

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

March 1, 2021 – May 31, 2021

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Executive Summary

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, the following are measured: 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). 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 by quantifying PM₁₀ and BC concentrations and exceedances and comparing concentrations between the Landfill and Community sites. A more in-depth analysis is performed for the annual report.

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 Fifty-Fourth Quarterly Report summarizes the March 2021–May 2021 (2021 spring quarter) monitoring results from the fourteenth year of continuous data collection.

Statistics

For this quarter, the percent data capture for hourly PM₁₀ was 100.0% at both the Landfill site and the Community site. Of the captured PM₁₀ data, 4.3% were invalidated at the Landfill site, and approximately 0.2% were invalidated at the Community site. None of the PM₁₀ data were deemed suspect at either the Landfill site or the Community site.

Hourly BC data capture was approximately 99.7% at the Landfill site and 99.4% at the Community site. Of the captured hourly BC data, 0.05% of data were deemed invalid at the Landfill site and no data were deemed invalid at the Community site. Of the captured hourly BC data, approximately

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

² County Condition 81.

5.0% were deemed suspect at the Landfill site, and 8.7% were deemed suspect at the Community site.

During this quarter, the state 24-hr PM₁₀ standard (50 µg/m³) was exceeded on 57% of days (50 days out of the valid 88 days of the quarter) at the Landfill site and was not exceeded at the Community site (0 days out of the valid 92 days of the quarter). The federal 24-hr PM₁₀ standard (150 µg/m³) was not exceeded on any day at the Landfill site or Community site for this quarter. In the spring 2021 quarter, the 24-hr average BC concentration was approximately 0.41 µg/m³ at the Landfill site and 0.36 µg/m³ at the Community site. Both sites exhibited ranges of 24-hr average BC concentrations on the low end of the 14 monitored spring quarters (2008–2021). 24-hr average BC concentrations at the Landfill site and Community site were slightly higher this spring quarter than the last two spring quarters.

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 March 1, 2021, through May 31, 2021. The collected data are validated and evaluated quarterly for completeness. This is the fourteenth year that continuous data were collected in the spring from 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.

