N00236.002425
ALAMEDA POINT
SSIC NO. 5090.3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

May 8, 2000

Mr. Richard Weissenborn, Code 5090
Department of the Navy
Southwest Division
1220 Pacific Highway
San Diego, CA 92132-5190

RE: Review of the Draft Surfactant Enhanced Subsurface Remediation DNAPL Removal Treatability Study Results Report at Site 5, Alameda Point

Dear Mr. Weissenborn:

Attached to this letter is EPA's contractor, TechLaw Inc, evaluation of the Draft Surfactant Enhanced Subsurface Remediation (SESR) DNAPL Removal Treatability Study Results Report at Site 5, Alameda Point, Alameda, California, dated February 3, 2000 (the Report).

The Report makes the claim that the SESR technology achieved over 97% removal of DNAPL in the Treatability Study Area (the Study Area). This calculation was based upon a comparison of Partioning Interwell Tracer Tests (PITTs) performed before the SESR Treatability Study (pre-PITT) and after the SESR Treatability Study (post-PITT), as well as an estimate of DNAPL present in the Study Area based upon soil samples collected before and after the SESR Treatability Study. However, the calculations presented in the Report show a wide range of estimated DNAPL volume in the Study Area based upon the method of estimation, and show a wide range in recovery percentage for the different tracers used in the pre- and post-PITTs. Additionally, the actual change in volatile organic compound concentrations measured in groundwater samples collected before and after the SESR Treatability Study (presented in Table 4.6 of the Report) do not support the assertion that 97% percent of the DNAPL was removed from the Study Area. Based upon the data presented in the Report, the SESR Treatability Study should be treated as a qualitative study, rather than as a quantitative study.

In addition to the comments provided on the Draft Study results, for your information, I am attaching EPA's comments from March 25, 1999, submitted after our review of the SURBEC

workplan. These comments highlight our concerns over the lack of good quantitative characterization data and the potential effect this lack of information could have on the results of the study.

Please call me at (415) 744-2367 if you have any questions concerning this matter.

Sincerely,

Anna-Marie Cook
Remedial Project Manager

cc: Michael McClelland, BEC SWDiv
Michael Bloom, SWDiv
Dennis Wong, EPAWest
Mary Rose Cassa, DTSC
Brad Job, RWQCB
Adam Klein, TechLaw Inc
Mary Sutter, RAB Co-Chair
Ted Splitter, City of Alameda

Attachments

GENERAL COMMENTS

1. The data presented in the Draft Surfactant Enhanced Subsurface Remediation (SESR) DNAPL Removal Treatability Study Results Report at Alameda Point (Site 5) (the Report) appear to suggest that the SESR Treatability Study (the Study) is more qualitative than quantitative. When there is an effort to provide a more quantitative analysis of the data, the mass-balance calculations do not agree with each other, further reinforcing the perception that the SESR Treatability Study (the Study) results are more qualitative than quantitative. The following lists some of the data and the subsequent calculations which suggest that the Study should be viewed as a qualitative study:

   - The calculation for the swept pore volume of the Study test cell (the Study Area) was 8,499 gallons for the pre-Partitioning Interwell Tracer Test (PITT), and 8,677 gallons for the post-PITT. However, the Study Area was 20 ft. x 20 ft. x 4 ft. (13-17 feet below ground surface). Assuming a soil porosity of 30% (an assumption made in Report), the total pore volume of the Study Area would be approximately 3,600 gallons, less than half of the swept pore volume calculated from the PITTs.

   - The total mass of tracer recovered during the pre-PITT ranged from 113% to 157% of the calculated mass injected, while the mass of tracer recovered during the post-PITT ranged from 59% to 95.8% of the calculated mass injected. The poor agreement between tracer mass injected and tracer mass recovered during the pre- and post-PITTs raises questions regarding the accuracy of the DNAPL presented in the Study.

