Expert Panel Interim Review of the Site-Specific Cleanup Goal Report and Human Health Screening Risk Evaluation

July 24, 2013

1. Introduction

This report contains the Expert Panel's interim review of the 2013 Site-Specific Cleanup Goal Report and Human Health Screening Risk Evaluation (2009, amended 2010 and 2011) as requested by the Regional Water Quality Control Board.

The Expert Panel's charge it to provide its recommendation for the Regional Board to consider in determining whether remedial actions and cleanup goals proposed by the responsible parties named in the Cleanup Order are consistent with applicable legal authorities, including State Water Resources Control Board (State Water Board) Resolution No. 92-49 ("Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304) (Resolution 92-49). Resolution 92-49 governs the Regional Board in requiring responsible parties to remediate the site to levels that will result in meeting all water quality standards and are "consistent with the maximum benefit to the people of the state."

The Expert Panel has reviewed several aspects of the Site-Specific Cleanup Goal Report (SSCG) and Human Health Screening Risk Evaluation (HHSRE). First, the panel evaluated the transparency, consistency, objectivity and the use of appropriate sensitivity analysis within and across the reports. Second, the panel identified areas of potentially important uncertainty in the reported knowledge of sources, transport and exposure to chemical of potential concern.

This interim report begins by lying out technical review criteria/principles. Section 3 then contains background information relevant to how the Expert Panel applied these technical criteria/principles in their review of the SSCG and HHSRE. Section 4 introduces concerns that arise when applying these principles to the SSCG and HHSRE. Section 5 contains other concerns/questions that arise from insufficient evidence. Finally, Section 6 summarizes and applies State Water Board Resolution 92-49 to this interim review.

2. Technical Review Criteria

This interim review of the human health risk assessment and cleanup goals work for the Former Kast Property (herein after referred to as Kast) has been analyzed based upon these principles:

- **Transparency**- A regulator and/or informed reader should be able to clearly identify and follow the logic and underlying assumptions (including those made under the banner of "best professional judgment") utilized in (i) the derivation of cleanup goals and (ii) overall risks for the site as a whole and at an individual homeowner level.

- **Consistency**- Methodological approaches for the risk assessment work should be based on a combination of (i) guidance and procedures published by the relevant regulatory agencies/authorities and as needed (ii) peer-reviewed scientific literature. If possible, methodological disparities (e.g., selection of chemicals of concern) should be minimized; however, if these differences occur a scientific and/or regulatory rationale should be provided.

- **Objectivity** (evidence based)- There should be a relevant and reasonably complete database that is useable for quantitative risk assessment. If there are significant data gaps for (i) media specific data sets (e.g., soil, air, water, biota), (ii) exposure assessment parameters (e.g., frequency, duration, behavioral patterns), and (iii) key toxicological parameters (e.g., slope factors, reference doses, toxic equivalency factors) then clear explanation and justification for bridging assumptions should be provided.

- **Sensitivity-** "How do we know what's important?" As applied to risk assessment, sensitivity analysis is "any systematic, common sense technique used to understand how risk estimates and, in particular risk-based decisions, are dependent on variability and uncertainty in the factors contributing to risk" (USEPA, 2001).
    - It is extremely useful for regulators and readers to understand the major "drivers" of the risk estimates, i.e., those parameters, factors, and assumptions that are significantly impacting the calculated risk.

3. Background Relevant to Application of the Technical Review Principles

The SSCG has these stated objectives:

- Evaluate impacts to shallow soils 0-10 feet below ground surface.
- Consider listed guidelines and Polices in the development of cleanup goals.
- Address groundwater cleanup goals.
- Develop site-specific cleanup levels for residential land use and for construction/utility worker exposures.

The SSCG utilizes over 550 Phase II Interim and Follow-up Reports that contain property-specific investigations and these include a *Human Health Screening Risk Evaluation (HHSRE)*. The HHSREs (various dates 2009/2010/2011) provided an initial evaluation, residential property by property, of calculated potential risks and is tantamount, in many respects, to a baseline human health risk assessment. The HHSRE was designed to assist in interim response planning.

