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LETTER AND COMMENTS FROM U S EPA REGION IV REGARDING REMEDIAL
INVESTIGATION REPORT ADDENDUM AND FEASIBILITY STUDY REPORT FOR SITE 45
FORMER DRY CLEANING FACILITY MCRD PARRIS ISLAND SC
10/12/2011
U S EPA REGION IV



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, S.W.
ATLANTA, GEORGIA 30303

October 12, 2011

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

4SD-FFB

Commanding Officer
Naval Facilities Engineering Command Southeast
Attn: Mr. Charles Cook (OPA6) Remedial Project Manager
P.O. Box 30
135 Ajax Street
Building 135
Naval Air Station, JAX
Jacksonville, FL. 32212-0030

SUBJ: Review and comments for the Remedial Investigation Report Addendum and Feasibility Study Report (RI/FS) for Site 45, Former Dry Cleaning Facility, Marine Corps Recruit Depot, Parris Island, SC.

Dear Mr. Cook:

The U.S. Environmental Protection Agency (EPA) Region 4 has completed its review of the above subject document and has comments as included herein. EPA's review has produced the following comments:

REMEDIAL INVESTIGATION (RI) REPORT ADDENDUM COMMENTS:

1. **General Comment:**

EPA does not support use of a radon attenuation factor as a surrogate for subsurface Volatile Organic Compounds (VOCs), or for site-specific calibration of attenuation factors for other chemicals of concern (COCs). However, the RI Report does present a variety of other possible lines of evidence regarding vapor intrusion (VI) related site exposures, including the results of two hypothetical scenarios run through the Johnson and Ettinger (J&E) vapor intrusion model over a hot spot and an average plume exposure, a site-specific screening evaluation for Building 192 using EPA's Draft VI Guidance, and a modeled risk assessment using the J&E model for Building 192.

From the screening evaluation, it was reported that indoor air and soil gas concentrations at Building 192 exceed levels corresponding to a risk level of 10^{-6} or an HI of 1, however, EPA understands that Appendix S indicates none of the indoor air or soil gas concentrations exceed levels corresponding to 1×10^{-4} or an HI of 1. If this is not the case, please clarify. Otherwise, the screening evaluation indicates the estimated risk falls within EPA's risk range and could be subject to a risk management decision.

The estimated risks from the J&E model indicate the risks from indoor air and/or soil vapor intrusion at Building 192 is approximately 2×10^{-5} or less. Therefore, the modeling estimate indicates that risk likely falls within EPA's risk range and could therefore be subject to a risk management decision.

The RI Report also mentions indoor sources for tetrachloroethene (PCE) in the new dry cleaning facility and references the Tichenor research supporting the concept of off-gassing of PCE from dry-cleaned clothes as a significant indoor source for PCE. This provides additional information to be considered in a risk management decision.

The other identified uncertainties associated with the risk assessment could also be considered in a risk management decision.

Soil gas data at Building 192 is very limited, does not provide for seasonal and/or temporal transience, and does not sufficiently account for spatial variability as required by EPA's guidance. The limitations could be considered in a risk management decision.

EPA's understanding is that the exposure assessment for workers in Building 192 assumed an exposure frequency of 250 days a year and exposure duration of 25 years. However, an action is being proposed to remediate the sources of subslab soil gas potentially attributable to Site 45, being contaminated soil and groundwater. Please discuss whether the remedial actions being proposed will be effective in a timely manner as compared to the exposure assumptions described above. Also discuss whether or not subslab soil gas monitoring may be necessary in order to verify that subslab soil gas concentrations are being reduced as the sources are being remediated and to ensure the selected remedy (whatever it may be) is protective in the short term and the long term. The impact of proposed site remedial actions could be considered in a risk management decision, as well as the projected need for subslab soil gas monitoring.

Please clarify if the Navy is intending to propose that a risk management decision be made determining that no remedial action is necessary to mitigate indoor air at Building 192 at this time since the calculated risk levels fall within EPA's risk range. If so, please clarify if the Navy intends to include a remedial action objective to mitigate site related sources of contaminated subslab soil vapors in the vapor intrusion exposure pathway, being contaminated soils and groundwater; and whether or not any monitoring of subslab soil gas at Building 192 will be proposed to indicate whether or not that objective is being met and to ensure the remedy is protective until clean-up goals are met.

7. An argument could be made that if a facility located immediately above the secondary source zone and containing significant indoor sources of PCE does not have a risk level that exceeds EPA's risk range, then a facility much further removed and with little or no indoor PCE sources relative to the other facility will not likely have a risk level that exceeds EPA's risk range, if any risk exists at all.

Building 293 is reportedly within 100 feet horizontally of contaminated groundwater exceeding trigger levels for VI assessments, yet has not been subject of a site-specific assessment. There is a well with concentrations below the trigger levels between the building and the plume. However, this does not guarantee soil vapors would not be drawn from the plume through the vadose zone into the crawl space beneath Building 293. The Navy should consider whether soil gas data from the vadose zone between the plume and Building 293 might support an argument that an assessment is not necessary. Otherwise, a site-specific assessment should be conducted in accordance with EPA's VI Guidance. Additionally, if soil gas data is gathered and indicates that a site-specific assessment is not necessary, soil gas should still be monitored periodically in case the plume migrates closer to Building 293, as is likely after the storm water drains are sealed.

