



Sonoma Technology, Inc.
Innovative Environmental Solutions

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

June 1, 2018 – August 31, 2018

Quarterly Report
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Executive Summary

ES-1. Background

Continuous monitoring of meteorological and air quality parameters began at the Sunshine Canyon Landfill (Landfill site) and at Van Gogh Elementary School (Community site) in the nearby community of Granada Hills in fall 2007. At these sites, particulate matter less than 10 microns in aerodynamic diameter (PM₁₀), wind speed (WS) and wind direction (WD), and black carbon (BC), as a surrogate for diesel particulate matter (DPM) are measured. The collected data are validated and evaluated for completeness quarterly. Monitoring is conducted to fulfill stipulations in the City of Los Angeles' Conditions of Approval for the expansion of the landfill.¹ Similar conditions cover the County of Los Angeles' portion of the landfill.²

PM₁₀ concentrations are compared with federal and state PM₁₀ standards. When PM₁₀ concentrations are above the standard (i.e., an exceedance), additional comparisons are made with the historical, regional, and annual ambient PM₁₀ concentrations. The PM₁₀ and BC data are analyzed annually to characterize the impact of landfill operations on ambient air quality as observed at the Community site. 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 Forty-Third Quarterly Report summarizes the June-August (2018 summer quarter) monitoring results from the twelfth year of continuous monitoring.

ES-2. Statistics

For this quarter, the percent data capture for PM₁₀ was 100.0% at the Landfill site and 100.0% at the Community site. Approximately 0.4% of the captured PM₁₀ data were invalidated at the Landfill site, and approximately 0.2% were invalidated at the Community site. No hourly PM₁₀ values were deemed suspect at either of the monitoring sites in this quarter.

Hourly BC data capture was 99.9% at the Landfill site and 99.1% at the Community site. No hourly BC data were invalidated at the Landfill site, and 1.0% of hourly BC data were invalidated at the Community site. Approximately 2.1% of hourly BC data were deemed suspect at the Landfill site, and 11.4% at the Community site.

During this quarter, the state 24-hr PM₁₀ standard (50 µg/m³) was exceeded on 21% of days (19) at the Landfill site. There was one state standard exceedance at the Community site. There were no exceedances of the federal 24-hr PM₁₀ standard (150 µg/m³) at the Landfill site or the Community site.

¹ Section C.10.a of Ordinance No. 172,933.

² County Condition 81.

1. Introduction

This report summarizes data completeness, ambient particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) concentrations, average and maximum ambient black carbon (BC, a surrogate for diesel particulate matter [DPM]) concentrations, instrument flow rate verification (quality control) data, and field operations for the quarterly period of June 1, 2018, through August 31, 2018. The collected data are validated and evaluated for completeness quarterly. This is the twelfth consecutive year that data were collected in the summer from continuous monitors at the Sunshine Canyon Landfill site (LS; previously called the Berm site) and the Van Gogh Elementary School Community site (CS). The monitoring site locations are shown in **Figure 1**. PM_{10} is measured with a beta attenuation monitor (BAM), and BC is measured with an Aethalometer. The Sunshine Canyon Landfill North (LN) monitoring site shown in Figure 1 was installed in December 2015 and decommissioned on May 31, 2017.

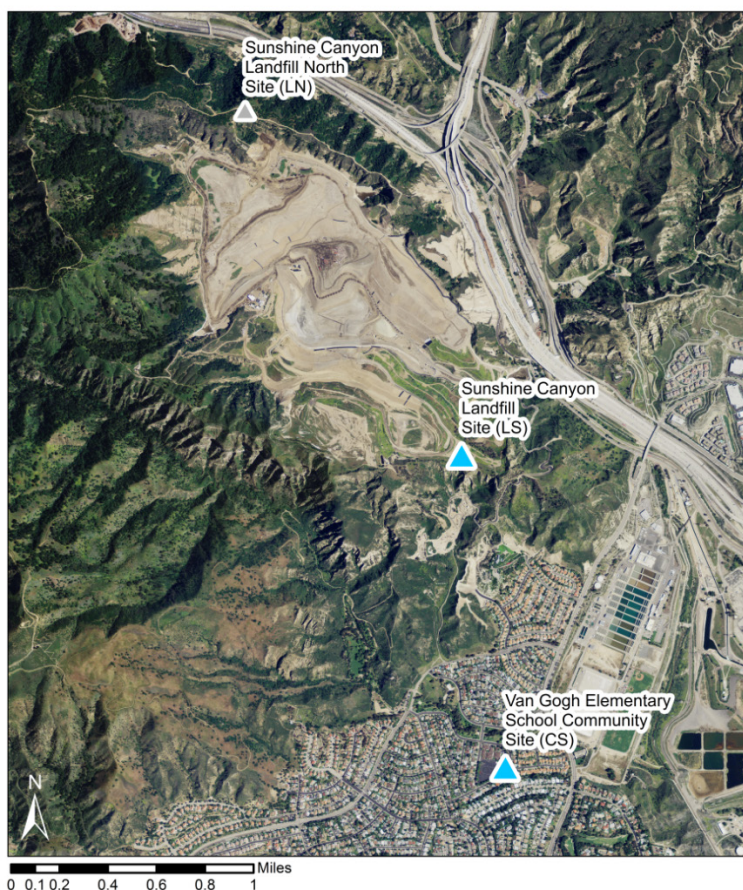


Figure 1. View of Sunshine Canyon Landfill and the surrounding monitoring stations (blue triangles): Sunshine Canyon Landfill (LS) and Community site (CS). The Sunshine Canyon Landfill North site (LN, gray triangle) collected data from December 1, 2015, through May 31, 2017, and has since been decommissioned.

