



Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221

OCT 24 2005

Ms. Sharon White
Radiation Protection Division
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Ave, N. W.
Washington, DC 20460

Subject: Magenta Transmissivity Fact Sheet

Dear Ms. White:

The enclosed paper was primarily developed in May 2005 to summarize our investigation of early testing of Magenta transmissivity and is being provided in response to a recent request by Mr. Peake of your staff. If additional information is required, please contact Daryl Mercer of my staff at 505-234-7452.

Sincerely,

A handwritten signature in black ink, appearing to read "L. Piper", written in a cursive style.

Lloyd L. Piper
Acting Manager

Enclosure

cc w/enclosure
T. Peake, EPA *ED
C. Byrum, EPA ED
G. Basabilvazo, CBFO ED
R. Patterson, CBFO ED
M. Rigali, SNL ED
S. Kouba, WRES ED
CBFO M&RC

Sharon White

-2-

bcc: w/enclosure

D. Mercer, CBFO

ED

R. Beauheim, SNL

ED

MAGENTA TRANSMISSIVITY FACT SHEET

Summary:

In 2000, the DOE thoroughly investigated allegations that were originally raised in the Citizens Against Radioactive Dumping (CARD) lawsuit filed in 1999 challenging the validity of the WIPP Disposal Phase Supplemental Environmental Impact Statement. The DOE investigation concluded that there was no basis to believe that data important to the long-term performance of WIPP had been compromised. The EPA was provided the results of the DOE investigation and subsequently conducted their own independent investigation. This paper has been prepared to summarize the DOE evaluation.

Background

Overlaying WIPP, there are two principal subsurface water bearing zones (the Culebra and the Magenta) that could potentially transport contaminants from an inadvertent drilling intrusion into the WIPP. Such contaminants could find their way to water sources that could be used by either cattle or humans, thus posing the potential for adverse health impacts. The Culebra lies below the Magenta (closer to the repository level) and is more transmissive. Thus, in our model of a brine release subsequent to a drilling intrusion, the brine (water) tends to flow from the drill hole to and then through the Culebra, since it offers the path of least resistance. In scenarios modeled in performance assessment, the brine never even rises to the level of the Magenta, which in any case is less permeable and would offer more resistance to outward flow.

Some stakeholders believe that the Magenta is filled with holes (karst in geologic terminology), offers less resistance to groundwater flow than the Culebra, and would, therefore, allow more of the repository's contents to be released subsequent to a drilling intrusion than is modeled by the WIPP performance assessment.

Basis of the Allegations

A WIPP stakeholder found a hand-edited page from a draft hydrology report in USGS files that showed a revision in the transmissivity range for the Magenta Member of the Rustler Formation from $<1 - 40 \text{ ft}^2/\text{day}$ to $10^{-4} - 1 \text{ ft}^2/\text{day}$. By comparing the handwriting on the page to a signed, handwritten memo from Jerry Mercer, then a USGS hydrologist, the stakeholder identified Mercer as the person who edited the page. The stakeholder alleges that Mercer's revision was an "act of data falsification [that] has steered the entire WIPP hydrologic investigation in a false direction, allowing the DOE to completely ignore the most transmissive aquifer in the immediate vicinity of the WIPP waste panels." All this transpired in 1999.

Summary of DOE Investigation and Results

The transmissivity value of $40 \text{ ft}^2/\text{day}$ appears to derive from a preliminary bailing test performed by the USGS on the Magenta in well H-3 in 1977. Later evaluation of the data showed that a packer placed in the well to isolate the Magenta from the more transmissive Culebra was leaking during the bailing test, and that the test did not accurately reflect the properties of the Magenta. From the start, the bailing test was intended to determine whether or not the Magenta could be tested using standard hydrogeological techniques (i.e., slug or pumping tests), not to provide a reliable estimate of transmissivity. Subsequent to the bailing test, the leaking packer was replaced and a slug test was performed on the Magenta. The data from this test have never been published, but the test was interpreted by the USGS, and reported to show a transmissivity of $0.1 \text{ ft}^2/\text{day}$ in a 1983 report by Mercer. Arrangements are being made with and by the USGS to publish these old data for public consumption.

