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LETTER AND COMMENTS FROM U S EPA REGION I REGARDING DRAFT FEASIBILITY STUDY FOR BUILDING 82 NAS SOUTH WEYMOUTH MA
10/22/2009
U S EPA REGION I

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

October 22, 2009

Brian J. Helland, P.E.
BRAC Program Management Office NE
4911 South Broad Street
Philadelphia, PA 19112-1303

Re: Draft Feasibility Study for Building 82

Dear Mr. Helland:

Thank you for the opportunity to review the *draft Feasibility Study for Building 82* dated September 2009. Consistent with EPA's June 26, 2009 groundwater policy (OSWER Directive 9283.1-33), groundwaters that are current or potential sources of drinking water that exceed risk-based standards or pose an unacceptable risk generally warrant a remedial action under CERCLA. Overall, EPA is concerned that only one of the alternatives retained for detailed analysis is Applicable or Relevant and Appropriate Requirement (ARAR) compliant. Detailed comments are provided in Attachment A. EPA will forward its comments on the ARARs tables shortly under separate cover. We appreciate the electronic copies provided to us on October 22, 2009.

Page 2-1 of the FS identifies soil and groundwater as media of concern, yet only alternatives to remediate groundwater are evaluated. The FS should more clearly explain why soil alternatives were not evaluated.

Please add a table with remediation goals to accompany the remedial action objectives (RAOs). Pursuant to 40 CFR §300.430(e)(i), RAOs should specify the contaminants, media of concern, and remediation goals. Remediation goals shall establish acceptable exposure levels that are protective of human health and the environment.

A preliminary remediation goal (PRG) needs to be established for vinyl chloride, a daughter product of trichloroethylene (TCE), especially for Alternatives G-3 and G-4. Based on the relatively low concentrations of TCE detected at the site, it appears unnecessary to establish a PRG for either cis-1,2-dichloroethylene or trans-1,2-dichloroethylene. The daughter product of 1,1-dichloroethane (1,1-DCA) is chloroethane, which does not have an established maximum contaminant level (MCL). Since enhanced biological treatment and natural attenuation of site contamination are viewed as viable alternatives, evaluation of the daughter products is appropriate.

1,1,1-trichloroethane (1,1,1-TCA) was detected at a concentration of 360 µg/L at one location, which exceeds the MCL of 200 µg/L. In addition, the daughter products of 1,1,1-TCA include 1,1-DCA and 1,1-dichloroethylene (1,1-DCE). 1,1-DCA has been addressed in the Feasibility Study Report (FS); 1,1-DCE has not been addressed. 1,1-DCE has an MCL of 7 µg/L and was detected in groundwater where the 1,1,1-TCA concentration was 360 µg/L and where cleanup of 1,1-DCA is planned. Therefore, 1,1-DCE should be identified as a potential contaminant of concern and a PRG should be established for it, especially since enhanced biological treatment and natural attenuation

of site contamination are considered as viable alternatives that might result in the generation of 1,1-DCA and 1,1-DCE.

The Massachusetts Drinking Water Guidelines list 1,1-dichloroethane with a guideline concentration of 70 micrograms per liter (μg/L) which is less than the proposed risk-based concentration of 99 μg/L. Please identify the Massachusetts Drinking Water Guidelines as a to-be-considered (TBC) criterion and use the 70 μg/L concentration as the PRG.

The site figures should be updated to include the road that was constructed north of Building 82.

Please clarify why NGVD 1929 was used for this FS. The vertical datum used at other SOWEY sites is NAVD 1988. Please ensure that the datums used for this site going forward are consistent with datums used previously or plan to account for the differences in the datums in the long-term monitoring and reporting program.

Please expand the discussion of the potential impact of the implementation of any of the proposed remedies on the schedule for development.

