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**DEPARTMENT OF THE NAVY**
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From: Commanding Officer, Navy Environmental Health Center
To: Commanding Officer, Atlantic Division, Naval Facilities Engineering Command, ATTN: Katherine Landman, 1510 Gilbert Street, Norfolk, VA 23511-2699

Subj: MEDICAL REVIEW OF INSTALLATION RESTORATION PROGRAM DOCUMENTS FOR MARINE CORPS BASE, CAMP LEJEUNE, NC

Ref: (a) Baker Environmental, Inc. transmittal ltr of 29 Jun 95

Encl: (1) Medical review of Draft Remedial Investigation Report for Operable Unit No. 8 (Site 16), Marine Corps Base, Camp Lejeune, NC
(2) Medical/Health Comments Survey

1. As you requested in reference (a), we completed a medical review of the "Draft Remedial Investigation Report for Operable Unit No. 8 (Site 16), Marine Corps Base, Camp Lejeune, North Carolina." The attached comments are included for your information as enclosure (1).

2. Please complete and return enclosure (2). Your comments are needed to continually improve our services to you.

3. The points of contact for this review are Mr. Kenneth G. Astley and Mr. David McConaughy, Health Risk Assessment Department, Environmental Programs. If you would like to discuss this medical review or if you desire further technical assistance, please call them at (804) 444-7575 or DSN 564-7575, extensions 377 and 434, respectively.

A. F. JONES
By direction

## MEDICAL REVIEW OF REMEDIAL INVESTIGATION DOCUMENT

Ref: (a) Risk Assessment Guidance for Superfund, Vol. 1, Part A: Human Health Evaluation Manual, Dec 1989 (EPA 540/1-89/002)
(b) Phone Conversation with Kevin Koporec, U. S. Environmental Protection Agency (EPA) Region IV, Atlanta GA of 21 August 1995
(c) U. S. EPA Region III Technical Guidance on Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening, January 1993

**General Comments**:

1. The draft document entitled "Draft Remedial Investigation Report Operable Unit No. 8 (Site 16) Marine Corps Base, Camp Lejeune, North Carolina," dated June 1995 was provided to the Navy Environmental Health Center for review on 5 July 1995. The report was prepared for Atlantic Division, Naval Facilities Engineering Command by Baker Environmental, Inc.

**Review Comments and Recommendations**:

1. Page ES-2, "Remedial Investigation Activities"

Comment: The text on page ES-2 states that a total of 32 surface soil samples were collected at "ground surface to one foot below ground surface (bgs)." The collection of soil surface samples at 0 to 12 inches is inconsistent with Environmental Protection Agency (EPA) guidance such as reference (a) which defines surface soil samples from depths of 0 to 6 inches and the Agency for Toxic Substance Disease Registry's (ATSDR) *Public Health Assessment Guidance Manual* (1994) which defines surface soil as soil samples from depths of 0 to 3 inches.

Recommendation: To facilitate correlation between Public Health Assessments and Health Risk Assessments and to minimize costs associated with redundant sample collection and analysis, we recommend the adoption of "0 to 3 inches" as the norm for surface soil sample collection for any future site soil sampling investigations and/or monitoring efforts that may be undertaken. The adoption of this sampling protocol will not be in controversy with current EPA guidance because reference (a) does direct that surface soil samples should be collected "from the shallowest depth that can be practically obtained" to accurately reflect potential surface soil exposure pathways.

2. Page 4-1, Section 4.1, "Data Management and Tracking"

Comment: The text states "Data may be qualified as estimated for several reasons, including an accedence of holding times, high or low surrogate recovery, or intra-sample variability. In addition, values may be assigned an estimate "J" qualifier if the reported value is below the Contract Required Detection Limit or the Contract Required Quantitation Limit (CRQL)." The text further states "Compounds which were not detected and had inaccurate or

imprecise quantitation limits were assigned the 'UJ" qualifier." Reference (a) recommends the use of one-half the sample quantitation limit (SQL) as a proxy concentration for non-detects if there is reason to believe that the chemical is present at a concentration that is below the SQL.

