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OFFICE OF ENVIRONMENT, HEALTH AND SAFETY
UNIVERSITY HALL, 3rd FLOOR

BERKELEY, CALIFORNIA 94720-1150

March 10, 2022

Nicole Yuen
Project Manager
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710

Sara Ziff
Project Manager
U.S. Environmental Protection Agency, Region 9
75 Hawthorn Street
San Francisco, California 94105

Subject: **Sampling Results for Western Stege Marsh Near-Surface Sediment Samples**
January 24, 2022 Sampling Event
Richmond Field Station Site, University of California, Berkeley

Dear Ms. Yuen and Ms. Ziff:

University of California, Berkeley Office of Environment, Health & Safety staff conducted the annual Public Health Assessment recommended marsh sediment sampling at the Richmond Field Station Site on January 24, 2022. The objective of the sampling effort was to characterize near-surface sediment in remediated portions of the Western Stege Marsh, as well as to evaluate incidental sediment contact by marsh restoration workers. This sampling event replicates the near-surface sediment sampling conducted annually in January or February from 2008-2020. This letter provides the rationale for the selected sampling locations, a summary of field sampling protocols, including minor adjustments from previous years, and sample results. A figure showing the sampling locations is presented at the end of this letter. Complete analytical results are presented in Attachment 1.

Sample Locations

Incremental sampling methodology (ISM) sampling was selected for this project to provide a comprehensive and thorough evaluation of chemical concentrations in a specific area of potential exposure, or decision unit. The ISM sampling strategy for this project was based on selecting a decision unit to best represent potential exposure by workers involved in restoration activities within remediated marsh areas.

In January 2008, UC Berkeley established site-specific boundaries of the areas where marsh restoration activities may be performed. Based on this information, one decision unit, identified as Western Stege Marsh Decision Unit 1, was identified to evaluate possible exposure areas within remediated portions of the marsh under this sampling activity. This decision unit was first sampled in January 2008, and then once every subsequent year until 2020, after which sampling transitioned to every two years (even-numbered years). The location and extent of the Western Stege Marsh Decision Unit 1 are presented on the figure at the end of this sampling letter. The decision unit encompassed an area recommended for sampling in the Public Health Assessment, Evaluation of Exposure to Contaminants at the University of California, Berkeley, Richmond Field Station, as prepared by the California Department of Public Health and Agency for Toxic Substances and Disease Registry, dated March 13, 2008. The health assessment report concluded that there was an unknown potential health risk to marsh restoration workers posed by recontamination of sediment in the remediated marsh.

Surface samples at depths of 0 to 2 inches below ground surface (bgs) were collected because the decision unit is intended to characterize near-surface soils. The rationale for this sampling interval is that the sediment which workers may be exposed to during planting or weeding on the marsh plain. The near-surface sediment also represents any sediment that may be migrating within slough channels and being deposited on top of clean Bay Mud used as backfill in 2002 to 2004. Two previous sampling events were conducted in this decision unit in 2005 and 2006 using a discrete sampling methodology.

Field Sampling Protocols

The near-surface sediment sample was collected on January 24, 2022. The decision unit was identified in the field based on the description above and consistent with previous sampling events. One ISM surface soil sample was collected from the decision unit. The ISM soil sample consisted of 80 subsamples, or increment locations, collected from 0 to 2 inches bgs. The number of increments was increased from 50 in previous samples to 80 samples in January 2018 due to guidance from Federal EPA that recommends a minimum of 75 increments be collected for assessment of PCB concentrations using ISM methodology.[1,2]

The ISM sampling technique was used to obtain sufficient near-surface soft sediments from the decision unit to account for both compositional and distributional heterogeneity of any possible contamination. The sampling protocol followed these steps:

1. The field sampler began at a corner of the decision unit and sampled in an orthogonal pattern, moving from east to west to collect subsamples from 80 locations with the decision unit. The location of these subsamples, shown in approximation on the attached figure, was not critical as long as they were distributed throughout the decision unit. The subsamples were collected using one clean metal spoon or disposable trowel for the decision unit.

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[1] U.S. Environmental Protection Agency. (2019). *Incremental Sampling Methodology (ISM) at Polychlorinated Biphenyl (PCB) Cleanup Sites*. Retrieved February 28, 2020 from EPA: https://www.epa.gov/pcbs/incremental-sampling-methodology-ism-pcb-cleanup-sites

[2] Ibid. (2017). *PCB Facility Approval Streamlining Toolbox: A Framwork for Streamlining PCB Site Cleanup Approvals*. Retrieved February 28, 2020 from EPA: https://www.epa.gov/sites/production/files/2017-06/documents/06072017_final_pcbfast_toolbox_508compliant.pdf

2. The 80 subsamples were placed into clean, unused 32 ounce glass jars as they were collected. The final sample consisted of two nearly full 32 ounce jars.

3. The entire sample was placed on ice, and delivered via courier to McCampbell Analytical, Inc., in Pittsburg, California, after the sampling event, on January 24, 2022 for analysis by the McCampbell Analytical Multi-Incremental Sub-Sampling (MIS) Procedure with subsampling to 30 gram sample for PCBs and a 10 gram subsample for metals analyses. A copy of the chain-of-custody form is presented in Attachment 1.

Sample Results

The sample was submitted for analysis of metals and polychlorinated biphenyls (PCB) using the methods listed below.

