



Department of Toxic Substances Control

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Edmund G. Brown Jr.
Governor

August 16, 2011

Mr. Keith Forman
Department of the Navy
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COMMENTS TO DRAFT TECHNICAL MEMORANDUM SOIL VAPOR INVESTIGATION IN SUPPORT OF VAPOR INTRUSION ASSESSMENT PARCELS B, D-1 AND UC-2, HUNTERS POINT SHIPYARD, SAN FRANCISCO, CALIFORNIA

Dear Mr. Forman:

The Department of Toxic Substances Control (DTSC) thanks you for the opportunity to review the Draft Technical Memorandum Soil Vapor Investigation in Support of Vapor Intrusion Assessment for Parcels B, D-1 and UC-2, Hunters Point Shipyard, San Francisco, California dated July 1, 2011 (SVI Memo). The DTSC's Human and Ecological Risk Office (HERO) has also received and reviewed the SVI Memo and their comments are included as an enclosure to this letter.

The primary objective of the soil vapor investigation was to refine areas requiring institutional controls (ARICs) for the exposure pathway of vapor intrusion to indoor air as determined in the Record of Decision documents and determine which parcel areas should be reduced, expanded, or eliminated from prior ARIC designation.

Based on our review, DTSC has the following comments:

- (1) General comment. The objective of the Soil Vapor Investigation (SVI) was to refine areas requiring institutional controls (ARICs) for the exposure pathway of vapor intrusion to indoor air only and all conclusions and statements made in the SVI Memo should be revised to reflect this specific objective. As currently presented, the statements incorrectly imply that the results from the current SVI are being carried forward to determine if ARICs for all contaminants in all media (soil, groundwater, etc.) need to remain for future redevelopment efforts.
- (2) General comment. It is unclear if the "tiered approach" applies to either the sampling, risk assessment, or both. For polycyclic aromatic hydrocarbons (PAHs)

and pesticides, it appears the tiered approach to initial sampling was applied. There appears to also be a Tier I screening-level for the residential exposure scenario and a grid-specific Tier II assessment for the soil vapor intrusion Human Health Risk Assessment (HHRA). The tiered approach must be more clearly defined, described, or re-named in the SVI memo to avoid confusion between sampling and risk assessment approaches.

- (3) Section 5.3 – Soil Gas Probe Installation and Sampling. The text states that groundwater depths and adjusted soil gas sampling depths are provided in Tables 4-1 through 4-4. However, Tables 4-1 through 4-4 cannot be found in the SVI memo.
- (4) Section 6.1 – Deviations from the SAP. All sample locations that were relocated should be identified, the rationale for moving the location should be specified (e.g. low-flow or no-flow conditions), and the location to which it was moved in comparison to the initially proposed location (e.g. relocated 2 feet to the east of the original proposed location where no underground obstruction was marked) should be presented either in the text or in a figure. In addition, please provide the technical basis or rationale for why each SAP deviation was implemented.
- (5) Section 6.3.1 – Detection and Reporting Limits. Please explain how the samples with reporting limits exceeding SGALs were addressed and what number(s), if any, were carried forward to the HHRA.
- (6) Section 6.4 – Offsite Analytical Results. Please clarify if either eleven or twelve verification soil gas samples were collected and analyzed. In addition, please either provide a general summary of how the Air Toxics laboratory results compared to the on-site mobile laboratory results in this section or reference the discussion presented in the fourth bullet of Section 8.0.
- (7) Section 7.3.3.2.1 – Residential Scenario. Please briefly clarify what is meant by the recommendation that the parcel grid box be “further evaluated to determine the final ARIC designation.” It is DTSC’s understanding that any potential further evaluation will be conducted outside of the current investigation. The scope and extent of any additional ARIC evaluation(s) will need to be defined and conducted under the continued oversight of regulatory agencies.
- (8) Sections 7.5 and 8.0 – HHRA Summary and Conclusion.
 - (a) Please see general comment #1 regarding conclusions needing clarification for (ARICs) limited to the exposure pathway of vapor intrusion to indoor air as well as general comment #2 regarding the tiered approach.
 - (b) The grid blocks classified in the document as “minimal risk” with cancer risks that fall between 1×10^{-6} and 5×10^{-6} should be included as grid blocks that require designation as ARICs for the exposure pathway of vapor intrusion to indoor air.

