Department of Energy

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12 FEB 2001

Mr. James A. Saric, Remedial Project Manager
U.S. Environmental Protection Agency
Region V, SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0333-01

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

RESPONSES TO THE OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE RESPONSE TO COMMENTS ON THE RE-INJECTION DEMONSTRATION TEST REPORT RtC

References:
1) Letter from T. Schneider to J. Reising, "Comments on Re-Injection Demonstration Report RtC," dated December 19, 2000

2) Letter from J. Reising to J. Saric and T. Schneider, "Responses to OEPA Comments on the Re-Injection Demonstration Test Report for the Aquifer Restoration and Wastewater Project," dated October 18, 2000

This correspondence submits the responses to the Ohio Environmental Protection Agency (OEPA) comments [Reference 1] on the Re-Injection Demonstration Test Report RtC Responses to Comments document [Reference 2] for the Aquifer Restoration and Wastewater Project for your review and approval. The responses were discussed with OEPA and their contractor HSI GeoTrans during a conference call on January 16, 2001.

Recycled and Recyclable

If you have any questions or concerns regarding these responses, please contact Robert Janke at (513) 648-3124.

Sincerely,

Johnny Reising

FEMP:R.J. Janke

Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosures

cc w/enclosures:
R. J. Janke, OH/FEMP
G. Jablonowski, USEPA-V, SRF-5J
V. Orr, OEPA-Columbus
T. Schneider, OEPA-Dayton (three copies of enclosures)
F. Bell, ATSDR
F. Hodge, Tetra Tech
M. Schupe, HSI GeoTrans
R. Vandegrift, ODH
AR Coordinator, Fluor Fernald, Inc./78

cc w/o enclosures:
K. Chaney, EM-31/CLOV
N. Hallein, EM-31/CLOV
A. Tanner, OH/FEMP
D. Carr, Fluor Fernald, Inc./2
D. Brettschneider, Fluor Fernald, Inc./52-5
K. Broberg, Fluor Fernald, Inc./52-5
T. Hagen, Fluor Fernald, Inc./65-2
W. Hertel, Fluor Fernald, Inc./52-5
S. Hinnefeld, Fluor Fernald, Inc./31
M. Jewett, Fluor Fernald, Inc./52-2
T. Walsh, Fluor Fernald, Inc./46
ECDC, Fluor Fernald, Inc./52-7

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RESPONSES TO OEPA COMMENTS ON THE RE-INJECTION DEMONSTRATION TEST REPORT RtC

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

FEBRUARY 2001

U.S. DEPARTMENT OF ENERGY

Attachment To: B-0670
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RESPONSES TO OEPA COMMENTS ON THE RE-INJECTION DEMONSTRATION TEST REPORT RtC

COMMENTS

1. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section #: Pg.#: Line #: Code: C
Original Comment #: 4

Comment: DOE proposes to interpret the anomalously high DO results obtained from the Hydrolab by applying a scaling factor that assumes the highest measured concentration represents 100 percent saturation. Inherent in this approach is the assumption that DO values cannot exceed 100 percent. The DO membrane uses the principal of reverse osmosis to determine the dissolved oxygen concentration of a water sample. Although not present in dissolved form, oxygen present in entrained air bubbles that contact the probe will also register a reading. Greater than 100 percent DO readings may, therefore, be measured. The handling and treatment of the groundwater prior to its re-injection would likely cause a significant amount of entrained air bubbles to occur in the re-injected water. The proposed scheme for correcting the data will, therefore, very likely produce even greater errors in the interpretation of the DO data. In situ water quality monitoring is an invaluable tool for understanding the effects of re-injection on the ambient groundwater conditions. Hopefully, future applications of tools such as the Hydrolab will be undertaken with greater regard to accurate calibration and operation.

Response: Ohio EPA raises three issues in their comment:

a) Greater than 100 percent DO readings may be measured
b) DOE's proposed scheme for correcting the data will very likely produce even greater errors in the interpretation of the DO data
c) Future applications of tools such as the Hydrolab should be undertaken with greater regard to accurate calibration and operation.

