40-8743

PDR

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January 20, 1981

Ms. Kathy Hamill
Project Manager
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, Maryland 20910

Re: Responses to Ott Water Engineers Comments on Hydrological Methodology - Sand Rock Mill Project - NRC Docket No. 40-8743

Dear Ms. Hamill:

On October 31, 1980, Conoco staff members discussed hydrological methods with you and your consultants (Ott Water Engineers) regarding procedures used By Conoco in the Sand Rock Mil Environmental Report. After careful study and consideration of the ques ions raised, Conoco is offering the following commentary.

Below is a discussion of the length of test requirements for applicability of the straight line method, (modified Theis equation) and the time values which these tests should yield a straight line plot.

A plot of the well function, W(u), and the inverse of the well function variable, 1/u, shows that one should expect the straight line to be applicable near a u value of 0.1 (see Figure 1). Even the 1/u value of 5 (u of 0.2) plots very close to the straight line. Therefore, Theis' theory shows that the straight line method should be applicable for u values less than 0.1, instead of the 0.01 which Jacob recommended.

A match of log-log data plots to the Theis type curve were made using the transmissitivites obtained from the straight line method. In general, a good match was obtained between the data and the type curve. The test time for a u value of 0.1 was noted. The following table gives the time since the test started for the u values of 0.1 and the length of the test.

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Add'l info

Well No.	Time of U Value of 0.1 (min)	Length of Test (min)
P-2	25	229
P-6	62	357
P-8	18	264
P-17	13	345
35N-1C	160	294
35N-2C	32	275
35N-3	6.2	285
35N-6	280	307
35N-7C	220	248
35N-7D	45	359
35N-7F	0.05	186
35N-7G	45	275

The data should be forming a straight line, at least by the u value of 0.1. All lengths of tests are greater than the time of a u value of 0.1. Lengths of tests for wells 35N-6 and 35N-7C are only slightly greater than the time value at u of 0.1. The inverse of the injection rate for both of these wells fits on a straight line at a u value of approximately 0.25. The enclosed plot shows that the Theis data should fit close to the straight line starting at a u value of 0.2. Therefore, the straight line analyses of these two wells should be adequate.

Three log-log plots of the inverse of the injection rate versus the time since the start of injection are attached. These three figures, Nos. 2, 3, and 4, are presented for comparison of the log-log matches versus the straight line fit. The match of the Theis type curve to this data is shown on these three figures. The theis equation in the form for constant head injection tests was used to compute the transmissivity and storage coefficient of the aquifer. The best match which produced the same transmissivity as the straight line fit was used for the three plots. Good matches are shown for each of the tests. Storage coefficients of 3.2×10^{-3}, 0.12 and 0.037 were computed for wells P-2, P-6 and 34N-2C, respectively. Storage coefficients from single well tests are likely to be erroneous because the effective well radius is difficult to accurately estimated. It is not recommended to use storage coefficients from single well tests.

The inverse of the injection rate reasonably follows the Theis type curve for these three tests, which shows that the straight line method is adequate for determining the transmissivity for these tests.

We hope this explanation of our methodology illustrates why we feel our permeability test data is correct.

If you need any further information or would like to discuss our results further, please let me know.