- Metals by EPA Method 6020 with extraction Method 3050B
- PCB analysis by EPA Method 8082 with Soxhlet Extraction Method 3540C

Pesticide analysis was excluded from this year's sampling event because review of pesticide analyses from previous sampling events dating from 2008 to 2017 determined that pesticides are not a chemical of concern. This is consistent with the March 17, 2010 Final CDPH and ATSDR Public Health Assessment's evaluation of marsh sediments and surface water at the RFS which identifies PCB and metals and potential exposure risks. Previous pesticide analyses are included for reference and will be included in future reports.

PCBs were reported at concentrations less than the commercial/industrial screening levels. Arsenic was reported at a concentration exceeding its background concentration of 16 milligrams per kilogram. All other metals analyzed were detected at concentrations less than the applicable commercial/industrial screening level or not detected. The sampling results and screening criteria are presented in the tables following this letter.

The January 2022 sampling results were compared with the 2008 through 2020 sampling results from the same decision unit, as well as with averages from discrete samples collected from the same area during sampling events in 2005 and 2006. The analytical results from the 2020 sampling event are similar to the previously collected data; no trends have been identified.

If you have any questions or comments regarding this submittal, please call me at (510) 725-2528.

Sincerely,

Alicia Bihler
Environmental Programs Manager

Enclosures: Analytical Summary Tables
Sample Location Figure

Attachment 1: McCampbell Analytical Results Work Order Number 2201A62

POLYCHLORINATED BIPHENYLS (PCB) RESULTS
REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg)

Screening Criteria	PCBs [1]			
	Aroclor-1248	**Aroclor-1254**	**Aroclor-1260**	**Total Aroclors**
Commercial worker	*0.528*	*0.588*	*0.595*	*0.577*
Construction worker	*3.99*	*2.29*	*4.01*	*3.98*
Maintenance worker	*3.99*	*4.00*	*4.01*	*3.98*
Off-Site Receptor	*3.07*	*4.15*	*6.44*	*2.61*
Other	*1*[2]	*1*[2]	*1*[2]	*1*
Category I Criteria	*1*	*1*	*1*	*1*
Category II Criteria	*1*	*1*	*1*	*1*
Sample Location				
WSM 16 discrete sample mean [3] March 1, 2005	0.19[4]	0.14[5]	0.054	0.384
WSM 30 discrete sample mean [3] June 13, 2006	0.22[6]	ND	0.016[7]	0.236
WSM DU1-001 January 17, 2008	0.081	0.053	0.021 J	0.155
WSM DU1-002 February 4, 2009	0.18	0.10	0.05	0.33
WSM DU1-003 February 18, 2010	0.31	0.16	0.036 J	0.506
WSM DU1-004 February 22, 2011	0.048 U	0.048 U	0.048 U	ND (<0.048)
WSM DU1-005 February 3, 2012	0.034 U	0.096	0.068	0.164
WSM DU1-006 February 4, 2013	0.010 U	0.010 U	0.010 U	ND (<0.010)
WSM DU1-007 February 27, 2014	0.19	0.042 U	0.03 J	0.268
WSM DU1-008 January 27, 2015	0.094	0.097	0.036	0.227
WSM DU1-009 January 21, 2016	0.100	ND (<0.0097)	ND (<0.0097)	0.100
WSMPHA17 January 18, 2017	ND (<0.012)	0.033	0.018	0.051
WSM2018PHA January 26, 2018	ND (<0.160)	ND	0.410	0.410
WSM2019PHA January 25, 2019	ND (<0.066)	ND (<0.066)	ND (<0.066)	ND
WSM2020PHA January 31, 2020	ND (<0.033)	0.15	ND (<0.033)	0.15
WSM2022PHA January 24, 2022	0.24 A	ND (<0.050)	ND (<0.050)	0.24

Notes:

Bold values indicate that the result exceeded the Category I criterion.
Screening criteria based on the Final Soil Management Plan, Revision 2, Table C-1, December 31, 2019.

(1)	All other PCBs not detected
(2)	Other criteria for PCBs are based on Toxic Substances Control Act (TSCA) criteria for high occupancy areas with no cap
(3)	For detect-only data, the mean is the arithmetic mean. For chemicals with non-detect measurements, this value is the arithmetic mean with one-half the detection limit substituted for non-detect measurements.
(4)	Thirteen detections
(5)	Eleven detections
(6)	Nineteen detections
(7)	Twelve detections
J	Estimated Value
NA	Not available
ND, U	Not detected
A	The reported value is determined using a "single point" calibration by GC-ECD as allowed by the method.

PESTICIDE RESULTS
REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg)

