



Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

MAR 13 1984

Mr. M. S. Nataraja
U. S. Nuclear Regulatory Commission
1915 Eastern Avenue
Silver Spring, MD 20901

Dear Mr. Nataraja:

NUCLEAR REGULATORY COMMISSION - GEOMECHANICS DATA REVIEW VISIT

At the January 23-26, 1984, Geomechanics Data Review Visit by Nuclear Regulatory Commission (NRC) staff personnel and consultant, you asked for further background and documentation for orientation purposes. Accordingly, enclosed are the following (Enclosure 1):

1. Sample Block Test Data and related calculations
2. Sample Hydrofracturing Test Data and related calculations

The above items are provided for information only as they are preliminary in nature and, thus, have not yet been fully analyzed in relation to other similar data.

Documents requested by three NRC Consultants (V. Rajaram and Robert Cummings of Engineers International, Inc. and K. Wahi of Sandia) have been shipped separately. Enclosure 2 is listings of those documents.

No further action items remain outstanding from the visit. If there are questions or we may assist you further, please feel free to contact Mr. James E. Mecca of my staff at (509) 376-5038 or FTS 444-5038.

Very truly yours,

O. L. Olson, Project Manager
Basalt Waste Isolation Project Office

WM DOCKET CONTROL
CENTER
BWI:AJB
Enclosures
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WM Record File

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Docket No.

End 1 (Part 1)

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Distribution:

Nataraja
Kennedy

Wright

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DOCUMENTS REQUESTED BY M.S.NATARAJA
DURING THE JANUARY 23-26, 1984, NRC
GEOMECHANICS DATA REVIEW VISIT

Enclosed is a compilation of data sets from Block Test #1 which provides a representative sample of the type of information available from the test.

Included are data for test cycles 3R, 6, and 12 from:

- the Basalt Deformation Measurement System (BDMS)
- the Multiple-Position Borehole Extensometer (MPBX)
- the U.S. Bureau of Mines' type Borehole Deformation Gages (BDGs)
- the Vibrating Wire Stressmeters (VWSs)

Provided in each data set are printouts of the raw data values collected from each instrument, the data reduction program through which the raw values were processed, and examples of the generated values and plots from which the test results are evaluated.

Also included as appendices to the data sets are two documents which provide background information:

Appendix I is a copy of the paper "Rock Mass Deformation Properties from a Large-Scale Block Test" which was presented at the 24th U.S. Symposium on Rock Mechanics and contains an overview of the experimental setting and procedures.

Appendix II contains additional background information on the testing that has been performed since the symposium paper, as well as instrument specific descriptions of the tables and plots included in the data sets.

Only the information presented in the paper of Appendix I has been included in previously reviewed and released documents.

DOCUMENTS PROVIDED TO V. RAJARAM,
ENGINEERS INTERNATIONAL, AS REQUESTED AT
JANUARY 23-26, 1984, NRC GEOMECHANICS
DATA REVIEW VISIT

<u>Document Number</u>	<u>Document Title</u>
SD-BWI-DP-041	Rock Mechanics Data Package
SD-BWI-TD-004	Tabulation of Physical and Mechanical Property Data From Borehole RRL-14
SD-BWI-TD-003	Tabulation of Physical and Mechanical Property Data From Borehole RRL-6
SD-BWI-TI-132	Tabulation of Young's Moduli and Poisson's Ratio Uniaxial and Triaxial Compressive Strength Tests from Boreholes RRL-2
RHO-QA-PL-3 Rev 1L	Quality Assurance Program Plan
RSD-BWI-DP-023	BWIP Data Package Potentiometric
RSD-BWI-DP-035	Deep Borehole Correlation
RHO-BWI-C-77	Thermal/Mechanical Properties of Pomona Member Basalt Full-Scale Heater Test #1 (Area 1)
RSD-BWI-SA-160	BWIP QA Program
RSD-BWI-SA-281 P	Bibliography and Documents Issued List Through FY 1982
RSD-BWI-MA-004	Basalt Operating Procedures Manual (only Table of Contents provided)
RSD-BWI-SA-069	Discriminatory Analyses Flow Identification
RRL-02	Drilling Shaft Report, June 1982
836101/A-C	BWIP Borehole Spalling
BRMC-268	Borehole Geophysical Log RRL-2
None	Neutron-Neutron Geophysical Log RRL-2
None	Gamma-Gamma Geophysical Log RRL-2
None	Caliper Geophysical Log RRL-2
None	Sonic Geophysical Log RRL-2

Document NumberDocument Title

H06 0000913

Prototype Flatjack Assembly with Instrumentation

SD-BWI-TP-018

Test Plan for In Situ Stress Measurement by the Hydraulic Fracturing Method in Borehole RRL-2

SD-BWI-TP-030

Test Plan for In Situ Stress Measurement by the Hydraulic Fracturing Method in Boreholes RRL-6 and DC-4

SD-BWI-TD-006

Summary of Borehole RRL-2 Hydraulic Fracturing Test Data and Data Analysis Methods

