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NAVY ENVIRONMENTAL HEALTH CENTER ENVIRONMENTAL PROGRAMS DIRECTORATE

Work Plan Review

Location: Camp Lejeune, North Carolina

Command: Marine Corps Base Camp Lejeune

Site: Site 89

Work Description: Engineering Evaluation/Cost Analysis Field Investigation

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GENERAL SERVICES ADMINISTRATION

Enclosure (1)

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**MEDICAL REVIEW OF THE
DRAFT ENGINEERING EVALUATION/COST ANALYSIS
FIELD INVESTIGATION WORK PLAN
SITE 89, OPERABLE UNIT NO. 16
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

Draft of 10-18-00

- Ref: (a) Risk Assessment Guidance for Superfund, Volume I, Part A: Human Health Evaluation Manual, December 1989 (EPA/540/1-89/002)
(b) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, October 1988 (EPA/540/G-89/004)

General Comments:

1. The document entitled "Draft Engineering Evaluation/Cost Analysis Field Investigation Work Plan Site 89, Operable Unit No. 16, Marine Corps Base, Camp Lejeune, North Carolina," dated August 2000 was provided to the Navy Environmental Health Center for review on 6 September 2000. The document was prepared for the Atlantic Division, Naval Facilities Engineering Command by Baker Environmental, Inc., Coraopolis, Pennsylvania.
2. We feel that the "Field Investigation Work Plan" is well-thought out and reads well. We agree with installing an intermediate monitoring well (MW) in the approximate center of the source zone, immediately above a semi-confining layer. Our main concern is the potential for continued migration of the chlorinated hydrocarbon groundwater plumes through the semi-confining layer of the upper portion of the Castle Hayne Aquifer (e.g., safety and integrity of the water supply wells). We believe that it would be beneficial to use a groundwater model (that is, developed for Camp Lejeune) to predict whether Site 89 contaminants will be within the influence of the drinking water supply wells. The precautions taken to prevent the enhancement of groundwater migration within the various source areas during the field investigations should be addressed in greater detail.
3. We also suggest that chemical oxidation should be considered for review as one of the technologies to aid in the remediation of groundwater, if feasible.
4. We are available to assist with any other human health risk assessment and risk communication needs you may have.

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Specific Comments and Recommendations:

1. Pages 2-1, 2-2, Section 2.1, "Site Background"
Pages 2-2 - 2-4, Section 2.2, "Current Site Conceptual Model"

Comments:

a. Both the Acronym and Abbreviations list and Sections 2-1 and 2-2 of the document refer to 1,1,2,2-tetrachloroethane as "1122-TCA" and 1,1,2-tetrachloroethane as "112-TCA." These nomenclature should be rechecked and corrected, as necessary. It is not clear whether "112-TCA" actually is 1,1,1,2-tetrachloroethane or 1,1,2-trichloroethane. It is customary to refer to trichloroethene as "TCE" and trichloroethane as "TCA." The acronyms/abbreviations for tetrachloroethene and tetrachloroethane are "PCE" and "PCA," respectively (that is, the "P" stands for "poly").

b. Although the acronym "PCA" also is mentioned in the text on page 2-3, it is not listed in the Acronym and Abbreviations Section.

Recommendation: Correct the "1,1,2-tetrachloroethane" nomenclature in the Acronym and Abbreviations list and the text. Provide the CAS Number and chemical formulas for each compound, as feasible. List "PCA" in the Acronym and Abbreviations Section. State whether "PCA" and "1,1,2,2-TCA" both refer to 1,1,2,2-tetrachloroethane.