Please clarify if the Navy is intending to provide for soil gas data from the vadose zone located between the plume and Building 293 which might support an argument that no site-specific assessment is necessary for Building 293 or if the Navy intends to conduct a site-specific assessment of Building 293. Also, please clarify if the Navy is willing to gather soil gas data periodically to ensure contaminated vapors are not being drawn towards Building 293. And finally, clarify if the Navy intends to include a remedial action objective to mitigate site related sources of contaminated soil vapors, being contaminated soils and groundwater; and whether or not any monitoring of soil gas in the vadose zone between the plume and Building 293 will be proposed to ensure the remedy is protective until clean-up goals are met.

Lastly, given the current site condition and limitations of soil gas data, a remedy including Land Use Controls (LUCs) to protect against vapor intrusion during future construction should be included in the FS Alternatives.

All comments from this point forward are made assuming the Navy intentions are as indicated above.

2. **Executive Summary, Bullets, Page ES-1 & ES-2; Section 4.4; throughout the text:**

First Bullet – The paragraph states that deep wells are “clean”, however the data presented in the paragraph indicates concentrations were detected at low concentrations, implying they were below the screening level but not clearly stating so. Please revise the document to state the concentrations were below the screening level rather than stating the wells are “clean”. Please make this revision wherever similar language is used throughout the document, omitting “clean” and inserting “below screening levels”. Change pages should be submitted to address this issue.

do we have a team decision here?

Last Bullet – The last bullet states that sediment and surface water will be discussed separately rather than in this RI Addendum due to insufficient data. Therefore, this RI/FS will lead to an Interim Record of Decision unless sufficient sediment and surface water data is provided, analyzed, and reported in accordance with RI/FS guidance requirements; and if necessary, remedial alternatives are developed and screened accordingly in an FS Addendum (or by amending this document) prior to finalization of the ROD for Site 45. This comment also applies to Section 4.4 of the RI Addendum.

3. **General Comment and Section 1.2.4, GSI Environmental Vapor Intrusion Study, Page 1-4**

This comment applies throughout the document wherever the GSI study is referenced.

~~to be~~
Risk Assessors

Section 1.2.4 states that the difference between the attenuation factors for radon and PCE suggests the vast majority of the PCE inside the building is coming from inside the building. However, the differences in the attenuation factors may also be attributed to: a) the spatial heterogeneity of the PCE source zones versus the more homogenous nature of radon contamination; b) temporally varying horizontal extent and depth of a mobile PCE source plume versus the more stationary wide-spread continuing radon source; c) variable degradation rates of volatile organic compounds (VOCs); and d) low detections in ambient air. To place the results in proper perspective, Section 1.2.4 should have included additional lines of evidence when interpreting the differences in attenuation factors. Due to the variety of potential influences on attenuation factors, EPA does not accept the use of Radon attenuation factors as is done in the GSI report. Additionally, EPA did not approve the Sampling and Analysis Plan (SAP) used by GSI in the study. EPA had concerns and questions which were not addressed.

4. **Figure 1-2**

team decision?

The Site Boundary should be revised to include Building 192 beneath which COCs have been detected in soil gas. Since soil gas data is sparse and no clean line established, the boundary line should be dashed, indicating the soil gas is not fully delineated. Additionally, since COCs have been detected in the sewer line out to the marsh, this area should also be included in the Site Boundary. An inset depicting the pipe line and marsh should be added to the figure. This also applies to any other figures in the document depicting the site boundary. Change pages should be submitted.

5. **Section 4**

As mentioned regarding the insufficient sediment and surface water data, the Section should also mention the limited delineation of soil gas under building 192 and lack of soil gas data at building 293. Both facilities are reportedly within 100 feet of groundwater with COC concentrations which exceed the trigger value requiring site-specific facility assessments. The RI should identify soil gas as not being completely delineated. The data gap can be filled as needed and as part of future phases of the CERCLA process as

indicated for other data gaps or areas of delineation needing refinement. A change page should be submitted.

Additionally, a bullet should be added at the end of the list on page 4-11 which reads something like, "Additional soil gas data associated with buildings 192 and 293 will be needed, but may be provided as part of future phases of the CERCLA process and as called for in a risk management decision pertaining to VI." Please submit a change page.

6. **Section 5, Page 5-1**

A very brief discussion of fate and transport of VOCs via volatilization should be added here if it is not included in the original RI. The text should mention there is evidence of VOCs in subslab soil gas beneath Building 192 and describe the possible fate and transport mechanisms which got it there. Please submit a change page.

Data regarding whether or not there is a clean layer of groundwater at the top of the water table might also help to answer the fate and transport question of whether soil gas is likely to be contaminated by volatilization from the plume in not only the known location near Building 192, but also for the area near building 293, or in various areas across the plume. The Navy should consider if this is data would be useful to the Base for managing construction at the site. The data could be obtained in future phases of CERCLA to further refine the conceptual site model and to potentially guide implementation of LUCs.

