-Fu Tsang
Lawrence Berkeley
Laboratory

Concluding Remarks