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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

APR 16 1993

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CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Ms. Linda Berry
Department of the Navy - Atlantic Division
Naval Facilities Engineering Command
Code 1822
Norfolk, Virginia 23511-6287

RE: Marine Corps Base Camp Lejeune NPL Site
HPIA Shallow Aquifer
Jacksonville, North Carolina

Dear Ms. Berry:

EPA has reviewed the document titled "Draft Treatbility Study Report for the Shallow Aquifer at the Hadnot Point Industrial Area Operable Unit". Comments on the draft document are enclosed. In addition, all issues raised in the March 23, 1993 meeting in Raleigh, NC must also be addressed in preparing the Final Report.

If you have any questions or comments, please call me at (404) 347-3016.

Sincerely,

Michelle M. Glenn
Senior Project Manager

Enclosure

cc: Peter Burger, NCDEHNR
Neal Paul, MCB Camp Lejeune

COMMENTS
DRAFT TREATABILITY STUDY REPORT

IN GENERAL:

The bench-scale and pilot tests were conducted on ground water samples that contained contaminant levels 3 orders of magnitude lower than samples collected in the field, January 1991. Proof should be provided that the treatment system as designed will remediate ground water samples that are contaminated at levels that approach the concentrations of the January 1991 sampling results.

The purpose of the aquifer test as stated on page 3-6 was to determine surficial aquifer properties and to select appropriate pumping rates of the extraction wells and optimal well locations. Due to well construction, well development, or the location of the recovery well, the data obtained is not representative of aquifer properties for the Hadnot Point Industrial Area (HPIA) and cannot be used to design the extraction system.

Previous studies conducted by the USGS estimate the hydraulic conductivity of the surficial aquifer to be approximately 50 ft/d. An aquifer test was not conducted, so this value was based on the lithologic composition of the aquifer. The value calculated from the February 2 aquifer test data was 1.6 ft/d which is much lower than expected for the type of sediment present at HPIA. The value obtained through aquifer test results may represent the hydraulic properties of a clay lense within the aquifer, but does not represent the hydraulic properties of the surficial aquifer for the area of HPIA.

A potential problem that may have caused low yields during the test may be lack of recovery well development. The treatability study (page 4-14) states that the recovery well was developed by removing 150 gallons (5 to 6 well volumes). Removing 5 to 6 well volumes is purging the well. Removing this amount of water will not develop the well properly. Proper development involves overpumping and surging. Improperly developed wells will not free fine grain sediments surrounding the well bore which prevents maximum ground water flow into the well.

Another factor that may have caused low yields during the aquifer test could be the lithology the recovery well penetrates. This zone consists of 15 feet of silt and clay according to the lithologic logs provided in Appendix L. This zone has a low permeability relative to surrounding areas and is not representative of the lithology (silty sand) of the surficial aquifer in the HPIA area. The recovery well should be properly developed. If the well continues to provide low production rates, the well should be abandoned and a recovery well at a new location should be used for conducting the aquifer test. Before the aquifer test is conducted, a step drawdown test should be performed. If yields greater than 5 gpm cannot be obtained then this well should not be used, and another location should be selected for conducting the test.

The recovery well diameter is 6 inches according to the Remedial Design and the Treatability Study. However, according to the well construction description in Appendix L, the diameter is 4 inches. Appendix A of the RD applies a recovery well diameter of 3 inches in calculations of hydraulic properties. This discrepancy should be corrected.

COMMENTS

1. A monitor well location map should accompany this document. The map should show the locations of all the monitor wells that have been installed at the site.

2. A justification should be presented for conducting the oil and grease treatability study. No data are presented in the Draft Treatability Study Report that indicate elevated levels of oil and grease in groundwater at the HPIA. Furthermore, the January 1991 analytical data that is used as the basis for characterizing groundwater quality at HPIA does not include an analysis for oil and grease. Monitoring data should be presented that demonstrate the magnitude and cause of any oil and grease contamination at HPIA.

3. The Draft Treatability Study Report concludes in Section 6 that chemical treatment for metals removal is not necessary. No data are presented that indicate that simple settling in the oil/water separator will reduce the concentrations of metals to required action levels and to levels that will ensure efficient operation of the air stripper. Therefore, the use of flocculants should be considered prior to air stripping to improve settling of metal-bearing particulates.

