Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

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

September 1, 2013 – November 30, 2013

Quarterly Report
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This document contains blank pages to accommodate double-sided printing.

Table of Contents

Section **Page**

List of Figures

List of Tables

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. PM_{10} (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. PM_{10} concentrations are then compared with federal and state PM_{10} standards. When PM_{10} exceedances occur, additional comparisons are made with the historical, regional, and annual ambient PM_{10} concentrations. At least annually, the PM_{10} 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 and to the Los Angeles County Department of Regional Planning. This Twenty-Fourth Quarterly Report summarizes the autumn quarter monitoring results from the sixth year of continuous monitoring.

ES-2. Statistics

The percent data capture for PM_{10} at the Sunshine Canyon Landfill monitoring site and at Van Gogh Elementary School for this quarterly period was 100%. At the Landfill site, 2.0% of the captured PM_{10} data were invalidated, while 1.0% were deemed suspect. At Van Gogh School, 4.3% of the captured data were invalidated, while 0.6% were deemed suspect. Data capture for BC was 99.1% at the Landfill site and 99.3% at Van Gogh School, with all captured data valid. The wind data capture percentage was 98.6% at the Landfill site and 100.0% at Van Gogh School. 99.2% of the captured wind data were valid at both locations except 0.2% of wind speed data were suspect at the Landfill site.

There was one exceedance of the federal 24-hr PM_{10} standard of 150 $\mu g/m^3$ during this quarter at the Landfill site (a concentration of 200 $\mu g/m^3$ on October 4, 2013, with a concentration of 64 $\mu g/m^3$ at the Van Gogh School on the same day). There were no federal exceedances during this quarter at Van Gogh School. The percentage of days on which the state standard of 50 $\mu g/m^3$ was exceeded for the September-November quarter was 16% for the Landfill site and 8% for the Van Gogh School site.

1. Introduction

This report provides a summary of data completeness, ambient PM_{10} (particulate matter less than 10 microns in aerodynamic diameter) concentrations, average and maximum black carbon (BC) concentrations, instrument flow rate verification (quality control) data, and field operations for the quarterly period of September 1, 2013, through November 30, 2013 (referred to as "this quarter" or "this quarterly period" throughout this report). Data from this quarterly period represent the sixth consecutive year of autumn 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 this quarter. The percent data capture for PM_{10} was 100% at the Landfill site and at Van Gogh School. At the Landfill monitoring site, about 2.0% of the captured PM_{10} data were invalidated, and 1.0% were deemed suspect. At Van Gogh School, 4.3% of the captured data were invalidated, and 0.6% were deemed suspect. Suspect data are included in subsequent analyses (e.g., regional comparisons), while invalid data are not.

BC data capture was 99.1% at the Landfill site and 99.3% at the Van Gogh School, with all data valid. The wind data capture percentage was 98.6% at Landfill sites and 100% at Van Gogh School. 99.2% of the wind data were valid at each site, with 0.2% of wind speed data suspect at the Landfill site.

Table 1. Data completeness statistics for this quarter.

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	9/1/2013 through 11/30/2013	100.0	99.1	98.6	98.0	100.0	99.2	1.0	0.0	0.2
Van Gogh Elem. School	9/1/2013 through 11/30/2013	100.0	99.3	100.0	95.7	100.0	99.2	0.6	0.0	0.0

[a] Percent Data Capture is the number 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 number of data values that are either valid or suspect, divided by the number of captured data values.
[c] Percent Data Suspect is the number of data values labeled as suspect divided by the number of captured data values.

3. PM_{10} Exceedances

The federal and state PM_{10} exceedances for the current quarter, the corresponding quarters of the previous five years (2008, 2009, 2010, 2011, 2012), and of the baseline year (November 22, 2001, to November 21, 2002), are summarized in **Table 2**. There were no exceedances of the federal 24-hr PM_{10} standard of 150 µg/m^3 during this quarter at Van Gogh School, but there was one exceedance at the Landfill monitoring site (a concentration of 200 µg/m^3 on October 4, 2013, with a concentration of 64 µg/m^3 at the Van Gogh School on the same day). The percentage of days on which the state standard of 50 µg/m^3 was exceeded for the September through November quarter was 8% for the Van Gogh School site and 16% for the Landfill site.

