

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

June 1, 2021 – August 31, 2021

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# Executive Summary

## Background

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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<sub>10</sub>), 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.<sup>1</sup> Similar conditions cover the County of Los Angeles' portion of the landfill.<sup>2</sup>

PM<sub>10</sub> concentrations are compared with federal and state PM<sub>10</sub> standards. When PM<sub>10</sub> concentrations are above the standard (i.e., an exceedance), additional comparisons are made with the historical, regional, and annual ambient PM<sub>10</sub> concentrations. The PM<sub>10</sub> 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<sub>10</sub> 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-Fifth Quarterly Report summarizes the June 2021–August 2021 (2021 summer quarter) monitoring results from the fifteenth year of continuous data collection.

## Statistics

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For this quarter, the percent data capture for hourly PM<sub>10</sub> was 91.4% at the Landfill site and 99.5% at the Community site. Of the captured PM<sub>10</sub> data, 5.5% were invalidated at the Landfill site, and 7.9% were invalidated at the Community site. None of the PM<sub>10</sub> data were deemed suspect at either the Landfill site or the Community site.

Hourly BC data capture was approximately 91% at the Landfill site and 89.3% at the Community site. Of the captured hourly BC data, no data were deemed invalid at the Landfill site and no data were

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<sup>1</sup> Section C.10.a of Ordinance No. 172,933.

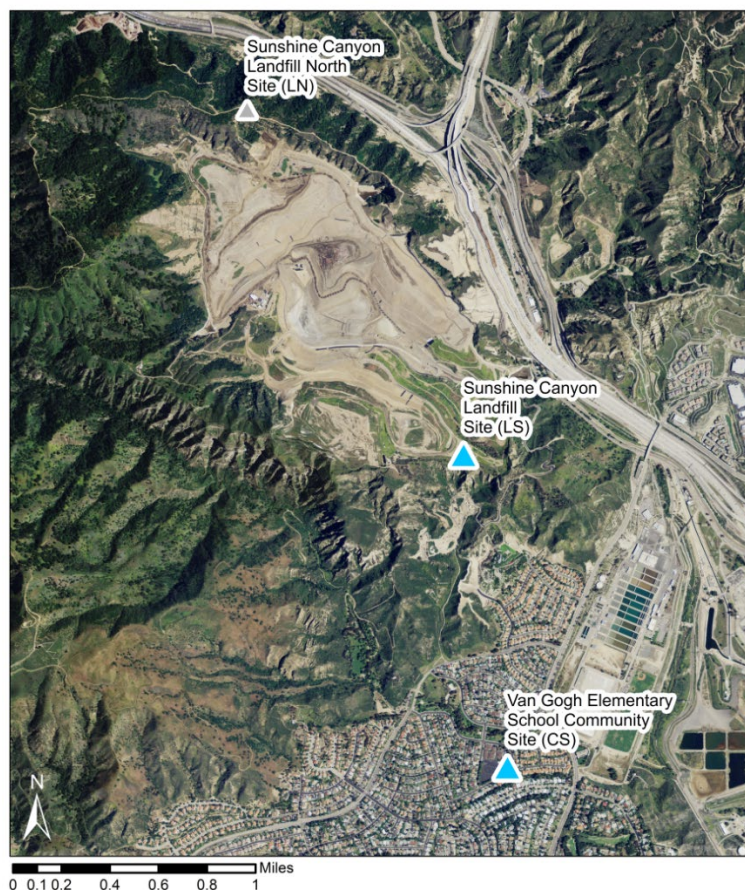
<sup>2</sup> County Condition 81.

deemed invalid at the Community site. Of the captured hourly BC data, approximately 2.2% were deemed suspect at the Landfill site, and 11.1% were deemed suspect at the Community site.