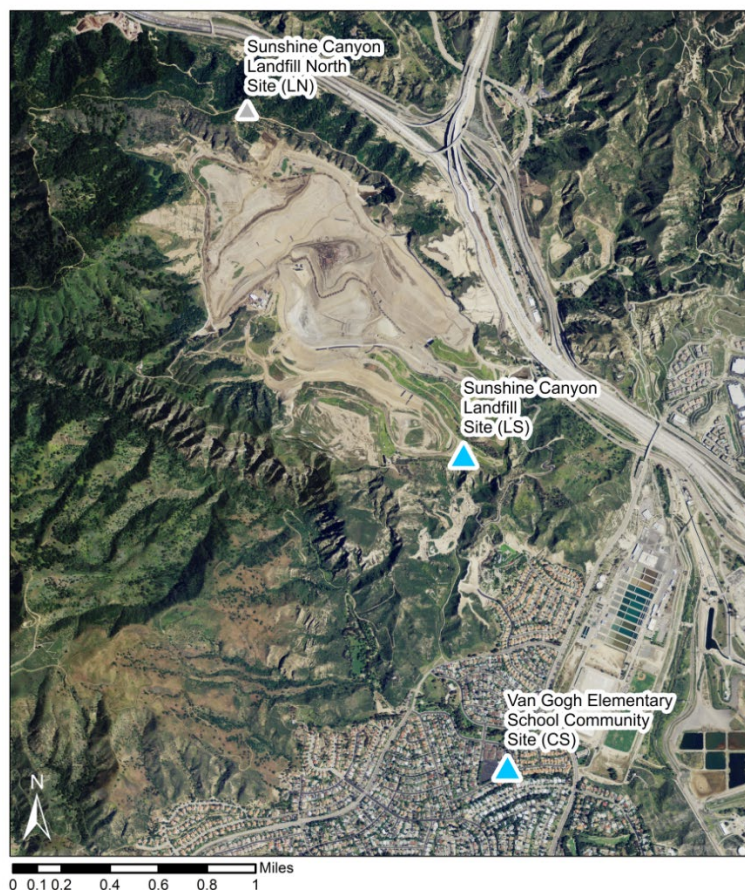


Figure 1. View of Sunshine Canyon Landfill and the surrounding monitoring stations (blue triangles): Sunshine Canyon Landfill site (LS) and Community site (CS). The Sunshine Canyon Landfill North site (LN, gray triangle) collected data from December 1, 2015, through May 31, 2017, and has since been decommissioned.

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 2021 spring 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 both the Landfill site and the Community site. Approximately 4.3% 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 PM₁₀, hourly BC, and 1-min wind speed and wind direction data for the 2021 spring 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)	03/01/2021-05/31/2021	100.0	99.7	98.9	95.7	99.95	100.0	0.0	5.0	48.3
Community Site (CS)	03/01/2021-05/31/2021	100.0	99.4	98.9	99.8	100.0	100.0	0.0	8.7	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 approximately 99.7% at the Landfill site and 99.4% at the Community site. 0.05% of data were invalidated at the Landfill site, and no hourly BC data were invalidated at the Community site. At the Landfill site, 5.0% of hourly BC data were deemed suspect; at the Community site, 8.7% hourly BC data were deemed suspect.

The wind data capture percentage was 98.9% at both the Landfill site and Community site. Among those captured data, none of the data were invalidated at the Landfill site or at the Community site. At the Landfill site, 48.3% of data were deemed suspect. A field site visit to the Landfill site on May 4, 2021, found that the anemometer instrument that measures WS and WD rotated 10 degrees to the east of true north since the last field site visit on March 22, 2021. Misters near the Landfill site produced ground saturation around the cement platform that holds the meteorological tower,

causing the platform to shift out of alignment. There were no available meteorological data at a nearby site that could substitute for meteorological data at the Landfill site during this 43-day period between site visits. Because the meteorological data at the Landfill site during this 43-day period did not exhibit any unusual tendencies (i.e., data was similar to those of the time period surrounding the 43 days), the data was flagged as suspect and not invalidated. At the Community site, there were no data that were flagged as suspect.

3. PM₁₀ Exceedances

The federal and state PM₁₀ exceedances during the spring quarter of the baseline year (2002), the spring quarters of the previous 13 years (2008–2020), and the current spring quarter (2021) are summarized in [Table 2](#). In this quarter, the state PM₁₀ standard of 50 µg/m³ was exceeded on 57% of days (50 out of 88 valid days) at the Landfill site and zero days at the Community site. This is the highest percentage of state PM₁₀ exceedances during the spring quarters on record at the Landfill site. Conversely, this is the seventh year in a row with either one or zero state PM₁₀ exceedances during the spring quarter at the Community site.

Table 2. Number of exceedances of federal and state 24-hr PM₁₀ standards during the spring quarters of the baseline year (2002) and years from 2008 to 2021. 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 spring quarter is shown in **bold**.