Each issue is discussed below.

a) DOE agrees, that should an entrained air bubble make it to the DO probe (25 feet away from the point of injection), it could register a reading on the DO probe. It can be added to the list of other possibilities that were presented for the greater than 100 percent readings: "poor calibration, improper fitting of the membrane on the probe, or membrane failure or fouling". However, the assumption that the true dissolved oxygen cannot exceed 100 percent is sound, and is demanded by the fundamental principles that underlie solution chemistry. At a given temperature and atmospheric O_2 pressure dissolved oxygen is fixed. You cannot have over 100 percent in solution. For surface water at 12 degrees Celsius this corresponds to a maximum 100 percent concentration of 10.8 mg/L. Therefore normalizing to a maximum dissolved oxygen number is required if solution chemistry is the topic.
b) The original comment asked if the greater than 100 percent saturation data should just be ignored, and if the DO data collected after January were more accurate than the data collected from the initial monitoring event after re-injection started. As stated in the previous comment response, the DO data were used to interpret trends or relative changes over time. The data collected were sufficient for this purpose and normalizing the dissolved oxygen results has no bearing on the trend. The methodology presented in DOE's comment response, for gaining a better

understanding of the accuracy of the data goes above and beyond the intended purpose of the data and attempts to address Ohio EPA's question. The methodology involved normalizing the data to 100 percent using a scaling factor. The adjusted DO concentrations were then compared to the expected DO concentration in surface water at atmospheric pressure and found to be higher than they should be. The cause for this is not known, be it an entrained air bubble or fouling of the filter, etc. DOE would welcome any suggestions Ohio EPA might have in further interpreting the data that would lead to more accurate results but reminds Ohio EPA that such refinement is not needed to meet the objective of the re-injection demonstration.

c) As mentioned in the previous comment response, administrative controls are in place concerning the calibration and operation of the probes. DOE is aware that DO probes are known to be quite sensitive. The probes would not have been deployed had they not passed calibration. Given the distance from the probes to the point of injection (approximately 25 feet) it is felt that most entrained air would have been released from the water prior to passing the probes, therefore the most likely cause for the suspect readings was membrane fouling.

Action: As discussed on the conference call on January 16, 2001, in the future DOE will assume the dissolved oxygen levels are at saturation (i.e., at 100 percent) when readings are greater than 100 percent saturation.

2. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section #: Pg #: Line #: Code: C
Original Comment #: 5

Comment: DOE contends that there has not been a redox shift at Well 32305. As a result, they indicate that there was no strong promotion of bacterial growth because relatively oxidized waters (injectate and aquifer) of similar Eh were mixing. The redox ranges that characterize the relative mobility of iron in the Great Miami are discussed in Section 4 of the report. Iron will be mobile as Fe+2 in the redox range of 75 - 200 mV and will be immobile as Fe+3 in groundwater with redox readings ranging from 300 - 450 mV. The redox data in Table 5-1 shows that the first few redox measurements in 32305 were in the range transitional between the mobile and immobile ranges. All measurements after November, 1999 are greater than 300 suggesting that a redox shift has, in fact, occurred. A Mann-Kendall trend test on the redox data verifies the presence of an increasing trend (p value of 0.03) in the redox data at a 95 percent confidence level. In contrast to IW-8 redox interpretation, the redox shift at IW-9 is more subtle but nonetheless clearly indicates that re-injection likely creates conditions that are conducive to new bacterial growth in some portions of the aquifer. Evidence for plugging at IW-9 was not observed during the re-injection demonstration period because the year long study period was not long enough to allow sufficient plugging to occur for the well to require treatment, given the more subtle contrast in the injectate and aquifer water chemistries.

Response: The use of the term "redox shift" was meant to indicate a major change in Eh conditions, going from negative to positive or positive to negative as presented in paragraph 2, page 5-7 of the Re-Injection Demonstration Test Report". As Ohio EPA points out, a statistical analysis conducted by them using data from Well 32305 indicates that, although a major shift in Eh is not indicated, a subtle change in Eh is. The impact of this subtle change is yet to be determined. Obviously the change was not large enough to produce a plugging problem in the closest re-injection well (IW-9) during the demonstration because IW-9 did not require any treatments for plugging. DOE will continue to monitor this subtle change as outlined in the most recent revision of the IEMP.

DOE is in agreement with the statement that re-injection creates conditions that are conductive to new bacterial growth in the aquifer. DOE was aware of this situation prior to the initiation of the one-year demonstration. The purpose of the demonstration was to determine if re-injection could be operated cost-effectively under these situations. DOE believes that it can, but acknowledges that plugging can become more of problem in the future. By continuing to monitor pH and Eh, DOE will be able to get a better understanding what subtle changes might be occurring in the aquifer over time due to the re-injection and the impact that these changes have on the aquifer.

Action: As stated in response.