While the Draft Final human health risk assessment (HHRA) and the Draft Final ecological risk assessment (ERA) are accurately summarized in Sections 1.4.1 and 1.4.2 respectively, it would be helpful if summary risk tables were added to the FS text in Section 1.4. Please note that there are several outstanding issues with the RI that must be resolved before any remedial decisions can be made. The major issues that might influence the risk assessment conclusions include:

- General questions about source area definition, groundwater flow directions, and contaminant migration pathways
- Better understanding of the occurrence of PCBs in groundwater
- Source of TCE contamination in groundwater
- Add aroclor 1260 and lead as groundwater COPC
- Add aroclor 1248 to dermal risks calculations for groundwater
- Add dibenzofuran and 1,2,3-trichlorobenzene to non-cancer HI calculations
- The 81,460 ug/kg hit of total PAH in the northern ditch should be delineated to determine the extent of contamination in that area. The ditch provides sufficient habitat for benthic inverts and small mammals and birds.
- The invertebrate EPCs (based on BAFs and sediment concentrations) used for the intake calculations for the star nosed mole and Carolina wren should be reviewed.

Since groundwater, but not soil, is proposed for remediation, please show the cumulative risk of the four selected groundwater COCs at their selected PRGs in combination with the soil risks of non-background COPCs. The risk of the four COCs with PRGs set to 1E-05 ILCR is 4E-05. The total risk of these four COCs should then be added to the risk of non-background soil COCs (*i.e.,* 7E-05 ILCR for benzopyrene equivalents, 1E-06 ILCR for benzene, 3E-06 ILCR for chloroform, 6E-06 ILCR for tetrachloroethene, and 7E-06 ILCR for heptachlor epoxide; *see* Table 9.10A.RME in Appendix G-1 to the RI). The total risk of soil and groundwater at the risk-based PRGs would be 1.3E-04, which is too high given that inhalation risk owing to household water use was not quantified and less conservative TCE toxicity factors were used. Also, since MCLs are ARARs, please calculate the cumulative soil and groundwater risk of TCE and Aroclor-1248 at their MCL concentration combined with 1E-06 or 1E-05 risk-based PRGs for NDNP and 1,1-DCA. If the risks

are unacceptable, it may be necessary to use risk-based PRGs lower than the MCLs to ensure remedy protectiveness. Please also evaluate the vapor intrusion risk associated with the proposed groundwater PRGs, in combination with the vapor intrusion risk of the non-PRG volatile COCs (benzene, chloroform, PCE).

Since manganese in groundwater had two samples greater than background, and the groundwater EPC is supposed to be the maximum concentration in any well according to EPA region I guidance, it is necessary to derive a risk-based PRG for manganese in groundwater. This value will likely be close to the Health Advisory of 0.3 mg/l, which is a TBC.

I look forward working with you and the Massachusetts Department of Environmental Protection to select a remedy for the Building 82 site. Please contact me at (617) 918-1385 to arrange a meeting to discuss these comments. Thank you.

Sincerely,

Kymberlee Keckler, Remedial Project Manager
Federal Facilities Superfund Section

Attachment

cc: Dave Barney, USN, South Weymouth, MA
Dave Chaffin, MADEP, Boston, MA
Kevin Donovan, SSTTDC, South Weymouth, MA
Rona Gregory, USEPA, Boston, MA
Phoebe Call, TTNUS, Wilmington, MA