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)	03/01/02–05/31/02	Baseline Year	0	21/56 (38%)
	03/01/08–05/31/08	2008 Spring	1 (05/21/08)	20/89 (22%)
	03/01/09–05/31/09	2009 Spring	1 (05/06/09)	24/89 (27%)
	03/01/10–05/31/10	2010 Spring	0	10/90 (11%)
	03/01/11–05/31/11	2011 Spring	1 (04/30/11)	8/49 (16%)
	03/01/12–05/31/12	2012 Spring	1 (05/22/12)	15/89 (17%)
	03/01/13–05/31/13	2013 Spring	2 (03/21/13, 04/08/13)	34/91 (37%)
	03/01/14–05/31/14	2014 Spring	0	19/92 (21%)
	03/01/15–05/31/15	2015 Spring	0	5/91 (5%)
	03/01/16–05/31/16	2016 Spring	0	1/49 (2%)
	03/01/17–05/31/17	2017 Spring	6 (03/27/17, 04/20/17, 04/21/17, 04/25/17, 04/27/17, 04/28/17)	26/86 (24%)
	03/01/18–05/31/18	2018 Spring	1 (04/12/18)	5/87 (6%)
	03/01/19–05/31/19	2019 Spring	1 (04/09/19)	6/87 (7%)
	03/01/20–05/31/20	2020 Spring	0	24/72 (34%)
	03/01/21–05/31/21	2021 Spring	0	50/88 (57%)
Community Site (CS)	03/01/02–05/31/02	Baseline Year	0	17/55 (31%)
	03/01/08–05/31/08	2008 Spring	1 (05/21/08)	6/92 (7%)
	03/01/09–05/31/09	2009 Spring	0	17/88 (19%)
	03/01/10–05/31/10	2010 Spring	0	7/91 (8%)
	03/01/11–05/31/11	2011 Spring	0	3/92 (3%)
	03/01/12–05/31/12	2012 Spring	0	9/70 (13%)
	03/01/13–05/31/13	2013 Spring	0	18/92 (20%)
	03/01/14–05/31/14	2014 Spring	0	6/92 (7%)
	03/01/15–05/31/15	2015 Spring	0	1/91 (1%)
	03/01/16–05/31/16	2016 Spring	0	0/69 (0%)
	03/01/17–05/31/17	2017 Spring	0	0/90 (0%)
	03/01/18–05/31/18	2018 Spring	0	0/92 (0%)
	03/01/19–05/31/19	2019 Spring	0	1/91 (2%)
	03/01/20–05/31/20	2020 Spring	0	0/58 (0%)
	03/01/21–05/31/21	2021 Spring	0	0/92 (0%)

The federal 24-hr PM₁₀ standard (150 µg/m³) was not exceeded at the Landfill site, nor at the Community site. This is the fourth spring quarter in a row to have either one or zero federal 24-hr PM₁₀ exceedances at the Landfill site.

4. Average and Maximum Black Carbon 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 by an Aethalometer, which passes air through a filter tape trapping the suspended particles. Light-absorbing particles attenuate a light beam projected through the deposit. 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), subjecting Aethalometers to a saturation effect. 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 and Community sites have been adjusted in this report to compensate for this tape saturation effect; this compensation was not 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, which are unavailable.

The 24-hr average and maximum compensated BC concentrations collected during the 2021 spring quarter, the compensated BC data from the fall quarters of the 13 previous years, and the uncompensated data from the baseline year are provided in [Table 3](#). The 2021 spring quarter 24-hr BC concentration averages at both the Landfill site and Community site are on the lower end of all the previous spring quarters but are higher than the most recent two.

Distributions of 24-hr average PM₁₀ and BC data from spring quarters of 2008 through 2021 (presented as notched box-whisker plots⁵), and percentile trends for these metrics, are shown in [Figures 2 through 5](#).

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 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. 24-hr BC concentrations for the spring quarter of the baseline year (2002) and each year from 2008 to 2021. Uncompensated BC values are reported for the 2002 spring quarter. The most recent fall quarter is shown in **bold**.