Sincerely,

T. W. Quigley

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Enclosures

cc: J. E. Cearley
S. W. Thomas
J. Barrett - Ott Water Engineers

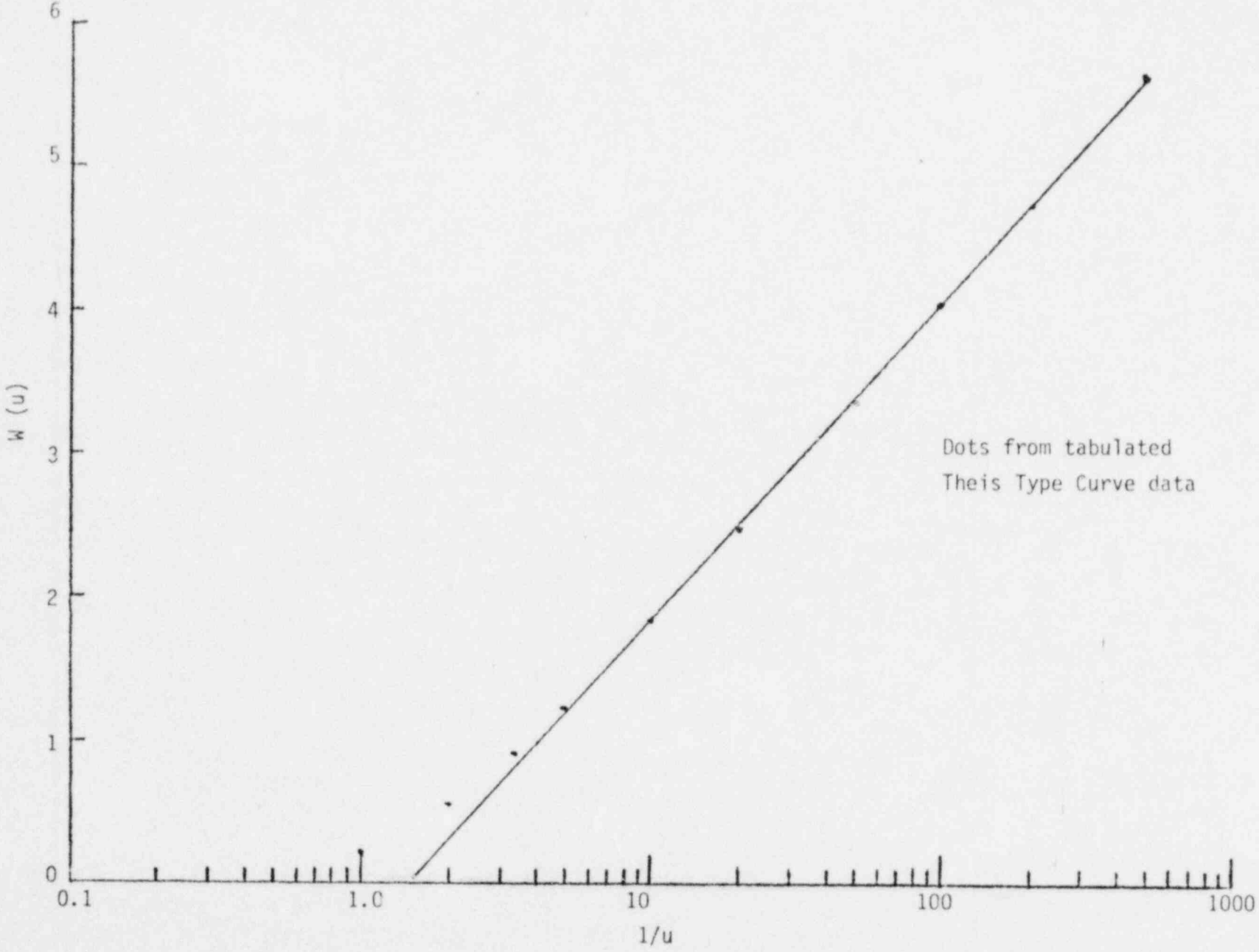

Figure 1 – THEIS WELL FUNCTION VERSUS INVERSE OF THE WELL FUNCTION VARIABLE

Hole 35N-2C
Sw = 87.4

$$T = \frac{114.6\ Q\ W(u)}{Sw} = \frac{114.6}{87.4(1.45)} = 0.9 \text{ gal/day/ft}$$