Monitoring is conducted to fulfill stipulations in the City of Los Angeles' Conditions of Approval for the expansion of the landfill.³ Similar conditions cover the County of Los Angeles' portion of the landfill.⁴

³ Section C.10.a of Ordinance No. 172,933.

⁴ County Condition 81.

2. Data Completeness

Completeness statistics for all measured variables during the 2018 summer quarter are shown in **Table 1**. Data deemed as suspect are included in subsequent analyses (e.g., regional comparisons), while invalid data are not. The percent data capture for PM₁₀ was 100.0% at the Landfill site and 100.0% at the Community site. Approximately 0.4% and 0.2% of the captured PM₁₀ data were invalidated at the Landfill and Community sites, respectively. No hourly PM₁₀ values were deemed suspect at either of the monitoring sites in this quarter.

Table 1. Data completeness statistics for hourly BC, hourly PM₁₀, and 1-min wind speed and wind direction data for the 2018 summer quarter monitoring period.

Monitoring Location	Dates	Data Capture (%) ^a			Data Valid or Suspect (%) ^b			Data Suspect (%) ^c		
		PM ₁₀	BC	WS/WD	PM ₁₀	BC	WS/WD	PM ₁₀	BC	WS/WD
Sunshine Canyon Landfill (LS)	06/01/18-08/31/18	100.0	99.9	98.7	99.6	100.0	98.9	0.0	2.1	0.003
Community Site (CS)	06/01/18-08/31/18	100.0	99.1	100.0	99.8	99.0	98.9	0.0	11.4	0.0

^a Data Capture is the number of collected data values divided by the total number of expected data intervals during the date range indicated in the “Dates” column (e.g., for the raw BC 1-hr data, 24 data values per day are expected), multiplied by 100.

^b Data Valid or Suspect is the number of data values that are either valid or suspect divided by the number of captured data values, multiplied by 100.

^c Data Suspect is the number of data values labeled as suspect divided by the number of captured data values, multiplied by 100.

Hourly BC data capture was 99.9% at the Landfill site and 99.1% at the Community site. No BC data were invalidated at the Landfill site, and 2.1% were deemed suspect. Approximately 1.0% of the BC data were invalidated at the Community site, and 11.4% were deemed suspect. Suspect data were flagged as suspect because at least one of the 5-minute records in a 1-hour interval was voided as a result of a BC concentration less than -0.1 µg/m³.

The wind data capture percentages were 98.7% at the Landfill site and 100.0% at the Community site. Approximately 1.1% of the data were invalidated at the Landfill site, with 0.003% of the data deemed suspect. Approximately 1.1% of the data were invalidated at the Community site, although no data were deemed suspect.

3. PM₁₀ Exceedances

The federal and state PM₁₀ exceedances for the summer quarter of the baseline year (2002), the summer quarters of the previous ten years (2008–2017), and the current summer quarter (2018) are summarized in **Table 2**. In this quarter, the percentage of days on which the state PM₁₀ standard of 50 µg/m³ was exceeded was 21% (19 days) at the Landfill site, and 2% (1 day) at the Community site.

There were no exceedances of the federal 24-hr PM₁₀ standard of 150 µg/m³ during the 2018 summer quarter at the Landfill site or at the Community site.

Table 2. Number of exceedances of federal and state 24-hr PM₁₀ standards during the summer quarters of the baseline year (2002) and each year from 2008 to 2018. In the “Federal 24-hr” column, the values are number of exceedances and the date(s) on which those exceedances occurred. In the “State 24-hr” 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. The most recent summer quarter is shown in **bold**. The LN site only measured PM₁₀ for one summer quarter.

Site	Quarter Period	Quarter Name	Exceedances of PM ₁₀ Standard	
			Federal 24-hr 150 µg/m ³	State 24-hr 50 µg/m ³
Sunshine Canyon Landfill (LS)	06/01/02–08/31/02	Baseline Year	0	44/67 (66%)
	06/01/08–08/31/08	2008 Summer	0	28/92 (30%)
	06/01/09–08/31/09	2009 Summer	0	16/87 (18%)
	06/01/10–08/31/10	2010 Summer	0	11/91 (12%)
	06/01/11–08/31/11	2011 Summer	0	23/92 (25%)
	06/01/12–08/31/12	2012 Summer	0	10/76 (13%)
	06/01/13–08/31/13	2013 Summer	0	14/91 (15%)
	06/01/14–08/31/14	2014 Summer	0	19/91 (21%)
	06/01/15–08/31/15	2015 Summer	0	8/92 (9%)
	06/01/16–08/31/16	2016 Summer	2 (07/22/2016 & 07/30/2016)	16/92 (17%)
	06/01/17–08/31/17	2017 Summer	0	41/91 (46%)
	06/01/18–08/31/18	2018 Summer	0	19/91 (21%)
Sunshine Canyon Landfill North (LN)	06/01/16–08/31/16	2016 Summer	1 (07/30/2016)	59/92 (64%)
Community Site (CS)	06/01/02–08/31/02	Baseline Year	0	5/16 (31%)
	06/01/08–08/31/08	2008 Summer	0	25/89 (28%)
	06/01/09–08/31/09	2009 Summer	0	13/90 (14%)
	06/01/10–08/31/10	2010 Summer	0	27/83 (33%)
	06/01/11–08/31/11	2011 Summer	0	11/92 (12%)
	06/01/12–08/31/12	2012 Summer	0	10/92 (11%)
	06/01/13–08/31/13	2013 Summer	0	9/90 (10%)
	06/01/14–08/31/14	2014 Summer	0	22/86 (26%)
	06/01/15–08/31/15	2015 Summer	0	0/30 (0%)
	06/01/16–08/31/16	2016 Summer	0	4/92 (4%)
	06/01/17–08/31/17	2017 Summer	0	2/92 (3%)
	06/01/18–08/31/18	2018 Summer	0	1/92 (2%)

The one exceedance of the state 24-hr PM₁₀ standard at the Community Site occurred on August 7, 2018. An exceedance of the state 24-hr PM₁₀ standard also occurred at the Landfill Site on the same day. Elevated PM₁₀ concentrations were reported across the region on that day (shown in **Figure 2**), and it is likely that wildfire smoke from the Holy Fire contributed to these high concentrations.

