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

June 1, 2020 – August 31, 2020

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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 (PM_{10}), 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]

PM_{10} concentrations are compared with federal and state PM_{10} standards. When PM_{10} concentrations are above the standard (i.e., an exceedance), additional comparisons are made with the historical, regional, and annual ambient PM_{10} concentrations. The PM_{10} 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 PM_{10} 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-first Quarterly Report summarizes the June 2020–August 2020 (2020 summer quarter) monitoring results from the fourteenth year of continuous data collection.

Statistics

For this quarter, the percent data capture for PM_{10} was 99.0% at both the Landfill site and the Community site. Of the captured PM_{10} data, approximately 0.2% were invalidated at the Landfill site, and approximately 0.7% were invalidated at the Community site. None of the PM_{10} data were deemed suspect at either the Landfill site or the Community site.

Hourly BC data capture was 99.9% at the Landfill site and 97.1% at the Community site. Of the captured hourly BC data, no data were deemed invalid at either the Landfill site or the Community

[1] Section C.10.a of Ordinance No. 172,933.
[2] County Condition 81.

site. Of the BC data, approximately 4.5% were deemed suspect at the Landfill site, and approximately 8.9% were deemed suspect at the Community site.

During this quarter, the state 24-hr PM_{10} standard (50 µg/m^3) was exceeded on 70% of days (63 days out of the valid 91 days of the quarter) at the Landfill site and 2% of days at the Community site (1 day out of the valid 90 days of the quarter). The federal 24-hr PM_{10} standard (150 µg/m^3) was not exceeded on any days at the Landfill site nor on any days at the Community site. In the summer 2020 quarter, the Community site recorded the lowest median 24-hr average BC concentration, and both sites exhibited smaller ranges of 24-hr average BC concentrations than in previous years.

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, 2020, through August 31, 2020. The collected data are validated and evaluated quarterly for completeness. This is the fourteenth year that continuous 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.

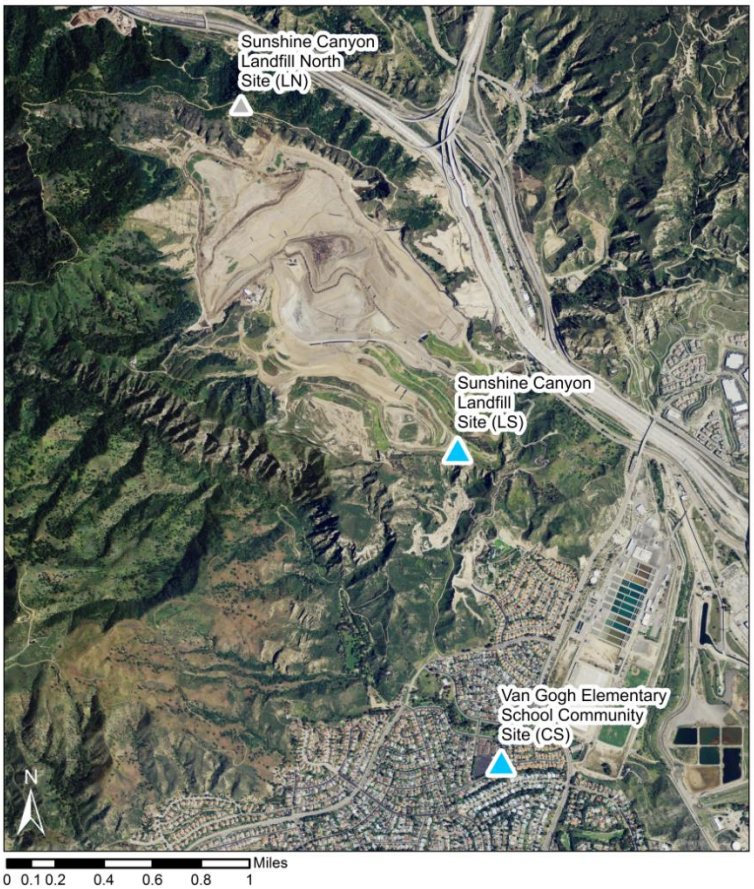

Figure 1. View of Sunshine Canyon Landfill and the surrounding monitoring stations (blue triangles): Sunshine Canyon Landfill (LS) and Community site (CS). The Sunshine Canyon Landfill North site (LN, gray triangle) collected data from December 1, 2015 through May 31, 2017 and has since been decommissioned.

