

ELPC Air Quality Monitoring Report

Auburn Gresham • 2018–19



**ENVIRONMENTAL LAW
& POLICY CENTER**



MAPSCORPS



Introduction

Air pollution is a serious threat to the residents of Chicago, but pollution levels can vary by neighborhood and even block to block. To understand airborne particulate matter pollution at the local level, the Environmental Law & Policy Center (ELPC) and community partners are conducting an air quality monitoring program to better understand neighborhood particulate matter concentrations.

The data in this report was collected in the Greater Auburn Gresham community on the city's far Southwest Side in 2018 and 2019. Based on this data, we have also provided policy recommendations from ELPC and our community partners, to improve air quality and protect Chicagoans from dangerous air pollution.

1. What is Particulate Matter and Where Does it Come From?

Particulate matter (PM) is a highly toxic air contaminant composed of a mixture of fine carbon soot particles and gases that cause negative impacts on human health and the environment.

Diesel exhaust is a major source of PM pollution in Chicago. It comes from heavy duty vehicles such as trucks and buses, and equipment such as construction machinery. Diesel combustion pollutes the air with harmful particulates in and around highways, rail yards, ports, intermodal facilities, and construction sites. Other sources of PM include cars, wood burning stoves, industry, agricultural burns, and forest fires.

As a transportation and economic hub for the nation, Chicago has a lot of diesel vehicles and heavy equipment activity. Residents who live and work near areas with high concentrations of PM pollution are at risk of adverse health effects.

2. Particulate Matter and Health

Fine particulate matter (PM_{2.5}) can affect multiple systems in the human body. These microscopic particles are able to penetrate the natural defenses of the human body, become lodged in the lungs, and enter the bloodstream. Long-term PM_{2.5} exposure exacerbates asthma, chronic obstructive pulmonary disease (COPD), and other serious respiratory illnesses. It also has negative impacts on neurological systems, including impaired cognitive function, neurodevelopmental issues, and the potential for lifelong mental health problems.

The people most vulnerable to PM_{2.5} include children, older adults, and those with respiratory illnesses. Children are at particularly high risk due to their underdeveloped lung function and capacity. Elderly folks are at high risk for aggravation of chronic respiratory and cardiovascular illnesses. Even short-term PM_{2.5} exposure poses a wide variety of health risks, including coughs, headaches, lightheadedness, nausea, aggravated allergies, increased risk of heart attack, and other cardiovascular trauma.

Asthma is the most common chronic condition among children, affecting one in ten nationwide. African American and Latinx children are more likely to be hospitalized or die from asthma-related causes than Caucasian children. Children's asthma rates are very high in Chicago, about 45% higher than the Illinois average, and the burden falls even harder on communities of color. In 2015, the rate of emergency room visits among African American children was 75% greater than the citywide rate that year. COPD and other respiratory illnesses and heart problems are also rampant in Chicago.

PM_{2.5} and its associated toxins are also detrimental to the environment, as they contribute to local smog formation and contain greenhouse gases that significantly accelerate climate change. The United States Environmental Protection Agency (USEPA) groups and classifies PM_{2.5} concentration levels by air quality ranges and levels of health concern, as shown in *Figure 1*.

3. ELPC Examines PM2.5 in Chicago's Neighborhoods

ELPC measures short-term PM2.5 using the AirBeam, a low-cost, open-source, handheld monitor manufactured by HabitatMap, a Brooklyn-based environmental health justice non-profit. Despite its low cost, the AirBeam's measurements correlate well with the USEPA federal regulatory monitors (FRM). The AirBeam samples air at 1 second intervals and uses LED light-scattering technology to measure PM2.5 concentrations.

Since 2017, we have been using AirBeam monitors to teach residents to track air pollution, gain a better understanding of their exposure to PM2.5, and make better-informed decisions to protect their health. Our program documents neighborhood

air conditions by systematically collecting data in Chicago, primarily focusing on the South and West Sides. With the help of amazing local partners, we have been able to collect over nearly 12 million PM2.5 data points that are analyzed and displayed on a community developed dashboard, AirQualityChicago.org.