ATTACHMENT A

Page	Comment
p. 1-1, §1.1.1, ¶2	In the third sentence, replace "The alternatives should provide cost-effective methods" with "The alternatives must meet protectiveness standards and meet all ARARS, as required under the NCP, and provide the best balance of the remaining NCP criteria to mitigate the identified risks...."
p. 1-6, §1.2.2	The text indicates that an oil-water separator (OWS) was removed in 1998. Was the OWS that was removed the same one as indicated near the southwest corner of B82 on the Figure 1-3? Has this OWS been investigated? Have the subsurface soil and groundwater been investigated here? EPA is concerned that this area may represent an additional source area.
p. 1-7, §1.2.2	Please specify that the removal actions conducted under CERCLA authority.
p. 1-10, §1.2.6	While the text describes the effects of the two 42-inch drains on the local groundwater system, it should be noted that this assessment is made primarily on the basis of groundwater data collected from relatively wet times of year, (*i.e.,* times of year with relatively high water table conditions). Groundwater flow directions could revert to a more southwesterly pattern, (*i.e.,* consistent with the general regional flow direction for overburden groundwater in this part of the base) during drier periods. The flow patterns depicted on Figures 1-8 and 1-9 (both from April 26, 2007) are driven by the low heads in the vicinity of the drains, and the relatively high heads in the vicinity of the surface water ditches along the northern, western, and southwestern perimeters of the site. At lower water table conditions typical of drier periods, it is likely that neither of these forces would affect groundwater, particularly to the degree suggested by these figures. Figure 1-7 indicates that a drop of only a few feet would cause the 42-inch drains to be above the water table. At such times, they would essentially be disconnected from the deeper aquifer materials, and would therefore not be expected to exert drain-like effects. Similarly, the drainage ditches, which have been reported to be dry at times, may also be effectively disconnected from the groundwater system under lower water table conditions. The groundwater database suggests that water table fluctuations of sufficient magnitude have occurred regularly. EPA therefore believes that the Navy should further assess groundwater flow patterns under drier conditions to determine whether flow directions change. As a result, revisions to the CSM may be needed, which may affect the evaluation of remedial alternatives and implementation of a final remedy. Additional monitoring points may be necessary.
p. 1-12, §1.3, ¶2	The fourth sentence explains why pesticides and metals are considered background. The presence of pesticides in fill material is not an intended use of pesticides. The Navy is responsible for placing pesticide-laden soil as fill at the Building 82 site. If it has been brought to the site as fill, it is not background. Pesticides may have been used as intended in soil at the Naval

Air Station, but then using that soil as fill is not an intended use and therefore the Navy is responsible for the cost of cleaning up that soil.

p. 1-13, §1.3.1 Please explain why spills and aircraft exhaust were not considered as potential sources. Fuel releases from aircraft are common at other airbases. Spills on the apron may have created secondary sources within and beneath the peripheral ditches.

p. 1-13, §1.3.1 With respect to the GTM-2 Release Area, it should be noted that dissolved contaminants may be transported downgradient to the southwest under lower water table conditions (*see also* comment for page 1-10, §1.2.6).

p. 1-14, §1.3.1 Napthalene could also be residual from fuel spills on the apron areas rather than incomplete combustion.

p. 1-14, §1.3.1 PCBs in the MW-11D and MW08-016D areas could be from leakage of contaminants discharged to catch basins or into the 42-inch drains (*e.g.,* during low water table conditions). Please prepare a map showing the engineered drainage system in the apron areas.

p. 1-15, §1.3.2 The discussion in the last paragraph states that evaluation of the site building indicated no on site source for TCE and that the TCE contamination in groundwater may be from an off site source. Review of the area of TCE contamination together with the contaminant source areas in the building and the building drain lines suggests that the source of the TCE, especially the deep TCE, may well be Building 82 and that TCE was transported to its present location via the five-inch sanitary sewer that passes right through the TCE area of contamination. Drain D-5 discharged to the five-inch sewer and other drains were re-routed through that sewer in 1977. Transport via the sewer line would account for not finding TCE in the soil at and upgradient of the area of contamination. Although EPA recognizes that investigations to date have not identified DNAPL, the release of DNAPL could account for the distribution of TCE in the southeastern portion of the site. DNAPL would migrate along the top of till following the till gradients and also percolate through the till to greater depths. This could also potentially account for the shallower TCE detections. Please add the complete route of the five-inch sewer line to the FS figures and identify the material and nature of the sewer line (*e.g.,* vitrified clay) and further evaluate this potential source (possibly in a pre-design investigation or supplemental RI if necessary) to determine if it is the source of the TCE, especially the deep TCE. To justify the existence of an off site source further investigations would also be required.

If a release of TCE has occurred at the site in the form of DNAPL, the alternatives as evaluated in this FS would not meet the remedial goals. The existing database for the TCE area is not adequate to support decision-making related to site remedies. A better investigation of the TCE area of contamination is warranted. In particular, given the limited thickness of the overburden deposits, a more complete investigation would necessitate drilling

into the bedrock beneath the suspected source areas or secondary source areas. EPA notes that chlorinated solvent contamination has penetrated into the bedrock at neighboring and upgradient sites (*i.e.,* SRA and Building 81).