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 2020 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 PM_{10} was 99.0% at both the Landfill site and the Community site. Approximately 0.2% and 0.7% of the captured PM_{10} data were invalidated at the Landfill and Community sites, respectively. No hourly PM_{10} values were deemed suspect at either of the monitoring sites in this quarter.

Table 1. Data completeness statistics for hourly PM_{10}, hourly BC, and 1-min wind speed and wind direction data for the 2020 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)	06/01/20 - 08/31/20	99.0	99.9	100.0	99.8	100.0	98.9	0.0	4.5	0.002
Community Site (CS)	06/01/20 - 08/31/20	99.0	97.1	100.0	99.3	100.0	98.9	0.0	8.9	0.01

[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 97.1% at the Community site. No hourly BC data were invalidated at the Landfill site or the Community site. At the Landfill site, 4.5% of hourly BC data were deemed suspect; at the Community site, 8.9% hourly BC data were deemed suspect.

The wind data capture percentages were 100.0% at both the Landfill site and the Community site. Among those captured data, approximately 1.1% of the data were invalidated at the Landfill site, with less than 0.002% deemed suspect. Approximately 1.1% of the data were invalidated at the Community site, with 0.01% deemed suspect.

3. PM_{10} Exceedances

The federal and state PM_{10} exceedances for the summer quarter of the baseline year (2002), the summer quarters of the previous 12 years (2008–2019), and the current summer quarter (2020) are summarized in Table 2. In this quarter, the state PM_{10} standard of 50 µg/m^3 was exceeded on 70% of days (63 days) at the Landfill site and on 1 day at the Community site. This is the highest percentage of state PM_{10} exceedances for the summer quarters on record at both the Landfill site and the Community site. As shown in Table 2, state exceedances at the Landfill site were uncharacteristically high for this time period. Throughout most of August, several wildfires were active north of the monitoring site. Table 3 and Figure 2 depict the major fire events in the immediate area of the Landfill.

The federal 24-hr PM_{10} standard (150 µg/m^3) was not exceeded on any days at either the Landfill site or the Community site. Over the 14 summer quarters of PM_{10} measurements, including the baseline year (2001-2002), there were federal 24-hr exceedances during one quarter at the Landfill site and none at the Community site.

Table 2. Number of exceedances of federal and state 24-hr PM_{10} standards during the summer quarters of the baseline year (2002) and years from 2008 to 2020. 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 PM_{10} concentrations were measured. The most recent summer 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)	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%)

Site	Quarter Period	Quarter Name	Exceedances of PM_{10} Standard	
			Federal 24-hr 150 µg/m^3	State 24-hr 50 µg/m^3
	06/01/18–08/31/18	2018 Summer	0	19/91 (21%)
	06/01/19–08/31/19	2019 Summer	0	2/91 (3%)
	06/01/20–08/31/20	2020 Summer	0	63/91 (70%)
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%)
	06/01/19–08/31/19	2019 Summer	0	0/91 (0%)
	06/01/20–08/31/20	2020 Summer	0	1/90 (2%)

Table 3. Active wildfire events in the immediate areas around the Landfill during the summer quarter of 2020.

Fire Name	Occurrence Date	Acres Burned
Elsmere Fire	August 3	200
Texas Fire	August 8	210
Lake Fire	August 12	31,000

