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# Ambient Air Quality Monitoring at Sunshine Canyon Landfill and Van Gogh Elementary School

Continuous monitoring of particulate matter, black carbon, wind speed, and wind direction began at the Sunshine Canyon Landfill (Landfill Site) and at Van Gogh Elementary School (Community Site) in Granada Hills in fall 2007.

These data are used to characterize ambient air pollution concentrations on a neighborhood scale in the context of the Los Angeles basin and to evaluate the impact of landfill operations on air quality in the community.

## Particulate Matter ($PM_{10}$)

$PM_{10}$ is particulate matter less than 10 microns in diameter. A human hair is about 100 micrometers in diameter. Its width could hold roughly 10 $PM_{10}$ particles. $PM_{10}$ is present in dust, smoke, soot, and dirt. It can be inhaled and drawn into the lungs, causing health problems for some people.

## Black Carbon (BC)

Black carbon is a sooty black material emitted from gas and diesel engines, coal-fired power plants, and other sources that burn fossil fuel. Many BC particles are too small to be visible. BC emissions can cause adverse health and climate effects.

## Wind

Wind Speed and Wind Direction are measured because they can significantly affect when and how far airborne pollutants travel from their sources.

Wind-Blown Dust

Landfill Operations

Dirt Roads

Vehicular Traffic

Diesel Engines

Industrial Activities

# Statistical Summary for the Fall 2022 Quarter

## $PM_{10}$ Exceedances

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total $PM_{10}$ Fall Quarter Exceedances over 15 Years | 23 | **Landfill Site** Federal Exceedances | 5 | **Community Site** Federal Exceedances | 483 | **Landfill Site** State Exceedances | 97 | **Community Site** State Exceedances |
| Total Exceedances in the 60th Quarter | 1 | **Landfill Site** Federal Exceedances | 0 | **Community Site** Federal Exceedances | 46 | **Landfill Site** State Exceedances | 0 | **Community Site** State Exceedances |

**$PM_{10}$**

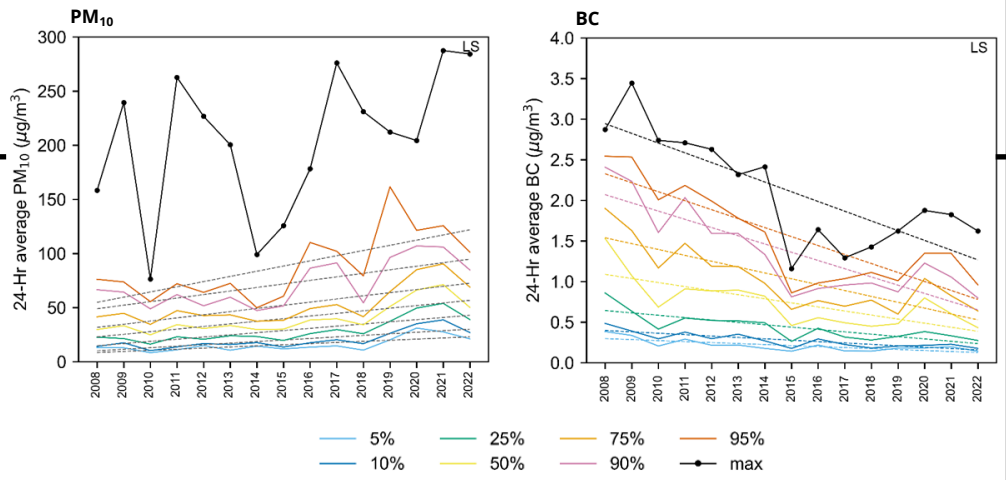
### Landfill Site

There is a statistically significant increasing trend in most of the 24-hr average percentiles. However, all percentiles have decreased since the 2022 fall quarter.

### Community Site

There is a statistically significant decreasing trend for only the 75th percentile. The maximum concentration value saw a shape decrease from the following fall.

## Average and Maximum Black Carbon and $PM_{10}$ Concentrations




**Black Carbon**

### Landfill Site

There is a statistically significant decreasing trend in all percentiles at the Landfill site during fall quarters over the observational record. All percentiles and maximum slightly decreased at the Landfill site from the fall quarter of 2021 to the fall quarter of 2022.

### Community Site

There is a statistically significant declining trend in fall quarter 24-hr BC concentrations at all percentiles and the maximum; all percentiles were lower in the 2022 fall quarter than in the previous one.

## Data Completeness

| | *Data Capture* | | | *Valid Data Used for Analysis* | | |
|---|---|---|---|---|---|---|
| | $PM_{10}$ | BC | Wind Speed & Direction | $PM_{10}$ | BC | Wind Speed & Direction |
| Landfill Site | 99.6% | 99.9% | 98.8% | 99.8% | 100% | 99.3% |
| Community Site | 99.9% | 99.7% | 98.9% | 99.7% | 100% | 100% |

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

September 1, 2022 – November 30, 2022


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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 fall 2007. The following parameters are measured at these sites: 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 quarterly for completeness. 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 Sixtieth Quarterly Report summarizes the September 1, 2022–November 30, 2022, (2022 fall quarter) monitoring results from the fifteenth year of continuous data collection.

