UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
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JAN 30 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Kevin Cloe
Navy Technical Representative
Installation Restoration Section (South)
Environmental Program Branch
Environmental Division,
Atlantic Division (LANTDIV), Code EV23KC
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, VA 23511-2699

Re: Naval Station Roosevelt Roads - EPA I.D. Number PRD2170027203

1. November 24, 2003 Draft Corrective Measures Study (CMS) Final Report for Tow Way Fuel Farm (SWMUs 7 and 8)

2. November 24, 2003 revisions to the July 23, 2003 Corrective Measures Study (CMS) Final Report and CMS Investigation Report for SWMU 53

Dear Mr. Cloe:

The United States Environmental Protection Agency (EPA) Region 2 has completed its review of the above documents which were submitted on behalf of the Navy by Baker Environmental's letters of November 24, 2003. As part of its review, EPA requested our contractor, Booz Allen Hamilton, to review both documents. Based on Booz Allen's review, EPA finds that the November 24, 2003 revisions to the July 23, 2003 Corrective Measures Study (CMS) Final Report and CMS Investigation Report for SWMU 53 are acceptable. Therefore, the CMS Report for SWMU 53 is now complete and approved.

As you know, the CMS Final Report recommends a remedy that involves excavation and disposal of approximately 4200 cubic yards of surface soils contaminated with pesticides (DDT, DDE, chlorodane, heptachlor epoxide, and kepone) and metals (lead, arsenic, zinc, and chromium). Pursuant to Condition III.E.9 of the facility's 1994 RCRA Permit, prior to that proposed remedy being fully approved, a permit modification pursuant to 40 CFR § 270.41 must be implemented, and such a proposed permit modification must undergo public notice and comment. Therefore, the remedy recommended by the CMS will not be fully approved until a permit modification selecting it, and public notice and comment on that remedy, have been completed.

Draft CMS Final Report for Tow Way Fuel Farm

EPA finds that the November 24, 2003 Draft CMS Final Report for Tow Way Fuel Farm (TWFF), SWMUs 7 and 8, is not yet fully acceptable. Among other things, the CMS Report should be revised to thoroughly consider the impact of the upcoming closure of the installation on March 31, 2004. In particular, the introduction section of the CMS Report should be expanded to describe the planned closure of Naval Station Roosevelt Roads (NSRR), and potential future land use changes at the TWFF site. The CMS must indicate how the Navy will ensure that the proposed Corrective Action Objectives (CAOs) remain appropriate when the installation is closed and the site is transferred to private ownership. The discussion of CAOs should thoroughly describe their basis and the land use assumptions that were made in their development. The discussion provided in the CMS Report should be adequate to establish that the CAOs will remain appropriate after the property transfers. The future use of the site should be clearly established in the CMS Report, and the evaluations of implementability and effectiveness should thoroughly consider this issue.

Also, the CMS recommends that land-use controls (LUCs), including institutional and engineering controls, as the best remedial alternative for soil at the TWFF site and are an important component of the recommended groundwater remedy. This is appropriate as LUCs are required in any case where contamination is left in place above unrestricted reuse and unlimited exposure levels. The access restrictions inherent in the current operation of the site, as part of an active Navy installation, would facilitate implementation of LUCs.

However, the LUCs have not been adequately defined or evaluated in the CMS Report. As part of the technical evaluation and justification for the selected remedy, the CMS Report should be revised to identify the specific LUC mechanisms that will be utilized (e.g., fencing, signage, covenant restrictions, zoning/permitting requirements), the potential routes of exposure to contaminated soil and groundwater, and the means by which the LUC mechanisms will effectively block each potential exposure route.

In addition, with the pending closure of the installation, future land uses are likely to change and LUCs will be significantly more difficult to implement, monitor, and enforce after base closure. It is imperative that the evaluation provided in the CMS Report adequately addresses those issues.

Also the CMS's evaluation of alternatives should more thoroughly and specifically consider the time that each alternative will require to reach the CAOs for each media. This evaluation is required by Section IV.A.1.c.ii of the "Scope of Work for the CMS" given in Appendix B of the facility's 1994 RCRA Permit. Specific time frame estimates should be identified and thoroughly justified for each alternative component and considered as part of the technical, human health, and cost evaluations. Preference should be given to alternative components that permanently reduce contaminant concentrations and the related potential for exposure in the shortest relative time period.

These and additional comments are discussed more fully in the enclosed January 13, 2004 Technical Review prepared by Booz Allen & Hamilton. Within 60 days of your receipt of this letter, please submit a revised Draft CMS Final Report for Tow Way Fuel Farm, which addresses the above comments and those in the enclosed Technical Review.

If you have any questions, please telephone Timothy R. Gordon, the Remedial Project Manager, at (212) 637- 4167.