During this quarter, the state 24-hr  $\text{PM}_{10}$  standard ( $50 \mu\text{g}/\text{m}^3$ ) was exceeded on 94% of days (73 days out of the valid 78 days of the quarter) at the Landfill site and was exceeded at the Community site on 2% of days (1 day out of the valid 84 days of the quarter). The federal 24-hr  $\text{PM}_{10}$  standard ( $150 \mu\text{g}/\text{m}^3$ ) was not exceeded on any day at the Landfill site or Community site for this quarter. In the summer 2021 quarter, the 24-hr average BC concentration was approximately  $0.62 \mu\text{g}/\text{m}^3$  at the Landfill site and  $0.57 \mu\text{g}/\text{m}^3$  at the Community site. Both sites exhibited ranges of 24-hr average BC concentrations on the low end of the previous 14 monitored summer quarters (2008–2021). 24-hr average BC concentrations at the Landfill site were slightly higher this summer quarter than the last three summer quarters. 24-hr average BC concentrations at the Community site were slightly higher this summer quarter than the last two summer quarters. 24-hr max BC concentrations at both sites this summer quarter reflected the second lowest concentrations out of all summer 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 June 1, 2021, through August 31, 2021. The collected data are validated and evaluated quarterly for completeness. This is the fifteenth year that continuous data were collected in the summer from monitors at the Sunshine Canyon Landfill site (previously called the Berm site) and the Van Gogh Elementary School Community site. 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 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 and Community site. The Sunshine Canyon Landfill North site (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.<sup>3</sup> Similar conditions cover the County of Los Angeles' portion of the landfill.<sup>4</sup>

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<sup>3</sup> Section C.10.a of Ordinance No. 172,933.

<sup>4</sup> County Condition 81.

## 2. Data Completeness

Completeness statistics for all measured variables during the 2021 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<sub>10</sub> was 91.4% at the Landfill site and 99.5% at the Community site. Approximately 5.5% and 7.9% of the captured PM<sub>10</sub> data were invalidated at the Landfill and Community sites, respectively. No hourly PM<sub>10</sub> values were deemed suspect at either of the monitoring sites in this quarter.

**Table 1.** Data completeness statistics for hourly PM<sub>10</sub>, hourly BC, and 1-min wind speed and wind direction data for the 2021 summer quarter monitoring period.

Monitoring Location	Dates	Data Capture (%) <sup>a</sup>			Data Valid or Suspect (%) <sup>b</sup>			Data Suspect (%) <sup>c</sup>		
		PM <sub>10</sub>	BC	WS/WD	PM <sub>10</sub>	BC	WS/WD	PM <sub>10</sub>	BC	WS/WD
Sunshine Canyon Landfill	06/01/2021-08/31/2021	91.4	91.0	100.0	94.5	100.0	90.3	0.0	2.2	0.01
Community Site	06/01/2021-08/31/2021	99.5	89.3	100.0	92.1	100.0	98.5	0.0	11.1	0.0

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> 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 91.0% at the Landfill site and 89.3% at the Community site. No data were invalidated at the Landfill site or the Community site. At the Landfill site, 2.2% of hourly BC data were deemed suspect; at the Community site, 11.1% hourly BC data were deemed suspect.

The wind data capture percentage was 100.0% at both the Landfill site and Community site. Among those captured data, 90.3% were deemed valid at the Landfill site and 98.5% were valid at the Community site. At the Landfill site, <0.1% (0.01%) of data were deemed suspect and no data were deemed suspect at the Community site.



### 3. PM<sub>10</sub> Exceedances

The federal and state PM<sub>10</sub> exceedances during the summer quarter of the baseline year (2002), the summer quarters of the previous 13 years (2008–2020), and the current summer quarter (2021) are summarized in [Table 2](#). In this quarter, the state PM<sub>10</sub> standard of 50 µg/m<sup>3</sup> was exceeded on 94% of days (73 out of 78 valid days) at the Landfill site and 2% of the days (1 out of 84 valid days) at the Community site. This is the highest percentage of state PM<sub>10</sub> exceedances during the summer quarters on record at the Landfill site. Conversely, this is the seventh year in a row reflecting less than 5% of days with PM<sub>10</sub> exceedances during the summer quarter at the Community site.