## Statistics

For this quarter, percent data capture for hourly $PM_{10}$ was 99.95% at the Landfill site and 99.91% at the Community site. Of the captured $PM_{10}$ data, 0.23% were invalidated at the Landfill site, and 0.32% were invalidated at the Community site. None of the $PM_{10}$ data were deemed suspect at the Landfill site, and approximately 0.92% were deemed suspect at the Community site.

Hourly BC data capture was 99.86% at the Landfill site and 99.68% at the Community site. Of the captured hourly BC data, no data were deemed invalid at the Landfill or Community sites. Of the

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

captured hourly BC data, 3.53% were deemed suspect at the Landfill site, and 6.89% were deemed suspect at the Community site.

One-min WS and WD data capture was 98.82% at the Landfill site and 98.90% at the Community site. Of the captured 1-min WS and WD data, 0.74% were deemed invalid at the Landfill site, and none were deemed invalid at the Community site. Of the captured 1-min WS and WD data, 0.05% were deemed suspect at the Landfill site, and no data were deemed suspect at the Community site.

During this quarter, the state 24-hr $PM_{10}$ standard (50 µg/$m^3$) was exceeded on 56% of days (51 days out of the valid 91 days of the quarter) at the Landfill site, and on no days at the Community site (there were also 91 valid days of $PM_{10}$ data at the Community site this quarter). There was one federal exceedance of 24-hr $PM_{10}$ at the Landfill site, and no exceedances at the Community site. In the fall 2022 quarter, the 24-hr average BC concentration was 0.48 $\mu^{g/m3}$ at the Landfill site and 0.g/$m^3$g/$m^3$ at the Community site. Both sites exhibited the lowest 24-hr average BC concentrations of the 15 monitored fall quarters (2008–2022).

# 1. Introduction

This report summarizes data completeness, ambient particulate matter less than 10 microns in aerodynamic diPM$_{10}$er (PM$_{10}$) concentrations, average and maximum ambient black carbon (BC) as a surrogate for diesel particulate matter (DPM) concentrations, instrument flow rate verification (quality control) data, and field operations for the quarterly period of September 1, 2022, through November 30, 2022. The collected data are validated and evaluated quarterly for completeness. This is the fifteenth year that continuous data were collected in the fall from continuous 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.

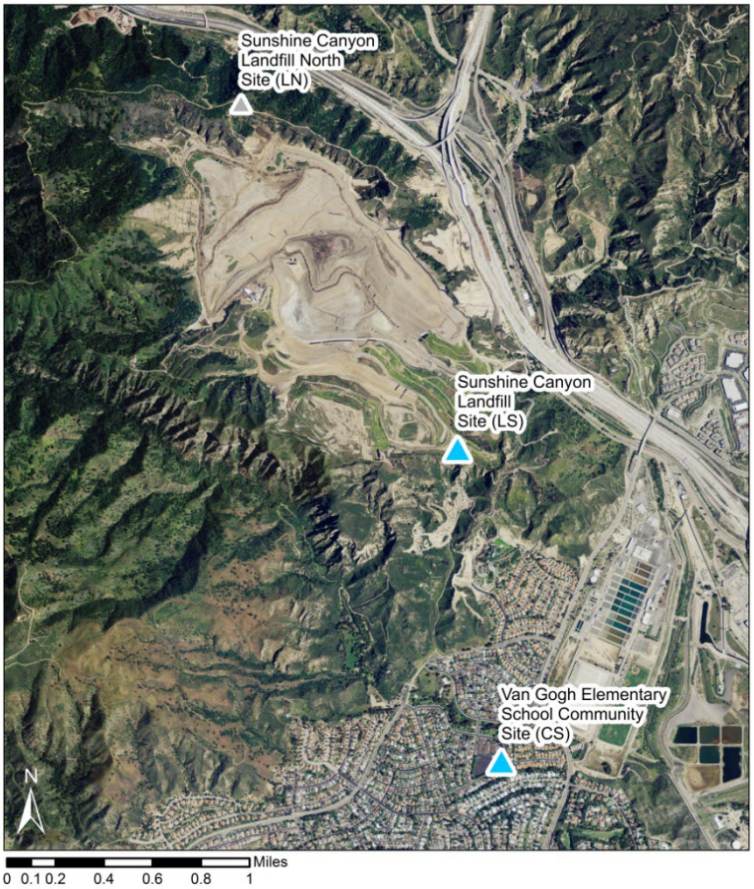


**Figure 1.** View of Sunshine Canyon Landfill and the surrounding monitoring stations (blue triangles): Landfill site and Community site. The Sunshine Canyon Landfill North site (gray triangle) collected data from Dec. 1, 2015, through May 31, 2017, and has since been decommissioned.