Sincerely yours,

Timothy R. Gordon, for

Dale Carpenter, Chief
Caribbean Section
RCRA Programs Branch

Enclosure

cc: Mr. Julio I. Rodriguez Colon, P.R. Environmental Quality Board, with encl.
Ms. Madeline Rivera, Public Works Dept., Naval Station Roosevelt Roads, with encl.
Ms. Kathy Rogovin, Booz Allen & Hamilton, w/o encl..
Mr. Mark Kimes, Baker Environmental, with encl.

TECHNICAL REVIEW OF THE NOVEMBER 24, 2003 DRAFT CORRECTIVE MEASURES STUDY FINAL REPORT TOW WAY FUEL FARM

NAVAL STATION ROOSEVELT ROADS CEIBA, PUERTO RICO

REPA3-1203-020
January 13, 2004

I. GENERAL COMMENTS

1. The November 24, 2003, Draft Corrective Measures Study Final Report for the Tow Way Fuel Farm (CMS Report) recommends implementation of Alternative 1 for the final remedy at the Tow Way Fuel Farm (TWFF). However, a number of concerns regarding the level of detail and the adequacy of the evaluation presented for the various alternatives considered have been identified during review of the CMS Report. These concerns are identified and discussed in the following General and Specific Comments. Until these concerns are adequately addressed, it is not possible to accept the current recommendation of the CMS Report. After fully addressing all of the concerns identified in the following comments, the remedial alternatives should be reevaluated and the recommendation revised as appropriate.

2. The CMS Report should be revised to thoroughly consider the impact of the upcoming closure of the installation on March 31, 2004. In particular, the introduction section of the CMS Report should be expanded to describe the planned closure of the installation, and potential future land use changes at the TWFF site. Naval Station Roosevelt Roads (NSRR) should ensure that the Corrective Action Objectives (CAOs) will remain appropriate when the installation is closed and the site is transferred to private ownership. The discussion of CAOs should thoroughly describe their basis and the land use assumptions that were made in their development. The discussion provided in the CMS Report should be adequate to establish that the CAOs will remain appropriate after the property transfers. The future use of the site should be clearly established in the CMS Report, and the evaluations of implementability and effectiveness should thoroughly consider this issue.

3. Land-use controls (LUCs), including institutional and engineering controls, were selected as the best remedial alternative for soil at the TWFF site and are an important component of each soil and groundwater remedy. This is appropriate as LUCs are required in any case where contamination is left in place above unrestricted reuse and unlimited exposure levels. Furthermore, access restrictions inherent in the current operation of the site on an active Navy installation would facilitate implementation of LUCs.

However, the LUCs have not been adequately defined or evaluated in the CMS Report. As part of the technical evaluation and justification for the selected remedy, the CMS Report should be revised to identify the specific LUC mechanisms that will be utilized (e.g., fencing, signage, covenant restrictions, zoning/permitting requirements), the potential routes of exposure to contaminated soil and groundwater, and the means by which the LUC mechanisms will effectively block each potential exposure route.

A critical aspect of this evaluation will be the pending closure of the installation. Future land uses are likely to change and LUCs will be significantly more difficult to implement, monitor, and enforce after base closure, so it is imperative that the evaluation provided in the CMS Report adequately addresses these issues.

4. The evaluation of alternatives should more thoroughly and specifically consider the time that each alternative will require to reach the CAOs for each media, as required by Section IV.A.1.c.ii of the Scope of Work for the CMS established in Appendix B of the NSRR's Part B Permit. Specific timeframe estimates should be identified and thoroughly justified for each alternative component and considered as part of the technical, human health, and cost evaluations. Preference should be given to alternative components that permanently reduce contaminant concentrations and the related potential for exposure in the shortest relative time period.

5. Numerous deficiencies were identified in the cost estimates. Each of the cost estimates should be thoroughly revised as described in the Specific Comments below.

6. The CMS Report provides summary discussions and evaluations of the individual technologies that comprise each of the remedial alternatives considered in the CMS. However, sufficient detail regarding the anticipated implementation of these technologies have not been provided to allow for an adequate evaluation of the effectiveness and cost of each of the individual remedial alternatives. The CMS Report should be revised to provide preliminary and general design details for the component technologies as expected to be implemented in each of the remedial alternatives. Examples of the type and level of detail required to evaluate the remedial alternatives are provided in the following General and Specific Comments.