**Table 2.** Number of exceedances of federal and state 24-hr PM<sub>10</sub> standards during the summer 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 PM<sub>10</sub> concentrations were measured. The most recent summer quarter is shown in **bold**.

Site	Quarter Period	Quarter Name	Exceedances of PM <sub>10</sub> Standard	
			Federal 24-hr 150 µg/m <sup>3</sup>	State 24-hr 50 µg/m <sup>3</sup>
Sunshine Canyon Landfill	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%)
	06/01/19–08/31/19	2019 Summer	0	2/91 (3%)
	06/01/20–08/31/20	2020 Summer	0	63/91 (70%)
	<b>06/01/21–08/31/21</b>	<b>2021 Summer</b>	<b>0</b>	<b>73/78 (94%)</b>

Site	Quarter Period	Quarter Name	Exceedances of PM <sub>10</sub> Standard	
			Federal 24-hr 150 µg/m <sup>3</sup>	State 24-hr 50 µg/m <sup>3</sup>
Sunshine Canyon Landfill North	06/01/16–08/31/16	2016 Summer	1 (07/30/2016)	59/92 (64%)
Community Site	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%)
	<b>06/01/21–08/31/21</b>	<b>2021 Summer</b>	<b>0</b>	<b>1/84 (2%)</b>

The federal 24-hr PM<sub>10</sub> standard (150 µg/m<sup>3</sup>) was not exceeded at the Landfill site, nor at the Community site. This is the fifth summer quarter in a row to have either one or zero federal 24-hr PM<sub>10</sub> exceedances at the Landfill site and the fourteenth summer quarter in a row with no federal 24-hr PM<sub>10</sub> exceedances at the Community site.

## 4. Average and Maximum Black Carbon and PM<sub>10</sub> 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 negative health impacts 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 29<sup>th</sup> 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 29<sup>th</sup> Quarterly Report. All BC data shown in this Quarterly Report have been compensated, with the exception of the unavailable data from the baseline year.

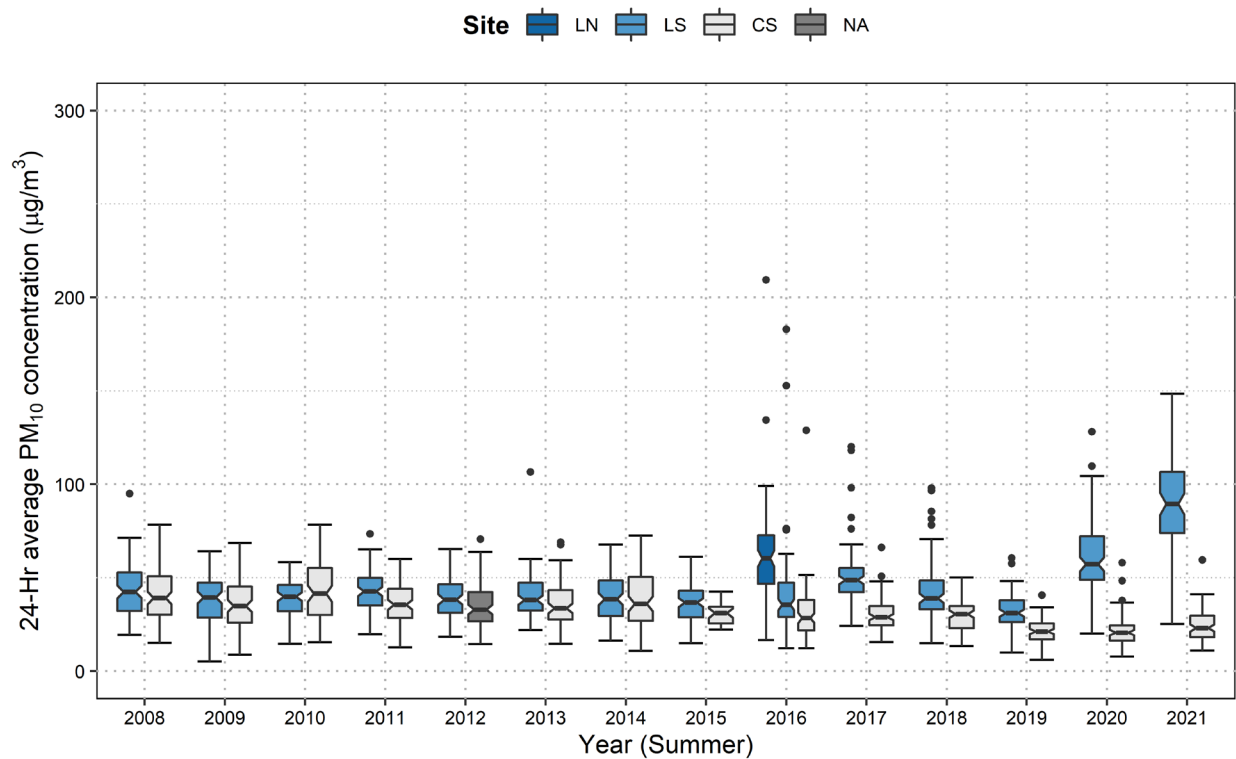
The 24-hr average and maximum compensated BC concentrations collected during the 2021 summer quarter, the compensated BC data from the summer quarters of the 13 previous years, and the uncompensated data from the baseline year are provided in [Table 3](#). The 2021 summer quarter 24-hr BC concentration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

