Department of Toxic Substances Control

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February 14, 2013

Mr. Greg Haet
EH&S Associate Director, Environmental Protection
Office of Environment, Health & Safety
University of California, Berkeley
University Hall, 3rd Floor, #1150
Berkeley, California 94720

Dear Mr. Haet:

The Department of Toxic Substances Control (DTSC) received the document entitled *Draft Site Characterization Report, Proposed Richmond Bay Campus* (SCR). The SCR, dated January 9, 2013, was prepared by Tetra Tech, Inc. for the University of California, Berkeley, Richmond Field Station (RFS), located in Richmond, California. The SCR includes: a description of the RFS site setting, site history, previous site investigations and cleanup actions, results of the Phase III field investigation, human health risk assessment, and conclusions and recommendations. The SCR does not include natural open space areas, except for groundwater, that are not currently identified for future redevelopment. Those open space areas will continue to be evaluated under Field Sampling Workplan investigation phases IV and V. We have reviewed the SCR and have the following comments, along with the enclosed memorandum prepared by DTSC's Human and Ecological Risk Office.

1. As we have discussed, include as an appendix a memorandum describing the sampling and associated chemical data from the EPA Building 201 soil mounds. This appendix should be referenced/summarized in Section 5.2.3.1 (Phase III Investigation Purpose) and any other relevant section.

2. Page 3-13, Section 3.4.6, Pyrite Cinders Management. The text states *"Table 3-1 presents the analytical results for select metals (arsenic, copper, lead, mercury, and zinc) from seven samples of upland cinder material collected in 2005 and 2006. Table 3-1 also provides a comparison with site-specific target levels (SSTL) developed for human health protection of a construction worker, used for comparison to site concentrations in the CCR (Tetra Tech 2008d). The concentrations for these metals are all less than the total threshold limit concentration used to determine if soils are hazardous."* Review indicates the table does not include SSTLs. Also, the total threshold limit concentration (TTLC) indicates concentrations above which waste may be required to be managed as hazardous waste primarily for disposal purposes and should not be used as screening criteria for remediation of soils. Please correct these items.

3. Page 4-11, Section 4.3.1, Pesticides: This section references residential Preliminary Remediation Goals (PRGs). Identify if these are U.S. EPA Region 9 PRGs, and if so,

indicate that the PRGs have been superseded by U.S. EPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites and include RSLs on the acronyms and abbreviations list.

4. Page 4-14, Section 4.4 Incremental Sampling Methodology Sampling: Please specify in the text how many replicate samples were prepared and analyzed at each of the reported 27 areas subjected to incremental sampling.

5. Page 5-14, Section 5.2.3.2.2 Hand Augering and Groundwater Grab Sampling: The text states *"At the following seven locations selected at random, triplicate samples were collected within 1 foot of the original sample in a triangular formation: MFA03, MFA12, MFA26, MFA28, MFA39, MFA62, and MFA66. DQOs and comparative results of these triplicates are in Section 5.2.3.3.4."* Section 5.2.3.3.4 Conclusions Regarding Laboratory Data Quality and Data Usability does not provide the stated information. Please correct as needed.

6. Page 5-14, Section 5.2.3.2.2 Hand Augering and Groundwater Grab Sampling, MFA Area, last paragraph: According to this section, pyrite cinders were noted within the top 2.5 feet of soil in 8 of the 39 borings and at two additional locations at 4 feet below ground surface or below. If noted in the boring logs, amend the text to indicate the range of the thickness of the pyrite cinders observed.

7. Page 5-18, Section 5.2.3.3.2 Data Quality Review Findings: Indicate which mercury analysis is being discussed under each relevant bullet item. Also indicate which samples discussed in bullet item six did not meeting holding times and resulted in a "J" qualifier.

8. Page 5-19, Section 5.2.3.3.2, fourth bullet item: This item states that details regarding the potential underestimation of VOC concentrations are included in Section 5.2.3.3.6. This section does not exist in our copy of the SCR. Revise the reference or include the section.

