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NOVEMBER 30, 1998

U. S. Department of Energy
Weldon Spring Site Remedial Action Project
ATTN: Mr. Stephen H. McCracken
DOE Project Director
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St. Charles, MO 63304

SUBJECT: Contract No. DE-AC05-86OR21548
RESPONSES TO MDNR COMMENTS ON THE PILOT PUMPING TEST COMPLETION REPORT, REV. A

Attached, please find responses to comments provided by the Missouri Department of Natural Resources - Division of Geology and Land Survey on the draft *Completion Report for the Pilot Pumping Test for the Groundwater Operable Unit at the Weldon Spring Site*. The PMC appreciates the MDNR-DGLS's input on this document. Please forward these responses to Myrna Rueff, Geologist at the MDNR-DGLS. Attached is a draft letter for your use.

If you have any questions or comments, please contact Rebecca Cato at (314) 441-8086 extension 3507.

Sincerely,

Douglas E. Steffen
Project Director

DES/bc/cjt

Attachment as stated

cc: Pamela Thompson

DRAFT LETTER

SUBJECT: **Responses to MDNR Comments on Pilot Pumping Test Completion Report, Rev. A**

Attached please find responses to your comments on the draft *Completion Report for the Pilot Pumping Test for the Groundwater Operable Unit at the Weldon Spring Site*. The Department of Energy appreciates your input on this document.

If you have any questions or comments, please contact Karen Reed.

RESPONSES TO COMMENTS

1. Section 1, Introduction, paragraph 2. Diana Travis, MDNR, has made the comment previously that the maximum TCE concentration was 9,000 µg/l at Well 2038 during the 6/96 sampling event not 1,300 µg/l listed in this paragraph.

   The text has been revised to include the 9,000 µg/l TCE value reported at MW-2038. This value has not been duplicated in subsequent sampling events and, therefore, is suspect.

2. Section 3.2, Water Level Monitoring, paragraph 2, and Table 3-1. I do not see the point of monitoring the water level of the additional 12 wells only during the recovery period without obtaining the water levels before the pump test was initiated or during the pumping phase.

   Immediately after pumping, measuring the recovery to static conditions in wells with no previous water level data is a valid method to evaluate drawdown. This is often done at municipal wells and other intermittent fields. The information from these additional wells, as well as the long-term test comparisons, were used to evaluate the boundaries of dewatering.

3. Section 4.1.1, Stratigraphy, paragraph 1. The description of the strongly weathered subzone "vuggy, weakly cemented chert breccia with minor limestone fragments in a sandy, clay matrix...generally found at the top of the weathered unit but is discontinuous across the site: is similar to what is commonly identified as residuum. Is your strongly weathered subzone the same unit as residuum or are you considering them as distinctly different units?

   The strongly weathered unit is a subunit of the weathered Burlington-Keokuk Limestone, as discussed in the *Remedial Investigation* (July 1997). The description of the strongly weathered subunit is consistent with that provided by Mugel in the *Geohydrology of the Weldon Spring Ordnance Works, St. Charles County, Missouri* (USGS Report 96-4171). Typically, this subunit has been identified where weathering features are particularly abundant or intense in the weathered Burlington-Keokuk Limestone. The distinguishing characteristic of this unit is brecciated chert, which is not present in the residuum.

4. Section 5.1, Hydrogeology, paragraph 2. I believe a word is missing from the first sentence. Inserting the word "divide" after "groundwater" would made the sentence complete.

   Text has been revised.

5. Section 5.4.2, Area of Influence, paragraph 6. The total drawdown of MW-3027 is given as 0.5 ft. in this paragraph, but is indicated to be 1.5 ft. in paragraph 1 of this same section. Which is correct?

   If referencing the drawdown of 0.15 ft. discussed in paragraph 1 of this section, it was measured in MW-3027 during the long-term test after 10 days of pumping. The 0.15 ft. drawdown was used to evaluate analytical methods for the final pumping test data. The total drawdown in MW-3027 of 0.5 ft discussed in paragraph 6 was measured after 18 days of pumping.

6. Figure 5-5. The groundwater surface contours are presented in this figure in great detail with relatively few data points. Please explain how the contour were determined. Also, a large area of the hydraulic capture zone is depicted around MW-2035 with no data pints to support this interpretation. Please explain how this portion of the hydraulic capture zone was determined.

   The modeled groundwater surface depicted over the 2,500 ft. by 2,500 ft. area was constructed from static water level data measured in the 27 monitoring wells identified in Table 3-1 of the report. This surface was modeled using the spline algorithm in GIS, which is consistent with previously presented modeled groundwater surfaces. The detail is due to the use of a 1-ft contour interval.

   The hydraulic capture zone was generated by modeling the flow paths over the groundwater surface depicted in Figure 5-5. If the flow paths from an area converged at the pumping well, this area was included in the hydraulic capture zone. Since flow from MW-2035 is directed toward the pumping well, it is intuitive that the groundwater upgradient of this location would also be captured by this well.

7. Section 5.4.3, Aquifer Properties, Table 5-2 and paragraph 6. I only had time to review one of the reference, Boonstra and Boehmer (1986), on the fractured dike-aquifer analytical model. According to the authors, the model presented in this paper only considers dikes less than 10 m wide, which is considerably smaller than the effective width of 100 ft used in the analysis of the WSSRAP groundwater operable unit pump test.

   Subsequent references by Boonstra and Boehmer discussed in the document indicated that the solution is applicable to dike widths greater than 20 m. In the final version of this report, an effective width of 50 ft was used after further review of the geologic data from the area.

8. Section 8.2, Conclusions. Much of this report deals with the role of weathering of the upper Burlington-Keokuk bedrock. This needs to be emphasized in this section. In addition to stratigraphy and structure, the degree of solution weathering

of the Burlington-Keokuk Formation has significant influence on the permeability and direction of groundwater flow beneath the chemical plant.

Comment noted. Additional discussion has been incorporated into Section 8.

9. Section 8.2.2, Aquifer Test Analysis, bullet 1. Typographic error in the segment "shallow bedrock aquifer if semi-confined" should probably be written " shallow bedrock aquifer is semi-confined."

   Text has been revised.

10. Section 8.2.3, Aquifer Test Analysis, bullet 9. There are two possible typographical errors in the second sentence. Suggest changes: "characteristic on" to characteristic of" and "aquifer of" to "aquifer to."

    Text has been revised.

11. Section 8.3, Discussion, paragraph 2. I understand that the intent of this report is to deliver the pump test results to the Argonne National Laboratory. The process of "natural flushing" used at Oak Ridge U.S. DOE site may be appropriate, however, MDNR would be concerned if TCE cannot be contained on site at WSSRAP.

    Comment noted. As stated, the intent of this report was to present the results of the pilot-scale pumping test. Any decisions regarding the potential for remediation of the TCE impacted groundwater and methods that may be employed will be deferred to the *Proposed Plan*.