2. Pages 2-1, 2-2, Section 2.1, "Site Background"

Comments:

a. Page 2-1 states that significantly increasing concentrations of 1122-TCA at well MW02 (located adjacent to, and west of the former underground storage tank (UST)) lead to additional investigations that focused on the former fuel bladder storage area and heavy vehicle maintenance and storage area. The southern portion of the Defense Reutilization Marketing Office (DRMO) (that is, Site 89) is the focus of the current time-critical removal action (TCRA) for Site 89 vadose zone soils and the follow-on Engineering Evaluation/Cost Analysis (EE/CA). Edwards Creek is located to the south and west of Site 89.

b. The findings from previous investigations, including the Remedial Investigation (RI), immediate response activities, and the soil delineation activities, determined that chemicals including 1122-TCA, tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride exceeded screening criteria in soil, groundwater, surface water, and sediment. The findings also indicated that a contaminant source zone was present below the water table, and was, in part, in the form of a dense, non-aqueous phase liquid (DNAPL). The purpose of the field investigation is to fill in the data gaps in the site characterization required for identifying, screening, and analyzing remedial action alternatives. The objective of the work plan is to identify and detail the EE/CA field investigation reporting tasks.

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c. Baker conducted a pre-construction soil delineation in March 2000.

Recommendations:

a. Discuss the petroleum products and waste products previously stored, used, or disposed of on-site.

b. Discuss the environmental degradation products of the various chlorinated hydrocarbons present and consider including them as chemicals of potential concern (COPCs), as applicable.

c. Explain use of the term "pre-construction."

3. Pages 2-2 - 2-4, Section 2.2, "Current Site Conceptual Model"

Comments:

a. Page 2-2 states that the current site conceptual model (SCM) describes conditions related to stratigraphy, hydrogeology, and the nature and extent of contamination.

b. Page 2-3 states that "The data collected to date suggest that there are multiple soil contaminant plumes. In the former vehicle maintenance and storage area, a substantial 1122-TCA soil plume appears to be relatively young and has been superimposed on an older TCE/petroleum soil plume."

c. The report does not contain a site conceptual model (SCM) to include both current and future potential exposure pathways applicable for this site. This would help to identify the potential residual risks remaining from migration of site-related chemicals to various media to include nearby surface waters, etc.

Recommendations:

a. Identify potential sources for the chlorinated hydrocarbons detected in soil samples. Indicate if an on-going spill/leak is suspected for causing the substantially large "relatively young" 1122-TCA soil contamination.

b. Include a SCM that depicts both the current and the future potentially complete exposure pathways.

4. Pages 2-2 - 2-4, Section 2.2, "Current Site Conceptual Model"

Comments:

a. Page 2-3 refers to "soil contaminant plumes." The term "plumes" is usually associated with groundwater contamination.

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b. Page 2-3 gives the concentrations of chlorinated solvents in the vadose zone soil in the units of parts per billion (ppb). Although it is customary to provide groundwater concentrations of chemicals in either units of micrograms per liter (ug/l) or ppb, soil concentrations usually are reported in milligrams per kilogram (mg/kg) or parts per million (ppm). Both the United States Environmental Protection Agency (U.S. EPA) Region III Risk-Based Screening (RBC) Tables and the Region IX Preliminary Remediation Goals (PRG) Tables used for soil screening purposes follow this convention.

Recommendation: Clarify use of the phrase "soil contaminant plumes." Consider reporting the concentrations of chemicals detected in soil in mg/kg.

5. Pages 3-1 - 3-3, Section 3.3, "Field Investigation"

Comments:

a. Page 3-1 states that there are three primary data gaps:

- An undelineated source zone below the water table, including DNAPI.
- Insufficient stratigraphic characterization in and around the former vehicle maintenance and storage area source zone, particularly potential DNAPL vertical flow barriers.
- Insufficient data regarding groundwater contamination within the source zone and immediately downgradient of the source area.

b. Page 3-2 states that a soil and groundwater investigation program has been designed to fill these data gaps through the use of soil borings and permanent MWs. About 20 direct push soil borings will be advanced until the source area has been vertically delineated (that is, about 20 feet (ft)). Soil borings outside the source zone may be up to about 40 ft for stratigraphic characterization.

