



DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132-5190

M60050.002587
MCAS EL TORO
SSIC #5090.3

5090
Ser 06CC.DG/1292
December 07, 2001

Ms. Triss Chesney
California Environmental Protection Agency
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4700

Dear Ms. Chesney:

Subject: FINAL TECHNICAL MEMORANDUM, PHASE II EVALUATION OF RADIONUCLIDES
IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EOD RANGE, MCAS
EL TORO, CALIFORNIA

Enclosure (1) is the final version of the subject document. The document has been revised and finalized in accordance with comments received from the BRAC clean-up team and the Local Redevelopment Authority. Also, enclosed are the responses to the comments themselves. Please contact either Ms. Content Arnold at (619) 532-0790 or myself at (619) 532-0765 if you have any questions, or need additional information, and thank you for your support in the close-out of this key issue affecting the IR program at MCAS El Toro.

Sincerely,

DEAN GOULD
Base Realignment and Closure
Environmental Coordinator
By direction of the Commander

- Enclosure: 1. Final Technical Memorandum, Phase II Evaluation of Radionuclides In
Groundwater at Former Landfill Sites and the EOD Range, MCAS El Toro,
California
2. Response to comments on the Draft Technical Memorandum, Phase II Evaluation
of Radionuclides in Groundwater at Former Landfill Sites and the EOD Range,
MCAS El Toro, California

Copy to: (w/encl.)
Ms. Patricia Hannon, RWQCB
Ms. Nicole Moutoux, U.S. EPA
Mr. Greg F. Hurley Esq., RAB Co-Chair
Ms. Marcia Rudolph, RAB Sub-Committee Chair
Ms. Polin Modanlou, LRA
Mr. Wayne D. Lee, COMCABWEST



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Ms. Nicole Moutoux
US Environmental Protection Agency
Region IX (SFD 8-2)
Hazardous Waste Management Division
75 Hawthorne Street
San Francisco, CA 94105-3901

Dear Ms. Moutoux:

Subject: FINAL TECHNICAL MEMORANDUM, PHASE II EVALUATION OF RADIONUCLIDES
IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EOD RANGE, MCAS
EL TORO, CALIFORNIA

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Ms. Patricia Hannon
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Dear Ms. Hannon:

Subject: FINAL TECHNICAL MEMORANDUM, PHASE II EVALUATION OF RADIONUCLIDES
IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EOD RANGE, MCAS
EL TORO, CALIFORNIA

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ENCLOSURE 1

FINAL TECHNICAL MEMORANDUM
PHASE II EVALUATION OF RADIONUCLIDES IN
GROUNDWATER AT FORMER LANDFILL SITES
AND THE EOD RANGE

DATED DECEMBER 2001

IS ENTERED IN THE DATABASE AND FILED AT
ADMINISTRATIVE RECORD NO. **M60050.002588**

Document Title: Draft Technical Memorandum, Phase II Evaluation of Radionuclides in Groundwater at Former Landfill Sites and the EOD Range, Marine Corps Air Station, El Toro, California

Reviewer: Mr. Kurt Jackson and Ms. Deirdre Dement, California Department of Health Services; comments received 9 August 2001

Comment No.	Section/ Page No.	Comment	Response
GENERAL COMMENTS			
1.		The subject document is well written and includes appropriate information. Based on this report DHS concurs that the uranium found in the groundwater at this time is naturally occurring.	Comment noted.
SPECIFIC COMMENTS			
1.	Executive Summary Page i	Executive summary, Page I, recommends reevaluation of CERCLA Groundwater Monitoring Plan with respect to the need for radionuclide monitoring. The conclusions on Page 5-1 also suggest possible revision of the record-of-decision based on this study. It should be noted that the current lack of radionuclide contamination in groundwater does not speak to the radiological content of landfills which has not yet reached the groundwater. Therefore the need or lack of need for radionuclide groundwater monitoring in the future will depend on the knowledge of what went into the landfills and what was used at the site more than it will depend on the results of this study.	<p>We concur with the comment that the current lack of radionuclide contamination in groundwater does not speak to the possible radiological content in landfills which, if present, could potentially migrate to groundwater.</p> <p>This fact is acknowledged in the last paragraph of the Executive Summary which states, "Therefore, it is recommended that, once the results of the ongoing radiological survey are available, the current monitoring or radionuclides, as specified in the CERCLA Groundwater Monitoring Plan, be reevaluated."</p> <p>The results of the radiological survey will be taken into consideration in evaluating the monitoring program.</p> <p>Please note radionuclides were initially considered COPCs, and were retained as COPCs due to detections of radioactivity in groundwater samples.</p> <p>Now that we know conclusively that the radionuclides detected in groundwater samples are naturally occurring, the monitoring requirements could potentially be revised.</p>
2.	Section 1.4 Page 1-7	Page 1-7, Lines 1 and 2, should read Environmental Management Branch instead of Radiological Services Branch.	This change has been made in final revision of the document.

