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29 AUG 1995

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. 11 (Site 7), 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. 11 (Site 7), 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 Ms. Katharine Kurtz or 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 490 and 434, respectively.

A. F. JONES
By direction

MEDICAL REVIEW OF INSTALLATION RESTORATION DOCUMENT

Ref: (a) Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, June 1988 (NEESA 20.2-047B)
(b) Risk Assessment Guidance for Superfund, Vol. 1, Part A: Human Health Evaluation Manual, Dec 1989 (EPA 540/1-89/002)
(c) Phone Conversation with Kevin Koporec, U. S. EPA Region IV, Atlanta GA of 21 August 1995
(d) USEPA 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. 11 (Site 7), Marine Corps Base, Camp Lejeune, North Carolina," (Report Volume I and Appendices Volumes I and II), dated 29 June 1995, was provided to the Navy Environmental Health Center (NAVENVIRHLTHCEN) for review on 5 July 1995. The draft Remedial Investigation (RI) report was prepared for the Atlantic Division, Naval Facilities Engineering Command by Baker Environmental, Inc. Our comments and recommendations are provided below.

2. We have a serious question concerning the validity of the Baseline Risk Assessment conclusions based on the questionable information provided in Section 6.0. This section of the document repeatedly refers to Site 16. This RI is for Site 7 (OU # 11). It is impossible to know whether this is a typographical error or whether the data presented pertains to Site 16 instead of Site 7.

Review Comments and Recommendations:

1. Page ES-3, "Remedial Investigation Activities"
Page 2-3, Section 2.2.1.1, "Quality Assurance and Quality Control"
Page 4-7, Section 4.4, "Analytical Results"

Comments:

a. The report indicates two different levels of Quality Control (QC) were used to support the Data Quality Objectives (DQO) of the RI. Reference (a) discusses QC levels available as analytical options. These levels are based on the type of site to be investigated, the level of accuracy and precision required for the data, and its intended use. Level D (Level IV) QC is required for sites that are on, or about to be on, the National Priorities List (NPL). (Camp Lejeune was placed on the NPL on 4 October 1989). The laboratory that performs Level D QC must use the Contract Laboratory Program (CLP) methods and must be able to generate the CLP data package. (For both Level D and Level C QC, analysis of the U. S. Navy audit and

performance sample is required in addition to any sample specified by the EPA Superfund Program). Level C (Level III) allows the use of non-CLP methods.

b. The Executive Summary states that the majority of the samples were analyzed by CLP methods, using Level III DQOs. The Quality Assurance/Quality Control (QA/QC) section of the document states that Level IV (Level D) DQOs were implemented for the surface soil field QA/QC samples.

Recommendation: Consideration should be given to stipulating Level D DQO for all future analytical needs. Clarify the Level of DQO used throughout the RI. Use of the term "majority" is ambiguous whereas providing the applicable percentage would be clearer.

2. Page ES-5, "Groundwater"
   Page ES-6, "Human Health Risk Assessment"

Comment: One portion of the text states that the elevated (unfiltered) levels of metals in groundwater that exceed either federal and/or state criteria are aluminum, chromium, iron and lead. Another portion of the report indicates that only iron, chromium, and lead exceed either federal or state groundwater criteria.

Recommendation: Clarify which metals exceed the criteria.

3. Table 1-1, "Previous Investigation Detected Contaminants in Soil"

Comment: 4,4'-DDT is not listed as a detected contaminant, although 4,4'-DDD (a close analog of DDT) was detected in both surface (zero to two feet) and subsurface (three to twelve feet) soil. 4,4'-DDE was detected in surface soil. Another section of the text reports that the maximum pesticide level detected in the surface soil is for 4,4'-DDT (280 ug/kg), which is reported to be one of the most prevalent pesticides found in both surface and subsurface soils.

Recommendation: Verify that DDT was not detected in previous soil investigations at Site 7.

4. Table 1-1, "Previous Investigation Detected Contaminants in Soil"

Comment: The text describes the surface soil investigations conducted at Site 7. The sample depth from which surface soil samples were collected is listed as zero to twelve inches. Table 1-1 reports zero to two feet as surface soil. Reference (b) defines "surface soil" samples as samples taken from depths of zero to six inches. The *ATSDR Public Health Assessment Guidance Manual* (1994) (Agency for Toxic Substance and Disease Registry) defines "surface soil" samples as soil samples collected from depths of zero to three inches below ground surface (bgs), and "subsurface soil" samples are defined as samples taken at depths greater than three

inches. The text should discuss the use of other regional guidance that may have precedence, if applicable.