9. Page 6-5, Section 6.2.1 Soil Screening Criteria: This section is confusing as it states that soil analytical data were compared to calculated human health risk-based concentrations (RBCs) for future commercial workers as derived in Appendix C. However, Appendix C also includes development of RBCs for future construction and maintenance workers as well as unrestricted use. Please amend the text to address unrestricted use and construction and maintenance workers in addition to commercial workers.

10. Page 6-7, Section 6.3.1.1.1, Building 112 Transformer Area, last sentence: The meaning of the last sentence, which states that the paved road may serve as a barrier to surface soil contamination to the east is unclear. For example, the reader could interpret this sentence to mean that the PCB contamination would not have migrated further than the road, or that the road serves the purpose of a barrier cap. Please clarify and provide additional explanation for the statement, or delete the last half of the sentence.

11. Page 6-13, Section 6.3.1.3 Corporation Yard, TPH: When the information contained in this paragraph was compared to Table B-8, the following discrepancies were found and need to be corrected. In addition, DTSC did not verify the accuracy of all data presented in the text of the report. All sections providing numerical data values should be confirmed.

a. ~~The diesel value of 330 mg/kg was sample CY03 (duplicate), not CY04 (duplicate).~~

b. The maximum concentration of gasoline was 1400 mg/kg, not 6.1 mg/kg. It appears that the description of motor oil-range organics and gasoline has been reversed.

12. Page 6-15, Section 6.3.1.4, EERC (ASTs): The ESLs included on this table need to be placed across the table, rather than in a separate column.

13. Page 6-24, Section 6.3.2.1, Site-Wide Groundwater Results: Table B-10 indicates that the discussion regarding mercury detection at location B195 should state the filtered (not unfiltered) samples exceeded the MCL in the last two rounds of sampling. Correct this discrepancy.

14. Figure 6-15: Add the identifier of B195 to the figure.

15. Table 6-2: Screening Criteria for Groundwater: Add the California MCL of 13 mg/L for methyl tert butyl ether (MTBE).

16. Appendix E, Figure E-1, Disturbed Soil Areas: Identify the meaning of CRT in the notes section.

If you have any questions, please contact Lynn Nakashima at (510) 540-3839 or email at Nakashima, Lynn@DTSC.

Sincerely,

Lynn Nakashima

Mark Vest

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MEMORANDUM

TO: Lynn Nakashima
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FROM: Kimiko Klein, Ph.D.
Staff Toxicologist Emerita
Human and Ecological Risk Office (HERO)

DATE: February 13, 2013

SUBJECT: Draft Site Characterization Report, Proposed Richmond Bay Campus
UNIVERSITY OF CALIFORNIA, BERKELEY, RICHMOND FIELD STATION
PCA 11019 Site Code: 201605-00

Background

The University of California Richmond Field Station (RFS) is located on 96 acres of former industrial upland and around 74 acres of transition area, Western Stege Marsh, and the outboard area south of the bay trail. Industrial use of the uplands, including the manufacture of explosives containing mercury fulminate and a briquette company, took place from the 1870's until 1950, when the University of California purchased the property for an engineering research facility. Several remedial measures have taken place, including treatment and transport to the adjacent Zeneca property of mercury-contaminated soils, installation of a biologically active permeable barrier, installation of a slurry wall between the Zeneca property and the RFS, and removal of contaminated sediments from West Stege Marsh with replacement by clean fill to restore California clapper rail habitat. Soils with elevated arsenic concentrations in limited areas of the site have also been removed. The University of California is proposing to establish a Richmond Bay Campus that will include most of this site and will be engaged in research, education and support (RES) functions. The Human and Ecological Risk Office (HERO) has provided technical support for this site since 2007. The approach for a human health risk assessment was discussed in a meeting on November

15, 2012. The HERO provided informal comments on November 20, 2012. All HERO comments were adequately addressed in a final *Technical Approach for Human Health Risk Assessment* memorandum, dated February 1, 2013.