c. A Geoprobe or Stratoprobe rig equipped with a Membrane Interface Probe (MIP) and a soil electrical conductivity probe will be used to advance borings and collect data. The probe pair, run in tandem, will produce real-time vertical profiles of stratigraphy and contaminant distribution on closely-spaced intervals. Up to 25 auger borings will be advanced to verify MIP/conductivity probe results and define DNAPL vertical and horizontal extent. Continuous split-spoon samples will be collected from these borings at locations selected based on the results of the direct push borings.

d. The effectiveness of the MIP/conductivity probe will be closely monitored and evaluated during the first few days of field operations. Up to three soil samples will be collected from each boring for laboratory analysis to identify the contaminants present and assess whether DNAPL also is present (that is, target compound list (TCL) volatile organic compounds (VOCs)). Selected samples will be analyzed for total organic carbon (TOC), grain size, and synthetic precipitation leaching procedure (SPLP).

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e. The analytical data will be input into a computer program called "NAPLANAL," which partitions contaminant concentration into water, soil, and NAPL based on certain aquifer matrix and contaminant characteristics.

f. Two permanent MW clusters will be installed to address the groundwater data gap. Each cluster will contain one Type II shallow MW (that is, about 15 ft deep) and one intermediate Type II MW (about 40-ft deep). One cluster will be placed in the approximate center of the source zone, the other directly downgradient of the source area. The shallow MW will be installed in the surficial aquifer and will intersect the water table. The intermediate MW will be installed in the upper portion of the Castle Hayne aquifer, immediately above a semi-confining layer (that is, observed at about 40 ft below ground surface (bgs)).

g. As stated above under "General Comments," the potential for continued migration of the chlorinated hydrocarbon groundwater plumes through the semi-confining layer of the upper portion of the Castle Hayne Aquifer (e.g., safety and integrity of the water supply wells) is not addressed.

Recommendation: Address the potential for continued migration of the chlorinated hydrocarbon groundwater plumes through the semi-confining layer of the upper portion of the Castle Hayne Aquifer (e.g., safety and integrity of the water supply wells). Discuss the precautions taken to prevent the enhancement of groundwater migration within the various source areas during the field investigations. Address the distance to the nearest supply well used for drinking water purposes and provide a site map that depicts their locations in relation to Site 89, as applicable. Consider using a groundwater model developed for Camp Lejeune to predict whether Site 89 contaminants will be within the influence of the drinking water supply wells.

6. Table 7-1, "Summary of Sampling and Analytical Objectives"

Comments:

a. Table 7 does not include metals analysis for Site 89 soils and groundwater, except for investigative-derived waste (IDW) testing purposes. Waste petroleum products, such as, waste oils, frequently contained metals in addition to chlorinated hydrocarbons. Because of this, it may be appropriate to also sample for metals in subsurface soils and groundwater.

b. Table 7-1 indicates a 21-day laboratory turn-around time for groundwater analysis for volatile organics. The document should state what the acceptable turn-around time is for the "Encore" sampler method/contract laboratory program (CLP) requirements.

Recommendations:

a. Consider sampling for metals for Site 89 subsurface soils and groundwater.

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b. Discuss the "Encore" sampler method/CLP turn-around time requirements for volatile organic compounds (VOCs).

7. Pages 6-2 - 6-3, Section 6.1.2, "Soil Sample Laboratory Submission Procedures" Appendix A, "Soil Sample Acquisition"

Comments:

a. Page 6-2 briefly discusses the procedure for using the Encore Sampler for collecting volatile organic analysis (VOA) samples for laboratory analysis after split-spoon soil sample collection. The reader is referred to Appendix A for more information.

b. Page 5 of Appendix A provides additional details for collecting split-spoon soil samples, to include obtaining composite soil samples for environmental analysis. Although the previous paragraph on page 5 states that "Soil samples for volatile organic compounds should not be mixed," the text further states that a slightly modified approach is used for collecting composite soil samples. This procedure involves placing the individual discrete soil samples from the desired sample interval into a stainless-steel bowl and covering the bowl with aluminum foil between samples to minimize volatile loss. No mention is made of the preference for sample compositing in the laboratory.