7. The CMS Report does not appear to adequately consider the time periods that will be required to achieve groundwater and phase-separated hydrocarbon (PSH) CAOs for each of the evaluated remedial alternatives. EPA requires that remedial timeframes be reasonable. While it may not be possible to predict precisely the remedial timeframe for each alternative, the relative timeframes for each alternative should be identified and considered, particularly if significant differences are likely to exist in the times required for each alternative to meet the CAOs. Of particular importance to meeting CAOs for groundwater is the removal of the PSH, which is the source of the dissolved contaminants in groundwater. As noted in General Comment No. 11, the selected remedy includes a

technology which may not provide a reasonable timeframe for reducing this source material. Other technological options appear to be available that may dramatically reduce the time require to meet CAOs for groundwater and/or PSH. For example, as indicated in the Task 1 CMS Report (pg. 2-6), previous studies at the TWFF indicate that two- and three-phase product recovery systems could dramatically reduce remedial timeframes for the PSH at TWFF. Other studies indicate that CleanOx may also significantly reduce remedial timeframes.

It is also important to note that the selected alternative relies on monitored natural attenuation (MNA) to control the migration of the groundwater plume while the contaminant source represented by the PSH is being removed. During the period required to remove the contaminant source, the groundwater immediately downgradient from the source area will remain contaminated, although the growth of the plume is expected to be limited by natural attenuation. Ultimately, after the source material is removed, natural attenuation is expected to improve groundwater quality sufficiently within the plume so that it meets the CAOs for groundwater. During the period in which the groundwater quality does not meet CAOs, exposures to contaminated groundwater will be controlled through institutional controls. However, unless a more reasonable timeframe for meeting groundwater CAOs is achieved through source reduction, more aggressive controls on groundwater contamination, such as hydraulic control at the downgradient edge of the source, may be more appropriate than MNA.

8. Various remedial technologies are considered in the CMS Report for use in the remediation of PSH and contaminated groundwater. The effectiveness of these remedial technologies can be strongly affected by the characteristics of the subsurface in which the contamination is found. The stratigraphy of the TWFF is variable and the CMS Report has not provided a detailed discussion of the characteristics of the actual materials in which the subject contaminants are known to exist. The CMS Report should be revised to provide a detailed description of the distribution of contaminants that will undergo remediation and of the materials in which these contaminants are found. A detailed discussion should be provided of the known hydraulic properties of the actual materials that will undergo remediation and of the effect of these properties on each of the evaluated remedial technologies considered. The results of any previous pilot studies should be reported in the context of the nature and characteristics of the materials in which these tests were conducted relative to those materials which will actually undergo remediation as part of the final remedy. Cross sections depicting the water table, PSH lenses, distribution of dissolved contaminants, and geologic strata should also be presented for those areas of groundwater and PSH contamination that will undergo remediation.

9. All of the proposed remedial alternatives rely on MNA to control and limit the growth of the groundwater plume during the remediation of the source material represented by the PSH and/or during the remediation of groundwater. To demonstrate the effectiveness of

MNA at the TWFF, the CMS Report (pg. 2-5) indicates that, "the groundwater contamination at the TWFF has not shown any movement toward the Ensenada Honda, with the primary benzene-related contamination remaining around the 470-wells (470-MW1 and 470-MW3) on the west side of the lower TWFF." The CMS Report further indicates that, "concentrations of benzene and ethylbenzene in these wells have decreased since April 1998," and that, "the dissolved plume has not changed in size since April 1998." No further substantive discussion regarding the natural attenuation mechanisms involved in controlling plume movement, particularly the biodegradation processes acting at the site, is provided in the CMS Report. Similarly, no discussion of natural attenuation parameters in groundwater has been presented in the CMS Report. A detailed analysis demonstrating the stability of the plume using trends in contaminant concentrations within and on the periphery of the plume based on historical groundwater quality data has not be provided. A discussion of groundwater flow rates and an analysis of expected contaminant migration rates relative to observed contaminant migration rates is similarly not presented in the CMS Report. While it will likely be possible to rely on natural attenuation to control the migration of the contaminant plume in groundwater at the TWFF, an adequate demonstration of the effectiveness of natural attenuation should be provided in the CMS Report.

10. Alternatives 1 and 3 include skimming of PSH to reduce PSH at the TWFF. Alternative 1 has been selected as the preferred alternative based in part on the effectiveness of PSH skimming. In Table 3-3, PSH skimming has been assigned a moderate effectiveness and is exceeded in its effectiveness rating only by dual phase extraction with steam flushing. As part of the technical evaluation of the performance of Alternative 1, the CMS Report (pg. 2-6) concludes that PSH pneumatic skimming, when diligently operated and maintained, will effectively reduce the quantity of free product in the subsurface. However, the CMS Report does not provide sufficient analysis to support its conclusions regarding the relative effectiveness of PSH skimming. In addition, the CMS Report does not provide any evaluation of the capability of PSH skimming to meet the Corrective Action Objective (CAO) established for PSH. The CAO established for PSH is to reduce its thickness to 0.01 feet (Table 1-1).