7. **Section 6.1.2, Exposure Assessment, Page 6-2**

The last sentence of the first paragraph of Section 6.1.2 states that the vapor intrusion pathway does not appear to be complete for Site 45 under current conditions. However, Section 6.1.2 previously suggested this pathway was complete because Buildings 293 and 192, the new dry cleaning facility, are located within 100 feet of the groundwater VOC plume. Although these two buildings may be upgradient or side gradient of the VOC groundwater plume, soil vapors do not necessarily follow groundwater flow and can be influenced by preferential pathways, presence of pavement, etc. Further, it appears that the new dry cleaning facility was evaluated for vapor intrusion as indicated in Section 6.2, GSI Environmental Inc., Vapor Intrusion Pilot Test Sampling, due to the proximity of the building to the groundwater VOC plume. Vapors were found to be contaminated in both the soil gas and the indoor air, although insufficient data exists to attribute the indoor air contamination directly to the sub slab soil gas. Additionally, no soil gas data has been collected near Building 293. To promote clarity in the administrative record for this site, Section 6.1.2 should be revised to state that the vapor intrusion pathway may potentially be complete for buildings within 100 feet of the groundwater VOC plume. Please submit a change page.

8. **Section 6.1.2, Exposure Assessment, Page 6-3**

The first paragraph on Page 6-3 states that a future scenario was not evaluated for Building 293 because the Johnson and Ettinger model only evaluates slab on grade or

basement construction and Building 293 has a vented crawl space. Section 6.1.2 further states that Vapor Intrusion Guidance recommends a site specific assessment be conducted, gathering soil gas and/or indoor air samples as needed. Provide for the site-specific evaluation of the vapor intrusion pathway at Building 293 or provide a detailed explanation why this is not required. (See General Comment #1.)

The text states that no future industrial scenario was evaluated. Therefore, in addition to LUCs preventing residential construction and/or use of Site 45, LUCs designed to require vapor intrusion preventive measures for all future non-residential construction within 100 feet of the groundwater plume should be considered as a remedial alternative.

9. **Section 6.2, GSI Environmental Inc., Vapor Intrusion Pilot Test Sampling, Page 6-5**

Section 6.2 indicates that six sub slab soil gas samples, two soil gas samples, six indoor air samples, and two ambient air samples were collected at the new dry cleaning building. However, a figure is not included or referenced to illustrate the locations of these samples. To clarify for the administrative record the location of the soil gas and air samples relative to the distribution of detections and the proximity to potential VOC sources, a figure should be included that illustrates where all the samples were collected. Revise the RI Addendum Report to include a figure and reference to the figure illustrating the location of all the samples used by the GSI Environmental, Inc. (GSI) study to evaluate the vapor intrusion pathway at the new dry cleaning building and/or include the GSI Work Plan and Report in the Appendix. Further include a description that differentiates samples denoted by a "PP" versus an "NP" sample identifier. Please submit change pages accordingly.

Furthermore, the last sentence on the page indicates the work was not sponsored by the Navy. EPA understands this was a Navy ESTCP sponsored project. Please clarify.

10. **Section 6.2, GSI Environmental Inc., Vapor Intrusion Pilot Test Sampling, Page 6-7**

According to Section 6.2, soil vapor and indoor air samples were collected for VOC and radon analysis. However a discussion explaining how these samples were collected and the analytical methods utilized is not provided. To ensure that the radon soil vapor and indoor air data meet the data quality objectives for use in the indoor air risk analysis, a description of how these samples were collected should be included, perhaps by referencing and including the GSI Work Plan and/or Report as part of Appendix B. Please submit change pages accordingly.

11. **Section 6.3.2, Exposure Assessment, Page 6-8**

Section 6.3.2 indicates that a 95-percent Upper Confidence Limit (UCL) on the mean was used for the indoor air and soil gas data to represent the exposure point concentration (EPC). However, when evaluating vapor intrusion risks associated with hypothetical groundwater contamination, a hot-spot and an average concentration was used to evaluate risks. Due to the variability often observed in soil vapor samples, the maximum

concentration should be used as the EPC. In addition, due to the warning messages listed in Appendix S, Soil Gas and Vapor Intrusion Screening and Modeling Results, regarding the impacts of small sample population size on the reliability, accuracy, and meaningfulness of the UCL results, a hot-spot analysis should also be performed on the soil gas and indoor air results in site-specific assessments where the data set is small along with the risk calculations based on the UCL. This adjustment to site data analysis should be implemented in future soil gas and indoor air data analysis efforts at the site.

12. Section 6.3.5, Risk Characterization – Indoor Air, Page 6-10

Section 6.3.5 concludes that the cancer risk of 2×10^{-5} is within acceptable levels. However, the acceptability of risks is determined by a risk management decision when risks fall within EPA's risk management range of 1×10^{-6} to 1×10^{-4} . Section 6.3.5 should be revised to state that "the calculated cancer risk falls within EPA's risk management range and should be considered in a risk management decision" and remove the determination that this risk is "acceptable" since a risk management decision has not yet been made and EPA takes other factors into account when arriving at risk management decisions for a site. Please submit a change page.

