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NAB LITTLE CREEK
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LETTER TRANSMITTING NAVY'S RESPONSES TO U S EPA REGION III'S COMMENTS ON IMPLEMENTATION PLAN FOR GROUNDWATER TREATABLE STUDY AT SITE 13 NAB LITTLE CREEK VA
7/31/2000
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July 31, 2000

Mr. Bruce Beach
US EPA Region III
1650 Arch Street
Philadelphia, PA 19103

Subject: Responses to Comments
Implementation Plan for the Groundwater Treatability Study at Site 13
NAB Little Creek, Virginia Beach, VA
N62470-95-D-6007, CTO 98

Dear Mr. Beach:

On behalf of the Navy, this letter provides responses to the comments that EPA had on the Draft Implementation Plan for the Groundwater Treatability Study at Site 13 at NAB Little Creek dated September 1999.

Comment 1. Page 1-1, Paragraph 2: The ORC should be placed in the unsaturated or fringe zone, the shallow saturated zone as well as the deeper or "lower portions" of the aquifer. The contaminant levels were highest in the shallow part of the aquifer. Also, in this paragraph, please add "aerobic" before the word enhancement and add "a 3-month long" before the word bench in the second line.

Response. That is the intent. The text in the introduction was in error and will be revised. The ORC will be injected from the top of the water table to the confining unit (approximately 6 feet bgs to 23 feet bgs). All requested changes will be made.

Comment 2. Page 1-1, Second Bullet: Please add "former" before the word unit in the second line.

Response. Agree.

Comment 3. Page 1-1, Section 1.1: This section should indicate the past tense, i.e. Site 13 formerly consisted of a dip .... Some indication of the removal action should be included at the end of this section as well as Section 1.3.3.

Response. Agree.

Comment 4. Page 1-3, Paragraph 3: Please change "this plume" to "these plumes" at the end of this paragraph.

Response. Agree.

Comment 5. Page 1-3, Section 1.3.2: The regulatory criteria for a "clean closure" of this unit should be referenced to residential soils not industrial. Also, indicate that the maximum concentration of PCP as reported in this section has been removed along with all soils above the water table at this unit. Make reference to the next section.

Response. The paragraph did not state and did not mean to imply that the industrial RBC was a "clean closure" criteria. Industrial soil RBCs would however be an applicable indicator of possible risk issues for Site 13, which is in an industrial setting. The paragraph will be revised to clarify this point.

Comment 6. Page 1-4, Section 1.3.3: Please indicate how much is "several" when referring to the soil removed below the water table. Also, please indicate that area where the soils were removed was repaved after backfilling with sand.

Response. Agree. The final report will also include a figure showing the depth of soil removal in each section of the excavation.

Comment 7. Page 2-1, Section 2.2: Please identify any risk numbers (RBCs in soil and tap water) for the intermediate breakdown products from aerobic degradation of PCP. Please discuss the potential risks from these breakdown products and the methods proposed to monitor for these compounds. Also, are there any studies that might indicate a nitrogen-limiting aerobic biodegradation of PCP.

Response. Section 2.2 lists the intermediate aerobic breakdown products of PCP. None of these compounds are listed in EPA region III RBC tables. Also, none are listed in EPA's IRIS and HEAST data bases. Because these breakdown products have fewer chlorides that PCP and because they are shortlived (they have not been found to accumulate in the environment at similar sites, it is assumed that the risk they pose is significantly less than PCP. (See Appendix A Section II.B)

These intermediate compounds are not on the TCL for semivolatile organics. As specified in Section 5, tentatively identified compounds will be listed on the analysis results and compared to the anticipated breakdown products for identification, however past research has indicated that these compounds have not been found to accumulate and are not likely to be detected (See Appendix A, Section II.B).

In the studies reviewed during the preparation of this work plan, no conclusive evidence has been found to indicate that nitrogen may be a limiting factor of aerobic PCP degradation at Site 13. In a series of bench-scale tests conducted by Vernalia et.al. on PCP-contaminated soil in 1997, side by side aerobic tests showed no significant difference in degradation rate between cells inoculated with fertilizer (10,000 mg/kg of TKN) and those not inoculated (200 mg/kg TKN). The bench-scale test conducted with the Site 13 soil by APC did not include nitrogen or phosphorous amendments. These tests showed complete removal of PCP.