PM2.5	Air Quality Index	PM2.5 Health Effects	Precautionary Actions
0 to 12.0 µg/m3	Good 0-50	Little to no risk.	None.
12.1 to 35 µg/m3	Moderate 51 to 100	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
35.1 to 55 µg/m3	Unhealthy for Sensitive Groups 51 to 100	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.
55.1+ µg/m3	Unhealthy 151+	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion; everyone else should limit prolonged exertion.

Figure 1. U.S. EPA particulate matter concentration level classifications.

Monitoring in Auburn Gresham

ELPC works with two community partners in Auburn Gresham to collect particulate matter data in the summer. MAPSCorps is a Southside-based organization that trains youth to produce high quality data about community assets, and the Greater Auburn Gresham Development Corporation (GAGDC) is a community development corporation that promotes programs and initiatives to improve overall community vitality.

Each year fifteen teens participated in the monitoring program. Those teens were divided into three groups; each group was given an AirBeam monitor to collect data while asset mapping and answering research questions about their communities. Groups walked down sidewalks on busy streets in Auburn Gresham, including Damen, Ashland, Racine, Halsted, Vincennes, Stewart, 79th, and 87th, as shown in Figure 2. The data was collected on various dates between May and August in 2018 and 2019, typically between 8:00am and 2:00pm, Monday through Thursday.