13. Section 6.3.6, Uncertainty Analysis, Page 6-10

Section 6.3.6 does not address some uncertainties in the methodology employed in the analysis of vapor intrusion risk. These uncertainties should be discussed in the uncertainties section. Please submit a change page accordingly. The omitted uncertainties are summarized below:

- According to the ProUCL output in Appendix S, Soil Gas and Vapor Intrusion Screening and Modeling Results, most of the output sheets include a warning with respect to the limited sample size for calculating the upper 95th confidence on the mean. The warning states that the sample sizes for most of the UCL calculations "may not be adequate enough to compute meaningful and reliable test statistics and estimates!" The limitations of the data and the potential impacts of the data limitations on the risk results should be discussed in the uncertainty analysis. In defending the data set used, it would be helpful to highlight the relatively consistent results obtained across the indoor air and soil gas samples. Further, in the future, a hot-spot analysis or maximum concentration analysis should also be run to provide a range of risks and bound the uncertainties associated with the use of a limited sample size until a substantial data set can be established. Data set size limitations should be considered in a risk management decision.
- The risks associated with the new dry cleaning facility using soil vapor and indoor air were evaluated using data collected that represent a single point in time and season (summer). Thus, a full understanding of the concentrations over time is not known, as seasons vary and the depth of the water table changes. The uncertainty associated with relying on temporally limited data should be addressed in the uncertainty analysis and considered in a risk management decision.

14. Section 6.3.6, Uncertainty Analysis, Page 6-11

The second bulleted item on Page 6-11 states that the majority of the PCE detected in the indoor air samples is originating from within the dry cleaning facility based on the difference in attenuation factors between radon and PCE. EPA does not support this use of a radon attenuation factor. Please indicate so in the text. Please submit a change page.

Several lines of evidence may explain the differences in attenuation factors. Other reasons for the differences in the attenuation factors may include: a) the spatial heterogeneity of the PCE source zones versus the more homogenous nature of radon contamination; b) temporally varying horizontal extent of a mobile PCE source plume versus the more stationary wide-spread radon source; c) variable degradation rates of VOC versus constant for radon; and d) the low level of PCE detected in ambient air samples. Section 6.3.6 could include additional lines of evidence when interpreting the differences in attenuation factors to place the results in proper perspective and provide stronger justification on the relative contribution of subsurface contamination to indoor air concentrations versus the contributions of air contaminants unrelated to the subsurface. Please submit a change page accordingly.

This comment also applies to the second to the last sentence in Appendix S, Soil Gas and Vapor Intrusion Screening and Modeling Results.

15. Section 6.4, Conclusions, Page 6-11

Section 6.4 conclusions need to be more specific to support risk management decisions.

In the second bullet and elsewhere, please separate conclusions pertaining to Building 192 from those pertaining to Building 293.

The second bulleted conclusion regarding Building 293 only addresses future conditions and implies monitoring may be necessary. Please clarify. Also, before this conclusion is made, please add a conclusion regarding the current state and the requirement for a site-specific assessment and/or the need for data supporting a claim that no site-specific assessment is necessary. Please submit a change page.

The second bulleted conclusion regarding Building 192 states “risk of an unacceptable level of indoor air contamination caused by vapor intrusion is *very unlikely*” at the new dry cleaning facility because the new facility is located upstream of the groundwater plume. Terms like “very unlikely” are difficult to support given the number of uncertainties associated with the vapor intrusion assessment conducted for Building 192, the new dry cleaning facility. Consider modifying the conclusion to address what is known and what is needed, then what is anticipated. For example, we can conclude that although current data indicates calculated risk falls within EPA’s risk range, additional data and/or monitoring of subslab soil gas are needed to ensure the risk is not exceeding EPA’s risk range over time. Once seasonal and/or temporal transience has been accounted for through a more robust data set obtained over time, calculated risk levels

would not be expected to increase since the facility is located up gradient of the plume and no new contaminant loads are anticipated. Please submit a change page accordingly.

In the third bullet, please modify the last sentence to read, "... current vapor intrusion risks are less than or within the EPA risk management range and a risk management decision should be made..." The Navy should propose what the decision should be. Also remove the determination that this risk is "acceptable" since a risk management decision has not been made yet and other factors are taken into account when arriving at risk management decisions for a site. Please submit a change page.

The Navy may also wish to include a bullet that summarizes lines of evidence that support their proposed risk management decision including results of the screening level evaluation, the J&E model results, a comparison of predicted indoor air concentrations from soil gas against the levels actually measured in indoor air and ambient air to demonstrate there is potentially a large in-building contribution to indoor air concentrations relative to the contribution from the subsurface, and Tichenor's research supporting the possibility of significant off-gassing from clothes dry-cleaned with PCE. Further support your proposal by confirming your intention to address site-related contamination in soils and groundwater which may be contributing to soil gas contamination and your willingness to monitor subslab soil gas to ensure calculated risks do not exceed EPA's risk range over time and the selected remedy is protective until remediation goals are met. If a bullet is added, please submit a change page.

And lastly, the last bulleted conclusion should be removed since acceptability of risk is to be determined through a risk management decision that has not been made yet.

16. **Section 7.0, Conclusions, Nature and Extent/Characterization, Page 7-1**

Section 7.0 discusses the groundwater contamination in both the northern plume and southern plume areas at Site 45. The second bulleted item under Site Characteristics indicates that the two plumes of groundwater contamination present are apparently intermingling in downgradient areas. However, updated comprehensive figures illustrating the current condition of commingled horizontal and vertical extents of both the northern and southern plumes in groundwater at Site 45 were not presented. In order to address the uncertainties in the extent of groundwater contamination, coupled with the duration between the most recent site-wide comprehensive sampling event and now, the EPA requested that a comprehensive baseline sampling event be conducted to support alternative analysis in the feasibility study (FS). However, as indicated in the last bulleted item on Page 7-1, any further refinement could be accomplished as part of future phases of regulatory activity at the site. Please clarify if the baseline sampling event has been conducted, if so, provide updated plume figures, if not, clarify when the event will take place and updated plume figures will be available.

