



Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

Fourteenth Quarterly Report of Ambient Air Quality Monitoring at Sunshine Canyon Landfill and Van Gogh Elementary School

(March 1, 2011 – May 31, 2011)

Quarterly Report
STI-910036-4160-QR

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Prepared for

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July 5, 2011

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Executive Summary

ES-1. Background

Continuous monitoring of meteorological and air quality parameters began at the Sunshine Canyon Landfill (the 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. Wind speed and wind direction are measured as 1-minute averages, and black carbon (BC, a surrogate for diesel particulate matter) is averaged over 5-minute intervals. The collected data undergo quarterly validation and are evaluated for completeness.

Following data validation, all data are reported as hourly averages. PM₁₀ concentrations are then 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. This Fourteenth Quarterly Report summarizes the spring quarter monitoring results from the fourth year of continuous monitoring.

ES-2. Statistics

Data capture for the monitoring period of March 1, 2011, through May 31, 2011, was greater than 99% for BC and wind parameters at both sites. PM₁₀ data capture at Van Gogh School was 100%, but a mechanical component failure occurred in the PM₁₀ monitor at the Landfill site. PM₁₀ data capture at that site was only 65% for this quarter. There were no exceedances of the 150 µg/m³ 24-hr federal PM₁₀ standard at either site during this monitoring quarter. The more stringent 24-hr California state PM₁₀ standard (50 µg/m³) was exceeded during this period on 14% of the days at the Landfill site and on only 2% of the days at the Van Gogh School site. Average 24-hr BC concentrations at the Landfill and School sites were similar for this quarterly period, and were the lowest among all spring quarter measurements to date.

ES-3. Landfill Gas Sampling

Four one-hour integrated ambient air samples for landfill gas (LFG) and hazardous air pollutants (HAPs) were obtained on March 4, 2011. Measured methane concentrations (3.2 to 4.8 ppmV) were above background levels (1.8 ppmV). Hazardous air pollutants measured at the Van Gogh School site were within the historical concentration range for the Los Angeles area. High concentrations of toluene and dichloromethane were detected at the landfill sampling location, and moderately high concentrations of some hydrocarbons (xylenes, hexane, ethylbenzene) were also present there.

1. Introduction

This report provides a summary of data completeness, ambient PM₁₀ (particulate matter less than 10 microns in aerodynamic diameter) concentrations, average and maximum black carbon (BC) concentrations, concentrations of methane and non-methane organic compounds (NMOCs) from landfill gas (LFG) sampling, instrument flow rate verification (quality control) data, and field operations for the quarterly period of March 1, 2011, through May 31, 2011. Data from this quarterly period represent the fourth consecutive year of spring season data collected from continuous monitoring at the Sunshine Canyon Landfill and Van Gogh Elementary School monitoring sites.

2. Data Completeness

Table 1 gives completeness statistics for all measured variables for the period March 1, 2011, through May 31, 2011. Data capture rates for BC and wind speed/wind direction (WS/WD) were near 100% at both sites. However, the PM₁₀ monitor at the Landfill site was down for a time because the capstan motor drive mechanism failed and required factory repair. The ensuing downtime resulted in a 65% data capture rate for PM₁₀ at that site for this quarter. Additionally, of the captured data, about 15% of the hourly data points were invalidated. A portion of the invalidated data was attributed to the capstan motor failure (points logged before the unit was removed for repair). Following reinstallation of the repaired monitor, the monitor's pump performance began to deteriorate, leading to variable hourly air sample volumes, and it was replaced as well. This also contributed to some PM₁₀ data invalidation.

Table 1. Data completeness statistics for the recent monitoring quarter, March 1, 2011, through May 31, 2011.

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	3/1/11–5/31/11	65%	100%	99.5%	85%	100%	98.5%	0.0%	0.0%	0.0%
Van Gogh Elem. School	3/1/11–5/31/11	100%	100%	100%	98.8%	100%	100%	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 and the corresponding quarters of the previous three years (2008, 2009, and 2010) and the baseline year (November 22, 2001–November 21, 2002), are summarized in **Table 2**. There were no exceedances of the Federal 24-hr PM₁₀ standard of 150 µg/m³ at either monitoring location. The percentage of days exceeding the state standard of 50 µg/m³ for the March-May quarter was 2% for the Van Gogh School site and 14% for the Sunshine Canyon Landfill site. The proportion of days exceeding the state standard during springtime monitoring has exhibited an overall downward trend since the baseline year of 2001–2002.