$$S = \frac{Tt}{2693r^2} = \frac{0.9(3.2)}{2693(0.17)^2} = 0.037$$

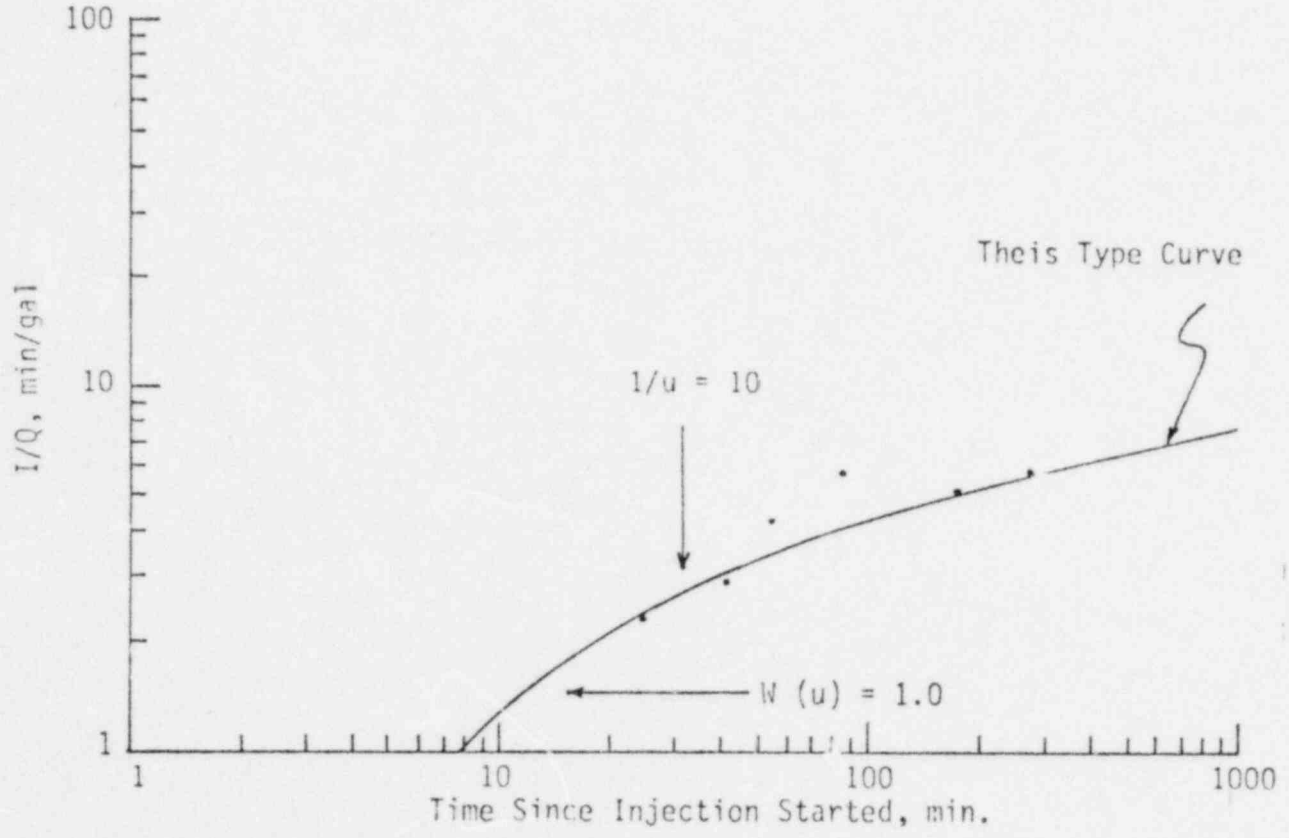

Figure 2

Hole P-6
Sw = 35.8

$$T = \frac{114.6\ Q\ W(u)}{Sw} = \frac{114.6}{(35.8)(2.1)} = 1.5 \text{ gal/day/ft}$$

