SUMMARY REPORT: 2018 AMBIENT AIR MONITORING FOR ASBESTOS, METALS AND RESPIRABLE DUSTS
BAY AREA RAPID TRANSIT
M-LINE, OAKLAND AND SAN FRANCISCO, CA

PREPARED FOR:

MS. ANDREA ENEIDI, CSP
BAY AREA RAPID TRANSIT (BART)
SYSTEM SAFETY DEPARTMENT
300 LAKESIDE DRIVE, 18TH FLOOR
OAKLAND, CA 94612

PREPARED BY:

SCA
ENVIRONMENTAL, INC.

1 LAKESIDE DRIVE, SUITE 215
OAKLAND, CA 94612
TEL: (510) 645-6200
EFAX: (415) 962-0736

SCA PROJECT NO.: B-12658

UPDATED: MAY 25, 2018

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DAN LEUNG, CIH, CSP, CAC #07-4175
VICE PRESIDENT, INDUSTRIAL HYGIENIST

SCA ENVIRONMENTAL, INC.
1 LAKESIDE DRIVE, SUITE 215
OAKLAND, CA 94612
TEL: (510) 645-6200
EFAX: (415) 962-0736

Abstract

This report summarizes the observations and results of ambient air testing for asbestos, metals and total respirable dust conducted at the various Bay Area Rapid Transit (BART) stations with asbestos-containing fireproofing and/or vinyl asbestos floor tiles and mastics. The monitoring was conducted from April 9-11, 2018. The purpose of monitoring the stations with asbestos-containing fireproofing and/or vinyl asbestos floor tiles and mastic was to determine the level of airborne asbestos in the stations and to assess the potential hazards to occupants.

The sample results revealed airborne asbestos fiber levels were all <0.001 fibers/cc based on Phase Contrast Microscopy (PCM) analyses, with the exception of the sample collected at the Berkeley Station which was overloaded. These results indicate that the airborne asbestos concentration at all sites tested is statistically comparable to background levels, and is not affected by the presence of asbestos-containing construction materials, such as asbestos-containing fireproofing found throughout the structural members.

The downtown San Francisco stations experience black settled dust from the Muni-Metro system sharing a similar tunnel and ventilation system and from rail grinding activities. Airborne sampling was conducted for total respirable dust. In summary, total respirable dust concentrations were found to be as follows:

- Total respirable dust levels at the Embarcadero Center Station's Service Area adjacent to the Bike Room on the Concourse Level had a concentration ranging from 0.006 to 0.109 mg/m^3 with an average concentration of 0.050 mg/m^3, or well under the OSHA Permissible Exposure Limit of 5.0 mg/m^3.
- Total respirable dust levels at the Embarcadero Center Station's Station Agent's Booth on the Concourse Level had a concentration ranging from 0.006 to 0.135 mg/m^3 with an average concentration of 0.061 mg/m^3, or well under the OSHA Permissible Exposure Limit of 5.0 mg/m^3.
- Total respirable dust levels at the Montgomery Station's Fan Room 107 on the Concourse Level had a concentration ranging from 0.016 to 0.102 mg/m^3 with an average concentration of 0.051 mg/m^3, or well under the OSHA Permissible Exposure Limit of 5.0 mg/m^3.
- Total respirable dust levels at the Montgomery Station's Station Agent's Booth on the Concourse Level had a concentration ranging from 0.010 to 0.111 mg/m^3 with an average concentration of 0.044 mg/m^3, or well under the OSHA Permissible Exposure Limit of 5.0 mg/m^3.

Finally, settled dust samples from the Montgomery, Powell and Civic Center Station trackside Fan Rooms were analyzed for metal content with the following results (see Table 1):

- The Montgomery Street trackside settled dust sample collected in Fan Room 305 has an elevated concentration (6,100 mg/kg) of zinc over the TTLC concentration of 2,400 mg/kg and an elevated concentration (7,600 mg/kg) of copper over the TTLC concentration of 2,500 mg/kg; defining this material as a hazardous waste. STLC testing of chromium, copper, lead, nickel and zinc are needed to determine the leachability of these metals. Previous settled dust sampling in 2016 showed similar concentrations for chromium, copper, lead and zinc for this station.
- The Powell Street trackside settled dust sample collected in Fan Room 304 has concentrations under the Title 22 TTLC for each metal (see Table 7). STLC testing of zinc is needed to determine the leachability of this metal, since the result was above 10% of the TTLC standard.
- The Civic Center trackside settled dust sample collected in Fan Room 301A/B has concentrations under the Title 22 TTLC for each metal (see Table 7). STLC testing of chromium, copper and zinc are needed to determine the leachability of these metals, since the results were above 10% of the TTLC standards. Previous settled dust sampling in 2016 showed similar concentrations for chromium, copper and zinc for this station.
- The iron concentrations of the settled dust samples collected at all three stations ranged from 23,000 to 600,000 mg/kg.

Table 1: CAM-17 Settled Dust Analyses

Metal	Montgomery Settled dust TTLC (mg/kg)	Powell Station Settled dust TTLC (mg/kg)	Civic Center Settled dust TTLC (mg/kg)	Title 22 Hazardous Waste TTLC Standard (mg/kg)	Title 22 Hazardous Waste STLC Std. (mg/l)	Comments
Antimony	16	4.8	15	500	1.5	Below Title 22 TTLC Std.
Arsenic	44	3.1	13	500	5.0	Below Title 22 TTLC Std.
Barium	55	61	220	10000	100	Below Title 22 TTLC Std.
Beryllium	ND	ND	ND	75	0.75	Below Title 22 TTLC Std.
Cadmium	2.4	4.1	26	100(1)	1.0	Below Title 22 TTLC Std.
Chromium	270	21	93	500 (CrVI)	5	Below Title 22 TTLC Std.
Cobalt	47	3.4	17	8000	80	Below Title 22 TTLC Std.
Copper	**7,600(1)**	160	610	2,500	25	**Above Title 22 TTLC Std. for Montgomery**
Iron	600,000	23,000	94,000	N/A	N/A	N/A
Lead	280	43	81	1,000	5.0	Below Title 22 TTLC Std.
Mercury	0.11	ND	0.084	20	0.2	Below Title 22 TTLC Std.
Molybdenum	33	4.1	20	3500	350	Below Title 22 TTLC Std.
Nickel	1300	16	120	2000	20	Below Title 22 TTLC Std.
Selenium	ND	ND	ND	100	1.0	Below Title 22 TTLC Std.
Silver	1.3	ND	ND	500	5	Below Title 22 TTLC Std.
Thallium	ND	ND	ND	700	7.0	Below Title 22 TTLC Std.
Vanadium	9.1	8.9	37	5000	24	Below Title 22 TTLC Std.
Zinc	**6,100(1)**	1,900	1,300	2400	250	**Above Title 22 TTLC Std. for Montgomery**

NR = None Recorded
ND = None Detected
N/A = Not Applicable

(1) Requires STLC and TCLP analyses to fully characterize waste disposal requirement, but generally is considered a hazardous waste

Project Personnel

BAY AREA RAPID TRANSIT (BART)

District Industrial Hygienist .....Andrea Eneidi, CSP

SCA ENVIRONMENTAL, INC. (SCA)

Certified Industrial Hygienist .....Dan Leung, CIH, CSP, CAC #07-4175
Certified Site Surveillance Technician .....Chaowen “Stanley” Huang, CSST #16-5737

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1.0 Introduction

This report summarizes the sampling results collected during the ambient air monitoring for asbestos conducted in the Bay Area Rapid Transit's system-wide stations with asbestos-containing fireproofing. The airborne asbestos sampling included the following stations:

- Powell Street Station, San Francisco, CA
- Montgomery Street Station, San Francisco, CA
- 12th Street Station, Oakland, CA
- 19th Street Station, Oakland, CA
- MacArthur Station, Oakland, CA
- Berkeley Main Station, Berkeley, CA
- Ashby Station, Berkeley, CA
- 16th Street Station, San Francisco, CA
- 24th Street Station, San Francisco, CA
- Rockridge Station, Oakland, CA
- Lafayette Station, Lafayette, CA

SCA Environmental, Inc. (SCA) conducted the monitoring from April 9, 2018 to April 11, 2018 at the request of the Bay Area Rapid Transit District's System Safety Department.

Portions of the systems' structural steel are protected with fireproofing that contains 5 to 10% Chrysotile asbestos. In addition, several other construction materials contain asbestos (including various vinyl floor tiles and mastics in various Train Control Rooms throughout the legacy stations. Asbestos is regulated as a respiratory carcinogen. In order to verify that the operations and maintenance program implemented for this building are working properly, testing for the levels of airborne asbestos fibers is conducted periodically.

2.0 Methodology

Asbestos

Ambient air samples for asbestos were collected at the following stations and quantities:

San Francisco
- Powell Street Station (2)
- Montgomery Street Station (2)

Oakland
- 12th Street Station (1)
- 19th Street Station (1)
- MacArthur Station (1)
- Berkeley Main Station (1)
- Ashby Station (1)

M-Line
- 16th Street (1)
- 24th Street (1)

C-Line
- Rockridge (1)
- Lafayette (1)

All the asbestos samples were analyzed by Phase Contrast Microscopy (PCM), except for the project blanks, in accordance with the National Institute for Occupational Safety and Health (NIOSH) method 7400. PCM results are calculated in fibers per cubic centimeter (f/cc).

All air samples were collected for an approximately 24 hour period using Buck Libra low flow, AC-operated or similar air pumps to maintain even flow rates. Samples were collected on Zefon International Inc. Model Z008BA 25-millimeter, 0.8-micrometer pore size, mixed cellulose ester membrane filters in open-faced cassettes with conductive cowls. Pump flow rates were calibrated against a primary standard.

The contract laboratories that provided analytical asbestos services for the project are summarized below:

Laboratory	Analysis Type	Accreditation
EMSL Analytical, Inc. San Leandro, CA	Phase Contrast Microscopy (PCM) and Polarized Light Microscopy (PLM) Asbestos Analyses	• National Voluntary Laboratory Accreditation Program (NVLAP # 101048-3). • California Environmental Laboratory Accreditation Program (ELAP #1620).