Table 2. Number of exceedances of federal and state 24-hr PM₁₀ standards during the current quarter and the March through May quarterly periods of the baseline year and of 2008, 2009, and 2010. In the Federal column, the values are *number of exceedances* and the *date* on which those exceedances occurred. In the State column, the values are *number of exceedances/total possible days* and the *percentage of exceedances* out of the total number of days having valid 24-hr average PM₁₀ concentrations.

Site	Quarterly Period	PM ₁₀ Standard	
		Federal 24-hr 150 µg/m ³	State 24-hr 50 µg/m ³
Van Gogh School	3/1/02–5/31/02	0	17/55 (31%)
	3/1/08–5/31/08	1 (5/21/08)	6/911 (7%)
	3/1/09–5/31/09	0	16/87 (18%)
	3/1/10–5/31/10	0	6/88 (7%)
	3/1/11–5/31/11	0	2/92 (2%)
Sunshine Canyon Landfill	3/1/02–5/31/02	0	21/56 (38%)
	3/1/08–5/31/08	1 (5/21/08)	20/88 (23%)
	3/1/09–5/31/09	1 (5/6/09)	24/88 (27%)
	3/1/10–5/31/10	0	10/89 (11%)
	3/1/11–5/31/11	0	7/49 (14%)

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 3 provides the 24-hr average and maximum 24-hr BC concentrations for March 1, 2011, through May 31, 2011, and compares these concentrations with data from corresponding quarters of the three most recent years and the baseline year. The average 24-hr BC concentrations at both monitoring sites during the 2011 spring quarter were the lowest of those measured to date. The maximum 24-hr BC concentration measured at the landfill site was also the lowest of those recorded in previous spring quarters.

Table 3. Comparison of 24-hr BC concentrations for the current quarter with those measured in the March 1 through May 31 quarterly periods of the baseline year and of 2008, 2009, and 2010.

Site	Quarterly Period	BC Concentrations ($\mu\text{g}/\text{m}^3$)	
		Average 24-hr	Maximum 24-hr
Van Gogh School	3/1/02–5/31/02	0.72	2.22
	3/1/08–5/31/08	0.51	1.26
	3/1/09–5/31/09	0.72	1.64
	3/1/10–5/31/10	0.61	1.68
	3/1/11–5/31/11	0.51	1.37
Sunshine Canyon Landfill	3/1/02–5/31/02	0.72	2.22
	3/1/08–5/31/08	0.64	1.73
	3/1/09–5/31/09	0.90	2.97
	3/1/10–5/31/10	0.60	1.81
	3/1/11–5/31/11	0.57	1.51

5. Landfill Gas 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 sampling periods (four per year) prescribed by the Conditions of Approval (C.10.a), we have chosen to focus on sampling LFG during the fall and winter months, when winds change from an onshore (southerly) flow to an offshore (northerly) flow, and when early morning meteorological conditions favor downslope 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 that transport from

the landfill may be occurring during those months. The last of the four allotted annual samples occurred during the spring quarter in March.

LFG gas was sampled on March 4, 2011. 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 and by selective ion monitoring. Target compounds included NMOCs commonly associated with landfills, including those compounds specified in SCAQMD's Core Group of "Carcinogenic and Toxic Air Contaminants" 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), Centers for Disease Control (CDC).

5.1 Methane

The March 4, 2011, samples exhibited methane concentrations above the average ambient concentration for the northern hemisphere of 1.8 ppmV (**Table 4**).

Table 4. Ambient concentrations of methane measured at the Landfill monitoring site and the Van Gogh School site on March 4, 2011.

