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Sandia National Laboratories

Albuquerque, New Mexico 87185

March 12, 1985

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WM-RES  
WM Record File  
A1158  
JNL

WM Project 10, 11, 16  
Docket No.

SRV ✓  
LWR ✓ (B, U, S)

Dr. Richard Codell  
Geotechnical Branch  
Division of Waste Management  
U.S. Nuclear Regulatory Commission  
7915 Eastern Avenue  
Silver Spring, MD 20910

Distribution:  
Codell  
Still  
(Return to: WMA, 20910)  
Joan-ticket  
af

Dear Dr. Codell:

Enclosed is the monthly report on FIN A-1158, Repository Site Description and Technology Transfer for February 1985.

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

Sincerely,

Robert M. Cranwell, Supervisor  
Waste Management Systems  
Division 6431

RMC:6431:jm

Enclosure

Copy to:

Office of the Director, NMSS  
Attn: Program Support  
Robert Browning, Director  
Division of Waste Management  
Malcolm R. Knapp  
Division of Waste Management  
Enrico Conti, Branch Chief  
Health Siting & Waste Management Division  
John Randall  
Division of Radiation Programs and  
Earth Sciences  
6430 N. R. Ortiz  
6431 R. M. Cranwell  
6431 R. L. Hunter  
6431 M. D. Siegel

8504090472 850312  
PDR WMRES EXISANL  
A-1158 PDR

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

CONTRACTOR: Sandia National LABORATORIES BUDGET PERIOD: 10/84 -  
9/85

NMSS PROGRAM MANAGER: R. B. Codell BUDGET AMOUNT: \$90K  
(Tentative)

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 FEBRUARY 1985

##### Repository Site Definition

No activity. We are waiting for NRC comments on the RSD for unsaturated tuff.

Most of the subcontractor charges of 28K on this contract will be credited at a later date. A request for reclassification of funds for this project has been made but is requiring some time to get through the Sandia budgeting system.

PROGRAM: Technology Transfer FIN#: A-1158  
Task II

CONTRACTOR: Sandia National Laboratories BUDGET PERIOD: 10/84 -  
9/85

NMSS PROGRAM MANAGER: R. Codell BUDGET AMOUNT: \$277K  
(Tentative)

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 FEBRUARY 1985

We have started work on modifying and documenting the TOUGH code. Finalizing the code involves many small modifications and a few bigger ones. The most important accomplishment in February was implementation and successful testing of a scaling procedure for the Jacobian matrix. We also changed data statements and file assignments for improved compatibility with IBM machines, as originally requested by Peter Ornstein of NRC. Review of sample problems was initiated.

A request was made by Lawrence Berkeley Laboratory (LBL) to extend the ending date of Karsten Pruess's contract to 10/31/85. This request was made due to the fact that they (LBL) were unable to authorize Dr. Pruess to begin work until some internal approvals were secured. A copy of the request is attached. We have initiated a change order requesting extension of the period of performance to 10/31/85. If you have any problems with this, please let us know.

19 1985



# Lawrence Berkeley Laboratory

1 Cyclotron Road Berkeley, California 94720

(415) 486-4000 • FTS 451-4000

February 5, 1985

Mr. J. J. Mace  
Sandia National Laboratory  
Purchasing Organization, 3745  
Albuquerque, New Mexico 87185

Subject: MPO 21-5303

Dear Mr. Mace:

Enclosed is an acknowledgement copy of the subject order. Because we were unable to authorize Dr. Pruess to begin work until some internal approvals were secured, I would like to request an amendment:

- 1) Correct the Principal Investigator's name to Karsten Pruess
- 2) Extend ending date to 10/31/85
- 3) Change deliverable schedule as per attached

If you have any questions, my FTS number is 451-4133. Thank you.

Sincerely,

Bonnie L. Neeley  
Contract and Grant  
Administrator

cc: K. Pruess  
H. Todd

*Please note date changes if you agree send in change order requesting extension of period of performance & change in delivery schedule*

*D. M. Rowwell 6431 66337*



**Sandia National Laboratories**

Purchasing Organization 3745  
P. O. Box 5800  
Albuquerque, NM 87185

DOCUMENT NUMBER 21-5303

Document Date DEC 11 1984

This is an Order between Sandia and the Contractor noted below.

**CONTRACTOR:**  
LAWRENCE BERKELEY LABORATORY  
PO BOX 528  
BERKELEY, CA 94701

Rec'd CFO/BPP Office  
JAN 7 1985

This Order includes the terms on this Signature Page and Section I bearing the above document date DEC 11 1984 and no other terms except as expressly agreed to in writing.

**SHIP TO:**  
Sandia National Laboratories  
1515 Eubank Blvd S.E.  
Bldg 894, for 21-5303  
Albuquerque, NM 87123

**INVOICE IN DUPLICATE TO:**  
Sandia National Laboratories  
Supplier Acct. Div., 0155 for 21-5303  
P. O. Box 5800  
Albuquerque, NM 87185

**SHIPPING INSTRUCTIONS:** Enclose packing memorandum with each shipment.

**SHIP VIA:** Contractor's Choice and Expense.

**F.O.B.:** Destination.

**PAYMENT TERMS:** Net 30 Days.

*456 3/8*

This Order is effective on the above document date. Please sign the copy of this Signature Page and return it to the Sandia Contracting Representative.