   - The calculation of DNAPL mass/volume from the soil cores in the Study Area indicated a volume of 34 gallons of DNAPL. However, the soil core data indicated that five of the six borings advanced within the Study Area, and three of the four monitoring/recovery wells (MRW-1 through 4) had at least one soil sample with VOC concentrations in excess of 100 mg/kg, suggesting the presence of DNAPL across the entire Study Area. Assuming that DNAPL is present in only a one foot section across the Study Area, and a soil porosity of 30%, the total volume of DNAPL estimated from the soil cores would be approximately 900 gallons. Although DNAPL typically occurs in lenses rather than across an entire zone, the calculation of DNAPL recovery from the Study was based upon VOC concentrations, and not the actual presence of DNAPL, and therefore this type of calculation is consistent with the calculation performed to estimate DNAPL recovery during the Study.

   - On page 4-7 of the Report, during a discussion of the pre-PITT, it is stated that "Since there is a large discrepancy of the estimated NAPL volume, even between the (tracers) hexanol and the DMP, these results should be considered more qualitative than quantitative."

   Despite the apparent qualitative nature of the Study, the Report makes the claim that the SESR technology removed greater than 97% of the DNAPL present in the Study Area.

This claim is based entirely upon a comparison of the pre-PITT results and the post-PITT results, despite the statement in the Report that the pre-PITT results should be considered more qualitative. Additionally, although the lowest volume of DNAPL measured by the pre-PITT in the Study Area was 100 gallons, the mass of DNAPL recovered during the Study was only approximately 65 gallons. of DNAPL. Furthermore, this claim is not supported by the post-Study groundwater sampling results, which are presented in Table 4.6 in the Report. These data indicate that at monitoring wells MRW-1 through 4, the post-Study TCA concentrations were between 24 and 120 mg/l and the post-Study TCE concentrations were between 9.2 and 86 mg/l, concentrations that are indicative of the presence of DNAPL. Given the qualitative nature of the data presented in the Report, the discrepancy between the different estimates of DNAPL present in the Study Area and the elevated concentrations of VOCs remaining in the groundwater after the completion of the Study, it appears unlikely that the SESR technology removed greater than 97% of the DNAPL present in the Study Area. Please revise the Report to remove the claims regarding removal efficiency of the SESR Technology, and include additional text regarding the qualitative nature of the Study. Alternatively, please provide additional justification for the removal efficiency claims.

2. A wide variety of calculations are not presented in the Report, such as the calculation of DNAPL volume from the soil cores and the calculation of surfactant recovery from the Study. Many of these missing calculations are cited in the Specific Comments provided below. The Report should be revised to include appendices with all of these calculations.

3. The Report does not contain detailed lithologic cross-sections of the Study area, even though it appears that sufficient lithologic data were collected to construct such cross-sections. These types of cross-sections are necessary to evaluate some of the claims made in the Report, such as the existence of preferential flow paths in the Study area. Please revise the Report to provide detailed lithologic cross-sections. These cross-sections should include both the soil and groundwater volatile organic compound (VOC) analytical data that was collected at the Study area, or alternatively, separate cross-sections should be constructed for lithology and for the analytical data.

4. The discussion of the site investigation activities presented in the Report is confusing. Several different investigation phases were conducted as part of the Study, and each phase is presented in the Report in a separate section. Please revise this discussion to combine all of the different investigation phases (Phase I, Phase II, Preliminary Site Investigation, etc...) into one discussion, in order to more clearly present the total number of soil borings and monitoring wells installed and the number of groundwater and soil samples collected.

SPECIFIC COMMENTS

1. **Section 1.3, Page 1-4:** The first paragraph on this page discusses sewer lines in the vicinity of the Study area. Please show these sewer lines on the Study area maps.

2. **Section 2.2, page 2-2:** The last paragraph of this section indicates that a pump test was conducted at IR Site 5, however these data are not provided in the Report.

3. **Section 2.3.1.1, page 2-3:** This section discusses the soil boring and monitoring well installation conducted as part of the Preliminary Site Investigation, but does not present the data from the investigation. Please revise this section to include the well screen interval for MW-2A-AE, and the depths of the soil samples.

4. **Section 2.3.3, page 2-5:** This section states that four additional geoprobe borings were advanced near location 2A-G2 to collect discrete groundwater and soil samples. However, these geoprobe borings are not any closer to location 2A-G2 than the borings drilled during the Phase I geoprobe investigation. Please revise the Report to clarify the intended purpose of these additional geoprobe borings.