Respirable Dust

Ambient sampling for total respirable dust was conducted at two downtown San Francisco stations, which experience black settled dust deposits associated with the Muni-Metro system within the same tunnels and ventilation system and wheel grinding activities. Total respirable dust sampling was conducted at:

- Montgomery Street Station, San Francisco, CA
- Embarcadero Station, San Francisco, CA

Particulate readings were made utilizing a TSI Dust-Trak, which measures respirable dust or PM_{10} levels. Measurements are reported as mg/m^3.

Particulate matter (PM) is a complex mixture of tiny particles that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These particles vary greatly in size, shape and chemical composition,

and can be made up of many different materials, such as metals, settled dust, soil, dust, mold and fungi. Particles 10 microns or less in diameter are defines as "respirable particulate matter" or PM_{10}. Fine particles are 2.5 microns or less in diameter ($PM_{2.5}$) and can contribute significantly to regional haze and reduction in visibility.

Spot Particulate Sampling.

In addition to the longer-term respirable dust sampling at the two BART stations noted above, SCA conducted spot sampling at agent booths, ticket machines and trackside to determine typical PM_{10} and $PM_{2.5}$ concentrations for BART passengers and employees. Stations sampled included 24th Street through Embarcadero in San Francisco.

Particulate readings were made utilizing a TSI Dust-Trak, which measures $PM_{2.5}$ and PM_{10} levels.

Settled Dust Sampling

CAM-17 metal analyses were completed for settled dust samples collected in the Montgomery, Powell and Civic Center track beds by EPA Method 6010B/7470A by McCampbell Analytical Inc.'s ELAP-accredited laboratory in Pittsburg, CA. PLM analysis for asbestos was also conducted at the Berkeley Station Break Room 108.

3.0 Applicable Standards

Asbestos

A summary of airborne asbestos standards applicable to this project is tabulated in Table 2 as follows:

Table 2: Summary of Asbestos Standards

Source	Level	Nature	Comments
Cal/OSHA[1]	0.1 f/cc 1.0 f/cc	Occupational & mandatory	8-hour Time Weighted Average (TWA) Permissible Exposure Level (PEL) (triggers OSHA required training, medical examinations, etc.) Excursion Limit (EL) for 30 minutes sampling duration
NIOSH[2]	0.1 f/cc	Recommended	Occupational PEL
ACGIH[3]	0.2 f/cc	Recommended	Occupational Threshold Limit Value (TLV) Notice of Intended Changes
Calif. Prop 65[4]	vague	Mandatory	Standard and monitoring method are unclear, but generally interpreted as comparable to outside ambient air
Bay Area Rapid Transit	0.01 f/cc (PCM) 70 str/mm^2 (TEM)	Contractual & mandatory Contractual & mandatory	Ambient air action level for occupied areas via PCM. Originating from AHERA[5] regulations and adopted by Bay Area Rapid Transit. Ambient air action level for occupied areas via TEM. Originating from AHERA[5] regulations and adopted by Bay Area Rapid Transit.

1 California Department of Industrial Relations, Division of Occupational Safety and Health, 8 CCR 1529.
2 National Institute of Occupational Safety and Health
3 American Conference of Governmental Industrial Hygienists, 2004
4 California Proposition 65
5 Asbestos Hazard Emergency Response Act (AHERA); 40 CFR Part 763

Respirable Dust

Extensive research indicates that exposure to PM_{10} and $PM_{2.5}$ levels exceeding current air quality standards is associated with increased risk of hospitalization for lung and heart-related respiratory illness, including emergency room visits for asthma. PM exposure is also associated with increased risk of premature deaths, especially in the elderly and people with pre-existing cardiopulmonary disease. In children, studies have shown associations between PM exposure and reduced lung function and increased respiratory symptoms and illnesses.

Table 3 below summarizes the applicable published Cal/OSHA and ACGIH permissible exposure limits for respirable dust as well as the California Air Resources Board's standards. Note that some of the addressed standards cover office environments and are not occupational exposure standards for BART station employees. In addition, many of these standards are arithmetic mean levels over a 24-hour or annual period; therefore, exposure within the BART system needs to be time-weighed against other daily or annual exposures outside the BART system.

Table 3: Summary of Respirable Dust Standards

Contaminant	Source	Level	Nature	Comments
Particulate	N/A	ambient	N/A	Compare against outdoor readings to indicate effectiveness of filter units in air handling system
	Cal/OSHA[1]	5 mg/m^3	Mandatory/ Occupational	8-hour TWA PEL for respirable dust
		10 mg/m^3		8-hour TWA PEL for total dust
	ACGIH[2]	10 mg/m^3	Recommended/ Occupational	8-hour TWA TLV resulting in lung disorders
	EPA[3]	0.05 mg/m^3	Recommended/ Indoor Occupancy (Offices)	National Ambient Air Quality Standard
Respirable Particles (PM_{10})	ASHRAE[4]	0.05 mg/m^3	Recommended Indoor Occupancy (Offices)	Based on protecting office environments against respiratory morbidity in the general population and avoiding exacerbation of asthma with no carcinogens. Indoor concentrations are normally lower. Guideline level may lead to unacceptable deposition of "dust."
	CARB[5]	0.05 mg/m^3	Recommended by CARB	24 hour California Air Resources Board Maximum Indoor Level
		0.02 mg/m^3		Annual arithmetic mean level
	EPA[3]	0.15 mg/m^3	Recommended by LEED Program (for Offices)	National Ambient Air Quality Standard
	LEED[6]	0.05 mg/m^3	Recommended by LEED Program (for Offices)[6]	8-hour TWA PEL for respirable dust for office environments using a TSI Sidepak Aerosol Monitor or PEM Sampler with PM_{10} lab analyses
Respirable Particles ($PM_{2.5}$)	CARB[5]	0.02 mg/m^3	Recommended by CARB	Annual arithmetic mean level
	EPA[3]	0.035 mg/m^3	Recommended by EPA	24-hr arithmetic mean level

Table 1 Footnotes:

1. California Department of Industrial Relations, Division of Occupational Safety and Health, Title 8 General Safety Orders §5155.
2. American Conference of Governmental Industrial Hygienists, 2016, Threshold Limit Values for Chemical Substances and Physical Agents
3. U.S. Environmental Protection Agency, National Ambient Air Quality Standard.
4. ASHRAE Standards 62-1989R, Appendix C-1, August 1996, and 62.1-2004, Appendix B.
5. California Air Resources Board, June 2005, "Draft for Public Review – Report to the California Legislature Indoor Air Pollution in California," Table 4.1.
6. U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED), Indoor Air Quality testing, credit 3.2, November 2008.

CAM-17 Metals

Total Threshold Limit Concentrations (TTLC), Soluble Threshold Limit Concentrations (STLC), and Toxicity Characteristic Leaching Procedure (TCLP) limits are published under Title 22 of the California Code of Regulations §662261.24 for classifying hazardous waste. Applicable standards for the CAM-17 metals are included in Tables 1, 7 and 8 herein.

4.0 Results and Discussion

Asbestos

Sampling was conducted as part of the BART's Ambient Air Quality Monitoring Program, since the listed stations have asbestos-containing fireproofing. Sampling was conducted for an approximately 24-hour period from April 9 to April 10, 2018 in the San Francisco stations and April 10 to April 11, 2018 in the East Bay Stations.

At the request of Ms. Andrea Eneidi, CSP within BART's System Safety Department, SCA Environmental, Inc. (SCA) conducted visual inspections and ambient air testing. SCA's Environmental Scientist, Mr. Chaowen "Stanley" Huang (Certified Site Surveillance Technician #16-5737), conducted work under the direct supervision of Mr. Dan Leung, CIH, CSP of SCA. Mr. Leung is a Cal/OSHA registered Certified Asbestos Consultant (CAC #07-4175) and a Certified Industrial Hygienist (CIH).

The ambient air sampling results for the Stations are summarized in Table 4 below. The laboratory reports and field data sheets are included as Attachment 1. All observed asbestos-containing fireproofing was noted to be in "good" condition. No notable areas of imminent danger were observed within the representative areas viewed by SCA's Surveyor. Asbestos fireproofing on the Concourse Level of the Powell Street Station was significantly abated since the prior ambient air sampling in May 2011.

Background airborne fiber concentrations by PCM were as follows:

Table 4: Summary of Airborne Asbestos Results

Station	Location	Sample I.D.	Results (fibers/cc)	Comments
Lafayette	Train Control Room 103	LAF-TC103	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
Rockridge	Janitor's Room 203	ROCK-203	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
MacArthur	Break Room 102	MAC-102	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
Berkeley	Break Room 108	BERK-108	Overloaded	**Above the EPA's PCM Clearance Air Standards of 0.01 f/cc**
Ashby	Elevator Room 204	ASH-204	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
19th St. Oakland	Mech. Room 108A	19-108A	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
12th St. Oakland	Electrical Room 107C	12-107C	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
Montgomery	Coffee Shop Storage/Elect Room 110.	MONT-110	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
Montgomery	Storage Room 111	MONT-111	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
Powell	Police Break Room	POW-POL-BK	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
Powell	Electrical Room 110	POW-110	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
16th St. Mission	Mech. Room 101A	16-101A	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc
24th St. Mission	Mech. Room 101A	24-101A	<0.001	Well below the EPA's PCM Clearance Air Standards of 0.01 f/cc

All ambient station air samples were below BART's Perimeter Action Level of 0.01 fibers per cubic centimeter (fibers/cc), with the exception of the sample collected at the Berkeley Break Room 108 which was overloaded. The results were generally found to be comparable to the previous sampling rounds completed by SCA and other Consultants.

Respirable Dust (PM_{10})

SCA sampled for respirable dust at two San Francisco Stations to determine typical airborne dust concentrations. Sampling occurred during typical daytime and nighttime operations with the fans on as well as overnight. The purpose of this sampling was to determine the concentrations of black carbon settled dust arising from the Muni-Metro system, which shares a common ventilation system.

