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"LETTER AND U S NAVY RESPONSE TO U S EPA REGION IV COMMENTS ON DRAFT REMEDIAL INVESTIGATION, BASELINE RISK ASSESSMENT AND FEASIBILITY STUDY FOR OPERABLE UNIT 8 (OU 8) SITE 3 NAS CECIL FIELD FL"
12/14/1995
ABB ENVIRONMENTAL SERVICES INC

ABB
ASEA BROWN BOVERI

December 14, 1995

Mr. Bart Reedy
Remedial Project Manager
Federal Facilities Section
Waste Management Division
USEPA Region IV
245 Courtland Street, N.E.
Atlanta, Georgia 30365

Subject: Responses to USEPA Comments on Draft Remedial Investigation, Baseline Risk Assessment, and Feasibility Study Reports, Operable Unit (OU) 8, Site 3, Naval Air Station Cecil Field, Florida Contract No. N62467-89-D-0317/090

Dear Mr. Reedy,

On behalf of Southern Division, Naval Facilities Engineering Command ABB Environmental Services, Inc. is pleased to forward three copies of responses to your comments on the Draft Remedial Investigation, Baseline Risk Assessment, and Feasibility Study Reports for OU 8, Site 3, NAS Cecil Field, Florida.

The Navy has agreed with USEPA recommendations proposed in all comments except comment numbers 3, 10, 40, 41, 43, 46, 47, 48, 51, 52, 60, 61, 77, 100, and 104 where additional information has been presented to address USEPA comments. A meeting or conference call may be arranged to discuss our responses prior to finalizing the reports in a manner that is acceptable to all parties. We would appreciate your expeditious review of these Responses to Comments.

Sincerely,

ABB ENVIRONMENTAL SERVICES, INC.

Rao Angara
NAS Cecil Field
Installation Manager

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USEPA REVIEW COMMENTS
Naval Air Station Cecil Field, Operable Unit 8
Jacksonville, Florida

Mitch Cohen, Dynamac Corporation, Staff Engineer, July 12, 1995

1. The Draft FS adequately presents historical information on OU 8, including analytical results from previous investigations. Additionally, the Draft FS identifies remedial action objectives (RAOs), selects and screens remedial technologies, develops remedial alternatives and presents a detailed analysis of each alternative as per the RI/FS Guidance manual.

   No response required.

2. With regard to ground water contamination, the Draft FS presents a comprehensive list of potential remedial alternatives to treat ground water, screens the technologies in a logical manner and presents promising remedial alternatives.

   No response required.

3. With regard to soil contamination, the Draft FS presents no alternatives for remediating the surface or subsurface soil, which is inadequate. The Draft FS states in Section 2.0 that trichloroethene (TCE) detected in the vadose zone in the disposal pit area acts as a source of ground water contamination by leaching into the ground water at concentrations above the maximum contaminant level of 5 micrograms per liter. The Draft FS also states that the "contaminated soil will continue to act as a source of ground water contamination for 23 years." Since NAS Cecil Field is a Base Realignment and Closure (BRAC) site and expeditious restoration of the base is desired, the contaminated soil source area must be addressed. If contaminated soil is not addressed, then contaminants will continue to leach into the ground water, hindering ground water remediation.

   No alternatives for remediating the surface and subsurface soil was developed because there was no human health or ecological risk from soil exposure, few detections of chemicals of concern were observed, and the natural rate of groundwater cleanup is longer than leaching of contaminants from soil under natural conditions. The Navy understands the implications of Naval Air Station (NAS) Cecil Field being a Base Realignment and Closure base, but since natural conditions will bring concentrations of trichloroethene (TCE) in the surface soil to below risk-based levels, an active remediation of soil was not addressed.

4. Page iii, Executive Summary, Table:

   The table in the middle of this page is somewhat confusing and is inconsistent with the text. For example, the first row, "Duration Time," lists alternative MM-4 as taking 19 years, while the text in the last paragraph at the bottom of the page show alternative MM-4 as taking 9 years. Also, the alternatives listed in the row, "Present worth cost" do not appear to be in the correct order. These discrepancies should be addressed.

   The table and text on Page iii were revised as part of an errata package. The reviewer did not have the errata package when reviewing the document. The revisions will be included in the final report.

5. Page 1-11, Figure 1-3:

The site boundary should be shown on this figure in order to adequately assess the locations of the soil and ground water samples.

Figure 1-3 of this feasibility study (FS) will be modified and this area of investigation will be shown on the figure.

6. Page 1-13, Section 1.4.3, Paragraph 6:

The text refers to Figure 1-1 for the location of the Navy helicopter crash site. However the details of the Navy helicopter crash site are shown on Figure 1-3, not figure 1-1. clarify this discrepancy.

The discrepancy will be clarified in the Final FS.

7. Page 2-5, Figure 2-1:

Regarding the placement of site boundaries, see Specific Comment No. 5.

See response to Comment No. 5.

8. Figures 2-2 and 2-3:

The water table should be shown on these lithologic cross sections for completeness.

The water table will be shown on these figures.

9. Page 2-13, Figure 2-6:

Figure 2-6 shows the locations of confirmatory soil samples; however, the figure should also present analytical results of the soil samples or present results in a separate table. By presenting analytical data along with sample locations, soil contamination can be easily assessed. Additionally, this manner of presenting data is consistent with the preferred manner in which ground water data was presented.

A new figure (Figure 2-7) will be created depicting TCE, total recoverable petroleum hydrocarbons (TRPH), and total volatile organic compounds in surface and subsurface soil.

10. Page 4-6, Section 4.3.1, Paragraph 5:

The text states that no RAOs specific to surface soil and subsurface soil were developed based on the results of the remedial investigation (RI). However, this conclusion does not seem justified in light of the information presented in paragraph 4 of the same page which states that "TCE present in the subsurface vadose zone soil in the historic pit area is still leaching to ground water and causing TCE contamination above the MCL of 5 $\mu g/\ell$ at OU 8." Therefore, the Draft FS should justify why soil remediation was not addressed. See the General comments section.

No remedial action objectives for source control was developed because there was no human health or ecological risk from soil exposure, few detections of chemicals of concern were observed, and the natural rate of groundwater cleanup is longer than leaching of contaminants from soil under natural conditions.

11. Page 4-9, Section 4.3.1, Paragraph 2:

The text states that no "substantial exceedences of surface water or sediment quality guidelines were identified for aquatic receptors in Rowell Creek." Clarify what is meant by "substantial exceedences."

Exceedences of surface water and sediment quality benchmarks can be found on Tables 6-5 and 6-6 of the Draft Baseline Risk Assessment (BRA) and are summarized below. The term "substantial exceedences" was used because only two contaminants detected in both surface water and sediment exceeded screening benchmarks. Only aluminum and silver exceeded aquatic benchmark values and only Aroclor-1254 and 4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT) exceeded sediment quality benchmarks. The ecological risk assessment of conditions at operable unit (OU) 8 indicates that there is little chance of risk to aquatic receptors due to exposure to concentrations of these contaminants (Section 6.5.2, Draft BRA). This discussion will be added to the text of the final FS.

