Department of Toxic Substances Control

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December 21, 2017

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 *Draft Phase V Sampling Results Technical Memorandum Western Stege Marsh* (Draft Report), dated July 27, 2017, for the University of California Berkeley, Richmond Field Station Site located in Richmond, California. The Draft Report was prepared by Tetra Tech Inc. on behalf of the University of California, Berkeley (UC) and describes the results of sediment and pore water sampling that was performed in West Stege Marsh (WSM). Sediment and pore water samples were collected from 19 locations at two depths (0-0.5 and 1.5-2.0 feet below ground surface (bgs)). Nineteen sediment samples collected from 0-0.5 feet bgs were analyzed for metals and PCBs. Methyl mercury analysis was performed on the ten samples with the highest mercury concentrations. Nineteen sediment samples collected from 1.5-2.0 feet bgs were analyzed for PCBs. Additionally, pore water was extracted from the sediment collected from 0-0.5 feet bgs and all nineteen samples were analyzed for metals. Ten samples were analyzed for methylmercury. DTSC's Human and Ecological Risk Office (HERO), and HERO's Ecological Risk Assessment Section (ERAS) comments after review of the Draft Report are enclosed. DTSC's program staff comments are as follows:

1. Page 20, Section 4.3, Comparison with Previous Sediment Results: Exhibit 2 provides a qualitative comparison of the previous and Phase V sampling results and an observations column. Replace this section with the statistical evaluation found in ERAS' specific comment 1 (Wilcoxon Rank Sum Test).

2. Page 25, Section 6.0, Summary:
   a. The discussion of the results of the triplicate analysis includes various statements regarding the reliability of the discrete samples. Provide references that support the statements made regarding the statements.

b. Incremental sampling methodology (ISM) is proposed for future sampling as an alternative to discrete sampling when deemed necessary to improve UC's ability to make decisions based on individual sampling results. Prior to the use of ISM, the applicability of ISM in a tidal wetland area, a dynamic environment, needs to be validated; and the basis for the number and location of decision units needs to be described. In addition, describe how ISM sampling will take into account receptor home ranges.

3. Table 4. Statistical Summary of Chemicals Detected in Sediments: Include on this table the sample depths and include the 95% UCL value for each chemical.

4. Table 5. Statistical Summary of Chemicals Detected in Pore Water: Footnote a references "note 3". Include note 3 or revise the footnote.

5. Table 6. Western Stege Marsh Sediment Detected Metal Summary Compared to Human Health Screening Criteria:
    a. The Off-Site Receptor Screening Criteria include "Not Applicable" for some metals found in sediment samples. Explain in the footnotes why the criteria for some metals is not applicable.
    b. The second footnote states that some detected concentrations are not reported as exceedances for any screening criteria if the concentrations are below ambient/background concentrations. Identify on the table the ambient/background concentrations associated with the applicable metals.

If you have any questions, please contact Lynn Nakashima at (510) 540-3839 or lynn.nakashima@dtsc.ca.gov.

Sincerely,

Lynn Nakashima, Project Manager
Senior Environmental Scientist
Brownfields and Environmental
Restoration Program
Berkeley Office - Cleanup Operations

Gerard F. Aarons, PG, CHG
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Enclosures

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MEMORANDUM

TO: Lynn Nakashima
Senior Hazardous Substances Scientist
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700 Heinz Avenue, Suite 200
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FROM: Kimiko Klein, Ph.D.
Staff Toxicologist Emerita
Human and Ecological Risk Office (HERO)

DATE: November 30, 2017

SUBJECT: Phase V Sampling Results Technical Memorandum
RICHMOND FIELD STATION SITE, UNIVERSITY OF CALIFORNIA, BERKELEY
PCA 11018 Site Code: 201605-00

Background

The University of California Richmond Field Station (UCRFS) is located on 96 acres of former industrial upland and 13 acres of transition habitat and tidal marsh. Industrial use of the uplands, including the manufacture of blasting caps containing mercury fulminate, and a briquette company, took place from the 1870's until 1950, when the University of California purchased the property for use as an engineering research facility. Several remedial measures have been implemented and include the treatment and transport to the adjacent Zeneca property of mercury contaminated soils, installation of a biologically active permeable barrier (PAPB), installation of a slurry wall between the Zeneca property and the USRFS, excavation and removal of contaminated sediments from a portion of West Stege Marsh, and backfilling with clean fill to restore Ridgeway's rail habitat. Soils with elevated arsenic concentrations in limited areas of the site have also been removed. The Human and Ecological Risk Office (HERO) has

provided technical support for this site since 2007.