Total respirable dust concentrations were found to be as follows:

Table 5: Respirable Dust Concentrations

Location	Start Date	Sampling Time	Respirable Dust Concentration			Permissible Exposure Limit (mg/m^3)	Comments
			Max. Level (mg/m^3)	Min. Level (mg/m^3)	Average Level (mg/m3)		
Embarcadero Concourse Level Northeast Station Agent's Booth	4/10/18	18:30 hrs.	0.109	0.006	0.050	5.0	Well Below 8-hr. PEL
Embarcadero Concourse Level South Station Agent's Booth	4/10/18	19:00 hrs.	0.135	0.006	0.061	5.0	Well Below 8-hr. PEL
Montgomery Platform Level Station Fan Room 107	4/9/18	22:00 hrs.	0.102	0.016	0.051	5.0	Well Below 8-hr. PEL
Montgomery Concourse Level South Station Agent's Booth	4/9/18	22:50 hrs.	0.111	0.010	0.044	5.0	Well Below 8-hr. PEL

All sample results were found to be well under Cal/OSHA's occupational exposure standard of 5.0 mg/m^3.

Spot PM_{10} and $PM_{2.5}$ Reading

The results of spot PM_{10} and $PM_{2.5}$ readings for various San Francisco Line stations are presented in Table 6.

Table 6: Spot PM_{10} and $PM_{2.5}$ Readings

				PM_{10} Concentrations (mg/m^3)			$PM_{2.5}$ Concentrations (mg/m^3)		
Station	**Date**	**Time**	**Location**	**Max**	**Avg.**	**Min.**	**Max**	**Avg.**	**Min**
CAAQS Std.[1]					0.05			0.035	
Cal/OSHA 8-hr. PEL Respirable Dust[2]					5			---	
19th St.	4/11/2018	2:28 p.m.	Lower Trackside	0.078	0.050	0.022	0.060	0.038	0.016
19th St.	4/11/2018	2:07 p.m.	Central Agent Booth	0.047	0.031	0.015	0.043	0.030	0.016
19th St.	4/11/2018	2:21 p.m.	North Ticket Machines	0.034	0.024	0.013	0.019	0.015	0.010
12th St.	4/11/2018	1:54 p.m.	Upper Trackside	0.038	0.027	0.016	0.030	0.024	0.017
12th St.	4/11/2018	2:08 p.m.	Central Agent Booth	0.038	0.029	0.019	0.032	0.025	0.017
12th St.	4/11/2018	2:16 p.m.	North Ticket Machines	0.049	0.038	0.026	0.035	0.030	0.024
Montgomery	4/11/2018	10:10 a.m.	Trackside	0.136	0.122	0.108	0.098	0.090	0.081
Montgomery	4/11/2018	10:26 a.m.	North Agent Booth	0.121	0.094	0.067	0.091	0.067	0.043
Montgomery	4/11/2018	10:33 a.m.	North Ticket Machines	0.111	0.087	0.062	0.075	0.058	0.040
Powell	4/11/2018	11:16 a.m.	Police Squad Room	0.037	0.030	0.022	0.033	0.025	0.017
Powell	4/11/2018	11:06 a.m.	South Agent Booth	0.098	0.059	0.019	0.067	0.039	0.011
Powell	4/11/2018	10:52 a.m.	North Ticket Machines	0.102	0.084	0.066	0.071	0.058	0.044
16th St.	4/11/2018	12:08 p.m.	Trackside	0.149	0.121	0.093	0.120	0.100	0.079
16th St.	4/11/2018	12:20 p.m.	Agent Booth	0.134	0.090	0.046	0.090	0.067	0.043
16th St.	4/11/2018	12:29 p.m.	Ticket Machines	0.124	0.079	0.033	0.102	0.066	0.029
24th St.	4/11/2018	12:46 p.m.	Trackside	0.158	0.127	0.095	0.115	0.099	0.084
24th St.	4/11/2018	12:53 p.m.	Agent Booth	0.128	0.071	0.014	0.104	0.063	0.022
24th St.	4/11/2018	13:06 p.m.	Ticket Machines	0.089	0.055	0.020	0.094	0.056	0.017
Civic Center	4/11/2018	11:33 a.m.	Trackside	0.193	0.161	0.128	0.145	0.117	0.088
Civic Center	4/11/2018	11:50 a.m.	North Agent Booth	0.077	0.048	0.019	0.052	0.033	0.013
Civic Center	4/11/2018	11:55 a.m.	North Ticket Machines	0.082	0.060	0.037	0.050	0.037	0.024
Embarcadero	4/11/2018	10:02 a.m.	Trackside	0.270	0.242	0.213	0.172	0.150	0.128
Embarcadero	4/11/2018	9:44 a.m.	South Agent Booth	0.181	0.159	0.137	0.108	0.101	0.093
Embarcadero	4/11/2018	9:50 a.m.	South Ticket Machines	0.168	0.142	0.116	0.106	0.095	0.083
			Maximum	0.270	0.242	0.213	0.172	0.150	0.128
			Minimum	0.034	0.024	0.013	0.019	0.015	0.010

				PM_{10} Concentrations (mg/m^3)			$PM_{2.5}$ Concentrations (mg/m^3)		
Station	**Date**	**Time**	**Location**	**Max**	**Avg.**	**Min.**	**Max**	**Avg.**	**Min**
CAAQS Std.[1]					0.05			0.035	
Cal/OSHA 8-hr. PEL Respirable Dust[2]					5			---	
			Average	0.110	0.084	0.059	0.080	0.061	0.043

Source: (1) California Environmental Protection Agency Air Resources Board, April 25, 2005
http://www.arb.ca.gov/research/aaqs/caaqs/pm/pm.htm
(2) Table AC-1 Permissible Exposure Limits for Chemical Contaminants
https://www.dir.ca.gov/title8/5155table_ac1.html

None of the spot measurements found PM_{10} levels exceeding Cal/OSHA's 8-hr. Permissible Exposure Limit of 5.0 mg/m^3; Cal/OSHA has no established occupational standard for $PM_{2.5}$. While the short-term $PM_{2.5}$ exposures exceed the EPA/CARB level of 0.35 mg/m^3, the EPA/CARB standard is an annual average concentration. Passengers and employees need to weigh their exposures outside of the station with the time-weighted exposures indoors. Note that the airborne levels within the BART system largely contain carbon, cellulose, silica and iron as contaminants, based on previous bulk sample analyses.

Cleanup of the stations with HEPA-filtered vacuums would help reduce the airborne dust concentrations. Use of power washing would require proper filtering and disposal of the waste water because of its metal content.

Settled Dust

Settled dust samples were collected within the trackside fan rooms at three San Francisco Stations to determine their metal content. Analyses were completed by McCampbell Analytical Inc.'s ELAP-accredited laboratory. The results of the CAM-17 analyses are as follows:

Table 7: Settled Dust CAM-17 TTLC Metal Analyses

CAM-17 Metal	Sample MONT-305		Sample POWELL-304		Sample CIVIC-301A/B		Title 22 Hazardous Waste TTLC/ STLC Standard*
	TTLC (ppm)	STLC/ TCLP (mg/l)	TTLC (ppm)	STLC/ TCLP (mg/l)	TTLC (ppm)	STLC/ TCLP (mg/l)	
Antimony	16	N/A	4.8	N/A	15	N/A	500 / 15
Arsenic	44	N/A	3.1	N/A	13	N/A	500 /5.0
Barium	55	N/A	61	N/A	220	N/A	10000 / 100
Beryllium	ND	N/A	ND	N/A	ND	N/A	75 / 0.75
Cadmium	2.4	N/A	4.1	N/A	26	N/A	100 / 1.0
Chromium	270	TBD	21	N/A	93	TBD	500 (CrVI) / 5
Cobalt	47	N/A	3.4	N/A	17	N/A	8000 / 80
Copper	**7,600**	TBD	160	N/A	610	TBD	2500 / 25
Iron	600,000	N/A	23,000	N/A	94,000	N/A	N/A
Lead	280	TBD	43	N/A	81	N/A	1,000 / 5.0
Mercury	0.11	N/A	ND	N/A	0.084	N/A	20 / 0.2
Molybdenum	33	N/A	4.1	N/A	20	N/A	3500 / 350
Nickel	1300	TBD	16	N/A	120	N/A	2000 /20
Selenium	ND	N/A	ND	N/A	ND	N/A	100 / 1.0
Silver	1.3	N/A	ND	N/A	ND	N/A	500 / 5
Thallium	ND	N/A	ND	N/A	ND	N/A	700 / 7.0
Vanadium	9.1	N/A	8.9	N/A	37	N/A	2400/ 24
Zinc	**6,100**	TBD	1,900	TBD	1,300	TBD	5000 / 250

ND = None Detected
N/A = TTLC results under 10% of standard, so extraction testing is not required
TBD = To Be Determined
TTLC = Total Threshold Limit Concentration in ppm or mg/kg
STLC = Soluble Threshold Limit Concentrations in mg/liter
TCLP = Toxicity Characteristic Leaching Procedure in mg/liter

The results of the CAM-17 analyses are as follows:

- The Montgomery Street trackside settled dust sample has an elevated concentration (6,100 mg/kg) of zinc over the TTLC concentration of 5,000 mg/kg and an elevated concentration (7,600 mg/kg) of copper over the TTLC concentration of 2,500 mg/kg; defining this material as a hazardous waste. STLC testing of chromium, copper, lead, nickel and zinc are needed to determine the leachability of these metals. Previous settled dust sampling in 2016 showed similar concentrations for chromium, copper, lead and zinc for this station.
- The Powell Street trackside settled dust sample has concentrations under the Title 22 TTLC for each (see Table 7). STLC testing of zinc is needed to determine the leachability of this metal, since the result was above 10% of the TTLC standard.
- The Civic Center trackside settled dust sample has concentrations under the Title 22 TTLC for each (see Table 7). STLC testing of chromium and zinc are needed to determine the leachability of these metals. Previous settled dust sampling in 2016 showed similar concentrations for chromium, copper, and zinc.
- The iron concentrations of the settled dust samples collected at all three stations ranged from 23,000 to 600,000 mg/kg.