BWI-02-TP-0101

Near-Surface Test Facility Test Program (Phase I and Phase II)

BWI-212-MD-01

Near-Surface Test Facility Test Procedure Guidelines

None

Summary of Near-Surface Test Facility Results and Their Application to Repository Design

RSD-BWI-ES-001

Near-Surface Test Facility Numerical Analysis of the Phase I Tests

RSD-BWI-TI-024

Supporting Document: Applicability of the Near-Surface Test Facility Program to Repository Design

RHO-BW-ST-33 P

Automated Data Acquisition and Analysis System Used in the Basalt Waste Isolation Project's Near-Surface Test Facility

HWS-10097

Rock Instrumentation Full-Scale Test #1 Data Logger Inputs for Near-Surface Test Facility

RHO-BWI-CD-15 Rev 2

Phase I Heater Test Plan for the Thermo-mechanical Response of Basalt

BWI-72-STP-01

Operating Test Procedure Support Data Full-Scale Test #1

None

Conversion Algorithms for Rock Instrumentation System, Near-Surface Test Facility, No. A-001

Document Number

Document Title

None

Final Report for the Rock Instrumentation System Full-Scale Heater Tests No. 1 and No. 2 at the Near-Surface Test Facility, Hanford Nuclear Reservation, Washington

RHO-BWI-C-100

Thermal/Mechanical Properties of Pomona Member Basalt -- Area 3 and Summary

RSD-BWI-TI-023

Supporting Document -- Analysis of Thermal Properties of Basalt from Heater Test #2 Experiment

RSD-BWI-VP-001

Data Verification Plan NSTF Full-Scale Heater Test No. 1 and 2

RSD-BWI-TI-061

Preliminary Results for Full-Scale Heater Tests #1 and #2 (Vol. I and II)

SD-BWI-TP-015 A-0

Test Plan for Suitability Assessment of Five Overcoring Stress Measurement Techniques

None

Crosshole Seismic Tests at the Near-Surface Test Facility -- Final Report

SD-BWI-TL-005

Rock Mechanics Instrumentation Modification for Thermomechanical Field Tests in Basalt at the Near-Surface Test Facility

None

Calibration and Environmental Testing of the Rock Instrumentation System for Jointed Block Test No. 1 at the Near-Surface Test Facility, Hanford Nuclear Reservation, Washington

**DOCUMENTS REQUESTED BY ROBERT CUMMINGS,
OF ENGINEERS INTERNATIONAL, DURING
THE JANUARY 23-26, 1984, NRC GEOMECHANICS
DATA REVIEW VISIT**

Enclosed are data from specific hydrofracturing tests conducted in Hanford Site boreholes RRL-2, RRL-6, and DC-4. Test numbers from which data were requested are 3A, 3B, 1A, and 2B from RRL-2; 3, 8, and 9 from RRL-6; and 1, 2, and 3 from DC-4.

Included in the package are the following:

- copies of interval pressure and flow rate versus time curves, along with the corresponding packer pressure and interval pressure versus time curves for the requested tests in borehole RRL-2

- copies of pressure/flow rate versus time curves and the associated data sheets for the requested tests in boreholes RRL-6 and DC-4

- copies of the full-size impression packer tracings from the requested tests in boreholes RRL-6 and DC-4

- copies of all televiewer data received to date from the U.S. Geological Survey (USGS) for boreholes RRL-6 and DC-4; data from DC-4 includes pre- and post-hydrofracturing logs; data from RRL-2 has not yet been received from the USGS

- a package outlining the equipment used in RRL-2, RRL-6, and DC-4 testing

- a list of comments on procedures, variations, and deviations for hydrofracturing tests conducted in boreholes RRL-2, RRL-6, and DC-4

- a list of comments on recorded data for hydrofracturing tests in boreholes RRL-2, RRL-6, and DC-4

- a copy of the borehole reports for boreholes RRL-2, RRL-6, and DC-4 (Rockwell document number SD-BWI-TI-113, SD-BWI-TI-167, and RHO-BWI-C-40, respectively); the reports contain geologic, hydrologic, hydrochemical, geomechanical, and preliminary in situ stress data

- a copy of SD-BWI-TD-006, "Summary of Borehole RRL-2 Hydraulic Fracturing Test Data and Data Analysis Methods," which contains core photographs, impression packer tracings, equations used, interpreted data, and other information pertaining to tests in RRL-2

- a copy of the test plans written for conducting hydrofracturing tests in boreholes RRL-2 and RRL-6/DC-4 (document numbers SD-BWI-TP-018 and SD-BWI-TP-030, respectively)

a copy of SD-BWI-DP-035, "Deep Borehole Stratigraphic Correlation Charts and Structure Cross Sections," which contains information obtained from core photographs, well site geologists' logs and the core itself for boreholes RRL-2, RRL-6, DC-4, and other Hanford Site boreholes

copies of the following geophysical logs for borehole RRL-2:

- 3-D velocity (Birdwell)
- Electric (Birdwell)
- Gamma ray- neutron (Birdwell)
- NX density, caliper (Birdwell)
- Elastic properties log (Birdwell)

copies of the following geophysical logs for borehole DC-4:

- Sonic (Edcon)
- Neutron porosity (Edcon)
- Bulk density (Edcon)
- Density (Edcon)
- Natural gamma (Edcon)
- Gamma ray-neutron (Birdwell)

All available copies of logs for RRL-6 and other Hanford Site boreholes were previously transmitted to R.J.Wright of the NRC (via DOE-RL) in June 1983.

