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10 October 1986

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

"NRC Technical Assistance
for Design Reviews"
Contract No. NRC-02-85-002
FIN D1016

Dear David:

Enclosed is Itasca's trip report for the Appendix 7 Visit to SRPO and Fluor. Please call me if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads "Roger D. Hart".

Roger D. Hart
Project Manager

cc: J. Greeves, Engineering Branch
Office of the Director, NMSS
E. Wiggins, Division of Contracts
DWM Document Control Room

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ITASCA TRIP REPORT

DATES: 29 September - 3 October 1986

LOCATION: U.S. Department of Energy Salt Repository Project Office (Columbus, Ohio) and Fluor Technology, Inc. (Irvine, California)

PURPOSE: Appendix 7 Visit to SRPO and Fluor

ATTENDEES: A. Avel (SRPO, Columbus); B. Cummings (Engineers International); R. Hart (Itasca); J. Pearring and N. Tanious (NRC); O. Thompson (DOE-HDQ); and T. Verma (NRC On-Site representative)

PREPARED BY: R. Hart

SUMMARY

An Appendix 7 site assignment to the SRPO Columbus, Ohio, office was conducted by the NRC on 29-30 September 1986 and to Fluor Technology, Inc., Irvine, California, on 1-3 October 1986. Fluor is developing the conceptual design for the salt repository at Deaf Smith County, Texas.

Members of the NRC group conducting this visit were J. Pearring and N. Tanious (NRC), T. Verma (NRC On-Site representative), B. Cummings (Engineers International), and R. Hart (Itasca). The group was also accompanied by A. Avel (SRPO, Columbus) and O. Thompson (DOE-HDQ).

This trip report is in the same format as that defined for Appendix 7 site assignments.

Purpose of Trip — The purpose of this trip was to review and observe activities presently being conducted for the SRP and to discuss, informally, preliminary concerns about site activities. The focus of the visit to SRPO, Columbus, was to review the activities related to the in-situ testing program and data base for the SRPO. At Fluor, the review centered on the conceptual design report for

the repository. In addition, at both facilities, several recent documents were reviewed to provide supporting information on specific issues related to the SRP.

Accomplishments — At the SRPO in Columbus, several activities were reviewed. These are briefly described.

The SRPO Network Process was provided and described by SRPO and ONWI staff. This network presents the logic and assumptions for meeting a 1991 license application for the salt repository. The network is described by the SRPO as an optimistic schedule which does not allow for major problems or delays.

An overview of the in-situ testing program was provided by H. Kalia, ONWI. The discussions only involved the plans for construction of the testing facility and the components of the testing program. No discussion was given on the rationale for the individual tests or how the test results will be assessed for meeting design needs.

A report described as the "Synthetic Data Base" has been prepared by ONWI to provide preliminary information for conceptual design activities. Stone and Webster, Woodward-Clyde, PB-KBB, and Fluor were involved with preparation of this document. The report is planned for use in the SCP and SCP-CDR, the ESF Title II design, and the ACD. The information in this report is not site-specific because such data are not available. When site-specific data become available, the synthetic data base will be either confirmed or replaced with site-specific data. The data are recorded as mean values and upper and lower recorded values of selected measurements. It should be noted that thermal and mechanical properties are for laboratory-scale specimens of salt and non-salt materials. The data base does not provide information on rock mass behavior.

A summary of EDBH activity plans was provided by W. Newcomb (ONWI) and the general surface-base investigation program was described by O. Swanson (ONWI). A Surface Investigation Plan (SIP) is in preparation and is tentatively planned for release in Spring 1987. The SRPO is having a series of reports, Site Specific Plans (SSPs), prepared to support specific activities for the SIP and the underground testing program. Approximately 42 SSPs are planned. Four SSPs are presently planned for release with the SIP. These concern the EDBH, shaft design foundation borings, shaft monitoring, and seismic reflection and refraction. The four major chapters of the SIP were described as follows.

- Chapter 1 — Purpose and Objectives (contains a description of information to obtain and the rationale for the surface characterization program)
- Chapter 2 — Activities to Monitor Environmental and Socioeconomic Conditions
- Chapter 3 — Activities to Obtain Information for Design Requirements
- Chapter 4 — Confirmation of Site Conceptual Model

A description of the seismic sections of the Shaft Design Guide was provided by J. Hileman (ONWI). An expert panel of four consultants (John Lysmer, Robert Kennedy, Ed Cording, and Chris St. John) assessed the adequacy of data supporting ground motion for the Deaf Smith region. Two documents were prepared as a result of seismic studies: a seismic data base document and a design guide for seismic design components of shaft design.

Information on geologic mapping for the ES was provided and discussed by ONWI and SRPO staff.

Several documents were made available for a cursory review. The documents which I identified as important for detailed review, when released by DOE, are:

- (1) Salt Repository Project Shaft Design Guide, Working Draft (July 1986);
- (2) Draft Underground Test Plan for Site Characterization and Testing in an Exploratory Shaft Facility in Salt (February, 1986);
- (3) Salt Repository Project Requirements Document (July 1986); and
- (4) Generic Requirements for a Mined Geologic System (September 1984).

