R-009-207.52

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REVIEW OF THE SOUTH PLUME GROUNDWATER SYSTEM DESIGN

08/26/92

OEPA/DOE-FN
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George V. Voinovich
Governor

August 26, 1992

Mr. Jack R. Craig
Project Manager
U.S. DOE FEMP
P.O. Box 398705
Cincinnati, Ohio 45239

Dear Mr. Craig:

Ohio EPA has reviewed the South Plume Groundwater System Design, Monitoring, and Evaluation Program Plan and comments are attached. If you have any questions please contact Tom Schneider or me.

Sincerely,

Graham E. Mitchell
Project Manager

GEM/yrc

cc: Jenifer Kwasniewski, DERR
Tom Schneider, DERR
Jim Saric, U.S. EPA
Dennis Carr, WEMCO
Lisa August, GeoTrans
Tom Hahne, PRC
Robert Owen, ODH

(FERMAINTT)
PARTIAL ACTION RESPONSE
to T-1928
(4720)

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ATTACHMENT - OHIO EPA COMMENTS

General Comment

1. Because many of the activities described in this document will be the responsibility of the new ERMC, Fluor Daniel, a statement acknowledging this should be included in the text.

Specific Comments

1. Page 1-2, line 30: Remove mercury from the list of contaminants associated with the PRRS.

2. Section 1.3, page 1-4, line 24: The Zone 1 plume is defined here by the extent of the 20 ug/l total uranium level, whereas page 1-3, line 12 and page 1-4, line 7 seem to define Zone 1 as the extent of the 30 ug/l total uranium level. This indirect discrepancy should be clarified.

3. Section 1.2, page 1-3, line 34: It should be clear that this is referring to a future document. Suggested language ... "but at a level that may be specified in the FEMP O.U. 5 Record of Decision (ROD) in August of 1995".

4. Section 1.3, page 1-4, lines 37 and 38: This sentence causes the reader confusion as the recovery wells are not located near the "source".

5. Section 1.4, page 1-5, line 17: "Volume I -- Operation Methodology" appears to be a relict of the prior draft.

6. Page 1-5, lines 27-30: The ground water model has never been properly calibrated nor has it ever been validated. The lines should be revised to read "The pump test data will be used to calibrate the model. Over time, field measurements will be obtained and compared to predicted values in order to validate the model.

7. Page 1-5, line 32: Change Validation to Calibration and Validation.

8. Page 1-5, line 35: Change Validation to Calibration.

9. Page 1-5, line 36: Change Recalibration to Validation. The activities which FEMP refers to as "Recalibration" are actually part of calibration. FEMP needs to develop a deliverable discussing activities performed to validate the model.

10. Page 1-5, line 32: Change Validation to Calibration.

11. Page 1-5, line 37: Change Validated to Calibrated.

12. Page 1-5, line 40: Add a step detailing how long term validation will be determined.

    It is clear from this report that DOE does not intend to properly validate the ground water model. Short term changes to make the ground waters model reflect observed data are part of model calibration not validation. Model validation is done by comparing obsesrved values against values which have been predicted by the model over a very long period of time. Validation is a dynamic process which corrects and adjusts the model over its useful life.

    DOE should incorporate this type of model validation in the work plan. Additionally, the wording of the entire work plan should be revised to reflect the true meaning of calibrate and validate in regard to the ground water model.

13. Section 2.1, page 2-6, line 17: It seems that runoff from the waste pits to Paddys Run should also be added as contributors to the south plume contamination.

14. Section 3.1.2, page 3-3, lines 31 and 32: How will vertical capture be defined?

15. Page 3-3, lines 12-13: Include a table with sampling results which show that the south plume is primarily at shallow depth.

16. Section 3.4, page 3-7, line 14: This report should be provided to U.S. EPA and Ohio EPA for <u>review</u> <u>and</u> <u>comment</u>. These comments will give DOE and contractors feedback prior to DOE submitting revisions to the operation, design, and monitoring plans.

17. Page 3-5, line 4: An additional monitoring well should be installed 90 degrees to the orientations of the other three monitoring wells to indicate he shape of the cone of influence and anisotropic characteristics of the hydraulic conductivity distribution. This will provide more representative data than one well, and will insure that this data will be obtained even if a problem develops with one of the wells.

18. Page 3-5, line 16: Revise line 16 to read "The other two observation wells will be at 90 ...".

19. Page 3-6, section 3.4: Incorporate these activities in the Model Calibration section (3.3) and change section 3.4 to Model Validation. This section should discuss DOE's plans for long term model validation.

