



Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

**TWELFTH QUARTERLY REPORT OF AMBIENT AIR
QUALITY MONITORING AT SUNSHINE CANYON
LANDFILL AND VAN GOGH ELEMENTARY SCHOOL
(September 1, 2010–November 30, 2010)**

**Quarterly Report
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**By
David L. Vaughn
Paul T. Roberts
Sonoma Technology, Inc.
1455 N. McDowell Blvd., Suite D
Petaluma, CA 94954-6503**

**Prepared for
Planning Department, City of Los Angeles
City Hall, Room 825
200 N. Spring St.
Los Angeles, CA 90012**

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EXECUTIVE SUMMARY

ES.1 BACKGROUND

Continuous monitoring of meteorological and air quality parameters began at the Sunshine Canyon Landfill and at Van Gogh Elementary School in the nearby community of Granada Hills in fall 2007. PM₁₀ (particulate matter less than 10 microns in aerodynamic diameter) is measured hourly, and wind speed, wind direction, and black carbon (BC, a surrogate for diesel particulate matter) are measured as 5-minute averages and reported as hourly averages. The collected data undergo quarterly validation and are evaluated for completeness. PM₁₀ concentrations are compared with federal and state PM₁₀ standards. When PM₁₀ exceedances occur, additional comparisons are made with the historical, regional, and annual ambient PM₁₀ concentrations. At least annually, the PM₁₀ and BC data are analyzed to characterize the impact of landfill operations on ambient air quality on a neighborhood scale. The validated hourly data and a summary of the analytical results and field operations are reported to the Planning Department of the City of Los Angeles.

ES.2 STATISTICS

Data capture for the monitoring period of September 1, 2010, through November 30, 2010, was close to 100% for PM₁₀, BC, and wind parameters at both sites. There were no exceedances of the 150 µg/m³ 24-hr federal PM₁₀ standard. The more stringent 24-hr California state PM₁₀ standard (50 µg/m³) was exceeded during this period on only 8% of the days at the Van Gogh School site and on only 9% of the days at the landfill site, the lowest proportions of any fall measurement periods to date. Average 24-hr BC concentrations at both monitoring sites were similar for the fall quarterly period, with average and maximum concentrations the lowest of any fall quarterly measurement period to date.

ES.3 LANDFILL GAS SAMPLING

One-hour integrated ambient air samples for landfill gas (LFG) and hazardous air pollutants (HAPs) were obtained on November 5 and November 18. Analysis of the November 5 samples is complete. Most concentrations during the November 5 sampling event were within the range of values observed elsewhere in the Los Angeles and Ventura county areas. Elevated levels of aromatic hydrocarbons (compounds with a benzene ring) and the compounds dichloromethane, hexane, and methane were detected in the 7:00 a.m. sample at the landfill monitoring site. Aromatic hydrocarbons were high at the Van Gogh School site in the 8:00 a.m. sample. This suggests a plume passing the landfill site late in the 7:00-8:00 a.m. hour, then moving to the school monitoring site, where the plume was detected in the 8:00-9:00 a.m. sample.

1. INTRODUCTION

This report provides a summary of data completeness, ambient PM₁₀ concentrations, average and maximum black carbon (BC) concentrations, concentrations of methane and non-methane organic compounds (NMOC) from landfill gas (LFG) sampling, instrument flow rate verification (quality control) data, and field operations for the quarterly period of September 1, 2010, through November 30, 2010. Data from this quarterly period represent the third year of fall season data collected from continuous monitoring at the Sunshine Canyon Landfill and Van Gogh Elementary School monitoring sites.

2. DATA COMPLETENESS

Table 2-1 gives completeness statistics for all measured variables for the period September 1, 2010, through November 30, 2010. Data capture rates for PM₁₀, BC, and wind speed/wind direction (WS/WD) were near 100% at both sites. A few hours of meteorological data from the landfill site were invalidated when the data acquisition system's analog-to-digital converter incorrectly recorded zero values for wind speed and wind direction.

Table 2-1. Data completeness statistics for the recent monitoring quarter, September 1, 2010, through November 30, 2010.