Document Reviewed

The HERO reviewed a document entitled "Draft Site Characterization Report, Proposed Richmond Bay Campus, University of California, Berkeley, Richmond Field Station, Richmond, California", dated January 9, 2013, and prepared by Tetra Tech, Inc., for the Office of Environment, Health and Safety, University of California, Berkeley. This is a two-volume report. The HERO received this report on January 11, 2013.

General Comments

This site characterization report focuses only on that portion of the RFS that is proposed to become part of the RES campus. The HERO perused the entire report but critically reviewed those sections in the main text associated with human health risk assessment issues, particularly Section 8 – Human Health Risk Assessment. The HERO also reviewed Appendix B – Comparison of all RES Area Soil Results and Site-Wide Groundwater Results to RBCs, Appendix C – Development of Risk-Based Concentrations, and Appendix G – Human Health Risk Assessment. The HERO did not critically review the data tables and assumes that other Department of Toxic Substances Control (DTSC) staff have reviewed data for adherence to all data quality assurance objectives. No ecological risk assessment is included in this report, since the proposed RES campus will not include any ecologically significant areas.

The principal chemicals of potential concern detected at this site include: arsenic in pyrite cinders from the adjacent Zeneca site and used as fill on-site, mercury in a mercury fulminate area (MFA) associated with the former explosives manufacturer that occupied most of the current RFS site, polychlorinated biphenyls (PCBs) from former transformer locations, and polycyclic aromatic hydrocarbons (PAHs) from various former industrial activities. Dioxins, lead and other metals have also been detected in specific on-site areas.

The cancer risks calculated in this report for future commercial/industrial workers and unrestricted use in the MFA are 1×10^{-4} to 3×10^{-4}, respectively. These cancer risks are based on Aroclor-1248 and arsenic. The exposure point concentration of arsenic in the MFA is 6.6 mg/kg, which is below the local background concentration of 16 mg/kg. The hazard indices for future commercial/industrial workers and unrestricted land use are 2 and 19, respectively. These hazards are based on Aroclor-1254 and mercury.

The calculated cancer risks for future commercial/industrial workers and unrestricted use in the Corporation Yard are 2×10^{-4} and 8×10^{-4}, respectively. These

risks are based on Aroclor-1254, arsenic, and carcinogenic PAHs. The exposure point concentrations of arsenic and carcinogenic PAHs are greater than their background concentrations. The hazard indices for future commercial/industrial workers and unrestricted land use are 2 and 19, respectively. These hazards are based on Aroclor-1254, arsenic, and dioxins.

The HERO has the following specific comments.

Specific Comments

1. Page 1-1 Section 1.1 Field Sampling Workplan. This section discusses the field sampling workplan (FSW) prepared to address data gaps. This section should be revised to include a brief summary of the focus of each phase (Phases I through V) of that workplan.

2. Page 1-1 Section 1.2 Proposed Redevelopment. This section provides an overview of the proposed RES campus to be established on portions of the RFS property as well as on an adjacent property identified as the Regatta Property. This section should be revised to describe the Regatta Property with an explanation that this property is not part of the RFS and will not be further discussed in this report.

3. Page 2-3 Section 2.4 Hydrogeology. This section discusses site hydrogeology. Please include the range of depths below the surface to first encountered groundwater across the site. In addition, include the range of depths used in this report to define shallow, intermediate and deep groundwater.

4. Page 2-4 Section 2.5 Ecology. This section describes the habitats currently existing on the site and the possible future ecological risk assessment that may be performed, depending on the shape and time frame of future development . A description of the outboard marsh and its current condition should be included in this section.

5. Page 3-2 Section 3.1.3 Early Site History, and Figure 3-1 Historic Potential Source Areas from former Industrial Operations (pre 2002). This section summarizes uses of the site prior to the purchase of the site by the University of California Regents. One company that used a portion of the site was the U.S. Briquette Company. This company should be discussed in the text and its site shown on Figure 3-1. It should be stated that the area occupied by this former company has not been investigated and represents a possible remaining data gap.

6. Page 3-11 Section 3.4.3 Marina Bay. Section 3.4 gives the history of sites in the vicinity of the RFS. Information for the Marina Bay site should include the nature of any remaining oversight activities by the DTSC.