Recommendation: We are encouraging the adoption of "zero to three inches" as the norm for surface soil sample collection for any future site soil sampling investigation and/or monitoring efforts that may be undertaken. The adoption of this sampling protocol will not be in controversy with current U. S. EPA guidance because reference (b) 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.

5. Page 2-1, Section 2.0, "Field Investigation"

Comment: This section of the report indicates that the investigative procedures and methodologies for the RI conducted at Site 7 are discussed in detail in the Field Sampling and Analysis Plan (FSAP) for Operable Unit (OU) # 8 (Baker 1994). A copy of this FSAP was not included with the review documents provided. This information would be useful to review, especially in regard to the forthcoming U. S. EPA Region IV groundwater low flow purging technique used to sample the five permanent monitoring wells (a bailer technique was used to sample the temporary monitoring wells).

Recommendation: Either provide a copy of the FSAP for OU # 8 or provide more information concerning the field sampling and analysis methodologies used in the RI for OU # 11 (Site 7) currently under review.

6. Page 2-6, Section 2.3, "Groundwater Investigation"
Pages 4-3 - 4-5, Section 4.2.2.2, "Groundwater"
Appendix G, "Baker's Evaluation of Metals in Groundwater"

Comments:

a. We would like to comment that the sampling method used to sample the potential site-related contaminants in groundwater must be the same as the method used to sample the groundwater to determine the site-related background levels if comparison to background is used to select Chemicals of Potential Concern (COPCs).

b. The text should address how the different sampling methods (such as low-flow techniques and bailer methods) affected the analytical results, particularly if the background groundwater sampling method did not use the low flow sampling technique.

c. The report also should describe the sampling methods in greater detail. The text indicates the use of a 0.45-micron filter in the field to remove small particles of silt and clay that otherwise would be dissolved during sample preservation. The text does not specify whether this filter was used to sample for filtered and/or unfiltered samples.

Recommendations:

a. Ensure that background monitoring well sampling data (including data from base-wide background groundwater monitoring investigations) be used for comparison purposes to select Site 7 COPCs only if the sampling method employed to determine background levels is the same as used in the site investigation (e.g., low flow sampling technique).

b. Provide more detailed information concerning the sampling procedures (or a copy of the FSAP) and the possible effect of the different procedures used on the data obtained (e.g., reference (b) indicates that use of a 0.45 micron filter may screen out some potentially mobile particulates to which contaminants are absorbed and thus under-represent contaminant concentrations).

7. Page 2-9, Section 2.6.1, "Benthic Macroinvertebrate Investigation"
Page 2-10, Section 2.6.2, "Fish Investigation"

Comment:

a. Specific details concerning the benthic macro invertebrate sampling and analysis are not included in the report. The text refers the reader to the FSAP for additional information. "Larger fish" were not collected at the mouth of the Western tributary at Northeast Creek, although an attempt was made to catch "larger fish" by using a hoop net. No size descriptions, species of fish/shellfish or distinctive eating habits of the consuming population were identified in the Human Health Risk Assessment (HHRA).

b. Bottom feeding species may have contaminant body burdens that are high relative to other fish species of similar lipid content and size. Certain pesticides found on site (e.g., dieldrin) are reported to bioaccumulate in fish; therefore, low concentrations of these analytes in sediment and surface water may still yield high fish tissue concentrations.

c. ATSDR published a guidance manual entitled *Environmental Data Needed for Public Health Assessments* dated June 1994. 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) Analyze 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 the protocol used, including how each species was harvested; how representative samples were selected; what portions were sampled and tested; special specimen handling procedures; identification of contaminants analyzed for; and, methods used and their detection limits.

d. ATSDR also stresses that the population(s) consuming/harvesting the fish be considered when conducting the HHRA (e.g., ethnic populations, fish preparation methods, recreational or subsistence fisher persons, amount consumed, etc.).

e. Another useful document to consult prior to performing any additional biota sampling is entitled *Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish* (EPA-503/8-89-002), dated September 1988. This document stresses that stratification by size is extremely important. The EPA document also indicates that the class size of each species selected for analysis should be representative of those likely to be consumed by the potentially exposed human population.