J. J. Mace 12/11/84  
SANDIA CONTRACTING REPRESENTATIVE  
J. J. Mace

Bonnie L. Neeley  
AUTHORIZED CONTRACTOR REPRESENTATIVE  
Name & Title Contract & Grant Administrator

(505) 844-2209 TWX 910-989-1600

Date 2/5/84 Phone FTS 451-4133

CONTRACTOR I



BL

**SECTION I**

**ICG: PREAMBLE - 114-KIC (4-34)**

This is an Integrated Contractor Order by Sandia Laboratories on the Contractor pursuant to their contracts with the U. S. Department of Energy and the Working Agreement with Sandia, if any.

Government property may be furnished by Sandia for the performance of this Order. Such property will be listed on the Sandia Shippers which are incorporated into and made a part of this Order. At the completion or termination of this Order, Contractor shall forward a listing of any remaining property to the Sandia Contracting Representative for disposition instructions.

**STATEMENT OF WORK**

This effort involves documentation of the Transport of Unsaturated Groundwater and Heat (TOUGH) computer code. The code is being developed at Lawrence Berkeley Laboratory (LBL) and is being considered by the U.S. Nuclear Regulatory Commission (NRC) and SNLA as a possible code for use in performance assessment of high-level radioactive waste repositories in unsaturated media.

**TASK 1:** Finalize a version of the TOUGH computer code and document. This version should be similar to the code described in the seminar presented to the NRC in August, 1983. Additional capabilities should include: a) non-linear material properties, b) a scaling factor to adjust the units, and c) an extended library of capillary functions.

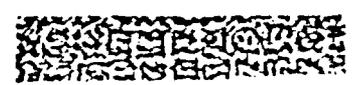
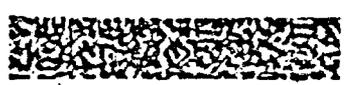
**Time Schedule**

<i>Summer 1985</i>	<i>Jan 85</i>	December 1984 - February 1985	-- Finalize version
<i>Jan 1985</i>	<i>May</i>	February 1984 - March 1985	-- Rework final version to be consistent with sample problems developed

**TASK 2:** Assist Argonne Software Center in resolving the proprietary claim to the MA28 Package contained in the TOUGH code. This package is in the Harwell Subroutine Library.

**Time Schedule**

<i>February 1985</i>	<i>May 1985</i>	December 1984 - March 1984
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TASK 3: Develop sample problems for purpose of illustrating capabilities of TOUGH. Provide a variety of problems from simple to complex. Consider problems which are meaningful and relevant to the intended use of the code. Include problems to demonstrate the following: 1) 1-D infiltration problem, 2) 2-D infiltration problem, 3) flow to a geothermal well, 4) radial heat flow problem around a canister for purposes of demonstrating code capability for two-component, two-phase fluid and heat flow, 5) similar to problem 4 only for fractured media, 6) demonstration of code capability for two-component, two-phase fluid and heat flow using 2-D stratigraphy from a real site, and 7) 3-D infiltration and heat problem, if feasible.

Time Schedule

- December 1985* - *June*  
December 1984 - April 1985 -- Complete first four problems
- Detailed approach for problems 5 - 7.
- May*  
March 15, 1985 -- Status meeting to discuss problems 5 - 7.

TASK 4: Draft a self-contained document for the TOUGH code. Include the following topics: 1) physical effects modeled by TOUGH, 2) governing equations, 3) mathematical and numerical methods, 4) architecture of code, 5) preparation of input data, 6) output of code, 7) description of sample problems.

All work performed under this task shall meet the standards of NUREG-0856.

Time Schedule

- August* *October*  
June 1985 - August 1985

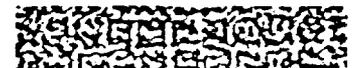
TASK 5: Revise draft self-contained document incorporating and addressing comments from SNLA and NRC. Prepare final camera-ready document for publication by NRC.

Time Schedule

- August* *October*  
June-1985 - August 1985

Reporting Schedule:

Monthly progress reports will be provided to SNLA by the 1st day of the following month. These will be provided to the project leader.



A-1158, Tasks I and III  
 0976.020  
 February 1985

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	0.4
II. Direct Loaded Labor Costs	0.0	4.0
Materials and Services	0.0	0.0
ADP Support (computer)	0.0	0.0
Subcontracts	28.0	121.0
Travel	0.0	0.0
Other	-1.0	0.0
<b>TOTAL COSTS</b>	<b>27.0</b>	<b>125.0</b>

Other = rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY85 Projected Funding Level	FY85 Funds Received to Date	FY85 Funding Balance Needed
None	90K	None	90K

\*Additional credit is still due to this case number. These corrections will be made in forthcoming monthlies.

A-1158, Task II  
 0976.010  
 February 1985

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	1.0
II. Direct Loaded Labor Costs	2.0	9.0
Materials and Services	0.0	0.0
ADP Support (computer)	0.0	0.0
Subcontracts	29.0*	41.0
Travel	0.0	0.0
Other	<u>0.0</u>	<u>0.0</u>
TOTAL COSTS	31.0	50.0

Other = rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY85 Projected Funding Level	FY85 Funds Received to Date	FY85 Funding Balance Needed
172K	277K	None	105K

\*This includes charges for Karsten Pruess's contract and a surcharge for on-site contractors.

A-1158

TOTAL FOR 0976.010 and 0976.020

FEBRUARY 1985

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	1.4
II. Direct Loaded Labor Costs	2.0	13.0
Materials and Services	0.0	0.0
ADP Support (computer)	0.0	0.0
Subcontracts	57.0	162.0
Travel	0.0	0.0
Other	<u>-1.0</u>	<u>0.0</u>
TOTAL COSTS	58.0	175.0

Other = rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY85 Projected Funding Level	FY85 Funds Received to Date	FY85 Funding Balance Needed
172K	367K	None	195K