Copies of core photographs from the requested test intervals in boreholes RRL- 6 and DC-4 have yet to be received from Battelle Photography. When received, they will be transmitted separately.

DOCUMENTS PROVIDED TO K. WAHI
OF SANDIA AS REQUESTED AT
JANUARY 23-26, 1984, GEOMECHANICS
DATA REVIEW VISIT

<u>Document Number</u>	<u>Document Title</u>
RHO-BWI-C-50 P	Determination of Basalt Physical and Thermal Properties at Varying Temperatures, Pressures, and Moisture Contents, First Progress Report, Fiscal Year 1979
RHO-BWI-C-54	Determination of Basalt Physical and Thermal Properties at Varying Temperatures, Pressures, and Moisture Contents, Second Progress Report, Fiscal Year 1979
RHO-BWI-C-55	Determination of Basalt Physical and Thermal Properties at Varying Temperatures, Pressures, and Moisture Contents, Third Progress Report, Fiscal Year 1979
RHO-BWI-C-77	Thermal/Mechanical Properties of Pomona Member Basalt - Full Scale Heater Test #1 (Area 1)
RHO-BWI-C-85	Thermal/Mechanical Properties of Pomona Member Basalt - Full-Scale Heater Test #2 (Area 2)
RHO-BWI-C-90	Thermal and Mechanical Properties of Hanford Basalts, Compilation and Analyses
RHO-BWI-C-100	Thermal/Mechanical Properties of Pomona Member Basalt - Area 3 and Summary
RHO-BWI-C-92	Thermal/Mechanical Properties of Umtanum Basalt -- Borehole DC-2
None	Results of Thermomechanical Tests on Specimens of Hanford Basalts
SD-BWI-TI-132	Tabulation of Young's Moduli and Poisson's Ratio Determinations from Uniaxial and Triaxial Compressive Strength Tests from Boreholes RRL-2, RRL-6, and RRL-14
SD-BWI-TD-002	Tabulation of Physical and Mechanical Property Data from Borehole RRL-2
SD-BWI-TD-003	Tabulation of Physical and Mechanical Property Data from Borehole RRL-6

<u>Document Number</u>	<u>Document Title</u>
SD-BWI-TD-004	Tabulation of Physical and Mechanical Property Data from Borehole RRL-14
SD-BWI-DP-041	Rock Mechanics Data Package
BWI-02-TP-0101	Near-Surface Test Facility Test Program (Phase I and Phase II)
None	Results from the Near-Surface Test Facility -- Heater Tests and Block Tests
None	Summary of Near-Surface Test Facility Results and Their Application to Repository Design
RSD-BWI-ES-001	Near-Surface Test Facility Numerical Analysis of the Phase I Tests
RSD-BWI-TI-024	Supporting Document: Applicability of the Near-Surface Test Facility Program to Repository Design
None	Status Report on the Full-Scale Electric Heater Tests at the Hanford Near-Surface Test Facility
RHO-BWI-CD-15 Rev 2	Phase I Heater Test Plan for the Thermo-mechanical Response of Basalt
RSD-BWI-TI-060	Supporting Document: Verification of Thermal Model for Full-Scale Heater Test
None	Final Report for the Rock Instrumentation System Full-Scale Heater Tests No. 1 & No. 2 at the Near-Surface Test Facility, Hanford Nuclear Reservation, Washington
RHO-BWI-C-77	Thermal/Mechanical Properties of Pomona Member Basalt -- Full-Scale Heater Test #1 (Area 1)
RHO-BWI-C-85	Thermal/Mechanical Properties of Pomona Member Basalt -- Full-Scale Heater Test #2 (Area 2)
RHO-BWI-C-91	Thermal/Mechanical Properties of Pomona and Untanum Basalts -- Elevated Temperature Comparative Triaxial Test

Document Number

Document Title

RHO-BWI-C-86

Numerical Predication of Basalt Response for
Near-Surface Test Facility Heater Test #1 and
#2

RSD-BWI-TI-023

Supporting Document -- Analysis of Thermal
Properties of Basalt from Heater Test #2
Experiment

SD-BWI-TL-005

Rock Mechanics Instrumentation Modifications
for Thermomechanical Field Tests in Basalt
at the Near-Surface Test Facility

None

Multiposition Borehole Extensometer Baseline
Conversion Algorithm, Near-Surface Test
Facility