**Table 3.** 24-hr BC concentrations for the summer quarter of the baseline year (2002) and each year from 2008 to 2021. Uncompensated BC values are reported for the 2002 summer quarter. The most recent fall quarter is shown in **bold**.

Site	Quarterly Period	Quarter Name	BC Concentrations (µg/m <sup>3</sup> )	
			Average 24-Hr	Maximum 24-Hr
Sunshine Canyon Landfill	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
	<b>06/01/21–08/31/21</b>	<b>2021 Summer</b>	<b>0.62</b>	<b>1.10</b>
Sunshine Canyon Landfill North	06/01/16–08/31/16	2016 Summer	0.86	2.17
Community Site	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
	<b>06/01/21–08/31/21</b>	<b>2021 Summer</b>	<b>0.57</b>	<b>1.13</b>

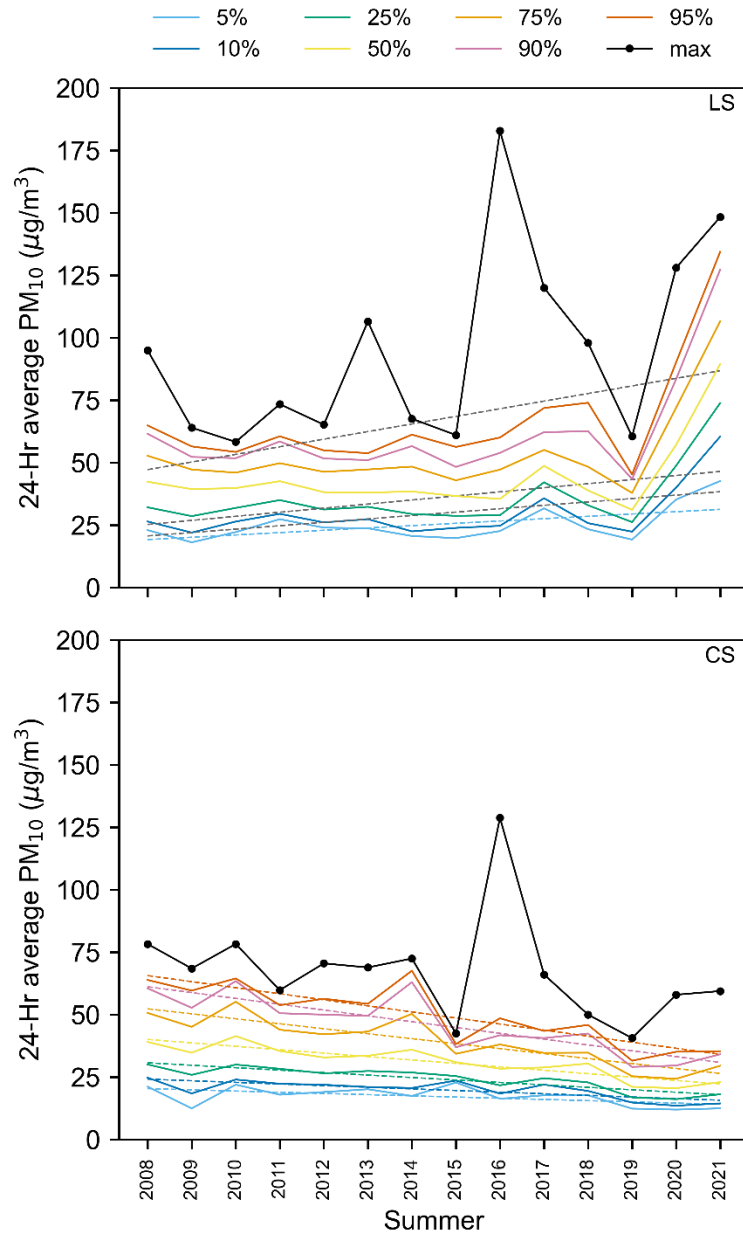
\* Uncompensated BC values.