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Reviewer: Mr. Kurt Jackson and Ms. Deirdre Dement, California Department of Health Services; comments received 9 August 2001

Comment No.	Section/ Page No.	Comment	Response
3.	Section 2.2 Page 2-4	Page 2-4 first paragraph under General Chemistry does not mention whether stable isotope samples were filtered. However, on Page 3-1 it is stated that the stable isotope samples were unfiltered, but this seems to be contradicted by the sentence above that, which indicates that the samples collected for uranium analysis (which were filtered) were also measured for stable isotopes. Clarification of these statements is needed. The basis for selecting filtered or unfiltered samples for stable isotope analysis should also be stated on Page 2-4.	Sample aliquots analyzed for stable isotopes were unfiltered. The text has been revised to include the rationale for using unfiltered samples for the stable isotope evaluation.
4.	Table 3-2 Page 3-5	The footnotes on Table 3-2, Page 3-5 should specify the conversion between tritium units (TU) and pCi per liter. Tritium Units are not a unit familiar to most individuals who may be reviewing the document and drinking water standards are stated in units of pCi per liter. The conversion factor is given on Page vii under the acronyms and abbreviations section.	Table 3-2 has been revised to include tritium concentrations converted to pCi/L. A footnote indicating the relationship between TUs and pCi/L has been added to Table C-1.

Document Title: Draft Technical Memorandum, Phase II Evaluation of Radionuclides in Groundwater at Former Landfill Sites and the EOD Range, Marine Corps Air Station, El Toro, California

Reviewer: Dr. Nancy E. Ruiz, Ph.D., and Dr. Bertrand Palmer, Ph.D., P.E., Geosyntec Consultants (for the MCAS El Toro Local Redevelopment Authority; comments received 13 August 2001

Comment No.	Section/ Page No.	Comment	Response
SPECIFIC COMMENTS			
1.	Pages 1-1 and 5-1	DON/USMC states that radionuclides detected in groundwater are likely naturally occurring radioactive isotopes (see Draft TM at Pages 1-1 and 5-1). The implication of this statement is that since the uranium isotope ratios indicate naturally occurring material, the source of radioactivity is likewise naturally occurring. However, DON/USMC does not provide information regarding the potential source of the radioactivity. Could DON/USMC provide information regarding the natural source of radioactivity at MCAS El Toro?	As indicated in Section 1.2 on Page 1-1, the potential source of the naturally occurring radioactive isotopes found in groundwater is the geological formations through which the groundwater has flowed. The element responsible for most of the radioactivity detected is uranium. Analysis of samples with the highest gross alpha results had corresponding higher uranium values (Tech Memo, March 2000).
2.	Pages 1-1 and 5-1	DON/USMC states that radioactivity is naturally occurring at MCAS El Toro (see Draft TM at Pages 1-1 and 5-1). However, a cursory review of Irvine Ranch Water District (IRWD) water quality, as presented on the IRWD website, indicates that gross alpha concentrations in four of six groundwater samples collected on-station by DON/USMC (low concentration range 5.0 to 10.9 pCi/L, net of error) exceed the maximum concentration detected in off-station IRWD wells during 2000 (3.6 pCi/L). Could DON/USMC provide an explanation for this observation?	<p>This evaluation demonstrated that the radionuclides detected in groundwater beneath MCAS El Toro are naturally occurring, irrespective of the gross alpha concentrations.</p> <p>However, a possible explanation for the observation that gross alpha concentrations seem to be higher in on-site wells is the closer proximity of the on-site wells to the Santa Ana Mountains (and the granitic formations that are the most likely source for these naturally occurring radionuclides).</p>