	Pesticides [1]													
Screening Criteria	**Aldrin**	**Alpha-bhc**	**Heptachlor**	**Heptachlor expoxide**	**Endosulfan I**	**Dieldrin**	**Endrin**	**Endosulfan sulfate**	**4,4'-DDD**	**4,4'-DDE**	**4,4'-DDT**	**Alpha-Chlordane**	**Gamma-Chlordane**	**Methoxychlor**
Commercial worker	*0.184*	*0.235*	*0.626*	*0.330*	*6,030*	*0.093*	*159*	*3,180*	*6.18*	*9.28*	*7.06*	*6.10*	*6.10*	--
Construction worker	*1.41*	*1.58*	*5.14*	*2.59*	*1,990*	*0.623*	*43.1*	*855*	*4.3*	*70.5*	*49.9*	*43.60*	*43.6*	--
Maintenance worker	*1.415*	*1.58*	*5.14*	*2.59*	*49,600*	*0.623*	*1,080*	*21,400*	*41.5*	*70.5*	*49.9*	*43.60*	*43.6*	--
Off-Site Receptors	*0.984*	*2,120*	*1.03*	*0.910*	*10,300*	*830*	--	*34,000,000*	*55,300*	*60.7*	*39,400*	*42.0*	*42.90*	--
Category I Criteria	*0.184*	*0.235*	*0.626*	*0.330*	*1,990*	*0.0926*	*43.1*	*855*	*4.31*	*9.28*	*7.06*	*6.10*	*6.10*	--
Category II Criteria	*1.84*	*2.35*	*6.26*	*3.30*	*19,900*	*0.926*	*431*	*8,550*	*43.1*	*92.8*	*70.6*	*61.0*	*61.0*	--
Sample Location														
WSM 16 discrete sample mean[2] March 1, 2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM 30 discrete sample mean [2] June 13, 2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM DU1-001 January 17, 2008	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.017 U	0.017 U	0.17 U
WSM DU1-002 February 4, 2009	0.060 U	0.060 U	0.060 U	0.060 U	0.060 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.060 U	0.060 U	0.60 U
WSM DU1-003 February 18, 2010	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.032 U	0.032 U	0.32 U
WSM DU1-004 February 22, 2011	0.017 CJ	0.034 U	0.034 U	0.033 CJ	0.0037 UJ	0.029 CJ	0.046 CJ	0.031 UJ	0.038 UJ	0.066 U	0.044 CJ	0.023 UJ	0.034 U	0.012 UJ
WSM DU1-005 February 3, 2012	0.0023 CJ	0.006 U	0.006 U	0.0031 J	0.006 U	0.012 U	0.012 U	0.012 U	0.0037 J	0.0036 CJ	0.0041 CJ	0.0015 CJ	0.0015 CJ	0.06 U
WSM DU1-006 February 4, 2013	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.017 U	0.017 U	0.17 U
WSM DU1-007 February 27, 2014	0.037 U	0.037 U	0.037 U	0.0095 CJ	0.037 U	0.072 U	0.072 U	0.072 U	0.072 U	0.072 U	0.072 U	0.037 U	0.037 U	0.37 U

	Aldrin	Alpha-bhc	Heptachlor	Heptachlor expoxide	Endosulfan I	Dieldrin	Endrin	Endosulfan sulfate	4,4'-DDD	4,4'-DDE	4,4'-DDT	Alpha-Chlordane	Gamma-Chlordane	Methoxychlor
WSM DU1-008 January 27, 2015	0.0042 U	0.00048 C J	0.00069 C J	0.0042 U	0.0042 U	0.0042 U	0.016 C J	0.0081 U	0.0077 C J	0.0081 U	0.18 C	0.00042 U	0.00042 U	0.00042 U
WSM DU1-009 January 21, 2016	ND (< 0.034)	ND (< 0.034)	0.040	ND (< 0.034)	ND (< 0.034)	ND (< 0.034)	ND (< 0.067)	ND (< 0.067)	ND (< 0.067)	ND (< 0.067)	ND (< 0.067)	ND (< 0.034)	ND (< 0.034)	ND (< 0.34)
WSMPHA17 January 18, 2017	ND (<0.033)	ND (<0.033)	ND (<0.033)	ND (<0.033)	ND (<0.033)	ND (< 0.033)	ND (< 0.065)	ND (< 0.065)	ND (< 0.065)	ND (< 0.065)	ND (< 0.065)	ND (< 0.033)	ND (< 0.033)	ND (< 0.33)
WSM2018PHA January 26, 2018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2019PHA January 25, 2019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2020PHA January 31, 2020	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2022PHA January 24, 2022	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Only chemicals that were detected or have screening criteria are listed.
Bold values indicate that the result exceeded the Category I criterion.

Screening criteria based on the Final Soil Management Plan, Revision 2, Table C-1, December 21, 2019.

(1) All other pesticides were not detected.
(2) For detect-only data, the mean is the arithmetic mean. For chemicals with non-detect measurements, this value is the arithmetic mean with one-half the detection limit substituted for non-detect measurements.

C Relative percent difference between columns exceeds 40%
J Estimated Value
NA Not available – samples collected in 2005, 2006, 2018, 2019, and 2020 were not analyzed for pesticides.
U Not detected (method blank contamination)

METAL RESULTS
REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg)

