RESPONSE TO REGULATORY AGENCY COMMENTS ON THE DRAFT FIELD INVESTIGATION SUMMARY REPORT AND VAPOR INTRUSION RISK EVALUATION FOR THE INSTALLATION RESTORATION SITE 17 AND BUILDING 503 AREA, FORMER MARE ISLAND NAVAL SHIPYARD, VALLEJO, CALIFORNIA MARCH 3, 2009

This document presents the Department of the Navy's responses to comments from Buck King of the Department of Toxic Substances Control's (DTSC) Geological Services Unit (GSU); John Christopher, Ph.D., from DTSC's Human and Ecological Risk Division (HERD); Paisha Jorgensen, P.G. from the San Francisco Bay Regional Water Quality Control Board (Water Board); and Carolyn d'Almeida from the U.S. Environmental Protection Agency (EPA). These comments were submitted on the "Draft Field Summary Report and Vapor Intrusion Risk Evaluation for Installation Restoration Site 17 (IR17) and Building 503 Area, Former Mare Island Naval Shipyard (Mare Island), Vallejo, California" dated January 6, 2009. The comments addressed below were received from Mr. King on February 2, 2009 (dated January 29, 2009); Dr. Christopher on February 10, 2009 (dated February 9, 2009); Mr. Jorgensen on January 30, 2009; and Ms. d'Almeida on January 29, 2009.

RESPONSES TO DTSC GSU COMMENTS

1. Comment: **The GSU recommends that the vapor intrusion risk identified at IR17SG002, IR17SG024, and IR17SG014 be addressed by soil removal to reduce or eliminate the potential future health risk. The source area associated with IR17SG002 is already identified for removal in the EE/CA IRAP. GSU has previously recommended that the soil removal action be implemented.**

   Response: The Navy has proposed in the Engineering Evaluation and Cost Analysis/Interim Remedial Action Plan (EECA/IRAP) to conduct a removal action to address free product and risk attributable to the free product via the vapor intrusion (VI) exposure pathway. This removal action will address the VI risk identified at active soil gas (ASG) sample locations IR17SG002 and IR17SG014. An exploratory excavation at ASG sample location IR17SG024 is not specified in the selected removal alternative; however, the Navy will conduct this task as part of the non-time-critical removal action (NTCRA) field effort. The agreement to conduct this additional excavation will be documented in the response to comments in the draft final EECA/IRAP.

2. Comment: **The chlorinated solvent soil vapor contamination area identified at IR17SG024 should be addressed by soil excavation to eliminate this well defined area of potential future health risk. The soil excavation side walls should be evaluated using field screening vapor monitoring**

instruments during removal activity and confirmed by soil sidewall confirmation analytical results.

Response: An exploratory excavation at ASG sample location IR17SG024 is not specified in the selected removal alternative; however, the Navy will conduct this task as part of the NTCRA field effort. The agreement to conduct this additional excavation will be documented in the response to comments in the draft final EECA/IRAP.

3. **Comment: The benzene, ethylbenzene, and 1,2,4-trimethylbenzene soil vapor contamination area identified at IR17SG014 should be addressed by soil excavation to eliminate this well defined area of potential future health risk. The soil excavation side walls should be evaluated using field screening vapor monitoring instruments and confirmed by soil sidewall confirmation analytical results.**

Response: See response to DTSC GSU general comment 1.

RESPONSES TO DTSC HERD COMMENTS

GENERAL COMMENTS

1. **Comment: Overall: The risk assessment information is well presented. It can be made adequate by summing risks and hazards in the current document with those from a prior risk assessment of contamination in soil, and ensuring that not additional sources areas are identified via this process.**

Response: As agreed to during the January 14, 2009 Base Realignment and Cleanup Team (BCT) meeting (minutes were provided by the Navy in an e-mail dated January 27, 2009) the Navy provided a summary of cumulative human health risks for the IR17 and Building 503 Area (see Attachment A). Cumulative risks are summarized based on risks for direct contact with soil, as estimated in the 2006 human health risk assessment (HHRA) (SulTech 2006a) and the recent VI estimates of risk based on the 2008 ASG sample data. The cumulative risk summary provides risk information for pre- and post-removal scenarios and demonstrates that residual risks for a commercial/industrial scenario following the proposed removal do not exceed the EPA risk management range of 10^{-6} of 10^{-4} or a noncancer hazard of 1.