However, it is not clear whether 1) the HHSREs are now considered to constituent the "full" human health risk assessment, as the Expert Panel is hearing from Regional Board staff, or 2) whether a "full" human health risk assessment is scheduled for release in the future, as is stated in the SSCG report: "A full Human Health Risk Assessment (HHRA) incorporating the SSCGs proposed in this report will be conducted to further evaluate potential health risks once the site characterization work is complete. The HHRA will be used to guide final response action for impacted media at the Site and will likely be included in the Remediation Action Plan" (Site-Specific Cleanup Goal Report, Feb, 2013, page ES-1). The Expert Panel has concerns with either scenario 1) or 2).

<u>Concerns with Either Scenario:</u>
1) The HHSRE does not follow the guidelines of a standard human health risk assessment.
2) Alternatively, the utility of developing this document after the execution and release of the SSCG is potentially problematic for key decision makers at the Water Board. Typically, a human risk assessment should inform cleanup goals rather than be released after the cleanup goals are determined.

<u>Other Issues:</u>

- There are mathematical and methodological connections between calculating a cleanup level and a screening risk assessment; hence, there are links between the SSCG and the HHSREs. While the stated purposes of the two are "different," there is substantial methodological overlap.
    - There should be transparency, consistency, objectivity (same/similar data sets) and sensitivity (mathematical connection between the two calculated outcomes.
        - (i) Cleanup level based on a target risk (SSCG) and;
        - (ii) Property-specific risk based on an underlying media-specific screening level.

    - Both the SSCG and HHSREs utilize the same core calculation equation(s), it is simply a matter of variable rearrangement.
        - The basic media –specific data sets are similar (the SSCG has a somewhat fuller set simply because it is a more recent report);
        - Core exposure factors are the same as the residential scenarios;
        - Core toxicology parameters, e.g., reference doses, slope factors would be the same unless there was a published regulatory revision.

    - SSCG uses a 'target risk' level to back calculate scenario and media-specific cleanup levels, e.g., a residential scenario, assuming (a) standard exposure factors/parameters, (b) media-specific data sets for chosen chemicals of concern (COCs) and (c) standard chemical-specific toxicity factors

- HHSREs uses (a) media-specific data combined plus a COC selection process (all detects are included) in combination with (b) exposure factors and (c) toxicity parameters in order to calculate media-specific (e.g., soil, indoor air and sub-slab soil vapor) "cumulative risk index" for both carcinogenic and non-carcinogenic COCs, as well as a separate total petroleum hydrocarbon screen.

- While there is an acknowledged risk range that is utilized for carcinogens (10^{-6} – 10^{-4}) and non-carcinogens (hazard index <1.0) the point of departure is conservative, i.e., carcinogens 10^{-6}.
  - Risk range and points of departure are the same for both the SSCG and the HHSRE.

- Both documents correctly state (and this requires emphasis) that risk estimates generated should not be interpreted as the expected rates of disease in the exposed population but rather as estimates of potential risk, based on current knowledge and a number of assumptions.
  - There are a variety of uncertainty factors integrated within the toxicity factors that are meant to err on the side of public health protection in order to avoid underestimation of risk.
  - Risk assessment is best used as a ruler to compare one source with another and to prioritize concerns.

- Risk estimates are best used to prioritize different options and scenarios for decision makers. The risk estimates do not inform either an individual or a defined population whether a defined disease endpoint (e.g., cancer) is going to be actually developed.
  - Consistency and transparency of methodological approaches are essential for regulators.
  - Changes in certain key inputs have a cascade effect on the risk estimates (or risk indices) as the variables are connected

    Sensitivity analysis is a useful tool for revealing which variable in the risk model contribute most to the variation in estimates of risk.

    According to USEPA (2001), "This variation in risk could represent variability, uncertainty, or both, depending on the type of risk model and characterization of input variables."

4. General and Specific Analysis

- **Sub-slab soil vapor and residential air quality.**
  The most consequential decision is whether to accept, reject, or request modifications to the Geosyntec analysis of the relationship, (or lack thereof), between chemical-specific sub-slab soil vapor concentrations and residential indoor air monitoring.
  - Any determination that there is a relationship between sub-slab soil vapor and indoor air will have a direct and profound impact on all risk estimates and cleanup calculations, i.e., there will be a definite increase in risk estimates and a concomitant lowering (more stringent) of chemical-specific cleanup levels as pathway additivity will clearly change the calculations.