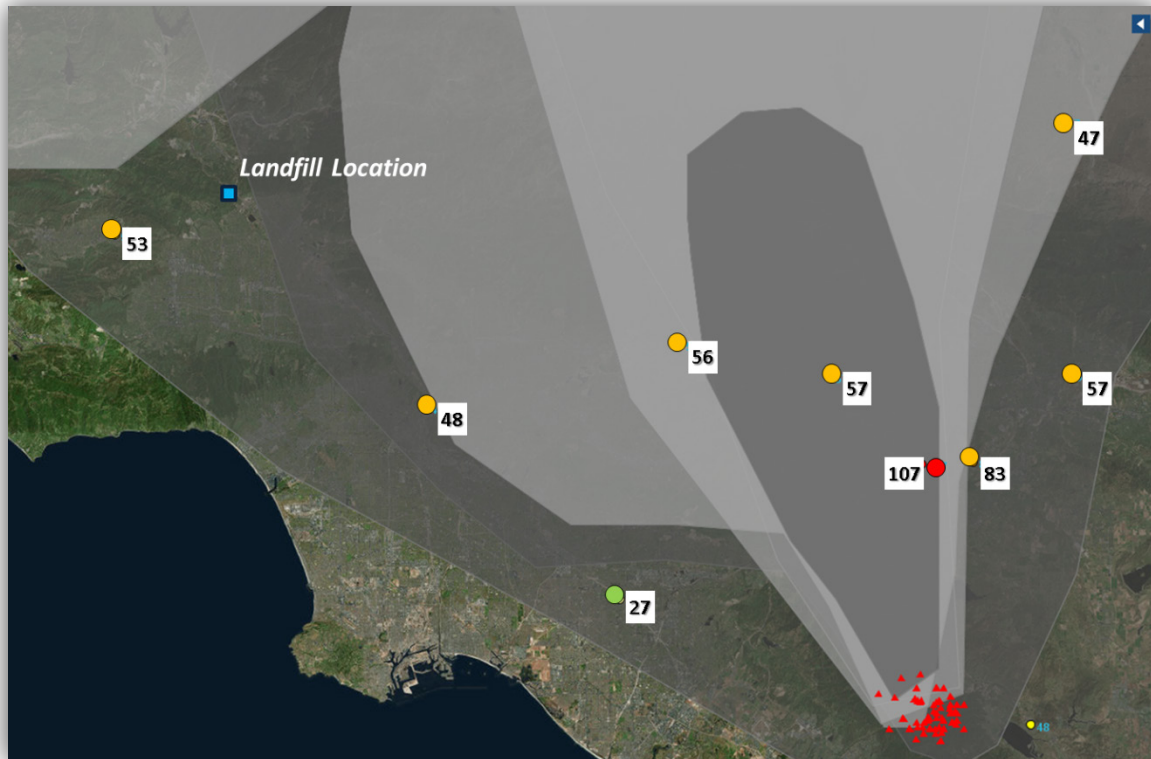


Figure 2. Hazard Mapping System (HMS) fire and smoke data, and regional 24-hr PM₁₀ measurements for August 7, 2018. Individual fire hotspot locations from the Holy Fire are denoted by red triangles, and areas of smoke are denoted by the grey polygons. Air quality monitoring sites are labeled by their reported 24-hr PM₁₀ concentration value. The location of the Sunshine Canyon Landfill is denoted by the blue square in the upper left quadrant. HMS and PM₁₀ data were obtained from the AirNow-Tech database (information online at <https://www.airnowtech.org>).

4. Average and Maximum Black Carbon Concentrations and PM₁₀ Concentrations

Although no federal or state standards exist for BC concentrations in ambient air, BC is a measurable component of ambient air that correlates well with 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 IV (MATES IV), 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 (South Coast Air Quality Management District, 2015).

BC is measured using an Aethalometer, which passes air through a filter tape trapping the suspended particles. A light beam projected through the deposit is attenuated by light-absorbing particles. Aethalometers are subject to a saturation effect, where the buildup of BC on the air sampling tape causes an artifact that affects the accuracy of the measured concentration (Drinovec et al., 2015; Allen, 2014). Instrument response is dampened with heavier loading (i.e., higher concentrations) of BC aerosol. This artifact can cause BC concentration readings to be lower than the true concentration. However, mathematical methods to correct the BC concentration values are available and widely used. All the reported BC values to date from the Landfill, Landfill North, and Community sites have been adjusted to compensate for this tape saturation effect; this compensation had not been performed in quarterly reports prior to the 29th Quarterly Report (winter 2015). Because the compensation process changes the reported concentration, and because uncompensated values were used in previous reports, prior-year BC concentrations shown in this report do not match concentrations reported prior to the 29th Quarterly Report. All BC data shown in this Quarterly Report have been compensated, with the exception of data from the baseline year, because the raw data for the baseline year are unavailable.