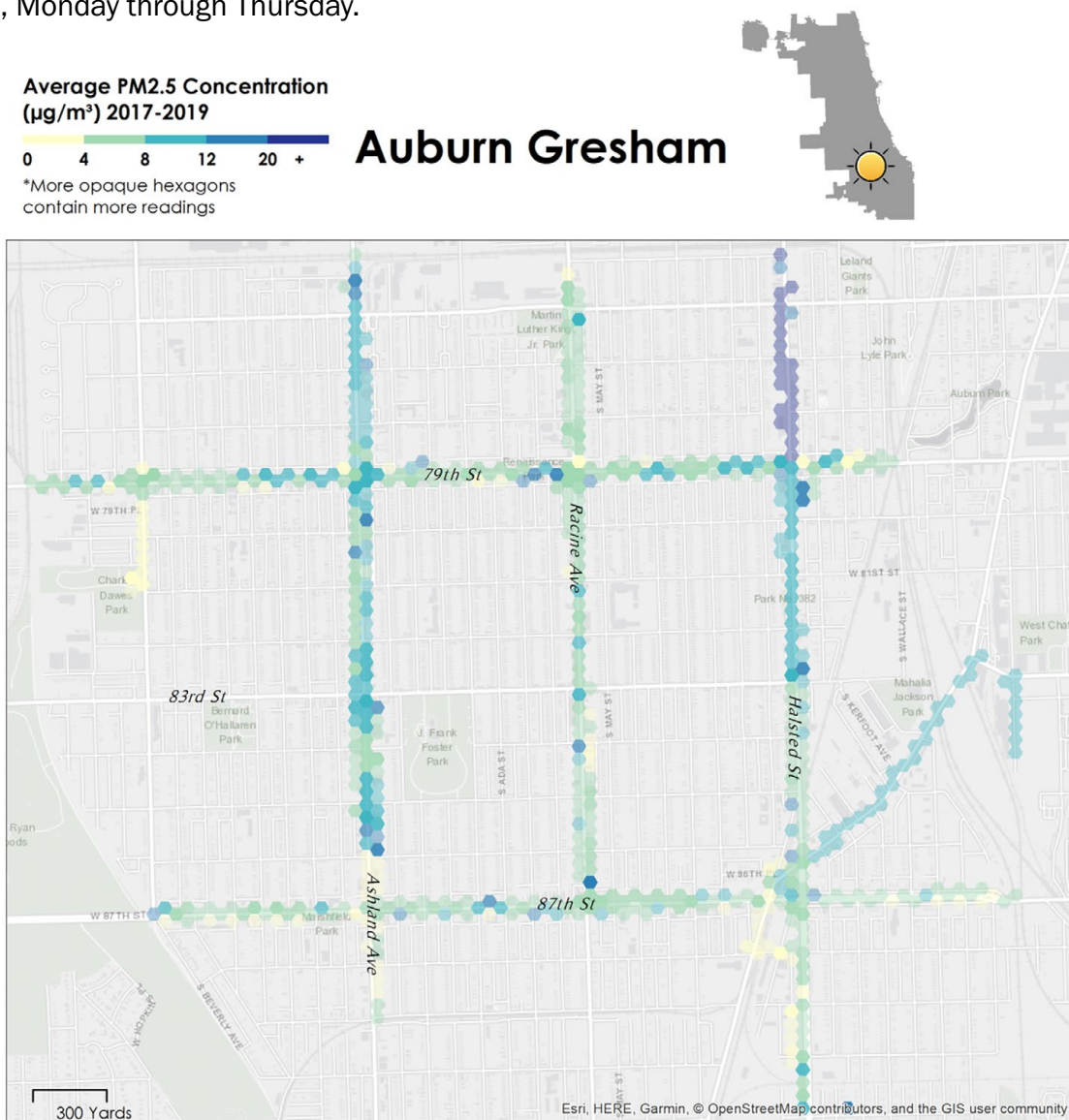


Figure 2. Average PM2.5 Concentration ($\mu\text{g}/\text{m}^3$) in Auburn Gresham, 2018-2019

Topline Results

As of Spring 2020, volunteers have collected 86,937 PM_{2.5} data points in Auburn Gresham. Of that data, 84% fell into the “good” air quality range (0-12 µg/m³), 15% was in the “moderate” range (12-35 µg/m³), and 1% was in the “unhealthy” categories (above 35 µg/m³).

This means that, for the majority of the time that volunteers were monitoring, the air was safe and posed little to no health risk. However, there were frequent instances of elevated particulate levels in the moderate and unhealthy categories, meaning volunteers and local residents were breathing in air that was harmful to health during those times, especially for those with a respiratory illness such as asthma.

Auburn Gresham Air Quality Data

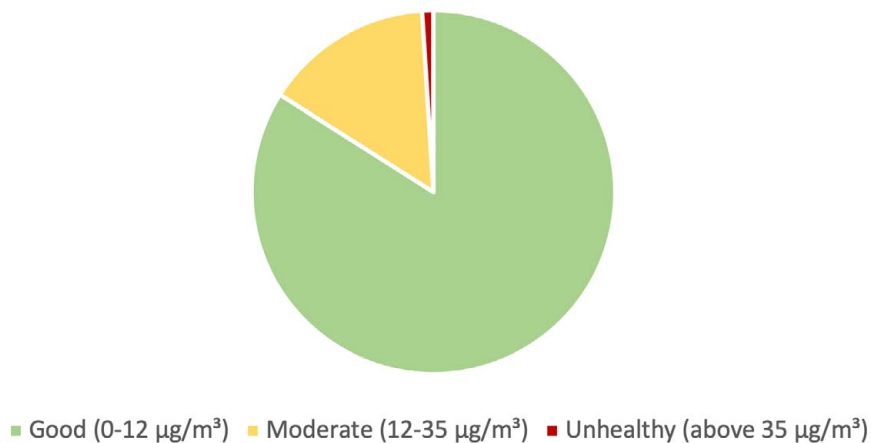


Figure 3. Average PM 2.5 categories in Auburn Gresham in 2018 & 2019

The box plots and line graphs below (Figures 3-6) illustrate the PM levels that MAPSCorps and GAGDC youth documented while monitoring in Auburn Gresham. Box plots are used to show the range of PM encountered during an hour. Outliers (the dots) depict moments when PM levels exceeded the typical range (the box) for that hour. The line graphs illustrate the average PM levels experienced by the hour.

2019 Hourly Breakdown

Volunteers collected 54,109 data points in 2019 during May, July, and August typically between 8:00am and 2:00pm (14:00). The box plot illustrates the range of PM_{2.5} concentrations that the monitor volunteers encountered while collecting data and when they experienced PM_{2.5} levels that exceeded the unhealthy categories (above 35 µg/m³). Unhealthy levels of PM_{2.5} were recorded in both the 9:00am and 11:00am hours, at the southwest corner of 79th & Racine Ave near the 79th street bus stop.

Overall hourly exposures throughout the day are low and well within the healthy PM_{2.5} range, with the highest hourly average occurring in the 1:00pm (13:00) hour.