Site	Quarterly Period	Quarter Name	BC Concentrations (µg/m ³)	
			Average 24-Hr	Maximum 24-Hr
Sunshine Canyon Landfill (LS)	03/01/02–05/31/02	Baseline Year	0.72 ^a	2.18 ^a
	03/01/08–05/31/08	2008 Spring	0.80	2.30
	03/01/09–05/31/09	2009 Spring	1.01	3.44
	03/01/10–05/31/10	2010 Spring	0.64	1.88
	03/01/11–05/31/11	2011 Spring	0.62	1.63
	03/01/12–05/31/12	2012 Spring	0.65	1.60
	03/01/13–05/31/13	2013 Spring	0.84	3.17
	03/01/14–05/31/14	2014 Spring	0.64	1.46
	03/01/15–05/31/15	2015 Spring	0.50	1.22
	03/01/16–05/31/16	2016 Spring	0.50	1.47
	03/01/17–05/31/17	2017 Spring	0.47	1.04
	03/01/18–05/31/18	2018 Spring	0.45 ^b	1.04 ^b
	03/01/19–05/31/19	2019 Spring	0.32	0.79
	03/01/20–05/31/20	2020 Spring	0.32	0.93
	03/01/21–05/31/21	2021 Spring	0.41	0.76
Community Site (CS)	03/01/02–05/31/02	Baseline Year	0.72 ^a	2.22 ^a
	03/01/08–05/31/08	2008 Spring	0.61	1.37
	03/01/09–05/31/09	2009 Spring	0.81	1.95
	03/01/10–05/31/10	2010 Spring	0.64	1.80
	03/01/11–05/31/11	2011 Spring	0.54	1.47
	03/01/12–05/31/12	2012 Spring	0.66	1.70
	03/01/13–05/31/13	2013 Spring	0.66	1.49
	03/01/14–05/31/14	2014 Spring	0.49	1.44
	03/01/15–05/31/15	2015 Spring	0.61	1.68
	03/01/16–05/31/16	2016 Spring	0.56	1.97
	03/01/17–05/31/17	2017 Spring	0.49	1.12
	03/01/18–05/31/18	2018 Spring	0.42	1.04
	03/01/19–05/31/19	2019 Spring	0.31	0.75
	03/01/20–05/31/20	2020 Spring	0.21	0.64
	03/01/21–05/31/21	2021 Spring	0.36	0.66

^a Uncompensated BC values.

^b Data taken from the secondary Aethalometer between April 20 and May 24, 2019, were used without corrections.