It is also possible that the TCE contamination could be attributed to a release related to the old utility lines that formerly traversed the site in that general area. It would be useful to show the route of those old utility lines in a figure and discuss them as a potential source of contamination. If the Navy has eliminated the old utility lines as a potential source, please explain it in the FS.

p. 1-16, §1.3.2

The FS acknowledges that the domain of TCE in groundwater in the southeastern portion of the site is not fully delineated, and states that additional investigation is needed. For purposes of evaluating remedial alternatives, some assumptions are made about the extent of the plume (pages 2-11 and 2-12; Sections 2.6.1 and 2.6.2). While these seem reasonable in the interest of moving the FS forward, a contingency should be developed in the event that further characterization reveals that the plume is significantly larger or contains TCE at significantly higher concentrations. The presence of unidentified residual NAPL material may provide a ready mechanism to replenish the limited aquifer volumes assumed to be impacted. As such, the volumes of groundwater/mass of contaminants may be underestimated. This issue underscores the need to further characterize the source areas to refine the CSM, thus enabling a more realistic assessment of remedial alternatives.

p. 1-17, §1.3.3

While metals may be expected to be background constituents, the presence of elevated levels of redox-sensitive metals such as iron, manganese, and arsenic suggests a relationship to organic chemicals released at the site. For example, these metals are commonly released from aquifer materials into groundwater as dissolved constituents under low DO and low redox conditions, but may re-accumulate in adjacent or down-gradient areas. EPA has observed areas of locally enhanced iron-staining in test pits conducted in the former N-S roadway alignment; Figure 1-10 shows a manganese exceedence at TP-100C. The staining in this pit appears to be co-located with residual asphaltic material and the concentration of redox-sensitive metals, and therefore, may be a function being collocated with the organic constituents in the asphalt and/or fuel release. The CSM should be updated to fully account for fate and transport of the redox-sensitive metals (see also comment for Figure 1-12).

Figure 1-1

Please correct the graphic scale.

Figure 1-7

This figure is cross-section D-D'. Cross-section C-C' has not been provided with the FS. Please include cross-section C-C' and revise the figure numbers accordingly. Also add another cross section through the southeastern portion of the site connecting MW07-03, B82-MW-10S/D, and B82-MW-202S/D to show the subsurface in the general direction of the groundwater flow in the area of TCE contamination.

Figure 1-12	The highest manganese levels in shallow ground water appear to be roughly co-located or downgradient to the GTM-2 release, suggesting a correlation of increased concentrations of the redox-sensitive metals (*e.g.,* iron, manganese, arsenic) in groundwater with releases of organic chemicals (*e.g.,* VOCs, CVOCs, PAHs, fuels).
p. 2-1, §2.2.1	The FS notes that no actionable risk was identified for any contaminant in soil, so that no further evaluation of remedial actions need be done. While this may be correct, the RI describes elevated manganese and lead at TP-101C (3 ft). Although this apparently isolated location may not pose actionable risk, EPA recommends consideration of a local removal action to address concerns about historical accumulation of inorganics.
p. 2-2, §2.2.2, ¶4	Benzene, chloroform, PCE, heptachlor epoxide, and arsenic are identified as contaminants of concern with total cancer risks greater than 10^{-4} and with a non-cancer hazard quotient greater than 1. However, those contaminants were erroneously screened out because the concentrations are below federal MCL standards. These contaminants must be retained to properly evaluate the total risk. Please discuss whether MTBE is a chemical of concern for groundwater.
p. 2-3, ¶1	Since the manganese was detected above background concentrations, it must be retained as a COC.
p. 2-3, ¶2	Change "affect" to "effect."
p. 2-3, §2.2.2, ¶2	The text states that well B82-MW-02 had a maximum concentration of 1,1-DCA. That concentration was actually detected at B82-GP-A01, which is proximate to B82-MW-02. Please correct.
p. 2-4, §2.3.1	In the first groundwater RAO, unacceptable risk seems to be defined as total ILCR greater than $1x10^{-5}$ OR HI greater than 1. Please explain why some contaminants of concern that had an HI greater than 1 were screened out earlier.
p. 2-10, ¶2	In the third sentence, the future use of the site is for "housing, offices, commercial, and retail." Please explain why vapor intrusion was not addressed.
p. 2-11, §2.5.1	*Ex situ* treatment, such as pump and treat, should be considered, particularly given the relatively low concentrations of many of the COCs.
Table 2-2	It is not apparent that the MCP is an ARAR for this site because it does not itself classify groundwater.
Table 2-3	Please correct Note #2. HI=0.1 is not presented.