Analyte	Detected Conc. at RC-SW-3 ($\mu g/\ell$)	Detected Conc. at CF3-SW-1 ($\mu g/\ell$)	Region IV Chronic Water (Surface Water) Quality Screening Value ($\mu g/\ell$)
Aluminum	141	559	87
Silver	0.24	ND	0.012
Analyte	**Detected Conc. at RC-SD-3 ($\mu g/kg$)**	**Detected Conc. at CF3-SD-1 ($\mu g/kg$)**	**Region IV Chronic Water (Sediment) Quality Screening Values ($\mu g/kg$)**
Aroclor-1254	180	ND	33
4,4'-DDT	ND	4.4	3.3

Notes: $\mu g/\ell$ = micrograms per liter. ND = not detected. $\mu g/kg$ = micrograms per kilograms. DDT = dichlorodiphenyltrichloroethane.

12. Page 4-23, Table 4-7:

Footnote 6 states that "Log K_{ow}" is the n-octanol-water partition coefficient; however, the abbreviation definitions at the bottom of the table state that "Log K_{ow}" is the organic carbon partitioning coefficient. Clarify this discrepancy.

The notes section is incorrect, K_{oc} is the organic carbon partitioning coefficient. This discrepancy will be clarified in the text.

Gregory M. Brown, P.E., Florida Department of Environmental Protection, July 10, 1995

Comments 13 - 33, were previously addressed and submitted on October 9, 1995. Comments and responses are not repeated here.

William N. O'Steen, U.S. Environmental Protection Agency (USEPA), Environmental Scientist, Groundwater Technology Support Unit, July 26, 1995

34. There are problems throughout sections 2 and 3 of the report with missing and duplicate pages.

These problems will be corrected during the final revision.

35. Regarding Table B-1, where there are no surface water standards for a constituent, there is no need to establish the background surface water concentration as a surface water remedial criterion.

Agree. No cleanup criteria based on background will be established for compounds in which there is no existing State or USEPA surface water criteria. The tables will be modified to reflect this.

36. Regarding Table B-1, the table indicates there is a Florida drinking water standard of 100 μg/L for 2-methylnaphthalene. This value should be the ground water remedial criterion, rather than the Florida guidance concentration for this compound.

The 100 micrograms per liter ($\mu g/\ell$) value comes from Florida Administrative Code (FAC) 62-770, Petroleum Contamination Site Cleanup Criteria, February, 1990, and is the cleanup criteria for the sum of naphthalene and methyl-naphthalene. The value in Table B-1 will be footnoted and this will be explained.

37. With regard to inorganic contaminants of concern, there are inconsistencies between Table 4-5 and Table B-6 with respect to the FOTW discharge criteria, the per cent removal required, and the per cent removal achievable by the FOTW.

These discrepancies will be resolved and the tables changed in the final revision.

38. On page 4-20, footnote 4 to Table 4-5 cites Appendix C; actually, Appendix B, Table B-6 should be referenced.

The text will be changed to read Appendix B.

39. In Table B-5, under the column Selected SW Criteria, and in Table B-6, under the column FOTW discharge criteria, several criteria are listed as "ND (1)". Presumably, this indicates non detect, with a detection limit of 1 μg/L. However, for the constituents where this criterion is listed, the selected criteria are based on non detect background concentrations, in the absence of specific surface water criteria. Where there are no surface water criteria (standards, guidance concentrations) established, the use of background concentrations as criteria is not required. This comment also applies to Table 4-5.

Agree. No cleanup criteria based on background will be established for compounds in which there is no existing State or USEPA surface water criteria. Tables that include shading of action levels will be modified to reflect this.

40. With regard to the estimated contaminant concentration in extracted ground water (in Tables B-4, B-5, B-6, B-7, and B-8), the procedure used to calculate the estimated concentration is inconsistent with the procedure used to calculate the estimated concentration in extracted ground water for NAS Cecil Field OU7. The weighted average procedure used in the OU7 FS Report Appendix D calculations should also be used for OU8, to make conservative estimations of the extracted ground water contaminant concentrations.

The weighted average procedure used for calculating estimated contaminant concentrations in extracted groundwater was used initially for OU 8. In this procedure, the locations of the proposed extraction wells are used as part of the calculation of estimated concentrations of contaminants. Because the placement of extraction wells will likely change during the detailed remedial design from what is proposed in the FS (if extraction wells are chosen as the preferred alternative), the Navy felt that this approach would not be best for OU 8. Moreover, this procedure yielded results within the same order of magnitude as the results obtained by using the averaging technique described in the FS (Table B-4, footnote 3). Therefore, the Navy reported the results obtained using this technique instead of the weighted average procedure.

41. Referring to Table 4-6, the estimated concentration in extracted ground water exceeds the maximum of detected concentrations. This condition is not possible.

Using the averaging technique described in comment #40 and in footnote 3 of Table B-4 of the FS, the reported detection limit for antimony (60 $\mu g/\ell$) was used as the "non-detect" concentration when averaging analytical results to estimate the extracted water concentration. This was done for all inorganics because they occur naturally in groundwater, whereas most organic contaminants are not expected to be present; using the detection limit as the "non-detect" concentration of a chemical gives a very conservative estimate of the concentration that might be found in extracted groundwater. Therefore, it is possible that the averaging process yielded a result higher than the highest reported detection of antimony. If the USEPA concurs, a less conservative assumption (non-detects = 0 $\mu g/\ell$, which gives a predicted concentration of 0.46 $\mu g/\ell$ as apposed to 18 $\mu g/\ell$) can be used for estimating the concentration of antimony in extracted water.

42. In Table 4-7, the data presentation indicates that the Henry's Law constants for 1, 1-dichloroethane and benzene range from 0 to greater than 500. This error should be corrected.

The dash represents a hyphen, not a range. This will be clarified.

43. Regarding Section 5.1.2.1, page 5-7, the series of treatment processes accompanying the UV oxidation treatment appears to be unnecessarily complicated. Rather than going through the steps detailed in this discussion, effective treatment of organics and inorganics could probably be attained by an initial step where the pH is raised and inorganics are precipitated, followed by treatment of the organics with UV oxidation. The same concern about the complicated treatment process applies to Section 5.3.4 on page 5-24 and to the discussion in Section 6.4.1. A similar comment was made regarding the proposed ground water treatment associated with remedial alternative MM-3 for Cecil Field NAS OU7.