The allegation of data falsification and misdirection of the WIPP hydrology program is utterly erroneous. The Magenta has been tested in 18 WIPP wells, most of them since the time of the alleged data falsification. In all but two wells, the transmissivity of the Magenta has been found to be less than or equal to $1 \text{ ft}^2/\text{day}$. The other two wells were tested AFTER Mercer made his revisions, and the correct values for those two wells (53 and $375 \text{ ft}^2/\text{day}$) were accurately reported in Mercer's 1983 USGS report. The Culebra dolomite has been tested at all of the locations where the Magenta has been tested and at many additional locations, and is consistently found to be one or more orders of magnitude more permeable than the Magenta.

Detailed Discussion of Allegations, and DOE's Investigation and Findings:

Allegations

A WIPP stakeholder, Dr. R.H. Phillips, gained access to USGS records in Albuquerque in March 1999 under an FOIA request. In the USGS files, he came across a draft hydrology report from approximately 1978 or 1979 that showed handwritten corrections (this was when reports were

still typed on typewriters) made by Jerry Mercer, then a USGS hydrologist. One page in the report shows a revision in the transmissivity range for the Magenta Member of the Rustler Formation from $<1 - 40 \text{ ft}^2/\text{day}$ to $10^{-4} - 1 \text{ ft}^2/\text{day}$. Phillips alleges that Mercer's revision was an "act of data falsification [that] has steered the entire WIPP hydrologic investigation in a false direction, allowing the DOE to completely ignore the most transmissive aquifer in the immediate vicinity of the WIPP waste panels. Jerry Mercer, for his services, was rewarded with a job at Sandia National Laboratories."

Phillips' allegation was contained in a motion filed in the United States District Court for the District of New Mexico in June 2000, *Citizens for Alternatives to Radioactive Dumping et al. vs. Bill Richardson, et al.* (CIV No. 99-321 JC/WWD). That motion was denied, but another motion was filed in appeal on July 14, 2004, *Citizens for Alternatives to Radioactive Dumping et al. vs. Spencer Abraham, et al.* (CIV No. 99-321 ACT/MCA (ACE)). The district court dismissed that motion and subsequently ultimately dismissed all claims against the Federal Government and the private defendants on September 30, 2004. The sole basis of the appeal to the 10th Circuit Court of Appeals from the district court dismissal is the alleged Mercer falsification.

Summary of DOE Investigation

The report page in question does not seem to correspond to any published USGS or Mercer report or paper. Our investigation identified no published report that contains a substantially similar page. The reported upper value of transmissivity for the Magenta was shown as $40 \text{ ft}^2/\text{day}$ in the Geological Characterization Report (GCR; Powers et al., 1978; reprinted as Appendix GCR of the CCA) for the WIPP prepared by Sandia National Laboratories (SNL). This was later shown as $2 \text{ ft}^2/\text{day}$ in Mercer and Orr (1979). This is similar to the information in the document that was identified by Phillips. A summary of the data examined in the investigation of this discrepancy in Magenta transmissivity values is set forth below:

1. In April 1977, a bailing and recovery test was performed on the Magenta Member of the Rustler Formation in well H-3. At the time of the testing, an inflatable packer was placed in the well to separate the Magenta interval from the lower, more permeable, Culebra interval. Thirty bailing runs were made in the well, removing approximately 360 gallons of water and causing the water level to drop from only 405.1 to 411.1 ft below land surface. The water level was then monitored for 33 days, during which it rose to 401.3 ft below land surface. Later monitoring showed the Magenta water level to typically be at approximately 250 ft, whereas the water level in the lower Culebra interval was typically at approximately 405 ft. Given that all of the "Magenta" water levels measured at the time of the bailing test were typical of the Culebra, not the Magenta, we surmise that, in fact, the packer separating the Magenta from the Culebra was leaking during the test.