The 24-hr average and maximum compensated BC concentrations collected during the 2018 summer quarter, the compensated BC data from the summer quarters of the ten previous years (2008-2017), and the uncompensated data from the baseline year are provided in **Table 3**. The 2018 summer quarter averages for both the Landfill and Community site are the lowest on record. Distributions of 24-hour average PM₁₀ and BC data from summer quarters from 2008 through 2018 (presented as notched box-whisker plots⁵), and percentile trends for these metrics, are shown in **Figures 3 through 7**.

⁵ A notched box-whisker plot shows the entire distribution of concentrations for each year. Each box illustrates the 25th (lower box extent), 50th (median, midline), and 75th (upper box extent) percentiles. The extent of the box indicates the interquartile range (IQR), where 50% of the data lie. The whiskers indicate values that are up to 1.5 times the IQR from the 25th or 75th percentile. Data outside of the IQR are referred to as “outliers” and are plotted individually. The boxes are notched (narrowed) at the median and return to full width at the 95% lower- and upper-confidence interval values (i.e., the extents of the notches indicate the range in which the median falls with 95% confidence). If the 95% confidence interval of the median is beyond the 25th or 75th percentile, then the notches extend beyond the box, which creates a “folded” appearance. If the notches of any two boxes do not overlap, there is strong evidence that the medians are statistically different at the 95% confidence level.

Table 3. Twenty-four-hour BC concentrations for the summer quarter of the baseline year (2002) and each year from 2008 through 2018. Asterisks (*) denote uncompensated BC values. The most recent summer quarter is shown in **bold**. The LN site only measured BC for one summer quarter.

Site	Quarterly Period	Quarter Name	BC Concentrations ($\mu\text{g}/\text{m}^3$)	
			Average 24-Hr	Maximum 24-Hr
Sunshine Canyon Landfill (LS)	06/01/02–08/31/02	Baseline Year	1.09*	2.69*
	06/01/08–08/31/08	2008 Summer	1.41	3.01
	06/01/09–08/31/09	2009 Summer	1.26	2.45
	06/01/10–08/31/10	2010 Summer	1.06	1.88
	06/01/11–08/31/11	2011 Summer	0.99	1.78
	06/01/12–08/31/12	2012 Summer	0.93	1.79
	06/01/13–08/31/13	2013 Summer	0.98	1.98
	06/01/14–08/31/14	2014 Summer	0.79	1.34
	06/01/15–08/31/15	2015 Summer	0.76	1.58
	06/01/16–08/31/16	2016 Summer	0.70	1.33
	06/01/17–08/31/17	2017 Summer	0.77	1.28
	06/01/18–08/31/18	2018 Summer	0.59	1.34
Sunshine Canyon Landfill North (LN)	06/01/16–08/31/16	2016 Summer	0.86	2.17
Community Site (CS)	06/01/02–08/31/02	Baseline Year	1.40*	2.33*
	06/01/08–08/31/08	2008 Summer	0.98	1.71
	06/01/09–08/31/09	2009 Summer	1.03	2.23
	06/01/10–08/31/10	2010 Summer	1.08	1.75
	06/01/11–08/31/11	2011 Summer	0.86	1.43
	06/01/12–08/31/12	2012 Summer	0.81	1.63
	06/01/13–08/31/13	2013 Summer	0.76	1.31
	06/01/14–08/31/14	2014 Summer	0.86	1.50
	06/01/15–08/31/15	2015 Summer	0.92	1.48
	06/01/16–08/31/16	2016 Summer	0.79	1.42
	06/01/17–08/31/17	2017 Summer	0.81	1.48
	06/01/18–08/31/18	2018 Summer	0.66	1.49