The Navy concurs that in some cases it is beneficial to remove iron prior to ultraviolet light and oxidation (UV/OX) . However, this may produce a hazardous waste for handling and disposal. In some cases iron is used to catalyze some of the UV/OX reaction. There are advantages and disadvantages for pre- and post-removal of iron. The final configuration will be determined during remedial design. For costing purposes in this FS the Navy chose a post-treatment iron removal configuration. If a pump-and-treat alternative is chosen as the preferred alternative for OU 8, pilot scale tests may be conducted as described in the FS to assess the efficiency of the treatment operation. Adjustments and alterations to the treatment train could be made during pilot scale testing and remedial design.

44. Regarding Section 5.1.4 on page 5-14, establishment of an injection well with a zone of discharge (area of noncompliance with ground water chemical-specific ARARs) as a part of remedial action for OU8 would not be allowed per Florida DEP regulation 62-522.300 (2) (a).

Agree. Based on the Florida Department of Environmental Protection's (FDEP) definition of an injection well being deeper than it is wide, the reinjection well would have to be a horizontal well. Any vertical reinjection well would require a waiver from FDEP. The text will be modified to clarify this.

45. Regarding comments about aquifer flushing of TCE made in Section 2.2.3.2 on page 2-18 and in Section 6.1.1, page 6-3, a TCE concentration of 5 μg/L will not attain the ground water chemical-specific ARAR of 3 μg/L (see Table B-1 in Appendix B). A 3 μg/L TCE concentration corresponds to a longer projected time frame for ground water remediation under a natural flushing scenario. The time required for the TCE soil leaching and ground water flushing processes to attain the 3 μg/L Florida drinking water standard should be calculated.

The aquifer flushing and soil leaching times will be reevaluated using a TCE concentration of 3 $\mu g/\ell$.

46. The large volume of TCE contaminated (>5 μg/L) ground water in the surficial aquifer (on the order of 10 to 20 million liters, based on RI Report figures 4-9 and 4-10) and large mass of dissolved TCE in the ground water (72.2 Kg, according to Appendix C of the FS Report) appears inconsistent with the very limited amount of soil TCE contamination documented in the RI Report. This apparent inconsistency could be indicative of (1) rapid TCE flushing from the vadose zone, (2) a discrete contaminant source which has not been detected by the soil sampling program, and which may represent a continuing contaminant source, or (3) some other cause.

Waste liquids were disposed of in an excavated pit which was in contact with the groundwater creating a direct pathway for TCE to enter groundwater. However, some TCE would be expected to be adsorbed to the surrounding soil as the waste liquids would create a mound above the water table and spread contaminants radially from the pit. It appears that the amount of adsorbed TCE was limited because extensive sampling and analysis for TCE during the soil screening and confirmatory soil sampling programs indicated few detections of TCE in the historical disposal pit area. Therefore, the Navy believes that there are no discrete sources as indicated by the absence of TCE in the soil sampling results.

47. The analysis of TCE flushing from the soil (RI Report, summarized in FS Report Section 6.1.1 as a 23-year time frame) does not suggest that the large mass of TCE now in the ground water was the result of a rapid flushing of TCE through the soil, under presently understood, operative contaminant transport mechanisms (transport of dissolved TCE primarily in soil moisture). Also, assuming the field screening data presented in the RI Report are reasonably correct, some relatively large concentrations of TCE remain in the upgradient part of the ground water contaminant plume.

There are therefore several potential indicators of a potentially significant ground water TCE source area remaining at the site.

See response to comment 46.

48. Some explanation is needed for the large ground water plume and relatively high ground water TCE concentrations in the upgradient part of the plume when there is apparently very little soil TCE contamination. There may be some need for additional source area control of ground water contamination which is not indicated by the OU8 RI Report and data analysis.

See response to comment 46.

49. On page 6-3, Section 6.1.1 should reference the part of the FS Report which contains the calculations used to estimate the time required for flushing of TCE from the aquifer.

TCE flushing calculations are in Appendix C. This will be referenced as suggested.

50. Appendix C presents the calculations used to estimate the time required for TCE to naturally flush from the surficial aquifer. In this Appendix, the report lists the seepage velocity in the aquifer as 104 ft/yr. This value conflicts with a seepage velocity estimate of 88 ft/yr presented in Section 3.6.2.3 of the OU8 RI Report.

The value of 104 feet per year (ft/yr) is the distance-weighted average value from the former disposal site to Rowell Creek in the top third of the surficial aquifer as determined from the results of the U.S. Geological Survey (USGS) numerical model. The 88 feet per year is the value for the disposal pit area calculated from the average of 7 water level measurements from monitoring wells 3S and 20S to determine gradient, then multiplied by the 3-feet-per-day calibrated model value for hydraulic conductivity, and divided by the effective porosity (0.2) used by the USGS in their numerical model. Appendix K of the remedial investigation (RI) presents detailed explanation.

51. One aspect of the Appendix C modeling which predicts the time required to naturally flush the aquifer is at a minimum very confusing but appears to be an erroneous model input. In Appendix C, point 3 of the discussion of remedial alternative MM-1 notes that the origin for the analytical solution was selected at a distance approximately 1400 feet upgradient from the former disposal pit. This condition implies that to match the observed contaminant distribution in the aquifer, the contaminant mass had to be introduced in the model input at a point 1400 feet upgradient of the source area. Since the model assumes a slug input of contaminant, it is intuitively concluded that if the slug was presumed to have entered the aquifer 20 years ago, a source upgradient of the disposal pit would have to be assumed in order for the model results to approximate the observed contaminant distribution in the aquifer. The obvious problem with this approach is that

the contamination has not been introduced into the aquifer at a point 1400 feet upgradient from the source area. Contamination has also not been introduced into the aquifer as a slug, but rather has entered the aquifer from a more continuous source that has probably decreased in strength over time. Thus, the selected model does not appear to be appropriate for the OU8 site conditions.

The model used to estimate plume migration is an analytical equation which requires input of site conditions to calibrate estimates to current observations of plume configuration. Wherever possible, actual site conditions are input into the model.

The analytical assumption of an instantaneous point source release of contaminants deviates from the actual site conditions. To compensate for this deviation, conditions different from actual site conditions had to be input to the model to yield an estimated contaminant plume which resembles the observed plume. This calibration step (i.e., using an origin 1,400 foot upgradient from the source area) is essential to establishing the credibility of model forecasts. Plume migration and configuration forecasts were considered reasonable based on the conceptual understanding of the site.

52. This apparent modeling problem could probably be resolved by selecting another model to consider the flushing of contaminants from the aquifer. This may require the use of a more complicated numerical model, where the observed contaminant mass can be distributed throughout the aquifer, rather than being assumed to have entered the aquifer at a specific point or zone, under a specific mass loading scenario.

More complex models requiring additional field data that may be available can be used to refine estimated plume migration rates and configuration. These more complex models were not selected for use during this FS because more accurate plume configuration and migration rates were not believed necessary for selecting a remedial alternative at OU 8.