Site	Methane Concentration (ppmV)	
	7:00–8:00 a.m.	8:00–9:00 a.m.
Sunshine Canyon Landfill	4.8	4.4
Van Gogh School	3.2	3.2

5.2 Non-Methane Organic Compounds (NMOCs)

Figure 1 illustrates how the concentrations of NMOC from the March 4 samples compare to annually averaged Los Angeles and Ventura county data from 2006 through 2009, obtained from the U.S. Environmental Protection Agency's (EPA's) Airdata system. Averages are based on the 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.

Hazardous air pollutants measured at the Van Gogh School site were within the concentration range for historical data for the Los Angeles and Ventura County area. High concentrations of toluene and dichloromethane were detected at the landfill sampling location, and moderately high concentrations of some hydrocarbons (xylenes, hexane, ethylbenzene) were also present there. While these compounds do not fit a specific "landfill" signature because many are associated with consumer products (gasoline) or combustion processes, the higher levels detected at the landfill site suggest that activities there contributed to the higher, localized concentrations. Wind direction during sampling was from the NNW across the landfill,

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).

but wind speeds were rather high. The high wind speeds may have dispersed the higher concentrations and thus the compounds were detected only at regional background concentration levels at the Van Gogh School site.

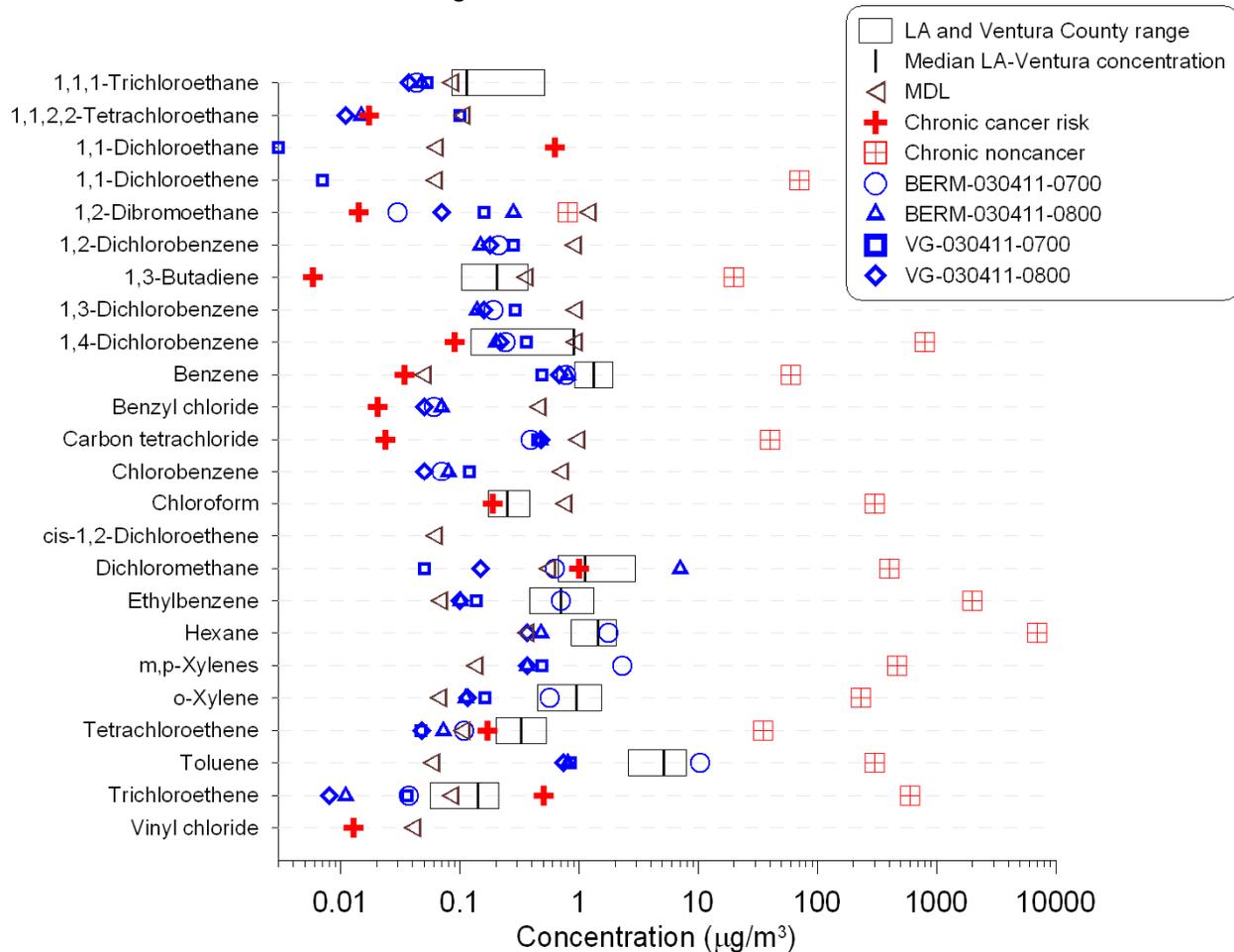


Figure 1. Ranges of the 10th to 90th percentile quarterly averages and median values for Los Angeles and Ventura county NMOC data from 2006 through 2009, as available. Shown are MDLs; chronic cancer risk; chronic noncancer hazard levels; and concentrations determined from samples collected at the Landfill site (BERM) and Van Gogh Elementary School site (VG) on March 4, 2011. 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 compounds.² Sample concentrations are compared to cancer benchmarks in the figure. Exposure to concentrations at the benchmark 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 would result in a higher rate. The data also show the chronic hazard values for the

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

compounds. These values are also for a 70-year exposure but represent health effects—such as asthma, neurological effects, or reproductive effects—other than cancer.

6. Field Operations