5. **Section 2.5, page 2-8:** This section of the Report describes a step-drawdown pump test conducted at well IW-1. The data collected as part of the pretest on May 24 should be presented in the Report.

6. **Section 2.5, page 2-9:** Please provide the full reference for the Aquifer Parameters Estimator (APE) program cited in the text.

7. **Section 2.6.1, page 2-9:** It is not clear from the discussion presented in this section how the mass of DNAPL in the test cell was calculated, and it appears that the mass of DNAPL has been significantly underestimated. For example, the data presented in this section indicate that most of the borings completed in the test cell have at least one soil sample between the depths of 13 and 17 feet below the ground surface (bgs) with volatile organic compound (VOC) concentrations that suggest the presence of DNAPL. As an approximation of the mass of DNAPL present, assuming that one foot of the test cell contains DNAPL across the entire test cell, and a soil porosity of 30 percent, the total mass of DNAPL present in the test cell is approximately 900 gallons, not the 34 gallon estimate presented in the Report. Provide the calculations and a clarification of the methodology used to estimate the mass of DNAPL in the test cell from the soil borings.

8. **Section 2.6.2, page 2-11:** The second paragraph on this page indicates that a summary of the surfactant and freshwater injection rates is provided in the following table, however there is no table following this paragraph and it is not clear what table is being referred to.

9. **Section 3.1, page 3-1:** This section refers to a groundwater model used to predict equipment requirements for the process system. Please present the results of the groundwater model discussed in this section.

10. **Section 3.1.1, page 3-2:** The second paragraph on this page indicates that "The MEUF (micellar-enhanced ultrafiltration) separated the effluent stream from the MPP (macro porous polymer) into permeate and retentate. The retentate from the MEUF was the concentrated surfactant stream. The retentate was sent to Surfactant Mixing Tank 1 for re-injection." Table 4.4, Contaminant Mass Distribution, indicates that the retentate contained 11.6 kg of TCA and TCE. Please revise the Report to clarify if the 11.6 kg of TCA and TCE measured in the retentate was reinjected into the Study area with the

retentate.

11. **Section 3.1.1, page 3-2:** The last two paragraphs on this page refer to wells IW-1, IW-2, IW-3 and IW-4. However, wells IW-3 and IW-4 are not presented on any of the Report maps. Please revise these maps to present the locations of these two wells.

12. **Section 3.2.5, page 3-6:** The first paragraph in this section indicates that bromide was used as a tracer in the post-PITT, while the second paragraph indicates that bromide was not used as a tracer in the post-PITT. Please revise the Report to clarify this discrepancy.

13. **Section 3, Figure 3-1:** The cross-section presented in this figure is a schematic cross-section. However, there are no detailed cross-sections provided in the Report. Please revise the Report to provide a more detailed cross-section of the test cell area.

14. **Section 4.1, page 4-2:** The first paragraph on this page indicates that MLS designation points B and C are located between the screened intervals of the injection/recovery wells. However, MLS designation point A is also located between the screened intervals of the injection/recovery wells. Please revise the Report to indicate that MLS designation point A is also located in the screened interval of the injection/recovery wells.

15. **Section 4.1, page 4-2:** The middle paragraph on this page states that "Most of the solubilized contaminant mass was recovered prior to day five of the surfactant injection indicating that most of the recovery enhancements were observed in the early stages of the flood." However, a review of Figures 4.1 and 4.2 indicate that a significant mass of contaminant was recovered after this point in time. Please revise the Report to remove this statement. Alternatively, please provide better quantification of the contaminant mass removal prior to day five of the surfactant injection.

16. **Section 4.1, page 4-2:** The last paragraph on this page discusses the relatively low recovery of contaminant mass at sample point MLS-1C, and suggests that the low recovery is due to preferential flow within the formation. However, this type of evaluation requires a detailed analysis of the hydrogeology within the test cell, and this analysis has not been presented in the Report. Additionally, this paragraph states that the results of the pre-PITT showed that the southwest quadrant of the Study Area had a much lower DNAPL residual mass than the southeast quadrant. However, no justification is provided in the Report for this statement. Please revise the Report to provide a detailed analysis of the hydrogeology of the test cell, including a detailed cross-section incorporating all of the lithologic data from borings within the Study Area. Additionally, please provide justification for the statement regarding the pre-PITT estimate of DNAPL in the southwest quadrant of the Study Area.