53. On page 6-7, in the discussion of the reduction of the toxicity, mobility, and volume, it is unclear how the plume size would not increase but the volume of contaminated ground water would increase.

The last sentence of the third paragraph on Page 6-7 will be deleted.

54. Section 6.2.1, page 6-9 states that in a preliminary evaluation, methane, ethane and ethene were found in the aquifer at OU8. The data which indicate the presence of these compounds was not presented in the RI Report. Therefore, the presence and distribution of these substances cannot be independently reviewed.

Groundwater from three monitoring wells was sampled and analyzed for methane, ethane, and ethene specifically to support the FS in determining if natural, unaided biodegradation is occurring at OU 8. The results of these analyses, which were performed by ABB

Environmental Services, Inc's (ABB-ES's) biotreatability lab in Wakefield, Massachusetts, will be presented in Appendix C of the final FS report. Methane was present in three wells at OU 8, but ethane and ethene were not detected above quantitation limits. The presence of methane and the corresponding absence of ethene indicates that TCE is being degraded naturally at OU 8, but that the degradation process is not going to completion. The text of the FS and the Final RI will be clarified to indicate the purpose and the results of this focused sampling effort.

55. In Section 6.2.1 on page 6-10, there is a statement "Based on hydrogeologic modeling, it is anticipated that 9 to 10 years would be required to distribute nutrients throughout the aquifer...An additional 2 to 3 years would then be required for biodegradation of organic compounds." The modeling or other analysis which supports these time estimates should be referenced in this section of the report. If the only supporting calculations are those presented in Appendix C of the FS Report, there is a great deal of uncertainty about the actual time required for the bioremediation process to work, if it would work.

The text will reference Appendix C. The estimate of 9 to 10 years for distribution of nutrients throughout the aquifer at OU 8, with an additional 2 to 3 years required to degrade organics present in the plume, is based on three sets of information: (1) modelling and data presented in Appendix C of the FS; (2) an analysis of the physical, hydrogeological, and contaminant characteristics of the plume at OU 8; and (3) ABB-ES' experience in bioremediation at similar sites. If a bioremediation alternative is selected for OU 8, more accurate estimates of the timeframe required for cleanup would be developed during remedial design and pilot-scale treatability studies. While there is some uncertainty concerning the bioremediation cleanup time, the time frames presented are believed to be reasonable and provide a basis from which a preferred alternative selection decision can be made.

56. On page 6-21, Section 6.3.1, the text should reference the calculations or modeling used to estimate the time required for source area volatilization.

The calculations used to estimate the time required for source area volatilization were provided verbally by a vendor. A reference to the calculations will be included in the final FS.

57. For remedial alternative MM-3, the potential for the proposed source area volatilization via in situ air stripping to adversely affect the downgradient bioremediation of chlorinated solvents should be addressed.

Source area volatilization should not affect the downgradient bioremediation of chlorinated solvents. Though conditions in the aquifer are assumed to be anaerobic, well locations in the source area will be selected so that the area of influence of volatilization will not

encompass the area of the plume that will be treated via bioremediation. This discussion will be added to the text of the FS.

58. In the second paragraph of Section 6.3.1.2, the last sentence does not appear to relate to the rest of the paragraph. This last sentence should probably be in an additional paragraph, with further explanation of the proposed monitoring provided.

This last sentence is improperly placed in this section and it will be removed.

59. For both alternatives MM-2 and MM-3, the possibility of nutrient addition through injection wells rather than trenches should be considered. The trenching process appears to be extremely costly; for remedial alternative MM-2, the cost is primarily due to the $810,000 estimated cost of disposal of excavated soil. Depending upon the nature of the nutrients added to the system and the rate of nutrient addition through injection wells (minimization of the induced hydraulic gradient is recommended), injection well nutrient addition may be both favorable and cost effective.

Both injection wells and infiltration trenches were considered when developing Alternatives MM-2 and MM-3. Infiltration trenches were chosen over injection wells for the following reasons:

- **Compared to injection wells, infiltration trenches take advantage of the natural hydraulic gradient toward Rowell Creek at OU 8; the introduction of nutrients into the aquifer would occur more uniformly across the entire plume.**
- **It was believed that the probability of biofouling of the trenches was lower than that of the injection wells.**
- **It was believed that maintenance of the trenches would be technically easier and faster than maintenance of several injection wells.**
- **A large number of injection wells would be needed to cover the areal extent of OU 8.**
- **operation and maintenance costs associated with the injection wells were high because of the large number of them.**

The cost for the disposal of excavated soil generated during trench installation is based on the assumption that all of the soil would be considered hazardous, requiring special handling and disposal. If analytical results of soil sampled during excavation indicate that it does not need to be handled as hazardous waste, then the cost of disposal would decrease significantly.

60. Appendix C presents the methodology and results from the estimation of the time required to remediate the ground water using the pump and treat remedial action. The approach used to make this estimate is unconventional, difficult to follow, and may be based on some erroneous assumptions. A more common approach for estimating the time to remediate a ground water contaminant plume is to use the EPA batch flush model. This model is documented in the EPA report Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, EPA/540/G-88/003. Use of this model has been simplified to the following equation, which is presented in an article by Zheng et al (Ground Water, Volume 29, Number 6, November-December, 1991):

$$PV = -R \ln C_e/C_i$$

where PV is the number of pore volumes of water which must be circulated through the area of contamination before the remedial goal is attained;
R is the retardation factor (per Section 5.2.3.2 of the OU8 RI Report, this value is estimated to be 2.3 for trichloroethene)
C_e is the remedial goal (3 μg/L Florida drinking water standard)
C_i is the initial contaminant concentration.

The Navy supports the use of the model (Hunt, 1983) presented in Appendix C of the FS. The batch flush model was used to predict a natural flushing time for the surficial aquifer at OU 8. The batch flushing model was run for OU8. The results are presented in Appendix K of the Draft RI. The number of pore volumes was calculated as 16.2, hence the time required to reduce TCE contamination in the vadose zone soils so that the resultant leachate has a TCE concentration of 5 $\mu g/\ell$, is estimated as 23 years. In Appendix C, the Navy calculated a time frame of 9 years required to remediate the groundwater using the pump-and-treat remedial action. The Navy thought the batch flush approach presented by the reviewer was sound, the results of the model used in the FS are similar to the results yielded using the batch flush model. Therefore, the Navy sees no benefit in revising the modeling effort, and the FS will be finalized using the original model presented in Appendix. Additionally, the more common approach will be presented in Appendix C for comparison. For future FSs, the Navy will consider the use of the less-complex batch flush model to predict pump-and-treat cleanup times and decide between the two.

