Sandia National Laboratories
Albuquerque, New Mexico 87185

August 25, 1980

Mr. Lawrence W. Rossbach
High Level Waste Technical
Development Branch
US Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Springs, MD 20555

Dear Mr. Rossbach:

Enclosed are copies of the summary of activities during July for the Reference Repository and Technology Transfer Program. I am also including a copy of the quarterly report for the Reference Repository Definition which describes the granite and shale sites.

Sincerely,

Nestor R. Ortiz

Nestor R. Ortiz, Supervisor
Fuel Cycle Risk Analysis
Division 4413

NRO:ls

Enclosures

PROGRAM: Reference Repository Definition and Technology Transfer — FIN #: A1158-9

CONTRACTOR: Sandia National Laboratories — BUDGET PERIOD: 10/79-9/80

NMSS PROGRAM MANAGER: L. W. Rossbach — BUDGET AMOUNT: $443,900

CONTRACTOR PROGRAM MANAGER: N. R. Ortiz — FTS PHONE: 844-5644

PRINCIPAL INVESTIGATORS: N. C. Finley — FTS PHONE: 844-6059
L. T. Ritchie — 844-6100
N. R. Ortiz — 844-5644

PROGRAM OBJECTIVES:

The first objective is 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 Nuclear Regulatory Commission (NRC) by the methodology program. The second objective is to develop reference repositories in media other than bedded salt (i.e., basalt, granite, and domed salt).

ACTIVITIES DURING JUNE 1980:

Reference Repository Definition

Efforts during the past month have been concentrated on synthesis of available data and collection of additional data for the three geologic systems targeted as possible models for the shale reference repository system (RRS).

For the Illinois Basin, a preliminary NW-SE cross section 100 miles in length has been drawn through the targeted area on the western flank of the basin. The cross section is oriented parallel to the structural dip, and available data suggest it is also parallel to the direction of groundwater movement. Fourteen lithologic units are shown in the section. In the plane of the section the candidate host rock (the New Albany Shale Group) is penetrated by five cores that have been analyzed in detail by researchers working on the Department of Energy's Eastern Gas Shales Program.

A preliminary 250 mile long E-W cross section through the targeted portion of the Williston Basin shows the distribution of fourteen major lithologic units. The cross section is oriented parallel to the direction of groundwater flow and generally parallel to the regional geologic structure. Maps of hydraulic head distribution in the major aquifer system within the region and of geologic structure and thickness of several important units have been obtained.

A fence diagram (a three dimensional cross section) has been drawn to show the distribution of eleven lithologic units in a portion of the western Canada sedimentary basin. In order to accurately depict

hydraulic head and hydraulic conductivity distributions in the system, basic data from 590 drill-stem tests and 35 aquifer tests are being analyzed.

Technology Transfer

1. Sample problems 8, 9 and 10 of the Sandia Waste Isolation Flow Transport (SWIFT) code were completed and documented. Problem 8 deals with two dimensional near-field heat transport from a bedded-salt reference repository. Problem 9 includes the effect of thermal convection for a U-tube breachment of a bedded salt reference depository. Problem 10 calculates the two dimensional flow and brine transport for a reference bedded-salt depository site. The set of ten problems covers SWIFT's four main areas which are groundwater, brine, heat and radionuclides transport.

2. The sample problem set of the Network Flow Transport (NWFT) model was completed. It includes the following sample problems:

   (1) Comparisons of the reference site flow system as modelled by SWIFT and NWFT

      (1a) Comparison of flow system for the reference site calculated using SWIFT and NWFT.

      (1b) Improvement of the comparison between Darcy velocities predicted by SWIFT and NWFT.

   (2) Simulation of the disruptive effects of a drill hole through the depository.

      (2a) Simulation of a borehole connecting the upper and lower aquifers through the depository.

      (2b) Introduction of a blockage to flow in the lower sandstone down-dip from the depository.

   (3) Simulation of a large disruption through the depository.

   (4) Simulation of a U-tube scenario

   (5) Transport of three-isotope decay chains over the paths caused by the disruptions of Problem 2.

   This problem set will be discussed in the next workshop at the NRC in Washington, D.C.