Recommendation:

a. Consider performing additional biota sampling of the surface water bodies that potentially could be impacted by site contamination. Consult the ATSDR and U. S. EPA documents suggested here for procedural guidance.

b. Discuss the fish, crabs and other shellfish that are harvested recreationally at this site. State whether or not these pathways should be included in current and future recreational adult ingestion exposure scenarios. If applicable, individual risks from the consumption of fish, crab or other shellfish should be calculated.

c. We are available to review any work plans that discuss future sampling of fish to determine potential site-related impact on human health and evaluate possible need for continued monitoring due to contaminate fate and transport.

8. Figure 2-1, "Soil Sampling Locations"
Page 3-7 and 3-8, Section 3.6, "Land Use Demographics"
Table 3-4, "Land Utilization: Developed Areas Acres/Land Use"

Comments:

a. The text indicates that a portion of the 36,086 military personnel and dependents that reside in base housing at Camp Lejeune live at the 428 acres Tarawa Terrace family housing

complex. Site 7 (Tarawa Terrace Dump) is located south/southwest of the 70 housing units. (The exact distance is not provided in the text). Open recreational areas and a Community Center are mentioned briefly. Table 3-4 Lists Tarawa Terrace I and II with 553 acres (428 of which are designated as family housing). The Tarawa Terrace Dump is located northeast of the Water Treatment Plant.

b. The report should provide more information concerning potential sensitive sub-populations and identify what daily routines and recreational activities would have the potential to cause exposure to site-related contaminants. Exposure scenarios involving civilian workers should be included, if appropriate.

c. Activities such as hunting and fishing should be described and evaluated for possible inclusion as potential exposure routes (e.g., food chain) in the HHRA.

d. With the proximity of State Route 24 and the three surface water bodies to Site 7, we feel that the accessibility of the site to trespassers should be described in terms of potential exposure assessment (the text states that public access is not restricted).

e. Figure 2-1 depicts a playground in close proximity to Building # TT44. This building is not identified either in the figure legend or in the accompanying text. (This building may be the Community Center, as the soil samples pulled from this area have the letters "CC" in their identification code). The text does not specifically describe sampling the playground area. The symbol designating a monitoring well location appears next to the playground area; however, this monitoring well is not identified numerically.

Recommendations:

a. Provide detailed information concerning possible transport mechanisms that could cause sensitive sub-populations, base civilian and military personnel (residents and non-residents), and potential trespassers to be exposed to site-related contaminants.

b. Discuss sampling results in regard to the playground soil (Samples # 07-CC-SB01 and # 07-CC-SB-02) and any monitoring well located in the vicinity of the playground. Properly identify all buildings depicted on site figures/maps of the area.

9. Pages 3.3 and 3-4, Section 3.4, "Hydrogeology"
Table 3-6, "Summary of Water Supply Wells Within a One-Mile Radius of Site 7"
Figure 3-10, "Water Supply Well Locations - Site 7"

Comments:

a. The current groundwater pathway scenario was eliminated based on the premise that shallow groundwater currently is not used as a potable source. For the future scenario, shallow

groundwater data were used to calculate the risk. Deep groundwater potential contamination (Castle Hayne Aquifer) was not evaluated as part of this investigation (Site 7). However, six potable supply wells were identified as located within a one-mile radius of Site 7 (Castle Hayne Aquifer).

b. Hydrogeological data indicates that recharge to the drinking water aquifer (Castle Hayne Aquifer) is directly related to the amount of recharge it receives from the surficial aquifer. Both the surficial and the Castle Hayne Aquifer are classified as suitable for drinking in their natural state. Therefore, we feel that a discussion should be presented concerning the potential for migration of chemicals from the shallow aquifer to the deep aquifer. The impact of these data uncertainties on the risk calculations should be presented. The report should indicate if deep groundwater aquifer sampling is planned as part of future investigations.

Recommendation: Based on the potential for chemical migration, consideration should be given to sampling the deep groundwater aquifer and presenting risk data, as appropriate.