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Reviewer: Dr. Nancy E. Ruiz, Ph.D., and Dr. Bertrand Palmer, Ph.D., P.E., Geosyntec Consultants (for the MCAS El Toro Local Redevelopment Authority; comments received 13 August 2001

Comment No.	Section/ Page No.	Comment	Response
3.	Page 1-2	<p>DON/USMC states that in previous studies, a comparison of upgradient and downgradient gross alpha activities did not show an apparent effect from landfill materials (see Draft TM at Page 1-2). The monitoring wells sampled at former landfill sites 3 and 5, as indicated in Figure 1-2, provide only cross-gradient gross alpha concentrations but not upgradient gross alpha concentrations. Could DON/USMC explain why upgradient wells were not selected for sampling at these two landfill sites?</p>	<p>Comparison of upgradient and downgradient gross alpha concentrations was performed during the 1998 station-wide evaluation and was not an objective of this evaluation. Upgradient versus downgradient comparisons of target analytes, except in obvious circumstances, is rarely conclusive.</p> <p>The inherent variability of the measurement systems, the presence of the analytes in nature, and the difficulty in "knowing" that the locations are correct make that approach less effective.</p> <p>This Phase II radionuclide evaluation focused on selected wells located near potential contaminant sources. Wells located upgradient from landfills were generally not selected because it was less likely that they would be affected in the event that radioactive materials were present in landfill waste.</p>

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Comment No.	Section/ Page No.	Comment	Response
4.		<p>DON/USMC installed a total of 15 new monitoring wells at MCAS El Toro during the Fall of 2000 to replace order (sic) monitoring wells. This work was documented in the Draft Technical Memorandum, Replacement Well Installation and Groundwater Evaluation, Marine Corps Air Station, El Toro, California, dated June 2001. Based on the data presented in this document, groundwater samples collected in the newly installed well had generally higher chemical concentrations than the groundwater samples collected in the older replaced wells. Was the evaluation of radionuclides in groundwater presented in the Draft TM performed using the older monitoring wells as the sampling point? If so, should sampling of the new monitoring wells be conducted to evaluate the validity of the data presented in the Draft TM? Would the conclusions of the Draft TM change if the concentration of radionuclides in groundwater were higher, as would have likely been the case if the new wells had been used?</p>	<p>The Draft Technical Memorandum, Replacement Well Installation and Groundwater Evaluation, Marine Corps Air Station, El Toro, California concluded that the submerged screens did <i>not</i> have a significant effect on the concentrations of TCE and PCE, but would affect the representativeness of samples from areas impacted by gasoline-range hydrocarbons (which tend to be concentrated at the water table).</p> <p>With regard to radionuclides, the concentrations reported in the replacement wells were very similar to historical data for the corresponding original wells (suggesting that a submerged screen would not have a significant effect on radionuclide concentrations).</p> <p>However, the determination that the radionuclides are from a natural source was <i>not</i> based upon the actual concentrations of uranium isotopes, but on the ratios of the isotopic concentrations (i.e., the magnitude of the concentrations have no effect on the evaluation presented in the Phase II Radionuclide Evaluation).</p> <p>The conclusion regarding the origin of the radionuclides in groundwater is still valid and therefore, sampling of the replacement wells is not recommended.</p>