	Metals																						
Screening Criteria	**Aluminum**	**Antimony**	**Arsenic (1)**	**Barium**	**Beryllium**	**Cadmium**	**Calcium**	**Chromium**	**Cobalt**	**Copper**	**Iron**	**Lead**	**Magnesium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel**	**Potassium**	**Selenium**	**Silver**	**Sodium**	**Thallium**	**Vanadium**	**Zinc**
Commercial worker	*NA*	*467*	*0.253*	*217,000*	*232*	*778*	*NA*	*1,750,000*	*347*	*46,700*	*818,000*	*320*	*NA*	*25,600*	*187*	*5,840*	*11,100*	*NA*	*5,840*	*5,840*	*NA*	*11.70*	*5,780*	*350,000*
Construction worker	*NA*	*142*	*0.85*	*2,120*	*21.4*	*36.6*	*NA*	*531,000*	*21.1*	*14,200*	*248,000*	*320*	*NA*	*213*	*39.6*	*1,770*	*60.4*	*NA*	*1,730*	*1,770*	*NA*	*3.54*	*351*	*106,000*
Maintenance worker	*NA*	*3,540*	*1.77*	*53,100*	*128*	*73*	*NA*	*13,300,000*	*34.1*	*354,000*	*6,190,000*	*320*	*NA*	*5,340*	*989*	*44,200*	*1,180*	*NA*	*44,200*	*44,200*	*NA*	*88.5*	*8,780*	*2,650,000*
Off-Site Receptors	*NA*	--	*888*	*709,000*	*1,590*	*909*	*NA*	--	*424*	--	--	--	*NA*	*71*	*42,500*	--	*14,700*	*NA*	*28,400,000*	--	*NA*	--	*142,000*	--
Other	*NA[2]*		*16[1]*						*73[2]*					*5,900[2]*			*280[2]*							
Category I Criteria	*NA*	*142*	*16*	*2,120*	*21.4*	*36.6*	*NA*	*100,000*	*73*	*14,200*	*100,000*	*320*	*NA*	*5,900*	*39.6*	*1,770*	*280*	*NA*	*1,730*	*1,770*	*NA*	*3.54*	*351*	*100,000*
Category II Criteria	*NA*	*1,420*	*16*	*21,200*	*214*	*366*	*NA*	*100,000*	*730*	*100,000*	*100,000*	*800*	*NA*	*5,900*	*396*	*17,700*	*604*	*NA*	*17,300*	*17,700*	*NA*	*35.4*	*3,510*	*100,000*
Sample Location																								
WSM 16 discrete sample mean [3] March 1, 2005	NA	ND	**55.7**	ND	0.84	1.2[3]	NA	86.44	ND	118	NA	51.56	NA	NA	2.59	ND	85.75	NA	1.15[4]	ND	NA	ND	ND	276
WSM 30 discrete sample mean [3] June 13, 2006	NA	6.2[c]	**55.3**	78.1	0.61	1.24[5]	NA	89.4	14.8	136	NA	82.1	NA	NA	3.5	2.4[6]	81.4	NA	1.03[7]	0.29[8]	NA	0.51[9]	81.5	321
WSM DU1-001 January 17, 2008	28,000	2.4	15	53	0.53	0.38 J	2,700	74	13	67	46,000	32	15,000	470	1.6	0.50 U	69	3,300	1.0 U	0.50 U	8,200	1.0 U	67	140
WSM DU1-002 February 4, 2009	8,800	1.3	**22**	31	0.89 U	0.52 J	2,600	39	10	79	26,000	44	9,600	620	1.8	1.3	48	3,900	0.73 J	0.89 U	30,000	0.89 U	39	210
WSM DU1-003 February 18, 2010	24,000	3.9	**26**	61	0.60	0.68 J	3,900	81	12	100	38,000	52	13,000	330	2.6	0.89 J	73	4,900	1.2 J	0.96 U	21,000	1.9 U	71	260
WSM DU1-004 February 22, 2011	23,000	11	**35**	57	0.67	0.50 J	3,700	78	13	110	36,000	59	13,000	360	3.0	1.8	75	4,900	2.0 U	0.34 J	23,000	2.0 U	68	280
WSM DU1-005 February 3, 2012	20,000	0.45 J	**29**	51	0.76 J	0.49 J	3,500	72	12	90	38,000	52	12,000	590	2.3	1.6	68	4,700	1.1	0.47 J	22,000	0.11 J	54	230
WSM DU1-006 February 4, 2013	28,000	1.2 U	**28**	60	0.61	0.31 J	3,600	84	16	96	45,000	56	13,000	510	2.0	1.8	83	4,600	1.2 U	0.43 J	14,000	1.2 U	77	240
WSM DU1-007 February 27, 2014	24,000	1.2	**48**	64	0.77 J	0.93 J	3,900	100	19	140	60,000	83	16,000	790	1.9	4.5	94	5,200	1.4	0.64 J	22,000	0.31 J	86	400
WSM DU1-008 January 27, 2015	23,000	0.50 J	**25**	52	0.66	0.41 J	3,900	76	15	59	37,000	41	12,000	780	1.5	1.3	76	4,200	1.1	0.29 J	17,000	0.15 J	72	190