Table 2-4	PRGs also need to be included for daughter products of the contaminants detected at the site because cleanup will not be completed until the concentrations of the daughter products also satisfy the ARARs. Please edit the table accordingly. Also, as noted elsewhere, 1,1,1-TCA has an MCL of 200 μg/L which is exceeded at this site and cleanup of 1,1-DCA to only 99 μg/L is not consistent with Massachusetts Drinking Water.
p. 3-6, §3.2.2.3	a) The discussion in the partial paragraph at the top of the page regarding the proposed monitoring parameters suggests that "Monitored Natural Attenuation," as defined in EPA directive 9200.4-17P, is proposed by this response action. It is not apparent that this is what is intended or that it is even appropriate considering the relatively low concentrations of contaminants of concern (COCs) as compared to the cleanup goals. A less rigorous program that relies on natural attenuation by physical processes (and biological processes only to the extent that they occur coincidentally) coupled with monitoring to evaluate trends in COC concentrations is more appropriate. Please clarify. b) The discussion under *Effectiveness* states that PCBs are much less affected by natural attenuation processes, which would not reduce the COCs to acceptable concentrations in a reasonable timeframe. While true for biological processes, it is not correct for physical processes such as dilution and absorption which likely would naturally reduce PCB concentrations in groundwater in a reasonable timeframe considering the relatively low concentrations detected. Please revise the PCB discussion to reflect this.
p. 3-7, §3.2.3.1	Please clarify how anaerobic and aerobic bioremediation processes can operate effectively in the same system. Given the inherent incompatibility, there would appear to be significant logistical issues that should be discussed in further detail in the implementability section.
Table 3-1	Please edit the table to address daughter products of detected COCs. Please clarify the discussion of groundwater extraction. While extraction wells are eliminated because "this technology would not restore groundwater," *ex situ* treatment options are eliminated across the board "since groundwater will not be extracted." As a result, "pump and treat" remedial alternatives may have been inappropriately eliminated.
p. 4-6, §4.2	EPA appreciates the discussion of the uncertainties associated with the TCE plume delineation and source identification. However, it must be acknowledged that if the plume is more widespread or additional sources are identified, the remedial alternatives may need to be revised.
p. 4-8, §4.2.2.1, ¶2	Please edit the last sentence to read: "... have COC concentrations greater than the PRGS, and possibly wells downgradient of these wells, to verify ...."

p. 4-9, §4.2.2.1	Please review the number of injection points listed for the shallow and deep TCE plumes and adjust them to consistently correspond with the number of locations and points per location. As necessary, also adjust the volume of reagent required.
p. 4-11, §4.2.2.2	Please edit the last sentence under Reduction of Toxicity, Mobility, or Volume through Treatment by stating "... residuals of concern would likely be ...." because residuals will be created. Make this correction throughout the FS.
p. 4-12, §4.2.3.1	The discussion of the anaerobic biodegradation of TCE should be expanded to acknowledge the step-wise progression of the process with the creation of daughter products. Cis-1,2-DCE and especially vinyl chloride are only slowly biodegraded under anaerobic conditions, suggesting that an aerobic environment needs to be created downstream to complete the biodegradation of TCE with no exceedance of MCLs for the daughter products.
p. 4-13, §4.2.3.1	There is no earlier discussion of the groundwater velocity for this site and velocities are not presented here. Please introduce the groundwater velocities for this site in Section 1.0.
p. 4-13, §4.2.3.1	The number of barriers and injection locations listed in the table differs from the values presented in Appendix C for Alternative G-3 and also these values are not consistent with the depiction of the deep TCE treatment design presented in Figure 4-2. Please correct.
p. 4-14, §4.2.3.2	In the first sentence of the last paragraph, please change the reference from *aerobic* to *anaerobic*.
p. 4-18, §4.2.4.1	a) In the discussion of the MNA component please reference the EPA MNA document and state clearly whether the intent of Alternative G-4 is to conduct MNA in compliance with the requirements of MNA as defined by EPA. An MNA alternative requires rigorous investigation of the site physical and chemical conditions and the nature and extent of contamination. The current database of information for this site is not adequate to support an MNA alternative. Therefore, the scope of this alternative must include additional investigations possibly a supplemental remedial investigation to accumulate the necessary information to support an MNA alternative. b) In the last paragraph of the discussion of the MNA component, please reference Appendix C for the calculations supporting the Biochlor modeling.
p. 4-20, §4.2.4.2	Under *Short-Term Effectiveness* it should be noted that there is a possibility that contamination could migrate from the site via the bedding for the 42-inch drainage system and contaminate downstream areas. The longer the contamination goes untreated, the greater that possibility apparently becomes based on the assumption that the drainage system is acting as a groundwater sink. This concern is greatest for alternative G-4 but also exists for the other alternatives. The monitoring for all alternatives needs to address that possibility.

