



Matthew Rodriguez
Secretary for
Environmental Protection



Department of Toxic Substances Control

Barbara A. Lee, Director
700 Heinz Avenue
Berkeley, California 94710-2721



Edmund G. Brown Jr.
Governor

August 07, 2015

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 IV Sampling Results Technical Memorandum* (Memorandum), dated June 5, 2015, for the Richmond Field Station Site, Berkeley Global Campus at Richmond Bay, located in Richmond, California. The Memorandum was prepared by Tetra Tech, Inc. on behalf of the University of California, Berkeley.

The Memorandum includes the results of four field investigation activities that comprise the following:

- soil sampling in the Upland Meadow;
- an exploratory excavation to investigate a magnetic anomaly in the Bulb area;
- passive soil gas sampling to investigate a potential source of carbon tetrachloride in the Carbon Tetrachloride Area of the Big Meadow; and,
- construction and sampling of additional groundwater piezometers near the biologically active permeable barrier in the Transition Area.

DTSC has reviewed the Memorandum and has the following comments, along with comments from our Human Health and Ecological Risk Office (HERO) and Ecological Risk Assessment Section (ERAS).

1. Page 7, Section 2.3 Exploratory Excavation in the Bulb: Include that the California Department of Public Health, Radiologic Health Branch was contacted and provided review and consultation of the work plan.
2. Page 15, Section 2.6 Waste Characterization and Disposal: Include whether decontamination water was generated and how the waste was handled.

3. Page 22, Section 3.5 Deviations: Include in this section that per Attachment 2, the cap on one of the passive soil samplers was dropped and replaced with a cap from one of the trip blanks. In addition, state that only one trip blank, not two, was analyzed.
4. Page 24, Section 4.1.1 Metals: The 95% UCL for site data should not be compared to the LBNL background values, which are 99th percentile upper estimates of the background values. The background concentrations were not based on a 95% UCL. Instead, each concentration should be compared individually to the background value or the original data set used to derive the background value should be evaluated and the 95% UCL determined and used for comparison.
5. Page 24, Section 4.1.1 Metals, Aluminum: This section states that aluminum should only be considered a potential chemical of concern for ecological risks if soil pH is less than 5.5. Aluminum is not expected to pose ecological risks as soil pH is not expected to be less than 5.5; however, no samples have been analyzed for pH. Samples from the upland meadows should be analyzed for pH during the next sampling event to confirm this assumption.
6. Page 25, Section 4.1.1 Arsenic: The 95% UCL for arsenic concentrations was compared to the established background value of 16 mg/kg. As the background concentration was not based on a 95% UCL, it is not an appropriate comparison. Rather, each concentration should be compared individually to the background value or the original data set used to derive the background value should be evaluated and the 95% UCL determined and used for comparison.
7. Figures 9, 10 and 11: The figures contain symbols and numerical values not identified or explained in the explanation. Revise the explanation.
8. Figure 13: Include two additional sample points around location UM33 as identified on the enclosed figure to determine if any sediment transport has occurred away from the raised area.
9. Appendix F, Distribution of Metals in the Upland Meadows, with Samples for Specific Sample Locations Emphasized: In several figures there are multiple arrows pointing in random directions, and it appears that there are duplicate sample points identified on the figures (e.g., Figure F-4).
10. Appendix G, 95UCL Calculation Methods: In the acronyms and abbreviations section it appears that the acronym for 95 UCL, "One-sided 99 percent upper confidence limit of the mean", is incorrect.

Mr. Greg Haet
August 07, 2015
Page 3

Your proposal to collect additional soil samples in the Upland Meadows for PCBs is approved with the addition of the two sample locations identified in the enclosure. Please provide DTSC with at least three weeks notice of the sampling event so that we may prepare and distribute a work notice. In addition, provide a response to these comments within 30 days of the date of this letter.

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

Sincerely,



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



Mark Vest, P.G.
Senior Engineering Geologist
Brownfields and Environmental
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Enclosures

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Department of Toxic Substances Control

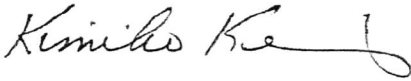
Barbara A. Lee, Director
8800 Cal Center Drive
Sacramento, California 95826-3200



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Governor

MEMORANDUM

TO: Lynn Nakashima
Senior Hazardous Substances Scientist
Brownfields and Environmental Restoration Program
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2721

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

DATE: August 6, 2015

SUBJECT: Phase IV 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 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 University intends to develop this site as part of a new major

research facility, the Berkeley Global Campus at Richmond. The Human and Ecological Risk Office (HERO) has been requested to provide technical support for this site.