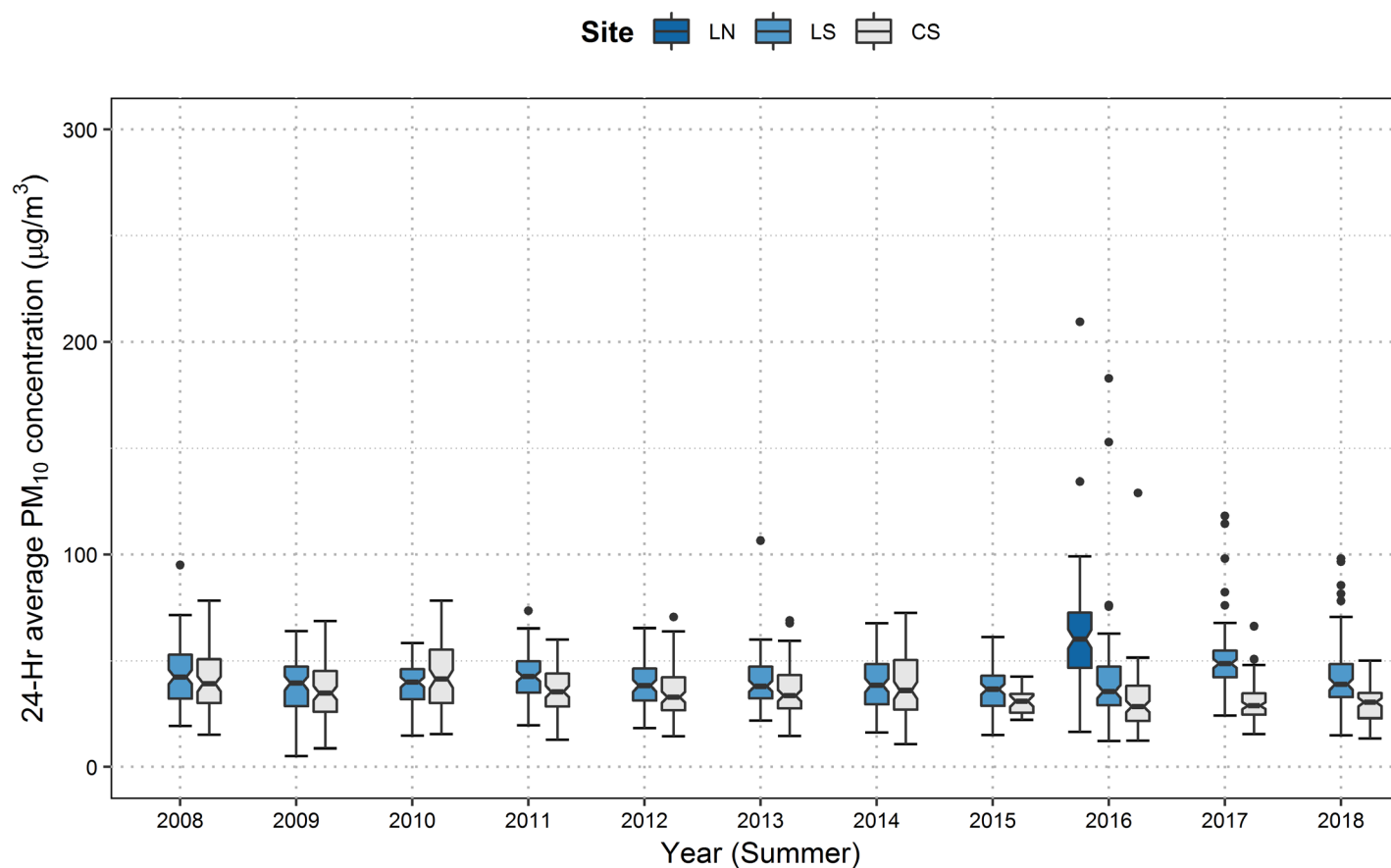


Figure 3. Distribution of 24-hr average PM₁₀ concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June-August) quarters from 2008 to 2018.

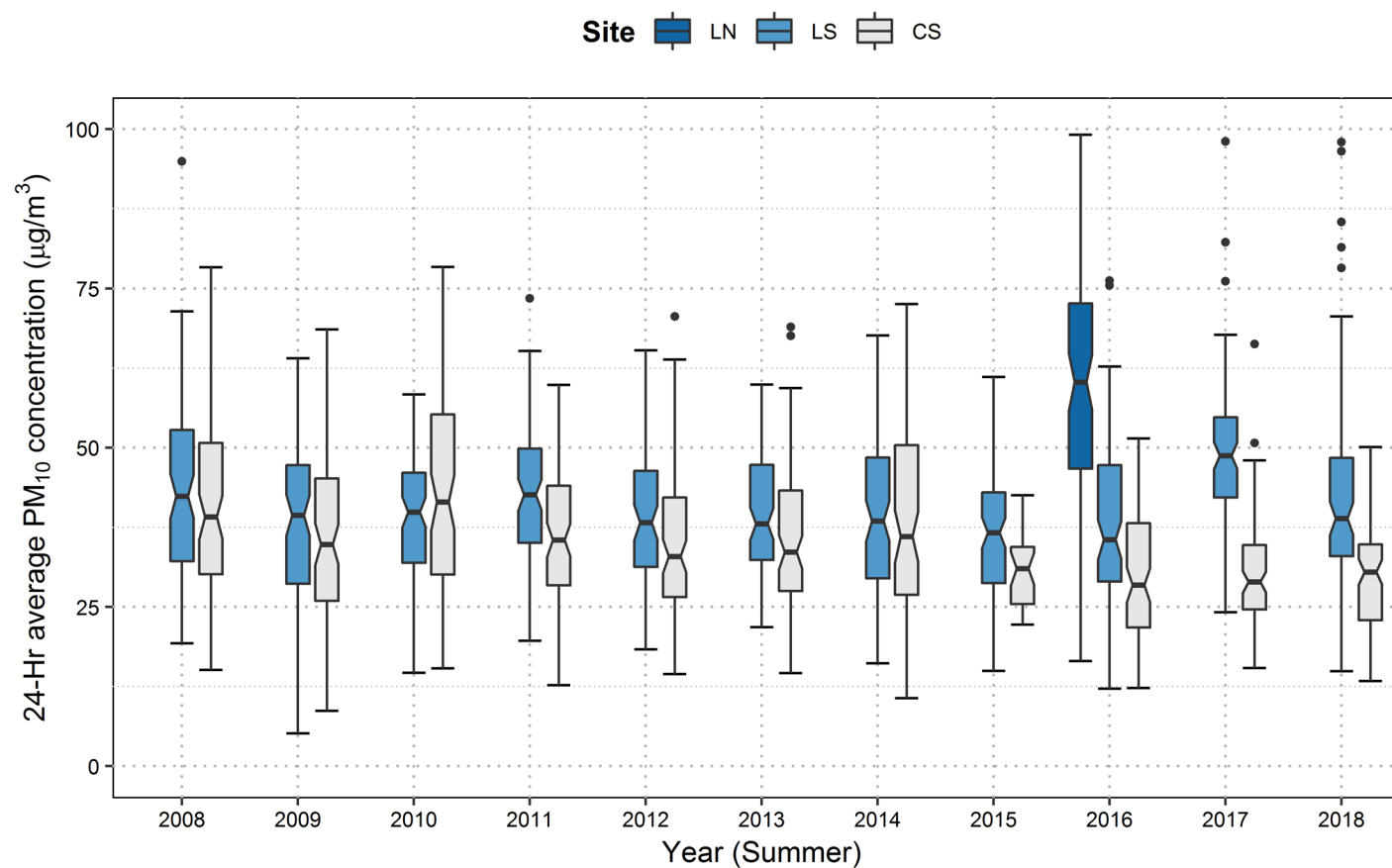


Figure 4. Distribution of 24-hr average PM₁₀ concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June-August) quarters from 2008 to 2018. This is the same data shown in Figure 3, but the graph has been zoomed into the lower concentration range