PM_{2.5} Concentrations by Hour. Auburn Gresham, 2019

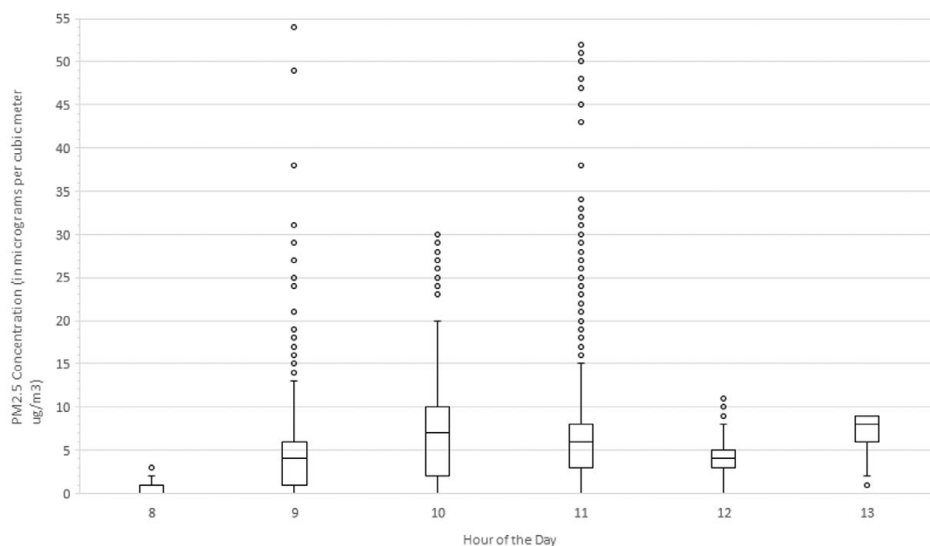


Figure 4. Summary box plots of PM_{2.5} concentrations (µg/m³) by hour of the day.

Average PM2.5 Concentrations by Hour. Auburn Gresham, 2019

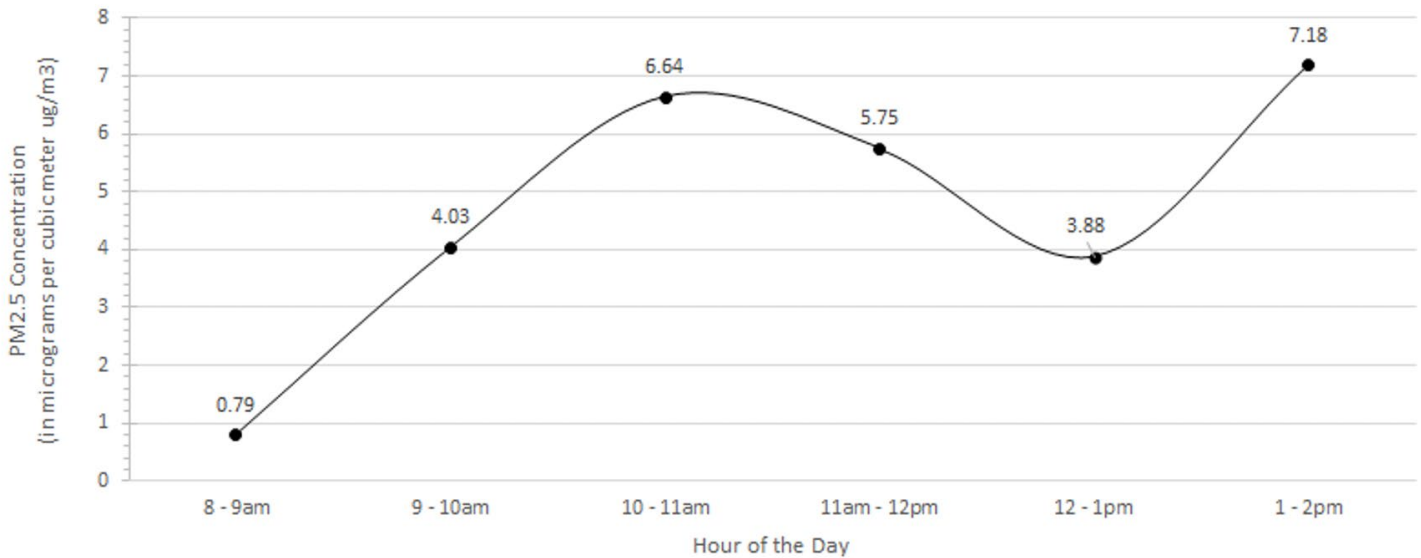


Figure 5. Average PM2.5 concentrations in Auburn Gresham, 2019 by hour of the day.