20. Section 5.2, page 5-3, line 4: See comment #16.

21. Appendix A, section 1.3, lines 9 and 10: Results of the pump test will be used to set the initial recovery well pumping rates at the pre-validated, model-determined recovery well locations. Provisions are included for system redesign after the model determined recovery well system is constructed, tested and evaluated; however, what provisions are included to use the pump test results to initially "validate" the model. If the pump test results demonstrate that the model determined number and location of recovery wells is not adequate, it may be necessary to modify the system design prior to the construction of the remaining recovery wells.

22. Appendix A, section 2.3.1, tables 2-2 and 2-3, page [A] 2-7 and [A] 2-8: Well No. SPM-2006 is listed as both a primary well and a secondary well.

23. Appendix A, section 2.3.1, figure 2-2: Wells 3015, 2015, 2106, and 3106 are not visible.

24. Appendix A, section 2.3.1, page [A] 2-9, lines 4 and 5: See comment #21.

25. Appendix A, section 2.3.1, page [A] 2-9, lines 27-29: While an expected drawdown of 3-4 feet may be reasonable, this statement assumes similar hydrogeologic properties/materials in the vicinity of RW-4 to that of the Venice test well. This statement should, therefore, be qualified.

26. Appendix A, section 3.2, page [A} 3-2, lines 8-9: This sentence is misleading as it implies that the model is numerically correct. The model validation described only considers groundwater flow, not aqueous chemistry. Because previous invalidated model simulations were used to distribute the contaminants, and the model will be used to simulate the containment of this distribution, the model's "correctness" in simulating the Removal Action is limited by the assumptions and approximations inherent in the solute transport runs.

27. Appendix A, section 3.1, page [A] 3-1, lines 14-15: The validation should refer to the model application at the site, not the validation of the SWIFT III model. In other words, the text should read "validation of the site application using the SWIFT III model". It is important to remember, the numerical model is not being validated; but rather that the validation of the data set used to

represent the conceptual model of the site is what is sought.

28. Appendix A, section 3.3, page [A] 3-2, lines 30-32: Comparison of simulated steady-state conditions to the observed conditions of the five-well pumping program after the first quarter of pumping will not provide an accurate indication that the model is "validated" because the hydrogeologic system cannot be considered to be at steady-state before pumping begins or after the first quarter of pumping.

    Why is there no mention of an unsuccessful validation? Does not the discussion of model recalibration deserve attention here? Model calibration and validation are iterative, thus why be so presumptuous that the results will be successful? The tone of the test seems to imply that model recalibration may not be necessary. The additional data gained from the pump test should logically be included in a refined model calibration. It is not rational to simply assume that the model may be able to demonstrate some degree of validation because such limited field tests have been used to develop the current conceptual model. Thus with a model based on a very limited number of field tests in the region of concern, greater emphasis on refined calibration should be made. In reality won't the validation exercise simply serve to demonstrate to insensitivity of the model, rather than the validity? Furthermore, the current calibrated model is based on steady-state flow conditions, thus wouldn't it be more prudent to discuss the simulation of the pump test as a calibration exercise rather than validation? The storage effects (primarily porosity to represent drainable porosity) have neither been measured in the form of specific storage, nor have the parameters been effectively used in the 1986 or 1988 head calibration comparisons. In other words, how can one validate storativity when the existing model was never calibrated with regard to storativity?

29. Appendix A, section 3.3, page [A] 3-2, lines 15-16: The groundwater flow model of the site is not "embodied in the SWIFT III computer code," rather the conceptual model of the site is modeled by construction of data sets (i.e., the numerical model) and simulated using the SWIFT III computer code.

30. Appendix A, section 3.3, page [A] 3-2, line 19: It is inappropriate to conclude that water in the pump test will only be drawn from the top 35 feet of the saturated zone of

the aquifer. The MODFLOW model discretization is simply too coarse (2 layers, 35 and 120 feet) to develop such a conclusion.

31. Appendix A, section 3.3, page [A] 3-2, lines 23: Change "each days" to "each day".

    Also, this section reads as though MODFLOW were to be used in the validation. The SWIFT code typically refers to "blocks", not "cells". Also what about vertical plots, an option available in SWIFT maps, but not MODFLOW head save files? What are the unexpected boundaries and why would they be unrepresented in the model? Furthermore, the model is not "programmed", but rather "data sets should be developed".