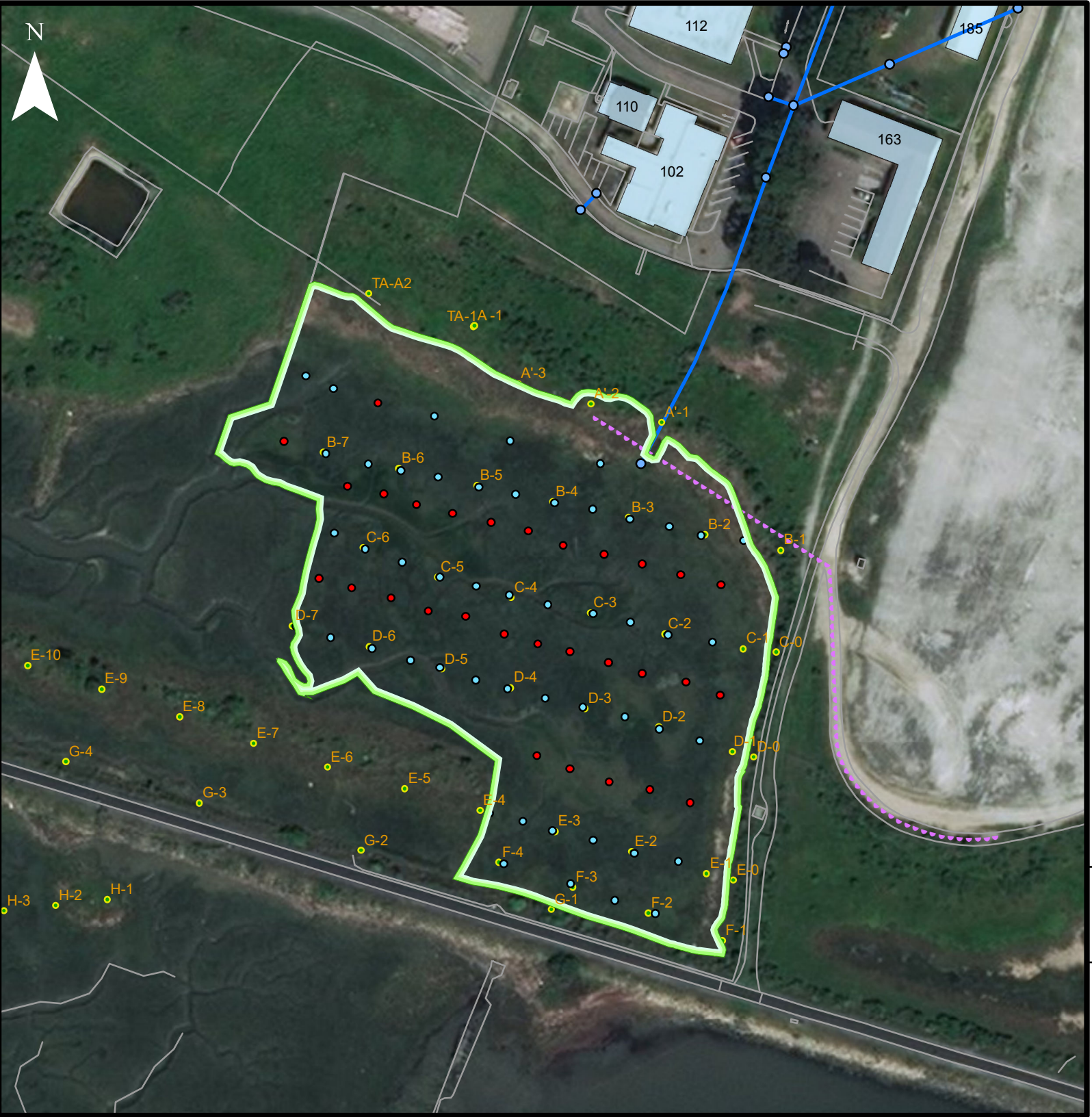
	Aluminum	Antimony	Arsenic (1)	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
WSM DU1-009 January 21, 2016	NA	0.88	**19**	47	0.65	2.0	NA	80	14	77	NA	38	NA	NA	2.2	2.2	73	NA	ND (<0.5)	0.25	NA	0.81	70	180
WSMPHA17 January 18, 2017	NA	ND (<2.0)	6.8	20	0.17	0.64	NA	30	4.6	29	NA	19	NA	NA	0.54	0.94	28	NA	ND (<2.0)	ND (<0.25)	NA	ND (<0.49)	29	110
WSM2018PHA January 26, 2018	NA	ND (<2.0)	13	21	0.21	0.27	NA	26	4.6	22	NA	17	NA	NA	0.46	0.63	24	NA	ND (<2.0)	ND (<0.25)	NA	ND (<0.51)	26	73
WSM2019PHA January 25, 2019	NA	ND (<2.0)	16	33	0.43	0.49	NA	53	9.3	52	NA	34	NA	NA	0.32	1.0	47	NA	ND (<2.0)	ND (<0.25)	NA	ND (<0.49)	49	140
WSM2020PHA January 31, 2020	NA	ND (<2.0)	**22**	50	0.50	0.34	NA	79	14	80	NA	42	NA	NA	0.61	1.6	71	NA	ND (<2.0)	0.33	NA	ND (<0.50)	64	180
WSM2022PHA January 24, 2022	NA	0.72	16	50	ND (<0.50)	ND (<0.50)	NA	65	8.9	52	NA	32	NA	NA	1.0	1.6	59	NA	0.57	ND (<0.50)	NA	ND (<0.50)	59	150

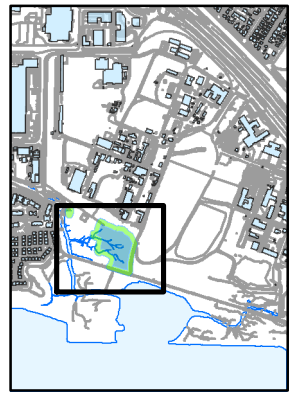
Notes:

Bold values indicate that the result exceeded the Category I criterion.
Screening criteria based on the Final Soil Management Plan, Revision 2, Table C-1, December 31, 2019.

NA	Not available
ND	Not detected
J	Estimated Value
U	Not detected
(1)	Arsenic screening value based on DTSC-approved ambient concentration developed for the adjacent Campus Bay site.
(2)	Screening levels for cobalt, manganese, and nickel were updated, and aluminum was eliminated as a chemical of concern in the Final SMP, Revision 1.
(3)	For detect-only data, the mean is the arithmetic mean. For chemicals with non-detect measurements, this value is the arithmetic mean with one-half the detection limit substituted for non-detect measurements
(4)	Fifteen detections
(5)	Eight detections
(6)	Eleven detections
(7)	Twenty-two detections
(8)	Twenty-six detections
(9)	Only thirteen detections
(10)	Two detections

.