Recommendation: When it is appropriate to use substitute values for non-detects, use one-half the SQL. If SQLs cannot be obtained, then consider using one-half the CRQLs, Maximum Detection Limits, or instrument detection limits, in that order, with caution.

3. Page 4-7, Section 4.4.1.1, "Surface Soil"
Table 4-5, "Summary Of Site Contamination"

Comment: The text states on page 4-7 concerning surface soil contaminants that "Bis(2-ethylhexyl)phthalate was detected in 6 of the 29 samples at concentrations ranging from 37J ug/kg [micrograms per kilogram] (16-SDA-SB02) to 490 ug/kg (16-DB-SB16)." Table 4-5 indicates that bis(2-ethylhexyl)phthalate was detected in a range of 37J ug/kg to 49 ug/kg. The information given in the text on page 4-7 conflicts with the information contained in table 4-5.

Recommendation: The information given in the text on page 4-7 conflicts with the information contained in table 4-5 and should be revised.

4. Page 4-9, Section 4.4.2.1, "Round One"
Table 4-5, "Summary Of Site Contamination"

Comment: The text states on page 4-9 concerning groundwater contaminants that "Only iron, at a concentration of 300 ug/L [micrograms per liter], was detected above the State and/or Federal standards." Table 4-5 indicates that iron was detected at a concentration of 712 ug/L. The information given in the text on page 4-9 conflicts with the information contained in table 4-5.

Recommendation: The information given in the text on page 4-9 conflicts with the information contained in table 4-5 and should be revised.

5. Page 6-3, Section 6.2.1.4, "Risk-Based Concentrations"

Comments:

a. Risk-based contaminants of potential concern (COPC) screening concentrations were derived by the U. S. EPA Region III in 1993 to support the selection of COPC based on toxicity and potential exposure routes. Use of the screening concentration provies an absolute comparison of potential risks associated with the presence of a COPC in a given medium, such as residential soil. The COPC values for potentially non-carcinogenic chemicals were derived individually based on a target hazard quotient (HQ) of **0.1** (The report suggests use of a HQ of 1.0 as criteria for selecting COPCs). The values from the screening tables should be updated by

incorporating information from another set of U. S. EPA Region III tables containing Risk-Based Concentrations (RBCs) that are issued on a quarterly basis.

b. Reference (b) recommends the use of the guidelines outlined in reference (c) to select COPC for Marine Corps Base Camp Lejeune Remedial Investigation sites in conjunction with use of the most recent U. S. EPA RBC Tables.

Recommendation: Consideration should be given to using the methods outlined by U. S. EPA Region III to select the COPCs for use in the human health risk assessment.

6. Page 6-9, Section 6.2.2.4, "Surface Water"
   Table 4-5, "Summary Of Site Contamination"

Comment: The text states on page 6-9 concerning surface water contaminates that "4-Methyl-2-pentanone was detected at a frequency of one in five samples at 6.4 ug/L." Table 4-5 indicates that in surface water 4-Methyl-2-pentanone was detected at a concentration of 7J ug/L. The information given in the text on page 6-9 conflicts with the information contained in table 4-5.

Recommendation: The information given in the text on page 6-9 concerning 4-Methyl-2-pentanone conflicts with the information contained in table 4-5 and should be revised.

7. Page 6-8, Section 6.2.2.2, "Subsurface Soil"
   Page 6-11, Section 6.3.2.2, "Subsurface Soil"
   Page 6-11, Section 6.3.2.4, "Surface Water/Sediment"
   Page 7-18, Section 7.6.1, "Surface Water and Sediment Exposure Pathway"

Comments:

a. The text states in section 6.2.2.2 that there were no contaminants retained as COPC in subsurface soil. The text in section 6.3.2.2 states "Subsurface soil is available for contact only during excavation activities, so potential exposure to subsurface soil is limited to construction workers. Exposure pathways involving ingestion and dermal contact are evaluated for future construction workers only." The reason for concern with subsurface soil should be further explained since no COPC were found in subsurface soil. The potential exposure of construction workers to surface soil was not addressed.