Tables 5 and 6 list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh School sites, respectively, between March 1, 2011, and May 31, 2011. **Table 7** shows the PM₁₀ and BC monitors' flow rates as reported by the monitors and measured with a NIST-traceable flow standard.

Table 5. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from March 1, 2011, through May 31, 2011.

Date of Site Visit	Description of Work
Friday, March 4, 2011	VOC sampling conducted. Also evaluated tape break error on PM ₁₀ monitor. Apparent failure of capstan drive motor. Took unit offline and prepped for shipment to manufacturer for repair.
Thursday, March 31, 2011	Audit of meteorological sensors conducted. Wind speed threshold test failed. The repaired PM ₁₀ monitor was reinstalled and self-tested; flow and leak checks made. Adjusted instrument clocks.
Wednesday, April 6, 2011	RMY 5305 wind sensor removed and bearings replaced; wind threshold torque test passed.
Saturday, April 9, 2011	Flow rate on PM ₁₀ monitor variable, pump replaced.
Friday, April 22, 2011	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Collected PM ₁₀ and BC data.
Thursday, May 26, 2011	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Collected PM ₁₀ and BC data. Installed new BAM tape; cleaned BAM capstan and pinch roller.

Table 6. Van Gogh School monitoring site visits and field maintenance and operations from March 1, 2011, through May 31, 2011.

Date of Site Visit	Description of Work
Friday, March 4, 2011	VOC sampling conducted.
Thursday, March 31, 2011	Audit of meteorological sensors conducted. Wind speed threshold test failed.
Wednesday, April 6, 2011	RMY 5305 wind sensor removed and bearings replaced; wind threshold torque test passed. New BAM tape installed.
Friday, April 22, 2011	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Collected PM ₁₀ and BC data. Cleaned BAM capstan roller and nozzle.
Thursday, May 26, 2011	Regular preventive maintenance. Flow checks on PM ₁₀ and BC samplers. Collected PM ₁₀ and BC data. Cleaned BAM capstan and pinch roller.

Table 7. Flow rates for the BAM PM₁₀ monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from March 1, 2011, through May 31, 2011. 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	3/31/11	-- ^a	-- ^a	-- ^a	-- ^a	--	--
	4/22/11	16.8	16.4	16.8	16.4	3.5	3.5
	5/26/11	16.5	16.7	16.5	16.7	3.0	3.1
Van Gogh Elementary School	4/22/11	16.7	16.5	16.7	16.5	3.4	3.3
	5/26/11	16.7	16.8	16.7	16.8	3.3	3.4

^a Flow calibration conducted.