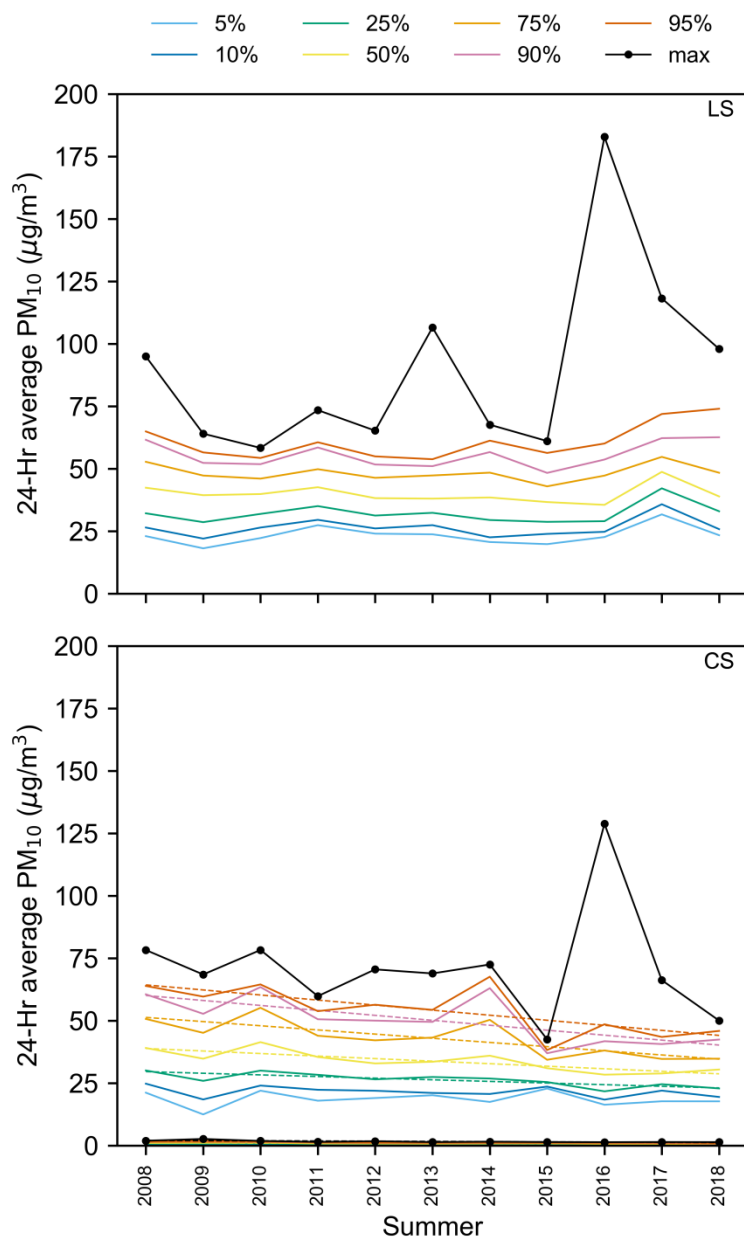


Figure 5. Trends of 24-hr average PM₁₀ maxima and percentiles at the Sunshine Canyon Landfill site (LS, top) and Community site (CS, bottom) during summer (June-August) quarters from 2008 to 2018. A colored dashed line denotes a statistically significant decreasing linear trend, whereas a gray dashed line denotes a statistically significant increasing linear trend. Statistical significance was defined at the 95% confidence level ($p\text{-value} \leq 0.05$).