$$S = \frac{Tt}{2693r^2} = \frac{(1.5)(6.2)}{2693(0.17)^2} = 0.12$$

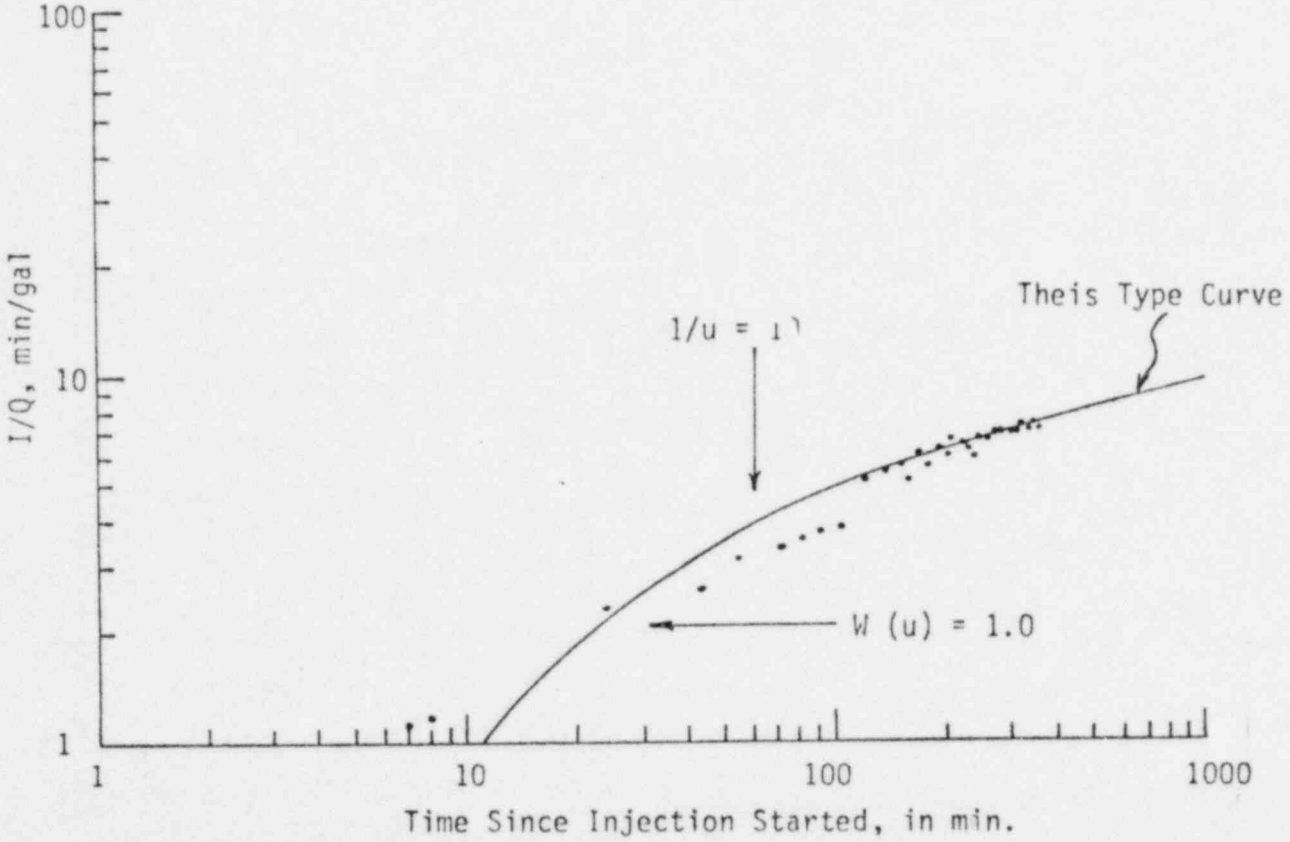

Figure 3

Hole P-2
Sw = 43.08

$$T = \frac{114.6\ Q\ W(u)}{Sw} = \frac{114.6}{43.08(26.6)} = 0.10 \text{ gal/day/ft}$$

$$S = \frac{Tt}{2693r^2} = \frac{(0.1)(2.5)}{2693(0.17)^2} = 3.2 \times 10^{-3}$$

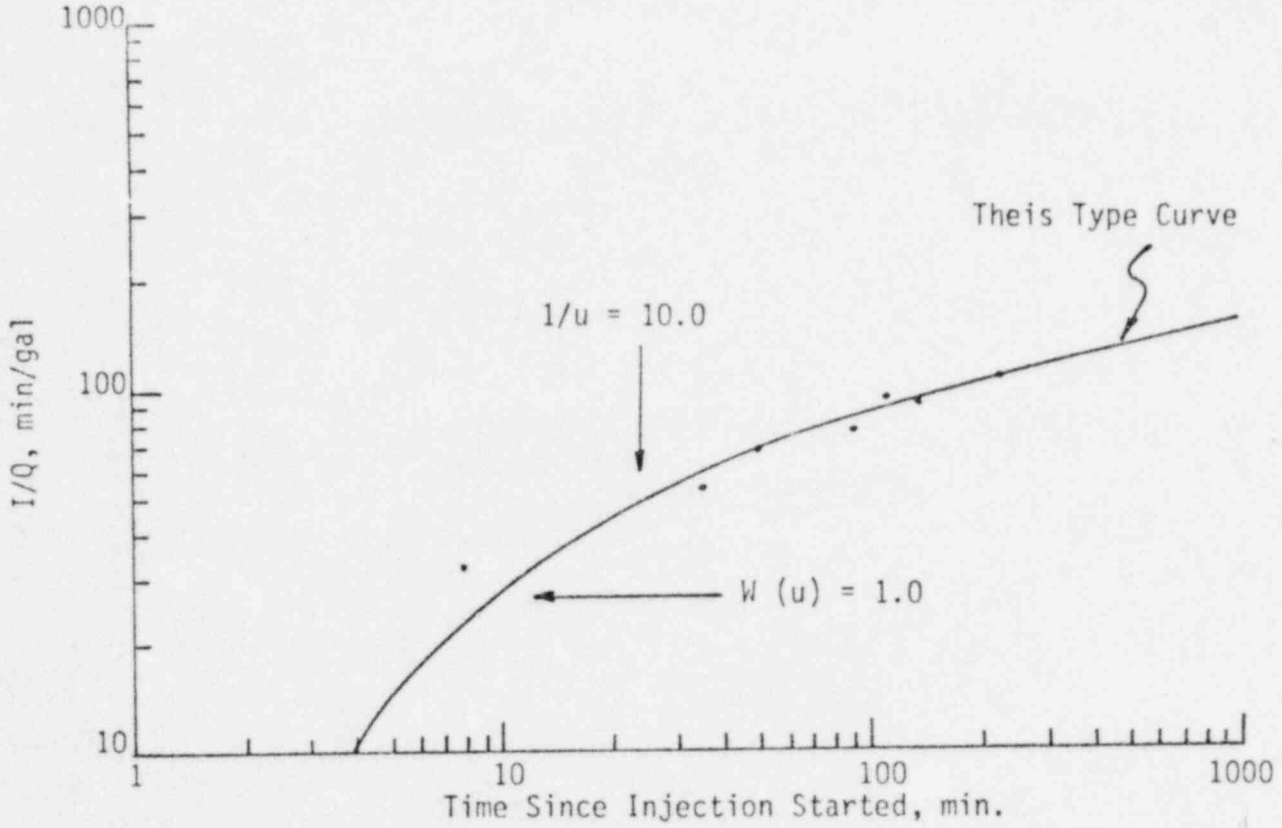

Figure 4