    <u>Concern:</u>
    The statistical analysis done to determine whether there is sub-slab to indoor air VOC (volatile organic compound) transfer, although impressive in the volume of data used, is flawed because it ignores spatial and temporal factors. It would be much more valuable if it was done for each individual home, rather than for the aggregate; mixing data from various time periods can also distort the results.

    However, a review of the sub-slab concentrations compared to the indoor air concentrations for each of the VOCs indicates that: (1) the 10-12 homes with elevated levels of a given VOC in the sub-slab soil vapors do not have elevated levels of that VOC in indoor air; (2) the few homes with elevated levels of a given VOC in indoor air have low levels of the same VOC in sub-slab vapors; (3) higher levels of indoor benzene or toluene concentrations correlate well with high levels of garage benzene or toluene concentrations, suggesting that this is the more likely source of benzene or toluene in these homes. The only apparent exceptions (from a preliminary analysis) were high levels of PCE in sub-slab soil vapor and indoors for 24436 Panama Ave, 24617 Marbella Ave and 24737 Marbella Ave.

    In light of the assertions by Everett and Associates that the input data in the statistical analysis is incomplete (as depicted in Everett's letter in Page 9), it may be necessary to review the results with a higher level of scrutiny.

- **Consistency in chemical of concern selection between the SSCG and HHSRE.**
  The absolute number of potential chemicals of concern (COCs) retained matters as the more carcinogens that are retained, mathematically the more it will drive back calculated cleanup levels as carcinogens are considered to be additive**.**
  - It matters if there are 10 versus 30 carcinogenic and/or non-carcinogenic compound selected.

    <u>Concern:</u>
    DTSC guidance typically advises that compounds retained if there is a "hit"

regardless of whether there are otherwise numerous non-detects for the same compound. This procedure was followed for the HHSRE; however, a different process was utilized in the SSCG.

The SSCG excluded certain detects based on overall frequency of detection. In risk assessment practice there is a screening argument that is often made for dropping compounds based on level of non-detects versus a single detect.

In terms of **transparency** the different COC selection methodology across reports should be highlighted AND the impact of this decision further characterized (**sensitivity**).

Consistency of methodology is critical for regulators and decision-makers.

- The calculated media-specific SSCG values would mathematically change (become more stringent) if the COC process used in the HHSRE was utilized.

- **Calculation of SSCG without considering additivity of risk and hazards.** HHRA Note 4 (Page 12) states "Risk must be summed across all carcinogenic chemicals and exposure pathways (including vapor intrusion to indoor air evaluated separately from comparison to RSLs). Similarly, hazard quotients must be summed across all chemicals and exposure pathways (including vapor intrusion to indoor air evaluated separately from comparison to RSLs) for threshold (non-carcinogenic) effects to provide a hazard index. … If the summed hazard index for the site is greater than one, then the hazard index may be recalculated for chemicals which have the same toxic manifestation or which affect the same target organ."

  Concern:
  The number of both carcinogenic and non-carcinogenic chemicals is greater than 10 for both site-wide and residential-specific COCs. While the SSCG uses 10^{-6} as the target risk and 1.0 for threshold hazard index, as the number of COCs becomes >10, the mathematical impact results in an overall risk greater than 10^{-5} and hazard risk well over 1. The SSCG does take additivity partially into account by multiply any target or threshold by 0.1 but again there are more than 10 COCs. Most states including California typically use 10^{-5} as a carcinogenic target. While cumulative and/or individual risks can be at the 10^{-4} level this is not typical and may not be agreeable to either regulators or Water Board decision makers.

- **SSCGs for soils.**
  The analysis provide for the development of SSCGs for soils in general follows reasonable methods and assumptions. Yet several issues deserve attention.