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Comment No.	Section/ Page No.	Comment	Response
5.	Page 4-1	DON/USMC states that a limited investigation of strontium ⁹⁰ was performed to assess the origin of previously reported elevated gross beta values (see Draft TM at Page 4-1). However, those samples analyzed for strontium ⁹⁰ were not analyzed for gross beta. Without information concerning the current gross beta activities, it is difficult to evaluate the significance of strontium ⁹⁰ concentrations presented. Could DON/USMC explain why gross beta analysis was not performed on these samples?	An evaluation of recent gross beta activities in the wells selected for strontium ⁹⁰ analysis indicates that the gross beta concentrations have remained relatively constant. The current gross beta activities would not alter any interpretations regarding their origin. As stated in the Work Plan, strontium ⁹⁰ analyses were performed to assess whether the elevated gross beta concentrations were due to man-made radionuclides. Selected samples from previous screening analysis for gross beta emissions had results that warranted more definitive evaluation to ascertain their source. It should be noted that these results were not necessarily evidence of a release.
6.	Appendix C	Appendix C of the Draft Technical Memorandum presents the results of water isotope analyses but little to no discussion of the significance of the findings. The approximate age of the groundwater samples collected, as indicated from tritium analyses, ranged from "recharged within the last 10 years" to "recharged prior to 1952". The age of the groundwater does not seem to be a function of groundwater elevation or well location. An analysis of the relationship of the age of the groundwater and uranium concentration could provide a further indication of the source of radioactivity in the groundwater. Could DON/USMC provide additional interpretation of the data presented in Appendix C?	The tritium evaluation was a secondary objective of this evaluation. Data from two independent laboratories confirmed that the radionuclides were naturally occurring. The tritium data could not be used to make definitive conclusions regarding the age of groundwater.

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Comment No.	Section/ Page No.	Comment	Response
7.	Appendix C	In Appendix C, the presentation of water isotope data plotted on the meteoric water line (MWL) in Figure C-1 appears to be of limited value for several reasons. First, the figure used as the basis of discussion is very small and difficult to see. Second, the contrast between the graph background and the El Toro data points is poor. Third, the use of data from Santa Maria could be misleading as Santa Maria is located very close to Vandenberg Air Force Base, which has been an active missile launch site for decades. DON/USMC should consider revising Figure C-1 using more representative data of the Orange County area.	Figure C-1 has been modified to ensure clarity. The Santa Maria data was omitted because it is not directly related to the MCAS El Toro data.
8.		During the review of the Draft Work Plan [Earth Tech, 2000] for this investigation, a reviewer commented that the appropriate unit for tritium concentration is picoCuries per liter (pCi/L). DON/USMC responded that tritium concentrations would be presented in both units. In Appendix C, Table C-1, tritium concentrations are presented in only tritium units (TU) and do not include corresponding concentrations in pCi/L. DON/USMC should revise Table C-1 to show both units of concentration.	Table 3-2 has been revised to include tritium concentrations converted to pCi/L. A footnote indicating the relationship between TUs and pCi/L has been added to Table C-1.

Document Title: Draft Technical Memorandum, Phase II Evaluation of Radionuclides in Groundwater at Former Landfill Sites and the EOD Range, Marine Corps Air Station, El Toro, California

Reviewer: Mr. Steve Dean, Technical Expert in Radiological Issues, Environmental Protection Agency; comments received 20 September 2001

Comment No.	Section/ Page No.	Comment	Response
SPECIFIC COMMENTS			
1.	Table 3-2 Page 3-5	Uranium 238:Uranium 235 ratios Columns: The table needs to include the actual concentrations of U238 and U235 for each sample as well as the ratios of each radionuclide in each sample. Documenting the range of naturally occurring uranium concentrations in MCAS-ET groundwater is important reference data for future groundwater investigations.	TIMS analysis performed by MIT/GeoChron evaluates the relative proportions of U235 to U238 and does not provide concentrations of each isotope. Total uranium concentration data from the initial phase of the radionuclide evaluation can be used to document the range of naturally occurring uranium.
2.	Table 3-2 Page 3-5	Tritium Results Column: Both state and federal environmental regulations express the Maximum Contaminant Level (MCL) for tritium concentrations in water in picoCuries per liter (pCi/l) not tritium units (TUs). Since the purpose of this document is to report the information impacted by radioactive contaminants, I recommend that the tritium data be reported in pCi/l. The tritium data in Table 3-2 should be reported in units that are consistent with regulatory MCLs for the sake of clarity and consistency.	Since the purpose of the tritium measurements was for geochemical and hydrological assessment, the units reported are those found in the literature and reference data, Tritium Units. Table 3-2 has been revised to include tritium concentrations converted to pCi/L. A footnote indicating the relationship between TUs and pCi/L has been added to Table C-1.
3.	Data Evaluation Page 4-1	The Navy has determined and then reported on the age of the water using tritium based on TU data, but should also include that the groundwater tritium levels are orders of magnitude below the drinking water MCL of 20,000 pCi/l.	Comment noted. A statement has been added to indicate the tritium concentrations are significantly lower than the MCL.