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 2022 fall 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 99.95% at the Landfill site and 99.91% at the Community site. Of the captured $PM_{10}$ data, 0.23% were invalidated at the Landfill site, and 0.32% were invalidated at the Community site. No hourly $PM_{10}$ values were deemed suspect at the Landfill site, and approximately 0.92% of hourly $PM_{10}$ values were deemed suspect at the Community site.

**Table 1.** Data completeness statistics for hourly $PM_{10}$, hourly BC, and 1-min WS and WD data for the 2022 fall 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 Site | 09/01/22-11/30/22 | 99.95 | 99.86 | 98.82 | 99.77 | 100 | 99.26 | 0 | 3.53 | 0.05 |
| Community Site | 09/01/22-11/30/22 | 99.91 | 99.68 | 98.90 | 99.68 | 100 | 100 | 0.92 | 6.89 | 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 99.86% at the Landfill site and 99.68% at the Community site. No data were deemed invalid at the Landfill or Community sites. At the Landfill site, 3.53% of hourly BC data were deemed suspect. At the Community site, 6.89% hourly BC data were deemed suspect.

At the Landfill site, the wind data capture percentage was 98.82%, 0.74% of captured wind data was invalidated, and 0.05% of captured wind data was deemed suspect. At the Community site, the wind data capture percentage was and 98.90%, none of the wind data were invalidated, and none were deemed suspect.

# 3. $PM_{10}$ Exceedances

The federal and state $PM_{10}$ exceedances for the fall quarter of the baseline year (2002), the fall quarters of the previous 14 years (2008–2021), and the current fall quarter (2022) are summarized in Table 2. In this quarter, the state $PM_{10}$ standard of 50 µg/$m^3$ was exceeded on 51% of days (46 of 91 days) at the Landfill site and on no days at the Community site. The percentage of state exceedances at the Landfill site for this current quarter is the lowest since the fall quarter of 2018.

**Table 2.** Number of exceedances of federal and state 24-hr $PM_{10}$ standards during the fall quarters of the baseline year (2002) and from 2008 to 2022. In the "Federal 24-hr" column, the values are the 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 fall quarter is shown in **bold**.

| Site | Quarter Period | Quarter Name | Exceedances of $PM_{10}$ Standard | |
|---|---|---|---|---|
| | | | Federal 24-hr 150 µg/m³ | State 24-hr 50 µg/m³ |
| Sunshine Canyon Landfill site (LS) | 09/01/02–11/30/02 | Baseline Year | 0 | 51/77 (66%) |
| | 09/01/08–11/30/08 | 2008 Fall | 1 (10/09/08) | 12/73 (16%) |
| | 09/01/09–11/30/09 | 2009 Fall | 1 (10/27/09) | 78/89 (19%) |
| | 09/01/10–11/30/10 | 2010 Fall | 0 | 8/86 (9%) |
| | 09/01/11–11/30/11 | 2011 Fall | 1 (11/02/11) | 20/89 (22%) |
| | 09/01/12–11/30/12 | 2012 Fall | 1 (10/26/12) | 9/85 (11%) |
| | 09/01/13–11/30/13 | 2013 Fall | 1 (10/04/13) | 14/89 (16%) |
| | 09/01/14–11/30/14 | 2014 Fall | 0 | 5/91 (5%) |
| | 09/01/15–11/30/15 | 2015 Fall | 0 | 10/86 (12%) |
| | 09/01/16–11/30/16 | 2016 Fall | 1 (11/27/16) | 12/48 (25%) |
| | 09/01/17–11/30/17 | 2017 Fall | 3 (10/09/17, 10/24/17, 11/21/17) | 27/87 (32%) |
| | 09/01/18–11/30/18 | 2018 Fall | 1 (11/8/2018) | 14/89 (16%) |
| | 09/01/19–11/30/19 | 2019 Fall | 5 (10/25/19, 10/31/19, 11/16/19, 11/25/19, 11/26/19) | 39/74 (53%) |
| | 09/01/20–11/30/20 | 2020 Fall | 4 (09/09/20, 10/16/20, 10/26/20, 11/26/20) | 67/91 (74%) |
| | 09/01/21–11/30/21 | 2021 Fall | 3 (09/23/21, 10/11/21, 11/25/21) | 71/89 (80%) |
| | **09/01/22–11/30/22** | **2022 Fall** | **1 (11/16/22)** | **46/91 (51%)** |