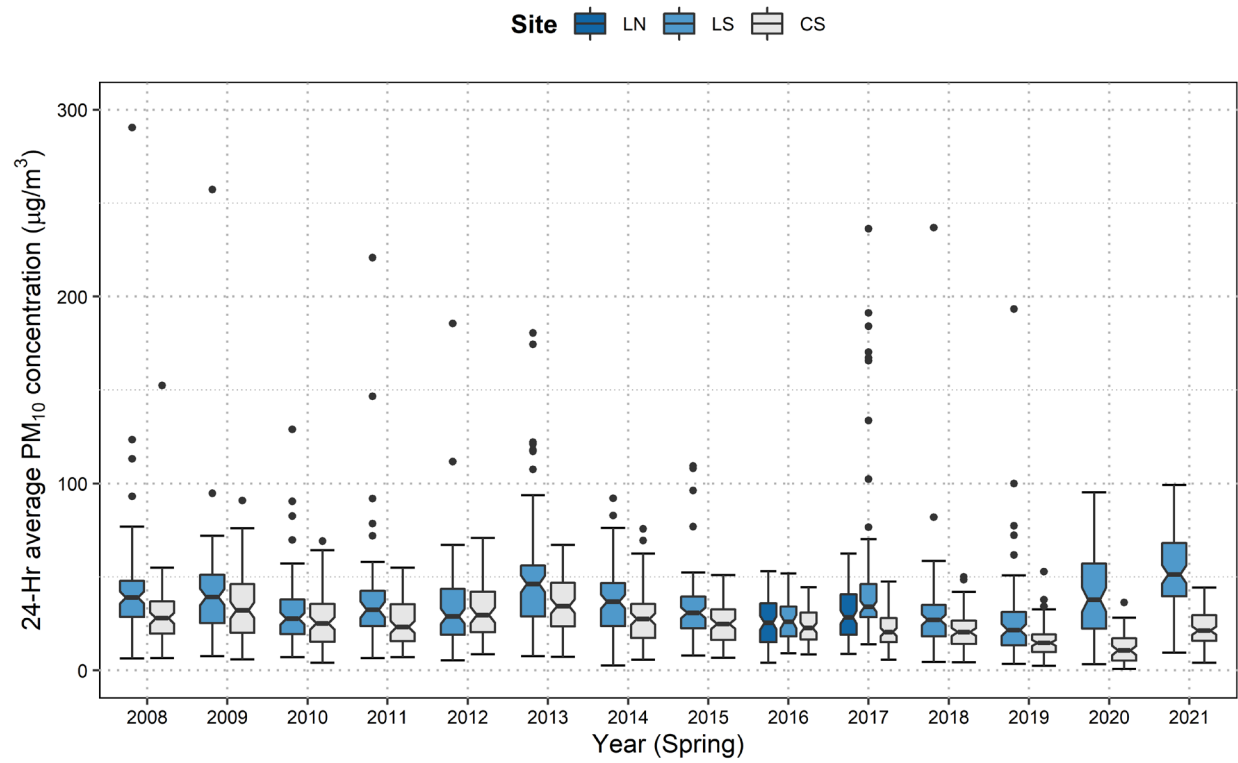


Figure 2. Distribution of 24-hr average PM₁₀ concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during spring (March-May) quarters from 2008 to 2021.