Document Reviewed

The HERO reviewed "Phase IV Sampling Results Technical Memorandum", dated June 5, 2015, and prepared by Tetra Tech, Inc., for the University of California, Berkeley. The HERO downloaded this document from Envirostor around July 24, 2015.

General Comments

Four specific field investigations took place in Phase IV Sampling: soil sampling in the upland meadows within the natural open space, exploratory excavation in the transition habitat area (the Bulb) to find the source of a magnetic anomaly identified there, passive soil gas sampling to identify a potential source of carbon tetrachloride detected in groundwater, and the placement of additional groundwater piezometers near the biologically active permeable barrier (BAPB) to monitor up-gradient and cross-gradient metals in groundwater. The results are as follows. Low concentrations of contaminants were detected in the upland meadows, and additional sampling is recommended to delineate the extent of polychlorinated biphenyl (PCB) contamination in one area. The magnetic anomaly was identified as construction debris, and no further action is recommended. No soil source of carbon tetrachloride could be identified in the passive soil gas sampling investigation, because volatile organic compounds (VOCs) were detected randomly at very low concentrations over the study area. The newly installed piezometers will be included in the annual groundwater monitoring program.

The HERO reviewed the entire document; however, the only major risk assessment issue in this Technical Memorandum is the comparison of risk-based screening criteria to summary soil data collected from the upland meadows. The HERO has a couple of specific comments.

Specific Comments

1. Table 5: Statistical Summary of Chemicals Detected in Upland Meadows Soil. Please correct Note b of this table by providing an adequate explanation for the lack of off-site receptor screening criteria for some detected chemicals. Also those chemicals without off-site screening criteria should be evaluated to determine if such criteria should be developed. Note b currently states that criteria were not calculated for non-volatile chemicals. These screening criteria represent soil concentrations for the inhalation exposure pathway for unrestricted land use and are taken from Appendix C Development of Risk-Based Concentrations in the Site Characterization Report for the Proposed Richmond Bay Campus (2013). These inhalation criteria were calculated assuming either a volatilization factor or a particulate emission

Lynn Nakashima
August 6, 2015
Page 3


factor for volatile or non-volatile compounds, respectively; therefore, it is incorrect to state that criteria were not calculated for non-volatile chemicals.


2. Table 5: Statistical Summary of Chemicals Detected in Upland Meadows Soil. Note c of this table provides the sources of the ecological screening criteria used to compare to the soil data. Verify that these criteria are acceptable to the Ecological Risk Assessment Section (ERAS) of the HERO.
3. Table 6: Upland Meadows Soil Detected Metals Compared to Human Health Screening Criteria. Please define "Category I Criteria" and "Category II On-Site Management Criteria" in a footnote to this table and any other table where these terms are used.

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: Thomas F. Booze, Ph.D. 
Staff Toxicologist
Human and Ecological Risk Office

Concur: Claudio Sorrentino, Ph.D. 
Senior Toxicologist
Human and Ecological Risk Office

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



Matthew Rodriguez,
Secretary for
Environmental Protection



Department of Toxic Substances Control

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Edmund G Brown,
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MEMORANDUM

TO: Lynn Nakashima
Senior Environmental Scientist
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710

FROM: J. Michael Eichelberger, Ph.D.
Staff Toxicologist
Ecological Risk Assessment Section (ERAS)
Human and Ecological Risk Office (HERO)
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826

DATE: August 6, 2015

SUBJECT: PHASE IV SAMPLING RESULTS TECHNICAL MEMORANDUM
RICHMOND FIELD STATION SITE BERKELEY GLOBAL CAMPUS AT
RICHMOND BAY UNIVERSITY OF CALIFORNIA, BERKELEY

PCA: 11018

Site Code: DTSC201605-00

Background

At the request of the DTSC project manager, ERAS is providing review and comment to the aforementioned subject document. Phase IV sampling included four areas of investigation: 1) Big meadow, EPA Meadow North, and West Meadow; 2) Carbon Tetrachloride Area; 3) The Magnetic Anomaly; and, 4) BAPB Area Groundwater. Sampling results for each of the areas are presented.