4. Groundwater elevation data for the period prior to initiation of the aquifer test should be included. This information is necessary to assess the controls on groundwater flow in the site vicinity such as recharge and discharge areas, the pumping of water supply wells in the area and any tidal influences caused by the nearby New River.

5. The very low flow rate of 1.5 gallons per minute (gpm) and the small cone of depression achieved during the aquifer test conducted in 1993 indicate that the aquifer test may have been improperly designed. Therefore, the aquifer test results should be considered suspect. Possible causes of the low flow rates include screen installation in a horizon with insufficient permeability and poor well construction. For example, the pumping well RW-1 is screened in the lower portion of the surficial aquifer where the lithology is described in boring logs as silt and clay. However, the upper portion of the surficial aquifer is described as sand and, would therefore, likely yield higher flow rates.

6. The Draft Treatability Study Report should address air emissions produced by the air stripper. This should include an analysis of the regulatory requirements for air emissions and how these emissions will be treated if treatment is required.

7. The settling of suspended solids will produce metal-bearing waste sludge. The Draft Treatability Study Report should describe how the waste sludge will be disposed.

8. The raw aquifer test data is included in the appendices, but none of this data is summarized in graphs of time versus drawdown or time versus recovery. Such graphs should be included in the Draft Treatability Study Report in order to permit verification of the aquifer test results.

9. The table of contents indicates that Section 3.3, Monitoring Results, begins on page 3-1. This important section was apparently omitted since the section "Regional Hydrogeology" begins on page 3-1, and there is no Section 3.3. The section on monitoring results should be included.

SPECIFIC COMMENTS

1. Page 1-4, Section 1.2, Paragraph 3 - The Draft Treatability Study Report presents analytical data from the January 1991 groundwater sampling round as being representative of the shallow aquifer water quality at the HPIA. The use of the January 1991 data set for the treatability studies is a poor choice since, according to the Draft Treatability Study Report documentation, "the compound concentrations from the January 1991 data were generally lower than the earlier studies." Data that represents the worst-case scenario should be used as a basis for the treatability

studies in order to test the treatment systems at the maximum concentrations that may be encountered. The use of data from the January 1991 data set is inappropriate since this data does not represent worst-case conditions.

The text states that "this data is similar to the results of the earlier studies with the exception that the compound concentrations from the January 1991 data were generally lower than the concentrations identified in the earlier studies." Summaries of the previous groundwater analytical data should be included in order to show the variation in concentrations over time. An explanation for these variations should be presented.

2. Page 3-1, Section 2.2, Paragraph 2 - The aquifer test results should be considered as suspect because of the very low flow rates and small cone of depression that were achieved during the test (see General Comment No. 5).

3. Page 3-2, Section 3.2, Paragraph 5 - Selected aquifer characteristics values resulting from the aquifer test conducted in 1988 are presented. The aquifer test design and test parameters should also be included in order to allow a more complete assessment of the results.

4. Page 3-7 - Distance/Drawdown curves and calculations used to determine the radius of influence for the extraction wells should be provided for review. Using the Theis equation to calculate the radius of influence for the surficial aquifer will produce questionable results since the equation assumes a confined aquifer.

   The design of the treatment system is focused on contaminated ground water of the surficial aquifer. The maximum amount of ground water that can be treated is 160 gpm which is probably over the maximum amount the extraction well field will produce from the surficial aquifer. It would be cost effective to design a treatment system that will accommodate the production rate necessary to remediate the Castle Hayne Aquifer. To estimate total ground water that must be extracted from each aquifer and the number, depth, and location of the wells, a ground water model such as Well Head Protection Area or the Aquifer Simulation Model could be utilized to design the extraction system and estimate the total yield necessary to remediate both aquifers simultaneously.

5. Page 4-1 - The location of the recovery wells should be repositioned in each plume once valid hydraulic data is obtained and accurate values for the radius of influence are calculated. The most down gradient extraction wells should be positioned on the plume boundary so that once the wells are pumped, the down gradient extent of contamination will be captured (i.e., if the radius of influence is 200 feet, the wells should be positioned 200 feet from the edge of the plume.) Also, the wells should be spaced so that the capture zones for each well slightly overlap.