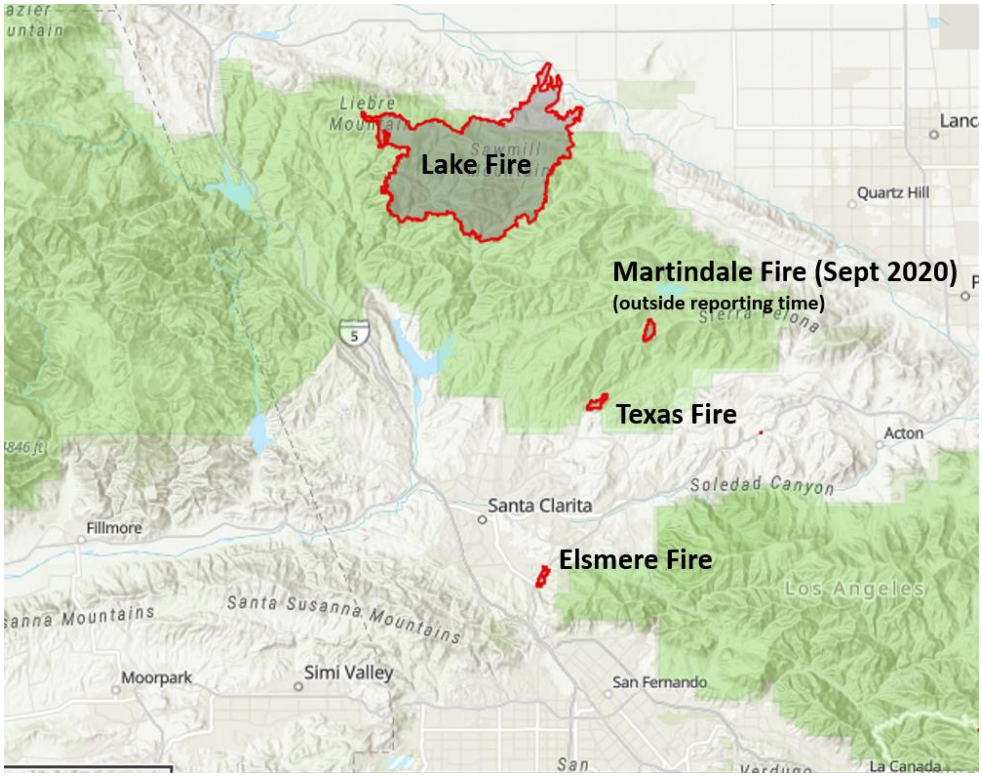

Figure 2. Location of the active wildfire events in the immediate areas around the Landfill and Community Monitoring Sites during the summer quarter of 2020. Note: other wildfires in the Southern California region were active in the fall quarter and contributed to regional smoke impacts.

4. Average and Maximum Black Carbon Concentrations and PM_{10} 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, Landfill North, and Community sites have been adjusted in this report 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, which are unavailable.

The 24-hr average and maximum compensated BC concentrations collected during the 2020 summer quarter, the compensated BC data from the summer quarters of the 12 previous years, and the uncompensated data from the baseline year are provided in Table 4. The 2020 summer quarter 24-hr BC concentration average at the Landfill site continues to be among the lowest on record for the third year in a row. At the Community site, the 2020 summer quarter 24-hr BC concentration average is the lowest recorded over the 14-year observational period.

Distributions of 24-hour average PM_{10} and BC data from summer quarters from 2008 through 2020 (presented as notched box-whisker plots[5]), and percentile trends for these metrics, are shown in **Figures 3 through 6**.

Table 4. 24-hr BC concentrations for the summer quarter of the baseline year (2002) and each year from 2008 to 2020. Uncompensated BC values are reported for the 2002 summer quarter. The most recent summer 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)	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
	06/01/19–08/31/19	2019 Summer	0.57	0.97
	06/01/20–08/31/20	2020 Summer	0.58	1.68
Sunshine Canyon Landfill North (LN)	06/01/16–08/31/16	2016 Summer	0.86	2.17

[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.

Site	Quarterly Period	Quarter Name	BC Concentrations (µg/m³)	
			Average 24-Hr	Maximum 24-Hr
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
	06/01/19–08/31/19	2019 Summer	0.54	0.92
	06/01/20–08/31/20	2020 Summer	0.47	1.53

[a] Uncompensated BC values.
[b] Data taken from the secondary Aethalometer between April 20 and May 24, 2019, were used without corrections.