2022 PHA Sampling Locations

- Decision Unit 1 boundary
- Increments added in 2018
- Increment location (approximate)
- Vegetation Quadrats
- Biologically Active Permeable Barrier

0 35 70 140 210 280

Feet

Berkeley EH&S
UNIVERSITY OF CALIFORNIA

Richmond Field Station Site
University of California, Berkeley

WESTERN STEGE MARSH NEAR SURFACE SAMPLING JANUARY 24, 2022

EH&S ANB 2020.01

Attachment 1

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 2201A62

Report Created for: UC Berkeley EH & S

317 University Hall 3rd Fl
Berkeley, CA 94720-1150

Project Contact: Alicia Bihler
Project P.O.: BB01491209
Project: RFS WSM PHA

Project Received: 01/24/2022

Analytical Report reviewed & approved for release on 02/10/2022 by:

Susan Thompson
Project Manager

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CA ELAP 1644 ♦ NELAP 4033 ORELAP

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"When Quality Counts"

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Glossary of Terms & Qualifier Definitions

Client: UC Berkeley EH & S **WorkOrder:** 2201A62

Project: RFS WSM PHA

Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
CPT	Consumer Product Testing not NELAP Accredited
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
LQL	Lowest Quantitation Level
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PDSD	Post Digestion Spike Duplicate
PF	Prep Factor
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
TZA	TimeZone Net Adjustment for sample collected outside of MAI's UTC.
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

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Client: UC Berkeley EH & S **WorkOrder:** 2201A62
Project: RFS WSM PHA

Analytical Qualifiers

A	The reported value is determined using a "single point" calibration by GC-ECD as allowed by the method.
h7	Copper (EPA 3660B) cleanup
j1	See attached narrative

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Case Narrative

Client: UC Berkeley EH & S
Project: RFS WSM PHA

Work Order: 2201A62
February 10, 2022

j1

Sample prepared per the Interstate Technology & Regulatory Council (ITRC). 2012. Incremental Sampling Methodology. ISM-1. Washington, D.C.: Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team. Www.itrcweb.org.

Sample aliquots are weighed for extraction after the air-drying step outlined in the ISM method; therefore all associated data is reported on an "air dried" basis.

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Analytical Report

Client:	UC Berkeley EH & S	**WorkOrder:**	2201A62
Date Received:	01/24/2022 15:20	**Extraction Method:**	SW3540C
Date Prepared:	02/08/2022	**Analytical Method:**	SW8082
Project:	RFS WSM PHA	**Unit:**	mg/kg

Polychlorinated Biphenyls (PCBs) Aroclors w/ Soxhlet Extraction

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
WSM2022PAH	**2201A62-001A**	**Soil**	**01/24/2022 11:15**	**GC23 02102210.d**	**239061**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Aroclor1016	ND		0.050	1	02/10/2022 12:01
Aroclor1221	ND		0.050	1	02/10/2022 12:01
Aroclor1232	ND		0.050	1	02/10/2022 12:01
Aroclor1242	ND		0.050	1	02/10/2022 12:01
Aroclor1248	**0.24**	A	0.050	1	02/10/2022 12:01
Aroclor1254	ND		0.050	1	02/10/2022 12:01
Aroclor1260	ND		0.050	1	02/10/2022 12:01
Aroclor1262	ND		0.050	1	02/10/2022 12:01
Aroclor1268	ND		0.050	1	02/10/2022 12:01
PCBs, total	**0.24**		0.050	1	02/10/2022 12:01

Surrogates	REC (%)	Limits	
Decachlorobiphenyl	112	50-150	02/10/2022 12:01

Analyst(s): KVE

Analytical Comments: h7,j1

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Analytical Report

Client:	UC Berkeley EH & S	**WorkOrder:**	2201A62
Date Received:	01/24/2022 15:20	**Extraction Method:**	SW3050B
Date Prepared:	02/07/2022	**Analytical Method:**	SW6020
Project:	RFS WSM PHA	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
WSM2022PAH	2201A62-001A	Soil	01/24/2022 11:15	ICP-MS5 114SMPL.d	238988

Analytes	Result	RL	DF	Date Analyzed
Antimony	**0.72**	0.50	1	02/08/2022 10:22
Arsenic	**16**	0.50	1	02/08/2022 10:22
Barium	**50**	5.0	1	02/08/2022 10:22
Beryllium	ND	0.50	1	02/08/2022 10:22
Cadmium	ND	0.50	1	02/08/2022 10:22
Chromium	**65**	0.50	1	02/08/2022 10:22
Cobalt	**8.9**	0.50	1	02/08/2022 10:22
Copper	**52**	0.50	1	02/08/2022 10:22
Lead	**32**	0.50	1	02/08/2022 10:22
Mercury	**1.0**	0.050	1	02/08/2022 10:22
Molybdenum	**1.6**	0.50	1	02/08/2022 10:22
Nickel	**59**	0.50	1	02/08/2022 10:22
Selenium	**0.57**	0.50	1	02/08/2022 10:22
Silver	ND	0.50	1	02/08/2022 10:22
Thallium	ND	0.50	1	02/08/2022 10:22
Vanadium	**59**	0.50	1	02/08/2022 10:22
Zinc	**150**	5.0	1	02/08/2022 10:22