   Page 4-1 - The text states that the wells shown on Drawings C-2 and C-3 are oriented perpendicular to the hydraulic gradient at the leading edge of the plume. However, recovery wells positioned in the north plume are positioned in hot spot areas of the plume close to the 900 buildings. According to past ground water samples, the leading edge of the plume (north plume) is close to the area of Birch Street (approximately 1800 feet south of proposed well locations). It is recommended that the first batch of recovery wells be installed in this area to prevent the plume from migrating further down gradient.

6. Page 4-4, Table 4-2 - The table presents the analyses conducted on groundwater that were used in the bench scale treatability tests. The table does not include volatile organic compounds (VOCs), yet VOCs were detected in high concentrations in groundwater. Therefore, the bench scale treatability tests could not have evaluated the effectiveness of VOC removal.

7. Page 4-7, Section 4.2.1.3, Paragraph 1 - Provide the composition of the cationic and anionic polymers.

8. Page 4-12, Section 4.3.1.1 - Same as Specific Comment No. 2.

9. Page 4-19, Section 4.3.1.1.3 - The results of the step drawdown test and the well development records should have been used to calculate the optimum discharge for the constant rate test. The flow rate variation of 0.6 - 1.6 gpm is large for a poorly recharging aquifer. Hence, the results derived from the constant rate test can only be considered as approximate.

10. Page 4-25, Section 4.3.2 - The release of fuels to groundwater has been documented at the HPIA. For example, 15 feet of free product was measured in monitor wells at

the Hadnot Point Fuel Farm during the Remedial Investigation (RI). Therefore, the sampling parameters chosen for the pilot-scale treatability study should have included the semivolatile organic compounds that were detected in groundwater during the RI.

11. Page 5-1, Section 5.1.1, Paragraph 2 - Simple settling should not be the only method for reducing total suspended solids (TSS). Chemical treatment should also be conducted in order to improve the speed and efficiency of the TSS reduction process.

    The quantity and chemical composition of the sludge have not been addressed. The sludge produced by the treatment process should be analyzed to determine the proper disposal method, and the sludge volume should be estimated. The sludge generation rate will depend upon the suspended solid concentrations and quantity of chemical polymers added to the process. Sludge analysis and sludge volume should be addressed in the Draft Treatability Study Report.

12. Page 5-6, Section 5.1.1.2, Paragraph 4 - The text states that "at this time, it is believed that oil/water separation will be the only pretreatment required for HPIA groundwater." This statement is incorrect because the metals that are present in the groundwater in high concentrations will reduce the air stripper efficiency. Chemical treatment is necessary to reduce metal concentrations prior to further treatment.

13. Page 5-11, Section 5.2.1.2, Paragraph 3 - The treatability results for metals presented in Section 5.0 indicate that in some of the sampling rounds the concentrations of iron and lead in the air stripper effluent were as much as four times greater than concentrations in the air stripper influent. In addition, metals concentrations in some samples taken after carbon filter treatment were as much as four times higher than samples taken prior to carbon treatment. These increases after carbon filtering occurred in chromium, iron, managanes and nickel. Metals would not be expected to increase after air stripper and carbon adsorption treatment; therefore, this should be explained.

14. Page 5-29, Section 5.2.1.3, Paragraph 1 - The text states that "the estimated average T and S values are 5.25 x 10^{-2} and 1.54 x 10^{-2} [gallons/day/foot] gal/day/ft, respectively." These values should be checked for accuracy since S is dimensionless and has no units and the value for

T should be expressed in units of either gallons/day/foot or area per unit time. Furthermore, if either of these values is intended to represent the transmissivity of the shallow aquifer in gallons/day/foot, both should be considered highly suspect. Assuming an aquifer thickness of 25 feet, then a transmissivity of 5.25×10^{-2} gallons/day/foot yields the hydraulic conductivity (k) value equal to 9.9×10^{-8} centimeters/second (cm/sec). A transmissivity of 1.54×10^{-2} gallons/day/foot yields the k value equal to 2.9×10^{-8} cm/sec. According to Fetter (1988) values for k in this range are representative of clay confining units, not aquifers.

15. Page 6.3, Section 6.2, Paragraph 4 - The second recommendation suggests using only the conventional oil/water separator to remove oil and grease and suspended solids. This recommendation is not valid since the groundwater contains metals. Pretreatment for metals reduction is necessary to achieve greater metal removal efficiency and to maximize VOC removal by the air stripper and carbon adsorption units.