17. **Section 4.1, page 4-3:** The first full paragraph on this page states that most of the increased solubilization was associated with the first three pore volumes of surfactant injected through the formation (day 1 - day 6). However, on page 4-2 it is stated that most of the contaminant mass was recovered prior to day five of the surfactant injection. Please revise the Report to clarify this apparent discrepancy.

18. **Section 4.1, page 4-3:** The third full paragraph on this page states that "the clay layer at 17.0 to 18.5 feet acts as a barrier to vertical flow", and further states that the increase in TCA and TCE concentrations (up to a factor of 5) observed within MLS-1D and MLS2-D (screened at a depth of 21.75 to 22 feet) during the surfactant injection phase of the Study was probably attributed to the increased pumping in the two samplers. It is not clear what is meant by the increased pumping of the two samplers. There is very little specific data presented in the Report to verify that there is a clay layer present at 17 to 18.5 feet in these locations, and that if this clay layer is present, it acts as an aquitard to both surfactants and contaminants. Finally, it is not clear how the TCA and TCE concentrations detected at these sampling points could increase five times if these sampling points are below the depth where the surfactant injection is mobilizing contaminants, and these sampling points are below the depth where groundwater extraction is occurring.

19. **Section 4.2, page 4-4:** The last sentence on this page states that the Pre-Treatability Study samples collected above 15 feet did not indicate the presence of dense, volatile organics. However, the data presented in Table 4.5 indicates that TCA and TCE were both detected in soil samples collected from borings at depths above 15 feet within the test cell.

20. **Section 4.2.2, page 4-5:** The first full paragraph on this page presents a discussion of the post-study TCA concentrations detected in the test cell. Please provide a discussion of the number of sample locations and soil samples collected during the post-study sampling.

21. **Section 4.2.2, page 4-6:** The last sentence in this section states that it was calculated that within the cell boundary there was an 80% decrease in mass of the TCA and a 56% decrease in mass of the TCE. However, the method of calculating these masses and the actual calculations are not presented in the Report. Please revise the Report to provide both the methodology for these calculations and the actual calculations.

22. **Section 4.2.3, page 4-6:** The last paragraph on this page discusses the calculation of swept pore volume, however, the methodology for performing these calculations and the calculations themselves are not presented in the Report. Additionally, given the size of the injected zone (20 ft x 20 ft x 4 ft) and the estimated porosity of 30%, it appears that the correct calculation would be 3,600 gallons, instead of the 5,500 gallons cited in the text. Given that the swept pore volume calculated from the pre-PITT was 8,499 gallons, over two times the actual pore volume, it appears that the data provided in the Report should be evaluated as qualitative data rather than quantitative data. Please revise the Report to provide a description of the calculation method and the actual calculations. Additionally, please add a statement to this section regarding the qualitative nature of the data.

23. **Section 4.2.3, page 4-8:** The last paragraph on this page discusses the calculation of recovered DNAPL, however these calculations are not presented in the Report. Please revise the Report to provide the calculations for removal of DNAPL during the Study.

24. **Section 4, Table 4.5:** The table indicates that the 16 foot intervals from IW-1 and 2, and the 15 and 17 foot interval from FWI-1 were not sampled (post-study). Provide an explanation for why these intervals were not sampled.

25. **Section 4, Table 4.6:** Table 4-6 presents the groundwater samples collected from MRW-2 and 3, and MLS-2C as shaded values. No explanation is given for what the shaded values mean. Table 4-5 states that shaded areas indicate samples collected from the clay aquitard beneath the aquifer. This does not seem to be a likely explanation for the shaded values in Table 4.6, since these are fixed groundwater monitoring wells, which did not change between the pre- and post-study sampling. Please clarify what is indicated by the shaded values in Table 4.6.