61. The initial trichloroethene concentration is variable throughout the area of surficial aquifer ground water contamination. The maximum detected concentration of trichloroethene in the surficial aquifer is 4200 μg/L (based on Figure 2-8 from the FS Report; Aquaprobe sampling location 3-9). By conservatively using this concentration in the batch flushing equation, one calculates that 16.7 pore volumes must be removed from the surficial aquifer before the 3 μg/L trichloroethene remedial goal is attained. As noted on page 2 of this memorandum, an estimated 10 to 20 million liters of contaminated surficial aquifer ground water are present at OU8. This range in volume is equivalent to between 2.64 and 5.28 million gallons of contaminated ground water (equal to one pore volume of contaminated ground water). For the pump and treat remedial designs presented in Appendix C of the FS Report, the total projected ground water discharge is either

30 gallons per minute (gpm) or 32 gpm. Therefore, for the estimated range in volume of contaminated ground water, a pumping rate of 30 gpm will require between 61.1 days and 122.2 days to remove one pore volume of water from the aquifer. Consequently, 16.7 pore volumes of water would be removed from the aquifer in a period of approximately 1020 days to 2040 days, or about 3 to 6 years. With a 32 gpm total pumping rate, the remedial action should attain a 3 μg/L trichloroethene concentration in a time of between 957 days and 1914 days. This analysis ignores the effect of contaminant mass remaining in stagnation zones, which would increase the time required for ground water remedial action objectives to be attained.

The Navy has estimated a total flushing time of 6 years which is close to the 5.6 years that the reviewer has calculated above. Pages 6 and 7 of Appendix C take into account the flushing of stagnant zones that will not be remediated in the pump and treat alternative. The last sentence of Page 6 and the first paragraph of Page 7 in Appendix C notes that "To complete the flushing, every other well will be converted to an injection well to cause a flow pattern to flush the dead (stagnation) zones...it should take no more than half the time above to complete the flushing of the dead zones, or about an additional 3 years." When the stagnation zones are included in the calculation, the total time to remediate the groundwater is 9 years.

62. The results of this alternate approach to estimating the remedial time frame for the pump and treat remedial action approximates the remedial time frame presented in Appendix C of the FS Report. To support the calculations presented in Appendix C, I recommend that this alternative method for calculating the ground water remedial time frame also be presented in the report.

The Navy will consider the use of the less-complex batch flush model to predict pump-and-treat cleanup times in future reports. However, since similar flushing times were calculated using different methods it is not necessary to include the batch flush method.

63. With regard to the potential wetlands impacts from remedial alternative MM-4, the FS Report should consider in the development of this remedial alternative EPA policy regarding remedial actions which could affect wetlands. Two EPA guidance documents should be consulted: OSWER Directive 9280.0-03, "Considering Wetlands at CERCLA Sites" (EPA 540/R-94/019), May 1994, and the EPA OSWER Fact Sheet "Controlling the Impacts of Remediation Activities in or Around Wetlands," EPA 530-F-93-0202. These publications should be available from the Superfund Docket and Information Center, (202) 382-6940.

Agree. The Navy will review the above referenced documents and incorporate any pertinent and relevant information.Joan J. Dupont, USEPA, Environmental Biologist, Ground Water Technology Support Unit, August 11, 1995

64. It is the policy of the EPA Region IV office of Health Assessment to require written responses to review comments provided by this office. If a meeting with the Federal Facility is to be held to discuss these comments, we request that written responses be provided prior to such a meeting.

We also request that any risk assessment comments received from the State or any other source be provided to the Office of Health Assessment for our site file. If risk comments from sources other than this office are forwarded to the Federal Facility contractor, the source should be clearly identified unless concurrence of this office is sought. In this case, we should formally review these comments and provide you with our response before they are forwarded.

The Navy will comply with the request.

65. Some of the statement in the May 1995 Draft Feasibility Study (FS) concerning ecological risk assessment were not mentioned in the April 1995 Draft Remedial Investigation (RI) Report or the April 1995 Draft Baseline Risk Assessment, implying that there might be a later draft of these two documents. For example, in my comments given below, I request clarification in the Draft RI Report and the Baseline Risk Assessment concerning the potential for ground water contaminants to discharge to the wetland prior to reaching Rowell Creek. I also request an evaluation of potential effects of this discharge on the wetland biota, particularly wetland vegetation, if such a pathway is possible. The summary of the Ecological Effects Assessment (Section 3.3.5, page 3-18) in the Draft FS discusses potential ground water contaminant effects on wetland vegetation, implying that the Baseline Risk Assessment has already been revised to include this topic.

Later drafts of the RI and BRA reports have not been prepared. The FS report will be amended to indicate that groundwater has not been observed to discharge into the OU 8 wetlands and, therefore, no groundwater exposure pathway for wetland biota exists.

66. <u>Sec. 3.6.2.1, Surficial Aquifer System, pp. 3-17 and 3-19:</u>

The text on page 3-17 states that the depth to groundwater at OU8 is as shallow as 1 foot bls (in the wet season). Since the topography changes from the disposal pit area toward the wetlands and Rowell Creek (Figure 3-1), does this shallow depth pertain to the pit area, the wetlands area, or where?

The shallow depth (1 foot below land surface [bls]) to groundwater pertains to the wetland area and the area from the wetland to approximately 500 feet to the west. Groundwater in the pit area is greater than 1 foot bls. This information will be added to the text of the Final RI report.

On page 3-19 the last sentence of paragraph 1 states that the water table is near land surface in the wetland west of Rowell Creek and that no ground water discharge has been observed in the wetland. Could shallow ground water reach the wetland during the wet season?

The referenced sentence, no groundwater discharge was observed, included the wet season.

67. Beginning with Figure 4-1, please check the figures showing contaminant distributions, to make sure they show the concentration units.

All figures in Chapter 4 will be checked and concentration units will be added if they are currently absent.

68. Sec. 4.2.3.1, p. 4-33:

In Figure 4-6, page 4-32, the ground water VOC data for monitoring wells CEF-3-28S and CEF-3-31S seem to indicate that ground water VOCs are present in the palustrine emergent persistent wetland area (shown in Figure 3-10, page 3-36). Since this type of wetland is generally "wetter" than the other two wetland types found in the OU8 study area (Table 3-6, page 3-37), is it possible that the ground water plume could reach the wetland surface, or at least the root zone of the wetland vegetation, in this area? If so, this ecological exposure should be evaluated in the Baseline Risk Assessment.

All evidence indicates that groundwater does not discharge into the wetland at the study area. During the wet season, groundwater is at a depth of one foot bls in the OU 8 wetland. Predominant vegetation in the wetland is graminoids and other typically shallow-growth plants. The hooded pitcher plant is also present, it does not send down deep roots. Therefore, the Navy does not believe wetland vegetation is likely to be at risk from groundwater exposure in the OU 8 wetland.

69. Sec. 5.1.5, p. 5-3:

See the comments given above concerning ground water discharge and the wetlands.

See responses above.

70. Sec. 5.2.2, p. 5-4:

If groundwater contaminants discharged to the wetlands, the contaminants would be not as diluted as they would upon discharge to the creek. Wetland biota would be exposed to higher contaminant concentrations. Please address this point.