7. Page 3-12 Section 3.4.4 Liquid Gold. This section describes the industrial activities that took place at Liquid Gold. Summary information on the remediation activities performed at this site should be included. The regulatory agencies historically and currently responsible for remediation oversight should be identified.

8. Page 3-13 Section 3.4.6 Pyrite Cinder Management, and Table 3-1 Analytical Results for Pyrite Cinders Soil Samples from the RFS Upland Area. The text states that site-specific target levels (SSTLs) for human health protection of the construction worker are included on Table 3-1. However, SSTLs are not listed in this table. Revise the table to include these SSTLs.

9. Page 5-8 Section 5.2.3 Phase III Investigation. One of the objectives of the Phase III investigation was to investigate the soil mounds at the EPA Building 201. A figure showing the locations of the mounds and a summary of the sample locations and the analytes tested for should be included in the text of this section. It should be stated in the text that the soil mounds are not within the proposed RES area and, therefore, will not be discussed further in this report. The HERO understands that the soil mounds sample results will be included in an appendix to be added to the report.

10. Page 6-3 Section 6.1.1.2 Calculation of Toxicity Equivalent-Based Concentrations – BAP (EQ). There is a table of potency equivalency factors (PEFs) for PAHs embedded in this section that lists PEFs from the DTSC HERO Human Health Risk Assessment (HHRA) Note 4 (June 9, 2011) and the U.S. Environmental Protection Agency (US EPA) Regional Screening Levels (RSLs) User's Guide (2012). The DTSC PEFs are based on the cancer slope factor (CSF) for benzo(a)pyrene (BAP) of 12 $(mg/kg/day)^{-1}$ formerly established by the California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA). This CSF was recently revised to 2.9 $(mg/kg/day)^{-1}$ by the OEHHA, and, therefore, the DTSC PEFs are no longer current or accurate. The HERO previously recommended that, since the CSF of 2.9 $(mg/kg/day)^{-1}$ is less conservative than the US EPA CSF of 7.3 $(mg/kg/day)^{-1}$, the US EPA CSF be used in this risk assessment. The HERO recommends that the US EPA PEFs derived assuming the US EPA CSF be used at this site.

11. Page 6-6 Section 6.2.2 Groundwater Screening Criteria; and Appendix C Development of Risk-based Concentrations. A) Groundwater is not expected to be a drinking water source at this site for reasons presented in this section. One reason is that high total dissolved solids (TDS) have been measured in the groundwater. The range of TDS values measured in groundwater at the site should be given in this section. B) RBCs assuming exposure to groundwater by construction workers in a trench are calculated in Appendix C, Section C4.3. Include a bullet in Section 6.2.2 identifying where these trench RBCs are used for

screening groundwater concentrations. If they are not used in the health risk assessment, please provide a rationale.

12. Page 7-12 Section 7.2.5 VOCs. Carbon tetrachloride was detected in groundwater at a location identified as "CTP". Please add this to the acronyms and abbreviations list or define in the text.

13. Page 8-6 Section 8.1.4.1 Characterization of Cancer Risks and Noncancer Hazards; and Page 8-10 Section 8.3.1 Human Health Risk Summary for the Mercury Fulminate Area and Associated Production Areas. The text of both sections states that the ratio of exposure point concentrations, expressed as maximum detected site concentrations, to risk-based concentrations (RBCs) is used to estimate health risks. The text should be revised, since exposure point concentrations used in the quantitative risk assessment are the 95% upper confidence limit (UCL) of the arithmetic means, if there are sufficient data.

14. Page 8-8 Section 8.2.1 Site-Wide Soil Screening Results. The results of screening of soil concentrations to RBCs are summarized in this section. A) The general areas where elevated levels of specific chemicals are concentrated should be given where it is possible. For example, elevated arsenic levels appear to be concentrated in the southwest corner of the RES and in the corporation yard, and elevated dioxins were detected only in the corporation yard. B) BAP concentrations are depicted in Figure B-6, not Figure B-5 as stated in the text. PCBs are depicted in Figure B-5. Correct the text. C) Add a brief discussion of manganese in this section and/or other appropriate section(s). Specifically, manganese was not identified as a chemical that exceeded its RBC, yet it is a primary chemical of concern in hazard index calculations for the construction worker at both the MFA and Corporation Yard.