2018 Hourly Breakdown

Volunteers collected 32,828 data points in 2018 during June and July most often between 9:00am and 3:00pm (15:00). The box plot illustrates the range of PM2.5 concentrations the monitor volunteers encountered while collecting data and when they experienced PM2.5 levels that exceeded the unhealthy categories (above 35 µg/m³). Unhealthy levels of PM2.5 were recorded around 9:00am at the Halsted & 79th Street CTA terminal, and 10:00am at 79th Street & Throop.

Average PM2.5 Concentrations by Hour. Auburn Gresham, 2018

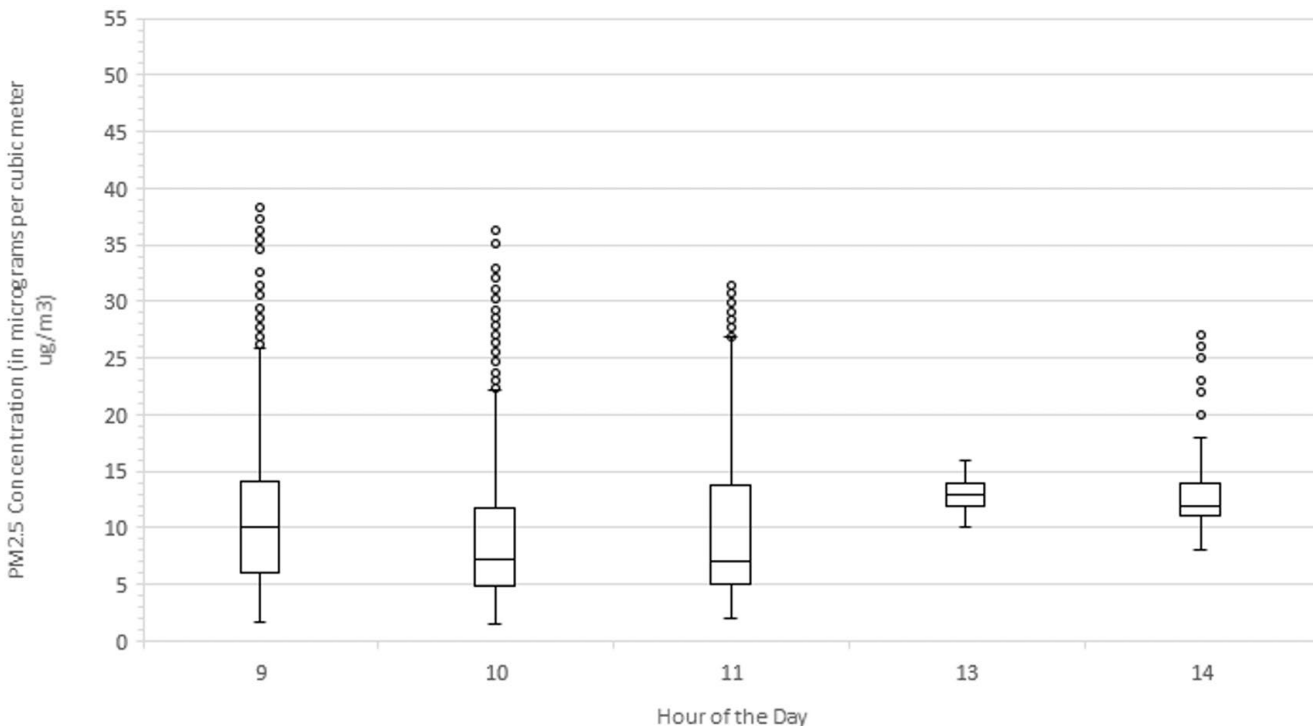


Figure 6. Summary box plots of PM2.5 concentrations (µg/m³) by hour of the day.
Note: 12:00pm is not represented on graph as no data was collected during that hour.

Overall, hourly exposures throughout the day are low and mostly within the healthy PM2.5 range rising in the afternoon to the moderate category with the highest hourly averages of 13.04 $\mu\text{g}/\text{m}^3$ occurring in the 1:00pm (13:00) hour and 12.45 $\mu\text{g}/\text{m}^3$ in the 2:00pm (14:00) hour.