Distributions of 24-hr average PM<sub>10</sub> and BC data from summer quarters of 2008 through 2021 (presented as notched box-whisker plots<sup>5</sup>), and percentile trends for these metrics, are shown in Figures 2 through 5.

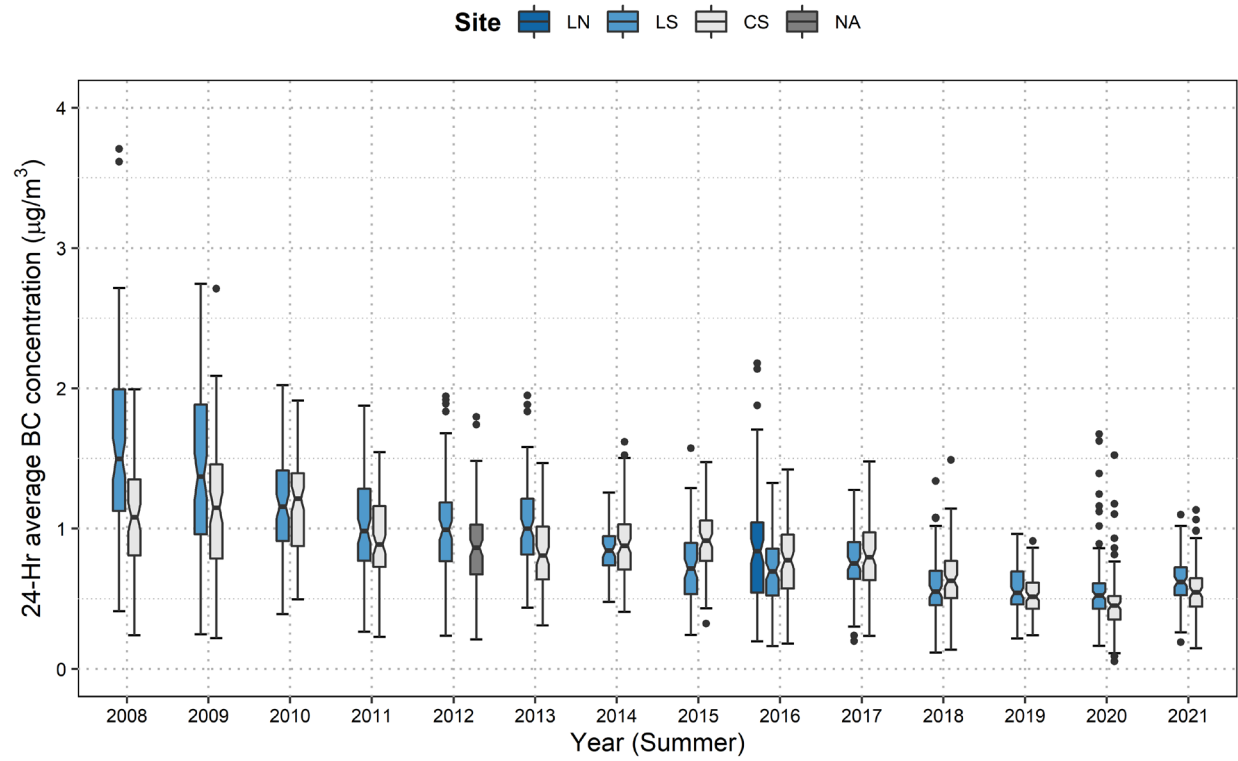


**Figure 2.** Distribution of 24-hr average PM<sub>10</sub> concentrations at the Sunshine Canyon Landfill North site, Landfill site, and Community site during summer (June-August) quarters from 2008 to 2021.

