



TETRA TECH, INC.

March 21, 2016

Lynn Nakashima  
Project Manager  
Department of Toxic Substances Control  
700 Heinz Avenue  
Berkeley, CA 94710

**Subject: Proposed Continued Groundwater Monitoring Locations for 2016  
Richmond Field Station Site  
Berkeley Global Campus, Richmond, CA  
Site Investigation and Remediation Order I/SE-RAO 07/07-004, Section 5.16**

Dear Ms. Nakashima:

Tetra Tech, Inc. was contracted by the University of California Berkeley to conduct groundwater sampling activities at Richmond Field Station (RFS) Site, at the Berkeley Global Campus in Richmond, California. The scope of the sampling was outlined in the Phase I Groundwater Field Sampling Workplan, dated June 2, 2010. The results of the Phase I investigation (2010 – 2012) and of continued groundwater monitoring in 2013 are presented in the Phase I November 2010 through April 2012 Groundwater Sampling Results Technical Memorandum, dated December 12, 2012, the 2013 Groundwater Sampling Results Technical Memorandum, dated October 10, 2013, the 2014 Groundwater Sampling Results Technical Memorandum, dated November 24, 2014, and the 2015 Groundwater Sampling Results Technical Memorandum, dated October 19, 2015.

The Phase I groundwater field effort was conducted to address data gaps through the installation and continued semi-annual monitoring of 51 piezometers throughout the RFS: 47 in the shallow groundwater zone and four in a deeper zone. Data collected from the developed piezometers included groundwater sample analyses, geological borehole logging, and depth to water measurements; all of which were used to develop a hydrogeologic model of the site, improve the understanding of overall site-wide groundwater quality, and to help confirm or deny the presence of contamination. UC Berkeley continued with a semi-annual groundwater sampling program at the 47 piezometers in the shallow groundwater zone and three existing shallow piezometers previously installed (PZ8, PZ9, and PZ11) for a total of 50 piezometers.

As a follow up to the Phase I groundwater investigation, UC Berkeley recommended annual groundwater monitoring in 2013 at a subset of the initial 50 shallow piezometers to evaluate ongoing conditions at RFS. Monitoring consisted of chemical analysis at 40 piezometers with sample results exceeding one-half of either the California or Federal maximum contaminant level (MCL) for drinking water standards during any of the previous four monitoring events; analytes were limited to those analytes that exceeded one-half the MCLs in each piezometer. Depth to water measurements were collected bi-annually, concurrent with the ongoing biannual sampling at the adjacent Campus Bay site, at all 50 shallow and 4 deep piezometers to continue the comprehensive assessment of seasonal groundwater flow. Groundwater sampling was completed in 2014 and 2015 consistent with the piezometers and analytes within the 2013 event.

UC Berkeley has completed a review of the four most recent consecutive groundwater sampling events: April 2012, April 2013, April 2014, and April 2015. Results indicate that in several piezometers all analytes are below one-half of the California and Federal MCL. As a result, UC Berkeley recommends the elimination of these analytes from the April 2016 event. Proposed analytes to be eliminated are summarized below:

- Elimination of volatile organic compound (VOC) analysis at piezometers Bulb1, Bulb2, CCC3, EERC, EPA, and WTA.
- Elimination of semi-volatile organic compounds and polycyclic aromatic hydrocarbons (SVOC/PAH) analyses at piezometers B128, B158, B180, B280A, Bulb2, CCC2, CTP, EPA, MFA, and WTA. Note there are no California or Federal MCLs with any SVOC/PAH detected.
- Elimination of metals analysis at piezometers B128, B158, B175S, B178, B480, CCC3, and PZ8. Piezometer Bulb 2 also meets the criteria for elimination for metals; however, UC Berkeley will continue to monitor for metals pending ongoing investigations in the Bulb and Western Transition Area under FSP Phase V.

The proposed April 2016 sampling event will also include the four piezometers installed in January 2015: ETA01, ETA02, ETA03, and WSM01 which were not sampled during the April 2015 event.

Modifying the sampling design in this way will eliminate all sampling at piezometers B128, B158, B180, CCC3, EPA, PZ8, and WTA. The revised number of piezometers proposed for sampling is 37. Table 1 summarizes the piezometers and analytes recommended for sampling in 2016, and also demonstrates which piezometers sampled in 2015 are not recommended for further sampling in 2016. Tables 2, 3, and 4 present the analytical data from the past four consecutive monitoring events for the piezometers identified above. Figure 1 shows graphically the piezometers proposed for continued monitoring in 2016, piezometers eliminated in 2013, and the current recommendations for piezometers to be eliminated from the April 2016 sampling event.