Average PM2.5 Concentrations by Hour. Auburn Gresham, 2018

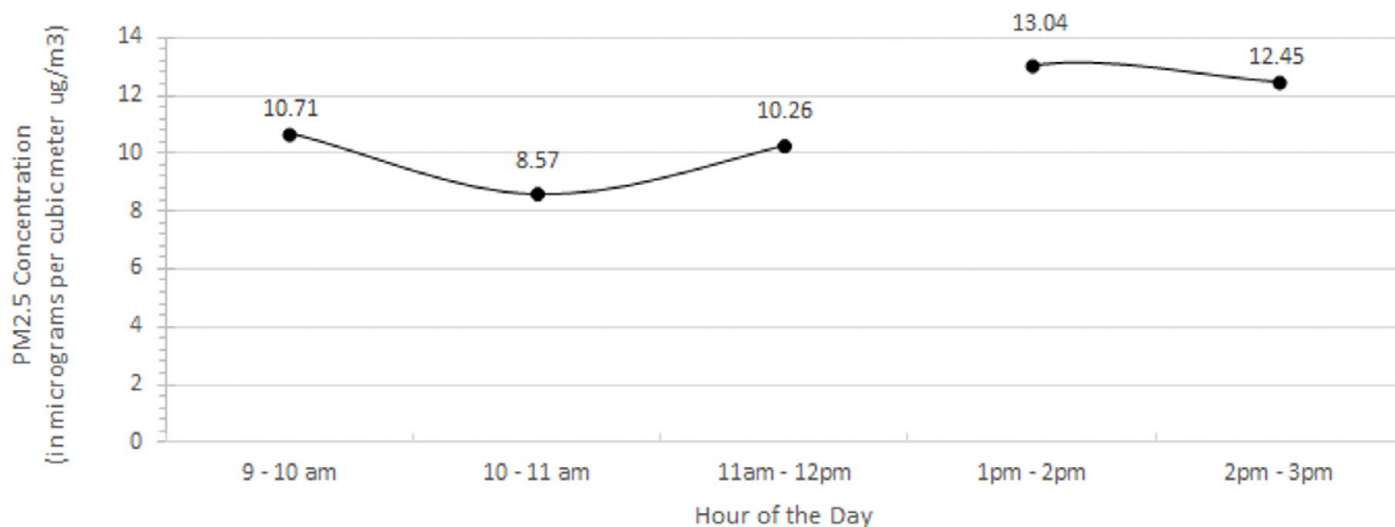


Figure 7. Average PM2.5 concentrations in Auburn Gresham, 2018 by hour of the day.
Note: 12:00pm is not represented on graph as no data was collected during that hour.

Data summary

Hourly concentrations overall were lower in 2019 than 2018. Both years showed peaks between 9 and 10 am (rush hour) at intersections and bus stops - suggesting traffic is a major driver of momentary harmful PM peaks. Other areas with elevated PM levels include: 79th street at the intersections of Ashland, Racine, and Halsted, Halsted between 75th & 79th, Ashland between 83rd and 87th, and various locations along 87th. This means that while volunteers were monitoring in those areas, they were frequently breathing in air that was harmful to their health.

As our monitors take a reading every second, they mimic the pattern of breathing. The map of Auburn Gresham (Figure 2) highlights areas where 14% of the data recorded was in the unhealthy category above $35\mu\text{g}/\text{m}^3$, depicted in the darkest blue. Thinking in terms of breathing, this means that in those hotspots of dark blue, about one out of every seven breaths were harmful to those who were monitoring and those who live and work there as well.

Volunteers found a greater prevalence of commercial vehicles in the late morning and early afternoon, an observation that lines up with the elevated PM levels documented during those times. Volunteers also noted that additional PM spikes occurred near old cars, trucks, and buses, near fires and grills, and in front of autobody shops. While monitoring in those areas, volunteers reported that the air caused difficulty breathing, sinus irritation, chest tightness, and headaches.