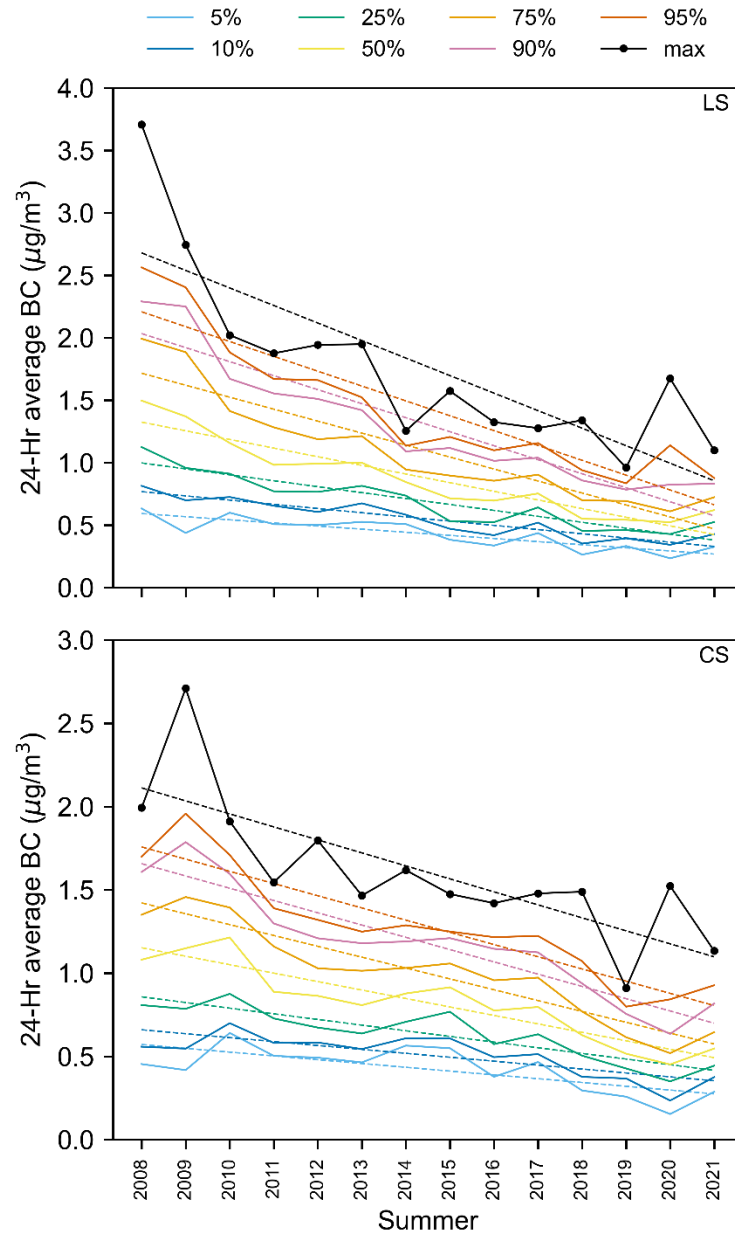
<sup>5</sup> A notched box-whisker plot shows the entire distribution of concentrations for each year. Each box illustrates the 25th (lower box extent), 50th (median, midline), and 75th (upper box extent) percentiles. The extent of the box indicates the interquartile range (IQR), where 50% of the data 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.