Comment 8. Page 4-1: Discuss the expected DO concentration in groundwater from the application of the ORC especially in relation to solubility of oxygen in the groundwater at the site. Do you expect, at least in the early part of the study, to have excess oxygen released that may migrate into the soil gas and into the monitoring wells.

Response. ORC works by slowly releasing oxygen into the water in a dissolved form (i.e.: it does not bubble or fizz oxygen out in a gaseous form that then equilibrates into the groundwater and vadose zone). CH2M HILL's experience at two BTEX sites has shown that dissolved oxygen levels have been in the 2 to 3 mg/l level. A separate study conducted by IT and the Army COE on a BTEX plume recorded dissolved oxygen concentrations increasing from 0.3 mg/L before injection to a maximum of 1.6 mg/L during treatment. Regenesis has stated that they would not expect to see oxygen levels increase in the vadose zone. In fact that is one reason why Regenesis does not recommend using this product for treating contaminated soil in the vadose zone.

Comment 9. Page 5-1: Please discuss the potential usefulness of monitoring soil gas, especially for the volatilization of PCP, and identifying the degradation products such as carbon dioxide.

Response. Pentachlorophenol is a semivolatile with a vapor pressure of 1x10(-4) mm Hg. This is similar to PCBs and many PAHs such as fluorine and phenanthrene. Volatiles such as TCE and PCE have vapor pressures that are 5 orders of magnitude greater. Therefor we would not expect to see PCP volatilize. Also, for the reasons stated above under comment 8, the ORC would not be expected to provide any additional driving force for volatilization over current conditions. Carbon dioxide will be monitored for in the groundwater.

Comment 10. Page 5-1, Section 5.1 and Figure 5: Based on the water levels presented in Figure 2, groundwater should flow south-southwest from the former unit. However there is a component of westward flow that should not be missed. Figure 5 indicates only one monitoring well in the deeper portion of the unconfined aquifer (LS13-MW21D). Two additional deeper wells should be proposed, one each at LS13-MW22 and LS13-MW23. Also, consideration should be given for sampling monitoring wells LS-MW14, LS13-MW13S, and LS13-MW06S during the latter portion of the study to help determine the long-term effect of ORC enhancements.

Response. We believe that having six monitoring wells (three of them deep) along a 30-foot transect may not be warranted, particularly considering the fact that all data to date indicates that the upper portion of the aquifer has higher contaminant concentrations than the lower portion and that data from other wood treatment sites that used a diesel/PCP mixture show that the releases take the form of an LNAPL. However we do agree that EPA's concern over having only one deep well. As an alternative to EPA's comment, we

suggest installing three wells in the upper portion (5-15 feet) of the aquifer as currently planned and installing two wells in the lower portion (15-25 feet) of the aquifer. These two deep wells would be installed midway between proposed wells 21S and 22S and between 21S and 23S. These new wells would be designated 24D and 25D (well 21D would be dropped from the plan).

The duration of the pilot test under this plan is 39 weeks. The assumption is that after this time period we will have enough information to make a determination as to whether the technology is working or will not work and whether a larger application will be needed. These questions will be addressed in a feasibilty study. At that time consideration will certainly be given to monitoring the wells further downgradient in the plume However during the period of the test it is not likely that wells 13S, 14, and 06S will be impacted.

Comment 11. Page 5-2, Section 5.2 and Table 3: For base-line and study sampling, please discuss earlier results of sampling, especially for VOCs, inorganics, and any detection level problems for SVOCs. Please discuss what effect the ORC is expected to have on VOCs (if any) and inorganic concentrations in the affected zones. Explain why inorganics are not proposed for analysis. Nitrate analysis should be considered. Also, this may be a good section to discuss how the intermediates from aerobic degradation of PCP may be identified.

Response. No VOCs were detected in the two former wells near the dip tank excavation. Detection limits were 1 ug/l. A total of 8.8 ug/l were detected in well 3T (the downgradient well to be used in the test). This included 4.5 ug/l of cis-DCE and 4.3 ug/l of TCE. The increased dissolved oxygen would help to degrade the cis-DCE if it were to reach the well, and would likely not affect the TCE. The primary mass of VOCs is at well 11S (600ug/l), about 300 feet downgradient of the pilot study location. It is not expected that the test will increase dissolved oxygen concentrations that far away from the injection point.

Chlorinated VOCs (PCE, TCE, DCE and vinyl chloride will be added to the parameter list for well 3T and well 21S.