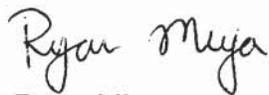
- (9) Section 9.0 – Recommendations.
- (a) Please see general comment #1 regarding conclusions needing clarification for (ARICs) limited to the exposure pathway of vapor intrusion to indoor air.
 - (b) Third bullet. While the results of the SVI suggest that no development restrictions due to potential vapor intrusion to indoor air should remain for Parcels B, D-1, G, and UC-2 grid blocks not sampled in the current SVI, activity restrictions may still be warranted in some areas onsite due to the presence of other contaminants present in the soil / groundwater that are not accounted for in the current SVI HHRA.
 - (c) Fifth bullet. The recommendation presented appears unclear and may be better defined with more specific descriptions. It is also unclear why the “better definition of the modeling parameters” would not be applied to any other grid blocks beyond the two specified in the text.
- (10) Tables 5-1, 5-2, 5-3, and 5-4. The Location Status designations of “Tier 1, Tier II, and Collect” should be defined and differentiated in the table notes for clarification.
- (11) Table 6-1. Please define / identify what the “***” symbol means in sample BCSG02-3.0dup next to the benzene detection of 1002 micrograms per cubic meter. Was this result carried forward to the SVI HHRA? In addition, please see comment #5 above regarding clarification of how samples with reporting limits exceeding SGALs were addressed.
- (12) Table 6-2 and 6-4. The column with the sample date needs correction / expansion.
- (13) Table 6-9. Please consider reporting results for chrysene, benzo(b) fluoranthene, hexachloroethane, 2,6-dimethylnaphthalene, and 2,3,5-trimethylnaphthalene as results less than the reporting limit. Otherwise, please specify the respective laboratory reporting limits for each of these analytes in the table footnote.
- (14) Table 7-1. Please add the applicable Parcel designation in parenthesis to each of the IR Site areas identified for clarification. For example, “IR Site 10 (Parcel B).”
- (15) Figure 2-2 – Parcels Location Map. Please highlight those parcels that are applicable to the current SVI Memo in a different color to differentiate them from the other active Hunters Point Shipyard parcels presented on the map (Parcels B, D-1, G, and UC-2).
- (16) Figure 4-2 – Tier I HHRA Sampling Locations and Initial Evaluation of Data VOCs at Parcel D-1. The two geotechnical samples collected in Parcel G near the Parcel D-1 border appear missing and should be added to the figure.
- (17) Figures 7-2 through 7-5. The results presented in the figure should be expanded to be more inclusive of the risk assessment results. For example, if the grid square was carried forward to the Tier II risk assessment, the Tier II result should also be

Mr. Forman
August 16, 2011
Page 4

included (but not highlighted blue if below the 1×10^{-6} risk threshold). Without this additional information it is potentially confusing for readers to understand why a grid square is colored green but also found to exceed the 1×10^{-6} risk threshold. In addition, all colored grid squares should either have their corresponding risk estimate presented on the figure or a footnote should be added indicating that those grid squares without a risk estimate were found to be below the 1×10^{-6} risk threshold for the Tier I analysis.

If you have any questions, please contact me at 510-540-3775 or by e-mail at rmiya@dtsc.ca.gov.

Sincerely,



Ryan Miya
Senior Hazardous Substances Scientist
Brownfields and Environmental Restoration
Program - Berkeley

Enclosure

E-mail distribution:

Mr. Mark Ripperda, U.S. Environmental Protection Agency Region IX
Mr. Craig Cooper, U.S. Environmental Protection Agency Region IX
Mr. Ross Steenson, Regional Water Quality Control Board, San Francisco Bay Region
Ms. Amy Brownell, City of San Francisco
Ms. Melanie Kito, Department of the Navy
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TO: Ryan Miya, Project Manager
Brownfields and Environmental Restoration Program
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2721

FROM: Kimberly C. Day, Ph.D.
Staff Toxicologist, Human and Ecological Risk Office (HERO)

DATE: August 15, 2011

SUBJECT: DRAFT TECHNICAL MEMORANDUM SOIL VAPOR INVESTIGATION IN
SUPPORT OF VAPOR INTRUSION ASSESSMENT PARCELS B, D-1, G, AND
UC-2, HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA,
JULY 2011

PCA: 18042

Site: 200050-18

DOCUMENT REVIEWED: Draft Technical Memorandum Soil Vapor Investigation in Support of Vapor Intrusion Assessment Parcels B, D-1, G, and UC-2, Hunters Point Naval Shipyard, San Francisco, California. Prepared for Base Realignment and Closure Program Management Office West, San Diego, California. Prepared by Sealaska Environmental Services, LLC, San Diego, California. HERO received a copy of the document on July 5, 2011.