2. **Comment: Point-by-Point Assessment: The Navy estimated risk and hazard for each point sampled in the active soil gas survey. This method is useful**

for visualizing the patterns of contamination at IR-17, especially to identify possible source areas for removal. However, the estimates of risk must be viewed with caution, for no receptor could be exposed for the 25 or 30 years to the concentrations observed in one survey of concentrations in soil gas.

Response: Comment noted. The approach of estimating risks and hazards individually for each ASG sampling point is consistent with the VI risk methodology developed for the IR17 and Building 503 Area (ChaduxTt 2008a, 2008b).

3. **Comment:** **Inclusion of All Pathways: The purpose of the present risk assessment is to identify sources of contamination for possible removal actions. To make this process complete, the Navy must re-examine its prior risk assessment of contaminants in soil. The prior risk assessment used 95% upper confidence limits on mean concentrations of contaminants in soil. These values should be added to each result in the point-by-point assessment in the current document. Assessment of groundwater from the prior risk assessment need not be included; the volatile components are better represented by the more recent active soil gas measurements.**

Response: Please see the response to DTSC HERD general comment 1.

4. **Comment:** **1,3-Butadiene: At the project meeting on 14 January, I mentioned that on one occasion I had recommended use of the Federally published cancer slope factor (USEPA, 2002) over that published by the Office of Environmental Health Hazard Assessment (OEHHA) of Cal/EPA (OEHHA, 1995). I was under the misimpression that the newer file in IRIS represented a significant improvement over the older analysis by OEHHA. After discussing the matter with Dr. Joseph Brown of OEHHA, I learned that OEHHA had carefully studied the newer analysis by USEPA and had issued a lengthy list of objections, principally related to USEPA's quantitation of exposure to 1,3-butadiene in an large occupational epidemiological study. OEHHA stands by its earlier analysis. Therefore, HERD recommends that the Navy's risk assessment include the California cancer slope factor for 1,3-butadiene.**

Response: Comment noted; no changes will be made to the risk assessment.

5. **Comment:** **Removal Actions: The Navy proposes to remove free petroleum product where it is encountered, and to remove sources of vapor contamination near Building 503. We believe that once risks and**

hazards have been summed from the earlier risk assessment, risk managers will have enough information to locate and remove areas of contamination which will lower cancer risks for the site to < 1 E-4. These removals might leave some areas with hazard indices greater than 1.0.

Response: The Navy will be revising the risk characterization to include information about the summed risks and hazards. The Navy agrees that this information will be useful to evaluate the effectiveness of planned removals for reducing risk or hazards at the site. Please also see response to DTSC HERD general comment 1.

6. **Comment: Acceptable Risk: Risks as this site are dominated by the vapor intrusion pathway. The Navy estimates that their removal action will lower estimated cancer risks for current and future workers to <1 E-4. The Navy considers this to be acceptable risk for the occupational setting. DTSC believes that estimated cancer risks less than 1 E-6 are considered *de minimus*, while those between 1 E-6 and 1 E-4 require case-by-case risk management. Thus, risks <1 E-4 are not necessarily acceptable.**

Response: The Navy will make a risk management decision for the site in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 Code of Federal Regulations Part 300). This decision will be documented in the Proposed Plan and Record of Decision.

RESPONSES TO WATER BOARD COMMENTS

GENERAL COMMENTS

1. **Comment: A review of the figures provided during the January 19, 2009 BCT meeting indicates inconsistent correlation between the results of the passive soil vapor survey and the active soil vapor investigation. Additional discussion of the possible reasons for this, such as the heterogeneous nature of subsurface conditions, limitations associated with either sampling methodology, and/or the presence of preferential migration pathways, is warranted with regard to interpretation of the risk evaluations. In addition, the apparent presence of TPH contamination along the eastern border of Building 759, in conjunction with a preferential migration pathway warrant further discussion/evaluation.**

Response: The Navy conducted the Phase 1 PSG field screening survey to identify impacted areas and to focus subsequent Phase 2 soil, groundwater, and

ASG sampling. Discussion will be added to Section E6.0 of the VI risk evaluation to clarify this approach and to discuss any uncertainty in results of the ASG in relation to the passive soil gas (PSG) results.

The Phase 1 PSG survey samples were collected on a 50-foot grid basis and show no evidence that vapors are continuously present between Building 759 and the free product source area at the IR17 and Building 503 Area. The discontinuity of vapors indicates that vapor migration from the IR17 and Building 503 Area to off-site locations, from preferential pathways or otherwise, is not occurring. Additionally, the ASG sampling results and subsequent conservative VI risk evaluation do not indicate a risk to human health from samples collected along the edge of the building.