With the exception of dissolved iron, metals have only been sampled for in three wells at the site during the 1996 SRI. These are 9S, 10T, and 11S, located in the area where VOCs were found. The only dissolved metal found above tap water RBCs was manganese (844 ug/l). Dissolved iron concentrations were extremely low (100 ug/l) compared to total concentrations (approximately 100,000 ug/l) in these three wells. Dissolved iron detected near the former PCP tank ranged from 940 ug/l in Well 8S to 500 ug/l in Well 8D. Increasing dissolved oxygen in the aquifer would tend to desolubilize both manganese and iron as well as other common risk drivers such as arsenic.

While it is unlikely that the treatability test will affect metals concentrations in the groundwater to the extent that additional risks will be introduced to the site, dissolved and

total metals analyses will be added to four wells in the baseline round (1T, 21S, 24D, and 3T) and at least two wells in each intermediate and the final round (21S and 24D).

Comment 12. Page 5-4, Section 5.4: Please indicate where the assumptions come from and if there are conservative.

Response. The contaminant concentrations used for design came from real data over the past 4 years as is mentioned. While ORC treats the contaminants in the aqueous phase we used the maximum concentration for sorbed phase as is suggested by Regenesis (see technical bulletin 2.2.2.4 in Appendix B). Applying the maximum soil concentration throughouf the treatment area is a very conservative assumption, however we are trying to reduce the need of having to return for a repeat injection later on. The concentration of other oxygen-demanding factors such as dissolved iron and TOC are relatively low and would not expect to significantly increase the amount of oxygen needed.

The oxygen requirements for degrading PCP and TPH are based on straight stoichiometry and have been provided in Regenesis's technical papers (see 2.2.2.4 in Appendix B).

Comment 13. Page 5-5, Section 5.4: How was the maximum 7 pounds ORC/linear foot dosage determined?

Response. This maximum is based on the manufacture's (Regenesis's) experience with ORC slurry injection and the type of soil at the site (sand). Physical limitations of the injection tools and the properties of the slurry and aquifer material combine to limit injection quantities. The text will be revised to provide this backup.

Comment 14. Page 5-5, Section 5.5: In order to determine a more accurate groundwater velocity, should consideration be given to using a tracer, such a bromide?

Response. Given the simplicity of the site (a sand and silt aquifer of relatively shallow depth) we feel that standard calculations of average horizontal velocity using measured values of vertical gradients and hydraulic conductivity will provide adequately accurate velocity values and may possibly be more accurate than using tracers.

One problem with the use of tracers in this situation is that it is difficult to determine an average velocity vs. a maximum velocity. When the tracer first appears in the downgradient well, it may be a result of travel along a highly conductive preferred pathway and not indicative of the average conductivity across the depth of the aquifer. There is no way of telling when the average front of the tracer slug reaches the downgradient well, particularly when the well only has one screen (as opposed to a multilevel sampler).

Any insight that can be gained from the use of an added tracer may be achieved from the analysis of chloride ions. If the ORC works as expected, we will see an increase in chloride

in the nearby wells (e.g.: Well 21S). When we begin to see increases in chloride at the downgradient well (Well 3T) it will provide evidence that groundwater has traveled the distance between the wells.

Comment 15. Page 5-5, Section 5.6: Please consider providing the progress memos to Virginia and the EPA..

Response. Progress memos will be submitted to the members of the Little Creek Partnering Team.

Additional Proposed Change. In order to reduce the cost of ORC material, we propose to take advantage of the fact that the soil contamination at the site is highly variable with depth. TPH concentrations in the soil (the main driver of oxygen demand) are more than twice as high in the upper portion of the aquifer sediments (6-12 feet) than in the lower portion. The maximum detection at 10-12 feet was 39 mg/kg while at 18 feet it was below the 20 mg/kg detection limit.

The plan has been revised to propose an ORC application rate of 3.1 lbs per linear foot from a depth of 15 to 23 feet (bottom eight feet) and a rate of 6.3 lbs per linear foot from 15 to 6 feet (top nine feet). This will reduce the ORC requirements from 1,820 lbs to 1,385 lbs. This will reduce project costs by approximately $5,000.

Please let me know if these responses address your concerns. Upon your approval of these responses we will update and distribute the Final Implementation Plan for the Treatabilty Test .

Sincerely,

CH2M HILL

Scott J. MacEwen, P.E.
Activity Manager

Document1

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