Polarized Light Microscopy (PLM) analyses for asbestos for the Berkeley Station Break Room 108 found the following results:

Table 8: Bulk Asbestos Analysis

Sample I.D.	Location	Asbestos content	Comment
BERK-108-FLMAS	Berkeley Station Break Room 108	None detected in tile; 3% CH in black mastic	None detected in tile; 3% CH in black mastic

Note that airborne metal analyses were not conducted for the San Francisco stations in 2016 as the prior sampling found airborne metal concentrations to be relatively low. For informational purposes the metal concentrations in May 2011 for the Powell, Montgomery and Embarcadero Stations were as follows:

- Airborne lead concentrations during the sampling periods all fell below 0.014 µg/m^3, or less than the analytical detection limit. All perimeter airborne lead concentrations fell well below Cal/OSHA's Action Level or Permissible Exposure Level (PEL) of 30 µg/m^3 and 50 µg/m^3, respectively, as well as the National Ambient Air Quality Standard (NAAQS) of 1.5 µg/m^3.

- Airborne iron concentrations during the sampling period ranged from <4.6 to 80 µg/m^3. All airborne iron concentrations fell well below Cal/OSHA's Permissible Exposure Level (PEL) of 5,000 µg/m^3.

- Airborne copper concentrations during the sampling period ranged from <0.11 to 1.1 µg/m^3, or well below Cal/OSHA's Permissible Exposure Level (PEL) of 100 µg/m^3 for copper fume.

- Airborne zinc concentrations during the sampling period all fell below 1.4 µg/m^3, or less than the analytical detection limit, or well below Cal/OSHA's Permissible Exposure Level (PEL) of 5,000 µg/m^3 for zinc fumes.

- Airborne nickel concentrations during the sampling period ranged from <0.11 to 0.39 µg/m^3, or well below Cal/OSHA's Permissible Exposure Level (PEL) of 1,000 µg/m^3.

- Airborne chromium concentrations during the sampling period all ranged from 0.12 to 0.21 µg/m^3, or well below Cal/OSHA's Permissible Exposure Level (PEL) of 500 µg/m^3.

Please feel free to contact me directly if you have any questions.

Sincerely,
SCA ENVIRONMENTAL, INC.

Dan Leung, CIH, CSP, CAC #07-4175, CDPH #7329
Vice-President, Industrial Hygiene
(415) 867-9544
dleung@sca-enviro.com

Attachment 1

Laboratory Results – Airborne Asbestos

FIELD DATA SHEET

SCA Environmental, Inc.
650 Delancey St, #222, SF, CA 94107 — Tel 415-8821675 — Fax 415-9620736
1 Lakeside Drive, Suite 215, Oakland, CA 94612 — Tel 510-6456200 — Fax 415-9620736

PROJECT NAME BART 2018 Ambient Air Samp — **SCA PRJ #** B-12658
Zone — **DATE** 4/9/18 – 4/11/18
Activities Ambient Air Sampling
Asbestos-containing Stations

Inspected & Sampled By: JC — **Reviewed By:** GRC

COMMENTS: Ambient air sampling.
Media: 25mm 0.45micron MCEF
Method Ref: AHERA-TEM
Sampling Type: 0

BLANKS	BLANK			Rotom ID:	2310	Report #:	091807649	
SAMPLE LOC	19th St Mech Rm 108A	12th St Elect Rm 107C	Montgomery Coffee Stor/Elect Rm 110	Montgomery Stor Rm 111	Powell Elect Rm 110	Powell Police Brk Rm	16th St Mech Rm 101A	24th St Mech Rm 101A
START (LPM)	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8
STOP (LPM)	1.8	1.8	2	1.8	2.1	1.9	1.9	1.5
HEIGHT (ft)	5	5	5	5	5	5	5	5
SAMPLE I.D.	19-108A	12-107C	MONT-110	MONT-111	POWELL-110	POWELL-PBR	16-101A	24-101A
PUMP I.D.	1004	1001	1003	1004	1005	1001	1002	8026
AVG. FLOW RATE (LPM)	1.9	1.9	1.9	1.8	2	1.9	1.9	1.7
TIME ON (hh:mm)	15:28	15:16	13:18	12:47	11:52	11:33	13:53	14:13
TIME OFF	15:59	14:04	11:26	11:06	13:28	13:43	12:02	11:48
SAMPLED TIME (MIN.)	1471	1368	1328	1339	1536	1570	1329	1295
SAMPLE VOL. (L.)	2721	2531	2523	2410	2995	2905	2459	2137
microgram / M^3 lead								
p p b lead								
[PCM] Total Fibers / cc	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
[TEM] structures / cc								

SAMPLE LOC		MacArthur Break Rm 102	Ashby Elev Rm 204	Berkeley Break Rm 108	Lafayette Rm Train Control 103	Rockridge Jan Rm 203
START (LPM)		1.9	1.9	1.9	1.9	1.8
STOP (LPM)		1.9	1.8	2	1.9	1.7
HEIGHT (ft)		5	5	5	5	5
SAMPLE I.D.		MAC-102	ASH-204	BERK-108	LAF-TC-103	ROCK-203
PUMP I.D.		1005	10070	1003	1002	8026
AVG. FLOW RATE (LPM)		1.9	1.9	2.0	1.9	1.8
TIME ON (hh:mm)		16:53	17:26	17:44	16:04	16:28
TIME OFF		17:35	17:42	17:56	17:02	17:22
SAMPLED TIME (MIN.)		1482	1456	1452	1498	1494
SAMPLE VOL. (L.)		2816	2694	2831	2846	2615
microgram / M^3 lead						
p p b lead						
[PCM] Total Fibers / cc		0.002	<0.001	Overloaded	<0.001	<0.001
[TEM] structures / cc						

Sampling Location Diagram — work zone — * sample location

EMSL Analytical, Inc.

464 McCormick Street San Leandro, CA 94577
Tel/Fax: (510) 895-3675 / (510) 895-3680
http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091807649
Customer ID:	SCAE50
Customer PO:	B-12658
Project ID:	

Attention:	Dan Leung SCA Environmental, Inc. 650 Delancy Street Suite 222 San Francisco, CA 94107	**Phone:**	(415) 867-9544
		Fax:	(415) 962-0736
		Received Date:	04/12/2018 8:00 AM
		Analysis Date:	04/14/2018
		Collected Date:	
Project:	B-12658 - DL - BART, M-Line - 4/11		

Test Report: Fiber Count by Phase Contrast Microscopy (PCM), NIOSH 7400 Method - A Rules, Revision 3, Issue 2, 8/15/94

Sample	Location	Sample Date	Volume (liters)	Fibers	Fields	LOD (fib/cc)	Fibers/ mm²	Fibers/ cc	Notes
24-101A			2137.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0001									
16-101A			2459.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0002									
POW-110			2995.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0003									
POW-PBR			2905.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0004									
MONT-111			2410.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0005									
MONT-110			2523.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0006									
12-107C			2531.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0007									
19-108A			2721.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0008									
ASH-204			2694.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0009									
BERK-108									Overloaded
091807649-0010									
MAC-102			2816.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0011									
ROCK-203			2615.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0012									
LAF-TC103			2846.00	<5.5	100	0.001	<7.01	<0.001	
091807649-0013									

Limit of detection is 7 fibers/mm². Intra-laboratory Sr values: 5 - 20 fibers = 0.39, 21 - 50 fibers = 0.22, 51 - 100 fibers = 0.21. Inter-laboratory Sr values (Average of EMSL round robin data) = 0.35.The laboratory is not responsible for data reported in fibers/cc, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Unless otherwise noted, the results in this report have been blank corrected. Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by EMSL Analytical, Inc San Leandro, CA AIHA-LAP, LLC--IHLAP Accredited #101748

Initial report from: 04/14/2018 10:40:11

EMSL Analytical, Inc.

464 McCormick Street San Leandro, CA 94577

Tel/Fax: (510) 895-3675 / (510) 895-3680

http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091807649
Customer ID:	SCAE50
Customer PO:	B-12658
Project ID:	

Attention:	Dan Leung SCA Environmental, Inc. 650 Delancy Street Suite 222 San Francisco, CA 94107	**Phone:**	(415) 867-9544
		Fax:	(415) 962-0736
		Received Date:	04/12/2018 8:00 AM
		Analysis Date:	04/14/2018
		Collected Date:	
Project:	B-12658 - DL - BART, M-Line - 4/11		

Test Report: Fiber Count by Phase Contrast Microscopy (PCM), NIOSH 7400 Method - A Rules, Revision 3, Issue 2, 8/15/94

Sample	*Location*	*Sample Date*	*Volume (liters)*	*Fibers*	*Fields*	*LOD (fib/cc)*	*Fibers/ mm²*	*Fibers/ cc*	*Notes*
BLANK - HOLD *091807649-0014*									Field Blank Not Analyzed

The results reported have been blank corrected as applicable.

Analyst(s):

Nonette Patron PCM (13)

Matthew Batongbacal
or Other Approved Signatory

Limit of detection is 7 fibers/mm². Intra-laboratory Sr values: 5 - 20 fibers = 0.39, 21 - 50 fibers = 0.22, 51 - 100 fibers = 0.21. Inter-laboratory Sr values (Average of EMSL round robin data) = 0.35.The laboratory is not responsible for data reported in fibers/cc, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Unless otherwise noted, the results in this report have been blank corrected. Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by EMSL Analytical, Inc San Leandro, CA AIHA-LAP, LLC--IHLAP Accredited #101748

Initial report from: 04/14/2018 10:40:11

OrderID: 091807649

091807649

CHAIN OF CUSTODY FORM

Bill to: SCA

Email report/COC/Invoice to:

dlaung@sca-enviros.com (PROJ MGR)

shuang@scaehs.com (TECH)

labreports99@gmail.com (ACCT)

EMAIL HEADING: (Project #) - (Project Manager Initials) - (Site Name/Address) - (Date MMDD)

B-12658 | DL | BART, M-Line | 04/11

LAB EMSL

COURIER

LAB REP NOTIFIED: | Notification DATE/TIME:

AIRBILL/FLIGHT NO.: | Shipper REFERENCE I.D.