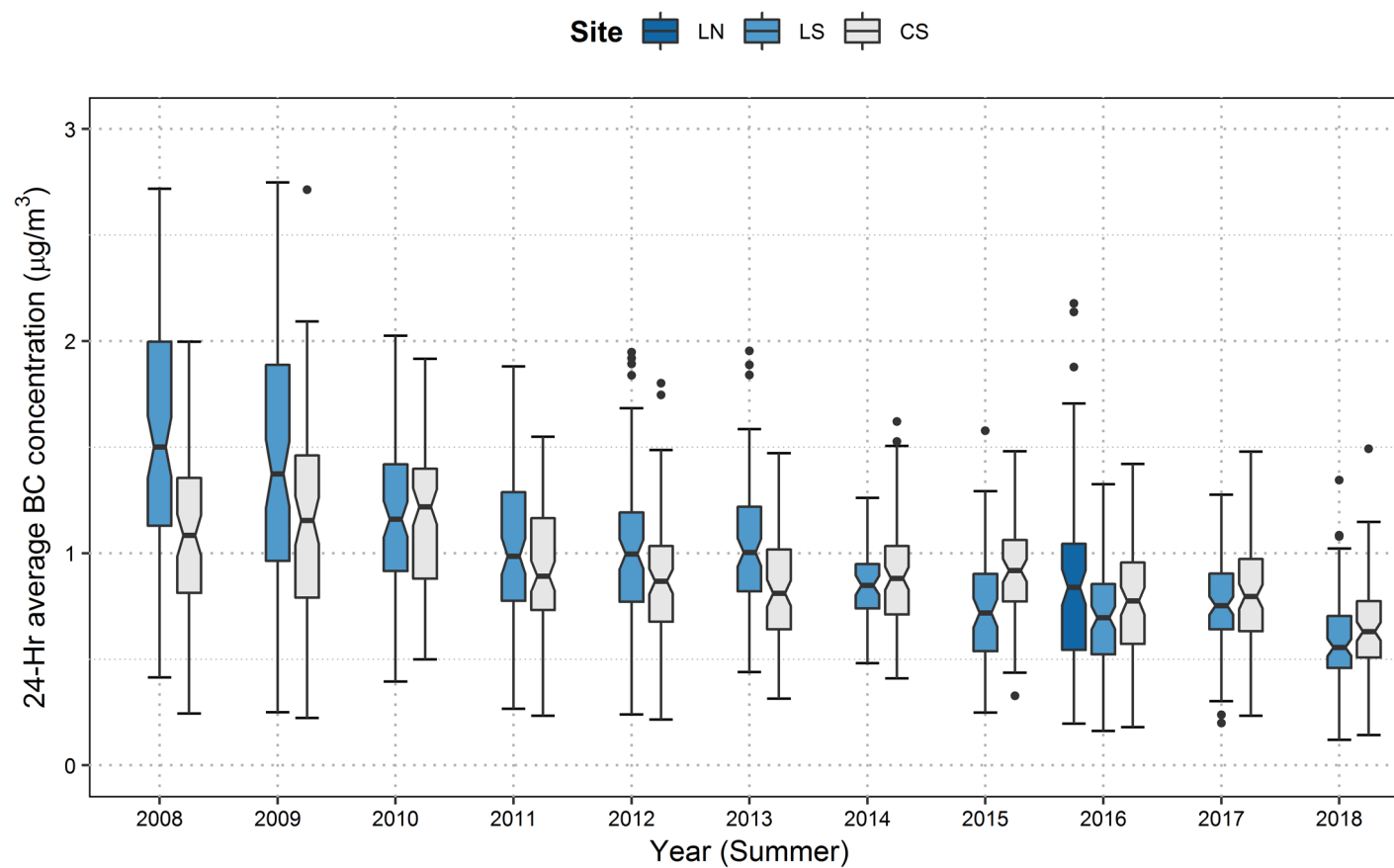


Figure 6. Distribution of daily 24-hr average BC concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June–August) quarters from 2008 to 2018.

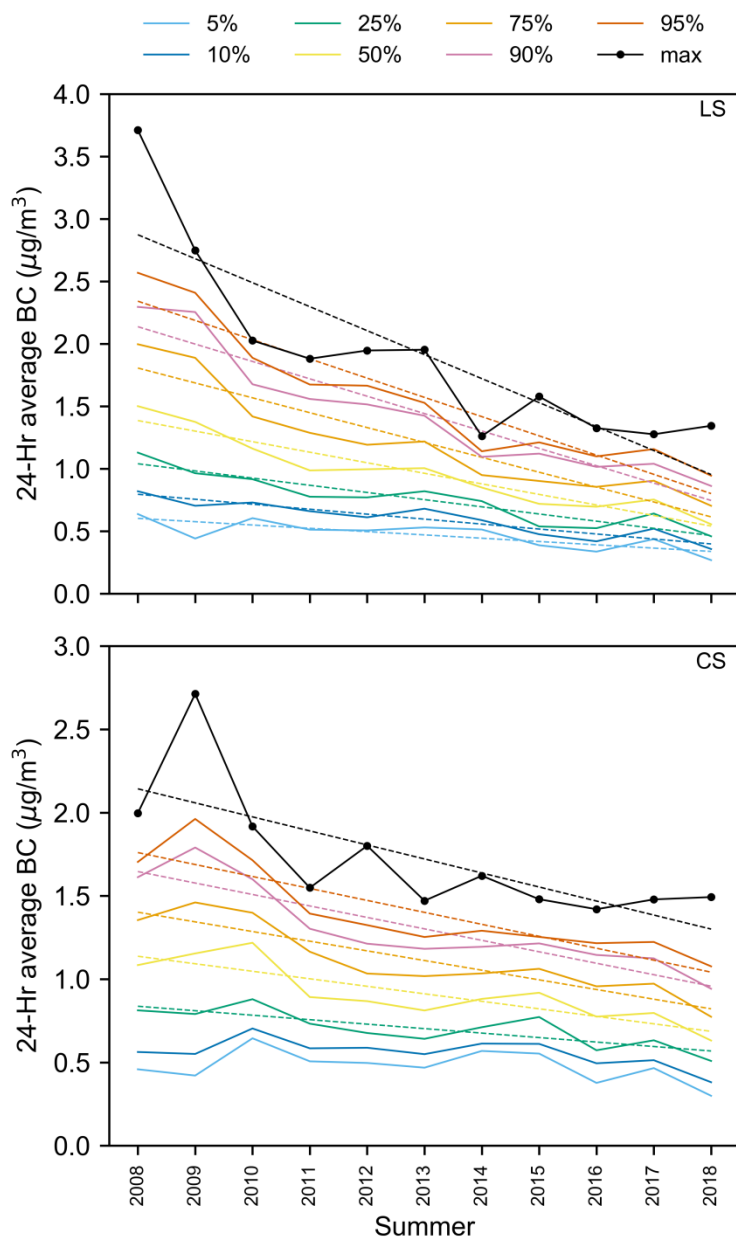


Figure 7. Trends of 24-hr average BC maxima and percentiles at the Sunshine Canyon Landfill site (LS, top) and Community site (CS, bottom) during summer (June-August) quarters from 2008 to 2018. A colored dashed line denotes a statistically significant decreasing linear trend, whereas a gray dashed line denotes a statistically significant increasing linear trend. Statistical significance was defined at the 95% confidence level (p-value ≤ 0.05).