Table 4-1	There is no table for Alternative G-1 No Action Alternative. Chemical-specific ARARs apply to the no action alternative.
Figure 4-1	This figure shows 52 deep TCE injection locations, which differs from the 66 locations identified in the table on page 4-9. Please correct if the intent is to show the appropriate number of borings.
Figure 4-2	This figure shows fewer than the 85 deep TCE injection points identified in the table on page 4-13 and fewer than the 12 barriers. Is the intent to show all the points on the figure? Please correct.
p. 5-1, §5.1.1, ¶2	The first sentence implies that monitoring during G-4 would not be effective because it does not discuss G-4. Please clarify.
p. 5-1, §5.1.2	The text states that alternatives G-2, G-3, and G-4 comply with ARARs. The concentration of 1,1,1-TCA present in groundwater at the site exceeds its MCL and no PRG has been established for 1,1,1-TCA. Therefore, the drinking water ARAR would not been satisfied for these alternatives. Please establish a PRG for 1,1,1-TCA because it was identified in an area with a known release and recognize its MCL as a PRG.
p. 5-2, §5.1.3	Because long-term effectiveness and permanence is applicable to the time after achievement of the cleanup goals, the second sentence is not an appropriate argument. It more appropriately belongs in the discussion of short-term effectiveness. EPA recognizes that G-4 might be less permanent because it does not involve as much destruction of contamination as the other alternatives and therefore some future event could cause the release of contamination adsorbed to soil and result in an exceedance of the remedial goals. Please clarify.
p. 5-3, §5.1.4	Please edit the first sentence to read "Alternatives G-2, G-3, and G-4 are not expected to generate treatment residues of concern."
p. 5-3, §5.1.5, ¶1	Please edit the second sentence to read " … short-term risk to site workers …." Please include the same information requested by the comment on Section 4.2.4.2 in the discussion in this section and modify the comparison accordingly.
p. 5-4, §5.1.6	Any development of the site with structures could potentially interfere with the need for additional future injection treatments should they become necessary. This is a greater concern for Alternative G-3 compared to G-2 because of the longer time to achieve the cleanup goals for G-3. Also, should natural attenuation fail to achieve the anticipated progression of contaminant reduction triggering the need for a more active remediation alternative, site development could impede the most appropriate cleanup remedy. Please consider this in light of remedy selection based on the nature and schedule for development of the site by the local authority.