See response to comment 68.

71. Sec. 6.4.5, pp. 6-20 to 6-21:

See the comments given above concerning possible discharge of ground water contaminants to the wetlands and potential effects on wetland biota.

See responses above.

72. Section 2.2. p. 2-7:

Paragraph #3 states that the delineated wetland is about 6 acres and the ground water plume underlies about 2 acres of the wetland. However, the Draft Feasibility Study (Executive Summary, page ii, and Section 1.4.2, page 1-10) states that the delineated wetland is 6.7 acres and the plume underlies about 2.7 acres of the wetland. Please check for consistency on this point.

The area estimates in the FS are more accurate. The Draft Risk Assessment will be amended on p. 2-7, paragraph #3, to read, "6.7 acres of delineated wetland, with the plume underlying about 2.7 acres of the wetland."

Paragraph #3 indicates that about two acres of the delineated wetland overlie the ground water contaminant plume. Comments provided above on the Draft Remedial Investigation Report express a concern about possible discharge of the ground water plume into the wetland (especially the palustrine emergent persistent wetland area) prior to reaching Rowell Creek. If it is determined that such a discharge is possible, this contaminant migration pathway and possible exposure for wetland biota (particularly wetland plants) must be evaluated in the Ecological Risk Assessment.

All evidence indicates that groundwater does not discharge into the wetland at the study area, so a contaminant migration pathway from groundwater to the wetland was not addressed. It is postulated, however, that groundwater discharges into Rowell Creek. For these reasons, sampling stations were selected in Rowell Creek, and the risk assessment addresses the risk to ecological receptors exposed to Rowell Creek surface water, sediment, and groundwater.

73. Section 5.2.4.1, p. 5-12:

In paragraph #2, it looks like an editorial note needs to be removed from line 1, so that the sentence reads "Examination and interpretation of the metric scores..."

The document will be amended as suggested.

74. Figure 6-1, p. 6-3:

The disposal pit should also be included as a source.

The figure will be amended as suggested.

75. Section 6.2, p. 6-9:

Paragraph #3 states that calcium, magnesium, potassium, and sodium were excluded as Ecological Chemicals of Potential Concern (ECPCs) for all media and iron was excluded for surface soil and sediment, calling them essential nutrients which are toxic only at extremely elevated concentrations.

While this statement is probably valid, the three supporting references cited focus only on effects on humans and other mammals, such as mink, foxes, and cattle. Is there any information available on the effects of these chemicals on plants and non-mammalian animals? What concentrations would be considered "extremely elevated?"

Appropriate literature sources are being researched for the requested toxicity data. Any relevant data that are available will be included in the Final BRA.

76. Section 6.2.4, p. 6-21:

See the comment given above concerning possible discharge of ground water contaminants into the wetlands. If the contaminant plume discharges into the wetlands, wetland biota would also be considered possible receptors.

See response to comment #72.

77. Section 6.4.1 Terrestrial Plants and Invertebrates, p. 6-49:

Although organic chemicals were found in surface soil at the site, they were apparently not detected in the surface soil samples used for the earthworm bioaccumulation test. Since some of these organic chemicals (e.g., 4,4'-DDT) can biomagnify along food chains, the lack of information on exposure and bioaccumulation of organics is a data gap that should be included in the Uncertainty Analyses, Section 6.6, page 6-77.

The bioaccumulation test for invertebrates only evaluated bioaccumulation of inorganic analytes. Based on a review of preliminary site screening data and past difficulties observed with earthworm matrix interference, bioaccumulation of pesticides was not assessed. In the food web model, conservative BAF values were calculated for pesticides, PCBs and other organics using numerous literature sources. Although this could be interpreted as a data gap, the Navy believes the approach taken has adequately addressed the issue of bioaccumulation of organics.

78. Table 6-8, p. 6-28:

For clarity, change the table's title to show that the table focuses only on inorganics.

The table will be amended as suggested.

79. Table 6-18, pp. 6-63 to 6-65:

For each analyte which exceeds at least one of the toxicity reference values shown in this table, calculate the average and maximum diluted unfiltered exposure concentrations and include them in this table.

The average and maximum exposure concentrations for each ECPC found has been calculated and is listed in the table under the unfiltered, filtered and diluted unfiltered groundwater heading.

80. Section 6.5.3, p. 6-70:

Paragraph #2 excludes aluminum, iron, and lead as toxicants in OU8 ground water, based upon concentrations similar to background concentrations. Comparison to background concentrations helps determine whether contaminants are site-related, but it tells nothing about toxicity. (That is, if background concentrations exceed toxicity benchmarks, and site concentrations are similar to background concentrations, then the site might not be contributing to additional toxicity.) Therefore, please modify the wording with respect to toxicity.

The document will be amended as suggested.

81. Table 6-21, p. 6-73:

Expand the title to say "for Dichlorobenzene."

The title will be amended accordingly.

82. Section 6.5.2, Surface Water, p. 6-58:

Table 6-16, page 6-59, indicates that the concentration of aluminum in surface water increases downstream in Rowell Creek. The "maximum predicted concentration of aluminum in diluted unfiltered groundwater" (i.e., based upon calculated dilution of groundwater contaminants upon discharge to Rowell Creek) is 357 ug/l(Section 6.5.3, page 6-66). This concentration is within the range of aluminum concentrations found in downstream surface water in Rowell Creek (i.e., 141 ug/l and 559 ug/l). While the statement in paragraph #3 about some degree of sorption of aluminum to particulates and decreased bioavailability is valid, paragraph #3 mentions that "several species of frogs, minnow, snails, and bass also exhibit sensitivity to low concentrations of certain aluminum salts." Therefore, modify the last statement in paragraph #3 to indicate that it is unlikely that the levels of aluminum in surface water pose an acute risk to the site's aquatic receptors (since the aluminum concentrations in surface water were below the acute Ambient Water Quality Criterion of 750 ug/l), but aluminum could pose a chronic risk to sensitive aquatic species in Rowell Creek.

The last statement will be modified as suggested.

83. Section 6.5.2, Sediment, p. 6-62:

Although Aroclor 1254 and 4,4'-DDT were not detected in ground water, ground water flow and discharge is not the only contaminant migration route from the site to Rowell Creek. Since Aroclor 1254 and 4,4'-DDT were found in surface soil at the site, address possible migration of these contaminants to the creek via surface water runoff. (According to Table 6-2, page 6-12, and Table 6-3, page 6-15, Aroclor 1254 had a very low frequency of detection in site surface soil, while 4,4'-DDT had a higher detection frequency in surface soil, occurring mainly in the Disposal Area.)

The document will be amended to include a discussion of possible, migration of these compounds via surface water runoff to Rowell Creek.