Table 2. Number of exceedances of federal and state 24-hr PM_{10} standards during this quarter and the September through November quarterly periods of the baseline year (2002) and each year from 2008 through 2012. 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 days on which valid 24-hr averages were measured* and the *percentage of exceedances* out of the total number of days on which valid 24-hr average PM_{10} concentrations were measured.

Site	Quarterly Period	PM_{10} Standard Exceedances, Dates, and Percentages	
		Federal 24-hr 150 µg/m^3	State 24-hr 50 µg/m^3
Sunshine Canyon Landfill	09/01/02–11/30/02	0	51/77 (66%)
	09/01/08–11/30/08	1 (10/9/2008)	12/73 (16%)
	09/01/09–11/30/09	1 (10/27/2009)	17/89 (19%)
	09/01/10–11/30/10	0	8/86 (9%)
	09/01/11–11/30/11	1 (11/2/2011)	20/89 (22%)
	09/01/12–11/30/12	1 (10/26/2012)	9/85 (11%)
	09/01/13–11/30/13	1 (10/4/2013)	14/89 (16%)
Van Gogh School	09/01/02–11/30/02	0	8/33 (24%)
	09/01/08–11/30/08	0	12/90 (13%)
	09/01/09–11/30/09	1 (10/27/2009)	11/78 (14%)
	09/01/10–11/30/10	0	7/91 (8%)
	09/01/11–11/30/11	0	11/88 (13%)
	09/01/12–11/30/12	0	5/90 (6%)
	09/01/13–11/30/13	0	7/85 (8%)

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. Findings from the Multiple Air Toxics Exposure Study III, conducted by the South Coast Air Quality Management District (SCAQMD), found DPM to be the most important toxic pollutant contributing to risk in the Los Angeles basin.[1]

Table 3 provides the 24-hr average and 24-hr maximum BC concentrations collected in this quarter, and compares these concentrations with data from the corresponding quarters of the five previous years as well as the baseline year. We reported that the June through August average and maximum 24-hr BC concentrations exhibited a consistent downward trend at the Landfill monitoring site from 2008 through 2013 (see the 23rd Quarterly Report). This pattern in average BC concentrations is also observable when comparing data among different years for the fall quarter (September through November). While the substantial decline in the fall quarter of 2010 was followed by higher values the following three years, the pattern is still one of decreasing concentrations with time. At Van Gogh School, concentrations in all fall quarters over the last six years have been much lower than in the baseline year, and the fall quarter of 2013 exhibited the lowest average 24-hr BC concentration since monitoring began. Maximum 24-hr BC concentrations are more susceptible to discreet events or parcels of air with unusually high BC concentrations, but it is worth noting that the last three years have shown reductions in maximum BC concentrations at both monitoring sites.

Figure 1 shows a notched box-whisker plot[2] of the fall quarter PM_{10} and BC data for the six monitoring years. Each box indicates the interquartile range (IQR), where 50% of the data lie, with the notch at the median. If notches do not overlap, this indicates the median concentrations are statistically different at the 95% confidence level. The whiskers go to 1.5 times the IQR; points beyond this are shown individually as diamonds. The following observations can be made regarding Figure 1:

- Except for 2010, the landfill monitor has registered an exceedance of the Federal 24-hr PM_{10} standard of 150 µg/m^3 in all other fall quarters.
- Median 24-hr PM_{10} concentrations were statistically significantly lower at Van Gogh School than at the Landfill site for all fall quarters except 2008 and 2010.
- Median 24-hr BC concentrations were statistically significantly lower at Van Gogh School than at the Landfill site for all fall quarters except 2010 to 2011.

[1] South Coast Air Quality Management District (2008) MATES-III: Multiple air toxics exposure study in the South Coast Air Basin. Final report prepared for the South Coast Air Quality Management District, Diamond Bar, CA, September. Available at http://www.aqmd.gov/prdas/matesIII/Final/Document/aaa-covermates3.pdf.