The CMS Report (pg. 2-4) acknowledges that the limitations associated with PSH skimming include "free product mobility and volume of removal." The CMS Report (pg 2-6) similarly indicates that, "baildown tests in the lower TWFF along the Forrestal Road have not produced favorable results because of lack of recovery after the initial baildown." It is also important to note that only limited recovery has been achieved recently from the current Interim Corrective Measure (ICM), which is based on PSH skimming. The Task 1 CMS Report (pg. 2-9) indicates that, "free product recovered from March 2001 through April 2002 yielded 111 gallons." To support conclusions regarding the effectiveness of PSH skimming, the CMS Report (pg. 2-6) does indicate that, "recent evidence at UGW25, where a majority of the PSH is located, has indicated that large quantities of product are available for removal at this well."

As acknowledged by the CMS Report, PSH skimming is limited by the mobility of the PSH. The PSH flows to a recovery well only in response to pressure gradient internal to the PSH. The recovery of substantial amounts of PSH may initially be feasible if thick layers of PSH are present that provide the necessary head to move product to the recovery well. However, as the thickness of the product layer is reduced, the gradient forcing the PSH to the recovery well is similarly reduced and flow to the well tends to drop off significantly. These limitations are further accentuated by the generally low permeability of the subsurface materials at the TWFF and the viscosity of the PSH. These influences combine to limit the radius of influence of each recovery well and to reduce the rate of recovery, particularly as the thickness of the PSH layer is reduced. As reported in the Task 1 CMS Report (pg. 2-6), previous studies conducted in 1995 have indicated that the radius of influence of such passive skimming systems are limited. These studies at the TWFF site indicated that based on an "estimated spill volume of 243,000 gallons, it would take 44 years or more to recover the total volume of spilled product and would take approximately 270 wells spaced 15 feet (apart) to recover the free product at the site."

The CMS Report does not adequately address the limitations inherent in passive PSH skimming when assessing the effectiveness of this technology. The effectiveness of PSH skimming may be overstated, particularly when implemented using the currently available network of wells. The ability of PSH skimming to reduce to PSH layers to the CAO of 0.01 foot has also not been addressed. The forces driving PSH into collections wells under such conditions are almost nonexistent, and it would not appear possible that this technology, by itself, would be capable of meeting the established objective for PSH removal. Similarly, the effectiveness of PSH skimming relative to other available technologies may not have been adequately assessed. The CMS Report should be revised to more fully assess the effectiveness of PSH skimming.

II. SPECIFIC COMMENTS

1.2.2 Establishment of Corrective Action Objectives, Page 1-2

1. The introductory paragraph should be expanded to describe the basis of the CAOs, including a description of the assumed exposure scenario. This discussion should clearly establish whether the exposure scenarios used in developing the CAOs were based on an operating military site, or whether they were based on potential routes of exposure after base closure and property transfer. If necessary, the CAOs should be revised as necessary to reflect the current plans to close the installation, which may result in residential reuse of the property.

1.2.2.1 Soil (Establishment of Corrective Action Objectives), Page 1-2

2. This section should briefly describe how other constituents typically associated with petroleum hydrocarbons were screened out as constituents of concern (COCs). A brief summary of benzene, toluene, ethylbenzene, and xylene (BTEX) and total petroleum hydrocarbon (TPH) results should be included and compared to appropriate screening criteria.

2.1.1 Soil (Process Option Descriptions), Page 2-1

3. Each of the process option descriptions should be expanded to more clearly describe each option. The descriptions should include the location and volume that the option is intended to address. Major elements of the system should be summarized and, where applicable, should specify the number and depth of individual treatment points. For institutional/engineering controls, the specific LUC mechanisms that would be used should be identified. This information should form the basis for development of the associated cost estimates, and the rationale for each of these assumptions should be specified. A separate table is recommended for presentation of the data.

4. The discussion of technology limitations should be revised to describe limitations that are specific to the site conditions and COCs. The current description of general potential limitations is not adequate. For example, rather than stating that bioventing may be limited by the amenability of the contaminant to biodegradation, specific discussion regarding the amenability of polynuclear aromatic hydrocarbons (PAHs) and arsenic should be presented. Similarly, instead of stating that the excavation option may be limited by proximity to a disposal facility, the report should provide an assessment of the availability of suitable disposal facilities in the area. For several process options, potentially significant limitations have not been identified. For example, no potential limitations have been identified for LUCs and the amenability of the contaminants to be treated has not been identified as a potential limitation for soil vapor extraction (SVE) or land farming. Each process option should be reviewed to ensure that all pertinent limitations are addressed. A separate table is recommended to summarize the information. In addition, the discussion of limitations should be balanced with a discussion of the advantages of each process option.

2.2 Evaluation of Alternatives, Pages 2-4 through 2-22

5. The evaluation of each alternative describes the future use of the site as industrial. Considering that the installation will be closed in March 2004 and the property ultimately transferred out of the Navy's control, it is unclear whether the future use of the site can be anticipated to be industrial. In the absence of a specific reuse plan, the maximum beneficial reuse (i.e., residential) should be assumed.