2. **Comment:** **Given the shallow depth to groundwater at IR-17 and the presence of groundwater contamination, the risk assessment should prepare an alternate vapor intrusion evaluation using groundwater as the source term, consistent with DTSC vapor intrusion guidance (2005). Since the calculated attenuation factors appear consistent with those for groundwater vapor obtained from the EPA Vapor Intrusion Database, a simple evaluation may be performed by converting the groundwater concentrations to soil vapor concentrations using Henry's Law constants adjusted for temperature. This assessment should also discuss the relative placement of the screened interval of the monitoring wells in the saturated zone in terms of predicting vapor concentrations at the capillary fringe.**

Response: The soil vapor monitoring used to support the current vapor inhalation risk characterization was conducted because agencies did not accept the previous vapor inhalation risk results that were based on extrapolation from groundwater concentrations. The previous VI risk assessment that was based on groundwater results was presented in the remedial investigation (RI) (SulTech 2006a). The current work was conducted using a sampling plan reviewed and approved by the BCT. As noted in DTSC HERD Comment 3, the volatile components are better represented by the recent ASG samples than by groundwater data. The Navy believes the current results are sufficient to move forward with removal or remedial action decision-making at the site.

3. **Comment:** **The presence of free-phase contaminants in groundwater either observed in previous investigations or those now present should be fully discussed. In particular, the fact that the Johnson and Ettinger model does not account for the presence of free-phase contamination, the indoor air concentrations for such conditions may be**

underestimated. As such, this needs to be considered in the subject report.

Response: The groundwater version of Johnson and Ettinger model (JEM) (DTSC 2003) does not account for the presence of free-phase contamination because it estimates subsurface vapor concentrations from dissolved-phase concentrations in groundwater, and does not predict transport from contamination from within the capillary fringe. However, use of ASG data collected from the IR17 and Building 503 Area as source concentrations in the soil gas version of the JEM (DTSC 2003) minimizes this concern because partitioning of free-phase contamination to soil gas is accounted for in the ASG measurements. Use of the soil gas version of the JEM for evaluating VI risks is consistent with the VI risk methodology developed for the IR17 and Building 503 Area (ChaduxTt 2008a, 2008b). No revisions will be made to the report as a result of this comment.

4. **Comment:** **Data Evaluation and Selection of Chemicals of Potential Concern, page E-5 – It does not appear that the leak detection protocol was adequate to determine whether atmospheric breakthrough occurred at any specific sampling location. According to the description provided on page E-5, sample tubing and associated fittings were exposed to 2-propanol. While this is appropriate to determine whether ambient air was drawn in though connections in the sample train, leak check compounds should have also been placed near the surface seals. Although the sample size was limited (1 L Summa® canisters), and approximately half of the samples were collected beneath a hardscape surface, there is always a concern that such shallow samples can be subject to ambient air intrusion and other atmospheric influences. At a minimum, the potential for underestimation of soil vapor concentrations should be considered when interpreting the results of the risk assessment in the report.**

Response: The text in Section E6.4 of Appendix E discusses the uncertainty related to atmospheric breakthrough during ASG sampling. Text in Section 2.2.6 of the main summary report and Section E3.0 of Appendix E will be clarified to state the tracer compound (2-propanol) was also applied to the surface seal, where the tubing meets the surface and the bentonite seal is present.

5. **Comment:** **Toxicity Criteria, page E-10 – Consistent with EPA's Inhalation Dosimetry Methodology (EPA, 1994), reference concentrations (RfCs) and inhalation unit risk (IUR) should not be converted to inhalation reference doses and cancer slope factors. The amount of the chemical that reaches the target site though the inhalation pathway is not a simple function of the inhalation rate and body weight. For those**

chemicals where RfCs and IUR factors are available, the dose should be estimated simply by adjusting for less than continuous exposure.

Response: The approach used to estimate inhalation exposures, which involved using inhalation rates and body weights to estimate chemical dose and converting inhalation unit risks (IUR) and reference concentrations (RfC) to inhalation reference doses and cancer slope factors, was consistent with the VI risk methodology developed for the IR17 and Building 503 Area (ChaduxTt 2008a, 2008b). The updated EPA (2009a) methodology for evaluating inhalation exposure, which involves estimating dose by adjusting for less-than-continuous exposure, was finalized by EPA on January 28, 2009, after the draft version of the VI risk evaluation was submitted on January 6, 2009 for regulatory agency review. The Navy will incorporate the updated EPA (2009a) methodology for estimating inhalation exposures into the final version of the VI risk evaluation. The updated EPA methodology results in lower inhalation doses than those estimated using the previous methodology; hence, the overall estimates of VI cancer risks and noncancer hazards may decrease.