Currently, the issue regarding the complete extent of groundwater contamination has not been adequately addressed prior to the evaluation of the remedial alternatives presented in the FS. This uncertainty impacts the scope of the groundwater problem and the

assumptions regarding the estimated volume of contaminated groundwater to be evaluated in the FS. It is recommended that a comprehensive baseline groundwater monitoring event be conducted so definitive level data can be collected to manage the uncertainty associated with the extent of contamination in the northern and southern plumes. This step is necessary for an adequate evaluation of remedial alternatives in the FS. Revise the RI Addendum Report to address this issue or provide the data and figures in a revised FS.

17. Section 7.0, Conclusions, Vapor Intrusion, Page 7-2

The second bullet states predicted concentrations could be checked by collecting indoor air samples. EPA suggests this may not be necessary if the Navy is willing to collect soil gas data in the vadose zone between the plume and Building 293. If soil gas results indicate concern still exists, then air samples could be taken from the crawl space for evaluation as well. EPA does not advise taking indoor air samples until soil gas and crawl space samples have failed to eliminate concerns. Consider modifying the bullet. Submit a change page accordingly.

18. Section 7.0, Conclusions, Vapor Intrusion, Page 7-3

Please modify the last sentence of the third bullet to read "...are within EPA's risk range and is therefore subject to a risk management decision.

Please add a bullet that indicates what the Navy is proposing for the risk management decision associated with indoor air at Building 192.

The Navy may also choose to include a bullet summarizing lines of evidence and intentions for soil and groundwater remediation which support their proposal (See comments above pertaining to Section 6 Conclusions for more detail.)

Consider modifying the second sentence in the last bullet to read "Soil gas and additional groundwater data may need to be collected..." The last sentence of the bullet is inconsistent with EPA Vapor Intrusion guidance and the science supporting it. Please delete it.

Submit change pages accordingly.

19. Section 7.0, Conclusions, General Groundwater Conclusions, Page 7-3 through 7-4

Modify the second bullet to read "... Based on the following, evaluation of soil and groundwater remedial solutions appears warranted."

Modify the third sub-bullet to read "... impact to surface waters and sediments..."

Modify the fourth sub-bullet to read "Potential vapor intrusion issues at Building 293, Building 192, and/or hypothetical..."

20. Appendix P, Revised Conceptual Site Model

The conceptual site model (CSM) in Appendix P indicates that vapor intrusion is a direct contact exposure route. However, vapor intrusion is an indirect exposure route to groundwater by volatilization from groundwater through soil into indoor air. To promote clarity in the CSM, a second arrow should come off the secondary release mechanism box entitled "Infiltration to Groundwater" and be directed to a new exposure mechanism box labeled "Air" below the box entitled "Direct Contact." In addition, an arrow should come off the "Air" box and be directed to a single exposure route "Inhalation" as was done for the inhalation exposure route associated with the dust and/or volatile emissions secondary release mechanism.

21. Appendix R, Groundwater Vapor Intrusion Modeling Results

The model output for PCE in Appendix R uses different toxicity values than what is used in the model output for PCE in Appendix S, Soil Gas and Vapor Intrusion Screening and Modeling Results. Appendix S appears to be using the most current toxicity values for PCE based on the most current regional screening level (RSL) table published by EPA in June 2011. Appendix S and Appendix R should be reviewed to ensure the toxicity value for each chemical is current and consistently used across the different models.

In addition, the EPCs used in the hotspot and average analysis in Appendix R do not match the values listed in Table 6-2, Vapor Intrusion Modeling Results. A spot check of PCE and trichloroethene (TCE) was conducted as summarized below:

Chemical	Table 6-2 EPC		Appendix R EPCs	
	Hot-Spot	Average	Hot-spot	Average
PCE	8117	1152	7380	1360
TCE	9609	1933	15,400	2840

Based on these discrepancies, the risks and hazard indices (HIs) presented in Table 6-2 are not consistent with those presented in Appendix R. The vapor intrusion section should undergo a thorough internal review to ensure that the summary EPC and risk tables are consistent with the vapor intrusion outputs presented in the appendices. It is evident both result in unacceptable risk. However, for the administrative record and clarity within this report, reconcile the differences in the report.

22. Appendix S, Soil Gas and Vapor Intrusion Screening and Modeling Results, Tier 2—Secondary Screening, Question 4(b)

Question 4(b) states: *Do measured indoor air concentrations of constituents of potential concern identified in Question 1 (and any degradation products) exceed the target concentrations given in Tables 2(a), 2(b), or 2(c)?* According to the answer presented, some of the target concentrations given in Table 2(a), 2(b), or 2(c) are exceeded. Specifically the response to this question states that benzene, ethylbenzene, and PCE

exceed the residential screening criteria set at a 1×10^{-6} risk level. Therefore, the J&E model was used to calculate site-specific risks and indicated the risk fell within EPA's risk range.

Note: This is not the typical approach to using the VI Draft Guidance for screening purposes. However, provided the use is for the purpose of making a risk management decision for the indoor air which will be followed by remedial action on the contaminated source media with monitoring to ensure risks do not exceed the risk range over time, this is sufficient for its intended purpose within this document. However, in the future recognize use of the Guidance for CERCLA purposes would anticipate the question to be answered "yes" to reflect the exceedance of 1×10^{-6} and the appropriate follow-on questions answered accordingly throughout the guidance.