| Site | Quarter Period | Quarter Name | Exceedances of $PM_{10}$ Standard | |
|---|---|---|---|---|
| | | | Federal 24-hr 150 µg/m³ | State 24-hr 50 µg/m³ |
| Community site (CS) | 09/01/02–11/30/02 | Baseline Year | 0 | 8/33 (24%) |
| | 09/01/08–11/30/08 | 2008 Fall | 0 | 12/90 (13%) |
| | 09/01/09–11/30/09 | 2009 Fall | 1 (10/27/2009) | 11/78 (14%) |
| | 09/01/10–11/30/10 | 2010 Fall | 0 | 7/91 (8%) |
| | 09/01/11–11/30/11 | 2011 Fall | 0 | 11/88 (13%) |
| | 09/01/12–11/30/12 | 2012 Fall | 0 | 5/90 (6%) |
| | 09/01/13–11/30/13 | 2013 Fall | 0 | 7/85 (8%) |
| | 09/01/14–11/30/14 | 2014 Fall | 0 | 0/91 (0%) |
| | 09/01/15–11/30/15 | 2015 Fall | 0 | 0/90 (0%) |
| | 09/01/16–11/30/16 | 2016 Fall | 0 | 1/50 (2%) |
| | 09/01/17–11/30/17 | 2017 Fall | 0 | 4/92 (5%) |
| | 09/01/18–11/30/18 | 2018 Fall | 0 | 2/88 (3%) |
| | 09/01/19–11/30/19 | 2019 Fall | 3 (10/10/19, 10/11/19, 10/30/19) | 17/90 (19%) |
| | 09/01/20–11/30/20 | 2020 Fall | 0 | 11/90 (13%) |
| | 09/01/21–11/30/21 | 2021 Fall | 1 (10/11/21) | 1/84 (2%) |
| | **09/01/22–11/30/22** | **2022 Fall** | **0** | **0/91 (0%)** |

The federal 24-hr $PM_{10}$ standard (150 µg/m³) was exceeded on one day (November 16, 2022) at the Landfill site, and on no days at the Community site. The Landfill site saw a decrease in the number of federal and state 24-hr $PM_{10}$ exceedances over the past three fall quarters. Figure 2 shows 24-hr $PM_{10}$ concentrations at sites across the greater Los Angeles area on the day when the federal 24-hr $PM_{10}$ standard was exceeded at the Landfill site.

**Figure 2.** $PM_{10}$ concentrations at FRM/FEM sites across the Los Angeles Area on November 16, 2022. Colors correspond to 24-hr $PM_{10}$ concentrations in $\mu g/m^3$. Note: no sites (within the map domain) besides the Landfill site recorded 24-hr $PM_{10}$ concentrations above the federal standard.

The federal exceedance that occurred on November 16 at the Landfill site was distinctive within the greater Los Angeles area. Some sites within the greater Los Angeles area had 24-hr concentrations above 90 $\mu g/m^3$, as indicated by the red and purple point locations, but did not exceed the 150 $\mu g/m^3$ federal standard. The 24-hr concentration at the Community site was approximately 31.8 $\mu g/m^3$, which is far lower than the 24-hr concentration of 284.3 $\mu g/m^3$ recorded at the Landfill site. We assume that landfill activity played a key role in the November 16 federal exceedance; however, the level of uncertainty in quantifying landfill contributions to neighborhood-scale pollutant concentrations remains high without the presence of an upwind landfill monitoring site.

# 4. Average and Maximum Black Carbon 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 (South Coast AQMD) 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 to trap 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 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, except unavailable data from the baseline year.

The 24-hr average and maximum compensated BC concentrations collected during the 2022 fall quarter, the compensated BC data from the fall quarters of the 14 previous years, and the uncompensated data from the baseline year are provided in Table 3. The 2022 fall quarter 24-hr average BC concentration at the Landfill site is the lowest on record. The 2022 fall quarter 24-hr maximum BC concentration at the Landfill site is the fourth lowest on record. The 2022 fall quarter 24-hr BC concentration average at the Community site is the second lowest fall concentration on record.

**Table 3.** 24-hr BC concentrations for the fall quarter of the baseline year (2002) and each year from 2008 to 2022. Uncompensated BC values are reported for the 2002 fall 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) | 09/01/02–11/30/02 | Baseline Year | 1.26* | 2.83* |
| | 09/01/08–11/30/08 | 2008 Fall | 1.47 | 2.88 |
| | 09/01/09–11/30/09 | 2009 Fall | 1.21 | 3.45 |
| | 09/01/10–11/30/10 | 2010 Fall | 0.87 | 2.74 |
| | 09/01/11–11/30/11 | 2011 Fall | 1.07 | 2.71 |
| | 09/01/12–11/30/12 | 2012 Fall | 0.95 | 2.63 |
| | 09/01/13–11/30/13 | 2013 Fall | 0.92 | 2.32 |
| | 09/01/14–11/30/14 | 2014 Fall | 0.81 | 2.42 |
| | 09/01/15–11/30/15 | 2015 Fall | 0.48 | 1.17 |
| | 09/01/16–11/30/16 | 2016 Fall | 0.59 | 1.64 |
| | 09/01/17–11/30/17 | 2017 Fall | 0.54 | 1.30 |
| | 09/01/18–11/30/18 | 2018 Fall | 0.55 | 1.43 |
| | 09/01/19–11/30/19 | 2019 Fall | 0.51 | 1.62 |
| | 09/01/20–11/30/20 | 2020 Fall | 0.75 | 1.90 |
| | 09/01/21–11/30/21 | 2021 Fall | 0.63 | 1.83 |
| | **09/01/22–11/30/22** | **2022 Fall** | **0.48** | **1.62** |
| Community Site (CS) | 09/01/02–11/30/02 | Baseline Year | 1.31* | 2.92* |
| | 09/01/08–11/30/08 | 2008 Fall | 0.86 | 6.15 |
| | 09/01/09–11/30/09 | 2009 Fall | 1.00 | 3.23 |
| | 09/01/10–11/30/10 | 2010 Fall | 0.80 | 2.47 |
| | 09/01/11–11/30/11 | 2011 Fall | 0.95 | 2.55 |
| | 09/01/12–11/30/12 | 2012 Fall | 0.77 | 2.07 |
| | 09/01/13–11/30/13 | 2013 Fall | 0.57 | 1.63 |
| | 09/01/14–11/30/14 | 2014 Fall | 0.83 | 1.98 |
| | 09/01/15–11/30/15 | 2015 Fall | 0.64 | 1.68 |
| | 09/01/16–11/30/16 | 2016 Fall | 0.64 | 1.54 |
| | 09/01/17–11/30/17 | 2017 Fall | 0.46 | 1.22 |