6. **Comment: Toxicity Criteria, page E-10 – n-Hexane should be used as a surrogate for 2-hexanone, as the adverse effects associated with exposure to n-hexane is associated with the 2,5-hexanedione metabolite.**

Response: The Navy will revise the vapor intrusion risk evaluation to use n-hexane as a surrogate for 2-hexanone.

7. **Comment: Interpretation of Hazard and Risk Levels, page E-13 – The text refers to the EPA memorandum regarding the role of the baseline risk assessment in Superfund remedy selections, as well as the target risk range as outlined in the NCP. While consideration of the NCP risk range is an integral part of the remedial decision process, the discussion of the risk management range within the risk assessment itself is inappropriate. The agency has clarified its position on the role of the risk assessor and risk manager on many occasions, most recently in its 1995 memorandum "Policy for Risk Characterization (EPA, 1995). In summary, risk assessors "are charged with (1) generating a credible, objective, realistic, and balanced analysis; (2) presenting information on hazard, dose-response, exposure and risks; and (3) explaining confidence in each assessment by clearly delineating uncertainties and assumptions along with the impacts of these factors...on the overall assessment. They do not make decisions on the acceptability of any risk level for protecting public health or selecting procedures for reducing risks." Hence, discussions of "acceptable risk levels" should be addressed separately and be**

confined to the appropriate decision documents in conjunction with an evaluation of the nine criteria.

Response: The RI and feasibility study (FS) reports for the IR17 and Building 503 area, including the HHRA, were finalized in 2006 (SulTech 2006a, 2006b). Evaluation of VI risks using soil gas data was completed to address regulatory agency comments on the 2006 RI report and HHRA. The Navy believes the discussion of risk range is appropriate for this VI risk characterization because the document is intended to support risk management decisions for the EECA/IRAP. No changes will be made to the report as a result of this comment.

SPECIFIC COMMENTS

1. **Comment:** **Page 16, Section 4.2.2, Hypothetical Future Commercial/Industrial Scenario – The last sentence states "*These risks are within the EPA risk management range of 10^{-6}*". 10^{-6} is not a range. In addition, a period is missing from the last bulleted item.**

   Response: The referenced statement will be corrected to indicate the EPA risk management range is 10^{-6} to 10^{-4}.

2. **Comment:** **Figure 5, Groundwater Sample Locations – Groundwater monitoring well 17W20 is not labeled.**

   Response: Figure 5 will be revised to label the location of monitoring well 17W20.

3. **Comment:** **Appendix B, Groundwater Sampling Forms – Groundwater samples collected for VOC analysis from wells 17W04, 17W05, 17W12, 17W13, 17W14, 17W16, 17W19, 17W20, 17TW01, 17TW02, 17TW03, and 17TW04 were submitted to the laboratory without a preservative. This is a deviation from the Sampling and Analysis Plan (SAP) that was not discussed in Section 2.2.9. Please provide a discussion of the rationale for submitting unpreserved VOC samples to the laboratory. In addition, please provide documentation that the laboratory was notified that the samples were not preserved.**

   Response: Text will be added to Section 2.2.9 of the main summary report to note that some groundwater samples collected for volatile organic compound analysis were submitted to the laboratory unpreserved. Groundwater collected in volatile organic analysis vials at certain wells reacted to the hydrochloric acid preservative, effervescence was observed in the vials at the time of sampling. Because effervescing would negatively affect the

sample by increasing the rate of volatilization of chemicals, the sample was not considered viable. The samples were re-collected in unpreserved vials. The lab was notified of the non-preserved samples in the following manner: sample vial label indicated "no preservative", chain-of-custody marked the samples as unpreserved; and a follow-up telephone call was placed to the lab to notify them to process the unpreserved samples immediately. In addition, no unpreserved samples were shipped to the lab for a Saturday delivery since the holding times would have been exceeded.

4. **Comment:** **Table F-1, Analytical Results for Soil Samples – Analytical results for total petroleum hydrocarbons as motor oil (TPHmo) are listed as "NA" for the following samples: IR17SB006, IR17SB007, IR17SB010, IR17SB011, IR17SB012, IR17SB013, IR17SB015, IR17SB016, IR17SB017, IR17SB019, IR17SB020, IR17SB022, IR17SB027, IR17SB029, IR17SB030. Please include an explanation in the "Notes" section of the table as to why the analytical results for TPHmo are "Not applicable".**

"Other components" are listed as constituents under Diesel/Motor Oil Range and Gasoline Range Petroleum Hydrocarbons. Please provide an explanation of "other components". It appears that samples IR17SB031 through IR17SB037 were not analyzed for TPHmo. If this is a typographical error, please correct; otherwise, include in Section 2.2.9 an explanation of this deviation from the SAP.