At the Fluor offices in Irvine, an overview of the repository design activities was provided by T. Mallonee, Project Manager, and the Fluor staff and subcontractors. Woodward-Clyde is providing assistance in geotechnical engineering aspects. Science Applications International Corp. is assisting with thermomechanical analysis and waste package and seal design aspects. Morrison-Knudsen Engineers is assisting with shaft and underground construction design.

The majority of the time at Fluor was spent becoming familiar with the latest draft of the SCP-CDR (September 1986) and supporting documents and discussing specific aspects of the design with Fluor staff and subcontractors. A considerable amount of information was made available and the time available only allowed for a brief review of these reports. The sections of the SCP-CDR and supporting documents which I scanned during the visit are listed below.

SCP-CDR

<u>Section</u>	<u>Title</u>
2.3	Data and Assumptions for Design
2.4	Design Requirements
3.2	Waste Retrieval
4.4	Underground Facilities
4.6	Structures, Systems, Components Important to Safety
6.3	Waste Retrieval
6.5	Performance Confirmation
7.1	Preclosure Design Analysis
7.2	Postclosure Design Analysis
7.3	Engineering Analysis of Design
7.4	Structures, Systems, Components Important to Safety
7.5	Analysis Conclusions

Waste Package/Repository Impact Study (September 1985)

Preliminary Waste Package Retrievability Report (September 1985)

Empirical Pillar Design Methods Report

Some specific observations regarding the Fluor visit are as follows.

Fluor essentially has completed the SCR-CDR and will be beginning pre-ACD activities. An important component for the ACD will be coordination with the ESF site testing activities.

Retrieval is identified as an important driver for design of a repository in salt. Salt creep is designated as a required design parameter.

John Tinucci (SAIC) discussed some of the details of the sensitivity analysis. For sensitivity analyses, SAIC has adopted a maximum thermal areal loading of 40 kw/acre and creep closure rates defined by the Synthetic Data Base to develop the design for the emplacement rooms, mains, and sub-mains. The sensitivity analyses looked at thermal load variations, backfill conditions, thermal

property variation, creep parameter variation, salt/non-salt layering, emplacement mode, entry spacing, borehole depth, and time of retrieval. The analyses have not considered the effects of inhomogeneities (such as clay seams) on rock mass behavior.

Following are some preliminary concerns about site activities observed during the Appendix 7 site visit.

It is not evident from the discussions presented how data needs, particularly those concerning the salt material model (including creep behavior and effects of inhomogeneities), will be addressed by in-situ testing for use in the repository design. The network schedule presented by SRPO does not appear to allow for incorporation of information on rock mass behavior gained from in-situ tests into the development of the salt material model. The scheduling gives the appearance that the design will be completed before a reasonable understanding of rock mass behavior is developed from in-situ testing.

Rationale supporting the development of the in-situ testing plan was not presented. It is not evident whether the testing will provide the required information to meet design needs and how the data will be assessed to determine if the amount of testing is sufficient to represent the general rock mass. Also, information was not available to support the rationale for testing conditions, such as duration of tests, location, and dimensions of the test configuration to minimize disturbance, and ranges of data values expected from tests.

The sensitivity analyses are very preliminary and assume rather idealized behavior of the rock mass. The effects of inhomogeneities such as clay seams and interbeds have not been examined. It appears that the assumed creep behavior used for the analyses is not supported as being representative of rock mass response, and the actual behavior may vary significantly. A particular concern is the certainty to which the creep behavior must be known.

Problems Encountered — The Appendix 7 visit was extremely worthwhile and provided an improved understanding of the SRPO activities. SRPO staff and contractors were extremely helpful providing requested information, and no problems were encountered in receiving information for reviews at the sites. The informal discussions and exchange of information were very beneficial.

Recommendations — Further Appendix 7 visits are strongly recommended. In particular, a visit involving both the performance assessment group and the in-situ testing group is recommended in order to provide improved understanding of the rationale supporting the development of the in-situ testing program.

Respectfully submitted,



Roger D. Hart

rdh/ks

COST BREAK-OUT*

Labor

Roger Hart	46 hrs @ \$22.12/hr	\$ 1,017.52
	TOTAL LABOR	\$ 1,017.52

Actual Expenses

Travel

Airfare (Mpls-Columbus-Irvine-Mpls) Hart	\$ 774.00
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Miscellaneous Travel Expenses Hart (taxi)	\$ 23.00
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Lodging

Hart (2 nights @ \$60.21/night)	\$ 120.42
(3 nights @ \$72.40/night)	217.20

Meals

Hart	\$ 113.89
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Miscellaneous Expenses

Hart (telephone)	\$ 0.60
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TOTAL EXPENSES:	\$ 1,249.11
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