  Concerns/Issues:

One important point is the SSCGs were developed for each COC independently, but there may be several COCs at any one location that exceed the SSCGs, and even though they may all be remediated to the SSCGs, when added up them may still exceed the one in a million or HQ =1 target levels; adequate measures need to be in place to avoid this situation. The 0-2 ft bgs levels (EF = 350 days/yr) seem adequate for protecting residents, including children, to exposure of site soils. There is a bit more concern with the 2-10 ft bgs (EF = 4 days/yr) levels which are two orders of magnitude higher in general, due to the low exposure frequency (EF) expected. While it is valid to assume a very low exposure frequency, these higher levels in soils may under certain circumstances be a source of sub-slab soil vapors that could slowly leak into the subsurface soils (0-2 ft below gruond surface or bgs) and under exceptional circumstances into homes. It may also be a concern for construction workers, although this has been addressed (Table 8). In fact, the difference between the subsurface levels (0-2 ft bgs) for residents and the 0-10 ft bgs SSCGs of VOCs for construction workers is so small, that it makes sense to use the SSCGs for VOCs from the subsurface levels throughout the entire first ten feet bgs.

It has been suggested that the 95 UCL be used as the criterion to use for each property. The PRPs should realize that a greater number of soils samples will be needed to determine a 95 UCL, given the large variability in COC concentrations in a given property. In addition, when there are some clear hot spots above the 95 UCL, a more thorough investigation is warranted to make sure that a site with high levels of contamination in some small hot spots is not classified as not requiring remediation because the hot spot is combined with data from cleaner soils.

In addition, given the tolerance in SSCGs (e.g. not requiring cleanup to TPH = 100 mg/kg), it may make sense to request that the PRPs set up a trust fund that would be available in the future (next 20-25 yers) for (1) long term monitoring of COCs in indoor air and sub-slab soil vapors (once a year in key locations which have tested high in the past, plus a few random additional locations); (2) providing adequate protection to construction workers and nearby residents in the case that excavation below 2 ft bgs is needed for an extended period (e.g. 5 days or more); (3) engineering controls for methane in sub-surface as needed.

- **Sensitivity**.

  As the COC selection results in 26 different carcinogens (12 Site COCs) and 34 non-carcinogens (15 Site COCs) the SSCG can be calculated based on the target risk or acceptable hazard quotient divided by the number of COC that make up that risk/hazard.

  <u>Concern/Issue:</u>

The sensitivity (impact) of this change should and can be easily shown for Board decision makers.

- **Consistency and objectivity of screening levels**.
  Screening levels developed in the HHSRE (Human Health Screening Evaluation Work Plan; Geosyntec 2009) are stated (pg 3) to be "consistent with" Cal-EPA-OEHHA and USEPA RSL." Geosyntech writes that COC screening was conducted using risk-based screening levels (RBSLs) that were calculated assuming potential residential exposures to COC in soil and soil vapor as part of the HHSRE process and presented in the approved HHSRE Work Plan (Geosyntec 2009) and that the screening criteria is 1/10 of the RBSLs regardless whether of Cancer (C) or Non Cancer (NC). Geosyntech also describes the background screen for both metals and carcinogenic PAHs (known as "cPAH").
    - **Objectivity**- It is unclear at this stage of the review whether the DTSC list of cPAHs was analyzed versus the shorter OEHHA cPAH list, i.e., DTSC includes several PAHs as "carcinogenic" that are not typically considered as cPAHs by USEPA or OEHHA.

  Concerns:
  1. Cal-EPA January 2005 (Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, page 6) indicates that standard "Superfund" algorithms are used for unrestricted land use scenario. HHRA Note 3 (version August 2012 updated May 2013, see Summary page 1) indicates that the EPA RSLs are appropriate risk based screening levels unless the analyte is listed on one of the accompanying tables then the RSL on the table should be used.
     a. EPA RSL equations were not used as mutagenic effects were not included in the RBSL calculations (determined using verification calculations and the provided spreadsheets). While HHRA Note 3 (Page 4) indicates that in 2008 the RSLs did include this effect, it is unclear whether Cal-EPA fully implements the uncertainty factors as the corresponding equations have not be referenced in the Cal-EPA documents review to date. This would impact the PAH RBSLs which are calculated using Cal-EPA toxicity values.
     b. PEF Calculation: In the HHSRE (Table 3), the F(x) is specific for Los Angeles so the resulting PEF is 1.2E+11 m^3/kg. However, in SSCG Report, Appendix A, page 5, the F(x) is noted to be the default from USEPA 2002 (Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites) but the mean wind speed is specific for Los Angeles, so the change results in a PEF of 2.8E+9 m^3/kg. This is two orders of magnitude more conservative, so this may have been a requested change, as USEPA 2002 does not specify that the default be used. USEPA 1996 (Soil Screening Guidance: Technical Background Document) actually provides the Los Angeles specific number for F(x) per Cowherd 1985, as recommend in USEPA 2002. (Note the 2009

HHSRE Work Plan did include the Los Angeles F(x) but all later versions of the PEF calculation did not).