DOCUMENTS PREVIOUSLY REVIEWED: 1) In a memorandum dated August 4, 2010 (K. Day to R. Miya), HERO reviewed the Draft Work Plan for Soil Vapor Intrusion Survey, Parcels B, D-1, G, and UC-2. 2) In a memorandum dated July 22, 2010 (K. Day to R. Miya), HERO reviewed the Preliminary Draft Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), Soil Vapor Intrusion Survey, and Appendix C – Human Health Risk Assessment For the Vapor Intrusion Pathway, Approach and Methodology, Parcels B, D-1, G, and UC-2. 3) HERO reviewed the Final Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunter Point Shipyard, San Francisco, California. HERO received a copy of the document on March 3, 2010. 4) In a memorandum dated January 11, 2010 (K. Day to R. Miya), HERO reviewed the Draft Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard.

BACKGROUND BASED ON INFORMATION PROVIDED IN THE SUBMISSION:

Hunters Point Naval Shipyard (HPNS) is located in San Francisco, California. The Navy used HPNS starting around 1939 for shipbuilding, repair, and maintenance, and continued to operate carrier overhaul and ship maintenance and repair facilities through the 1960s. HPNS was deactivated in 1974, and the Navy leased HPNS to a private ship repair company between 1976 and 1986. In 1987, the Navy resumed occupancy of HPNS. HPNS was designated for closure in

1991. Numerous volatile organic compounds (VOCs) have been identified in soil and groundwater and the inhalation of these VOCs through the vapor intrusion pathway was previously identified as a potentially complete pathway of exposure in previous human health risk assessments (HHRAs). The HHRAs for HPNS quantified risk for the vapor intrusion exposure pathway based on chemicals of concern (COCs) found in groundwater and development vapor intrusion-based remediation goals. Since the HHRAs for HPNS were completed, more recent guidance documents have been published and recommend the use of soil gas data to assess risk from vapor intrusion over groundwater and soil data. As a result, the Navy and the HPNS Base Realignment and Closure Cleanup Team (BCT) have agreed that the results from the soil gas surveys at HPNS will be used to refine the HHRA results.

This Technical Memorandum describes the soil gas sampling and analysis activities performed in support of a vapor intrusion (VI) assessment for Parcels B, D-1, G, and UC-2. The primary objectives of the soil vapor investigation (SVI) was to refine areas requiring institutional controls (ARICs) as determined in the Record of Decision and determine which parcel areas should be reduced, expanded, or eliminated from prior ARIC designation. The memorandum identifies COCs detected in soil gas, compares site-specific data to residential soil gas action levels (SGALs), presents a revised vapor intrusion HHRA, and presents recommendations for which parcel areas should remain or be de-designated as ARICs.

The volatile COCs identified in soil and groundwater from previous investigations and considered chemicals of potential concern for soil gas include: methane; gasoline constituents (benzene, toluene, ethylbenzene, and xylenes); diesel fuel constituents (naphthalene); non-chlorinated solvents (acetone, methyl ethyl ketone (2-butanone), and carbon disulfide); chlorinated solvents including tetrachloroethene (PCE), trichloroethene (TCE), trichloroethane, vinyl chloride, cis-1,2-dichloroethene; semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs) and pesticides. The depth to groundwater at the parcels range from six to ten feet below ground surface (bgs).

SCOPE OF REVIEW: HERO's review of the document is limited to those sections concerning human health risk assessment. We assume that regional personnel have evaluated the sampling methods for environmental media, the adequacy of site characterization, analytical chemistry methods, and quality assurance procedures

GENERAL COMMENTS - HUMAN HEALTH RISK ASSESSMENT

1. Samples Collected for Off-Site Analysis.

- a. In Section 5.3.6, the text states that 12 split soil gas samples were collected and sent to an off-site lab for analysis using EPA Method TO-15 to provide third-party confirmation of the mobile laboratory TO-15 analytical results. While in Section 6.4 (page 6-8), the text states that "*Eleven VOC soil gas samples designated by the suffix "OS" were collected as split samples for analysis by both the on-site and off-site laboratories.*" Then farther down in the same paragraph on page 6-8, the text states "*Results of the 12 VOC verification samples are presented alongside other sample results for the locations, in Table 6-1 through Table 6-4.*" Please note, HERO counted the number of samples designated with "OS", and only counted 11 samples. Please correct the discrepancies.