Response: Results for total petroleum hydrocarbons-motor oil (TPH-mo) were not reported by the analytical laboratory at the time of the draft field summary report distribution. However, TPH-mo results for all soil samples have since been received by the laboratory and were uploaded into the database. Table 8 of the main report and Table F-1 of Appendix F will be revised to reflect the resulting TPH-mo dataset. No changes will be made to the text with regards to a deviation from the sampling and analysis plan.

The laboratory reported specific results for TPH as gasoline, diesel, and motor oil. However, if the laboratory detected hydrocarbons within a different carbon range than our target analytes, they reported the result as "other compound."

5. **Comment:** **Table F-2, Analytical Results for Groundwater Samples – Analytical results for TPHmo are listed as "NA" for the following samples: 02817W10 and 02817W12. Please include an explanation in the "Notes" section of the table as to why the analytical results for TPHmo are "Not applicable".**

Similar to Comment #4, please provide an explanation of "other components".

Response: See response to Water Board specific comment 4 above.

RESPONSES TO EPA COMMENTS

GENERAL COMMENTS

1. **Comment:** **The Human Health Risk Assessment (HHRA) evaluated Phase 2 active soil gas (ASG) sampling data to support an assessment of the possible VI exposure pathway at the IR Site 17 and Building 503 Area (the Site). These data supplement and help clarify environmental conditions at the Site. However, some ASG samples were collected at shallow soil depths (i.e., less than 10 feet below ground surface [bgs]), which were not overlain by a confining layer (e.g., pavement). There is uncertainty as to the utility of these data. At shallow soil depths (where there is no confining layer,) the data cannot be used to reflect the potential for subslab vapor pooling under an existing structure. Specifically, soil gas equilibrium exchange with atmospheric air and biotransformation may underestimate analytical results. Typically, soil gas samples collected from depths shallower than 5 feet bgs are not suitable as the basis for quantitative risk evaluations. The occurrence of groundwater at the Site ranging from 3 to 9 feet bgs has complicated the collection of relevant data and compromised the defensibility of modeling future indoor air concentrations. The HHRA should recognize these uncertainties.**

   Response: The comment identifies the realities of potential exposure to soil gas at the site. It is not necessary that soil gas samples be collected beneath a confining layer. Indeed, an extensive layer such as pavement may overestimate exposure concentrations because it inhibits "equilibrium exchange" and biotransformation that commonly occurs. The objective of the exposure assessment is to develop reasonable maximum exposures for risk characterization. The Navy does not agree that data collected for this risk characterization are compromised or indefensible. The ASG data were collected at the request of the regulatory agencies per the approved sampling and analysis plan (ChaduxTt 2008c). The ASG data were evaluated per the approved VI methodology (ChaduxTt 2008a, 2008b). The report will be revised to recognize uncertainties that overestimate as well as underestimate risk.

2. **Comment:** **Importantly, the current multimedia data set and results of the VI risk evaluation do not support a case for unrestricted site use. While**

the Navy can implement "hotspot" removal at locations where ASG sampling data indicate significantly elevated cancer risks (i.e., above 10^{-4}, the upper end of EPA's acceptable risk management range), the actual extent of impacted media is unknown. A defensible dataset, predicated on multiple lines of evidence to accurately predict current or future indoor air concentrations, does not appear to exist. Based on the available site data and HHRA findings, the implementation of land use or institutional controls (LUCs/ICs) likely will be required for the Site; otherwise potentially extensive site-wide remediation will be required to achieve unrestricted land reuse. Examples of applicable LUCs/ICs include legally enforceable and transferable restrictive covenants on the deed of the subject property prohibiting the construction of confined or semi-confined structures such as slab-on-grade buildings or multi-level parking garages; and requiring future use of on-site or adjacent buildings to include direct monitoring programs and/or mitigation systems, such as a sub-grade vapor venting system. The deed for the property must disclose the presence of contamination and specify the land use limitations, exposure pathways, and receptor populations intended to be protected.

Response: The comment is noted and Navy will evaluate appropriate institutional controls for the site once the removal action is completed.