| Site | Quarterly Period | Quarter Name | BC Concentrations (µg/m³) | |
|---|---|---|---|---|
| | | | Average 24-Hr | Maximum 24-Hr |
| | 09/01/18–11/30/18 | 2018 Fall | 0.57 | 1.55 |
| | 09/01/19–11/30/19 | 2019 Fall | 0.48 | 1.88 |
| | 09/01/20–11/30/20 | 2020 Fall | 0.68 | 2.05 |
| | 09/01/21–11/30/21 | 2021 Fall | 0.55 | 1.51 |
| | **09/01/22–11/30/22** | **2022 Fall** | **0.47** | **1.65** |

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

Distributions of 24-hr average $PM_{10}$ and BC data from fall quarters of 2008 through 2022 (presented as notched box-whisker plots[5]), and percentile trends for these metrics, are shown in Figures 3 through 6.

[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.

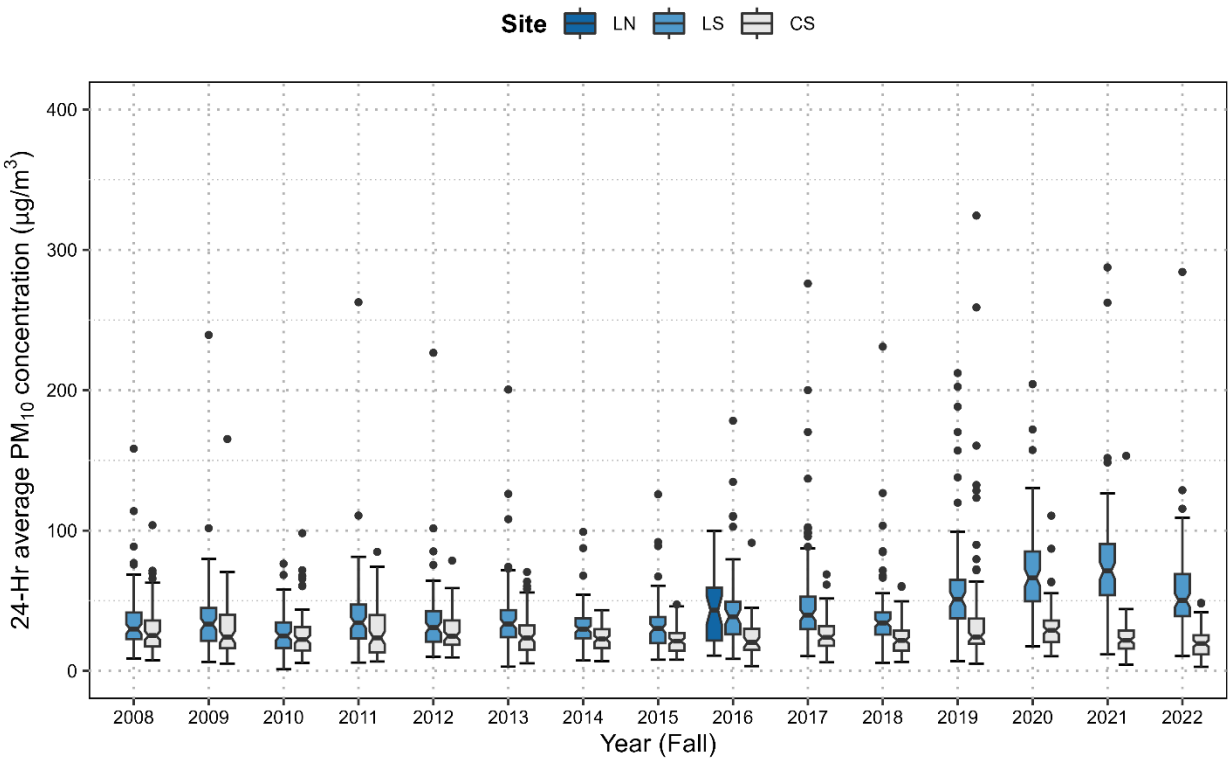


**Figure 3.** Distribution of 24-hr average $PM_{10}$ concentrations at the Sunshine Canyon Landfill North site, Landfill site, and Community site during fall (September-November) quarters from 2008 to 2022.

