



Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

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

September 1, 2014 – November 30, 2014

Quarterly Report
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Prepared by

David L. Vaughn
Angela L. Ekstrand
Sonoma Technology, Inc.
1455 N. McDowell Blvd., Suite D
Petaluma, CA 94954-6503
Ph 707.665.9900 | F 707.665.9800
sonomatech.com

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Planning Department, City of Los Angeles
City Hall, Room 525
200 N. Spring St.
Los Angeles, CA 90012
and
Los Angeles County Department of Regional Planning
320 West Temple Street, 13th Floor
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 (the Landfill) and at Van Gogh Elementary School in the nearby community of Granada Hills in fall of 2007. PM₁₀ (particulate matter less than 10 microns in aerodynamic diameter) is measured hourly. Wind speed (WS) and wind direction (WD) 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 and to the Los Angeles County Department of Regional Planning. This Twenty-Eighth Quarterly Report summarizes the fall quarter monitoring results from the seventh year of continuous monitoring.

ES-2. Statistics

The percent data capture for PM₁₀ was 99.9% at the Sunshine Canyon Landfill monitoring site and 100% at Van Gogh Elementary School for this quarterly period. At the Landfill site, 1.4% of the captured PM₁₀ data were invalidated, and 0.4% were deemed suspect. At Van Gogh School, 1.5% of the captured PM₁₀ data were invalidated, and 0.1% were deemed suspect. BC data capture was 99.3% at the Landfill site, with no data invalid and 0.05% suspect, while 99.2% was captured at Van Gogh School, with no data invalid and no data suspect. The wind data capture percentage was 99.9% at the Landfill site and 100% at Van Gogh School. At the Landfill site, 1.8% of the wind data were invalidated, and 0.3% were deemed suspect. At Van Gogh School, 2.7% of the wind data were invalidated and a single 1-minute record was deemed suspect.

There were no exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during this quarter at either site. The percentage of days on which the state PM₁₀ standard of 50 µg/m³ was exceeded for the September-November quarter was 5% at the Sunshine Canyon Landfill site; no exceedances of 50 µg/m³ occurred at Van Gogh School. At the Landfill site, average BC concentrations during the fall season have decreased each year since 2008.

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, instrument flow rate verification (quality control) data, and field operations for the quarterly period of September 1, 2014, through November 30, 2014. Data from this quarterly period represent the seventh consecutive 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 1 gives completeness statistics for all measured variables for the period September 1, 2014, through November 30, 2014. The percent data capture for PM₁₀ was 99.9% at the Landfill site and 100% at Van Gogh School. At the Landfill monitoring site, about 1.4% of the captured PM₁₀ data were invalidated and 0.4% were deemed suspect. At Van Gogh School, 1.5% of the captured data were invalidated and 0.1% were deemed suspect. Suspect data are included in subsequent analyses (e.g., regional comparisons), while invalid data are not.

BC data capture was 99.3% at the Landfill site with no data invalid, and 0.05% deemed suspect, while 99.2% was captured at the Van Gogh School with all data valid.

The wind data capture percentage was 99.9% at the Landfill site and 100% at Van Gogh School. About 1.8% of the wind data were invalidated at the Landfill site, with 0.3% of wind speed data deemed suspect. The percent of wind data invalidated at the Van Gogh School was 2.7%, and a single 1-minute record was deemed suspect.

Table 1. Data completeness statistics for the recent monitoring quarter, September 1, 2014–November 30, 2014.

| 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 | 9/1/2014 – 11/30/2014 | 99.9 | 99.3 | 99.9 | 98.6 | 100.0 | 98.3 | 0.4 | 0.05 | 0.3 |
| Van Gogh Elem. School | 9/1/2014 – 11/30/2014 | 100 | 99.2 | 100.0 | 98.5 | 100.0 | 97.3 | 0.1 | 0.0 | one 1-min record |

^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 per hour and 288 data values per day are expected).

^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. PM₁₀ Exceedances

The federal and state PM₁₀ exceedances for the current quarter, the corresponding quarters of the previous six years (2008, 2009, 2010, 2011, 2012, and 2013), and the fall quarter 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 PM₁₀ standard of 150 µg/m³ during this quarter at either site. The percentage of days on which the state standard of 50 µg/m³ was exceeded for the September-November quarter was 5% for the Landfill site, but no exceedances occurred at the Van Gogh School site.

Table 2. Number of exceedances of federal and state 24-hr PM₁₀ standards during the current quarter (2014) and the September through November quarterly periods of the baseline year (2002) and of 2008, 2009, 2010, 2011, 2012, and 2013. 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 PM₁₀ concentrations were measured.

| Site | Quarterly Period | Exceedances of PM ₁₀ Standard | |
|-----------------------------|-------------------|--|-------------------------------------|
| | | 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%) |
| | 09/01/14–11/30/14 | 0 | 5/91 (5%) |
| 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%) |
| | 09/01/14–11/30/14 | 0 | 0/91 (0%) |

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 air pollutant contributing to risk in the Los Angeles basin.¹

Table 3 provides the 24-hr average and maximum 24-hr BC concentrations collected from September 1, 2014, through November 30, 2014, and compares these concentrations with data from the corresponding quarters of the six previous years as well as the baseline year. Last year, we reported that, at the Landfill monitoring site, the September through November average and maximum 24-hr BC concentrations exhibited a consistent downward trend from 2008 through 2013; this pattern continued in 2014. This pattern is also observable when comparing data among different years for the summer quarter of June through August, but the pattern is not observable in the winter (November–February) or spring (March–May) quarters.