- i. The SGALs for benzene (using IRIS toxicity criteria) is $31.2 \mu\text{g}/\text{m}^3$, whereas, when using the OEHHA toxicity criteria, the SGAL is $8.39 \mu\text{g}/\text{m}^3$.
 - ii. The SGALs for methylene chloride (using IRIS toxicity criteria) is $518 \mu\text{g}/\text{m}^3$, whereas, when using the OEHHA toxicity criteria, the SGAL is $243 \mu\text{g}/\text{m}^3$.
 - iii. The SGALs for carbon tetrachloride (using IRIS toxicity criteria) is $16.2 \mu\text{g}/\text{m}^3$, whereas, when using the OEHHA toxicity criteria, the SGAL is $5.49 \mu\text{g}/\text{m}^3$.
 - iv. The SGALs for vinyl chloride (using IRIS toxicity criteria) is $55.3 \mu\text{g}/\text{m}^3$, whereas, when using the OEHHA toxicity criteria, the SGAL is $3.12 \mu\text{g}/\text{m}^3$.
- c. The Navy plans to use the derived SGALs in the second phase of the SVI activities for the assessment of soil gas in Parcels C, E, and possible further assessment of soil gas in Parcels UC-1 and UC-2. Please provide HERO with updated SGALs for review prior to start of the second phase of the SVI activities.
- d. *Attenuation Factors.* The attenuation factors listed in Section 7.2.2 for Cal/EPA for the residential (0.0009) and commercial (0.0004) exposure scenarios are the DTSC recommended attenuation factors for future buildings/structures. The text does not reflect that these attenuation factors are for future buildings/structures. Please note that DTSC recommends different attenuation factors for different building scenarios (i.e., existing and current). Please update the text to include that the DTSC attenuation factors are for future buildings.
- e. *For information only.* Under the Tier 1 risk assessment approach, to derive the SGALs the Navy used both the EPA default screening level attenuation factors (also called alphas) 0.01 and 0.001 and DTSC's default screening level attenuation factors 0.0009 and 0.0004 for the residential and commercial land use scenarios, respectively. Please note that DTSC has recently revised the default attenuation factors in the guidance document *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. DTSC expects to release the revised guidance document the end of August 2011. Please note this comment is for the Navy's information only.

These revised attenuation factors are:

- 1) Residential – Existing Building
 - a) Sample collected above the contaminant source – 0.002;
 - b) Building with crawl space – 1.0;
 - c) Building with either a basement or if a subslab sample is collected – 0.05.
- 2) Commercial – Existing Building
 - a) Sample collected above the contaminant source – 0.001;
 - b) Building with either a basement or if a subslab sample is collected – 0.05.
- 3) Residential – Future Building
 - a) Sample collected above the contaminant source – 0.001.
- 4) Commercial – Future Building
 - a) Sample collected above the contaminant source – 0.005.