23. **Appendix S, Soil Gas and Vapor Intrusion Screening and Modeling Results, Tier 2—Secondary Screening, Question 6**

EPA understands that a site-specific assessment was conducted for Building 192. As part of this assessment, the Navy has asked that the assessment be considered under a risk management decision for indoor air since the calculated risk falls within EPA's risk range. EPA is willing to consider this decision. However, EPA will expect the intent of the vapor intrusion guidance to be met otherwise. For a site specific assessment using soil gas, Question 6(f) reads as follows:

Q6(f): Is the subslab sampling data adequate? (We recommend doing subslab sampling before indoor air sampling) Some factors we recommend for consideration in this question include:

- Do analytical results meet the required detection thresholds?
- **Do the data account for seasonal and/or temporal transience?**
- **Do the data account for spatial variability?**
- Is there any reason to suspect random (sampling) or systematic (analytical) error?
- How do the data account for the site conceptual model?
- Was "background" ambient (outdoor) air or other vapor sources considered?

EPA recognizes the risk currently falls within the risk range, and that the Navy intends to remediate the soil and groundwater contamination which is the likely source for the subslab soil gas contamination. However, EPA also recognizes vapor intrusion is subject to temporal, seasonal, and other various influences resulting in a variation in concentrations over time. Therefore, EPA will expect the Navy to gather additional subslab soil gas samples and model indoor concentrations from there, in order to show a relative contribution to the indoor air of the facility and to ensure that variations in subslab concentrations would not likely be contributing to indoor concentrations which might be exceeding EPA's risk range over time. Once seasonal and temporal variations have been accounted for and the range of risk bounded, risks would not be expected to exceed that level since the facility is upgradient of the plume and no additional contaminant loads are anticipated.

FEASIBILITY STUDY REPORT TECHNICAL REVIEW COMMENTS

1. Section 1.2.3.1, Surface and Subsurface Soil, Page 1-11

The third paragraph in Section 1.2.3.1 states that the horizontal and vertical extent of soil contamination was not delineated. The text further states nearly all the soil samples collected within the footprint of the former dry cleaning building and above-ground storage tank area had significant concentrations of PCE and other chlorinated ethenes. However, this section of the Feasibility Study Report for Site 45 – Former Morale, Welfare, and Recreation Dry Cleaning Facility dated June 2011 (FS Report) only addresses the former dry cleaning building source area and does not discuss whether soil contamination is present at the second source area identified as a leak from a sanitary sewer in the vicinity of the new dry-cleaning facility and documented in Appendix A, USGS: Source, Transport, and Fate of Groundwater Contamination at Site 45 dated 2009 (2009 USGS Report). Currently, there is uncertainty regarding the extent of soil contamination in the southern plume source area and additional text is needed to discuss how the uncertainty and data gaps will be managed and adequately addressed. Revise the FS Report to address the data gaps and uncertainty in the extent of soil contamination at the second source area.

Section 1.2.3.2, Groundwater, Page 1-11

Section 1.2.3.2 indicates figures in plan view and cross section are presented in the FS Report and are based on remedial investigation (RI) and RI Addendum data for the northern plume area. Additionally, Section 1.2.3.2 discusses that the figures depicting the southern plume area and a portion of the northern plume are presented in the 2009 USGS Report. However, there are no figures provided in the RI Addendum Report or the FS Report depicting what is currently known about the extent of both the northern and southern chlorinated volatile organic compound (cVOC) dissolved plumes. The current interpretation of the extent of contamination in the northern plume is based on the most recent RI data from 2005. Further, much of the interpretation of the southern plume boundary presented in the 2009 USGS Report is based on monitoring well data and direct push technology (DPT) temporary well screening level data. As such, the 2009 USGS Report only presents a generalized distribution of contaminants in the southern plume. It was concluded in the RI Addendum Report that the nature and extent of groundwater contamination is well-defined with only a few areas of refinement needed. However, the existing data gaps were not identified in the RI Addendum Report or the FS Report and the resulting uncertainty impacts the scope of the groundwater problem and the evaluation of the remedial alternatives presented in the FS Report. It is recommended that a comprehensive baseline groundwater monitoring event be conducted so definitive level data can be collected to manage the uncertainty associated with the extent of contamination in the northern and southern plumes. This step is necessary for an adequate evaluation of remedial alternatives in the FS Report. Revise the FS Report to address this issue.

1 temp well
close to
MW31
Figure b
USGS
ref 2.

based on depth of sewer line, cont. is in saturated zone. Not a soil issue. Confirm during remedial design (4)

3. **Section 1.2.4.1, Natural Attenuation, Page 1-13**

Section 1.2.4.1 states the RI Addendum concluded that the groundwater environment is conducive to reductive dechlorination and biological degradation of chlorinated VOCs is indicated. However, a discussion of the relative impacts of Section 1.2.2.7, Fenton's Reagent Treatability Study, or Section 1.2.2.10, Emulsified Zero-Valent Iron Pilot Study, on the observed natural attenuation of cVOCs was not presented in Section 1.2.4.1. Currently, there is uncertainty regarding whether the flow and contaminant fate and transport of cVOCs is currently being impacted by the ongoing treatment provided by the implementation of the two pilot studies. Revise the FS Report to provide additional discussion that addresses the issue of continued impacts from previously implemented treatability studies.