32. Appendix A, section 3.3, page [A] 3-3, lines 12-13: The model user should save the simulated heads at monitor wells in the "well file" (____.WL). There is no need to save the entire matrix values for each time step at each block. The writer of this document is tainted by MODFLOW.

33. Appendix A, section 3.3, page [A] 3-3, lines 17-19: The issue of provisional model revision is conveniently slipped in here. What happened to the successful model validation? How can one define "significant differences" in step 5 when step 7 defines the calibration criteria? What determines validation criteria? If you can state calibration criteria, why not quantify what would determine validation criteria? Maybe the goal of validation is simply wishful thinking? More experienced modelers would probably not be so bold as to even attempt validation of a model where there simply are few, if any, meaningful pump tests from which the model was constructed.

34. Appendix A, section 3.3, page [A] 3-3, lines 28-29: What will the calibration criteria be? How will the calibration criteria for steady-state differ from the transient?

35. Appendix A, section 3.3, page [A] 3-3, lines 32-33: Do not perform visual comparisons, but rather create head difference of residual maps between the observed and simulated. This is best discussed in Section 3.4 and should be referenced here.

36. Appendix A, section 3.3, page [A] 3-3, lines 35-36: What is the justification for simply revising the storage values? What about the hydraulic conductivity? The storage values wil enter as the porosity. What about zonation of storage values? What about changes in boundary

conditions parameter such as leakage? What about the anisotropy ratio? The writer makes model calibration of a complex transient pump test seem so simple. It is suggested that this section at least mention the possibilities, rather than attempt to be so prescriptive.

37. Appendix A, section 3.3, page [A] 3-3, lines 38-39: What are the four cases? There are two sets of simulations - the transient pump test and the steady-state 5-well plan. Also, why are there expected conclusions? While additional field testing will almost always provide meaningful information to support the conceptual model development, why would one expect the model to be "validated" as originally calibrated, especially when the "validation" criteria are not yet defined? Don't develop the "validation" criteria after performing the "validation comparison". This is not acceptable.

38. Appendix A, page [A] 2-23, line 20: If 1200 gallons per minute (gpm) is theorized to be the optimum pumping rate for the pumping well, then add a fourth pumping rate of 1300 gpm, a fifth pumping rate of 1400 gpm and a sixth pumping rate of 1500 gpm to the step test. This will indicate if the 1200 gpm estimate is high or low compared to the actual capacity of the well.

39. Appendix A, page [A] 2-23, lines 28-34: The paragraph should be revised to state: "If the test is interrupted at any point so that the aquifer begins to recover, then the aquifer will be allowed to fully equilibrate and the pumping test will be repeated from the beginning (time=0).

40. Appendix A, page [A] 2-24, line 10: Should read "The maximum duration of a single test...".

41. Appendix A, page [A] 2-24, lines 17-28: The paragraph should be revised to state: "If the test is interrupted at any point so that the aquifer begins to recover, then the aquifer will be allowed to fully equilibrate and the pumping test will be repeated from the beginning (time=0).

The data which is obtained from this pump test is to be used in the calibration of the ground water model which is intended to predict ground water flow and transport characteristics for a very long period of time. Additionally, as stated in the work plan, the aquifer which has been affected is a very sensitive resource. As such, it is critical to maximize the accuracy of data when possible.

[redacted]

42. Appendix A, page [A] 3-3, line 37: An additional step should be inserted between items 9 and 10. This item should discuss validation of the ground water model over time.

43. Appendix A, page [A] 3-3, line 40: Should read "(1) the model's original calibration was correct, ...".

44. Appendix A, page [A] 3-4, lines 28-30: DOE should explain why kriging will be used over min curve.

45. Appendix A, attachment B, page [A] B-2: The rationale and purpose for implementing this procedure has not been stated in Appendix A. The coordination of this procedure with the rest of the procedures in the field test should be clarified.

46. Appendix A, attachment B: All of the procedures to implement this test are not included in this attachment, including: the collection of water level data utilizing the float/recorder and the transducer/data logger and the collection of head measurements to correlate with the transducer collected data.

47. Appendix B, section 1.3, page [B] 1-2, lines 25-26: This section should differentiate between system problems and system optimization as discussed in Section 5.3, page 5-3, of the DMEPP.

48. Page [B] 3-10, lines 26-37: Data should be displayed graphically in addition to statistics in order to visually display any possible trends.

yrc