5. Tier 1 – Risk Assessment Results. In Section 7.2.4, the Navy is recommending that the following 11 areas: Industrial Drain Line B/C; IR Sites 09, 17, 36, 37, 45, 53, and 61; PA 34, PA55, and 450S2K-7.03 “...would not need to remain as ARICs [areas requiring intuitional controls] for future redevelopment efforts” since the cumulative risk estimates were all below the point of departure, 1E-06, and non-cancer hazard estimates were less than 1. While this statement is accurate for the exposure pathway of vapor intrusion to indoor air, HERO cannot agree with the Navy's conclusion: “These cancer risk and non-cancer hazard estimates indicate that these 11 areas would not need to remain as ARICs for future redevelopment efforts.” This technical memorandum only presents the estimated cumulative risks and hazard indexes for the vapor intrusion to indoor air pathway and does not discuss or include the risks and hazards associated with the other exposure pathways (e.g., soil and groundwater). Please note that cumulative risks and hazards are additive across all exposure pathways and across all COCs. At this time, HERO cannot agree with the Navy's statement since there is no discussion of the other exposure pathways, we believe it is important that the document be updated in this regard.
6. Depth- and Chemical-Specific Attenuation Factors. The document only includes one complete set of the detailed Johnson and Ettinger Model (JEM) worksheets used to calculate the chemical-, depth-, grid-specific attenuation factors for Sample BCSG02-3.0. The text states that a “user familiar with JEM can reproduce the derived alphas based on the data in Table 7-2 and Appendix F, Attachment F-1.” While this is statement is true, for transparency and for those reviewers not as familiar with JEM, the Navy should provide ALL JEM worksheets for review. Please note that these can be provided on a CD and do not need to be printed out. Please provide these worksheets for our review prior to finalization of this technical memorandum.
7. Tier 2 – Toxicity Assessment (Section 7.3.2 and Appendix F, Attachments F-7 and F-8).
 - a. Section 7.3.2 states that the HHRA uses the same toxicity information used in development of the Tier 1 SGAL values and references the document, ChaduxTt 2010. While the ChaduxTt 2010 document states that the more health- protective toxicity criteria will be used between OEHHA and IRIS values in deriving the SGALs; however, this did not transpire. Please note HERO recommends that the more health-protective toxicity criteria between OEHHA and IRIS are used when calculating the risks and hazards for a given site. The toxicity values listed in Attachments F-7 and F-8 are not necessarily the more health- protective value, especially for benzene, vinyl chloride, and carbon tetrachloride. For these chemicals OEHHA's URFs are several-fold more conservative than the IRIS value: benzene - OEHHA - 2.9E-05 [$\mu\text{g}/\text{m}^3$]⁻¹; IRIS - 7.8E-06 [$\mu\text{g}/\text{m}^3$]⁻¹, vinyl chloride - OEHHA - 7.8E-05 [$\mu\text{g}/\text{m}^3$]⁻¹; IRIS – 4.4E-06 [$\mu\text{g}/\text{m}^3$]⁻¹, and carbon tetrachloride-OEHHA - 4.2E-05 [$\mu\text{g}/\text{m}^3$]⁻¹; IRIS – 1.5E-05 [$\mu\text{g}/\text{m}^3$]⁻¹. At this time, HERO cannot accept the incremental and cumulative risks and hazard quotients and indexes listed in Attachments F-7 and F-8. HERO recommends the Navy recalculate the incremental and cumulative risks and hazard indexes using the more health-protective toxicity criteria, and revise the text and tables in the main document and Appendix F to reflect the results.
 - b. Please note that HERO recalculated the incremental and cumulative risk for a couple of samples using OEHHA's toxicity criteria. For several of the areas, the

recalculated cumulative risk went from being outside the point of departure for risk management ($1E-06$) to being within the risk management range ($1E-06$ to $1E-04$). For example, the estimated risk for the residential land use scenario for sample location BCSG13-3.0 using IRIS toxicity criteria is $3.8E-07$, but when using OEHHA's toxicity criteria the risk is $1.4E-06$. The estimated risk for the residential land use scenario for sample location IR20B010-3.0 using IRIS toxicity criteria is $1.6E-07$, but when using OEHHA's toxicity criteria the risk is $1.9E-06$. The estimated risk for the commercial/industrial land use scenario for sample location IR33SV101-5.0 dup using IRIS toxicity criteria is $3.2E-07$, but when using OEHHA's toxicity criteria the risk is $1.2E-06$.

8. Tier 2 – Risk Assessment Results.

- a. At this time, HERO cannot accept the risk assessment presented in this technical memorandum since the more health-protective toxicity criteria were not used in the HHRA even though previous documents state they would be used (ChaduxTt 2010).
 - b. Residential Scenario. In Section 7.3.3.2.1, the text states that *"In general, the sampling and calculation results indicate that 79 out of 90 grids blocks located in Parcels B, D-1, G, and UC-2 are not at-risk from the vapor intrusion pathway and would no longer need to be designated as residential ARICs."* At this time, HERO cannot agree with this statement until the risks and hazards are recalculated using the more health-protective toxicity criteria as stated in our comment above. Furthermore, this technical memorandum only presents the estimated cumulative risks and hazard indexes for the vapor intrusion to indoor air pathway and does not discuss or include the risks and hazards associated with the other exposure pathways (e.g., soil and groundwater). Please note that cumulative risks and hazards are additive across all exposure pathways and across all COCs. When considering whether or not grid blocks would require residential ARIC, risk from all exposure pathways need to be considered and presented to risk managers so decisions can be based using all the relevant information. HERO defers to DTSC's project manager regarding risk management decisions. Please update the document accordingly.
 - c. Commercial/Industrial Scenario. At this time, HERO cannot agree with the text in Section 7.3.3.2.2 until the Navy updates the document accordingly. Please refer to our comment above, General Comment 7a and 7b. We believe it is important that the document be updated to include all relevant information.
9. Section 7.5 HHRA Summary and Conclusion and Section 8.0 Conclusions. At this time, HERO cannot accept and agree with the written text under HHRA Summary and Conclusion. In particular, HERO does not agree with the grid blocks that did not exceed the de minimis cancer risk threshold of $1E-06$, the grid blocks that do not require an ARIC designation, the grid blocks that are considered "minimal risk", and the grid blocks that substantially exceed (greater than $5E-06$) the de minimis threshold until the Navy updates the cumulative risks using the more health-protective toxicity criteria between the OEHHA and IRIS values. Secondly, as previously commented above, this technical memorandum only presents the estimated cumulative risks and hazard indexes for the vapor intrusion to indoor air pathway and does not discuss or include the risks and hazards associated with