Monitoring Location	Dates	Percent Data Capture ^a (%)			Percent Data Valid or Suspect (%) ^b			Percent Data Suspect (%) ^c		
		PM ₁₀	BC	WS/WD	PM ₁₀	BC	WS/WD	PM ₁₀	BC	WS/WD
Sunshine Canyon Landfill	9/1/10-11/30/10	99.4%	100%	99.3%	97.6%	100%	99.8%	0.0%	0.0%	0.0%
Van Gogh Elem. School	9/1/10-11/30/10	100%	100%	100%	99.8%	100%	99.9%	0.0%	0.0%	0.0%

^a Percent Data Capture is the percentage of collected data values divided by the total number of expected data intervals in the date range (e.g., for the raw BC 5-minute data, 12 data values are expected per hour and 288 data values are expected per day).

^b Percent Data Valid or Suspect is the percentage of data values that are either valid or suspect, divided by the number of captured data values.

^c Percent Data Suspect is the percentage of data values labeled as suspect divided by the number of captured data values.

3. PM₁₀ EXCEEDANCES

The federal and state PM₁₀ exceedances for the current quarter, the corresponding quarters of the previous two years (2008 and 2009), and the baseline year (November 22, 2001, to November 21, 2002), are summarized in **Table 3-1**. There were no exceedances of the 24-hr federal PM₁₀ standard during this fall quarter at either the Sunshine Canyon Landfill or Van Gogh School. The proportion of days exceeding the state standard of 50 µg/m³ for the September-November quarter was the lowest of all fall quarterly measurement periods to date, at 8% and 9% of the days for the Van Gogh School site and the Sunshine Canyon Landfill site, respectively.

Table 3-1. Number of exceedances of federal and state 24-hr PM₁₀ standards during the current quarter and the September through November quarterly periods of the baseline year and of 2008 and 2009.

Regulatory Level	Avg. Period	PM ₁₀ Standard	Van Gogh School				Sunshine Canyon Landfill			
			9/1/02-11/30/02	9/1/08-11/30/08	9/1/09-11/30/09	9/1/10-11/30/10	9/1/02-11/30/02	9/1/08-11/30/08	9/1/09-11/30/09	9/1/10-11/30/10
Federal	24-hr	150 µg/m ³	0	0	1 (10/27/09)	0	0	1 (10/9/08)	1 (10/27/09)	0
State	24-hr	50 µg/m ³	9/33 (27%)	12/90 (13%)	11/78 (14%)	7/91 (8%)	51/77 (66%)	12/73 (16%)	17/89 (19%)	8/86 (9%)

4. AVERAGE AND MAXIMUM BLACK CARBON CONCENTRATIONS

While no federal or state standards exist for BC concentrations in ambient air, BC is a measurable component of ambient air that correlates well with diesel particulate matter (DPM). Because of growing evidence that DPM is associated with several negative health effects, BC is often measured in an attempt to quantify the relative amounts of DPM in ambient air.

Table 4-1 provides the 24-hr average and maximum 24-hr BC concentrations for September 1, 2010, through November 30, 2010, and compares these concentrations with data from corresponding quarters of the two most recent years and the baseline year. In a pattern that parallels the average 24-hr PM₁₀ concentrations during the fall months, average BC concentrations at both monitoring sites were at the lowest level of all fall quarter measurement periods to date. The same was true for maximum 24-hr BC concentrations at both sites.

Table 4-1. Comparison of 24-hr BC concentrations for the current quarter with those measured in the September 1 through November 30 quarterly periods of the baseline year and of 2008 and 2009.