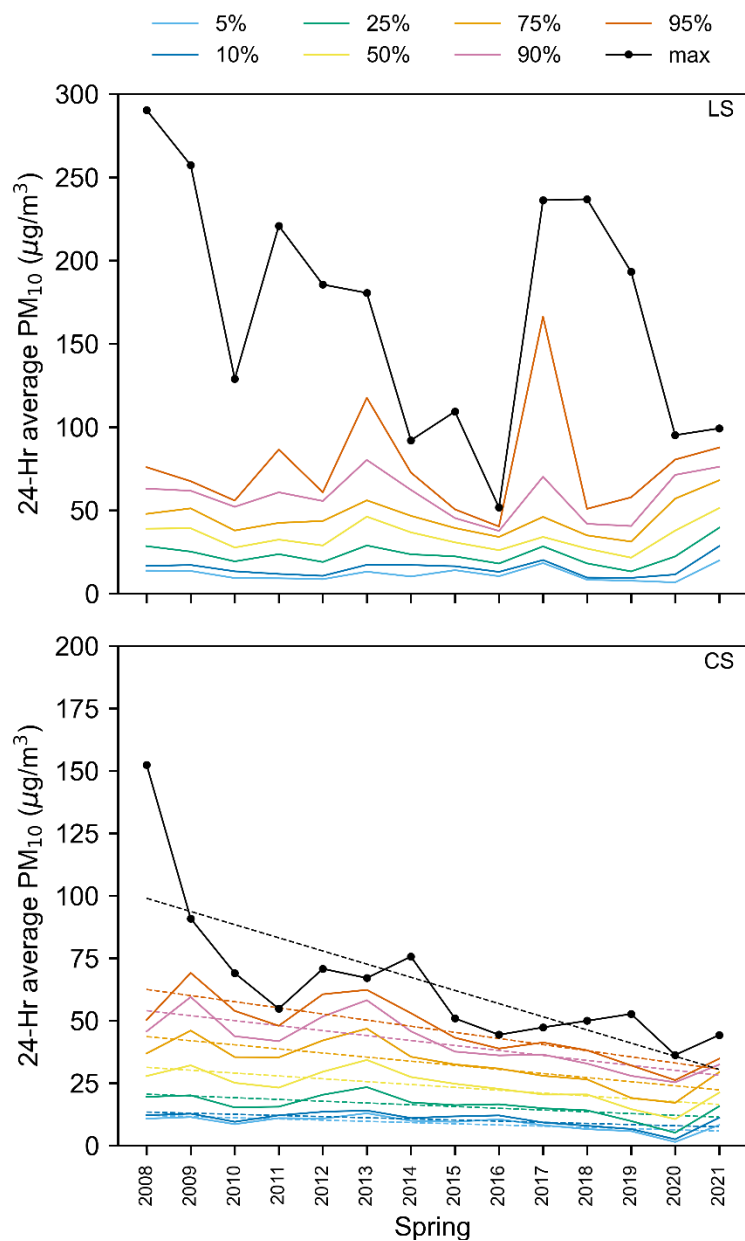


Figure 3. Trends of 24-hr average PM₁₀ maxima and percentiles at the Sunshine Canyon Landfill site (LS, top) and Community site (CS, bottom) during spring (March-May) quarters from 2008 to 2021. The colored dashed lines denote statistically significant decreasing linear trends. Statistical significance was defined at the 95% confidence level ($p\text{-value} \leq 0.05$).

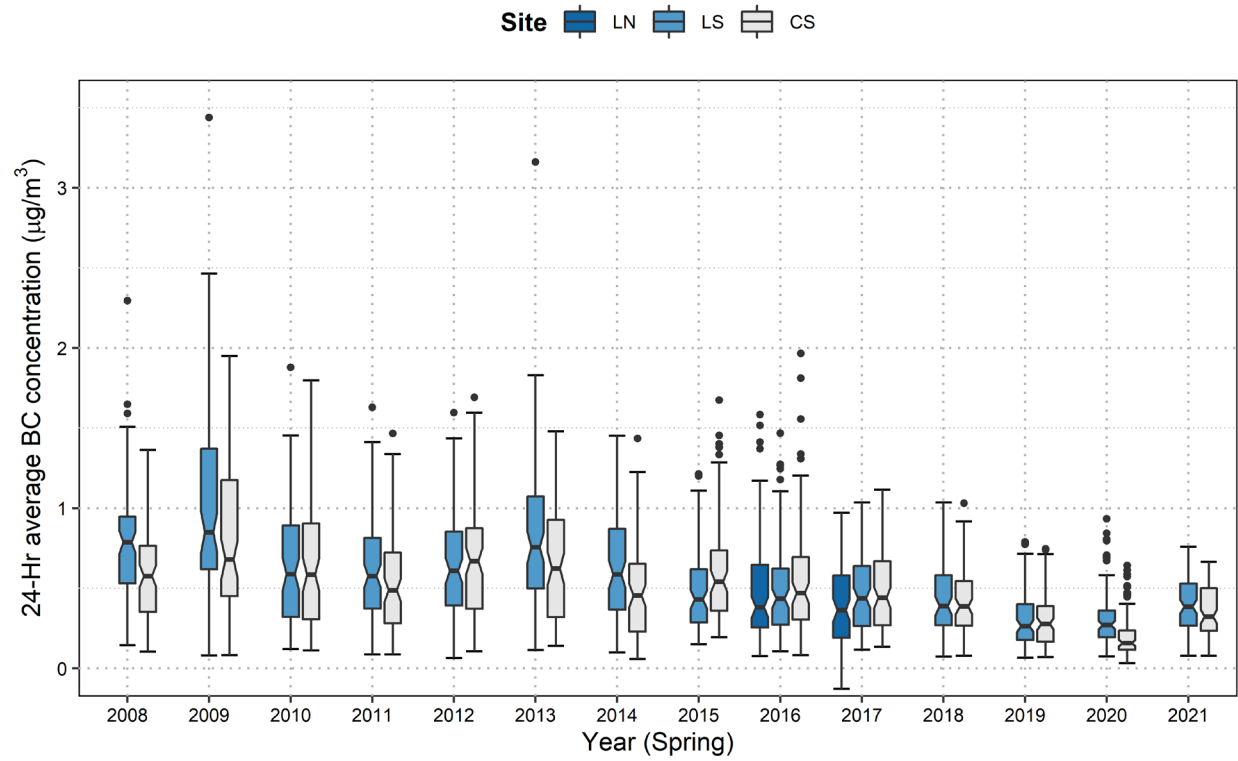


Figure 4. Distribution of 24-hr average BC concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during spring (March-May) quarters from 2008 to 2021.