3. **Comment:** **The Report indicates that the VI exposure pathway is likely incomplete under current and future conditions at the Site based on the absence of occupied buildings and planned future site use as a paved parking lot or structure. However, it should be noted that Building 759 is immediately adjacent to the western site boundary and houses at least one tenant, Earthquake Protection Systems, Inc. (451 Azuar Drive, Building 759, Mare Island, Vallejo, CA 94592). As required by California Assembly Bill 422 (approved on October 13, 2007), HHRAs must include "the development of reasonable maximum estimates of exposure to volatile organic compounds that may enter structures that are on the site or that are proposed to be constructed on the site and may cause exposure due to accumulation of those volatile organic compounds in the indoor air of those structures." The proximity of Building 759 to ASG sampling locations where generated data indicate an elevated risk – including IR17SG002, located about 100 feet from the building and where risk estimates exceed 10^{-4} – coupled with the fact that paving constitutes a confining layer extending from the source area to Building 759 - indicates the potential for harmful levels of volatile organic compounds to enter overlying indoor space(s). Depending on undefined transport pathways, the existing pavement cover could exacerbate vapor plume migration and sub-grade soil gas**

concentrations beneath or adjacent to Building 759. Shallow groundwater, utility lines (present and planned) constituting preferential flow pathways, the presence of a current occupant, the potential presence of free product on the water table, the distance from the recorded source area, and the nature of Building 759's construction (slab-on-pilings) all tend to complicate a modeling exercise to predict indoor air concentrations. Multiple lines of evidence are necessary to assess current exposures attributable to Building 759 as a result of VI. Additional information to be considered include shallow soil gas samples collected from beneath the existing building footprint, crawlspace air, and indoor air monitoring. These data can be reviewed to establish building-specific attenuation factors as well as the identification of any indoor confounding sources.

Response: Evaluation of potential VI exposure to current occupants of Building 759 was excluded from the VI risk evaluation because the VI exposure pathway is considered negligible for Building 759. Similar to the current (unoccupied) buildings at the IR17 and Building 503 Area, Building 759 is constructed on pilings for structural stability. Vapor intrusion guidance provided by the Interstate Technology and Regulatory Council (ITRC 2007), a coalition of state and federal environmental regulatory agencies, including EPA, states that homes on raised concrete pilings are not likely to pose vapor intrusion risks. Even if these raised foundations are enclosed with metal or vinyl underskirting, the natural ventilation through gaps and joints in the underskirting may be sufficient to dilute any contaminant soil gas emanating from the subsurface.

The following summary of information from the Field Investigation Summary Report and Vapor Intrusion Risk Evaluation is provided below to further demonstrate that potential VI exposure is negligible for current occupants of Building 759, and does not warrant further investigation:

a. Results of the Phase 1 PSG field screening survey indicated relatively low concentrations of petroleum compound vapors along the eastern edge of Building 759 and relatively high concentrations in the area where residual free phase petroleum product was previously identified. Phase 2 soil, groundwater, and ASG sampling verified the presence of residual free phase petroleum product at the intersection of Azuar Drive and J Street, and extending approximately 130 feet west of this location in the direction of Building 759 (see Figure 5 of the EECA/IRAP).

   The Phase 1 PSG samples were collected on a 50-foot grid basis and show no evidence that vapors are continuously present

between Building 759 and the free product source area at the IR17 and Building 503 Area. The discontinuity of vapors indicates that vapor migration from the IR17 and Building 503 Area to off-site locations, from preferential pathways or otherwise, is not occurring. Additionally, no detections of BTEX or other volatile chemicals were reported for the monitoring well (17W16) located between the residual free phase product area and Building 759.

b. Furthermore, results of the VI risk evaluation for each of the three ASG samples collected immediately adjacent to and near the eastern edge of Building 759 (IR17SG005, IR17SG006, IR17SG003) indicate that VI health risks for a future industrial worker are negligible and do not require further action (that is, cancer risks are less than 10^{-6} and noncancer hazards are less than 1). The risks estimated for a future industrial worker hypothetically assume a slab-on-grade foundation, a complete VI exposure pathway, and are based on EPA and DTSC default assumptions for indoor worker inhalation exposure. Extrapolation of these hypothetical assumptions to the adjacent piling-raised Building 759 (below which the accumulation of soil gas vapors is unlikely) indicates that hypothetical health risks for current workers at this building are likewise negligible. Based on Fick's Law, vapor concentrations away from the source concentration cannot exceed vapor concentrations at the source concentration. As noted above, ASG results for locations IR17SG005, IR17SG006, and IR17SG003 represent the vapor source concentrations closest to Building 759.

c. Although the estimated VI risks for a future industrial worker at IR17SG002 (approximately 125 feet east of the southeastern corner of Building 759) exceed the upper end of the EPA risk management range of 10^{-6} to 10^{-4} and the noncancer hazard index exceeds 1, industrial worker VI risks and hazards at IR17SG003, which is located in between IR17SG002 and Building 759, are negligible. As discussed in the EECA/IRAP, the Navy will be conducting a removal at the area of residual free phase petroleum product identified at IR17SG002, hence eliminating this location as a potential source area for vapors.