	BC Concentrations (µg/m ³)							
	Van Gogh School				Sunshine Canyon Landfill			
	9/1/02-11/30/02	9/1/08-11/30/08	9/1/09-11/30/09	9/1/10-11/30/10	9/1/02-11/30/02	9/1/08-11/30/08	9/1/09-11/30/09	9/1/10-11/30/10
Average 24-Hr	1.31	0.73	1.40	0.71	1.26	1.19	1.09	0.77
Maximum 24-Hr	2.92	4.88	2.33	2.13	2.83	2.32	2.69	2.29

5. LANDFILL GAS (LFG) SAMPLING

The ambient air quality monitoring work conducted during 2008-2010 at these sites has demonstrated that landfill impacts on the neighboring communities have seasonal, as well as diurnal, components. With the limited number of LFG samples (four per year) prescribed by the Conditions of Approval (C.10.a), we have chosen to focus on sampling LFG during the fall, when winds change from an onshore (southerly) flow to an offshore (northerly) flow, and when early morning meteorological conditions favor down-slope air flow patterns that may carry pollutants from the landfill to the community. The complaint registry at the South Coast Air Quality Management District (SCAQMD) indicates that odor complaints from the community

are most frequent from October to January, suggesting transport from the landfill may be occurring.

LFG gas sampling occurred on November 5 and November 18, 2010. Analysis of the November 5 samples is complete and presented below. (Chemical analysis of the November 18 samples is not yet complete.) Between 7:00 and 9:00 a.m. on each of those days, a total of four separate, integrated (hourly) samples were obtained: consecutive 1-hr samples were collected from 7:00 to 8:00 a.m. and 8:00 to 9:00 a.m. local time at each of the two monitoring sites. The samples were analyzed for methane by the American Society for Testing and Materials (ASTM) method D1946, and for NMOC by TO-15 using a Full Scan at Low Level and by Selective Ion Monitoring. Target compounds included NMOC commonly associated with landfills, including those compounds specified in SCAQMD’s Core Group of “Carcinogenic and Toxic Air Contaminants” listed in Rule 1150.1. Some other compounds included are not listed in SCAQMD’s Core Group but appear in the list of the Agency for Toxic Substances and Disease Registry (ATSDR), part of the Centers for Disease Control (CDC).

5.1 METHANE

All the methane concentrations measured previously (during 2008 and 2009) were at or slightly above the global average ambient concentration of approximately 1.8 ppmV. The November 5, 2010, sample exhibited some higher ambient concentrations compared to the previous years’ results (**Table 5-1**).

Table 5-1. Ambient concentrations of methane measured at the Landfill monitoring site and the Van Gogh School on November 5, 2010.

	Methane Concentration (ppmV)	
	7:00-8:00 a.m.	8:00-9:00 a.m.
Landfill Site	12.3	6.1
Van Gogh School	1.7	4.6

5.2 NON-METHANE ORGANIC COMPOUNDS (NMOC)

Figure 5-1 illustrates how the concentrations of NMOC from the November 5 samples compare to annually averaged Los Angeles and Ventura county data from 2006-2009, obtained from the U.S. Environmental Protection Agency’s (EPA’s) Airdata system. Averages are based on methodology described by McCarthy et. al. (2007)¹. The figures also allow comparison of the sample data with the Method Detection Limit (MDL) for the compounds.

¹ McCarthy M.C., Hafner H.R., Chinkin L.R., and Charrier J.G. (2007) Temporal variability of selected air toxics in the United States. *Atmos. Environ.* **41** (34), 7180-7194 (STI-2894). Available on the Internet at <http://dx.doi.org/10.1016/j.atmosenv.2007.05.037>