the other exposure pathways (e.g., soil and groundwater). When considering whether or not grid blocks would require residential ARIC, risk from all exposure pathways need to be considered and presented to risk managers so decisions can be based using all the relevant information. HERO defers to DTSC's project manager regarding risk management decisions. Please update the document accordingly and provide the updated text and tables for our review. We believe it is important that the document be updated to include all relevant information.

10. Section 9.0 Recommendations.

- a. HERO does not agree with the following statement, "*Likewise, the 79 parcel grid blocks that were specifically sampled and found to have volatiles in soil gas presenting no significant residential human health risk from VI and the inhalation pathway also should not have development restrictions;*". As previously commented above, this technical memorandum only presents the estimated cumulative risks and hazard indexes for the vapor intrusion to indoor air pathway and does not discuss or include the risks and hazards associated with the other exposure pathways (e.g., soil and groundwater) since cumulative risks and hazards are additive across all exposure pathways and across all COCs. While we acknowledge that the scope of this project was to collect soil gas samples and assess the human health risk from vapor intrusion to indoor air pathway, we believe it is important that the document be updated to include all relevant information because this information may be helpful for making risk management decisions about appropriate land uses and for public transparency.
- b. *For information only.* The fourth bullet discusses possible engineering design changes that can be implemented to eliminate the need for maintaining ARICs on marginally effected grid blocks including the use of vapor barriers. Please note, according to DTSC's Vapor Intrusion Mitigation Advisory (DTSC 2009) a vapor barrier alone is not an acceptable vapor intrusion mitigation system since they are not able to completely eliminate vapor intrusion due to the likelihood of punctures, perforations, tears, and incomplete seals.

11. Geotechnical Soil Sampling.

- a. HERO defers to DTSC's geologist regarding the physical soil property data collected during the investigation and whether the data was used appropriately in this technical memorandum.
- b. *Section 6.5 and Section 7.3.1.1.2.* The discussion regarding the results of the geotechnical soil samples, the number of samples used to develop the input parameters for the screening-level Johnson and Ettinger Model (JEM), samples collected, the number of samples actually used to develop chemical- and depth-specific attenuation factors is confusing at times. For example, the text on page 7-7 states, "*These input parameters were developed from geotechnical laboratory analysis of 29 samples obtained from boring locations immediately adjacent to 29 unique samples locations (Section 6.5).*" While in the next paragraph on page 7-7 discusses that of the 29 samples collected, four were excluded from the Tier II analysis because these samples would have produced attenuation factors more

restrictive to vapor flow. The text goes on to state, "*The relevant geotechnical data from the remaining twenty-five samples were used to develop chemical- and depth-specific attenuation factors for the twenty-five (25) immediately adjacent borings, and then for the near-by sample locations without a co-located geotechnical boring using the JEM.*" Please correct the discrepancies.

12. Tier I and Tier II. In the Technical Memorandum document the terms "Tier I" and "Tier II" are used to describe both the sampling protocol for PAHs and pesticides (Section 4.0) and the risk assessment process (Section 7.2.1). In Section 7.0, both roman numerals (i.e., I or II) and numerical values, (i.e., 1 or 2), follow the word "Tier". These terms are used to describe two completely separate facets, sampling protocol and risk assessment protocol. For clarity HERO recommends the Navy either 1) only use the terms "Tier I and II" to describe one facet or 2) ensure that roman numerals are used for one facet and numerical values are used for the other facet. Please update the document accordingly for consistency.