EST ARRIVAL DATE: | EST. ARRIVAL TIME:

INSTRUCTIONS TO LAB:

Method Reference 7400 PCM | AHERA TEM (≤0.005 s/cc AnaSen) | CARB-AHERA TEM 0.001 s/cc Ana Sensitivity

PLM (asbestos) | Flame AA (Lead)

Sample Media 25 37 mm | 0.45 0.8 micron | MCEF Bulk Water Wipe

RESULTS DUE: 3 Days | AM / PM

CHAIN OF CUSTODY DATA:

Sending Info: 14 samples submitted by CH on 04/11 at 19:00

Received by Lab: 14 samples received by SA on 4/12 at 8:00 AM

Received by Analyst: _____ samples received by _____ on _____ at _____ DB

SAMPLE ID	LITERS	Results	Ins/Blanks/Outs
24-101A	2137		
16-101A	2459		
POW-110	2993		
POW-PBR	2905		
MONT-111	2410		
MONT-110	2523		
12-107C	2531		
19-108A	2721		
ASH-204	2694		
BERK-108	2831		
MAC-102	2816		
ROCK-203	2615		
LAF-TC103	2846		
BLANK	0 LITERS		BLANK
	0 LITERS		BLANK
	0 LITERS		BLANK

INSTRUCTIONS TO LAB (delete items not applicable AND circle items applicable):

1. Pickup requested:
   Contact: _____
   Time of Call: _____
2. **Call contact to acknowledge receipt of samples.**
3. **Analyze samples by PCM only.**
4. Analyze inside samples by PCM first; if any sample >0.01 f/cc, contact program manager.
5. **If all samples are <0.01 f/cc, proceed with items 6, 7 or 8, as noted.**
6. Analyze inside samples only; stop if Avg >70 str/mm^2, contact PM before analyzing outsides or blanks.
7. **Analyze all samples, including outside samples and blanks.**
8. **Do NOT analyze outside or blank samples.**
9. **Analyze by TEM only the inside air sample with the highest PCM result.**
10. Serial analysis; stop at first positive (>1%); first trace (<0.1%);except sheetrock and plaster samples.
11. **Analyze all bulk samples, unless otherwise indicated.**
12. **PCB: <25 PPM detection limit required. Authorized to perform cleanup to meet the detection limit.**
13. _____

Report Number:

Invoice Number:

Supplies /Equipment	Qty
Hi-Vol (3040)	
Lo-Vol (3020)	13
TEM / Pb cassettes (3520)	
PCM cassettes (3500)	14
Bulk sampling supply (3710)	

ver 2015

Attachment 2

Respirable Dust (PM_{10}) Sampling Results – Embarcadero & Montgomery Street Stations

Instrument Name	DustTrak II
Model Number	8530
Serial Number	8530100827
Firmware Version	3.4
Calibration Date	10/28/2015
Test Name	Embarcadero NE
Test Start Time	1:37:32 PM
Test Start Date	4/10/2018
Test Length [D:H:M]	0:18:30
Test Interval [M:S]	10:00
Mass Average [mg/m3]	0.050
Mass Minimum [mg/m3]	0.006
Mass Maximum [mg/m3]	0.109
Mass TWA [mg/m3]	0.064
Photometric User Cal	1
Flow User Cal	0
Errors	
Number of Samples	111

Elapsed Time [s]	Mass [mg/m3]	Alarms	Errors
600	0.109		
1200	0.078		
1800	0.085		
2400	0.084		
3000	0.091		
3600	0.087		
4200	0.078		
4800	0.076		
5400	0.071		
6000	0.078		
6600	0.079		
7200	0.072		
7800	0.071		
8400	0.078		
9000	0.077		
9600	0.080		
10200	0.094		
10800	0.091		
11400	0.090		
12000	0.085		
12600	0.092		
13200	0.076		
13800	0.074		
14400	0.080		
15000	0.075		
15600	0.069		
16200	0.069		

16800	0.073
17400	0.072
18000	0.064
18600	0.056
19200	0.050
19800	0.049
20400	0.042
21000	0.038
21600	0.034
22200	0.032
22800	0.029
23400	0.025
24000	0.027
24600	0.035
25200	0.029
25800	0.031
26400	0.035
27000	0.038
27600	0.036
28200	0.034
28800	0.033
29400	0.034
30000	0.035
30600	0.037
31200	0.040
31800	0.037
32400	0.035
33000	0.031
33600	0.030
34200	0.038
34800	0.064
35400	0.062
36000	0.043
36600	0.034
37200	0.034
37800	0.035
38400	0.032
39000	0.026
39600	0.025
40200	0.023
40800	0.019
41400	0.017
42000	0.014
42600	0.012
43200	0.011
43800	0.010
44400	0.009

45000	0.008
45600	0.007
46200	0.007
46800	0.012
47400	0.009
48000	0.007
48600	0.006
49200	0.008
49800	0.007
50400	0.006
51000	0.006
51600	0.014
52200	0.023
52800	0.027
53400	0.034
54000	0.042
54600	0.048
55200	0.063
55800	0.047
56400	0.071
57000	0.072
57600	0.071
58200	0.060
58800	0.062
59400	0.062
60000	0.072
60600	0.075
61200	0.067
61800	0.060
62400	0.058
63000	0.068
63600	0.074
64200	0.081
64800	0.105
65400	0.101
66000	0.097
66600	0.085

Instrument Name	DustTrak II
Model Number	8530
Serial Number	8530100930
Firmware Version	3.4
Calibration Date	10/22/2015
Test Name	Embarcadero SW
Test Start Time	2:18:53 PM
Test Start Date	4/10/2018
Test Length [D:H:M]	0:19:00
Test Interval [M:S]	10:00
Mass Average [mg/m3]	0.061
Mass Minimum [mg/m3]	0.006
Mass Maximum [mg/m3]	0.135
Mass TWA [mg/m3]	0.073
Photometric User Cal	1
Flow User Cal	0
Errors	
Number of Samples	114

Elapsed Time [s]	Mass [mg/m3]	Alarms	Errors
600	0.089		
1200	0.102		
1800	0.095		
2400	0.074		
3000	0.066		
3600	0.066		
4200	0.062		
4800	0.056		
5400	0.061		
6000	0.085		
6600	0.098		
7200	0.088		
7800	0.088		
8400	0.084		
9000	0.065		
9600	0.056		
10200	0.087		
10800	0.093		
11400	0.105		
12000	0.111		
12600	0.104		
13200	0.102		
13800	0.104		
14400	0.085		
15000	0.095		
15600	0.095		
16200	0.072		

16800	0.081
17400	0.095
18000	0.098
18600	0.093
19200	0.110
19800	0.095
20400	0.067
21000	0.076
21600	0.070
22200	0.050
22800	0.036
23400	0.041
24000	0.047
24600	0.051
25200	0.033
25800	0.031
26400	0.027
27000	0.030
27600	0.038
28200	0.030
28800	0.024
29400	0.024
30000	0.027
30600	0.031
31200	0.041
31800	0.052
32400	0.059
33000	0.059
33600	0.058
34200	0.060
34800	0.039
35400	0.037
36000	0.033
36600	0.033
37200	0.036
37800	0.032
38400	0.036
39000	0.030
39600	0.021
40200	0.019
40800	0.017
41400	0.014
42000	0.012
42600	0.010
43200	0.009
43800	0.008
44400	0.008

45000	0.007
45600	0.007
46200	0.006
46800	0.006
47400	0.006
48000	0.009
48600	0.011
49200	0.010
49800	0.014
50400	0.012
51000	0.008
51600	0.008
52200	0.015
52800	0.069
53400	0.056
54000	0.061
54600	0.072
55200	0.092
55800	0.086
56400	0.070
57000	0.081
57600	0.090
58200	0.104
58800	0.083
59400	0.089
60000	0.101
60600	0.109
61200	0.088
61800	0.086
62400	0.084
63000	0.097
63600	0.090
64200	0.093
64800	0.091
65400	0.103
66000	0.131
66600	0.135
67200	0.121
67800	0.117
68400	0.129

Instrument Name	DustTrak II
Model Number	8530
Serial Number	8530100827
Firmware Version	3.4
Calibration Date	10/28/2015
Test Name	Montgomery S
Test Start Time	11:24:12 AM
Test Start Date	4/9/2018
Test Length [D:H:M]	0:22:50
Test Interval [M:S]	10:00
Mass Average [mg/m3]	0.044
Mass Minimum [mg/m3]	0.010
Mass Maximum [mg/m3]	0.111
Mass TWA [mg/m3]	0.060
Photometric User Cal	1
Flow User Cal	0
Errors	
Number of Samples	137

Elapsed Time [s]	Mass [mg/m3]	Alarms	Errors
600	0.111		
1200	0.087		
1800	0.083		
2400	0.084		
3000	0.077		
3600	0.088		
4200	0.088		
4800	0.078		
5400	0.082		
6000	0.071		
6600	0.069		
7200	0.077		
7800	0.066		
8400	0.072		
9000	0.070		
9600	0.058		
10200	0.058		
10800	0.061		
11400	0.062		
12000	0.066		
12600	0.068		
13200	0.058		
13800	0.064		
14400	0.063		
15000	0.051		
15600	0.036		
16200	0.039		

16800	0.056
17400	0.061
18000	0.064
18600	0.067
19200	0.062
19800	0.063
20400	0.066
21000	0.068
21600	0.063
22200	0.037
22800	0.041
23400	0.038
24000	0.039
24600	0.045
25200	0.043
25800	0.032
26400	0.035
27000	0.027
27600	0.022
28200	0.031
28800	0.035
29400	0.041
30000	0.032
30600	0.025
31200	0.032
31800	0.037
32400	0.036
33000	0.033
33600	0.033
34200	0.057
34800	0.057
35400	0.061
36000	0.063
36600	0.068
37200	0.065
37800	0.048
38400	0.033
39000	0.032
39600	0.040
40200	0.033
40800	0.016
41400	0.012
42000	0.011
42600	0.012
43200	0.013
43800	0.011
44400	0.012