While the inhalation dose from particulates is typically very small relative to the incidental ingestion making this variance insignificant (in of itself), it does demonstrate that RBSLs were modified between the HHSRE and the ones used in the SSCG Report. This would indicate that Geosyntec could have made other updates, especially in the case of toxicity updates or guidance updates between 2009 and 2013. The 2010 HHSRE addendum does demonstrate updates due to toxicity, in this case cPAH.

c. Does not appear that for analytes listed on the HHRA Note 3 Table 1 that the table's soil screening values were used but instead the corresponding Cal-EPA toxicity values from the on-line screening calculator with the exception of the cPAH which used the corresponding TEQ of the Cal-EPA 2010 BaP toxicity value. <u>This is appropriate</u> but as there were no modifications to the exposure parameters or to the equations with the exception of that discussed above in 1a (mutagenic effects) and 1b (PEF which is insignificant), it is unclear why the residential soil RBSLs from USEPA RSLs and the Cal-EPA HHRA Note 3 Table 1 were calculated versus using the published screening concentrations.

2. HHRA Note 4 (Page 3) dated June 2011 supports the above concerns with the following statement: "As discussed in HHRA Note 3, for the majority of the 706 listed chemicals with RSLs, HERO recommends use of the soil and tap water values listed in the Spring 2010 U.S. EPA RSL table. However some values listed in the U.S. EPA RSL table differ significantly (greater than four-fold) than values calculated using Cal/EPA toxicity criteria and risk assessment procedures. HERO has prepared a reference table for soil and tap water RSLs which indicate contaminants for which: 1) the 2004 EPA Region 9 PRG should be used; 2) the 2004 EPA Region 9 'Cal-modified' PRG should be used; or 3) the Cal/EPA California Human Health Screening Level (CHHSL) should be used."

3. HHRA Note 4 (Page 9) also indicated that RBSLs used should be annotated as they "do not consider physical limitations such as soil saturation and some RSLs exceed the "ceiling limit" concentration of $1x10^{+5}$ mg/kg. Soil RSLs that exceed Csat are denoted as "s." Soil RSLs exceeding $1x10^{+5}$ mg/kg are denoted as "m", meaning that the chemical represents more than 10% by weight of the soil sample. At such concentrations, the assumptions for soil contact used to derive the RSLs may no longer be valid. Cases in which the chemicals are present at concentrations exceeding $1x10^{+5}$ mg/kg or Csat need to be identified and addressed in the risk assessment." <u>This was not done.</u>

4. HHRA Note 4 (Page 12) "In general, HERO recommends that all detected compounds be selected as COPCs and be included in the quantitative risk evaluation. … Potential chemical breakdown products must also be considered, and the rationale should not be based on a "bright line" approach (e.g. preliminary cancer risk <1E-07, preliminary HQ<0.1). As detailed above, inorganics which are determined to be present at concentrations consistent with background will still need to be included in the total risk and hazard evaluation."

5. RBSLs do not appear to have been updated from the HHSRE (Geosyntec 2009, Table 10) using the more recent Cal-EPA guidance, though small input parameters are indicated (see 1b) to have been different. Earlier Cal-EPA (2005) guidance set the default sub-slab soil vapor to indoor air attenuation factor as 0.01 mg/m^3 to mg/m^3; whereas current guidance Cal-EPA [2011b, Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)] recommends the attenuation factor of 0.05 mg/m^3 to mg/m^3. Reviewing the COC selection for Soil Vapor and multiply the screening concentration by 0.2 for the correction, an additional four COC would be selected (styrene and vinyl acetate from non-sub-slab samples and 1,2-dichlorobenzene and cis-1,2-dichloroethene from sub-slab samples). Additionally bromomethane, already selected from sub-slab samples would be selected in the non-sub-slab samples. One would assume only styrene would be classified as a Site COC.