SPECIFIC COMMENTS - HUMAN HEALTH RISK ASSESSMENT

1. The heading for Section 5.7 states, "*LABORATORY ANALYSIS OF SOIL GAS AND AIR SAMPLES.*" For accuracy, please remove "*AND AIR*" from the heading since no air samples were collected as part of this sampling event.
2. Under the column heading, "*Location Status*" of Tables 5-1 (Parcel B), 5-2 (Parcel D-1), 5-3 (Parcel G), and 5-4 (Parcel UC-2) please clarify the difference between when "*Tier I*", "*Tier II*" or "*Collect*" is listed as the status for the sample location.
3. Table 5-1. For several sample locations (including but not limited to BCSG10, BCSG11, IR10SV101) there is a "?" following the depth listed under the column heading, "Probe Depth". Please clarify why a "?" is listed for these depths. If the exact depth is unknown, please include this information in the "*Notes*".
4. Under "*Notes*" for Tables 6-1, 6-2, 6-3, and 6-4 please provide explanations for the following designations: "OS", "dup" and "(2)". These three notations are used in this table, and for transparency their explanation needs to be provided for the reviewer. Please update the tables.
5. Please note that the SGAL listed for toluene in Tables 6-1, 6-2, 6-3, and 6-4, $5.23E06 \mu\text{g}/\text{m}^3$, differs from the SGAL listed in Appendix F- Attachment F-3, $5.21E05 \mu\text{g}/\text{m}^3$. Please correct the discrepancy. Furthermore, for the residential land use scenario, HERO recommends a SGAL for toluene of $3.13E04 \mu\text{g}/\text{m}^3$ (using EPA attenuation factor) and $3.5E05 \mu\text{g}/\text{m}^3$ (using DTSC attenuation factor). These SGALs were derived using OEHHA's RfC, $0.3 \text{ mg}/\text{m}^3$, instead of the IRIS RfC of $5 \text{ mg}/\text{m}^3$. The OEHHA RfC is more health protective than the IRIS RfC.
6. Table 6-1.
 - a. Please provide an explanation for the two asterisks after the soil gas concentration listed for benzene, sample location BCSG02-3.0 dup, and the single asterisk after the soil gas concentration listed for acetone, sample location BCSG02-3.0.

- b. Under "Notes", please provide an explanation for the designation of "SS".
7. Tables 6-2 and 6-4. The date the samples were collected cannot be seen and "#####" is listed as the date. Please update the table to show the date the soil gas samples were collected.
8. Table 6-3. Please provide an explanation for the single asterisk after the soil gas concentration listed for acetone, sample location IR50B020-5.5-OS.
9. Section 6.2, page 6-2, second paragraph. The second and third sentences in the second paragraph on page 6-2 use the term "...detectable [detected] at below the...". For clarity, please revise the sentences to add the word "or", so it now reads, detectable [detected] at or below.
10. In Section 6.3, two different unit classifications, $\mu\text{g/L}$ and $\mu\text{g/m}^3$, are used to describe the soil gas concentrations for several chemicals. Please use the same unit designation for soil gas samples, i.e., $\mu\text{g/m}^3$. Please review the rest of the document for consistency.
11. In Section 7.3.1.1.3, the text states, "...EPC values were estimated as the product of the sample's VOC source-term concentration and the chemical-specific alpha value (Described in Section 7.3.1.1.2)." Please note that Section 7.3.1.1.2 discusses chemical fate and transport while Section 7.3.1.1.1 discusses the source term concentrations. Please correct the text for accuracy.
12. Table 7-1.
 - a. Please explain why sample number PA33B013-0.5 was not recommended to be carried forward for Tier 2 Grid-Specific Risk Assessment. Furthermore, please provide an explanation as to why the detected concentration of carbon tetrachloride in this sample ($600 \mu\text{g/m}^3$) was not listed in Attachment F-1, and why the risk associated with the detected concentration of carbon tetrachloride was not calculated and presented in Attachment F-2.
 - b. Under Notes, the description for note "b" should refer to Attachment F-2, not Attachment 2, the description for note "c" should refer to Attachment F-3, not Attachment 3, the description for note "d" should refer to Attachment F-4, not Attachment 4, and the description for note "e" should refer to Attachment F-5, not Attachment 5. Please revise the text accordingly.
13. Please update the SGALs listed in Tables 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8, Appendix F – Attachment F-2, Attachment F-3, Attachment F-4 and Attachment F-6 with the revised SGALs, derived using the more health protective toxicity criteria. Please refer to our General Comment 4 above.
14. Please update the cumulative risks and hazard indexes listed in Table 7-1 and the incremental risks and hazard quotients listed in Appendix F – Attachment F-2, Attachment F-3, Attachment F-4 and Attachment F-6. Please refer to our General Comment 4 and Specific Comment 14 above. HERO briefly recalculated the cumulative risks for a couple of

samples. Our recalculated risks for IR20B010-3.0 was 1.5E-04 vs. the listed risk of 1.3E-05, for IR33B107-5.0 was 1.4E-04 vs. the listed risk of 3.2E-05, and for PA33B013-0.5-OS was 1.3E-4 vs. the listed risk of 7.1E-05.