6. Each of the alternatives includes LUCs (institutional and engineering controls) as an integral part of the remedy. In each case described, LUCs will be required indefinitely because arsenic contamination in soil will not degrade naturally in a reasonable timeframe and none of the proposed alternatives will fully remove arsenic contamination from the site. For each alternative, the evaluation states that institutional controls would be highly effective and have an indefinite useful service life. However, insufficient data or evaluation is provided to support these statements.

   In each alternative, fencing and building restrictions are identified as the LUCs that will be implemented. If the fencing surrounds all soil contamination that exceeds unlimited exposure and unrestricted reuse levels, it may be an effective LUC component. However, the CMS Report must clarify the location of the fencing relative to the contamination and describe how and by whom the fencing will be monitored and maintained over the long-term to establish its implementability, long-term effectiveness, and reliability. Similarly, it is unclear how the building restrictions will be implemented (e.g., restrictive covenants in the deed), monitored, and enforced over the long term. The CMS Report should be revised to clarify these issues. LUCs should be implemented in all areas where contamination remains above unlimited exposure and unrestricted reuse criteria.

2.2.2 Alternative 2

2.2.2.1 <u>Technical</u>

7. As part of the discussion of the performance of dual phase extraction in Alternative 2, the CMS Report (pg. 2-9) indicates that dual phase extraction with steam flushing "would effectively remove the COCs from the subsurface environment, provided that the mobility of the PSH would be increased through the use of steam in a predictable manner." The discussion further indicates that, "if the predictability of the increased mobility of the PSH cannot be determined prior installation, it may result in mobilization of PSH to previously unimpacted areas of the site." If the use of steam flushing is thought to potentially reduce the effectiveness of the dual phase extraction and reduce its potential value relative to other considered technologies, the implementation of dual phase extraction without steam flushing should be evaluated.

   In addition to dual phase extraction, the CMS Report should consider the implementation of three-phase extraction. Previous studies appear to indicate that three-phase extraction may offer significant advantages over dual phase extraction and result in substantially greater PSH removal.

8. The CMS Report (pgs. 2-9 and 2-10) indicates that disposal of the groundwater that results from the implementation of the dual phase extraction will be difficult. The CMS Report indicates that during past pilot studies the discharge of contaminated water to the facility's wastewater treatment plant (WWTP) and the subsequent discharge through the Nation Pollution Discharge Elimination System (NPDES) permitted outfall was

problematic due to the level of inorganic constituents. Without providing further details, the CMS Report indicates that although several attempts were made to pretreat the recovered groundwater prior to discharge to the WWTP, these attempts were not successful. Such an analysis does not appear sufficient to demonstrate that, in the context of a final remedy for the TWFF, it will not be possible to discharge or otherwise handle groundwater extracted from the subsurface during dual phase extraction. A full analysis of the potential approaches to the disposal of extracted groundwater, including reinjection into the subsurface, should be provided in the CMS Report.

9. As part of the discussion of the implementability of dual phase extraction in Alternative 2, the CMS Report (pg. 2-9) indicates that, "implementation of the piping associated with the dual phase recovery system may need to be increased to maintain adequate vacuum at the well head." To avoid the costs associated with the piping necessary to impose a vacuum at each recovery point and to transport recovered liquids from the each recovery point to a central collections point, the use of mobile dual phase extraction units should be considered. Since extraction wells generally require time for PSH levels to recover between periods of extraction, these systems also provide the added advantage of being able to be moved between recovery points on a routine schedule and therefore potentially reduce the total amount of equipment necessary.

   The CMS Report (pg. 2-9) also indicates that the equipment necessary for dual phase extraction would need to be obtained and shipped from the United States to Puerto Rico since the equipment is not readily available on the island." However, multiphase extractions systems are currently being implemented elsewhere in Puerto Rico, and multiphase extraction has previously been implemented during pilot studies at the TWFF. Obtaining the necessary equipment does not appear to be a significant impediment to the implementation of multiphase extraction on the island of Puerto Rico.

   The discussion of the implementability of dual phase extraction in Alternative 2 (pg. 2-9) also indicates that, "the PSH removal rate is expected to taper off once the initial removal of product is complete shortly after startup." However, the discussion does not indicate that a similar problem exists for PSH skimming. Furthermore, studies conducted at the site indicate that PSH removal with dual phase extraction should be significantly greater than with only PSH skimming.