Table 3. Comparison of 24-hr BC concentrations for the current quarter with those measured in the September through November quarterly periods of the baseline year (2002) and of 2008, 2009, 2010, 2011, 2012, 2013, and 2014.

| Site | Quarterly Period | BC Concentrations ($\mu\text{g}/\text{m}^3$) | |
|--------------------------|-------------------|--|---------------|
| | | 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 |
| | 09/01/14–11/30/14 | 0.75 | 1.88 |
| 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 |
| | 09/01/14–11/30/14 | 0.81 | 1.64 |

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 aqmd.gov/home/library/air-quality-data-studies/health-studies/mates-iii/mates-iii-final-report.

One likely contributing factor to these different trends in BC concentrations is the meteorology that characterizes the different times of the year. In summer months, southerly (onshore) wind flows dominate, so for the majority of each day's diurnal cycle, the BC concentrations are influenced heavily by air masses moving northward from the greater metropolitan area. Ongoing efforts to reduce ambient concentrations of DPM in the South Coast Air Basin (SoCAB) may have contributed to reduced BC concentrations on a regional scale. However, basin-wide evidence of this is lacking because BC has no standard and is not a criteria pollutant, and it is not routinely measured at the California Air Resources Board (CARB) or SCAQMD air monitoring stations. During the fall, meteorological conditions are more mixed, with diurnal patterns exhibiting both onshore and offshore flow characteristics. The northerly flows that occur during these time periods can carry cleaner air from north of the SoCAB, with variable contributions from the landfill operations (variable because landfill activity levels vary throughout the work day and between work days and non-work days).

Figure 1 shows a notched box-whisker plot² of the fall quarter PM₁₀ and BC data for the seven 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 that 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. For PM₁₀, these plots show no statistically significant trend in the concentrations over the last seven years for the fall quarter, although for the last four years, fall quarter PM₁₀ concentrations have been significantly lower at Van Gogh School than at the Landfill site. For BC, the trend of decreasing BC concentrations from regional influences during fall is evident.



Figure 1. Notched box-whisker plot of daily 24-hr average concentrations of PM₁₀ (left) and BC (right) at Sunshine Canyon Landfill (SBS) and Van Gogh (VGS) during fall quarters in 2008 to 2014.

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).

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, 2014, and November 30, 2014.

Table 4. Sunshine Canyon Landfill monitoring site visits and field maintenance and operations from September 1, 2014, through November 30, 2014.

| Date of Site Visit | Description of Work |
|--------------------|---|
| September 2, 2014 | Performed flow check on BC and beta attenuation monitor (BAM) samplers. Cleaned BAM roller, vane, and nozzle. Collected PM ₁₀ data. Card reader failure for BC sampler; replaced failed card with temporary card and took card for data recovery. |
| September 4, 2014 | Replaced temporary card with appropriate card. |
| September 22, 2014 | Replaced AC unit. |
| September 26, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. Cleaned BAM roller, vane, and nozzle. Changed BAM tape supply. |
| October 23, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. Cleaned BAM roller, vane, and nozzle. |
| October 31, 2014 | Cleaned BAM inlet. Performed flow check on BAM. |
| November 25, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. Cleaned BAM roller, vane, and nozzle. Changed BAM tape. |

Table 5. Van Gogh School monitoring site visits and field maintenance and operations from September 1, 2014, through November 30, 2014.

| Date of Site Visit | Description of Work |
|--------------------|---|
| September 2, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. Cleaned BAM roller, vane, and nozzle. |
| September 26, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. Cleaned BAM roller, vane, and nozzle. Changed BAM tape. |
| October 23, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. |
| October 31, 2014 | Cleaned BAM inlet. Performed flow check on BAM. |
| November 25, 2014 | Performed flow check on BC and BAM samplers. Collected PM ₁₀ and BC data. Cleaned BAM roller, vane, and nozzle. |

Table 6 shows the PM₁₀ 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. 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.

Table 6. Flow rates for the BAM PM₁₀ monitors and Aethalometer BC monitors at the Sunshine Canyon Landfill and Van Gogh School sites from September 1, 2014, through November 30, 2014.

| Location | Date | Flow Rates (lpm) | | | | | |
|----------------------------|------------|------------------|--------------------|-------------|-------------------|-----------------------|-----------------|
| | | BAM as Found | Reference as Found | BAM as Left | Reference as Left | Aethalometer as Found | Reference |
| Sunshine Canyon Landfill | 9/2/2014 | 16.7 | 16.5 | 16.7 | 16.5 | 3.0 | 3.3 |
| Sunshine Canyon Landfill | 9/26/14 | 16.7 | 16.6 | 16.7 | 16.6 | 3.0 | 3.2 |
| Sunshine Canyon Landfill | 10/23/04 | 16.7 | 16.6 | 16.7 | 16.6 | 3.1 | 3.3 |
| Sunshine Canyon Landfill | 10/31/04 | 16.7 | 17.0 | 16.7 | 17.0 | -- ^a | -- ^a |
| Sunshine Canyon Landfill | 11/25/2014 | 16.7 | 16.8 | 16.7 | 16.8 | 2.9 | 3.2 |
| Van Gogh Elementary School | 9/2/2014 | 16.7 | 16.6 | 16.7 | 16.6 | 3.1 | 3.2 |
| Van Gogh Elementary School | 9/26/2014 | 16.7 | 16.6 | 16.7 | 16.6 | 3.1 | 3.3 |
| Van Gogh Elementary School | 10/23/14 | 16.7 | 16.6 | 16.7 | 16.6 | 3.1 | 3.4 |
| Van Gogh Elementary School | 10/31/14 | 16.7 | 16.6 | 16.7 | 16.6 | -- ^a | -- ^a |
| Van Gogh Elementary School | 11/25/2014 | 16.7 | 16.6 | 16.7 | 16.6 | 3.0 | 3.1 |

^a Not measured.