Surrogates	REC (%)	Limits	
Terbium	103	70-130	02/08/2022 10:22

Analyst(s): WV

Analytical Comments: j1

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Quality Control Report

Client:	UC Berkeley EH & S	**WorkOrder:**	2201A62
Date Prepared:	02/08/2022	**BatchID:**	239061
Date Analyzed:	02/09/2022 - 02/10/2022	**Extraction Method:**	SW3540C
Instrument:	GC23	**Analytical Method:**	SW8082
Matrix:	Soil	**Unit:**	mg/kg
Project:	RFS WSM PHA	**Sample ID:**	MB/LCS/LCSD-239061 2201A62-001AMS/MSD

QC Summary Report for SW8082

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Aroclor1016	ND	0.0500	0.0500	-	-	-
Aroclor1221	ND	0.0500	0.0500	-	-	-
Aroclor1232	ND	0.0500	0.0500	-	-	-
Aroclor1242	ND	0.0500	0.0500	-	-	-
Aroclor1248	ND	0.0500	0.0500	-	-	-
Aroclor1254	ND	0.0500	0.0500	-	-	-
Aroclor1260	ND	0.0500	0.0500	-	-	-
Aroclor1262	ND	0.0500	0.0500	-	-	-
Aroclor1268	ND	0.0500	0.0500	-	-	-
Surrogate Recovery						
Decachlorobiphenyl	0.0512			0.05	102	50-150

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Aroclor1016	0.149	0.162	0.15	99	108	60-140	8.27	20
Aroclor1260	0.161	0.172	0.15	107	114	60-140	6.45	20
Surrogate Recovery								
Decachlorobiphenyl	0.0527	0.0523	0.050	105	105	50-150	0.725	20

Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Aroclor1016	1	0.204	0.193	0.15	ND	136	129	60-140	5.92	20
Aroclor1260	1	0.196	0.190	0.15	ND	130	127	60-140	2.58	20
Surrogate Recovery										
Decachlorobiphenyl	1	0.0440	0.0408	0.050		88	82	50-150	7.41	20

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Quality Control Report

Client:	UC Berkeley EH & S	**WorkOrder:**	2201A62
Date Prepared:	02/07/2022	**BatchID:**	238988
Date Analyzed:	02/08/2022	**Extraction Method:**	SW3050B
Instrument:	ICP-MS5	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/kg
Project:	RFS WSM PHA	**Sample ID:**	MB/LCS/LCSD-238988

QC Summary Report for Metals

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Antimony	ND	0.160	0.500	-	-	-
Arsenic	ND	0.140	0.500	-	-	-
Barium	ND	0.680	5.00	-	-	-
Beryllium	ND	0.0830	0.500	-	-	-
Cadmium	ND	0.0940	0.500	-	-	-
Chromium	ND	0.130	0.500	-	-	-
Cobalt	ND	0.0690	0.500	-	-	-
Copper	ND	0.230	0.500	-	-	-
Lead	ND	0.0690	0.500	-	-	-
Mercury	ND	0.0380	0.0500	-	-	-
Molybdenum	ND	0.140	0.500	-	-	-
Nickel	ND	0.0810	0.500	-	-	-
Selenium	ND	0.320	0.500	-	-	-
Silver	ND	0.110	0.500	-	-	-
Thallium	ND	0.0720	0.500	-	-	-
Vanadium	ND	0.150	0.500	-	-	-
Zinc	ND	3.20	5.00	-	-	-
Surrogate Recovery						
Terbium	507			500	101	70-130

(Cont.)

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Quality Control Report

Client:	UC Berkeley EH & S	**WorkOrder:**	2201A62
Date Prepared:	02/07/2022	**BatchID:**	238988
Date Analyzed:	02/08/2022	**Extraction Method:**	SW3050B
Instrument:	ICP-MS5	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/kg
Project:	RFS WSM PHA	**Sample ID:**	MB/LCS/LCSD-238988

QC Summary Report for Metals

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Antimony	49.1	50.8	50	98	102	75-125	3.42	20
Arsenic	51.6	51.0	50	103	102	75-125	1.24	20
Barium	493	491	500	99	98	75-125	0.491	20
Beryllium	49.3	48.2	50	99	96	75-125	2.15	20
Cadmium	50.1	50.0	50	100	100	75-125	0.146	20
Chromium	50.3	49.8	50	101	100	75-125	1.13	20
Cobalt	48.7	46.7	50	97	93	75-125	4.34	20
Copper	50.0	50.6	50	100	101	75-125	1.23	20
Lead	49.2	50.0	50	98	100	75-125	1.66	20
Mercury	1.17	1.24	1.25	94	99	75-125	5.49	20
Molybdenum	48.6	49.5	50	97	99	75-125	1.82	20
Nickel	51.2	51.4	50	102	103	75-125	0.316	20
Selenium	49.7	50.1	50	99	100	75-125	0.738	20
Silver	50.5	49.2	50	101	98	75-125	2.48	20
Thallium	48.6	49.0	50	97	98	75-125	0.676	20
Vanadium	50.4	50.2	50	101	100	75-125	0.489	20
Zinc	515	507	500	103	101	75-125	1.64	20
Surrogate Recovery								
Terbium	506	534	500	101	107	70-130	5.25	20

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CHAIN-OF-CUSTODY RECORD

WorkOrder: 2201A62 **ClientCode: UCB**

☐ WaterTrax ☐ CLIP ☐ EDF ☒ EQuIS ☒ Dry-Weight ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag
☒ Detection Summary ☐ Excel