The groundwater samples will be collected consistent with the protocols outlined in the Field Sampling Workplan dated June 2, 2010 and will follow the quality control measures for both field work and data analysis as outlined in the accompanying Quality Assurance Project Plan. Samples will be analyzed for dissolved metals (field-filtered) and VOCs at locations described above.

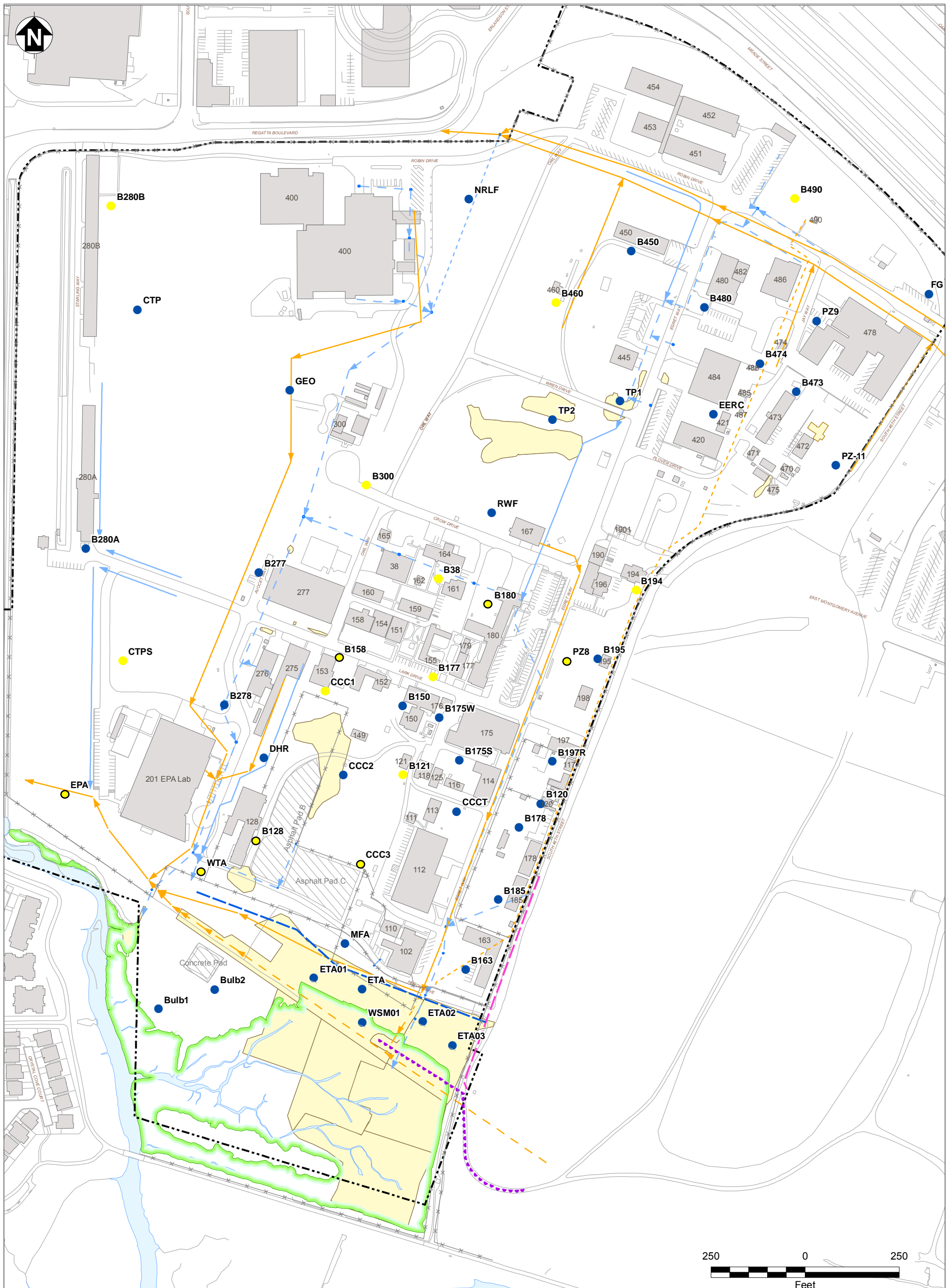
If you have any questions or comments regarding this submittal, please call me at (510) 302-6283.