3. A meeting was held with the Department of Hydrology and Water Resources of the University of Arizona (Professors E. S. Simpson and S. P. Neuman) and several staff members from Sandia. The

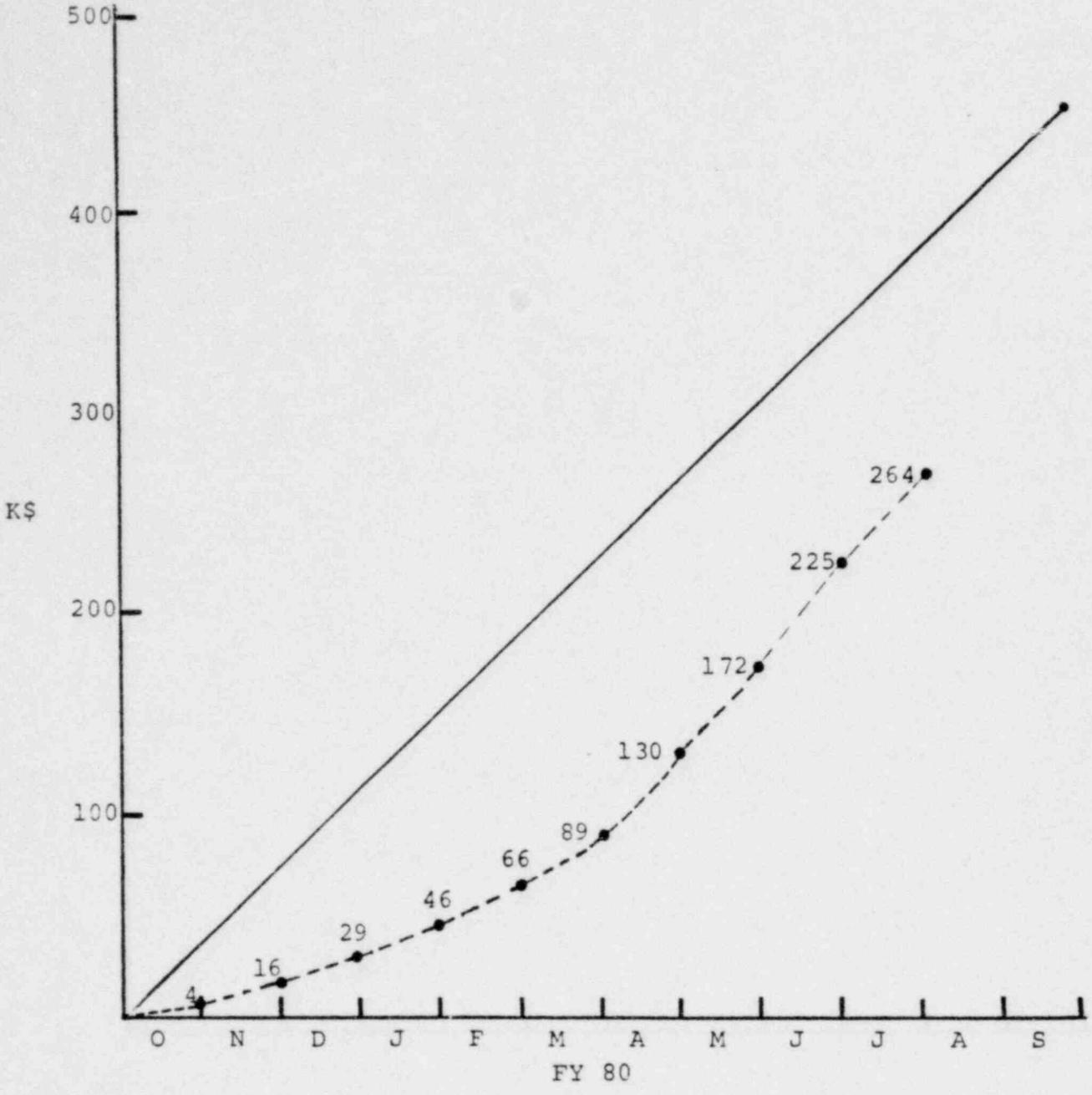
purpose of the meeting was to exchange technical information on projects related to nuclear waste management. The University of Arizona is providing support to NRC in the area of Nuclear Waste Management. Professors at the University of Arizona showed great interest in the new numerical technique developed at Sandia to simulate radionuclide transport through groundwater flow. The new technique is called "Distributed Velocity Method" (DVM). It allows the selection of large grid coordinates (Δx) and large time intervals (Δt) without causing oscillation or large numerical dispersion in solving the radionuclide transport problem. Previous numerical techniques on existing computer codes will operate over a limited range of Δx and Δt values. The University of Arizona was also very interested in learning the Latin Hypercube Sampling technique being used in our risk assessment analysis. They are using the Monte Carlo technique which is more expensive and requires larger number of computer runs.

Sandia is interested in the field tests that the University of Arizona will perform to obtain hydrologic and geologic data. These data could be very useful for the operation and validation of our computer models on groundwater flow. We are also interested in their project on modeling groundwater flow through fracture zones. Arrangements were made to continue the exchange of technical information.

MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:

None.

PROGRAM: REFERENCE REPOSITORY DEFINITION
AND TECHNOLOGY TRANSFER



RESOURCES EXPENDED:

	JULY 1980	CUMULATIVE
DOLLARS (K)	39	264 (50%)
MAN MONTHS	6	43