c. The procedure for obtaining composite samples for volatile organic compound (VOC) analysis also is discussed. Page 5 further states "In the event that a composite sample is required, care should be taken to obtain a representative sampling of each sample interval." We are concerned with taking composite samples in place of individual discrete samples from the desired soil intervals when obtaining data for use in human health risk assessments (IHRAs).

d. Page 8 of Appendix A states that "When a representative composite sample is to be prepared (e.g., samples taken from a grided area or from several different depths), it is best to composite individual samples in the laboratory where they can be more precisely composited on a weight or volume basis. If this is not possible....the individual samples should be placed in a stainless steel bucket."

e. In general, we believe that the laboratory data obtained from analyzing composite samples may indicate that the analyte concentrations are below the regulatory standard and lead to false, less conservative, assumptions. Because of the difficulty with obtaining uniform mixing and the potential for "diluting" the highest concentrations (that is, obtaining an inaccurate maximum (and minimum) detect value), we prefer taking discrete soil samples instead of composites. This is especially true for soil sampling for VOC analysis.

f. The portions of the document that refer to soil sampling for composites/VOC analysis are somewhat confusing and contradictory and should be rewritten. Appendix A

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does not include the actual United States Environmental Protection Agency (U.S. EPA)-approved "Encore Sampler" method.

Recommendations:

- a. Take discrete soil samples instead of composites when obtaining data for use in HHRAs.
- b. Rewrite and clearly explain the soil sampling procedure to follow for taking composite soil samples and/or for taking samples for VOC analysis (Appendix A).
- c. Include in Appendix A the U.S. EPA-approved "Encore Sampler" method in its entirety.
- d. Ensure that the soil sampling procedures provided in Appendix A agree with the information provided in the text concerning taking soil samples for environmental analysis.

7. Appendix A, "Soil Sample Acquisition"

Comments:

- a. Page 8, Section 5.2, of Appendix A is entitled "Surface Soil Samples." The first paragraph classifies surface soils as soils between the ground surface and 6 to 12 inches below the ground surface (bgs). The following paragraph discusses using a soil auger for taking deep samples (greater than 12 inches).
- b. Elsewhere in the text it states that this field investigation does not include sampling surface soils, as sufficient data already exists from previous investigations.

Recommendation: Ensure that the information provided in Appendix A agrees with the information provided in the text concerning taking surface soil samples. Consider renaming this section "Subsurface Soil Samples."

8. Page 6-1, Section 6.0, "Investigative Procedures"
Pages 6.6 - 6-8, Section 6.4, "Groundwater Sample Collection"
Appendix B, "Groundwater Sample Acquisition"

Comments:

- a. Page 6-1 states that the investigative procedures used for Site 89 comply with the field methods described in the U.S. EPA, Region IV, Environmental Services Division (ESD), Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECBSOPQAM), May 1996.

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b. Page 6-6 states that VOC loss through suction degassing is expected to be insignificant due to the very slow flow rates to be used. The procedure to be followed for collecting groundwater samples is detailed in Section 6.4. However, neither the subject of sampling for VOCs nor the use of a bailer is addressed in this section.

c. The groundwater sampling information given in Appendix B does not refer to the low flow groundwater sampling procedure discussed on page 6-6. Page 9 of Appendix B states that "The preferred method for collecting volatile organic samples and the accepted method by EPA Regions I through IV is with a bailer."

d. Page 7, Section 5.3, "Evacuation of Static Water (Purging)" of Appendix B discusses the drawbacks in using bailers to sample groundwater. One of the limitations listed on this page is "Collection and transfer of sample may cause aeration."

Recommendations:

a. Consider including the U. S. EPA Region IV procedure for low flow groundwater sampling in Appendix B.

b. Discuss the groundwater sampling procedures to be followed for VOC sampling in Section 6.4 and Appendix B, as applicable.

c. Ensure that the groundwater sampling procedures provided in Appendix B agree with the information given in Section 6.4.

d. Consider the drawbacks associated with use of bailers when sampling for VOCs for use in IHRAs.