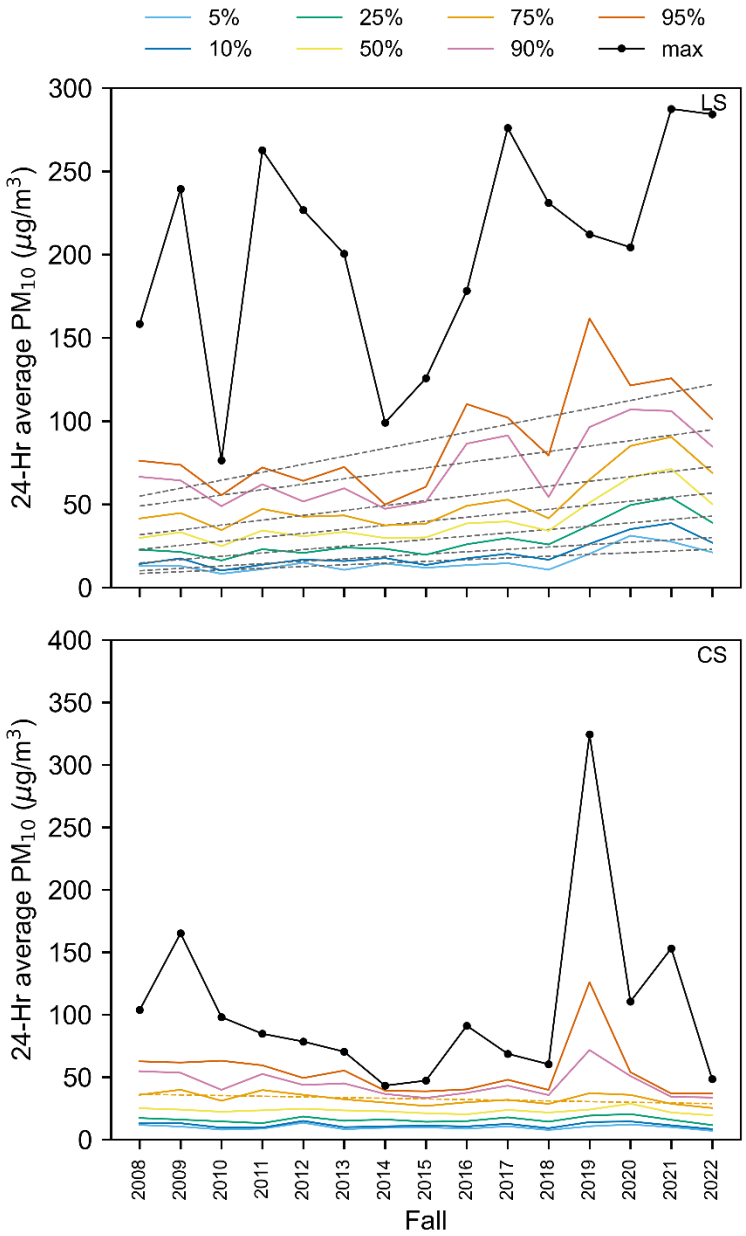


**Figure 4.** Trends of 24-hr average $PM_{10}$ maxima and percentiles at the Sunshine Canyon Landfill site (top) and Community site (bottom) during fall (September-November) quarters from 2008 to 2022. The dashed lines denote statistically significant decreasing linear trends. Statistical significance was defined at the 95% confidence level (*p-value* ≤ 0.05).