Sincerely,

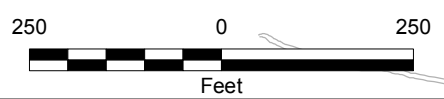


Jason Brodersen, P.G.  
Project Manager

cc: Greg Haet, UC Berkeley Office of Environment, Health and Safety  
Bill Marsh, Edgcomb Law Group



- Existing Buildings
- Asphalt/Concrete Pads
- Remediated Areas
- Surface Water
- Marsh Boundary
- Richmond Field Station Site Boundary
- Roads and Other Landscape Features
- Fenceline
- Biologically Active Permeable Barrier Wall
- Former Seawall (Approximate)
- Slurry Wall
- Storm Drain Lines:
  - Open Swale
  - Underground Culvert
  - Underground Culvert, Abandoned (Grouted at Manholes)
- Sanitary Sewer Lines:
  - Existing Sewer Line
  - Removed Sewer Line
  - Abandoned Sewer Line
- Proposed piezometer for sampling in April 2016
- Piezometer not sampled in April 2015
- Piezometer sampled in April 2015; proposed for eliminated sampling in April 2016



**Richmond Field Station Site  
University of California, Berkeley**

**FIGURE 1  
PROPOSED  
GROUNDWATER  
SAMPLING LOCATIONS**

2016 Groundwater Sampling Event

<b>Table 1. Piezometers Recommended for Sampling in 2016</b>			
<b>Piezometer</b>	<b>VOC EPA Method 8260B</b>	<b>SVOC/PAH EPA Method 8270C, SIM</b>	<b>Field Filtered Metals EPA Method 6020A/7400 Series</b>
B120	X		
B128 *		0	0
B150			X
B158 *			0
B163	X	0	X
B175S	X		0
B175W *	X		
B178	X		0
B180 *		0	
B185	X		
B195	X		X
B197R	X		X
B277	X		
B278	X		
B280A	X	0	
B450	X		X
B473	X		
B474			X
B480	X		0
Bulb1	0		X
Bulb2	0	0	X
CCC2	X	0	X
CCC3	0		0
CCCT	X		
CTP	X	0	X
DHR			X
EERC	0		X
EPA *	0	0	
ETA	X		X
ETA01	X		X
ETA02	X		X
ETA03	X		X
FG			X
GEO	X		
MFA	X	0	
NRLF			X
PZ11	X		X
PZ8 *			0
PZ9	X		
RWF	X		
TP1	X		X
TP2	X		
WTA *	0	0	
WSM01	X		X

Notes:

- X Sampling analyte recommended in 2016
- 0 Sampling analyte not recommended in 2016 (but was evaluated in 2015)
- \* Sampling at this piezometer would be discontinued

**Table 2: VOC Detected Results Summary**  
 2016 Groundwater Well Elimination Justification  
 University of California, Berkeley, Richmond Field Station Site

Sample Location	Sample Date	ETHYL BENZENE	ISOPROPYL BENZENE	m-p-XYLENE	METHYL TERT-BUTYL ETHER	o-XYLENE	p-ISOPROPYL TOLUENE	sec-BUTYL BENZENE	TETRACHLOROETHENE	TRANS-1,2-DICHLOROETHENE	TRICHLOROETHENE	VINYL CHLORIDE
California MCLs					13			5	10	5		0.5
Federal MCLs								5	100	5		2
1/2 MCL					6.5			2.5	5	2.5		0.25
<b>BULB1</b>	4/5/2012	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/5/2013	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/10/2014	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/13/2015	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
<b>BULB2</b>	4/5/2012	0.1 J	0.3 J	0.2 J	0.6	0.3 J	0.5 U	0.1 J	0.5 U	0.5 U	0.3 J	0.5 U
	4/5/2013	0.5 U	0.5 U	0.5 U	0.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U
	4/10/2014	0.5 U	0.5 U	0.5 U	0.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.7	0.5 U
	4/13/2015	0.5 U	0.5 U	0.5 U	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.4	0.5 U
<b>CCC3</b>	4/10/2012	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.3	0.5 U
	4/2/2013	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.4 J	0.5 U
	4/2/2014	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1	0.5 U
	4/15/2015	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J	0.5 U
<b>EERC</b>	4/6/2012	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/8/2013	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/3/2014	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/16/2015	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
<b>EPA</b>	4/6/2012	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/4/2013	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/10/2014	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/17/2015	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
<b>WTA</b>	4/5/2012	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.3	0.5 U	0.2 J	0.5 U
	4/5/2013	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.2 J	0.5 U
	4/10/2014	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1	0.5 U	0.5 U	0.5 U
	4/13/2015	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.3 J	0.5 U