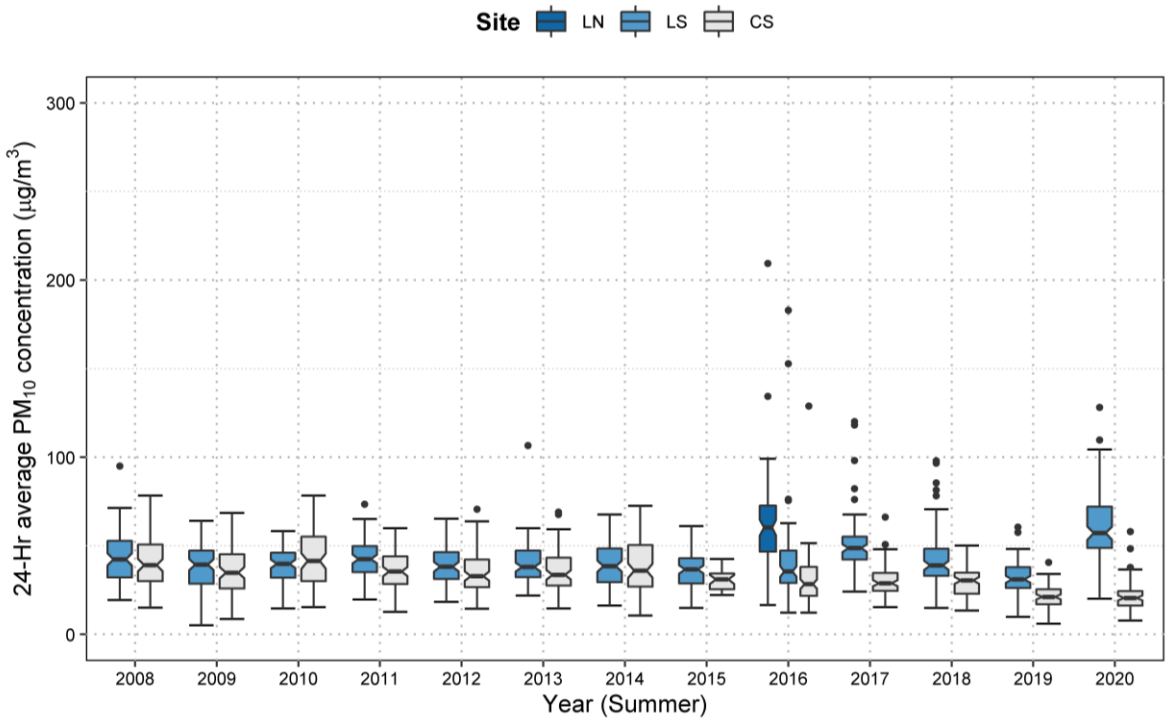

Figure 3. Distribution of 24-hr average PM_{10} concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June-August) quarters from 2008 to 2020.