While the vapor intrusion pathway used for the derivation of the RBSL for soil vapor, these SSCGs for soil vapor were calculated for the Utility Worker scenario for all COCs. If the vapor intrusion into the residential structure is believed to be an incomplete pathway (as per Appendix B of the SSCG Report), the RBSLs for soil vapor could be calculated using an industrial air RSL and the soil vapor attenuation for trench/utility workers in order to possibly reduce the number of soil vapor SSCGs.

- **Definition of surface soil.**
  HHRA Note 4 (Page 10) states "For evaluation of future residential land use scenarios, soil samples from the 0 to 10 foot (ft) below ground surface (bgs) interval should be collected. While recommended soil sampling depths may vary based on site-specific conditions; in general, discrete soil samples should be collected from both surface (0 to 0.5 ft bgs) and subsurface soil."

  Concerns: While the data collection appears to have following this sampling the depth of surface soil was extended to 2 feet. This is considered reasonable given the potential for gardening as referenced in the text. However the data were not presented by depth in any of the documents reviewed, especially in the SSCG document.

- **Multiple SSCGs for subsurface soil.**
  SSCGs were calculated for both residential and construction/utility worker exposure to subsurface soils (Tables 7 and 8, respectively). However, the SSCGs for construction and utility maintenance worker exposures … will be applied to soils from 0-10 feet bgs" (page 48).

  Concerns: Due to the exposure calculation using the child exposure factors in the residential exposure scenario, the SSCGs for the subsurface soils are more conservative for the residential subsurface exposure than the construction/utility worker. Why then was the worker-based SSCGs selected for the subsurface soils?

- **Use of cPAH**: HHRA Note 4 (Page 13).
  In some cases, benzo(a)pyrene (BaP)-equivalent concentrations are calculated and used in screening-level risk evaluations to assess risk from carcinogenic PAHs. ... If the BaP-equivalent concentration is calculated, the OEHHA potency equivalency factors (PEFs) should be used (OEHHA 2002). See Table 1."

  Concern: Document references use of cPAH, especially for background characterization, but the data tables do not show that the cPAH were calculated and background concentration was used only for BaP. Since the maximum BaP concentration was greater than background cPAH, the point becomes moot but should be considered as it makes the argument weak.

- **Lead**.
  Use of the Adult Lead Model (ALM) for the intermittent exposures to subsurface soils is inaccurate due to the lack of steady state scenario.

  Concern: Lead SSCG is not accurate for subsurface soil. USEPA (1994, 2003a, 2003b) recommends a minimum frequency of one day per week and duration of three consecutive months. For most of the construction/utility worker populations, this assumption is not met within the neighborhood or Site. Given the half-life of lead in blood is 30 days, the lead levels in the blood will not reach steady state but will probably be at least partly flushed from the blood prior to the next exposure. The current biokinetic models are not appropriate to evaluate non-steady-state exposures to lead and may underestimate the peak blood concentrations following short-term transient exposure.

  USEPA's 2003b guidance *ASSESSING INTERMITTENT OR VARIABLE EXPOSURES AT LEAD SITES* addresses how "to use the IEUBK model and ALM to assess a wider variety of exposure scenarios, including exposure from more than one location, varying intensities of exposure, track-in of soil from another location, and intermittent air exposures." Given the subsurface exposure is described by Geosyntec as the potential of the resident (child and adult) to come in contact with subsurface soil 4 times per year, the USEPA guidance would recommend using the time-weighted average to evaluate the child exposure. USEPA guidance (2003b) considers three (3) months "to be the minimum exposure to produce a quasi-steady-state PbB concentration. The reliability of the models for predicting PbB concentrations for exposure durations shorter than 3 months has not been assessed." This document for the ALM recommends using the shortest averaging time of the exposure, for example the exposure could be per week or 90 days.