Notes:

- All results are presented in µg/L.
- µg/L      Micrograms per liter
- ID        Identification
- J         Estimated value
- MCL     Maximum contaminant level
- U        Not detected
- VOC     Volatile organic compound

**Table 3: SVOC Detected Results Summary**  
 2016 Groundwater Well Elimination Justification  
 University of California, Berkeley, Richmond Field Station Site

Sample Location	Sample Date	SVOCs											
		1,4-DIOXANE	1-METHYLNAPHTHALENE	4-METHYLPHENOL	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	FLUORANTHENE	FLUORENE	NAPHTHALENE	PHENANTHRENE	PYRENE	
B128	4/2/2012	0.9 U	0.09 U	9.6 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
	4/5/2013	0.9 U	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	9.4 U	9.4 U	9.4 U	0.09 U	0.09 U	
	4/10/2014	0.9 U	0.09 U	9.8 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/13/2015	1 U	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
B163	4/2/2012	0.09 J	0.09 U	9.6 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/3/2013	0.2 J	0.1 U	11 U	0.1 U	0.1 U	0.1 U	11 U	11 U	11 U	0.1 U	0.1 U	
	4/1/2014	0.2 J	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
	4/14/2015	0.2 J	0.09 U	10 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
B180	4/4/2012	0.9 U	0.09 U	9.7 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/8/2013	0.9 U	0.09 U	9.3 U	0.09 U	0.09 U	0.09 U	9.3 U	9.3 U	9.3 U	0.09 U	0.09 U	
	4/8/2014	0.9 U	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/14/2015	0.9 U	0.09 U	9.6 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
B280A	4/3/2012	0.2 J	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/4/2013	0.2 J	0.09 U	10 U	0.09 U	0.09 U	0.09 U	10 U	10 U	10 U	0.09 U	0.09 U	
	4/9/2014	0.2 J	0.1 U	9.3 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
	4/17/2015	0.2 J	0.1 U	9.8 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
BULB2	4/5/2012	1 U	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
	4/5/2013	1 J	0.1 U	10 U	0.1 U	0.1 U	0.1 U	10 U	10 U	10 U	0.1 U	0.1 U	
	4/10/2014	1	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/13/2015	0.8 J	0.1 U	9.6 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
CCC2	4/10/2012	0.9 U	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/2/2013	0.9 U	0.09 U	9.5 U	0.09 U	0.09 U	0.09 U	9.5 U	9.5 U	9.5 U	0.09 U	0.09 U	
	4/2/2014	1 U	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
	4/15/2015	1 U	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
CTP	4/3/2012	0.9 U	0.09 U	9.5 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/4/2013	1 U	0.1 U	10 U	0.1 U	0.1 U	0.1 U	10 U	10 U	10 U	0.1 U	0.1 U	
	4/3/2014	1 U	0.1 U	9.3 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
	4/17/2015	1 U	0.1 U	9.3 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
EPA	4/6/2012	0.5 J	0.05 J	9.4 U	0.2	0.09 U	0.09 U	0.04 J	0.03 J	0.4	0.02 J	0.02 J	
	4/4/2013	0.9 U	0.09 U	9.3 U	0.09 U	0.09 U	0.09 U	9.3 U	9.3 U	9.3 U	0.09 U	0.09 U	
	4/10/2014	1 U	0.1 U	9.6 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
	4/17/2015	1 U	0.1 U	9.6 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
MFA	4/5/2012	1.2	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/5/2013	1.9	0.09 U	10 U	0.09 U	0.09 U	0.09 U	10 U	10 U	10 U	0.09 U	0.09 U	
	4/8/2014	1.8	0.09 U	9.3 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/13/2015	1.6	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
WTA	4/5/2012	0.9 U	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/5/2013	0.04 J	0.09 U	9.8 U	0.09 U	0.09 U	0.09 U	9.8 U	9.8 U	9.8 U	0.09 U	0.09 U	
	4/10/2014	0.9 U	0.09 U	9.4 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	
	4/13/2015	0.03 J	0.1 U	9.4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	

Notes:  
 No California or Federal MCLs are available for SVOCs detected in April 2012 through 2015.  
 All results are presented in µg/L.

µg/L Micrograms per liter  
 ID Identification  
 J Estimated value  
 MCL Maximum contaminant level  
 NA  
 SVOC Semivolatile organic compound  
 U Not detected

