

MEMORANDUM FOR: Philip S. Altomare, HLSE

JUL 07 1988

FROM: Seth Coplan, HLOB

SUBJECT: TECHNICAL ASSISTANCE NEEDS AT CNWRA IN PERFORMANCE ASSESSMENT

The attached work description presents the needs of the Compliance Demonstration Section in the area of performance assessment of high-level waste repositories. All work in the area of performance assessment will be phased out of Sandia National Laboratories. While much of the work now being done by Sandia will be acquired by the NRC staff, a large share of it needs to be transferred to the Center. Our request addresses two main needs; (1) transfer of technology from Sandia National Laboratories to the CNWRA, and (2) the growth in the capability of the CNWRA staff to understand and use the Sandia methodology and further develop technology to carry out performance assessments.

Please include this work description in the package being sent to the Center.

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Seth Coplan, Leader,
Compliance Demonstration Section
Operations Branch, Division of High-Level
Waste Management

Attachment:
Work description for
performance assessment tasks

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OFFICE: NMSS

PROJECT TITLE: TECHNICAL ASSISTANCE IN PERFORMANCE ASSESSMENT

CONTRACTOR: CNWRA

ESTIMATED PERIOD OF PERFORMANCE: 9/30/88 - 9/30/90

PROJECT MANAGER: TBD

| FY BUDGET (\$K) | FY88 | FY89 | FY90 |
|-----------------|------|------|------|
| PRIOR | 0 | 0 | 0 |
| OPERATING | | | |
| FOLLOW ON | | | |

SCOPE OF WORK

The capability of the NRC to carry out performance assessments of high-level waste repositories is being developed primarily by contract personnel at Sandia National Laboratory (SNL). The NRC has determined that the SNL effort should be phased out and transferred to the Center. The task consists of two parts. First, the existing technology must be transferred from SNL to the Center. Secondly, the staff of the Center must become capable of understanding and furthering the development of the technology necessary to carry out the performance assessments. The Center staff will be expected to continue the development of performance assessment methodologies as the SNL team is phased out, presumably at the end of FY89. Short-term and long-term tasks are identified below.

Short-term Tasks

- 1.1 The Center shall develop an overall management structure for the performance assessment group within the Center. This structure should establish a central role for performance assessment that will assure integration of input from the specific technical areas in assessing regulatory compliance. It also should provide a programmatic focus for establishment of priorities of work needed in the specific technical areas. The Center shall provide the NRC a plan describing this management structure and explaining how it incorporates the directives of this subtask.

- 1.2 As a high priority, the Center shall review and provide comments to the NRC on draft documents as they are prepared by SNL under NRC contracts FIN A-1165 and FIN A-1266. The NRC shall provide the Center copies of the Statements-of-Work (SOWs), with Schedules of Deliverables, for these projects so that the Center can plan appropriately for these reviews. These reviews shall require the Center to become completely familiar with all performance assessment aspects of 10 CFR 60 and 40 CFR 191, particularly 10 CFR 60.112 and 10 CFR 60.113.

- 1.3 The Center shall acquire the expertise to understand and run the SNL computer codes for performance assessment at the Yucca Mountain Site. Since most credit for the overall performance of the repository will presumably be placed on the unsaturated medium, emphasis should be given to codes that would apply to the unsaturated zone. However, codes may have to be used to evaluate the saturated zone, particularly where

saturation of the repository by a rising water table or by perched water are considered to be credible. The acquisition of the codes and training in their use should be justified by the Center in each case. The initial technical focus should be on developing an understanding of NRC modeling needs, the capability to use key models, and the capability to assess the results of model outputs by the DOE and by other NRC contractors. The eventual goal is to develop a complete performance assessment methodology to be used to support review of a license application. Short-term deliverables shall include reviews of the usefulness of current SNL codes for performance assessment modeling of the Yucca Mountain Site. The Center will need to hire or otherwise obtain expertise in the area of hydrogeology, geochemistry, materials science/engineering, modeling and computer science, geostatistics, and PRA to accomplish these tasks.

- 1.4 The Center shall participate in the performance assessment review of the SCP as requested by the NRC Project Manager, and is expected to provide assistance in the review of the semi-annual SCP updates and Study Plans. Review areas will primarily be those identified in FIN A-1165, Task 5, "Technical Assistance for SCP Review". An initial task shall be for the Center to review and provide comments to the NRC on the performance assessment review guides contained in the draft Technical Review Plan for NRC Staff Review of Site Characterization Plans.