While the utility worker exposure is not over the full exposure period, the weighted media concentration will not be annualized across the year, even though the models will assume the exposure occurs over a year. The TRW recommends not annualizing the weighted concentrations even though some of the lead burden accumulated during the exposure season will be eliminated during the intervening months between seasonal exposures. However, neither the IEUBK nor the ALM can simulate this loss of lead, so model predictions correspond to a full year of exposure to a constant exposure level regardless of the actual exposure period. The seasonal exposure can occur successively over years or for only one year. Since the model cannot predict the wash out period (no exposure), the resulting risk assessment is probably over-estimating the resulting risk.

- **Recap of the technical review.**
  An interim review of the Kast risk assessment has been performed. Knowledgeable and sophisticated practitioners have obviously performed the work. Spot check of risk spreadsheets demonstrates no calculation errors. The complexity and numerosity of the risk assessment reports is formidable almost to a fault. If the point of the entire risk assessment exercise is to provide a clear road map for regulators, Water Board decision makers and the public stakeholders then there are critical issues that should be more clearly addressed. Critical stakeholders should be able to more clearly follow a transparent, consistent and objective analysis that includes an analysis of the sensitivity of key assumptions and technical decisions.

5. Important Unknowns: Needed Additional Information

- **GW Plume delineation.**
  The extent of the plumes (different plumes for different COCs) is not explicitly determined in the information provided. In addition, the plume delineation analysis should establish the rate of migration of the various COCs, to better understand the risk to neighboring properties and wells. A gradient is provided, as well as soil types (sands) for the aquifers, but there should be some evaluation of adsorption (retardation), biodegradation and other processes that will support the assertion that the plumes are stable and will eventually be

decreasing, not just a statistical analysis (MAROS) of benzene (one COC). At present not all locations indicate stable or decreasing; some are increasing and many had "no trend" which means there is insufficient information to state they are stable or decreasing. Stable could be the norm for decades given the levels of TPH and the presence of LNAPLs. While in most cases the concentrations are not very high, there are a few locations where the concentrations of some COCs is many times above the MCL. The proposed SSCG of maintaining a stable or decreasing plume would require more monitoring. Given the significant amount of TPH in the overlying soils (Figure 10B in Plume Delineation Report indicates a very thick zone contaminated with petroleum derived compounds, at depth (8-40 ft bgs)), it is likely that the petroleum derived COC plumes will last for decades, with a significant monitoring cost to the PRPs. These can also be a continuous source of soil vapors to the sub-slab region. While there is not sufficient evidence to indicate that there is much migration of COC vapors from sub-slab to indoor air (see below), it will remain a concern that needs to be monitored for decades.

- **CVOCs sources.**
  There are CVOCs (chlorinated VOCs, alledgedly from off-site activities) at relatively high concentrations in MW-01, which is not downgradient of Turco. May be from former OTC. However, many CVOCs found in sub-slab soil samples at concentrations that appear to be too high for volatilization from groundwater 53 feet below (Bellflower aquifer). Figures 15A & B, 16 A & B (Plume Delineation Report) provide some sense of PCE & TCE contamination at shallow depths, which is difficult to explain as a result of GW transport from Turco or OTC. If these vapors are in equilibrium (or near equilibrium) with the soils in the shallow area, the concentrations in the soils are significant. As indicated by the SSCG report, one would not expect transport from off-site to on-site to be significant due to adsorption, dilution, biodegradation and other fate and transport processes. It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out.

  Lack of maps for CVOCs hinder ability to better understand their distribution and thus sources and risks. There is an emphasis on only considering petroleum-based COCs, even though data is available for many other COCs. Most of the CVOC data is only presented in tables and not considered in some of the analyses, which is not helpful for determining risk, regardless of PRP. They are considered as part of the SSCGs, and must be considered in the remedial action plan.

6. Cleanup Goals and the "Maximal benefit" Criteria

State Water Board Resolution 92-49 governs the Regional Board in requiring responsible parties to remediate the site to levels that will result in meeting all water quality standards and are "consistent with maximum benefit to the people of the state." The current SSCG remains consistent with this so long as it seeks to enable unrestricted land use of the parcels and is consistent with, and preserves, the previous level of residential land use and the value derived there from subject to it being economically and technically feasible. Whether it achieves these standards depends, in part, upon addressing the concerns raised above in the technical review of the SSCG and HHSRE.

References

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