2.2.3 Alternative 3

2.2.3.1 <u>Technical</u>

10. This alternative includes excavation of contaminated soil in accessible areas and electrochemical geooxidation (ECGO) in areas where soil was not accessible due to active fuel lines. If the TWFF facility, and associated tanks and fuel lines, will be decommissioned as a result of base closure, these access issues will not limit the areas accessible to excavation. Furthermore, sampling will be required when the tanks and

lines are decommissioned, and additional petroleum-contaminated soil will likely be identified at that time. The CMS Report should describe the anticipated long-term operational status of the TWFF facility, and the technical evaluation should be revised accordingly. If the Navy plans to decommission the facility, it is recommended that any corrective measures required for contaminated soil be postponed until that time to ensure that the full extent of contamination is accessible and active facility components do not limit the remedial options.

11. Alternative 3 includes the extraction of groundwater to control contaminant migration, with the subsequent reinjection of treated groundwater. However, the CMS Report does not provide any details for the preliminary design of this scheme. Details of the preliminary design should be provided so that the relative effectiveness of this alternative can be adequately judged and so that the cost estimates can be adequately evaluated. These preliminary design details should include the location and number of pumping and extraction wells, estimates of the anticipated pumping rates, and estimates of the capture zones, including depictions of the individual cones of depression created around each extraction well so that the potential impact of groundwater withdrawals on the collection and removal of PSH might be evaluated. The evaluation of this alternative should include an explicit evaluation of how the cones of depression around extraction wells might facilitate the removal of PSH.

12. When discussing the vacuum vapor extraction included in Alternative 3, the CMS Report (pg. 2-11) indicates that, "previous pilot tests at TWFF using vacuum assisted recovery were shown to be marginally more effective than simple skimming (Baker, 2003a)." The reference to Baker, 2003a is apparently to the Final Task 1 CMS Report. However, review of that report fails to clearly identify the referenced pilot tests or the results of any such tests. The summary of the referenced pilot tests in the Final Task 1 CMS Report should be clearly identified.

13. When evaluating the performance of Alternative 3, the CMS Report (pg. 2-12) indicates that, "hydraulic control of the capture zone may become more difficult with re-injection." The CMS Report does not explain how reinjection would make difficult the maintenance of a capture zone. Under most conditions, re-injection in downgradient areas can be used to facilitate capture. The above-cited statement should be fully explained and justified or removed from the CMS Report.

2.2.4 Alternative 4

2.2.4.1 <u>Technical</u>

14. Alternative 4 includes air sparging to address contamination of groundwater. However, no preliminary design details for the air sparging system have been provided. To allow an the adequate evaluation of the analysis of this element of Alternative 4, preliminary design details for the evaluated air sparging system should be provided. These details

should include the spacing and number of wells, design of wells, and the expected radius of influence of individual air sparging wells.

The CMS Report has advanced the use of air sparging principally as a means of remediating contaminated groundwater. However, air sparging may have a beneficial effect on the removal of PSH. The CMS should provide some discussion of the effect of the evaluated air sparging system on the removal of PSH. In addition, any potential interferences resulting from the use of air sparging with the PSH skimming system also intended for inclusion in Alternative 4 should be fully evaluated.

2.2.4.3 <u>Human Health</u>

15. When discussing the impact on human health from Alternative 4, the CMS Report (pg. 2-18) indicates that, "contaminant levels in groundwater will be reduced over time through active pumping and treating while the contaminant levels in soil may not be reduce over a similar timeframe." However, the previous description and evaluation of Alternative 4 do not indicate that pump and treat technology has been included in Alternative 4. Only air sparging has been included in this alternative to address groundwater contamination. This apparent discrepancy in the description and analysis of Alternative 4 should be corrected.

2.2.5 Alternative 5

2.2.5.1 <u>Technical</u>

16. The use of CleanOx for the purpose of remediating contaminated groundwater has been included in Alternative 5. However, the CMS Report fails to discuss the extent of the contaminant plume in groundwater that will undergo treatment and the method of distributing the CleanOx in the subsurface. These and other preliminary design details are necessary to allow adequate evaluation of the implementation of the CleanOx technology at the TWFF and should be included in the CMS Report.

3.1.1 Comparison of Alternatives on Technical Merits, Page 3-1

17. This section should be revised to provide separate comparisons of alternatives for soil, groundwater, and PSH, consistent with Tables 3-1 through 3-3. The final recommended alternative should be based on the best option for each medium. See the specific comments below regarding the comparison of alternatives presented in Tables 3-1 through 3-4, which also apply equally to the text of this section.

18. It is unclear whether the fuel farm will be decommissioned in conjunction with the base closure. If so, it would seem that any active fuel lines at the facility would be removed or closed in place. In this case, excavation will not be limited by the presence of active fuel lines, so this limitation should be removed from the evaluation in the CMS. Furthermore,

LUCs will be more difficult to implement, monitor, and enforce once the property is transferred. The CMS should be revised to address these issues. If the active fuel lines are to be decommissioned, then LUCs may not be the most appropriate corrective action for the soil in this area, because excavation would be feasible.