15. Table 7-3 lists the Tier 2 Grid-Specific Exposure Parameters for both the residential and commercial/industrial scenarios. Please note the value listed for the averaging time for carcinogens (ATc) for both the residential and commercial scenarios is incorrect and should be 70 years x 365 days/year or 25550 days and not 70 years. Also, the averaging time for noncarcinogens (ATnc) for the residential scenario should be 30 years x 365 days/year or 10950 days and not 25 years and the ATnc for the commercial scenario should be 25 years x 365 days/year or 9125 days and not 25 years. Please revise the table.
16. Table 7-4.
 - a. Please update the cumulative risks and hazard indexes listed in Table 7-4 with the risks and hazards calculated using the more health protective toxicity criteria. Please refer to General Comment 7 above.
 - b. For consistency, please list the cumulative cancer risk for sample number BCSG04-3.0 using scientific notation and not as 0.0000033.
 - c. There is a reference to note "c" following the value, 0.0000033. Please note there is no note "c" listed under "Notes" on page 2 of Table 7-4. Please correct the discrepancy.
 - d. Under Notes, two notes are listed "a" and "b". In the table note "a" is listed after the column heading, "*residential land use*^a" and note "b" is listed after the column heading "*commercial/industrial land use*^b". The description following note "a" and "b" state "*detailed results are provided in Attachment 6*" and "*detailed results are provided in Attachment 7*", respectively. Please note that the descriptions should refer to Attachment F-7 for residential land use and Attachment F-8 for commercial/industrial land use. Please revise the text accordingly.
17. Table 7-5 and Appendix F – Attachments F-7 and F-8. Please update the cumulative risks and hazard indexes listed in Table 7-5 and Appendix F – Attachments F-7 and F-8 with the risks and hazards calculated using the more health protective toxicity criteria. Please also, update the toxicity criteria listed in Attachments F-7 and F-8. Please refer to our General Comment 7 above.
18. Appendix F – Attachment F-1. Under "Notes" please provide explanations for the following designations: "OS", "dup" and "(2)". These three notations are used in this table, and for transparency their explanation needs to be provided for the reviewer. Please update the table.
19. The text on page 8-1 states that "...12 were split samples for off-site (OS) analysis, ...". Please revise the text to reflect that only 11 split samples were actually collected and sent for off-site analysis.

CONCLUSIONS

HERO has reviewed the draft Technical Memorandum Soil Vapor Investigation in Support of Vapor Intrusion Assessment Parcels B, D-1, G, and UC-2 at Hunters Point Naval Shipyard, San Francisco, California as related to human health risk assessment. At this time, HERO cannot accept the risk assessment presented in this technical memorandum. The more health-protective toxicity criteria between OEHHA and IRIS were not used in deriving the SGAL values used in the Tier 1 risk assessment and in the Tier 2 grid-specific risk assessment. For several chemicals the OEHHA value is several-fold more conservative than the IRIS value. Finally, the technical memorandum only presents the estimated cumulative risks and hazard indexes for the vapor intrusion to indoor air pathway and does not discuss or include the risks and hazards associated with the other exposure pathways (e.g., soil and groundwater). Cumulative risks and hazards are additive across all exposure pathways and across all COCs. Please address these issues and the other items noted above in the memorandum prior to finalization of this document.

Reviewed by: Michael J. Wade, Ph.D., D.A.B.T. 
Senior Toxicologist, HERO

REFERENCES

St. George Chadux and Tetra Tech EM, Inc. (ChaduxTt). 2010. *Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunters Point Shipyard, San Francisco, California*. Final. Prepared for: Base Realignment and Closure Program Management Office West, San Diego, California. April 30.

Department of Toxic Substances Control (DTSC), 2005. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. Interim Final. February 7.

Department of Toxic Substances Control (DTSC), 2009. *Vapor Intrusion Mitigation Advisory*. [http://www.dtsc.ca.gov/sitecleanup/upload/VI_Mitigation_Advisory_Apr09.pdf]