- 1.5 The Center shall establish a program of computer code maintenance and configuration management along the lines of the program developed by SNL. Specific technical assistance shall be as currently provided by SNL under FIN A-1165, Task 4. In addition, the Center shall investigate the

regulatory implications of software Quality Assurance (QA) beyond the code maintenance and configuration management aspects of the SNL program.

(Note: this task may fall under the QA Element in the Center, and would not have to be duplicated here. It may, however, be broken out as an item separate from other QA activities for the sake of performance assessment computer codes.)

- 1.6 The Center shall provide technical assistance to the NRC in the development and implementation of a preclosure performance assessment methodology. This assistance shall be along the lines of that being provided by SNL in FY88-89 for postclosure performance assessment under FIN A-1165, Task 1, and the deliverables shall be similar to those described in the SOW for FIN-1165.

- 1.7 The Center shall determine whether models being developed for demonstration of compliance with the waste package lifetime and release rate criteria under 10 CFR 60.113 (e.g., CONVO) can also be used for determining cumulative releases at the accessible environment under 40 CFR 191.13. The Center shall provide a report describing how NRC needs for these two criteria, with respect to the waste package and engineered barrier system, may differ.

Long-Term Tasks

- 2.1 As soon as practicable, the Center shall develop the capability to run performance assessments to be used as a tool in identifying further data and simulation needed to fulfill NRC's regulatory mission.

- 2.2 The Center shall develop an understanding of methods for quantifying, reducing and propagating uncertainties in performance assessments, and pursue further development of these methodologies where needed. This shall include uncertainty, sensitivity, and Bayesian analysis techniques. This task will extend work performed under FIN A-1165, Task 2.
- 2.3 The Center shall develop an understanding of existing techniques for estimating probabilities of disruptive events, necessary for the calculation of a CCDF of repository performance. This task will extend work performed under FIN A-1165, Task 3. The Center shall develop further techniques if necessary.
- 2.4 The Center shall, as requested by the NRC, support the development of licensing review criteria, technical positions, regulatory guides, review plans, rulemakings, and other forms of guidance to DOE on matters related to the assessment of compliance with 10 CFR 60 and 40 CFR 191, particularly 10 CFR 60.112 and 40 CFR 191.13.
- 2.5 The Center shall acquire selected computer codes in the areas of performance assessment, uncertainty analysis and sensitivity analysis that have not been developed by or for the NRC. The selection of codes will be decided jointly by the NRC and Center staffs. Sources for codes include those benchmarked under NRC project FIN B-6985, DOE and its contractors, and foreign high-level waste programs.

2.6 The Center shall, at the direction of the NRC, participate in national and international study groups and symposia dealing with performance assessment of high-level waste repositories.

2.7 Synthetic Data Bases

- a. The Center should prepare a feasibility study on the use of synthetic data bases in the regulatory process and submit recommendations to the staff.

- b. The Center should develop a plan for a comprehensive demonstration of the performance assessment methodology using a realistic synthetic data base. The synthetic data base would be representative to the degree possible of a real site. Performance of the base case (i.e., the undisturbed scenario) should be predicted using the performance assessment methodology, relying solely on "data" of the kind and quality likely to be available in the real site characterization. These data would be collected in this exercise by simulated programs of testing, e.g., the simulation of a pump test with a computer program and the synthetic data base in order to determine hydrogeologic properties. Results of the performance assessment using only the data inferred from the simulated tests would then be compared to the "true" performance of the repository determined from the complete synthetic data base. The intent of this exercise is to demonstrate the veracity of the performance assessment methodology and to point out apparent weaknesses. The Center should submit recommendations to the NRC staff on the feasibility, value and cost of such an endeavor.

User Need

The assessment of the overall containment of the repository is required under Sections 60.112 and 60.113 of 10 CFR 60, both for undisturbed and disturbed conditions. The technologies to review these predictions must be transferred from the existing contractors to the Center, and further developed and implemented in order to review site characterization programs and the license application.

Products

The Center will provide essential support to the NRC staff to ensure timely review of site characterization programs and licensing documents. The Center will establish the Quality Assurance infrastructure for computer codes used in performance assessment activities. (This may be covered already under the QA element.) The Center will provide plans and tools for the evaluation and implementation of a comprehensive strategy for NRC review of the DOE performance assessments used to support a license application. Trip reports will be prepared for all meetings attended.