10. Page 4-1, Section 4.1, "Data Management and Tracking"
Appendix K, "QA/QC Summaries"
Page 6-10, Section 6.2.2.6, "Tributary Surface Water"

Comments:

a. The text indicates that the "B" CLP data qualifier used in the RI identifies a compound that was detected in the method blank associated with the sample. The text indicates that "B" qualified data were not used in the risk assessment (e.g., bis(2-ethylhexyl)phthalate). According to reference (a), "B" qualified data should be included in the quantitative risk assessment.

b. All tables (e.g., Appendices J and K) do not provide explanations for data qualifiers used. We feel that tables should be treated as stand alone documents and that all information for the interpretation of data should be annotated in the table.

Recommendations:

a. Consider inclusion of "B" qualified data in the quantitative risk assessment for Site 7.

b. Provide descriptions of all data qualifiers used in the reports. Exhibit 5-4 of reference (b) lists Contract Laboratory Program (CLP) data qualifiers and their potential use in quantitative risk assessments.

11. Page 4-1, Section 4.1, "Data Management and Tracking"
Appendix B, "Sample Documentation"

Comments:

a. The text discusses "the primary importance" of the management and tracking of data from the time of field collection to receipt of validated electronic analytical results.

b. The laboratory personnel authorized to receive samples for analysis should sign and date the chain-of-custody forms provided. The chain-of-custody forms in Appendix B were not signed by the laboratory personnel (or dated). Internal Tracking Forms (Appendix B.2) were provided. These forms list the date individual samples were shipped and the date the samples were received by the laboratory, with the sample turn-around time provided. The majority of the soil boring samples took approximately two months to be received by the laboratory from the date shipped.

c. Although it would appear that holding times were exceeded, the text did not address this issue (e.g., reference (a) lists 14 days as the volatiles analysis holding time for soil samples). In several instances, the report stated that samples were sent to the laboratory for analysis by Federal Express to ensure overnight receipt of samples.

d. According to reference (a), the preservation method for soil/sediment samples is maintenance of samples at 4°C +/- 2°C until analysis. It is unlikely that the soil samples met this sample preservation criteria.

Recommendations:

a. Discuss the effect of the sample turn around times in terms of the validity of the data used in the HHRA.

b. Ensure that chain-of-custody forms are signed and dated by designated laboratory personnel for all future laboratory analysis and that copies are provided in the RI report.

12. Pages 4-6, 4-7, Section 4.3, "State and Federal Criteria and Standards"
Page 6-3, Section 6.2.1.4, "Risk-Based Concentrations"
Pages 6-6 - 6-11, Section 6.2.2, "Selection of Contaminants of Potential Concern"
Appendix L, "COPC Worksheets"

Comment:

a. Risk-based COPC screening concentrations were derived by the U. S. EPA Region III in 1993 to support the selection of COPCs based on toxicity and potential exposure routes. Use

of the screening concentration provides an absolute comparison of potential risks associated with the presence of a COPC in a given medium, such as residential soil. 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 (e.g., March 1995).

b. U. S. EPA Region IV (reference (c)) recommends use of the guidelines outlined in reference (d) to select COPCs for Marine Corps Base (MCB) Camp Lejeune RI Sites in conjunction with use of the most recent U. S. EPA RBC Tables (e.g., dated March 7, 1995).

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

13. Page 4-11, Section 4.4.5, "Quality Assurance/Quality Control"
Figure 2-2, "Tarawa Terrace Dump"

Comment:

a. The text indicates that chloroform, pentachlorophenol and bis(2-ethylhexyl)phthalate were detected in a field sample (7-FB01) collected from the fire hydrant at the Tarawa Terrace Wastewater Treatment Plant. This potable water source reportedly is used for decontamination of heavy equipment. Levels of inorganics also were reported in the sample. The text does not provide the concentrations of these contaminants nor does it discuss any rationale for their detection in this sample.

b. Figure 2-2 depicts the close proximity of the Wastewater Treatment Plant to the test pits. The RI report does not describe the National Pollutant Discharge Elimination System (NPDES) effluents from the site that may affect or be affected by the surrounding area.

c. Identification of the effluent streams and information concerning the plant's compliance history would be useful to this RI.