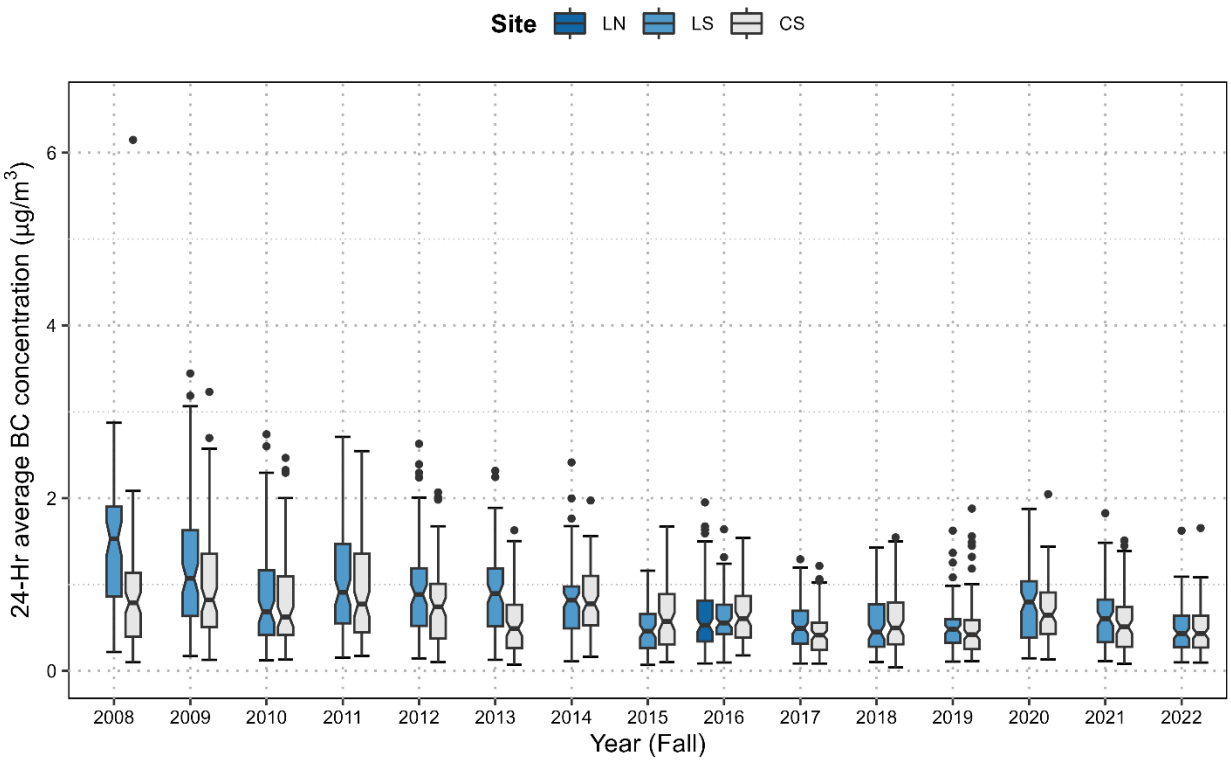


**Figure 5.** Distribution of 24-hr average BC concentrations at the Sunshine Canyon Landfill North site, Landfill site, and Community site during fall (September-November) quarters from 2008 to 2022.

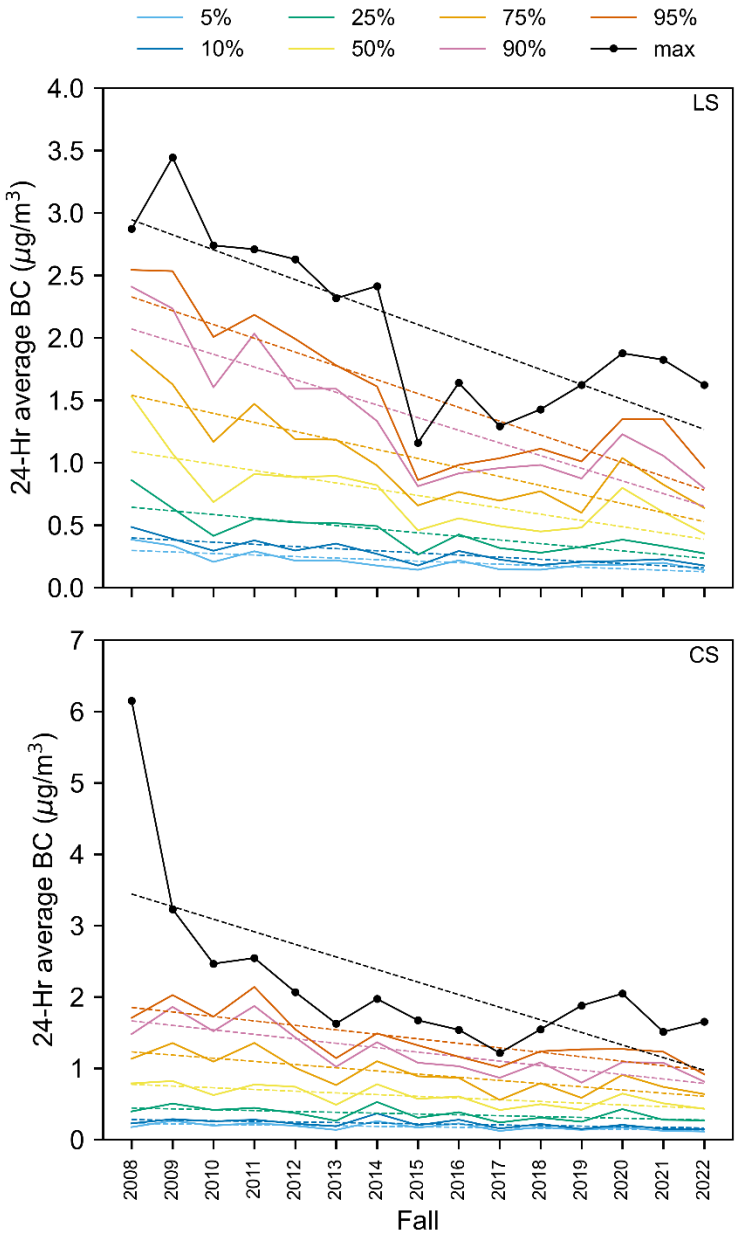


**Figure 6.** Trends of 24-hr average BC maxima and percentiles at the Sunshine Canyon Landfill site (top) and Community site (bottom) during fall (September-November) quarters from 2008 to 2022. The dashed lines denote statistically significant decreasing linear trends. Statistical significance was defined at the 95% confidence level (*p-value* ≤ 0.05).