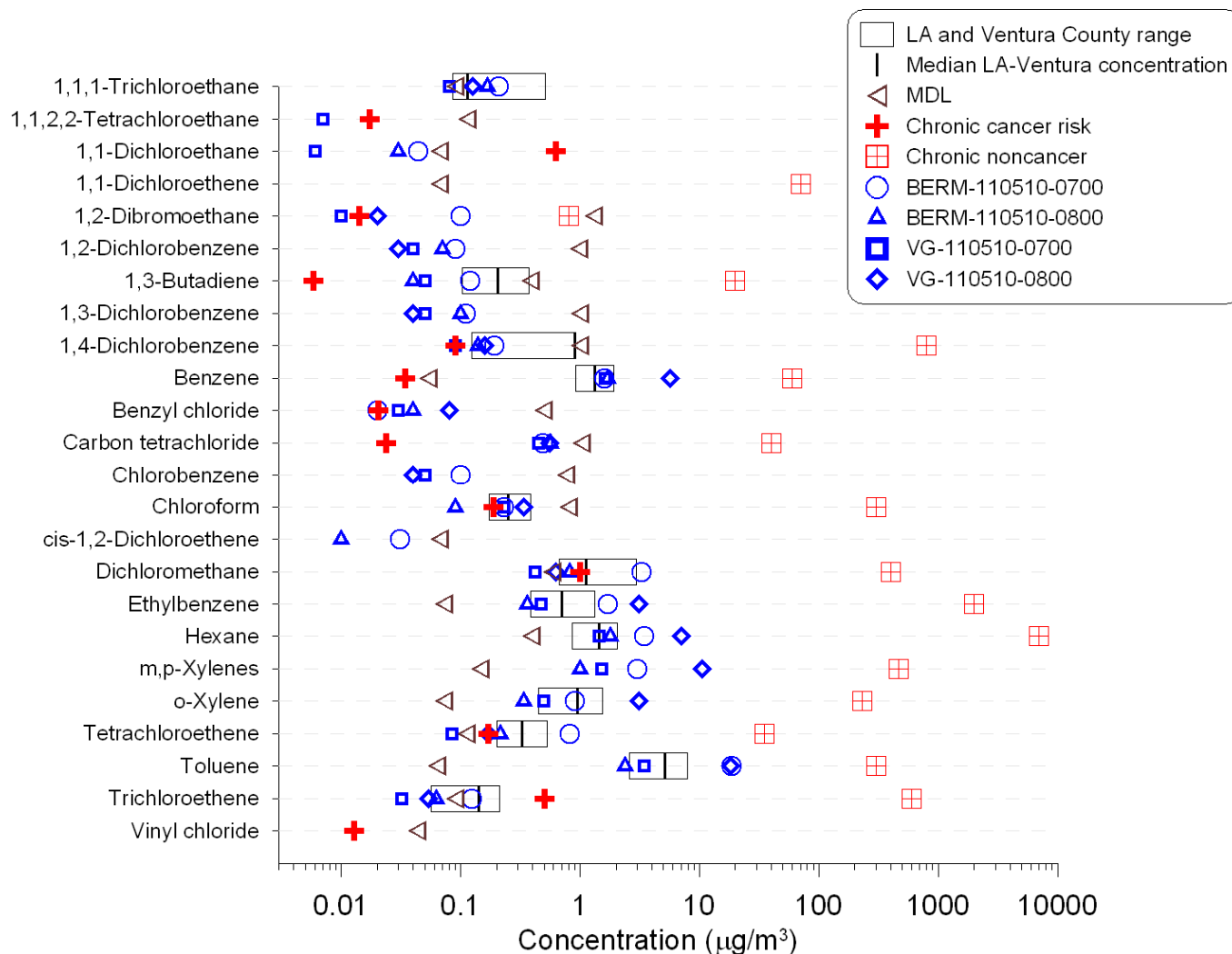


Figure 5-1. Ranges of the 10th to 90th percentile quarterly averages and median values for Los Angeles and Ventura county NMOC data from 2006-2009, as available. Concentrations determined from the November 5, 2010, samples collected at the landfill site (BERM) and Van Gogh Elementary School site (VG); MDLs; chronic cancer risk; and chronic noncancer hazard levels. For the November 5 sample, any data not shown were not detected by the analytical laboratory. Data below MDL that were reported are shown.

Some of the compounds associated with landfill emissions have been classified by the EPA as environmental and health hazards, or as air toxics. Cancer and noncancer health benchmarks have been established for many of these compounds². Sample concentrations are compared to cancer benchmarks in the figure. Exposure to concentrations at this level for 70 years would be expected to result in one additional case of cancer per million people. Concentrations below this level would result in a lower rate, and concentrations above this level

² <http://www.epa.gov/ttn/atw/toxsource/table1.pdf>

would result in a higher rate. The data also show the chronic hazard values for the compounds. These values are also for a 70-year exposure, but the health effects are noncancer, such as asthma, neurological effects, or reproductive effects.