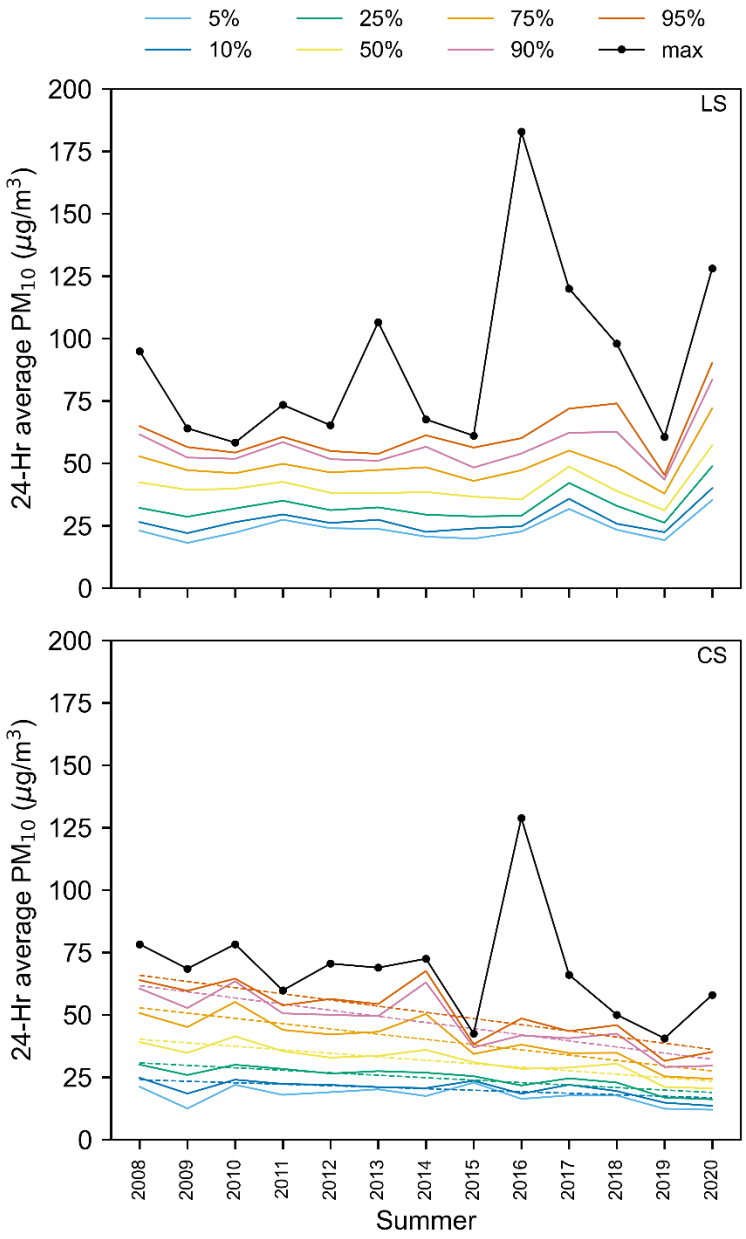

Figure 4. Trends of 24-hr average PM_{10} maxima and percentiles at the Sunshine Canyon Landfill site (LS, top) and Community site (CS, bottom) during summer (June-August) quarters from 2008 to 2020. A dashed line denotes a statistically significant decreasing linear trend. Statistical significance was defined at the 95% confidence level (*p-value* ≤ 0.05).

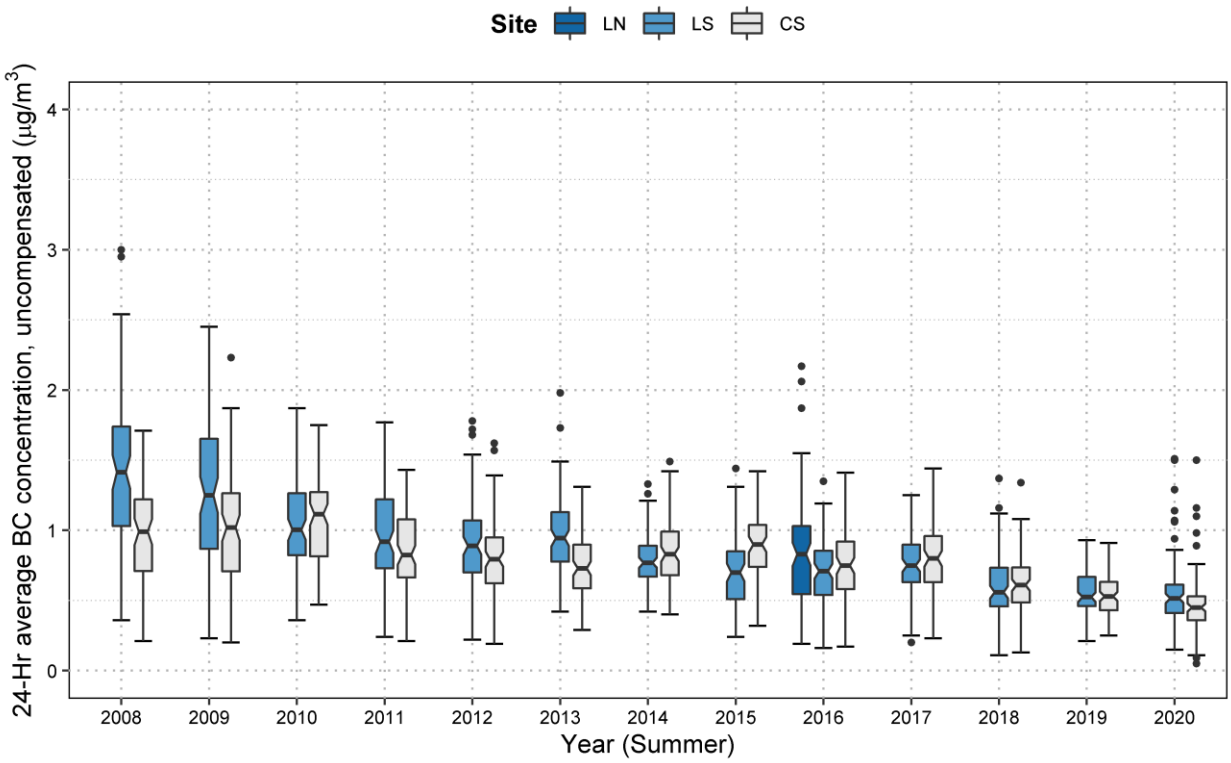

Figure 5. Distribution of 24-hr average BC concentrations at the Sunshine Canyon Landfill North site (LN), Landfill site (LS), and Community site (CS) during summer (June-August) quarters from 2008 to 2020.