At this time of year, the median 24-hr average $PM_{10}$ concentrations measured at the Community site are usually lower than those measured at the Landfill site (Figure 3). This remained true in the 2022 fall 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 $PM_{10}$ concentrations at the Community and Landfill sites is statistically significant. At the Landfill site, there is a statistically significant increasing trend in most of the 24-hr average percentiles (Figure 4). However, all percentiles have

decreased since the 2022 fall quarter. At the Community site, there is a statistically significant decreasing trend for the 75th percentile.

During the fall 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 fall 2022 quarter, the median 24-hr average BC concentration at the Landfill site was not statistically higher than at the Community site. There is some year-to-year variability in median 24-hr average BC concentrations over the 15 recorded consecutive years, but the range of 24-hr average BC values has generally decreased over time at both monitoring sites. In the fall 2022 quarter, both Landfill and Community sites saw slightly lower median 24-hr average BC concentrations than in the previous fall quarter.

There is a statistically significant decreasing trend in all percentiles at the Landfill site during fall quarters over the observational record (Figure 6). All percentiles and the maximum slightly decreased at the Landfill site from the fall quarter of 2021 to the fall quarter of 2022. At the Community site, there is a statistically significant declining trend in fall quarter 24-hr BC concentrations at all percentiles and the maximum, and all percentiles were lower in the 2022 fall quarter than in the previous one.

# 5. Field Operations

Tables 4 and 5 list dates and major tasks associated with visits to the Landfill and Community sites during the 2022 fall quarter.

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

| Date of Site Visit | Description of Work |
|---|---|
| 9/13/2022 | Collected $PM_{10}$ and BC data.<br>Performed flow checks on BAM and aethalometer.<br>Restarted aethalometer.<br>Cleaned roller, vane, and nozzle on BAM. |
| 10/20/2022 | Replaced BAM tape |
| 11/1/2022 | Collected $PM_{10}$ and BC data.<br>Performed flow checks on BAM and aethalometer.<br>Restarted aethalometer.<br>Cleaned roller, vane, and nozzle on BAM. |
| 11/16/2022 | Checked BAM flow.<br>Investigated possible anemometer directional error. |
| 12/27/2022[a] | Collected $PM_{10}$ and BC data.<br>Performed flow checks on BAM and aethalometer.<br>Restarted aethalometer.<br>Cleaned roller, vane, and nozzle on BAM.<br>Replaced BAM tape. |

[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 visits, field maintenance, and operations.

| Date of Site Visit | Description of Work |
|---|---|
| 9/12/2022 | Collected $PM_{10}$ and BC data.<br>Performed flow checks on BAM and aethalometer.<br>Restarted aethalometer.<br>Cleaned roller, vane, and nozzle on BAM.<br>Replaced BAM tape. |
| 11/1/2022 | Collected $PM_{10}$ and BC data.<br>Performed flow checks on BAM and aethalometer.<br>Restarted aethalometer.<br>Cleaned roller, vane, and nozzle on BAM. |
| 11/18/2022 | Swapped BAM instrument with backup.<br>Primary BAM instrument to be sent for repairs and calibration. |
| 11/23/2022 | Swapped site router. |
| 12/22/2022[a] | Swapped anemometer.<br>Calibrated newly installed anemometer.<br>Collected $PM_{10}$ and BC data.<br>Performed flow checks on BAM and aethalometer.<br>Restarted aethalometer.<br>Cleaned roller, vane, and nozzle on BAM. |

[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 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 $PM_{10}$ 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) | 9/13/2022 | 16.7 | 16.7 | 16.81 | 16.7 | 4.0 | 4.16 |
| | 11/1/2022 | 16.7 | 16.7 | 16.66 | 16.7 | 4.0 | 3.97 |
| | 12/27/2022[a] | 16.7 | 16.7 | 16.62 | 16.7 | 4.0 | 3.86 |
| Sunshine Canyon Community (CS) | 9/13/2022 | 16.7 | 16.7 | 16.66 | 16.7 | 4.2 | 4.01 |
| | 11/1/2022 | 16.7 | 16.7 | 16.63 | 16.7 | 4.2 | 4.08 |
| | 12/22/2022[a] | 16.7 | 16.7 | 16.72 | 16.7 | 4.1 | 4.12 |

[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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