Recommendation: Consideration should be given to providing additional information concerning characterization of the NPDES effluent streams and the locations of point source discharges that would have a bearing on the RI.

14. Pages 4-2, 4-3, Section 4.2.1, "Laboratory Contaminants"

Comments:

a. The text briefly mentions the use of additional sample preparation techniques for the analysis of a number of solid samples that exhibited high Tentatively Identified Compounds (TICs). The terms "medium level" sample preparation and "low level" sample preparation are used in conjunction with a "corrected" Contract Required Quantitation Limit (CRQL). We feel that these terms probably refer to the CLP CRQLs used for low to medium and high concentrations (e.g., low soil CRQL). Nevertheless, the text should explain these terms, as not all readers may be familiar with them. Although these methods may be explained in the QA/QC Plan (the report does not indicate this), we do not have a copy of this document to refer to.

b. In addition, reference (a) defines the term CRQL as a "Chemical-specific level that a CLP laboratory must be able to routinely and reliably detect and quantitate in specified sample matrix." Because a specific sample may require adjustments to the preparation or analytical method (e.g., dilution, use of a smaller sample aliquot) in order to be analyzed, the reported quantitation limit is called the Sample Quantitation Limit (SQL). SQLs take into account sample characteristics, sample preparation and analytical adjustments. These values are the most relevant quantitation limits for evaluating non-detected chemicals.

c. Section 5.6 of reference (b) provides additional guidance concerning the evaluation of TICs.

Recommendation: Define the sample preparation terminology used in the report. Review use of SQL versus CRQL in regard to reference (b) guidance provided. Consideration should be given to use of Special Analytical Services (SAS) for identification of "high concentrations" of TICs. Information concerning the identity of the contaminants and the concentrations detected should be provided.

15. Table 4-1, "Summary of Site Background and Base Background Inorganic Levels in Surface Soil"

Comment: Numerous tables in the report use the term "ND" to mean "Not Detected" instead of using the "U" data qualifier preceded by the SQL or CRQL, as indicated in Section 5.3.5 of reference (b). It is particularly meaningful to provide the SQL or CRQL when material was analyzed for, but not detected, to show that the detection limit was below the criteria or standard used to evaluate the data from a potential health effects standpoint.

Recommendation: Consideration should be given to using the CLP laboratory data qualifiers for any future data presentations.

16. Table 4-1, "Summary of Site Background and Base Background Inorganic Levels in Surface Soil"
Page 4-3, Section 4.2.2, "Naturally-Occurring Inorganic Elements"
Figure 2-1, "Soil Sampling Locations"
Page 2-2, Section 2.2.1, "Surface Soil Investigation"

Comments:

a. Table 4-1 presents a "Summary of Site Background and Base Background Inorganic Levels in Surface Soil." The text indicates that the base background ranges are based on analytical results of background samples collected in areas known to be unimpacted by site operations or disposal activities at MCB Camp Lejeune. The report further states that "only those inorganic parameters with concentrations exceeding these ranges will be considered." No comparison is given with site soil samples' inorganic analyte concentrations and U. S. EPA Region III RBC Tables for either residential or industrial soil ingestion.

b. Figure 2-1 depicts soil sampling location 7-BB-SB-01. The text indicates that three surface soil samples also were collected from background locations located to the north, north east, and north west of Site 7. Figure 2-1 is reported to provide the background soil sampling locations, designated as "BG." We were unable to identify any "BG" locations on Figure 2-1; however, three sample locations designated 07-BB-SB01, 07-BB-SB02 and 07-BB-SB03 were located.

c. We feel that the report should explicitly state that the "Site Background" inorganic surface soil concentrations reported in Table 4-1 represent the data obtained from the three background site soil sampling locations, not the inorganic data from the site soil sampling investigation. The text is confusing because it states that "to differentiate contamination due to site operations from naturally-occurring inorganic elements in site media, the results of the sample analyses were compared to information regarding background conditions at MCB Camp Lejeune."

d. Prior to eliminating inorganic chemicals, such as iron and manganese from the risk assessment, reference (b) suggests that chemicals must be shown to be present at levels that are not associated with adverse health effects (e.g., the base background range for iron in surface soil is reported to be from 69.7 to 9,640 mg/kg, up to over 9 % iron).

e. The presence of specific inorganics, for example iron, in soil samples may be attributable to site-related operations. (Site 7 is a former dump where metal debris from past disposal activities reportedly were found).