Document Reviewed

ERAS reviewed the document entitled "Phase IV Sampling Results Technical Memorandum Richmond Field Station Site Berkeley Global Campus at Richmond Bay University of California, Berkeley". The report is dated June 5, 2015, and ERAS received the report via an EnviroStor request dated June 9, 2015.

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.

General Comments

ERAS had recommended comparison of Big Meadow metal concentrations to the DTSC approved metals background data set for the adjoining Campus Bay (Zeneca) property. This comparison has been made and is presented in the report. In certain instances, ecological screening levels are less than the background values, and in these cases it is appropriate, as the report has done, to default to the background concentration as the screening level. However, appropriate comparisons of statistics between datasets need to be made to make meaningful decisions. The comparison of 95%UCL of site data to the 99th percentile of the upper tolerance limit of the background data set is not an appropriate comparison. The University of California should work with the DTSC project manager to develop an appropriate approach for conducting a site soil concentration comparison to the background soil dataset.

The EcoSSLs do not provide a screening level for mercury. In earlier discussions, ERAS directed the University of California to develop mercury screening levels based on an inorganic mercury toxicity reference value (TRV). Terrestrial soil chemistry does not favor the formation of organic mercury. Subsequently ERAS developed an inorganic mercury screening level and it was incorporated by the University of California in Table 5 of the report. Those numbers appear to be in error and ERAS cannot verify how they were derived because of a loss of the computer data ERAS used to calculate those numbers. Therefore, ERAS recalculated the screening levels and had them confirmed in-house by another HERO/ERAS toxicologist. ERAS apologizes for the inability to confirm the previous screening level derivations and the apparent error of those values in Table 5.

ERAS developed a range of screening levels for evaluation of Big Meadow soil mercury concentrations. One set of screening levels is based on a soil to earthworm bioaccumulation factor (BAF) of 1, and the second set is based on a soil to earthworm BAF based on an Oak Ridge national Laboratory (ORNL) soil to earthworm regression. The screening levels are shown below;

- BAF = 1
 - American Robin = 3.0 mg/kg
 - Ornate Shrew = 4.95 mg/kg
- BAF = LN(Worms) = $-0.684 + 0.118(\text{LN Soil})^*$
 - American Robin = 22 mg/kg
 - Ornate Shrew = 172 mg/kg

*ORNL. 1998. Development and Validation of Bioaccumulation Models for Earthworms. ES/ER/TM-220.

Mercury (I) chloride is very insoluble, with a solubility product constant of 1.43×10^{-18} (http://www4.ncsu.edu/~franzen/public_html/CH201/data/Solubility_Product_Constants.pdf). The high insolubility reduces bioavailability and undoubtedly accounts for the higher back calculated screening level. Although the revised screening levels are markedly different than those posted in the report, the outcome remains the same, the maximum Big Meadow mercury concentration is 2.4 mg/kg which is less than the most conservative screening level above. Existing mercury concentrations in Big Meadow soil do not pose a risk to ecological receptors.