19. Section 3.1 indicates that process options within each alternative may be added, substituted, or eliminated to create a more favorable alternative. However, there is no indication that this type of evaluation was conducted. An additional subsection should be added that specifically assesses whether other combinations of process options may be more appropriate. Because the soil and groundwater contamination is not co-located, there should be no significant benefit gained by grouping process options across these media. Soil alternatives should be evaluated independent of groundwater and PSH to ensure that the best alternative is selected for each medium.

Table 1-2

20. LUCs are required for any remedy where contamination is left in place above unrestricted reuse/unlimited exposure criteria. For alternatives where soil will be actively treated, LUCs will be required until such time that residual contamination has been reduced to acceptable levels. Therefore, LUCs for soil should be included as an element of each alternative.

21. If the fuel farm will be decommissioned in conjunction with closure of the installation, the combinations of ex-situ and in-situ process options for soil included in Alternatives 3 through 5 are unnecessary, as excavation of soil will not be precluded by the presence of active fuel lines and tanks. In any case, additional evaluation should be conducted to determine whether the individual process options are more appropriate than the combinations. For example, as presented in Table 3-1, if ECGO is dropped from Alternative 3, and all soil is remediated by excavation and disposal, all of the negative aspects of the evaluation drop out, making Alternative 3 far more appealing for remediation of soil.

Table 3-1

22. Table 3-1 should be revised as described below.

- For each alternative, the process options relevant to the soil media should be specified, so that the basis for the evaluation presented is clear.

- The effectiveness, useful life, and long-term reliability of LUCs should be reevaluated in light of the fact that the installation will be closed and the property transferred beyond the direct control of the Navy. To conclude that LUCs will be highly effective, have a long useful life, will restrict access indefinitely, and be

reliable over the long term is only be true if the Navy identifies and implements controls that can be effectively monitored and enforced indefinitely. The CMS Report, as currently written, fails to identify such controls.

- As described in Appendix B of the Part B Permit, time must be addressed from two perspectives. Each process option must be evaluated based on the time it takes to implement the corrective measure and the time it takes to see beneficial results, which are defined as reduction of contaminants to an acceptable level. For the purposes of this evaluation, estimated time periods should be determined for each process option to achieve unrestricted reuse and unlimited exposure criteria. The longer the time period, the less favorable the alternative should be ranked. Alternative 1, which for soil is limited to LUCs, should be rated least favorable in this regard, since no active measures are taken to reduce contaminant concentrations, and contamination will remain indefinitely.

- Similarly, the evaluation of human health and environmental protection should evaluate the relative ability of each alternative to reduce contaminant concentrations over time, which will result in a lower potential for exposure to contaminants over time. Options such as excavation and off-site disposal, which result in a permanent reduction in the concentration of all contaminants in the shortest period of time, should be considered more protective of human health and the environment than options such as LUCs, which allow contamination to remain in place indefinitely. To the extent that each alternative reduces the concentration of a larger proportion of the COCs over a shorter period of time, it should be considered more protective of human health and the environment over the long term. Alternatives that permanently remove PAH and arsenic contamination from soil in a shorter period of time should be considered more protective than those that leave PAHs and/or arsenic in place.

Table 3-4

23. The ranking of alternatives should be reevaluated and better justified. In particular, the justification for ranking Alternative 1 as the best alternative for all criteria is suspect. In the short term, all of the alternatives rely on LUCs to provide protection. Over the long term, Alternative 1 does the least to reduce contaminant concentrations, because there are no active remediation components. Alternatives 2, 4, and 5 have been penalized because they do not effectively treat arsenic and/or PAHs. However, Alternative 1 is listed as effective on all COCs, when it is not designed to actively treat or remove any COCs. The alternatives should be ranked based on the degree to which they remove COCs. Those which remove more COCs in a shorter timeframe should be given preference.

24. It is incorrect to indicate that all of the remedies are equally protective of human health. Some of the alternatives are ineffective at treating specific contaminants, and different

timeframes are associated with contaminant reduction for each alternative. To the extent that each alternative reduces the concentration of a larger proportion of the COCs over a shorter period of time, it should be considered more protective of human health over the long term. The alternatives should be evaluated with this in mind and ranked accordingly.

25. The ranking of alternatives based on environmental benefits is questionable. Alternative 4 is given a ranking of 3 because it may allow impacted groundwater to migrate before results are realized. This issue would seem to be of equal or greater concern for Alternative 1, where no groundwater treatment beyond MNA is proposed, yet Alternative 1 is given a ranking of 1.