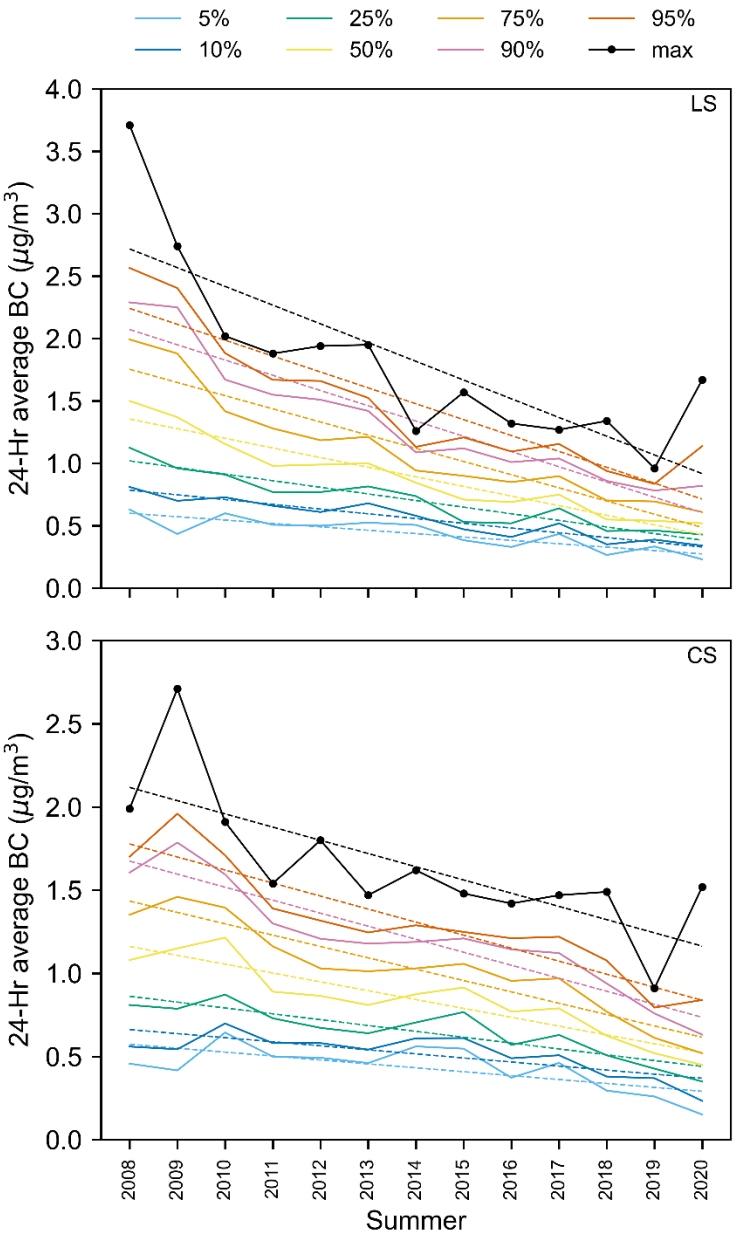

Figure 6. Trends of 24-hr average BC maxima and percentiles at the Sunshine Canyon Landfill site (LS, top) and Community site (CS, bottom) during summer (June-August) quarters from 2008 to 2020. A dashed line denotes a statistically significant decreasing linear trend. Statistical significance was defined at the 95% confidence level (*p-value* ≤ 0.05).

At this time of year, the median 24-average PM_{10} concentrations measured at the Community site are usually lower than those measured at the Landfill site (Figure 3). In the 2020 summer quarter, the median 24-hr average PM_{10} concentration was also 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 PM_{10} concentrations at the Community and the Landfill sites is

statistically significant. At the Landfill site, there is no statistically significant trend in any of the 24-hr average PM_{10} percentiles or the max values (Figure 4).6 All percentiles and the max value of the 24-hr average PM_{10} concentration at the Landfill site have increased since the 2019 summer quarter. The percentiles of the 24-hr average PM_{10} concentration in the 2020 summer quarter are the highest on record at the Landfill site. At the Community site, there is a statistically significant decreasing trend for all the 24-hr average PM_{10} percentiles; the percentiles in the 2020 summer quarter are among the lowest.