Recommendations:

a. Clarify the sampling locations for the "site background" surface soil ranges reported in Table 4-1.

b. Because background concentrations may represent a significant risk, consideration should be given to presenting the risk posed by naturally occurring background chemicals separately.

c. Consider revising the text to state that the detection of specific inorganics, such as iron, in soil samples may be attributable to site operations.

17. Table 4-5, "Summary of Site Contamination"
Table 6-3, "Inorganic Data Summary"

Comments:

a. Table 4-5 indicates that "No Criteria Established" (NE) are available for comparison for either the surface soil or sub-surface soil Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Pesticides, Poly Chlorinated Biphenyls (PCBs), and Inorganics detected. EPA Region IV guidance suggests that the criteria for determining significance of inorganics should be two times the background concentrations. This criteria is followed in Table 6-3 for inorganics.

b. We feel that, as previously stated, a table comparing the site-related analyte concentrations with the U. S. EPA Region III screening values for surface and sub-surface soil ingestion for residential and industrial exposure routes would be useful for comparison purposes.

Recommendation: Consideration should be given to providing a soil screening comparison table, according to U. S. EPA Region III guidance and Region IV concurrence, for risk assessment evaluation purposes.

18. Pages 5-2, 5-3, Section 5.2, "Contaminant Transport Pathways"
Figure 6-1, "Conceptual Site Model"
Table 6-12, "Matrix of Potential Human Exposure"
Pages 6-11, 6-12, Section 6.3.1, "Conceptual Site Model of Potential Exposure"

Comments:

a. Table 6-12 indicates that the inhalation of particulates outdoors is a viable exposure route for both future construction workers and both the current and future residential populations. Current military personnel are not included in the table as having a potential for exposure by this

route. In a discussion of the on-site deposition of windblown dust, the text concludes that this contaminant transport pathway is not of significance for Site 7. The only other contaminant transport pathway for soil described in the text is leaching to groundwater and surface soil run-off. No other potential air pathways are addressed in the text.

b. Figure 6-1 does not show any exposure pathways for the "current residential population" identified in Table 6-12. Only current military personnel, future residents and future construction workers are depicted in the conceptual site model presented in the figure. The use of the current military personnel and current residential population terminology in the table does not agree with the terminology used in the conceptual site model (or in the text).

c. Potential human exposure from the consumption of fish, shellfish or terrestrial organisms is not addressed either in the conceptual site model, the text or the figure.

d. Potential exposure to site contaminants by current site trespassers or recreational populations also are not listed as potential exposure pathways under consideration.

e. Although the conceptual site model depicts the ingestion of and dermal contact with on-site surface soil and the inhalation of particulate emissions from soil as accessible exposure routes for current military personnel, Table 6-12 does not indicate any exposure routes either from surface soil, sub-surface soil, groundwater, surface water, sediment or air for current military personnel. Current residential populations are listed in Table 6-12; however, the text does not indicate if these populations reside on-base (military housing) or in the neighboring community.

Recommendations:

a. The text, table, and figures should all agree in regard to the potential exposure routes and the potential populations at risk from site-related contaminants.

b. Readdress the potential exposure routes for the current military personnel. Either include the inhalation of fugitive dusts emanating from on-site surface soils; the ingestion of and dermal contact with on-site surface soil; and the ingestion of and dermal contact with surface waters and sediments or provide descriptions of the daily activities of the current military population that would preclude these exposure scenarios as likely. Provide additional information concerning the current residential population. Ensure consistency in use of terminology.

c. Address the potential exposure to humans from ingestion of fish, shellfish and/or terrestrial organisms (e.g., deer, fowl).

d. Include recreational populations and site trespassers as populations potentially at risk in the HHRA scenarios.

19. Page 7-33, Section 7.9.2.2, "Saltwater Stations"
Figure 7-3, "Quotient Index Ratios that Exceeded "1" in the Surface water and Sediment"

Comment: The text refers the reader to Figure 7-5 for a graphic display of the Quotient Indices (QIs) that are greater than "1." Figure 7-5 is not included in our copy of the report; however, Figure 7-3 provides QI information.

Recommendation: Refer to the correct figure.