[2] A notched box-whisker plot shows the entire distribution of concentrations for each year. In box-whisker plots, each box shows the 25th, 50th (median), and 75th percentiles. The boxes are notched (narrowed) at the median and return to full width at the 95% lower and upper confidence interval values. These plots indicate that we are 95% confident that the median falls within the notch. If the 95% confidence interval is beyond the 25th or 75th percentile, then the notches extend beyond the box (hence a "folded" appearance).

- Median 24-hr BC concentrations at the Landfill site decreased substantially in the fall quarters from 2008 to 2010, but changed little in fall quarters from 2011 and 2013.
- Median 24-hr BC concentrations in the fall quarter of 2013 were the lowest of all the fall quarterly periods measured to date.

Table 3. Comparison of 24-hr BC concentrations for this quarter with those measured in the September through November quarterly periods of the baseline year (2002) and each year from 2008 through 2012.

Site	Quarterly Period	BC Concentrations (µg/m^3)	
		Average 24-hr	Maximum 24-hr
Sunshine Canyon Landfill	09/01/02–11/30/02	1.26	2.83
	09/01/08–11/30/08	1.19	2.32
	09/01/09–11/30/09	1.04	2.98
	09/01/10–11/30/10	0.77	2.29
	09/01/11–11/30/11	0.98	2.45
	09/01/12–11/30/12	0.85	2.24
	09/01/13–11/30/13	0.82	2.11
Van Gogh School	09/01/02–11/30/02	1.31	2.92
	09/01/08–11/30/08	0.73	4.88
	09/01/09–11/30/09	0.84	2.77
	09/01/10–11/30/10	0.71	2.13
	09/01/11–11/30/11	0.85	2.24
	09/01/12–11/30/12	0.69	1.80
	09/01/13–11/30/13	0.52	1.49