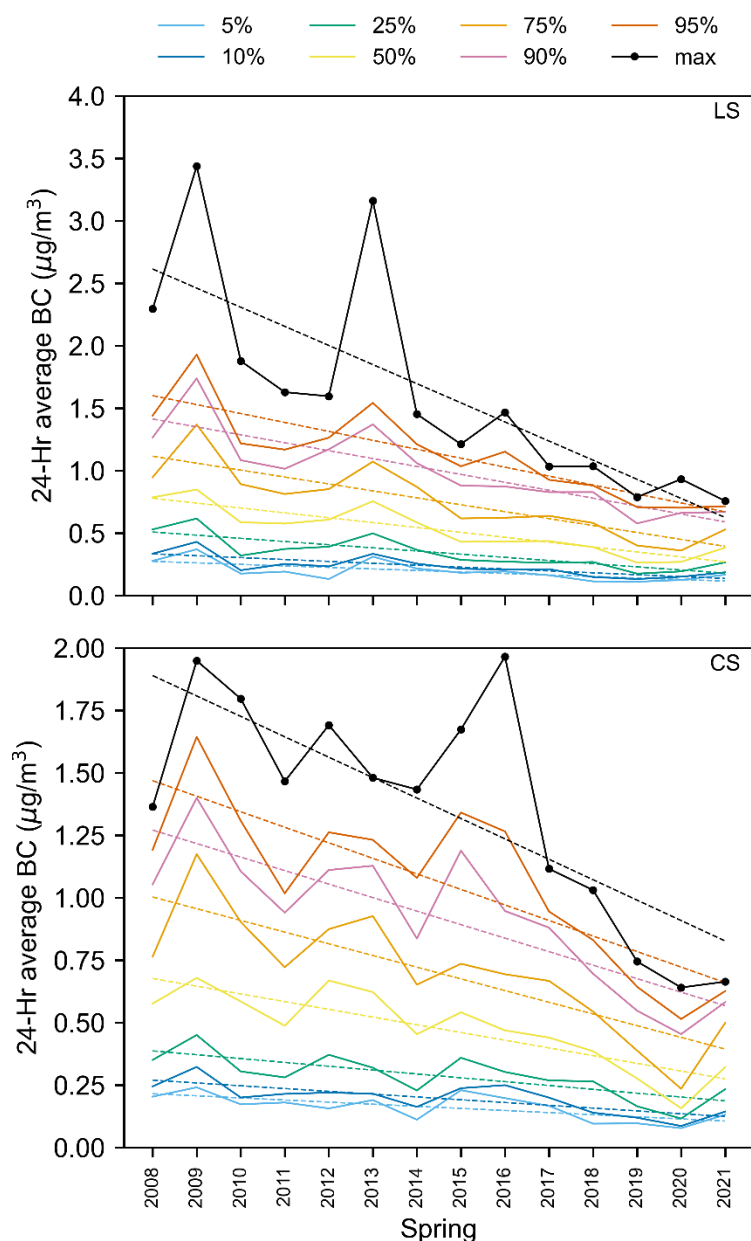


Figure 5. Trends of 24-hr average BC maxima and percentiles at the Sunshine Canyon Landfill site (LS, top) and Community site (CS, bottom) during spring (March-May) quarters from 2008 to 2021. The colored dashed lines denote statistically significant decreasing linear trends. Statistical significance was defined at the 95% confidence level ($p\text{-value} \leq 0.05$).

During spring, the median 24-average PM₁₀ concentrations measured at the Community site are usually lower than those measured at the Landfill site (Figure 2). This remained true in the 2021 spring quarter. As indicated by the non-overlapping notches (and the entire interquartile range) in the box-whisker plot, the difference between the median 24-hr PM₁₀ concentrations at the Community and the Landfill sites is statistically significant. At the Landfill site, there is not a

statistically significant increasing or decreasing trend in all of the 24-hr averages (Figure 3). All percentiles of the 24-hr average PM₁₀ concentration at the Landfill site have increased since the 2020 spring quarter. At the Community site, there is a statistically significant decreasing trend for all the 24-hr average PM₁₀ percentiles and maximum value. However, all 24-hr average PM₁₀ percentiles and maxima at the Community site increased from the 2020 spring quarter.