At this time of year, the median 24-average PM₁₀ concentrations measured at the Community site are usually lower than those measured at the Landfill site (Figures 3 and 4). In the 2017 and 2018 summer quarters, the median 24-hr average PM₁₀ concentrations were considerably higher at the Landfill site. As indicated by the non-overlapping notches (and the entire interquartile range) in the box-whisker plot, the difference between the median 24-hour PM₁₀ concentrations at the Community and the Landfill site is statistically significant. At the Landfill site, there is no statistically significant trend in the 24-hr average PM₁₀ percentiles (Figure 5).⁶ The 90th and 95th percentiles recorded in the past two summer quarters have been higher than in previous summer quarters. The maximum 24-hr average PM₁₀ concentration in summer quarter 2017 was the highest on record; however, the maximum 24-hr PM₁₀ concentration in summer quarter 2018 was the sixth highest on record. In contrast, at the Community site, there is a statistically significant decreasing trend of 24-hr average PM₁₀ percentiles.

During the summer quarters, the median 24-hr average BC concentrations are not usually significantly different between the Landfill and Community sites, as indicated by overlapping notches in the box-whisker plot (Figure 6). There is some year-to-year variability in median 24-hr average BC concentrations over the 11 recorded years, and the range of 24-hr average BC values has generally decreased over time at both monitoring sites. Similar to the average concentrations recorded in the previous two summer quarters (2016 and 2017), in summer quarter 2018, both sites recorded low median 24-hr average BC concentrations and smaller ranges of 24-hr average BC concentrations than earlier years.

While there is some year-to-year variability, over the observational record there is a statistically significant decrease in 24-hr average BC concentrations during summer quarters at the Landfill site (Figure 6). This may imply that the background BC levels at this site are also decreasing. At the Community site, there is a statistically significant decreasing trend in (1) summer-quarter 24-hr average BC 25th through 95th percentiles, and (2) maximum 24-hr average BC concentration. This trend has flattened out starting in 2014 at the Community site, and in 2016 at the Landfill site.

⁶ These results depend on the percentiles chosen in the trend analysis. Other percentiles may exhibit different trends, which may or may not be statistically significant.

5. Field Operations

Tables 4 and 5 list dates and major tasks associated with visits to the Landfill site and the Community site during the 2018 summer quarter.

Table 4. Landfill monitoring site visits, field maintenance, and operations.

Date of Site Visit	Description of Work
06/21/18	Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies and replaced the BAM tape. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.
7/20/18	Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies and replaced the BAM tape. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.
8/20/18	Unscheduled visit, website not current. Found proxy linked to network. Power cycled, rebooted control PC. Outbound data okay, remote inbound vnc not connecting. Advised Information Systems.
8/23/18	Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies and replaced the BAM tape. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.

Table 5. Community site visits, field maintenance, and operations.

Date of Site Visit	Description of Work
06/21/18	Found communications offline, rebooted modem. Found DR DAS closed on control PC, restarted DAS. Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies and replaced the BAM tape. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.
07/20/18	Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.
08/24/18	Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies and replaced the BAM tape. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.
09/24/18*	Collected PM ₁₀ and BC data. Restarted Aethalometer. Checked Aethalometer and BAM tape supplies. Cleaned BAM roller and nozzle, and performed leak check. Performed flow check on Aethalometer and BAM samplers.

* The next site visit that occurred after the current quarter is included in this report. The information from this site visit is used to assess the quality of the last portion of data from the current quarter.

Aethalometer and BAM flow rates measured with a National Institute of Standards and Technology (NIST)-traceable flow standard are shown in **Table 6**. BAM flow rates are volumetric (i.e., they depend on local temperature and pressure), and Aethalometer flow rates are at standard temperature and pressure. The target flow rate of the BAM is 16.7 liters per minute (lpm) volumetric to meet the 10-micron cut point of the inlet, with an acceptable range of 16.0 lpm to 17.3 lpm. The Aethalometer has no size cut point.

Table 6. Flow rates for the BAM PM₁₀ and Aethalometer BC monitors at the Landfill and Community sites. “Ref.” is the Reference and “Aeth.” is the Aethalometer.

Location	Date	Flow Rate (lpm)					
		As Found		As Left		As Found	
		BAM	Ref.	BAM	Ref.	Aeth.	Ref.
Sunshine Canyon Landfill (LS)	06/21/18	16.7	17.15	16.7	17.15	4.0	4.1
	07/20/18	16.7	17.35	16.7	17.35	4.0	4.3
	08/23/18	16.7	17.02	16.7	17.02	4.0	4.2
Community Site (CS)	06/21/18	16.7	16.71	16.7	17.02	3.1	3.4
	07/20/18	16.7	16.71	16.7	16.72	3.2	3.5
	08/24/18	16.7	16.70	16.7	16.84	3.1	3.2
	09/24/18 ^a	16.7	16.71	16.7	16.68	3.1	3.3

^a The next site visit that occurred after the current quarter is included in this report. The information from this site visit is used to assess the quality of the last portion of data from the current quarter.

6. References

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