2. No analysis of data collected in April 1977 is documented in any USGS report. However, the GCR (Powers et al., 1978) states (p. 6-36) "Preliminary transmissivity values [for the Magenta] computed by Mercer and Orr (1978) range from $40 \text{ ft}^2/\text{d}$ to less than $1 \text{ ft}^2/\text{d}$." In the references section of that report, the Mercer and Orr (1978) report is identified as a preliminary report submitted by USGS to DOE. It appears to have been a draft version of the later Mercer and Orr

(1979) report, and may well be the report containing the page edited by Mercer. The published Mercer and Orr (1979) report, however, states (p. 174) "Preliminary values of transmissivity for the Magenta range from 2 ft²/day in H-3 to less than 1 ft²/day in H-1.", but provides no indication of the test from which the H-3 value was derived, or the method used for its derivation. The USGS files contain a hand-drawn semilog plot of the water-level recovery data following the bailing in April 1977, showing straight-line analysis of two segments of the data: the first day of recovery and the subsequent 32 days. From the data for the first day, a transmissivity of 45.44 ft²/day was inferred. From the data for the last 32 days, a transmissivity of 1.79 ft²/day was inferred. This plot may be the source of both the 40 ft²/day ascribed to Mercer and Orr (1978) and the 2 ft²/day published in Mercer and Orr (1979). In any case, given the anomalous water levels throughout the bailing and recovery test and the suspected connection to the Culebra, no reliable value of Magenta transmissivity could be inferred. Nor did the USGS ever intend this to be a definitive test—the purpose of bailing was to obtain data that would allow design of a proper hydraulic test.

3. The Mercer (1983) report gives a transmissivity value for the Magenta at H-3 of 0.1 ft²/day, with no indication of the source of the data. However, the USGS files contain full documentation of a slug test performed on the Magenta in H-3 in May 1979, and also contain a semilog plot of the test data with a type-curve match showing a transmissivity estimate of 0.12 ft²/day. This slug test provides, by far, the data most suited to a reliable analysis, and appears to be the source of the transmissivity value given in Mercer (1983). The Mercer (1983) report also presents Magenta transmissivity values from more wells (12) than had been tested at the time of the Mercer and Orr (1979) report, with a range from 4×10^{-3} to 375 ft²/day. Hence, far from concealing the "true" range of Magenta transmissivity values as alleged by Phillips, the USGS openly expanded the range as additional data became available.

4. Since the Mercer (1983) report, SNL has tested the Magenta in six additional wells, and also retested the Magenta at H-3 in 1989. From the tests in H-3, Beauheim et al. (1991) inferred Magenta transmissivity values between 0.14 and 0.18 ft²/day. The highest Magenta transmissivity measured by SNL on the WIPP site is 0.38 ft²/day (Beauheim and Ruskauff, 1998).

5. Mr. Mercer left the USGS in 1984 to take a job with SNL, where he is still employed.

6. The Culebra dolomite has been tested at all of the locations where the Magenta has been tested and at many additional locations, and is consistently found to be one or more orders of magnitude more permeable than the Magenta. Hence, the WIPP project has appropriately focused more attention on the characterization of the Culebra than on the Magenta.

References:

Beauheim, R.L., and G.J. Ruskauff. 1998. *Analysis of Hydraulic Tests of the Culebra and Magenta Dolomites and Dewey Lake Redbeds Conducted at the Waste Isolation Pilot Plant Site.* SAND98-0049. Albuquerque, NM: Sandia National Laboratories.

Beauheim, R.L., T.F. Dale, and J.F. Pickens. 1991. *Interpretations of Single-Well Hydraulic Tests of the Rustler Formation Conducted in the Vicinity of the Waste Isolation Pilot Plant Site, 1988-1989*. SAND89-0869. Albuquerque, NM: Sandia National Laboratories.

Mercer, J.W. 1983. *Geohydrology of the Proposed Waste Isolation Pilot Plant Site, Los Medaños Area, Southeastern New Mexico*. Water-Resources Investigations Report 83-4016. Albuquerque, NM: US Geological Survey.

Mercer, J.W., and B.R. Orr. 1979. *Interim Data Report on the Geohydrology of the Proposed Waste Isolation Pilot Plant Site, Southeast New Mexico*. Water-Resources Investigations Report 79-98. Albuquerque, NM: US Geological Survey.

Powers, D.W., S.J. Lambert, S.-E. Shaffer, L.R. Hill, and W.D. Weart, eds. 1978. *Geological Characterization Report, Waste Isolation Pilot Plant (WIPP) Site, Southeastern New Mexico*. SAND78-1596, Volume II. Albuquerque, NM: Sandia National Laboratories.