With a few exceptions, the NMOC concentrations during the November 5 sampling event were within the range of values in the Los Angeles and Ventura county areas. Spikes above the Los Angeles concentration range of the aromatic hydrocarbons m-&p-xylenes, toluene, and ethylbenzene occurred in the 7 a.m. to 8 a.m. sample from the landfill monitoring site (circles in Figure 5-1). (Concentrations of these compounds were also higher in the May 2009 sampling.) Dichloromethane and hexane were also above the 90th percentile for the Los Angeles area in the 7:00 a.m. landfill sample. While the concentrations of the aromatic hydrocarbons were not elevated in the 7:00-8:00 a.m. sample at Van Gogh School, they were higher in the 8:00-9:00 a.m. school-based sample. This could be a result of transport time from the landfill monitoring site to the school monitoring site: a plume passing the landfill monitoring site late in the 7:00-8:00 a.m. hour would reach the school site during the following hour. Concentrations of these species are well below the chronic noncancer hazard levels, and there are no chronic cancer levels for these compounds.

6. FIELD OPERATIONS

Tables 6-1 and 6-2 list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh School sites, respectively, between September 1, 2010, and November 30, 2010. **Table 6-3** shows the PM₁₀ and BC monitors' flow rates as reported by the monitors and measured with a NIST-traceable flow standard.

Table 6-1. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from September 1, 2010, through November 30, 2010.

Date of Site Visit	Description of Work
Friday, September 10, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean the Beta Attenuation Monitor's (BAM) capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data. Install new BAM filter tape.
Thursday, September 23, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data.
Thursday, October 7, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data.
Wednesday, October 13, 2010	Unscheduled visit to address database write error for analog wind data.
Wednesday, November 3, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Collect PM ₁₀ and BC data.
Friday, November 5, 2010	One-hour integrated LFG samples collected: 07:00-08:00 and 08:00-09:00.
Wednesday, November 17, 2010	Unscheduled visit to repair broken BAM filter tape.
Thursday, November 18, 2010	One-hour integrated LFG samples collected: 07:00-08:00 and 08:00-09:00. Audit of wind sensor speed and direction performance conducted.

Table 6-2. Van Gogh School monitoring site visits and field maintenance and operations from September 1, 2010, through November 30, 2010.

Date of Site Visit	Description of Work
Friday, September 10, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data.
Thursday, September 23, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data.
Thursday, October 7, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data.
Wednesday, November 3, 2010	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Clean BAM capstan, roller, nozzle, and vane. Collect PM ₁₀ and BC data.
Friday, November 5, 2010	One-hour integrated LFG samples collected: 07:00-08:00 and 08:00-09:00.
Thursday, November 18, 2010	One-hour integrated LFG samples collected: 07:00-08:00 and 08:00-09:00. Audit of wind sensor speed and direction performance conducted.

Table 6-3. Flow rates for the BAM PM₁₀ monitors and Aethalometer™ BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from September 1, 2010, through November 30, 2010. BAM flow rates are volumetric (local temperature and pressure) and Aethalometer™ flow rates are at standard temperature and pressure. Reference flows were measured with a NIST-traceable flow standard. BAM target flow rate is 16.7 lpm volumetric to meet the 10-micron cut point of the inlet, with an acceptable range of 16.0 to 17.3 lpm. The Aethalometer™ has no size cut point.

Location	Date	Flow Rates (lpm)					
		BAM as Found	Reference	BAM as Left	Reference	Aethalometer™ as Found	Reference
Sunshine Canyon Landfill	9/10/10	16.7	16.7	16.7	16.7	3.3	3.6
	9/23/10	16.7	16.0	16.7	16.0	3.3	3.4
	10/7/10	16.6	16.3	16.6	16.3	3.3	3.3
	11/3/10	16.7	16.4	16.7	16.4	3.2	3.4
Van Gogh Elementary School	9/10/10	16.7	16.0	16.7	16.0	3.5	3.0
	9/23/10	16.7	16.7	16.7	16.7	3.5	3.3
	10/7/10	16.7	16.7	16.7	16.7	3.6	3.1
	11/3/10	16.7	16.3	16.7	16.3	3.5	3.1