No revisions will be made to the report as a result of this comment.

4. **Comment:** **Soil and groundwater data collected during the Phase 1 and 2 sampling events were not adequately incorporated into the current risk evaluation. HHRAs must evaluate cumulative risk; that is, combined risks from multiple exposure media and pathways. Please**

revise the HHRA to evaluate and discuss cumulative risks from VI and other potential complete exposure pathways from all relevant media sampled during the Phase 1 and 2 investigations. An update to the previous HHRA, prepared as part of the remedial investigation of the Site (SulTech 2006) and which focused on direct contact pathways, should include the recent Phase 2 soil and groundwater data sets in the evaluation of the hypothetical future resident, commercial/industrial worker, and construction worker exposure scenarios. Please define the direct and indirect exposure pathways with regard to at-risk populations. Please note that indoor workers, whose predominant exposures may be attributable to indirect pathways related to VI, may also be exposed via direct contact pathways to contaminants arising from outdoor soil. The variable of mass fraction of soil in indoor dust (M_{sd}) from USEPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) can be used to represent the fraction of indoor dust derived from outdoor soil. The default value of M_{sd} recommended by USEPA is 0.7 g soil/g dust.

Response: As agreed to during the January 14, 2009 BCT meeting (minutes were provided by the Navy in an e-mail dated January 27, 2009) the Navy provided a summary of cumulative human health risks for the IR17 and Building 503 Area (see Attachment A). Cumulative risks are summarized based on risks for direct contact with soil, as estimated in the 2006 HHRA (SulTech 2006a) and the recent VI estimates of risk based on the 2008 ASG sample data. The cumulative risk summary provides risk information for pre- and post-removal scenarios and demonstrates that residual risks for a commercial/industrial scenario following the proposed removal do not exceed the EPA risk management range of 10^{-6} of 10^{-4} or a noncancer hazard of 1.

5. **Comment:** **Volatilization of constituents from groundwater into the vadose zone is likely a source of observed soil gas constituents, but an evaluation of this relationship does not appear to have been provided to help characterize the source of soil gas, and which can be important for decisions of remediation vs. institutional controls. For example, soil gas sample IR17SG024 is shown as having a significant risk in a future hypothetical resident scenario (Figures E-2 and E-3) and which is apparently collocated with groundwater monitoring well location IR17TW03 where the highest chlorinated ethene concentrations are located (Table 9). However Table 9 lists monitoring well 17W15 as having the maximum groundwater concentrations of benzene, ethylbenzene, toluene and xylenes (BETX) but the figures depicting risk evaluation results (E-2 through E-5) do not indicate soil gas is a significant concern near this location. All soil and groundwater analyses should be thoroughly compared to the observed soil gas**

measurements to evaluate whether the sources of contamination reside in the groundwater and/or vadose zone soils, and include the possible transport of vapors and possibly groundwater through infrastructure conduits.

Response: Section 2.4 of the EECA/IRAP presents the current source, nature, and extent of contamination at the site for soil, groundwater, and soil gas contamination. The draft final EECA/IRAP will be updated to discuss the results of the validated data and include a summary of the VI risk evaluation which was not available at the time of issue for the draft EECA/IRAP. Section 2.4 of the EECA/IRAP will be updated to discuss the identified sources of contamination at the site as they relate to soil, groundwater, and soil gas as appropriate,.

6. **Comment: The Site includes a small part of the adjacent wetland, which is not evaluated in the HHRA. Please indicate in the Report how potential impacts from historic site activities on this excluded area will be evaluated.**

Response: A work plan for the investigation of the non-tidal wetland at the IR17 and Building 503 Area will be prepared and submitted for regulatory review at a later date.