Document Reviewed

The HERO reviewed "Phase V Sampling Results Technical Memorandum, Western Stege Marsh", dated July 27, 2017, and prepared by Tetra Tech, Inc., for the University of California, Berkeley. The HERO downloaded this document from Envirostor around November 3, 2017.

General Comments

This Phase V memorandum presents sediment and pore water sample results for the unremediated portions of Western Stege Marsh. The results show that metals, primarily arsenic, copper, cadmium and lead associated with pyrite cinders, and polychlorinated biphenyls (PCBs) are present in sediment at elevated concentrations. Arsenic, copper, lead nickel and mercury are present in pore water samples. In addition, there are low levels of methyl mercury in both sediment and porewater.

Triplicate sediment sample data indicate substantial heterogeneity in concentrations, so the report recommends that future sampling efforts be performed using the incremental sampling methodology (ISM). This issue should be discussed in depth by the DTSC, responsible party and consultant before any future field sampling plan for this area is submitted.

The HERO reviewed the entire report; however, as in memoranda presenting previous field sampling results, the only major risk assessment issue is the comparison of risk-based screening criteria to summary sediment and pore water data. The HERO understands that the Ecological Risk Assessment Section (ERAS) has also reviewed this subject technical memorandum. The HERO has a few specific comments.

Specific Comments

1. Page 16, Section 4.1 Metals Analyses – Methylmercury, and Table 4 Statistical Summary of Chemicals Detected in Western Stege Marsh Sediment. Calculate a screening level for the maintenance worker using the reference dose for methylmercury listed in the U.S. Environmental Protection Agency (US EPA) Integrated Risk Information System (IRIS) and the exposure parameters used for calculating the maintenance worker screening levels for the other chemicals. If necessary, HERO Human Health Risk Assessment (HHRA) Note Number 1 may be consulted for recommended default exposure factors. This value may then be added to Table 4 as the comparator to the measured concentrations. The ERAS should be consulted on whether an ecologically-based screening level should be established for methylmercury.

2. Page 19, Section 4.2 PCB Analyses, and Figure 4 Marsh Area Ownership. First, it would be informative to state in the text that elevated PCB concentrations have also been detected in the marsh owned by the City of Richmond that is adjacent and to the west of marsh owned by the University of California, as shown in Figure 4. Second, it may be necessary to perform a human health risk assessment for PCBs in the marsh to determine what the potential risk and hazard would be for maintenance workers and recreators.

3. Page 21, Section 5.0 Pore Water Sample Results. Pore water sample results are compared to 10x Ambient Water Quality Criteria, whereas in the memorandum from the ERAS, dated August 24, 2016, it is stated that no dilution factor should be applied to aquatic toxicity criteria. Please explain or correct.

4. Page 22, Section 5.0 Pore Water Sample Results. The text for copper, lead, and mercury states that "There are no Ambient Water Quality Criteria for arsenic". Correct the sentences to refer to the proper element.

Conclusions

The HERO has identified a few deficiencies as described in the specific comments above that must be addressed before the HERO can support its acceptance by the DTSC.

If you have any further questions, please contact Kimiko Klein at (510) 540-3762 or via electronic mail at kimi.klein @dtsc.ca.gov.

Reviewed by: Valerie Mitchell Hanley, Ph.D.
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Human and Ecological Risk Office

Concur: Claudio Sorrentino, Ph.D.
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cc: J. Michael Eichelberger, Ph.D.
Staff Toxicologist
Ecological Risk Assessment Section (ERAS)

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Secretary for
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Department of Toxic Substances Control

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MEMORANDUM

TO: Lynn Nakashima
Senior Environmental Scientist
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FROM: J. Michael Eichelberger, Ph.D. J. Michael Eichelberger
Staff Toxicologist
Ecological Risk Assessment Section (ERAS)
Human and Ecological Risk Office (HERO)
Department of Toxic Substances Control (DTSC)
8800 Cal Center Drive
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DATE: November 1, 2017

SUBJECT: DRAFT PHASE V SAMPLING RESULTS TECHNICAL MEMORANDUM WESTERN STEGE MARSH RICHOND FIELD STATION SITE, BERKELEY GLOBAL CAMPUS AT RICHMOND BAY, UNIVERSITY OF CALIFORNIA, BERKELEY

Project: DTSC201605-00 Activity: 11018

Background

The Ecological Risk Assessment Section, at the request of the DTSC project manager is providing comment on the aforementioned report in the subject line above. As described in the report, the Phase V sampling addresses data gaps in the investigation of Western Stege Marsh and in the Western Transition Area. In addition to supplemental sediment sampling in the unremediated portion of Western Stege Marsh, porewater sampling was also performed. The porewater fraction is a more reliable estimator of risk than is the sediment bound concentration. Sediment was sampled and analyzed for metals and Aroclors, and porewater was analyzed for dissolved metals.

