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WM Record File 101.2

WM Project WM-10

Docket No. \_\_\_\_\_

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(Return to WM, 623-SS)

Dear Dr. Wright:

**NRC QUESTIONS ON THE BWIP SCR (SCR-2)**

As requested by your letter of December 7, 1982, and discussed by telephone with you, M. Gordon, M. Webber, K. Chang and Mr. Ornstein of NRC; R. Baca, J. Davis, J. LaRue, and E. Moore, Rockwell Basalt Project; and D. Squires of my staff, on December 10, 1982, the following response is provided in answer to the questions presented.

Question No. 1:

In the two-dimensional modeling of BWIP using PORFLO (Chapter 12, pages 12.4-28 through 12.4-52), what function is used to describe the repository heat source term as a function of time?

The decay heat curve used in the near-field analysis is for 10-year old (PWR) spent fuel with a peak power of 1.7 kW. The relative heat generation rate factors, i.e., normalized power as a function of time, may be found in M. K. Altenhofen, 1981, "Waste Package Heat-Transfer Analysis: Model Development and Temperature Estimates for Waste Packages in a Repository Located in Basalt," RHO-BWI-ST-18. The specific values used in the near-field analysis are tabulated in the following table.

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Heat Source Term (Q) Table

<u>Time</u>	<u>Q(J/m<sup>3</sup>-yr)</u>	<u>Time</u>	<u>Q(J/m<sup>3</sup>-yr)</u>
0	1.47 x 10 <sup>8</sup>	190	1.94 x 10 <sup>7</sup>
5	1.214 x 10 <sup>8</sup>	290	1.544 x 10 <sup>7</sup>
10	1.039 x 10 <sup>8</sup>	390	1.279 x 10 <sup>7</sup>
15	9.393 x 10 <sup>7</sup>	490	1.132 x 10 <sup>7</sup>
20	8.644 x 10 <sup>7</sup>	990	6.527 x 10 <sup>6</sup>
30	7.31 x 10 <sup>7</sup>	1,990	3.44 x 10 <sup>6</sup>
40	6.233 x 10 <sup>7</sup>	5,990	2.043 x 10 <sup>6</sup>
50	5.66 x 10 <sup>7</sup>	9,990	1.617 x 10 <sup>6</sup>
70	4.131 x 10 <sup>7</sup>	50,000	6 x 10 <sup>5</sup>
100	3.146 x 10 <sup>7</sup>	100,000	3 x 10 <sup>5</sup>

Question No. 2:

Is the dependence of groundwater viscosity on temperature incorporated into the PORFLO model, and if so, how is it accounted for?

The viscosity of water is a relatively strong function of temperature. In the PORFLO code, the fluid viscosity is represented with an exponential function with temperature independent variable. The specific equation may be found in Perry and Chilton, 1973, Chemical Engineering Handbook. Viscosity is computed at every step in the PORFLO code. These viscosity values, in turn, are used to update the hydraulic conductivities.

Question No. 3:

Is the PORFLO code, which is used in the last performance assessment model described in Chapter 12, the same code as or an adaptation of PORFLOW (with the W) that was developed by ACRI of West Los Angeles, California? Where can we obtain documentation of PORFLO?

The PORFLO code is an adaptation of the PORFLOW code originally developed by ACRI. Over the past year and a half the code has been modified, documented internally, verified, and benchmarked by the staff of BCSR, Inc. A detailed User's Guide for PORFLO was recently prepared by BCSR which is expected to be issued in the near-term. A technical report is currently being finalized which contains the model theory, numerical techniques, as well as the results of model verification and benchmarking. The technical report is expected to be issued this fiscal year.

During the interchange between Baca and Gordon on hydrologic topics, the characteristics of layers below the Umtanum were discussed. The near-field analysis performed for the SCR assumed the following rock layer characteristics below the Umtanum.

Characteristics of Layers Below  
the Umtanum

<u>Unit</u>	<u>Thickness (m)</u>	<u>K<sub>x</sub> (m/sec)</u>	<u>K<sub>y</sub>(m/sec)</u>
GR-10 FT	7	$1 \times 10^{-7}$	$1 \times 10^{-7}$
GR-10	8.9	$1 \times 10^{-11}$	$1 \times 10^{-10}$
GR-11 FT	11.9	$1 \times 10^{-7}$	$1 \times 10^{-7}$
GR Composite	451.8	$1 \times 10^{-7}$	$1 \times 10^{-10}$

Question No. 4:

What is the source of mineral values per square kilometer in Washington and New Mexico? Ref. SCR 3.9.4, page 3.9-6.

The source of mineral values for Washington and New Mexico used in the SCR were taken from RHO-BWI-C-109, "Economic Geology of the Pasco Basin, Washington and Vicinity" (July 1981). This mineralogical information was originally obtained from the U. S. Bureau of Mines.

If you have any questions on the above material, please call.

Very truly yours,

*R. J. Squires*  
for O. L. Olson, Project Manager  
Basalt Waste Isolation Project Office

BWI:DJS

cc: R. Stein, DOE/HQ