4. **Section 1.2, Site Background, Page 1-2**

Section 1.2 references Figure 1-2 for the site layout. Please see comment #4 for the RI Addendum regarding updates to the Site Boundaries. Please modify Figure 1-2 in the FS accordingly.

5. **Section 1.2.5, Human Health Risk Assessment, Page 1-14 and 1-15**

Section 1.2.5 states that the quantitative risk assessment using the 2009 GSI Environmental pilot testing sampling soil gas data and indoor air data for the new dry cleaning facility resulted in a cumulative incremental lifetime cancer risk (ILCR) less than the EPA target cancer risk range of 1×10^{-6} to 1×10^{-4} , and the total HI for noncarcinogens is less than the target of 1. However, according to the results of the HHRA as presented in the RI Addendum Report, the risk results based on the measured indoor air concentrations fell within the EPA risk management range, not below this range as indicated in Section 1.2.5. Please modify the text accordingly.

Section 1.2.5 also states that the indoor air evaluation indicates that cancer risks and noncancer hazards are within "acceptable limits." However, acceptability is determined by risk managers. Please modify the text to state the risks are "within EPA's risk management range."

Section 1.2.5 should be revised to accurately summarize the results and conclusions of the human health risks at Building 192. Be consistent with revisions made to the RI Addendum (See comment above). State the Navy's proposal for a risk management decision regarding indoor air at Building 192. Support your proposal with a summary of lines of evidence and express the Navy's intent to remediate contaminated soil and groundwater and to monitor subslab soil gas to ensure levels are not contributing to indoor air concentrations to a degree that would exceed EPA's risk range.

In the last paragraph in the section, second sentence, please insert the words "soil gas and" after "Additional" and before "groundwater. Delete the last sentence in that it is in conflict with EPA's VI Guidance and the science that supports it. Replace the sentence

with a statement regarding the Navy's intent to either perform the site-specific assessment as required by the guidance or provide soil gas data from the vadose zone between the building and the plume which indicates no site-specific assessment is necessary. (See comments above in the RI Addendum pertaining to this Building.) If EPA's concerns are not addressed, additional comments may apply here.

6. **Section 2.1, Media of Concern, Page 2-1**

The next to last sentence states "... The contamination has not reached buildings (such as 293); therefore, this exposure path is not complete." According to EPA's VI Guidance, the pathway is potentially complete for any facility within 100 feet of a contamination source (either soil or groundwater). This is assumed to be true until a screening and/or risk evaluation eliminates the concern or data is provided which eliminates the concern. Furthermore, contamination has been documented as reaching Building 192 via soil gas and the vapor intrusion pathway. Please revise this paragraph to properly reflect the vapor intrusion concerns at the site. Clarify if the Navy is proposing a risk management decision be made to address the concern at Building 192 and what the Navy intends to do to address Building 293.

7. **Section 2.2, Chemicals of Concern for Remediation, Page 2-2**

Please ensure that all COCs *and their associated daughter products* are identified as COCs for which remedial goals should be established.

8. **Section 2.2, Chemicals of Concern for Remediation, Page 2-3**

Please modify the last paragraph to include industrial workers in Building 192 as having risks which exceed 1×10^{-6} but fall within EPA's risk range and have an HI of less than 1; then identify the COCs contributing to that risk. State that a risk management decision has been proposed to address this risk via the soil and groundwater remedies with monitoring of subslab soil gas to ensure risks do not exceed EPA's risk range.

9. **Section 2.3, Remedial Action Objectives, Page 2-2**

Please modify the last sentence of the first paragraph to read "... vapor intrusion into buildings from groundwater or soil contamination will be addressed by groundwater and soil remedies."

10. **Section 2.3.1, Statement of Remedial Action Objectives, Page 2-2**

Currently, there are recognized data gaps and uncertainty associated with the extent of soil and groundwater contamination at Site 45. This uncertainty impacts the scope of the soil and groundwater problems and assumptions made regarding the estimated volumes of soil and groundwater contamination used in the FS Report. As such, it is uncertain whether the remedial action objectives (RAOs) for soil and groundwater presented in

Section 2.3.1 will be adequately addressed by the remedial alternatives evaluated. Revise the FS Report to explain how this uncertainty will be managed.

11. Section 2.3.1, Statement of Remedial Action Objectives, Pages 2-2 and 2-3

Cleanup levels for CERCLA should be set at 1×10^{-6} and an HI of 1 unless otherwise justified and agreed to. Please modify the RAOs accordingly.

Please include a clarification in RAO No. 1 that industrial worker includes the Vapor Intrusion pathway exposure or add "commercial worker" as you have in GW RAO No. 2.

For GW RAO No. 3 please add "(i.e. MCLs or other risk based standards must be met.)"

12. Section 2.4, CLEANUP GOALS, Page 2-6

Cleanup levels for CERCLA should be set at levels that correspond to 1×10^{-6} and/or an HI of 1 unless otherwise justified and agreed to. Please modify the section text accordingly. Be sure to go back and recalculate cleanup levels for those groundwater COCs which did not have MCLs.

Also address changes needed to Table 2-3 and/or Table 2-4.