SPECIFIC COMMENTS

1. **Comment: Section E4.1.3, Toxicity Criteria, Page E-10: The last bullet in this section indicates that the EPA toxicity criteria for trichloroethylene (TCE) are undergoing review (EPA 2001). While this statement is still accurate – that toxicity data for TCE is still being reviewed under the Integrated Risk Information System (IRIS) program – reference should be made to the *Interim Recommended TCE Toxicity Values to Assess Human Health Risk and Recommendations for the VI Pathway Analysis*, recently issued by Office of Solid Waste and Emergency Response (OSWER, 2009), which formally recommends the use of California Environmental Protection Agency inhalation unit risk and oral slope factor. Formally, USEPA has moved away from implementation of simple route-to-route extrapolation for use in assessment of inhalation exposures and relies exclusively on promulgated inhalation unit risks and reference concentrations. The current assessment is then based on a dated approach, utilizing converted toxicity criteria in the form of inhalation reference doses and inhalation slope factors for all contaminants. Any revision of the current assessment should take the updated approach into account.**

Response: EPA's interim recommendation for trichloroethene (TCE) toxicity values for VI evaluations (EPA 2009b) was issued on January 14, 2009, after submittal of the draft Field Investigation Summary Report and VI Risk Evaluation. The text in Section E4.1.3 will be revised to reference EPA's interim recommendation, which recommends use of the California Environmental Protection Agency IUR and reference exposure level for TCE. This interim recommendation does not result in a revision in the toxicity criteria used for TCE in the VI risk evaluation for the IR17 and Building 503 Area.

As discussed in the response to Water Board general comment 5, the approach used to estimate inhalation exposures, which involved using inhalation rates and body weights to estimate chemical dose and converting IURs and RfCs to inhalation reference doses and cancer slope factors, was consistent with the VI risk methodology developed for the IR17 and Building 503 Area (ChaduxTt 2008a, 2008b). The updated EPA (2009a) methodology for evaluating inhalation exposures, which involves estimating dose by adjusting for less-than-continuous exposure, was finalized by EPA on January 28, 2009, after the draft version of the VI risk evaluation was submitted on January 6, 2009 for regulatory agency review. The Navy will incorporate the updated EPA (2009a) methodology for estimating inhalation exposures into the final version of the VI risk evaluation. The updated EPA methodology results in lower inhalation doses than those estimated using the previous methodology; hence, the overall estimates of VI cancer risks and noncancer hazards may decrease.

2. **Comment:** **Section E4.2, Step 2: Calculation of Risk-Based Concentrations for Soil Gas, Page E-10; and Table E-7: Attenuation Factors for Soil Gas-to-Indoor Air: The second step of the HHRA involves calculation of site-specific attenuation factors (α_{sg}) as part of deriving soil gas risk-based concentrations (RBC-SGs). The general equation used to calculate α_{sg} is correct. However, it should be noted that the site-specific α_{sg} values presented in Table E-7 are at least an order of magnitude less conservative than EPA default α_{sg} values for use in a screening level assessment such as has been presented. Default values are pertinent for use in assessing future exposure conditions. For example, default α_{sg} values for a residential building scenario typically range from 1E-01 to 1E-02, compared to the site-specific factors used in the HHRA, which are in the 1E-03 to 1E-04 range. It should also be realized that such uncertainties can be critical when modeling over such short transport pathways. This uncertainty should be investigated further, for example, by comparing soil gas concentrations beneath a building and actual indoor air concentrations inside the building.**

Response: Section E6.1 will be revised to acknowledge that the site-specific α_{sg} values for the IR17 and Building 503 area are lower (less conservative) than the generic, non-site-specific screening-level α_{sg} values provided by EPA in its 2002 VI guidance. This difference is not of concern because the EPA (2002) screening-level α_{sg} values are intended for screening sites at the early stages of a VI investigation. Site-specific data obtained for the IR17 and Building 503 Area during the 2008 Phase 1 and Phase 2 sampling events support use of refined, site-specific α_{sg} values.

As discussed in Section E6.1, comparison of the site-specific α_{sg} values with empirical data-based α_{sg} values provided by EPA (2008) for sites with contaminants shows that the site-specific α_{sg} values are higher (more conservative) than empirically observed α_{sg} values, and are therefore conservative and unlikely to result in an underestimate of health risks. In addition, the site-specific α_{sg} values are comparable to the worst-case scenario α_{sg} values recommended by DTSC (2005) for screening residential buildings constructed without engineered fill, and are therefore considered protective for evaluation of potential future VI exposures.

3. **Comment: Table E-9, Chemical-Specific Properties for Use in the Johnson and Ettinger Vapor Intrusion Model: According to Section E4.2 (Page E-11), Table E-9 presents chemical and physical properties for seven chemicals that were not represented in the Department of Toxic Substances Control's (2003) adaptation of the Johnson and Ettinger model. However, the referenced table only lists properties for six of the seven chemicals. Please revise Table E-9 to include ethanol**

Response: Table E-9 will be revised to include chemical and physical properties for ethanol.

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