During the spring quarters, the median 24-hr average BC concentrations are not usually significantly different between the Landfill and the Community sites, as indicated by overlapping notches in the box-whisker plot (Figure 4). In the spring 2021 quarter, the median 24-hr average BC concentration at the Landfill site was not statistically higher than that at the Community site, as indicated by the overlapping notches in the box-whisker plot. There is some year-to-year variability in median 24-hr average BC concentrations over the 14 recorded consecutive years, but the range of 24-hr average BC values has generally decreased over time at both monitoring sites. However, in the spring 2021 quarter, both the Landfill site and the Community site saw slightly higher median 24-hr average BC concentrations than in the previous spring quarter.

There is a statistically significant decreasing trend in 24-hr average BC concentrations, the 5th through 95th percentiles, and the maximum 24-hr BC concentrations at the Landfill site during spring quarters over the observational record (Figure 5). All percentiles of the 24-hr BC recorded at both the Landfill site and Community site in the 2021 spring quarter have increased from the previous spring quarter; only the maximum 24-hr BC concentrations at the Landfill site decreased from the previous spring quarter. At both the Landfill site and Community site, there is a statistically significant declining trend in spring quarter 24-hr average BC concentrations, at the 5th to 95th percentiles, and the 24-hr maximum BC over the 14 recorded consecutive years. There were no statistically significant increasing trends in the maxima or percentiles.

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 2021 spring quarter.

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

Date of Site Visit	Description of Work
03/22/2021	Collected PM ₁₀ and BC data Restarted Aethalometer Checked Aethalometer and BAM tape supplies Cleaned roller on Aethalometer Cleaned roller, vane, and nozzle on BAM Performed flow test on BAM and Aethalometer
05/04/2021	Collected PM ₁₀ and BC data Restarted Aethalometer Respooled, and cleaned roller, vane, and nozzle on BAM Found sample tape separated due to moisture on BAM Performed flow test on BAM and Aethalometer Semi-annual meteorology calibration Realigned anemometer to true North from position off line by +10° to the east
06/17/2021 ^a	Collected PM ₁₀ and BC data Respooled Aethalometer Restarted Aethalometer Cleaned roller, vane, and nozzle on BAM Performed flow test on BAM and Aethalometer Found damage to all sensors and analyzers due to misters near monitoring instruments

^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.

Table 5. Community site (CS) visits, field maintenance, and operations.

Date of Site Visit	Description of Work
03/22/2021	Collected PM ₁₀ and BC data Restarted Aethalometer Checked Aethalometer and BAM tape supplies Cleaned roller on Aethalometer Respoled, and cleaned roller, vane, and nozzle on BAM Performed flow test on BAM and Aethalometer Detected Trojan virus on drive
05/04/2021	Collected PM ₁₀ and BC data Restarted Aethalometer Checked Aethalometer and BAM tape supplies Cleaned roller on Aethalometer Cleaned roller, vane, and nozzle on BAM Performed flow test on BAM and Aethalometer Performed semi-annual meteorology calibration

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 particle cut point of the inlet, with an acceptable range of 16.0 lpm to 17.3 lpm. The Aethalometer has no particle 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)	03/22/2021	16.7	16.7	16.4	16.7	4.0	3.78
	05/04/2021	NA	16.7	16.65	16.7	4.0	4.2
	06/17/2021 ^a	16.7	16.7	16.54	16.7	4.0	3.81
Community Site (CS)	03/22/2021	16.7	16.7	16.84	16.7	4.2	4.14
	05/04/2021	16.7	16.7	16.72	16.7	4.2	4

^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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