Report to:
Alicia Bihler
UC Berkeley EH & S
317 University Hall 3rd Fl
Berkeley, CA 94720-1150
(510) 725-2528 FAX: (510) 643-7595

Email: abihler@berkeley.edu
cc/3rd Party: dscrimger@berkeley.edu;
PO: BB01491209
Project: RFS WSM PHA

Bill to:
Accounts Payable
UC Berkeley
317 University Hall #1150
Berkeley, CA 94720-1150
ucinvoice@berkeley.edu

Requested TATs: 10 days; 5 days;

Date Received: **01/24/2022**
Date Logged: **01/25/2022**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
2201A62-001	WSM2022PAH	Soil	1/24/2022 11:15	☐	A	A	A									

Test Legend:

1	8082_Soxhlet_S	2	CAM17MS_TTLC_S	3	PRDisposal Fee	4	
5		6		7		8	
9		10		11		12	

Prepared by: Agustina Venegas

Comments:

NOTE: Soil samples are discarded 60 days after receipt unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: UC BERKELEY EH & S
Client Contact: Alicia Bihler
Contact's Email: abihler@berkeley.edu

Project: RFS WSM PHA
Comments:

Work Order: 2201A62
QC Level: LEVEL 2
Date Logged: 1/25/2022

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

LabID	ClientSampID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	U**	Head Space	Dry-Weight	Collection Date & Time	TAT	Test Due Date	Sediment Content	Hold	Sub Out
001A	WSM2022PAH	Soil	SW6020 (CAM 17)	2	1L CG & 1-1L AG, Unpres	☐	☐	☐	1/24/2022 11:15	5 days	1/31/2022		☐	☐
			SW8082 (PCBs w/ Soxhlet Extraction)			☐	☐	☐		10 days	2/7/2022		☐	☐

NOTES: *** STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).**

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

U = An unpreserved container was received for a method that suggests a preservation in order to extend hold time for analysis.**

General COC

MAI Work Order # 2201A42

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CHAIN OF CUSTODY RECORD

Turn Around Time: 1 Day Rush | 2 Day Rush | 3 Day Rush | STD ● | Quote #
J-Flag / MDL | ESL | Cleanup Approved | Bottle Order #
Delivery Format: PDF | GeoTracker EDF | EDD | Write On (DW) | EQuIS

Report To: Alicia Bihler — Bill To: Alicia Bihler
Company: UC Berkeley EH&S
Email: abihler@berkeley.edu
Alt Email: dscrimger@berkeley.edu — Tele: 510-725-2528
Project Name: RFS WSM PHA — Project #:
Project Location: UC Berkeley Richmond Field Station — PO # BB01491209
Sampler Signature:

SAMPLE ID Location / Field Point	Sampling Date	Sampling Time	#Containers	Matrix	Preservative	ISM Prep/75 Increment	PCB 8082 + Soxhlet 3540C	CAM 17 Metals
WSM2022PAH	1/24/22	11:15A	2	soil		●	●	●

Analysis Requested

MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and for allowing us to work safely.

* If metals are requested for water samples and the water type (Matrix) is not specified on the chain of custody, MAI will default to metals by E200.8.

Please provide an adequate volume of sample. If the volume is not sufficient for a MS/MSD a LCS/LCSD will be prepared in its place and noted in the report.

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
Alicia Bihler/UCB EH&S	1/24/22	11:32	MAI/MAS	1/24/22	1132
MAI/MAS	1/24/22	1520		1/24/2022	1520

Comments / Instructions: Sample consists of all material in 2 32oz jars.

Matrix Code: DW=Drinking Water, GW=Ground Water, WW=Waste Water, SW=Seawater, S=Soil, SL=Sludge, A=Air, WP=Wipe, O=Other
Preservative Code: 1=4°C 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=ZnOAc/NaOH 7=None

Temp 2.5 °C Initials WAT

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Sample Receipt Checklist

Client Name: **UC Berkeley EH & S**
Project: **RFS WSM PHA**

WorkOrder №: **2201A62** Matrix: Soil
Carrier: Antonio Mason (MAI Courier)

Date and Time Received: **1/24/2022 15:20**
Date Logged: **1/25/2022**
Received by: Agustina Venegas
Logged by: Agustina Venegas

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Sample IDs noted by Client on COC?	Yes ☑	No ☐	
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐	
Sampler's name noted on COC?	Yes ☐	No ☑	
COC agrees with Quote?	Yes ☐	No ☐	NA ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	NA ☐
Samples Received on Ice?	Yes ☑	No ☐	
	(Ice Type: WET ICE)		
Sample/Temp Blank temperature	Temp: 3.5°C		NA ☐
ZHS conditional analyses: VOA meets zero headspace requirement (VOCs, TPHg/BTEX, RSK)?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
pH acceptable upon receipt (Metal: <2; Nitrate 353.2/4500NO3: <2; 522: <4; 218.7: >8)?	Yes ☐	No ☐	NA ☑
UCMR Samples:			
pH tested and acceptable upon receipt (200.7: ≤2; 533: 6 - 8; 537.1: 6 - 8)?	Yes ☐	No ☐	NA ☑
Free Chlorine tested and acceptable upon receipt (<0.1mg/L) [not applicable to 200.7]?	Yes ☐	No ☐	NA ☑

Comments: