

Sandia National Laboratories

Albuquerque, New Mexico 87185

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August 15, 1984

'84 AUG 17 WM:RES

WM Record File

A1158

SNL

WM Project 10,11,16

Docket No. _____

PDR ✓

LPDR ✓ (B.N.S.)

Mr. Peter M. Ornstein
Geotechnical Branch
Division of Waste Management
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Distribution:

ORNSTEIN

HITTE

(Return to WM, 623-SS)

JOAN-TICKET

Dear Mr. Ornstein:

Enclosed is the monthly report on FIN A-1158, Repository Site
Description and Technology Transfer for July 1984.

Please feel free to contact me if you have any questions or
comments.

Sincerely,

Robert M. Cranwell

Robert M. Cranwell, Supervisor
Waste Management Systems
Division 6431

RMC:6431:jm

Enclosure

Copy to:

Office of the Director, NMSS

Attn: Program Support

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Division of Waste Management

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PDR WASTE

WM-10

PDR

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PROGRAM: Repository Site Definitions; FIN#: A-1158
Short-term Technical Assistance Tasks I, III

CONTRACTOR: Sandia National BUDGET PERIOD: 10/83 -
Laboratories 9/84

NMSS PROGRAM MANAGER: P. M. Ornstein BUDGET AMOUNT: \$364K

CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368

PRINCIPAL INVESTIGATORS: R. L. Hunter FTS PHONE: 846-6337
M. D. Siegel FTS PHONE: 846-5448

PROJECT OBJECTIVE

To develop reference repositories in media other than bedded salt (i.e., basalt, domed salt, welded tuff, and granite).

ACTIVITIES DURING JULY 1984

Repository Site Definition

Ch. 1, Regional Setting, is complete and is being typed. Chapters 2 and 3 have been interchanged for clarity. The new Ch. 2, Stratigraphy, is nearly complete and will be submitted for typing in early August. Ch. 3, Petrology and Mineralogy, is partially written and should be complete by the end of August. Ch. 4, Geologic Structure, is nearly complete and will be submitted for typing in early August.

M. D. Siegel participated in the NRC/NNWSI Geochemistry workshop at Los Alamos National Laboratory as a part of another NRC Task at Sandia. The data and information obtained at this meeting will be reviewed and incorporated into Chapter 5. No samples of water have been obtained from unsaturated tuffs at Yucca Mountain. Geochemists at Los Alamos are relying on extrapolations of data obtained under saturated conditions in the laboratory and field to understand transport in the unsaturated zone. They have also suggested that processes that control the geochemistry of the rock-water system at Rainier Mesa provide good analogs for transport at Yucca Mountain. No site-specific data for unsaturated tuff have been collected. Data for saturated tuff (sorption ratios, ground-water compositions, calculations of solubilities) are currently being obtained. It has been suggested to P. O. Ornstein that Ch. 5 of the RSD contain; 1) data for saturated tuff collected since publication of NUREG/CR-2937, 2) a discussion of models used to describe solute transport in the unsaturated zone, and 3) discussion of assumptions and uncertainties in the above models

(including uncertainties involved in extrapolating data for saturated conditions to unsaturated conditions).

The literature search on transport and adsorption of contaminants in unsaturated porous media, also a part of Ch. 5, is almost complete. Most of the references treat problems associated with the shallow burial of low-level radioactive waste in arid or semi-arid soils. However, many of the fundamental principles governing transport and adsorption in this type of porous media should apply to unsaturated media in general.

The literature search for Ch. 6, Hydrology, continued during July. We have found NTS data on matrix porosity and degree of saturation in both the saturated and unsaturated zones, and on matrix and fracture permeability. We have also found some characteristic curves for intact and crushed Bandelier Tuff, a tuff found near Los Alamos, NM. We have also found some neutron probe data which was obtained from wells at NTS. These data provide an indication of the moisture content of rocks, but because of several factors (hole diameter, drilling muds, and possibly casing) the utility of this data for moisture content determination is suspect. We have not found any data on the matrix potential of water in rocks in the unsaturated zone at NTS. Because the investigation of the unsaturated zone at NTS is a recent development, it is unlikely that any matrix potential data will be found. During August, we plan to compile the on-hand data into tables and a rough draft of the hydrologic properties of NTS tuffs. If any new data becomes available during August, it will be incorporated into the rough draft.

A draft of Ch. 7, Thermomechanical Properties, is in preparation. Tables are being prepared for Density, Porosity, Young's Modulus, Poisson's Ratio, Strength, Thermal Conductivity, Specific Heat Capacity, and Coefficient of Thermal Expansion of Tuff.

Short-Term Technical Assistance

No activity.

PROGRAM: Technology Transfer

FIN#: A-1158
Task II

CONTRACTOR: Sandia National
Laboratories

BUDGET PERIOD: 10/83 -
9/84

NMSS PROGRAM MANAGER: P. M. Ornstein BUDGET AMOUNT: \$315K

CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368

PRINCIPAL INVESTIGATORS: R. L. Hunter FTS PHONE: 846-6337
M. D. Siegel FTS PHONE: 846-5448

PROJECT OBJECTIVE

To insure through technical support, problem definition, and documentation the timely, thorough, and efficient transfer of the information, analysis techniques, and analysis tools developed for the U.S. Nuclear Regulatory Commission (NRC) by the methodology program.

ACTIVITIES DURING JULY 1984

Revision of the SWIFT II Self-Teaching Curriculum

The review comments from Paul Davis, Evaristo Bonano, Gene Runkle and an outside Technical Editor were incorporated into a final draft of the report entitled "SWIFT II Self-Teaching Curriculum: Illustrative Problems for the Sandia Waste-Isolation Flow and Transport Model for Fractured Media." The report was sent to NRC on August 7, 1984 for any final review comments that may be appropriate since the report has been substantially revised. A simultaneous review by Sandia management will be initiated with the final camera-ready copy of the report expected to be available in September. The date of the final copy is dependent upon the extent of the NRC and/or SNLA management review comments that must be addressed and incorporated.

Self-Contained Document for TOUGH

A meeting was held on July 23, 1984 with Karsten Pruess at Lawrence Berkeley Laboratory to discuss the development of the self-contained document for the TOUGH computer code. Peter Ornstein, NRC, attended the meeting to provide comment on the arrangements for this document. The following issues were discussed and resolved:

1. The final version of TOUGH to be documented will be similar to the code described in the seminar presented at the NRC in August, 1983. Additional capabilities include a) non-linear material properties, b) a scaling factor to adjust the units to prevent numerical limits (this option saves factors of 5 in CPU time with 3-D problems), c) an extended library of capillary functions that may be selected by the user.

The vapor-pressure-lowering capability developed by K. Pruess will not be included in this final version of the code since this modeling function has not shown significant effects on the vapor pressure and the input parameters would need to be drastically revised and redefined to incorporate the vapor-pressure lowering.

2. The MA28 numerical solver from Harwell is a proprietary software package. Harwell has agreed to accept a one time fee of \$3000 for including MA28 in the TOUGH code. After the payment of this fee, Argonne will be authorized to distribute the entire code. Of course, the subroutine will be internally documented to warn users not to remove the MA28 solver for use in other programs. Lawrence Berkeley Laboratory will pay the \$3000 fee from their operating funds with no change in the cost of the contract to develop the self-contained document.
3. A preliminary list of sample problems to illustrate the capabilities of the TOUGH computer code was developed and will include:

Problem 1: 1-D infiltration problem

Problem 2: 2-D infiltration problem

Problem 3: Flow to geothermal well

Problem 4: Waste package benchmarking with other computer codes

Problem 5: Waste package with fracture

Problem 6: 2-D infiltration and heat problem using stratigraphy from a real site.

Problem 7: 3-D Problem infiltration and heat problem

The first three problems were developed and executed for the seminar presented last August, 1983. Therefore, these problems will only require some adjustment in the presentation of results and plotting techniques. The last four will require data acquisition, set up for the TOUGH computer code, execution, and presentation of results.

The contractual arrangements with K. Pruess, LBL, detailing the tasks to be performed with a ceiling price of \$80,000 will be initiated in August, 1984. Actual work on the contract is expected to be started in October, 1984, when K. Pruess returns from a work assignment in Europe.

Discussion of FY 84 Funding

In response to a request by P. O. Ornstein, we have prepared a table showing the funding and projected expenditures for FIN A-1158 for FY 84 (see below). The table is largely self-explanatory.

The carry over into FY 84 was \$570K. An additional \$110K has been received, as agreed upon by M. J. Wise and N. R. Ortiz. These funds were to cover the costs of additional work not included in the original \$570K. The additional work was largely complete by March '84; for example, an extra \$19K in Short Term TA. The additional funds are reflected in new totals under "III. Funding" on each estimate page.

The updated milestone chart requested by P. O. Ornstein will be included in the monthly report for August.

FUNDING SNAPSHOT: 0976 (FIN A-1158)

	84	85	
RSD + Short-Term TA			
Administrative (cost of R. L. Hunter plus maintaining RSD capability Sept. to Mar.)	\$ 45K		'84 Total \$364K
RSD (Since March)	\$240K	(new) \$35K	
STTA (over run due to NRC requests)	\$ 79K		
<hr/>			
Tech Trans.	Scenario Development	\$70K----carry over	'84 Total \$315K
	TOUGH	\$100K---carry over	
	Other	\$145K	

Note: Additional \$110K agreed on by M. J. Wise and N. R. Ortiz came in April. It was not immediately reflected in the monthly reports because personnel changes led to some confusion about the funding level.

'84 0976 Total
\$679K
(\$170K will be
carried over)

A-1158

TOTAL FOR 0976.010 and 0976.020

July 1984

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Month	Current Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.2	19.2
II. Direct Loaded Labor Costs	1.0	192.0
Materials and Services	1.0	16.0
ADP Support (computer)	0.0	3.0
Subcontracts	29.0	250.0
Travel	0.0	5.0
Other	0.0	2.0
TOTAL COSTS	31.0	468.0

Other = rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY84 Projected Funding Level	FY84 Funds Received to Date	FY84 Funding Balance Needed
570K	679K	679K	None

A-1158, Task II
 0976.010
 July 1984

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
 NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Month	Current Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.0	3.6
II. Direct Loaded Labor Costs	0.0	36.0
Materials and Services	0.0	14.0
ADP Support (computer)	0.0	0.0
Subcontracts*	9.0	61.0
Travel	0.0	1.0
Other	<u>0.0</u>	<u>1.0</u>
TOTAL COSTS	9.0	113.0

Other = rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY84 Projected Funding Level	FY84 Funds Received to Date	FY84 Funding Balance Needed
245K	315K	315K	None

*Subcontractor charges from Raytheon and Geotrans

A-1158, Tasks I and III
 0976.020
 July 1984

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO
 NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Month	Current Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.2	15.6
II. Direct Loaded Labor Costs	1.0	156.0
Materials and Services	1.0	2.0
ADP Support (computer)	0.0	3.0
Subcontracts*	20.0**	189.0
Travel	0.0	4.0
Other	0.0	1.0
TOTAL COSTS	22.0	355.0

Other = rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY84 Projected Funding Level	FY84 Funds Received to Date	FY84 Funding Balance Needed
325K	364K	364K	None

*Subcontractor charges from OAO, Raytheon, SAI, Remote Sensing and
 Geotrans

**A credit on the subcontract charges is pending. This will bring
 down the total costs on this project to an amount consistent with
 the total funding and the work that has been completed.