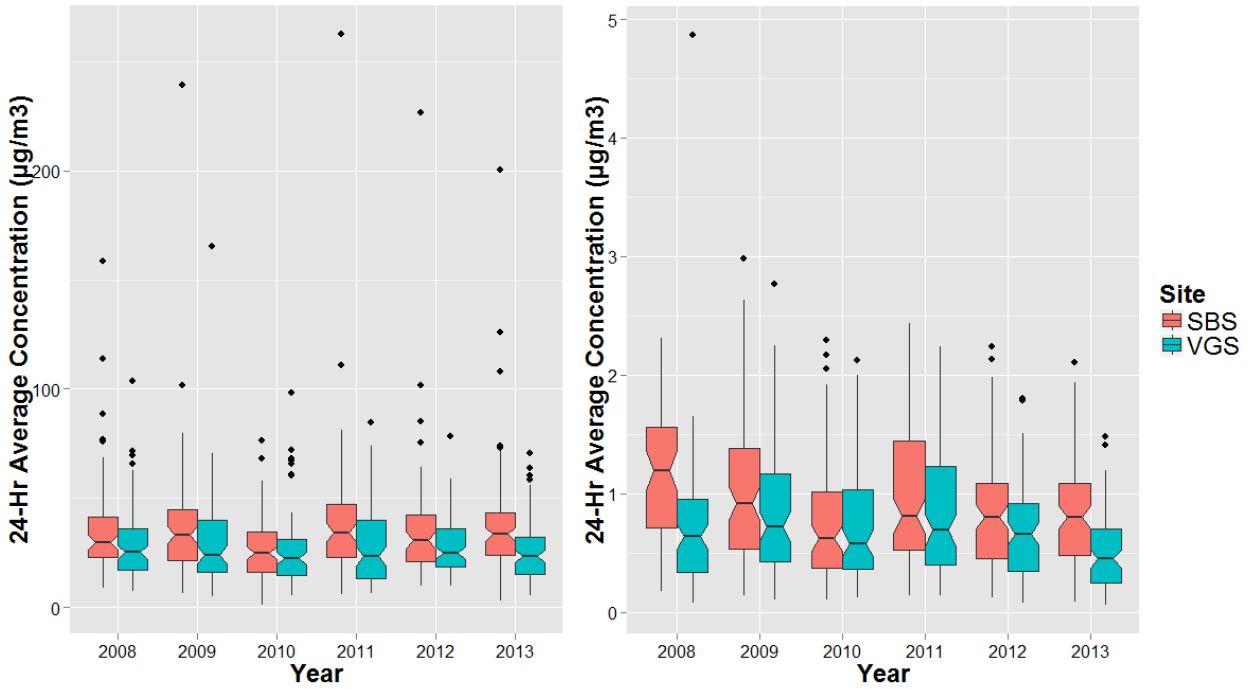

Figure 1. Notched box-whisker plot of daily 24-hr average concentrations for PM_{10} (left) and BC (right) during fall season at Sunshine Canyon Landfill (SBS) and Van Gogh (VGS) in years 2008 to 2013.

5. Field Operations

Tables 4 and 5 list dates and major tasks associated with visits to the Sunshine Canyon Landfill and Van Gogh sites between September 1, 2013, and November 30, 2013.

Table 4. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from September 1, 2013, through November 30, 2013.

Date of Site Visit	Description of Work
September 3, 2013	Collected BC data; performed Aethalometer flow check. Collected PM_{10} data; backed up PM_{10} data; performed BAM flow/leak check.
September 20, 2013	Collected BC data; backed up BC data; performed Aethalometer flow check. Collected PM_{10} data; backed up PM_{10} data. Cleaned BAM roller, vane, and nozzle. Performed BAM flow/leak check.
October 5, 2013	No communication; power cycled router and communications were re-established.
November 1, 2013	Replaced BAM tape, ran BAM self-test; backed up data.
November 25, 2013	Collected BC data; backed up BC data; performed Aethalometer flow check. Collected PM_{10} data; backed up PM_{10} data. Cleaned BAM roller, vane, and cabinet. Performed BAM flow/leak check.

Table 5. Van Gogh monitoring site visits and field maintenance and operations from September 1, 2013, through November 30, 2013.

Date of Site Visit	Description of Work
September 3, 2013	Collected BC data; backed up BC data; performed Aethalometer flow check. Collected PM_{10} data; backed up PM_{10} data; performed BAM flow/leak check.
September 20, 2013	Collected BC data; backed up BC data; performed Aethalometer flow check. Possible Aethalometer cabinet fan failure. Collected PM_{10} data; backed up PM_{10} data; performed BAM flow/leak check. Cleaned BAM cabinet, roller, and vane.
October 11, 2013	Replaced cooling fan in Aethalometer
October 14, 2013	Found BAM data error; reseated inlet hose at pump and BAM; ran BAM self-test; cleared data error.
November 1, 2013	Replaced BAM tape, ran BAM self-test; backed up data. Took compass readings and measured heights for three trees on east side of school.
November 25, 2013	Collected BC data; backed up BC data; performed Aethalometer flow check. Collected PM_{10} data; backed up PM_{10} data; performed BAM flow/leak check.

Table 6 shows the PM_{10} and BC flow rates as reported by the monitors and measured with a NIST-traceable flow standard. BAM flow rates are volumetric (local temperature and pressure), and Aethalometer flow rates are at standard temperature and pressure. The 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.

Table 6. Flow rates for the BAM PM_{10} monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from September 1, 2013, through November 30, 2013.

Location	Date	Flow Rates (lpm)					
		BAM as Found	Reference	BAM as Left	Reference	Aethalometer as Found	Reference
Sunshine Canyon Landfill	9/3/13	16.7	16.5	16.7	16.5	2.9	3.3
Sunshine Canyon Landfill	9/20/13	16.7	16.8	16.7	16.8	3.0	3.1
Sunshine Canyon Landfill	11/25/13	16.7	16.8	16.7	16.8	2.8	3.0
Van Gogh Elementary School	9/3/13	16.7	16.9	16.7	16.9	3.2	3.2
Van Gogh Elementary School	9/20/13	16.7	16.8	16.7	16.8	3.2	3.3
Van Gogh Elementary School	11/25/13	16.7	16.9	16.7	16.9	3.2	3.2