b. The text states in section 6.3.2.4 "Access to surface water at Site 16 is limited to a short stretch of the bank bordering Northeast Creek. It is possible that surface water recreational facilities may be expanded for future residents. Surface water and sediment exposure pathways include ingestion and dermal contact. Exposure is evaluated for future residential children and adults." Section 7.6.1 of the text states "Aquatic receptors are exposed to contaminants in the surface water and sediment by ingesting water while feeding and by direct contact while feeding

or swimming. In addition, aquatic organisms may ingest other aquatic flora and fauna that have bioaccumulated chemicals from the surface water and sediment. This exposure pathway is likely to occur at Site 16 and is retained for further analysis." The aquatic organism ingestion hazard to recreational fishermen was not discussed in the text.

Recommendations:

a. The text should discuss in more detail the reason for concern with construction workers exposure to subsurface soil instead of surface soil.

b. The aquatic organism ingestion hazard to recreational fishermen should be discussed in the text.

c. If a decision is made to conduct an aquatic organism tissue study, we recommend that you consult the document entitled, EPA-503/8-89-002, "Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish," September 1988. This document states, "Stratification by size is extremely important. The size classes of each species selected for analysis should be representative of those likely to be consumed by the potentially exposed human population."

d. The ATSDR published a guidance manual entitled "Environmental Data Needed for Public Health Assessments," dated June 1994. Although not a regulatory document, you may wish to consider their guidance. Under a section entitled "Food-Chain Exposure Pathway," the guidance recommends that when biota studies are performed:

(1) A sample size of at least 20 individuals per species, per episode, is desirable.

(2) Analyze only edible portions.

(3) Analysis of individual ("grab") rather than composite samples.

(4) Use a control population of at least 20 individuals from a comparable uncontaminated location, for determining background levels.

(5) Attach a copy of protocol used, including how each species was harvested; how representative samples were selected; what portions were sampled and analyzed; special specimen handling procedures; identify contaminants analyzed for; methods used; and their detection limits, etc..

8. Page 6-12, Section 6.3.3, "Quantification Of Exposure"

Comments:

a. The text states "Because all data sets originate from a skewed underlying distribution, log normal distribution is used to represent all relevant media. This ensures conservative CDI [chronic daily intake] calculations." The EPA supplemental risk assessment guidance (1992) indicates that a single number used to represent the health risk to an individual or population may hamper the risk manager's ability to make an informed risk decision. In essence, the guidance states that the risk estimates for both the upper bound reasonable maximum exposure (RME) and average case should be presented. We fully endorse the EPA's guidance for calculating quantitative risk estimates for the average as well as the RME case.

b. In addition, we question the use of the geometric mean versus the arithmetic mean used for the exposure calculations. At many site the contamination is not evenly distributed and areas of hot spots are identified. The EPA's guidance suggests that a separate risk assessment must be calculated if the hot spot is assumed to be visited more frequently than the other areas in the same medium. The geometric mean of a set of sampling results may be much lower than the calculated arithmetic mean. Although the geometric mean is a convenient parameter for describing central tendencies of log normal distributions, we do not feel that it is an appropriate basis for estimating the concentration term used in contamination exposure assessments.

Recommendation: Future remedial investigations should consider providing quantitative risk estimates for the average as well as the upper bound estimate using the 95% Upper Confidence Level (UCL) of the arithmetic mean concentration for the RME case rather than the 95% UCL of the geometric mean for the data quantitation term or, provide additional justification for the use of the geometric mean data.

9. Table 6-21, "Toxicity Factors"

Comment: The text indicated that the arsenic oral cancer slope factor, according to the Integrated Risk Information System (IRIS), was 1.7E+00. The IRIS indicated as of August 1995 that the slope factor was 1.5E+00. The text information on the arsenic cancer slope factor did not conform to the latest suggested protection level.

Recommendation: The text information on the arsenic cancer slope factor should conform to the latest update to IRIS.