13. Section 2.5, General Response Actions, Page 2-6 and 2-7

Please consider if Soil Mixing should be a GRA for consideration to address both contaminated soil and groundwater at once. The extent of soil contamination is not well defined and is possibly extensive when you consider both the historical facility footprint and the clay pipeline and the secondary disposal area where the clay pipe leaked. Combine this with the potential that if soils are remediated, then groundwater rises to 1 foot bgs again re-contaminating the soil, though likely not at the same level since higher concentrated contamination is deeper.

EPA had not asked for soil mixing to be considered before due to its resulting limitations. At other sites, soil mixing resulted in almost immediate complete remediation for both the source zone and the dissolved plume. Considering parts of the dissolved plume at site 45 are as highly contaminated as the source areas, this is a big plus. However, EPA understands that soil mixing at other sites resulted in a geological condition or unit that is not as sturdy as it was in its natural state. Whereas Site 45 could be redeveloped after remediation under other scenarios, future uses after soil mixing may be limited to parking lots, etc. The ground might not support a foundation and building in a sustainable manner. Given the limitations MCRD has with developable land, this option would have to be researched more closely to determine the likelihood that future development would be impacted. Additionally, the comparison would have to take into consideration the extent of utility rerouting etc. that would have to take place and the associated costs.

If Soil Mixing is included, modify the remainder of the FS accordingly.

14. Section 2.6, Estimated Volume of Contaminated Soil, Page 2-7

The first sentence in Section 2.6 states the extent of soil contamination was not delineated during previous investigations. However, the current extent of soil contamination appears to be based solely on soil samples collected within the footprint of the former dry cleaning building and above ground storage tank area as depicted in Figure 2-1, Estimated Extent of Soil Contamination. As such, Section 2.6 only addresses the former dry cleaning building source area and does not discuss whether soil contamination is present at the second source area. This apparent data gap impacts the scope of the soil contamination problem. The 2009 USGS Report in Appendix A identified a leak from a sanitary sewer in the vicinity of the new dry-cleaning facility as a second source contributing to groundwater contamination. Currently, there is uncertainty regarding whether soil contamination exists in the southern plume source area and additional text is needed to discuss how the data gaps and associated uncertainty will be managed and adequately addressed. Revise the FS Report to address this issue regarding the estimated volume of contaminated soil at Site 45.

15. Section 2.7.1, Volume of Contaminated Groundwater, Page 2-8

Updated maps illustrating the horizontal extent of contamination in the northern and southern plumes in a single figure were not presented. Additionally, cross sections of the southern plume were not prepared. As such, the extent of groundwater contamination is not fully depicted in plan view or in cross section which impacts the scope of the groundwater problem. These data gaps result in uncertainty in the calculated volumes of contaminated groundwater discussed in Section 2.7.1 as well as the estimated chemicals of concern (COC) mass presented in Section 2.7.2, Mass of Contaminants – Dissolved and Sorbed Phases, and in Table 2-6, Estimated Mass of COCs in Groundwater. It is recommended that a comprehensive baseline groundwater monitoring event be conducted so definitive level data can be collected to manage the uncertainty in the extent of contamination in the northern and southern plumes. This step is critical to an adequate evaluation of the remedial alternatives in the FS Report.

16. Table 2-3 and 2-4, Cleanup Goals

See comment above pertaining to the section on CLEANUP GOALS and make changes here as necessary. Also ensure all daughter products are included as COCs. Also ensure that COCs for vapor intrusion are included for soils as well as groundwater, since either source may be contributing.

17. Table 2-3, Cleanup Goals – Soil

The footnote section of Table 2-3 indicates the leachability to groundwater cleanup goal is based on a dilution attenuation factor (DAF) of 8 and a fraction of organic carbon of 0.006. However, the basis for determining the DAF of 8 and organic carbon fraction of 0.006 used to calculate the soil leachability to groundwater cleanup goal was not

discussed in the FS Report. Revise the FS Report to address this issue so the appropriateness of the DAF and organic carbon values used to calculate the leachability to groundwater cleanup goal can be fully evaluated.

18. **Section 3.5.2.3, Monitored Natural Attenuation, Page 3-18**

The first sentence on Page 3-18 indicates there is substantial evidence that natural attenuation is functioning at the site to degrade PCE and daughter products. However, it was previously noted that the FS Report does not discuss whether the fate and transport of the cVOCs dissolved in groundwater is currently being impacted by the pilot and treatability studies that were previously implemented (i.e., Fenton's Reagent Treatability Study and Emulsified Zero-Valent Iron Pilot Study). Revise the FS Report to provide additional discussion to address the uncertainty regarding whether there are continued impacts to groundwater from previously implemented treatability studies.

19. **Section 4 and 5, Alternatives**

The team should discuss what combination of soil and groundwater alternatives is preferable given overall site conditions and results of the comparative analysis. EPA suggests this be a major topic on the October meeting agenda.

This concludes EPA's comments on the RI/FS for Site 45 MCRD, Parris Island, S.C. EPA appreciates the effort of MCRD and the Navy in documenting all the site information to date and preparing comparisons of complex technologies for consideration. EPA looks forward to working together with MCRD, the Navy and SCDHEC in selecting a preferred alternative and moving on towards cleanup of the site. If you have any questions on these comments that would help expedite our progress towards that end, please feel free to contact me at (404) 562-9969.

Sincerely,



Lila Llamas
Senior Remedial Project Manager
US EPA Region 4

cc: Lisa Donohoe, MCRD
Meredith Amick, SCDHEC
Mark Sladic, TtNUS