During the summer 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 5). In the summer 2020 quarter, the median 24-hr average BC concentration at the Landfill site was statistically higher than that at the Community site, as indicated by the non-overlapping notches in the box-whisker plot. There is some year-to-year variability in median 24-hr average BC concentrations over the 13 recorded consecutive years, but the range of 24-hr average BC values has generally decreased over time at both monitoring sites. In the summer 2020 quarter, both the Landfill site and the Community site saw lower median 24-hr average BC concentrations (and smaller ranges of 24-hr average BC concentrations) for a third year in a row (starting 2018).

There is a statistically significant decreasing trend in 24-hr average BC concentrations, the 5^{th} through 95^{th} percentiles, and the maximum 24-hour BC concentrations, at the Landfill site during summer quarters over the observational record (Figure 6). The 5^{th} to 75^{th} percentiles of the 24-hr BC recorded in the 2020 summer quarter are the lowest measured at the Landfill site. At the Community site, there is also a statistically significant declining trend in summer quarter 24-hr average BC concentrations, at the 5^{th} to 95^{th} percentiles, and the 24-hr maximum BC, over the 13 recorded consecutive years. The 5^{th} to 90^{th} percentiles of the 24-hr BC recorded in the 2020 summer quarter are the lowest measured at the Community site.

5. Field Operations

Tables 5 and 6 list dates and major tasks associated with visits to the Landfill site and the Community site during the 2020 summer quarter.

Table 5. Landfill monitoring site (LS) visits, field maintenance, and operations.

Date of Site Visit	Description of Work
07/02/2020	Collected PM_{10} and BC data Restarted Aethalometer Checked Aethalometer and BAM tape supplies Performed flow check on Aethalometer and BAM Cleaned BAM roller, vane, and nozzle Performed leak test on BAM and passed
08/10/2020	Investigated data telemetry issue Found DRD crashed Rebooted PC and restarted Envidas viewer and reporter Verified remote access to PC
09/22/2020[a]	Annual met. calibration Aethalometer tape jammed and not feeding properly with overlapping measurements, likely caused by excessive moisture Cut off deteriorated tape and re-spooled remaining tape Backed up BC data and replaced data card Verified flow

[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 6. Community site (CS) visits, field maintenance, and operations.

Date of Site Visit	Description of Work
07/02/2020	Collected PM_{10} and BC data Restarted Aethalometer Checked Aethalometer and BAM tape supplies Found Aethalometer tape loose Re-tensioned Aethalometer tape and tested Performed flow test on Aethalometer and BAM Cleaned BAM roller, vane, and nozzle Performed leak test on BAM and passed
08/07/2020	Changed BAM tape
09/21/2020[a]	Annual MET calibration Collected PM_{10} and BC data Restarted Aethalometer Checked Aethalometer and BAM tape supplies Performed flow test on Aethalometer and BAM Cleaned BAM roller, vane, and nozzle Performed leak test on BAM Leak test passed

[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.

Aethalometer and BAM flow rates measured with a National Institute of Standards and Technology (NIST)-traceable flow standard are shown in Table 7. 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 7. Flow rates for the BAM PM_{10} 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)	07/02/2020	16.7	17.1	16.7	17.1	4.0	4.2
	08/10/2020	NA	NA	NA	NA	NA	NA
	09/22/2020	NA	NA	NA	NA	4.0	4.0
Community Site (CS)	07/02/2020	16.7	16.83	16.7	16.83	4.1	4.0
	07/08/2020	NA	NA	NA	NA	NA	NA
	09/21/2020[a]	16.7	16.66	16.7	16.66	4.1	4.18

[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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Drinovec L., Močnik G., Zotter P., Prévôt A.S.H., Ruckstuhl C., Coz E., Rupakheti M., Sciare J., Müller T., Wiedensohler A., and Hansen A.D.A. (2015) The "dual-spot" Aethalometer: an improved measurement of aerosol black carbon with real-time loading compensation. *Atmospheric Measurement Techniques*, 8, 1965-1979, doi: 10.5194/amt-8-1965-2015. Available at http://www.atmos-meas-tech.net/8/1965/2015/amt-8-1965-2015.pdf.

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