Figures 2-1 through 2-5

26. Each of these figures includes LUCs for soil, which is appropriate and necessary, because each alternative leaves at least a portion of the contaminated soil in place, pending successful completion of treatment. However, only the cost estimate for Alternative 1 includes cost for LUCs related to soil at the site. The cost estimates should be revised to include LUCs for the estimated period of time until all soil contamination at the site reaches unrestricted reuse/unlimited exposure levels.

Figure 3-1

27. The Corrective Measures schedule is incomplete. It appears to address only the construction and operation of the PSH skimming portion of the alternative. The schedule should be expanded to include the tasks associated with MNA, which the cost estimate assumes to include installation of 5 new monitoring wells and semiannual sampling for a period of 20 years. The schedule should also be expanded to include tasks associated with LUC implementation and monitoring. These tasks are not currently defined but may include developing and implementing restrictive covenants, construction of fencing, installation of signage, quarterly inspection, and annual reporting to EPA for an indefinite period.

Appendix B Cost Estimates

28. The cost of implementing LUCs is likely to be significantly greater than the $5,000 indicated in the cost estimates. Furthermore, no basis is provided for the $5,000 estimate. Supporting cost estimates should be developed that address costs associated with each of the LUC mechanisms identified, including costs associated with the initial development and implementation of the controls, as well as monitoring and enforcement costs for the duration of their expected lifetime. The cost estimates should include quarterly inspections of the site and annual reports to EPA.

29. The cost estimate ($1,085,000) provided for MNA is inadequate. The assumptions provided indicate that the estimate is based on 20 years of semiannual monitoring; however, no backup estimate has been provided as for the other remedy components. Furthermore, each of the five alternatives includes the same cost for MNA. The MNA time period should be different for each alternative, because each of the active treatment components should reduce the long-term monitoring requirements by a different amount, depending on its ability to remove source material and actively treat groundwater. Backup cost estimates should be provided for MNA, and the time period assumed for each alternative should be thoroughly justified.

30. The cost for the CleanOx component of Alternative 5 ($4,663,900) appears high and no supporting information is included to support the estimate. A cost estimate should be added to Appendix B to justify the cost of this remedy component.

31. In several instances, technology costs from the Federal Remediation Technologies Roundtable (FRTR) Web site have been used as a primary basis for the cost estimate. In some cases these data appear to have been used improperly. For example, in the capital cost estimate for bioventing, the primary cost driver is $50 per cubic yard for bioventing equipment. However, the FRTR Web site indicates that the cost for operating the bioventing system is $10 to $50 per cubic yard. It is inappropriate to use total operating cost data, such as that provided in the FRTR Web site as the basis for capital equipment cost. Similar issues were noted for other technologies. The cost estimates should be revised to use specific, documentable costs, for individual pieces of equipment or combined systems.

32. In several instances, operating costs appear to be overestimated. For example, the cost estimate for PSH skimming includes labor costs of 30 hours (i.e., nearly 4 days) per week associated with operation and maintenance (O&M) of 12 skimmers. Similarly, the cost estimate for O&M of the extraction wells includes labor costs of 32 hours per week for operation and maintenance of 8 extraction wells. These labor estimates are the primary basis for the total cost of each remedy component and appear greatly overestimated. Similar issues were noted with other technologies. The cost estimates should be revised to use more realistic estimates of labor associated with operating and maintaining the systems.

33. In several instances, the "ITEM PRICE" is inconsistent with the "QTY" and "UNIT PRICE." The most notable example is in the dual phase extraction cost estimate, where one steam flushing unit is listed at a cost of $250,000, and total price for the item is listed as $2,500,000, a ten-fold error. Similar issues were noted with other technologies. The cost estimates should be revised to correct this and similar multiplication errors.

34. The cost associated with disposal of excavated soil appears high ($180 per ton). This is of particular concern, because the disposal cost ($312,500) represents approximately two-

thirds of the total cost estimate ($461,682.87) and has a very significant effect on the overall cost. The basis for this estimate should be clarified or the unit cost should be revised.

35. The landfarming cost estimate is incorrectly titled "SVE," and soil disposal costs are similarly overestimated for this technology, especially considering that the soil will be treated prior to disposal.

36. The air sparging cost used in Alternative 4 ($350,000) is a lump sum amount from the FRTR Web site that is based on air sparging a single one-acre site. The cost estimate should be developed based on the capital and operating costs at the TWFF site. The estimate should be based on the size of the area requiring treatment, the nature/ concentration of contaminants, hydrogeological constraints, and the estimated timeframe required to reach CAOs.

37. The cost estimates for ECGO are incomplete. The basis for the stated capital costs are unclear and could not be verified using the referenced Remediation Technologies Development Forum (RTDF) Web site. Furthermore, no O&M costs have been estimated. Capital cost should be estimated based on the cost of installing the electrodes and associated systems, and O&M cost estimates should be included for the estimated time period for which the system will operate. O&M costs should include labor for operation and maintenance and electrical utilities.