84. Section 6.5.3, OU8 Shallow Groundwater, March 1994 Sampling, p. 6-66:

In this subsection, either address the potential effects of the ground water contaminant 1,2-dichlorobenzene upon discharge to Rowell Creek, or mention that they are addressed in a later subsection (i.e., OU8 Shallow Ground Water Testing, November 1994, page 6-70.)

The reader will be referred to the later subsection, as suggested.

85. Section 6.5.3, OU8 Shallow Groundwater Toxicity Testing, p. 6-77:

Comments given above expressed a concern about possible ground water contaminant discharge into the wetlands, prior to discharge into Rowell Creek. If it is determined that discharge into the wetlands can occur, then potential ecological risk related to such a discharge must be evaluated. (That is, without the dilution factor associated with discharge to Rowell Creek, could the ground water contaminants adversely affect wetland biota?)

Please see response to comment #72.

William N. O'Steen, USEPA, Environmental Scientist, Groundwater Technology Support Unit, July 26, 1995

86. Executive Summary, p.ii and Section 1.4.2, p. 1-10:

These sections state that the nearby wetlands are 6.7 acres and that the ground water contaminant plume underlies 2.7 acres of this wetland area. However, Section 2.2, page 2-7, of the Draft Baseline Risk Assessment states that the wetland is about 6 acres and the plume underlies about 2 acres of wetland. Please check this discrepancy.

The FS will be amended to read, "6.7 acres of delineated wetland, with the plume underlying about 2.7 acres of the wetland."

87. Section 3.3, p. 3-8:

Portions of the summary of the Ecological Risk Evaluation might need to be revised, depending upon the responses to the comments given above for the Draft RI Report and the Draft Baseline Risk Assessment.

The Ecological Risk Evaluation sections will be revised in all OU 8 documents to reflect the comments received.

88. Section 3.3.1, p. 3-8:

Comments given above for the Draft RI Report and the Draft Baseline Risk Assessment requested clarification of the potential for discharge of the ground water contaminant plume into the wetland, particularly the palustrine emergent persistent wetland area. The discussion of ground water and wetlands in this section might need to be revised, depending upon the responses to those comments.

This section will be revised to reflect the comments received.

89. Section 3.3.5, p 3-16:

This section might need to be revised, depending upon the responses to the comments given above for the Draft RI Report and the Draft Baseline Risk Assessment.

See response #87.

90. Section 4.3.1, Consideration of the Ecological Risk Assessment, pp 4-8 to 4-9:

This section might need to be revised, depending upon the responses to the comments given above for the Draft RI Report and the Draft Baseline Risk Assessment.

See response above.

91. Table 4-4, p. 4-17:

Please check the "Selected SW Criteria" column for 1,2-dichlorobenzene and nickel. According to the highlighted surface water numbers in Appendix Table B-1, pages B-1 to B-3, the criteria should be 50 μg/l (not 250 μg/l) for 1,2-dichlorobenzene and 160 μg/l (not 8.3 μg/l) for nickel. Also, the criterion for aluminum should be 87 μg/l. (See the comment given below for Table B-1.)

Tables 4-4, B-1, B-2, and B-3 will be revised and corrected in the Final FS.

92. Section 6.4.1.9, p. 6-34:

Under Remedial Alternative #4, a baseline wetlands inventory would be conducted prior to implementation of the alternative. Would this inventory be a repeat of the wetlands assessment already conducted during the Remedial Investigation (Draft Baseline Risk Assessment, Section 5.1, page 5-1)?

The wetlands inventory proposed for OU 8 would not repeat any of the activities previously performed under the wetlands assessment conducted during the RI at OU 8. The goal of the wetlands inventory would be to identify and fill any data gaps in the completed wetlands assessment that are required for the remedial design at OU 8. If it is determined that no data gaps exits, then the results of the wetlands assessment would be used to support the remedial design.

93. Table B-1, p. B-2:

Include the chronic AWQC of 87 μg/l for aluminum. (See Table 6-19, page 6-68, of the Draft Baseline Risk Assessment.

The table will be changed as suggested.

Ted Simon - U.S. Environmental Protection Agency (USEPA), Toxicologist, October 12, 1995

94. It is the policy of the EPA Region IV Office of Health Assessment to require written responses to review comments provided through this office. If a meeting with the facility is needed to discuss these comments, it is requested that any risk assessment comments received from the State or any other source be provided to the Office of Health Assessment for our site file. If risk comments from sources other than this office are forwarded to the Federal Facility, the source should be clearly identified unless concurrence of this office is sought. In this case, we should formally review these comments and provide you with our response before they are forwarded.

All comments and responses to risk assessment documents are traditionally compiled into one letter and distributed to all concerned parties.

95. Possible formation of Vinyl Chloride: EPA is concerned about the formation of vinyl chloride from anaerobic degradation of TCE. Other breakdown products of TCE are present and, hence, the absence of vinyl chloride is remarkable. The discussion of TCE breakdown on page 5-4 is an appropriate place to present a discussion of possibilities and any soil measurements that address the conditions such that vinyl chloride formation would not be favored.

The concern here is, of course, the carcinogenic toxicity of vinyl chloride.

Additional chemical data were collected at OU 8 after completion of the RI report to assist in the evaluation of unaided biodegradation of TCE. The data indicate that biodegradation is occurring but the transformation process is not going to vinyl chloride. The conditions that may be responsible for limiting the biological process under present conditions include: low pH (4.5-5.5); low levels of nitrogen, phosphate and sulfate; and/or low levels of an electron donor (carbon source). This information will be included in the discussion of TCE breakdown on page 5-4.

96. Mislabelling: A number of the plume maps (e.g. A-9, A-10) indicated that the plume was 1, 1, 2-trichloroethylene. TCE has no numbered isomers as its structure is fixed.

The plume maps were mislabelled and future references to TCE will not indicate that there are TCE isomers.

97. Page 4 - 2 and elsewhere, Use of 1991 Groundwater samples only. It says:

For groundwater, data from the 1991 sampling period will be used to assess risk.

No rationale was given for not using the 1993-94 data. Given that a TCE plume has formed and has moved from the site, the latest data or a combination of the phased data should be used. Failing that, a justification for omitting the data should be provided.

On page 4-38, the text indicates that wells CF3MW3S, CF3MW4S, CF3MW6S, CF3MW7D, CF3MW7S, CF3MW13S, CF314I, CF3MW15D, CF3MW18S, CF3MW19D, CF3MW28S, CF3MW29D, CF3MW31S and CF3MW32D were considered to be within the plume for the purpose of calculating groundwater exposure point concentrations. A table should have been provided giving the concentrations of the COPCs in these wells. Figure 3-3 was inadequate for depicting these wells. CF3MW4S was not on figure 3-3. CF3MW2S was shown on the figure for no apparent purpose - page 2-11 of the RI indicates this well was abandoned.

The risk assessment's lack of clarity regarding the wells considered to be in the plume and justification thereof is a major flaw and should be corrected.