15. Page 8-10 Section 8.3.1 Human Health Risk Summary for the Mercury Fulminate Area and Associated Production Area; and, Appendix G – Human Health Risk Assessment. The quantitative MFA risk assessment shows an elevated cumulative cancer risk of 10^{-4}. A) The information in Appendix G indicates that more than 50 percent of this risk is based on a maximum PCB concentration of 35 mg/kg Aroclor-1248. Aroclor-1248 was detected in only 2 of 55 samples analyzed, and this should be stated in the text. B) Most of the balance of the risk is from arsenic present at an exposure point concentration of 6.6 mg/kg, below the local background concentration of 16 mg/kg. The HERO recommends a cumulative risk calculation be added to this section that excludes arsenic.

16. Page 8-11 Section 8.3.1 Human Health Risk Summary for the Mercury Fulminate Area and Associated Production Area; and Table G-13 Cancer Risks and NonCancer Hazard Indices for Future Commercial Workers at the Mercury Fulminate Area and Associated Production Areas. The results of the MFA risk

assessment are presented in an embedded table in this section. Mercury should be added to the list of chemical risk drivers for the future commercial worker in the table and text, as Table G-13 indicates that one-half of the calculated Hazard Index comes from potential mercury exposure.

17. Page 8-13 Section 8.3.2 Human Health Risk Summary for the Corporation Yard; and, Table G-22 Cancer Risks and NonCancer Hazard Indices for Future Construction Workers at the Corporation Yard. The results of the Corporation Yard risk assessment are presented in an embedded table in this section. BAP equivalents should be added to the list of chemical risk drivers for the future construction worker in the table and text, as Table G-22 indicates that carcinogenic PAHs are one of the three carcinogens driving the cancer risk for the Corporation Yard.

18. Page 9-5 Section 9.2 Recommendations. There are two soil recommendations listed in this section. The first soil recommendation addresses the elevated PCB concentrations measured in specific areas. The second soil recommendation addresses the other chemicals of concern at this site in generic terms and should be expanded to specifically discuss arsenic, mercury, and carcinogenic PAHs. For example, details of the current interim pyrite cinders management plan should be evaluated to determine if this plan is adequate to address the elevated levels of arsenic still present in the RES area. Mercury is a major chemical of concern for noncancer adverse health effects for the construction worker in the MFA and should be specifically addressed in this recommendations section.

19. Figure B-1 Soil Sampling Locations and Analytical Groups in the RES Area. Add building numbers to this figure where appropriate. The mercury fulminate area does not appear to be delineated in this figure. Please explain or correct.

20. Appendix C Development of Risk-Based Concentrations. This appendix presents the approach for developing RBCs. The HERO received the spreadsheets calculating the RBCs via e-mail on January 11, 2013. These spreadsheets should be included in electronic form as an appendix to the report. In addition, printed sample spreadsheets should be provided in Appendix C showing the calculation of RBCs derived from exposure to indoor air contaminated by vapors intruding indoors from underlying groundwater and by exposure to air contaminated by vapors coming from groundwater in a trench.

21. Tables G-9 through G-12 Risk-Based Concentrations ... The footnotes to these tables incorrectly identify the concentrations as shown in milligrams per liter. Correct the footnotes to say "All concentrations shown in milligrams per kilogram (mg/kg)".

Conclusions

The human health risk assessment sections of this report cover all issues in a comprehensive manner and are clearly written. The HERO has identified deficiencies, as discussed above that must be satisfactorily addressed before the HERO can recommend the acceptance of this report.

If you have further questions, please contact me at Kklein@dtsc.ca.gov or by telephone at 510 540 3762.

Kimiko Klein for:

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