p. 5-4, §5.1.7	The costs for Alternatives G-2 and G-3 are difficult to compare as each alternative will require a pilot test to determine optimal injection spacing and others factors. As a result, it is premature to conclude that G-3 has a cost advantage over G-2.
Table 5-1	a) Please correct the discussion for G-2 long-term effectiveness. Specifically, acknowledge that Alternative G-2 would be the most permanent alternative because it would be completed the quickest thereby minimizing migration, it would destroy the most contamination, and result in the least amount of dilution and adsorption of contamination. b) Please correct the discussion for G-3 long-term effectiveness. c) It is not clear whether Alternative G-4 would irreversibly and permanently reduce contaminant toxicity and volume. Dilution could increase the volume of contamination and adsorption to soil would not be a permanent solution to groundwater contamination as it could desorb from the soil. Neither would G-4 be as permanent and effective as G-2 and G-3.
Appendix A, Table 4-8	All the PRGs listed in this table are from the Region 9 2004 PRG Table. These value have been superseded by the April 2009 Regional Screening Levels (RSLs). Note, for example, that the tapwater RSL for 1,1-DCA is 2.4 μg/L (ca) versus the 81 μg/L (nc) value listed in Table 4-8. Please update the table with the 2009 RSLs.
Appendix A, Table 4-9	A few apparent errors were noted in the reporting of total arochlors wherein the total value exceeded the individual arochlor analytical result. Please correct.
Appendix C, G-2	a) The reagent purchased for $1.50 per gallon is apparently 50% H_2O_2 not 12.5% H_2O_2, otherwise dilution water would not be required. Please correct Sheet 3 of 4. b) The Specific Gravity of 12.5% H_2O_2 should be 1.05, not 1.19. Pease correct Sheet 3 of 4.
Appendix C, G-3	In the third line under TCE (Sheet 1 of 2), please correct the typo: should be $m^3/(100\ cm)^3$. The calculated result is correct.
Appendix C, G-3, Sheet 2 of 2	In the shallow zone calculations for both TCE and 1-1,DCA please change the references from deep overburden to shallow overburden.
Appendix C, G-4,	Please correct the first line of the first sentence on page 1 to refer to the chlorinated <u>ethene</u> plume and please correct the second line to refer to 1,1-DCA.
Appendix C, G-4	a) On page 2, please change PCE to TCE in the last row of the table.

b) The explanation on page 3 regarding the assumption related to the method for calculating the source degradation term is unclear. Does this assumption mean that the source area TCE concentration in groundwater was adjusted upward to include both the groundwater TCE and the TCE adsorbed to the soil? Please explain.

b) The estimates for the performance of Alternative G-4 (especially the source degradation terms) use only very limited data to estimate input parameters for the model. While an attempt has been made to use conservative values, the lack of field data impacts the credibility of even these estimates. A well designed data gathering effort would be required before this alternative could be confidently selected for implementation at this site.

c) EPA was unable to reproduce the results presented in the screen shots included in the appendix for this alternative. Please review the screen shots provided to ensure the output shots presented are properly associated with the inputs shots provided. Also, please document other input parameters used to set up the models.

d) Please provide outputs for daughter products of the parent contaminants to verify that the residual concentrations of these contaminants also achieve the ARARs.

e) It is noted that the effective porosity shown in the screen shots for runs 1 and 3 is that for the deep subsurface (0.20) rather then the correct value of 0.25 for the shallow subsurface. Was this change made intentionally? Also the source degradation term used for run #2 was 0.033 rather than 0.33 as shown in the table on page 3 of Appendix C for the G-4 alternative. A value of 0.33 does not provide a stable solution. Please correct the source degradation term used for this run.

Appendix D

a) Please use the discount rate published annually by the Office of Management and Budget in Circular No. A-94, Appendix C. The most current rates were published December 2008. EPA's *Guide to Developing and Documenting Cost Estimates During the Feasibility Study* states that these rates are to be used for cost estimates for federal facilities. The 7% fixed rate is used only for non-federal facilities. Please use the correct discount rates.

b) Alternative G-2 Capital Cost: It appears that lines 1.1 and 1.2 have not been included in the total cost. Please correct the summation formulas.

c) Alternative G-3 Capital Cost: It appears that lines 1.1 and 1.2 have not been included in the total cost. Please correct the summation formulas.

d) Alternative G-3: the long-term monitoring program will also have to monitor for daughter products. Please adjust the costs accordingly. Also, the text states that monitoring would be quarterly for the first year. Please adjust the costs accordingly.

e) Alternative G-4: The cost estimate grossly underestimates the costs to implement this alternative if it truly is meant to be an EPA MNA alternative. Significantly more site characterization will be required to support an MNA alternative owing to the limited characterization data currently available. Similarly the monitoring program will need to be robust enough for an MNA approach and would also need to monitor for daughter products of contaminants in addition to the required MNA parameters. It is not apparent from the information presented for the G-4 monitoring program whether the included scope would be sufficient.