Document Reviewed

ERAS reviewed the document entitled "Draft Phase V Sampling Results Technical Memorandum Western Stege Marsh Richmond Field Station Site, Berkeley Global Campus at Richmond Bay, University of California, Berkeley", dated July 21, 2017, and prepared by Tetra Tech, Inc. (Oakland, CA). ERAS received the report for review via an EnviroStor request dated August 10, 2017.

Scope of the Review

The document was reviewed for scientific content related to the ecological risk assessment. Grammatical or typographical errors that do not affect the interpretation of the text have not been noted. We assume that regional personnel have evaluated the adequacy of site characterization, sampling of environmental media, and analytical chemistry data and quality.

Specific Comments

1. Pdf page 25 of 54, Section 4.3, Comparison with Previous Sediment Results. The report, in a table imbedded in the text, compares 'previous' and 'Phase V' average and maximum concentrations of the following Chemicals of Potential Ecological Concern (COPECs): arsenic, cadmium, opper, lead, mercury, methylmercury, selenium, zinc, Aroclor 1248, Aroclor 1254, and Aroclor 1260. As an alternative, ERAS recommends comparison of COPEC data sets using the Wilcoxon Rank Sum Test (WRST). The WRST is a nonparametric test that can help determine if one population is larger or smaller than the other and it does so by comparing means of the two populations (DTSC, 1997). If the previous and Phase V data sets are comparable for a COPEC, the combined dataset would provide a more robust evaluation of Western Stege Marsh sediment chemistry and potential adverse effects to the marsh's ecological receptors.

2. Pdf page 52 of 54, Table 8 Western Stege Marsh Sediment Detected PCB Summary, Phase V Sampling Results, Technical Memorandum, University of California, Berkeley, Richmond Field Station Site. Table 8 lists sample concentrations for Aroclor-1248, Aroclor-1254, Aroclor-1260, and Total Aroclors. The screening levels for each Aroclor are presented as the effects range low (ERL) of 22.7 µg/Kg and effects range median (ERM) of 180 µg/Kg. Since each Aroclor has a different mix of polychlorinated biphenyl (PCB) congeners, and since there is a wide range in toxicity of each PCB congener, the Aroclors are not equal in their toxicity. The ERL and ERM available for Aroclors are those for total PCBs, therefore ERAS recommends that the Total Aroclor category be used as the representative Aroclor for assessing potential toxicity in Western Stege Marsh. It is apparent there is significant exceedances of the total Aroclor (PCB) ERM in the marsh.

3. Pdf page 54 of 54, Table 9 Western Stege Marsh Pore Water Detected Metals Summary Compared to Aquatic Screening Criteria, Phase V Sampling Results, Technical Memorandum University of California, Berkeley, Richmond Field Station Site. There is no Marine Aquatic Toxicity Criteria in Table 9 for Chromium. The National Ambient Water Quality Criteria (NAWQC) (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table#table) lists a Criterion Continuous Concentration (CCC) of 50 µg/L for chromium VI. This value should be listed for the dissolved porewater screening level. Chromium (III) compounds are highly insoluble whereas the converse is true for chromium (VI) compounds which are very soluble. In addition, the pH of sea water is greater than 8.0 which favors the oxidized chromium (VI) compounds over the reduced chromium (III) compounds. It is therefore reasonable to assume that at the very least the preponderance of chromium detected in the filtered pore water is Chromium (VI).

Conclusions

Please address the comments above and make appropriate changes. ERAS recommends that the previous sampling data be compared to the Phase V sampling data by conducting a Wilcoxon Rank Sum Test. If the data from both sets are comparable, ERAS recommendscombining both data sets in the analysis. Significant exceedances of the PCB ERM is apparent in Western Stege Marsh. ERAS recommends that the evaluation of sediment PCBs be through comparison of the total PCB concentrations rather than the 3 individual Aroclors.

Reference

DTSC, 1997. Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities, Final Policy. Human and Ecological Risk division, Department of Toxic Substances Control, California Environmental Protection Agency.

Reviewed by Edward A. Fendick, Ph.D. E A Fendick
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Cc: Brian Faulkner, Ph.D.
Senior Toxicologist, HERO/ERAS