A. **The document under review included data from both 1991 and 1993/94 field sampling events. The statement will be rewritten to read "Data from both the 1991 and 1993/94 sampling period will be used to assess risk."**

B. **To facilitate the selection of wells within the groundwater plume, a new table will be included in the final risk assessment report. This table will list each well and specify the COPCs found and their concentrations.**

98. **Page 4-17, Comparative Cancer Risk.** It says:

> *In the United State, one in three women and one in two men develop cancer during their lifetime.*

Although this statement provides perspective on the cancer risk estimates, it most properly belongs in the discussion of uncertainty.

The statement will be removed from this part of the text.

99. **Page 4-19**. The discussion of the Region 3 RBC values and the Florida Guidance Concentrations is unclear, especially the statement about "insignificant underestimation of risk." It should be removed or rewritten.

Section 4.1.6.2 will be rewritten as follows:

"Selection of Chemicals of Potential Concern Human Health Contaminants of Potential Concern (HHCPC) selection procedures will follow USEPA guidance (USEPA, 1989f). The selection of HHCPCs is designed to eliminate, from further study, those contaminants which are present in concentrations which would not be expected to represent a significant human health risk. The screening process uses risk-based guidance concentrations available from USEPA Region III (RBC tables) and Florida Department of Environmental Protection (Soil Cleanup Goals and Ground Water Guidance Concentrations). These guidances are based on conservative assumption and should be protective at most sites.

100. **Page 4-23, Appendix I and Appendix N, Particulate Emission Factor.** The value of 4.97E+07 m^3/Kg was used as the PEF in all scenarios. This value corresponds to a PM_{10} of 20 $\mu g/m^3$. It seems incorrect to use the same value for an occupational worker, a resident and an excavation worker. EPA expects that the environment of the excavation worker will be much dustier than that of the occupational worker or the resident. Using the methods of Appendix I and assumptions appropriate to the excavation worker scenario, a PEF pertinent to this scenario should be calculated and used.

A PM_{10} value of 20 micrograms per cubic meters probably overestimates the risk a resident or occupational worker would receive. An overestimation of risk is protective of these populations.

101. Table 4-6, Selection of COPCs. The screening concentration for aluminum in groundwater should be 3700 not 11,000 mg/Kg.

Agree, 3,700 milligrams per kilogram (mg/kg) will be used. This modification will not change the findings because 3,700 mg/kg is still below the background screening concentration of

17,200 mg/kg and, therefore, aluminum would not be included as a contaminants of potential concern.

102. **Page 4-72, Use of filtered groundwater samples.** The text indicates that filtered samples may have been used. The Navy's contractor knows this is not appropriate. Low flow sampling techniques should be used to obtain a groundwater sample of low turbidity in lieu of filtration.

The next sentence in that paragraph reads, "The filtered data were not used in the human health risk assessment." To avoid any confusion, this paragraph will be rewritten. The intent of this paragraph was to inform the reader that both filtered and unfiltered samples were collected during the 1991 field investigation. (In 1991 USEPA's recommended groundwater sampling procedures required filtered and unfiltered samples to be collected and analyzed.) However, all groundwater data used in the risk assessment were unfiltered sample results.

103. **Page 4-73**. It says:

> *Samples from wells located in the plume had higher concentrations of inorganic chemicals than samples from wells located in the plume.*

This should be corrected.

This will be changed to read, "Samples from wells located in the plume had higher concentrations of inorganic chemicals than samples from wells located outside the plume."

104. **Table P-1 and on, Toxicity Values.**

All of the toxicity values were presented with too many significant figures. The number of significant figures is a reflection of the uncertainty of these numbers.

The oral SF for Arsenic is 1.5 $(mg/Kg\text{-}day)^{-1}$ given in IRIS. The inhalation SF for Arsenic is 50 $(mg/Kg\text{-}day)^{-1}$ used with a 30% absorption efficiency, giving an adjusted SF of 15 $(mg/Kg\text{-}day)^{-1}$. The value of 15 $(mg/Kg\text{-}day)^{-1}$ is that calculated from the unit risk of 4.3E-03 $(\mu g/m^3)^{-1}$ given in IRIS.

The oral RfD for trichloroethylene is 6E-03. Attached is an issue paper in this regard.

The oral RfD for 1, 2-dichlorobenzene should be used as a surrogate for 1,3- and 1,4-dichlorobenzene.

The oral RfD for naphthalene, 4E-02 mg/Kg-day, should be used as a surrogate value for 2-methylnaphthalene. An issue paper in this regard is attached.

The oral RfD for endrin should be used as a surrogate for endrin ketone.

NCEA has proposed a new provisional oral RfD for Aluminum of 1E+00 mg/Kg-day. An issue paper in this regard is attached.

NCEA has developed a provisional inhalation RfC for 1,1,1-trichloroethane of 1 mg/m^3. This value should be used. An issue paper is attached.

The RfD for manganese is about to be changed on IRIS to 0.14 mg/Kg-day for both food and water. For a 70 Kg adult, this corresponds to an permissible intake of 10 mg/day. EPA suggests the assumption that most individuals receive 5 mg/day from the diet. The difference 5 mg/day is divided by the MF of 3 and a body weight of 70 Kg, hence, leaving 0.024 mg/Kg-day for non-dietary exposure. This is for the contractor's information only. Manganese is not a risk driver and the document need not be changed.

Appendix P will be amended to include all the above surrogate and provisional values, except for manganese. We would like to discuss with the USEPA some of the ramifications of use of the recommended manganese value before adopting it as policy.

105. **Exposure Assumptions in the Appendix**

Region 4 EPA considers the youth trespasser to be between 7 and 16 years with a body weight of 45 Kg.

The basis for the exposure time of 8 hr/day and exposure frequency of 12 day/yr for the site worker should be presented.

The portions of the body representing those available for dermal contact should be stated.

The soil ingestion rate for the excavation worker should be 480 mg/day. Documentation is attached.

A. **Agree, the assumptions will be modified to conform with the USEPA's specifications. The child trespasser exposure period of 10 years (ages 7 to 16 years old) will be used instead of an 11 year exposure and a higher average body weight of 45 kilograms (kg) instead of 40 kg. The risk assessment final report will contain the risk as calculated based on these assumptions.**

B. **The site worker represents an infrequent worker to the site, such as a lawn maintenance worker. This worker would be expected to visit the site for one day a month (total of 12 days a year). Because his job is physically demanding, his ingestion rate would resemble the excavation worker. The site worker represents a scenario somewhere between the occupational worker who comes to the site every day, but does not perform stringent activities, and the excavation worker who only works at**

a single site for a very short time, but is expected to have a relatively high exposure rate to the contaminants during this period.

C. The final risk assessment will have a table listing the body parts and associated surface area used to calculate surface area for each type of scenario.

D. A soil ingestion rate of 480 mg/kg will be used for an excavation worker.