45000	0.022
45600	0.025
46200	0.019
46800	0.017
47400	0.016
48000	0.015
48600	0.014
49200	0.013
49800	0.014
50400	0.014
51000	0.014
51600	0.013
52200	0.012
52800	0.012
53400	0.011
54000	0.011
54600	0.011
55200	0.011
55800	0.012
56400	0.013
57000	0.012
57600	0.012
58200	0.015
58800	0.011
59400	0.010
60000	0.011
60600	0.019
61200	0.020
61800	0.020
62400	0.022
63000	0.021
63600	0.026
64200	0.029
64800	0.031
65400	0.068
66000	0.069
66600	0.062
67200	0.059
67800	0.056
68400	0.048
69000	0.035
69600	0.048
70200	0.052
70800	0.064
71400	0.048
72000	0.035
72600	0.035

73200	0.040
73800	0.063
74400	0.074
75000	0.065
75600	0.081
76200	0.085
76800	0.065
77400	0.071
78000	0.070
78600	0.066
79200	0.060
79800	0.061
80400	0.058
81000	0.050
81600	0.036
82200	0.032

Instrument Name	DustTrak II
Model Number	8530
Serial Number	8530100930
Firmware Version	3.4
Calibration Date	10/22/2015
Test Name	Montgomery
Test Start Time	12:50:43 PM
Test Start Date	4/9/2018
Test Length [D:H:M]	0:22:00
Test Interval [M:S]	10:00
Mass Average [mg/m3]	0.051
Mass Minimum [mg/m3]	0.016
Mass Maximum [mg/m3]	0.102
Mass TWA [mg/m3]	0.073
Photometric User Cal	1
Flow User Cal	0
Errors	
Number of Samples	132

Elapsed Time [s]	Mass [mg/m3]	Alarms	Errors
600	0.091		
1200	0.092		
1800	0.094		
2400	0.092		
3000	0.088		
3600	0.089		
4200	0.076		
4800	0.078		
5400	0.063		
6000	0.064		
6600	0.065		
7200	0.060		
7800	0.051		
8400	0.042		
9000	0.048		
9600	0.055		
10200	0.055		
10800	0.069		
11400	0.078		
12000	0.087		
12600	0.102		
13200	0.096		
13800	0.089		
14400	0.081		
15000	0.071		
15600	0.075		
16200	0.077		

16800	0.068
17400	0.060
18000	0.063
18600	0.086
19200	0.098
19800	0.101
20400	0.097
21000	0.064
21600	0.071
22200	0.075
22800	0.075
23400	0.081
24000	0.076
24600	0.065
25200	0.064
25800	0.056
26400	0.048
27000	0.058
27600	0.058
28200	0.058
28800	0.047
29400	0.046
30000	0.044
30600	0.045
31200	0.041
31800	0.053
32400	0.054
33000	0.053
33600	0.053
34200	0.056
34800	0.070
35400	0.070
36000	0.071
36600	0.064
37200	0.058
37800	0.048
38400	0.054
39000	0.038
39600	0.035
40200	0.038
40800	0.029
41400	0.030
42000	0.027
42600	0.026
43200	0.019
43800	0.019
44400	0.017

45000	0.017
45600	0.016
46200	0.018
46800	0.018
47400	0.018
48000	0.020
48600	0.023
49200	0.024
49800	0.022
50400	0.022
51000	0.020
51600	0.019
52200	0.019
52800	0.018
53400	0.018
54000	0.016
54600	0.016
55200	0.017
55800	0.018
56400	0.018
57000	0.019
57600	0.019
58200	0.021
58800	0.025
59400	0.026
60000	0.024
60600	0.023
61200	0.027
61800	0.029
62400	0.032
63000	0.031
63600	0.031
64200	0.035
64800	0.047
65400	0.056
66000	0.055
66600	0.044
67200	0.038
67800	0.038
68400	0.054
69000	0.059
69600	0.038
70200	0.036
70800	0.032
71400	0.034
72000	0.033
72600	0.036

73200	0.050
73800	0.047
74400	0.063
75000	0.042
75600	0.061
76200	0.081
76800	0.073
77400	0.069
78000	0.071
78600	0.080
79200	0.069

Attachment 3

San Francisco Line Spot Sampling Results for PM_{10} and $PM_{2.5}$

				PM10 Concentrations (mg/m3)			PM2.5 Concentrations (mg/m3)		
Station	**Location**	**Date**	**Time**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**
24th St. Mission	Trackside	4/11/2018	12:46	0.158	0.127	0.095	0.115	0.100	0.084
24th St. Mission	Agent Booth	4/11/2018	12:53	0.128	0.071	0.014	0.104	0.063	0.022
24th St. Mission	Ticket Machines	4/11/2018	13:06	0.089	0.055	0.020	0.094	0.056	0.017
16th St. Mission	Trackside	4/11/2018	12:08	0.149	0.121	0.093	0.120	0.100	0.079
16th St. Mission	Agent Booth	4/11/2018	12:20	0.134	0.090	0.046	0.090	0.067	0.043
16th St. Mission	Ticket Machines	4/11/2018	12:29	0.124	0.079	0.033	0.102	0.066	0.029
Civic Center	Trackside	4/11/2018	11:33	0.193	0.161	0.128	0.145	0.117	0.088
Civic Center	North Agent Booth	4/11/2018	11:50	0.077	0.048	0.019	0.052	0.033	0.013
Civic Center	North Ticket Machines	4/11/2018	11:55	0.082	0.060	0.037	0.050	0.037	0.024
Powell	Police Squad Room	4/11/2018	11:16	0.037	0.030	0.022	0.033	0.025	0.017
Powell	South Agent Booth	4/11/2018	11:06	0.098	0.059	0.019	0.067	0.039	0.011
Powell	North Ticket Machines	4/11/2018	10:52	0.102	0.084	0.066	0.071	0.058	0.044
Montgomery	Trackside	4/11/2018	10:10	0.136	0.122	0.108	0.098	0.090	0.081
Montgomery	North Agent Booth	4/11/2018	10:26	0.121	0.094	0.067	0.091	0.067	0.043
Montgomery	North Ticket Machines	4/11/2018	10:33	0.111	0.087	0.062	0.075	0.058	0.040
Embarcadero	Trackside	4/11/2018	10:02	0.270	0.242	0.213	0.172	0.150	0.128
Embarcadero	Southwest Agent Booth	4/11/2018	9:44	0.181	0.159	0.137	0.108	0.101	0.093
Embarcadero	Southwest Ticket Machines	4/11/2018	9:50	0.168	0.142	0.116	0.106	0.095	0.083
12th St. Oakland	Upper Platform Trackside	4/11/2018	13:54	0.038	0.027	0.016	0.030	0.024	0.017
12th St. Oakland	Central Agent Booth	4/11/2018	14:08	0.038	0.029	0.019	0.032	0.025	0.017
12th St. Oakland	North Ticket Machines	4/11/2018	14:16	0.049	0.038	0.026	0.035	0.030	0.024
19th St. Oakland	Lower Platform Trackside	4/11/2018	16:28	0.078	0.050	0.022	0.060	0.038	0.016
19th St. Oakland	Central Agent Booth	4/11/2018	16:07	0.047	0.031	0.015	0.043	0.030	0.016
19th St. Oakland	Northeast Ticket Machines	4/11/2018	16:21	0.034	0.024	0.013	0.019	0.015	0.010

Attachment 4

CAM-17 Settled Dust Metals Analyses – Montgomery, Powell & Civic Center Stations

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1804775 **Amended:** 05/18/2018

Report Created for: SCA Environmental, Inc.

1 Lakeside Drive, Suite 215
Oakland, CA 94612

Project Contact: Dan Leung
Project P.O.:
Project: B-12658; BART M-Line

Project Received: 04/13/2018

Analytical Report reviewed & approved for release on 04/20/2018 by:

Yen Cao
Project Manager

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: SCA Environmental, Inc.
Project: B-12658; BART M-Line
WorkOrder: 1804775

Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
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
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
N/A	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
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

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1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	SCA Environmental, Inc.	**WorkOrder:**	1804775
Date Received:	4/13/18 9:37	**Extraction Method:**	SW3050B
Date Prepared:	4/13/18	**Analytical Method:**	SW6020
Project:	B-12658; BART M-Line	**Unit:**	mg/Kg

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
MONT-305	**1804775-001A**	**Soil**	**04/09/2018 13:00**	**ICP-MS3 110SMPL.D**	**156474**

Analytes	Result	RL	DF	Date Analyzed
Antimony	**16**	0.50	1	04/16/2018 23:04
Arsenic	**44**	0.50	1	04/16/2018 23:04
Barium	**55**	5.0	1	04/16/2018 23:04
Beryllium	ND	0.50	1	04/16/2018 23:04
Cadmium	**2.4**	0.25	1	04/16/2018 23:04
Chromium	**270**	0.50	1	04/16/2018 23:04
Cobalt	**47**	0.50	1	04/16/2018 23:04
Copper	**7600**	10	20	04/17/2018 11:03
Iron	**600,000**	400	20	04/17/2018 11:03
Lead	**280**	0.50	1	04/16/2018 23:04
Mercury	**0.11**	0.050	1	04/16/2018 23:04
Molybdenum	**33**	0.50	1	04/16/2018 23:04
Nickel	**1300**	10	20	04/17/2018 11:03
Selenium	ND	0.50	1	04/16/2018 23:04
Silver	**1.3**	0.50	1	04/16/2018 23:04
Thallium	ND	0.50	1	04/16/2018 23:04
Vanadium	**9.1**	0.50	1	04/16/2018 23:04
Zinc	**6100**	100	20	04/17/2018 11:03

Surrogates	REC (%)	Limits	
Terbium	104	70-130	04/16/2018 23:04

Analyst(s): JC, ND

(Cont.)