**Figure 3.** Trends of 24-hr average PM<sub>10</sub> maxima and percentiles at the Sunshine Canyon Landfill site (top) and Community site (bottom) during summer (June-August) 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, Landfill site, and Community site during summer (June-August) quarters from 2008 to 2021.



**Figure 5.** Trends of 24-hr average BC maxima and percentiles at the Sunshine Canyon Landfill site (top) and Community site (bottom) during summer (June-August) 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 summer, the median 24-average PM<sub>10</sub> concentrations measured at the Community site are usually lower than those measured at the Landfill site (Figure 2). This remained true in the 2021 summer 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 PM<sub>10</sub> concentrations at the Community and the Landfill sites is statistically significant. At the Landfill site, there is a statistically

significant increasing trend in maximum 24-hr PM<sub>10</sub> concentrations during the summer quarters (Figure 3). All percentiles of the 24-hr average PM<sub>10</sub> concentration at the Landfill site have increased since the 2020 summer quarter. At the Community site, there is a statistically significant decreasing trend for all the 24-hr average PM<sub>10</sub> percentiles, but not for the maximum value. However, all 24-hr average PM<sub>10</sub> percentiles and maxima at the Community site increased slightly from the 2020 summer quarter.

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 4). In the summer 2021 quarter, the median 24-hr average BC concentration at the Landfill site was not statistically higher than that at the Community site. There is some year-to-year variability in median 24-hr average BC concentrations over the 14 recorded consecutive years, but this has generally decreased over time at both monitoring sites. However, in the summer 2021 quarter, both the Landfill site and the Community site saw slightly higher median 24-hr average BC concentrations than in the previous summer quarter.

There is a statistically significant decreasing trend in all percentiles and maximum of the 24-hr average BC concentrations at the Landfill site during summer quarters over the observational record (Figure 5). All percentiles except the 95<sup>th</sup> percentile of the 24-hr BC recorded at the Landfill site in the 2021 summer quarter have increased from the previous summer quarter. All percentiles of the 24-hr BC recorded at the Community site in the 2021 summer quarter increased from the previous summer quarters except for the maximum, which decreased. At both the Landfill site and Community site, there is a statistically significant declining trend in summer quarter 24-hr average BC concentrations, at the 5<sup>th</sup> to 95<sup>th</sup> 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

**Table 4** lists dates and major tasks associated with visits to the Landfill site during the 2021 summer quarter. The hard drive on the Community site computer failed toward the end of the Summer 2021 quarter, which erased field and backup field logs. Reoccurring power outages at the nearby power source are likely the cause of the hard drive failure. Therefore, field logs and flow rates recorded during the Summer 2021 quarter are unavailable for the Community site.

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

Date of Site Visit	Description of Work
06/17/2021	Collected PM <sub>10</sub> 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
07/21/2021	Found HVAC unit not running Alerted vendor Sol Aire Found tripped breaker – issue resolved
09/07/2021 <sup>a</sup>	Collected PM <sub>10</sub> and BC data Restarted Aethalometer Cleaned roller on Aethalometer – found indication of moisture on tape Cleaned roller, vane, and nozzle on BAM Performed flow test on BAM and Aethalometer

<sup>a</sup> 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 5](#). 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. Please note, due to the hard drive failure at the Community site recorded flow rates data was erased. Based on field staff observations, BAM flow rates measured at the Community site were within an acceptable range.

**Table 5.** Flow rates for the BAM PM<sub>10</sub> 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	06/17/2021	16.7	16.7	16.54	16.7	4.0	3.81
	09/07/2021 <sup>a</sup>	16.7	16.7	16.84	16.7	4.0	4.15

<sup>a</sup> 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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