Conclusions

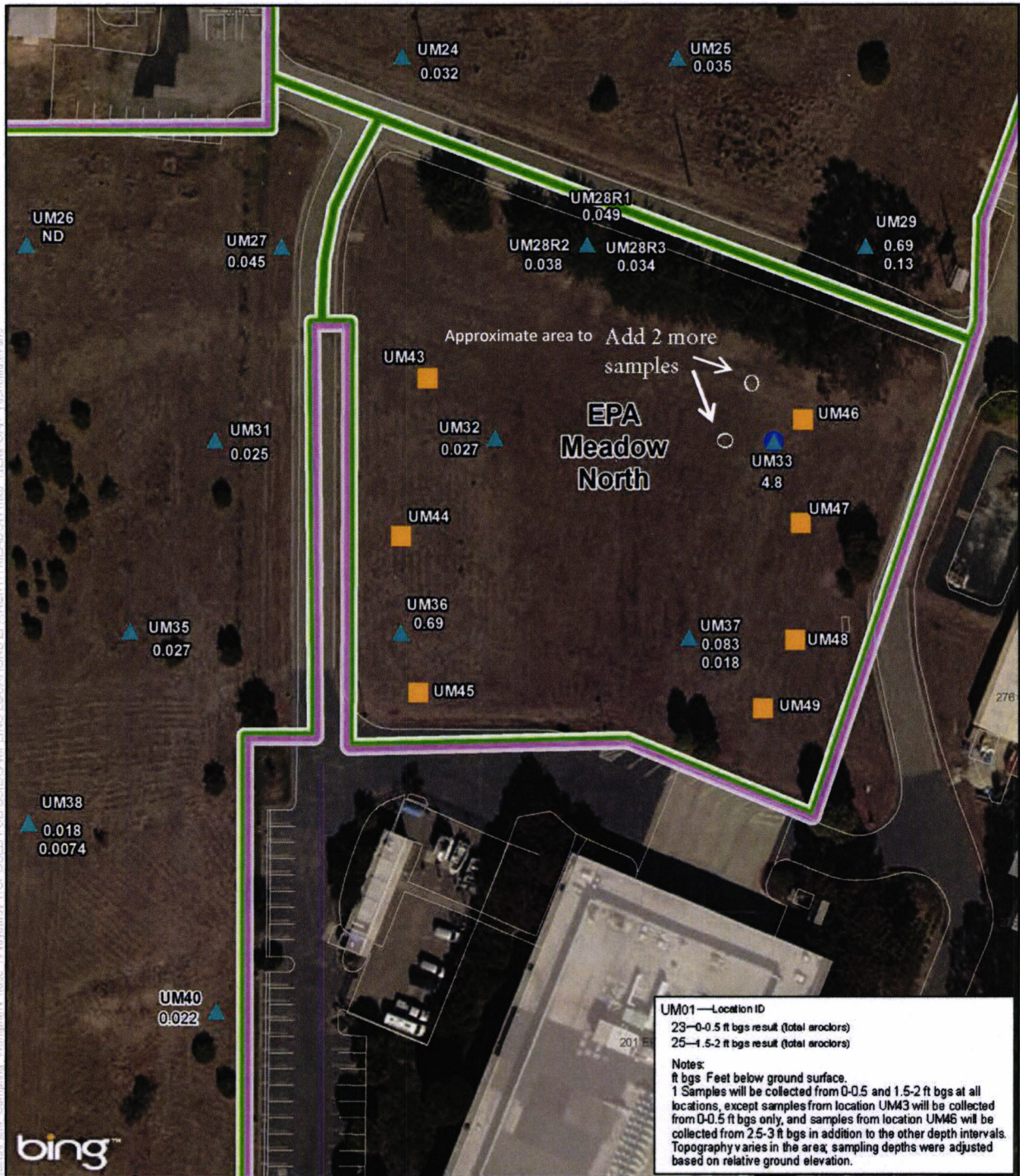
The soil investigation was conducted appropriately and provides useful data for assessing potential risks to ecological receptors from Big Meadow soil chemicals of potential concern. The assessment of Big Meadow soil concentration comparison to background needs to be reassessed by comparing like statistical parameters. ERAS recommends discussing appropriate methodology with the DTSC project manager. The mercury screening levels should be updated in the report. The updated screening levels do not change the conclusion that existing mercury concentrations do not pose a risk to ecological receptors. Conclusions concerning risk for some of the other constituents cannot be ascertained until a proper comparison to background is performed.

Reviewed by: Brian Faulkner, Ph.D.
Senior Toxicologist (HERO/ERAS)



Cc: James M. Polilsini, Ph.D.
Supervising Toxicologist

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UM01—Location ID
 23—0-0.5 ft bgs result (total aroclors)
 25—1.5-2 ft bgs result (total aroclors)
Notes:
 ft bgs Feet below ground surface.
 1 Samples will be collected from 0-0.5 and 1.5-2 ft bgs at all locations, except samples from location UM43 will be collected from 0-0.5 ft bgs only, and samples from location UM46 will be collected from 2.5-3 ft bgs in addition to the other depth intervals. Topography varies in the area, sampling depths were adjusted based on relative ground elevation.

- Proposed PCB Sampling Location¹
- ▲ Sampling Location
- Result exceeds lesser of maintenance worker and off-site receptor (inhalation) criteria of 1 mg/kg.
- Designated Natural Open Space
- Meadow Boundary



Richmond Field Station Site
University of California, Berkeley

FIGURE 13
PROPOSED
SOIL SAMPLING LOCATIONS
EPA NORTH MEADOW

Phase IV Sampling Results Technical Memorandum