CA ELAP 1644 • NELAP 4033ORELAP

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1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	SCA Environmental, Inc.	**WorkOrder:**	1804775
Date Received:	4/13/18 9:37	**Extraction Method:**	SW3050B
Date Prepared:	4/13/18	**Analytical Method:**	SW6020
Project:	B-12658; BART M-Line	**Unit:**	mg/Kg

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
POW-304	**1804775-002A**	**Soil**	**04/10/2018 12:00**	**ICP-MS3 116SMPL.D**	**156474**

Analytes	Result	RL	DF	Date Analyzed
Antimony	**4.8**	0.50	1	04/16/2018 23:41
Arsenic	**3.1**	0.50	1	04/16/2018 23:41
Barium	**61**	5.0	1	04/16/2018 23:41
Beryllium	ND	0.50	1	04/16/2018 23:41
Cadmium	**4.1**	0.25	1	04/16/2018 23:41
Chromium	**21**	0.50	1	04/16/2018 23:41
Cobalt	**3.4**	0.50	1	04/16/2018 23:41
Copper	**160**	0.50	1	04/16/2018 23:41
Iron	**23,000**	20	1	04/16/2018 23:41
Lead	**43**	0.50	1	04/16/2018 23:41
Mercury	ND	0.050	1	04/16/2018 23:41
Molybdenum	**4.1**	0.50	1	04/16/2018 23:41
Nickel	**16**	0.50	1	04/16/2018 23:41
Selenium	ND	0.50	1	04/16/2018 23:41
Silver	ND	0.50	1	04/16/2018 23:41
Thallium	ND	0.50	1	04/16/2018 23:41
Vanadium	**8.9**	0.50	1	04/16/2018 23:41
Zinc	**1900**	5.0	1	04/16/2018 23:41

Surrogates	REC (%)	Limits	
Terbium	107	70-130	04/16/2018 23:41

Analyst(s): ND

(Cont.)

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1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	SCA Environmental, Inc.	**WorkOrder:**	1804775
Date Received:	4/13/18 9:37	**Extraction Method:**	SW3050B
Date Prepared:	4/13/18	**Analytical Method:**	SW6020
Project:	B-12658; BART M-Line	**Unit:**	mg/Kg

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
CIVIC-301A/B	1804775-003A	Soil	04/10/2018 12:30	ICP-MS3 117SMPL.D	156474

Analytes	Result	RL	DF	Date Analyzed
Antimony	**15**	0.50	1	04/16/2018 23:47
Arsenic	**13**	0.50	1	04/16/2018 23:47
Barium	**220**	5.0	1	04/16/2018 23:47
Beryllium	ND	0.50	1	04/16/2018 23:47
Cadmium	**26**	0.25	1	04/16/2018 23:47
Chromium	**93**	0.50	1	04/16/2018 23:47
Cobalt	**17**	0.50	1	04/16/2018 23:47
Copper	**610**	5.0	10	04/17/2018 11:09
Iron	**94,000**	200	10	04/17/2018 11:09
Lead	**81**	0.50	1	04/16/2018 23:47
Mercury	**0.084**	0.050	1	04/16/2018 23:47
Molybdenum	**20**	0.50	1	04/16/2018 23:47
Nickel	**120**	0.50	1	04/16/2018 23:47
Selenium	ND	0.50	1	04/16/2018 23:47
Silver	ND	0.50	1	04/16/2018 23:47
Thallium	ND	0.50	1	04/16/2018 23:47
Vanadium	**37**	0.50	1	04/16/2018 23:47
Zinc	**1300**	5.0	1	04/16/2018 23:47

Surrogates	REC (%)	Limits	
Terbium	106	70-130	04/16/2018 23:47

Analyst(s): JC, ND

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"When Quality Counts"

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Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	SCA Environmental, Inc.	**WorkOrder:**	1804775
Date Prepared:	4/13/18	**BatchID:**	156474
Date Analyzed:	4/16/18	**Extraction Method:**	SW3050B
Instrument:	ICP-MS1, ICP-MS2	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	B-12658; BART M-Line	**Sample ID:**	MB/LCS-156474 1804780-001AMS/MSD

QC Summary Report for Metals

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Antimony	ND	54.6	0.50	50	-	109	75-125
Arsenic	ND	54.1	0.50	50	-	108	75-125
Barium	ND	538	5.0	500	-	108	75-125
Beryllium	ND	55.4	0.50	50	-	111	75-125
Cadmium	ND	53.2	0.25	50	-	106	75-125
Chromium	ND	52.8	0.50	50	-	106	75-125
Cobalt	ND	52.0	0.50	50	-	104	75-125
Copper	ND	53.4	0.50	50	-	107	75-125
Iron	ND	5300	20	5000	-	106	75-125
Lead	ND	53.9	0.50	50	-	108	75-125
Mercury	ND	1.32	0.050	1.25	-	106	75-125
Molybdenum	ND	53.3	0.50	50	-	107	75-125
Nickel	ND	54.6	0.50	50	-	109	75-125
Selenium	ND	54.6	0.50	50	-	109	75-125
Silver	ND	52.8	0.50	50	-	106	75-125
Thallium	ND	52.5	0.50	50	-	105	75-125
Vanadium	ND	53.3	0.50	50	-	107	75-125
Zinc	ND	544	5.0	500	-	109	75-125
Surrogate Recovery							
Terbium	514	545		500	103	109	70-130

(Cont.)

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Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	SCA Environmental, Inc.	**WorkOrder:**	1804775
Date Prepared:	4/13/18	**BatchID:**	156474
Date Analyzed:	4/16/18	**Extraction Method:**	SW3050B
Instrument:	ICP-MS1, ICP-MS2	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	B-12658; BART M-Line	**Sample ID:**	MB/LCS-156474 1804780-001AMS/MSD

QC Summary Report for Metals

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Antimony	55.1	54.2	50	ND	110	108	75-125	1.63	20
Arsenic	55.9	54.9	50	7.818	96	94	75-125	1.75	20
Barium	601	580	500	53.09	110	105	75-125	3.64	20
Beryllium	52.3	49.8	50	ND	104	99	75-125	4.95	20
Cadmium	51.7	51.0	50	ND	103	102	75-125	1.36	20
Chromium	91.8	99.3	50	38.50	107	122	75-125	7.85	20
Cobalt	57.3	55.8	50	8.506	98	95	75-125	2.71	20
Copper	64.8	63.1	50	13.53	103	99	75-125	2.67	20
Iron	22,900	22,300	5000	18,000	96	85	75-125	2.30	20
Lead	60.8	59.6	50	6.859	108	106	75-125	1.89	20
Mercury	1.37	1.33	1.25	0.06610	105	101	75-125	3.41	20
Molybdenum	52.8	51.3	50	0.7279	104	101	75-125	2.77	20
Nickel	100	98.2	50	49.90	101	97	75-125	2.18	20
Selenium	51.2	50.1	50	ND	102	100	75-125	2.27	20
Silver	51.5	50.9	50	ND	103	102	75-125	1.13	20
Thallium	50.7	50.1	50	ND	101	100	75-125	1.27	20
Vanadium	88.6	86.5	50	34.10	109	105	75-125	2.41	20
Zinc	566	558	500	49.49	103	102	75-125	1.39	20
Surrogate Recovery									
Terbium	525	515	500		105	103	70-130	1.98	20

Analyte	DLT Result	DLTRef Val	%D	%D Limit
Antimony	ND<2.5	ND	-	-
Arsenic	7.84	7.818	0.281	-
Barium	55.4	53.09	4.35	-
Beryllium	ND<2.5	ND	-	-
Cadmium	ND<1.2	ND	-	-
Chromium	41.8	38.50	8.57	20
Cobalt	9.34	8.506	9.80	-
Copper	13.2	13.53	2.44	20
Iron	20,000	18,000	11.1	20
Lead	7.08	6.859	3.22	-
Mercury	ND<0.25	0.06610	-	-
Molybdenum	ND<2.5	0.7279	-	-

(Cont.)

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Quality Control Report

Client:	SCA Environmental, Inc.	**WorkOrder:**	1804775
Date Prepared:	4/13/18	**BatchID:**	156474
Date Analyzed:	4/16/18	**Extraction Method:**	SW3050B
Instrument:	ICP-MS1, ICP-MS2	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	B-12658; BART M-Line	**Sample ID:**	MB/LCS-156474 1804780-001AMS/MSD

QC Summary Report for Metals

Analyte	DLT Result	DLTRef Val	%D	%D Limit
Nickel	52.0	49.90	4.21	20
Selenium	ND<2.5	ND	-	-
Silver	ND<2.5	ND	-	-
Thallium	ND<2.5	ND	-	-
Vanadium	36.8	34.10	7.92	20
Zinc	49.1	49.49	0.788	-

%D Control Limit applied to analytes with concentrations greater than 25 times the reporting limits.

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CHAIN-OF-CUSTODY RECORD

WorkOrder: 1804775 **ClientCode: SCAO**

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

Report to:
Dan Leung
SCA Environmental, Inc.
1 Lakeside Drive, Suite 215
Oakland, CA 94612
(510) 267-2726 FAX: (510) 839- 6200

Email: dleung@sca-enviro.com; labreports99@gm
cc/3rd Party:
PO:
Project: B-12658; BART M-Line

Bill to:
Accounts Payable
SCA Environmental, Inc.
1 Lakeside Drive, Suite 215
Oakland, CA 94612
emuise@sca-ic.com; pgervasio@scaeh

Requested TAT: 5 days;

Date Received: **04/13/2018**
Date Logged: **04/13/2018**

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
1804775-001	MONT-305	Soil	4/9/2018 13:00	☐	A											
1804775-002	POW-304	Soil	4/10/2018 12:00	☐	A											
1804775-003	CIVIC-301A/B	Soil	4/10/2018 12:30	☐	A											

Test Legend:

1	CAM17MS_TTLC_S	2		3		4	
5		6		7		8	
9		10		11		12	

Prepared by: Keylen Juarez

Comments:

NOTE: Soil samples are discarded 60 days after results are reported 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: SCA ENVIRONMENTAL, INC. **Project:** B-12658; BART M-Line **Work Order:** 1804775

Client Contact: Dan Leung **QC Level:** LEVEL 2

Contact's Email: dleung@sca-enviro.com; labreports99@gmail.com **Comments:** **Date Logged:** 4/13/2018

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

Lab ID	Client ID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1804775-001A	MONT-305	Soil	SW6020 (CAM 17)	1	2oz plastic jar w/ lid	☐	4/9/2018 13:00	5 days		☐	
1804775-002A	POW-304	Soil	SW6020 (CAM 17)	1	2oz plastic jar w/ lid	☐	4/10/2018 12:00	5 days		☐	
1804775-003A	CIVIC-301A/B	Soil	SW6020 (CAM 17)	1	2oz plastic jar w/ lid	☐	4/10/2018 12:30	5 days		☐	

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.

#1804775

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CHAIN OF CUSTODY RECORD

TURN AROUND TIME: RUSH ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAY ☒ 10 DAY ☐

GeoTracker EDF ☐ PDF ☒ EDD ☐ Write On (DW) ☐ EQuIS ☐

Effluent Sample Requiring "J" flag ☐ UST Clean Up Fund Project ☐; Claim #_____

Report To: Dan Leung	**Bill To:** SCA Environmental
Company: SCA Environmental, Inc	
1 Lakeside Dr. #205,	dleung@sca-enviro.com
Oakland, CA 94612	**E-Mail:** labreports99@gmail.com
Tele: (415) 867-9544	**Fax:** ( )
Project #: B-12658	**Project Name:** BART M-Line
Project Location: BART M-Line	**Purchase Order#**
Sampler Signature:	

SAMPLE ID	Location/ Field Point Name	SAMPLING Date	SAMPLING Time	# Containers	MATRIX: Ground Water	Waste Water	Drinking Water	Sea \ Water	Soil	Air	Sludge	Other	METHOD PRESERVED: HCL	HNO_3	Other
MONT-305	Montgomery	4/9/18	13:00	1								X			
POW-304	Powell	4/10/18	12:00	1								X			
CIVIC-301A/B	Civic Center	4/10/18	12:30	1								X			

Analysis Request

BTEX & TPH as Gas (8021/ 8015 or 8260) / MTBE	TPH as Diesel (8015)	Total Petroleum Oil & Grease (1664 / 5520 E/B&F)	Total Petroleum Hydrocarbons (418.1)	MTBE / BTEX ONLY (EPA 8260/ 8021)	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ; Aroclors / Congeners	EPA 507 / 8141 (NP Pesticides)	EPA 515 / 8151 (Acidic Cl Herbicides)	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.7 / 200.8 / 6010 / 6020)	LUFT 5 Metals (200.7 / 200.8 / 6010 / 6020)	Metals (200.7 / 200.8 / 6010 / 6020)	Filter sample for DISSOLVED metals analysis
												X			
												X			
												X			

****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.**

Relinquished By:	Date:	Time:	Received By:
Stanley Leung	4/12/18	15:00	UPS
UPS	4/13/18		

ICE/t°_____
GOOD CONDITION_____
HEAD SPACE ABSENT_____
DECHLORINATED IN LAB_____
APPROPRIATE CONTAINERS
PRESERVED IN LAB_____

VOAS O&G METALS OTHER HAZARDOUS:
PRESERVATION_____ pH<2_____

COMMENTS:
PCB
<25 PPM detection limit required.
Authorized to perform cleanup to meet the detection limit

J456 687 3861

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Sample Receipt Checklist

Client Name:	**SCA Environmental, Inc.**	Date and Time Received:	**4/13/2018 09:37**
Project:	**B-12658; BART M-Line**	Date Logged:	**4/13/2018**
		Received by:	Jena Alfaro
WorkOrder №:	**1804775** Matrix: Soil	Logged by:	Keylen Juarez
Carrier:	UPS		

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	☐
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:				NA	☑
Water - VOA vials have zero headspace / no bubbles?	Yes	☐	No	☐	NA	☑
Sample labels checked for correct preservation?	Yes	☐	No	☑		
pH acceptable upon receipt (Metal: <2; 522: <4; 218.7: >8)?	Yes	☐	No	☐	NA	☑
UCMR Samples:						
pH tested and acceptable upon receipt (200.8: ≤2; 525.3: ≤4; 530: ≤7; 541: <3; 544: <6.5 & 7.5)?	Yes	☐	No	☐	NA	☑
Free Chlorine tested and acceptable upon receipt (<0.1mg/L)?	Yes	☐	No	☐	NA	☑

Comments:

Attachment 5

Laboratory Results - Bulk Asbestos Analysis

EMSL Analytical, Inc.

464 McCormick Street San Leandro, CA 94577

Tel/Fax: (510) 895-3675 / (510) 895-3680

http://www.EMSL.com / sanleandrolab@emsl.com

EMSL Order:	091807657
Customer ID:	SCAE50
Customer PO:	B-12658
Project ID:	

Attention:	Dan Leung	**Phone:**	(415) 867-9544
	SCA Environmental, Inc.	**Fax:**	(415) 962-0736
	650 Delancy Street	**Received Date:**	04/12/2018 8:00 AM
	Suite 222	**Analysis Date:**	04/14/2018
	San Francisco, CA 94107	**Collected Date:**	
Project:	B-12658 - DL - BART, M-LINE - 04/11		

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
BERK-108-FLMAS-Floor Tile *091807657-0001*		White Non-Fibrous Homogeneous		70% Ca Carbonate 5% Matrix 25% Non-fibrous (Other)	None Detected
BERK-108-FLMAS-Mastic *091807657-0001A*		Black Non-Fibrous Homogeneous		80% Matrix 17% Non-fibrous (Other)	3% Chrysotile

Analyst(s)

Shane Heisser (2)

Matthew Batongbacal
or Other Approved Signatory

Initial report from: 04/14/2018 17:03:34

OrderID: 091807657

№091807657

CHAIN OF CUSTODY FORM

Bill to: SCA

Email report/COC/Invoice to:

dleung@sca-enviro.com (PROJ MGR)

shuang@scaehs.com (TECH)

labreports99@gmail.com (ACCT)

EMAIL HEADING: (Project #) - (Project Manager Initials) - (Site Name/Address) - (Date MMDD)

B-12658 | DL | BART, M-Line | 04/11

LAB EMSL

COURIER

LAB REP NOTIFIED:		Notification DATE/TIME:	
AIRBILL/FLIGHT NO.:		Shipper REFERENCE I.D.	
EST ARRIVAL DATE:		EST. ARRIVAL TIME:	

INSTRUCTIONS TO LAB:

Method Reference 7400 PCM | AHERA TEM (≤0.005 s/cc AnaSen) | CARB-AHERA TEM 0.001 s/cc Ana Sensitivity

PLM (asbestos) | Flame AA (Lead)

Sample Media 25 37 mm 0.45 0.8 micron MCEF Bulk Water Wipe

RESULTS DUE: 3 Days AM / PM

CHAIN OF CUSTODY DATA:

Sending Info: 1 samples submitted by CH on 04/11 at 19:00

Received by Lab: 1 samples received by SA on 4/12 at 8:00AM

Received by Analyst: _____ samples received by _____ on _____ at _____ DB

SAMPLE ID	LITERS	Results	Ins/Blanks/Outs
BERK-108-ELMAS			
	0 LITERS		BLANK
	0 LITERS		BLANK
	0 LITERS		BLANK

INSTRUCTIONS TO LAB (delete items not applicable AND circle items applicable):

1. Pickup requested:
   Contact: _____
   Time of Call: _____
2. **Call contact to acknowledge receipt of samples.**
3. **Analyze samples by PCM only.**
4. Analyze inside samples by PCM first; if any sample >0.01 f/cc, contact program manager.
5. **If all samples are <0.01 f/cc, proceed with items 6, 7 or 8, as noted.**
6. Analyze inside samples only; stop if Avg >70 str/mm^2, contact PM before analyzing outsides or blanks.
7. **Analyze all samples, including outside samples and blanks.**
8. **Do NOT analyze outside or blank samples.**
9. **Analyze by TEM only the inside air sample with the highest PCM result.**
10. Serial analysis; stop at first positive (>1%); first trace (<0.1%);except sheetrock and plaster samples.
11. **Analyze all bulk samples, unless otherwise indicated.**
12. **PCB: <25 PPM detection limit required. Authorized to perform cleanup to meet the detection limit.**
13. _____

Report Number:

Invoice Number:

Supplies /Equipment	Qty
Hi-Vol (3040)	
Lo-Vol (3020)	
TEM / Pb cassettes (3520)	
PCM cassettes (3500)	
Bulk sampling supply (3710)	1

ver 2015

Attachment 6

SCA's Personnel Certifications

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Daniel Leung
Name

Certification No. **07-4175**

Expires on **04/19/19**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

ABIH®

american board of industrial hygiene®

organized to improve the practice of industrial hygiene
proclaims that

Daniel M.K. Leung

having met all requirements of
education, experience and examination,
is hereby certified in the

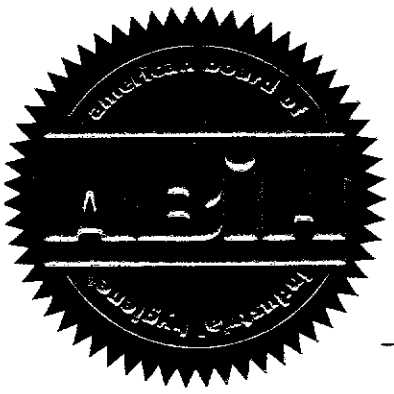
COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE

and has the right to use the designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH

Certificate Number	**10893 CP**
Awarded:	**November 21, 2015**
Expiration Date:	**June 1, 2021**



Chair, ABIH

Chief Executive Officer, ABIH

State of California Department of Public Health

Lead-Related Construction Certificate

Certificate Type

Inspector/Assessor

Expiration Date

10/14/2018

15080

Daniel M. K. Leung

ID #: 7329

State of California
Division of Occupational Safety and Health

Certified Site Surveillance Technician

Chaowen Huang
Name

Certification No. 16-5737

Expires on 08/17/18

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California Department of Public Health

Lead-Related Construction Certificate

Certificate Type

Expiration Date

Sampling Technician 09/09/2018

273143

Chaowen Huang

ID #: 29358