Recommendations to Improve Air Quality

Monitoring air quality is just the first step in targeting opportunities for effective air improvement. After conducting focus groups with those who monitored and holding meetings with our community partners, we learned that most community members' concerns are about idling trucks, truck traffic, high asthma rates, and noxious odors near trucking facilities. Based on this feedback and our preliminary data, ELPC suggests the following actions towards improving local air quality.



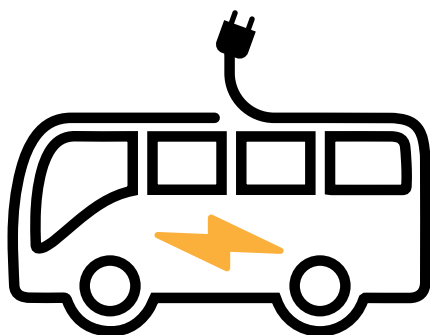
Vegetative/Sound Buffer and Tree Planting

Living, working, or going to school near highways and major transportation corridors can be harmful to respiratory, endocrine, and cardiovascular health. Children in schools in these areas are especially at risk due to underdeveloped lungs and prolonged exertion outdoors. Studies show a combination of thick, tall, full coverage, coniferous vegetation, such as evergreens, and sound barriers can significantly lower pollution around schools near highways.

ELPC is working with GAGDC and community partners to collect data and advocate for effective vegetative buffers around schools within 500 feet of I-90/94. This could include Progressives Leadership Academy, a charter school at 8522 S. Lafayette Ave, along the Dan Ryan Expressway. ELPC is now actively engaged with Morton Arboretum, USEPA and others to assess these and other sites' viability for vegetative buffers to effectively reduce PM levels.

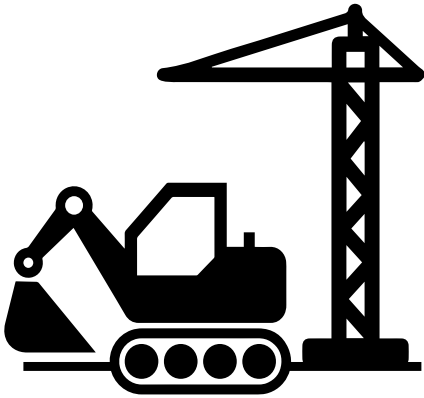
In addition to advocating for vegetative buffers, which may be a more long-term goal, ELPC also suggests applying for community tree planting grants through Openlands to add trees around the community, by schools, and/or in vacant lots.

CTA Electrification



Replacing diesel-powered buses with electric engines reduces not only harmful particulate matter pollution, but also greenhouse gas emissions. The City of Chicago has committed to electrify its fleet of 1800 buses by 2040, but the rollout so far has been slow. ELPC will work with GAGDC and interested community partners to ensure that the Chicago Transit Authority (CTA) carries out the citywide goal swiftly, while making the 79th street route a priority for early electrification. The 79th street bus is Chicago's busiest bus line, and a documented PM2.5 hotspot in the Auburn Gresham neighborhood. The CTA is working to improve service on this line to reduce congestion around bottleneck areas which could improve traffic flow and lessen idling, thus reducing PM.

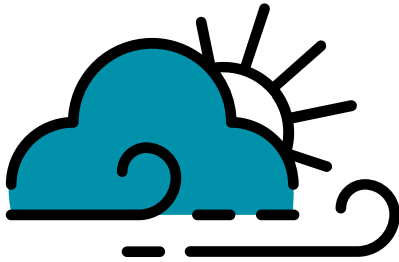
ELPC is now sharing our air quality data with CTA officials, to prioritize air quality and human health impacts in decisions regarding electric bus rollouts. Also, ELPC policy fellow Lucas Stephens [testified](#) at the latest CTA budget hearing to emphasize the importance of electric buses for clean air across Chicago.



Clean Construction

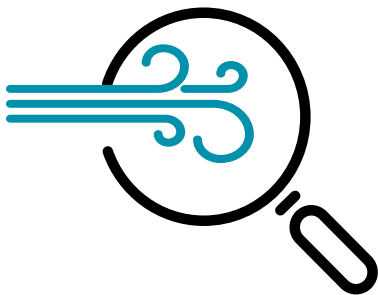
Most construction sites continue to rely on heavy-duty diesel vehicles, which emit toxic compounds and particulate matter, posing a threat to respiratory health. Changing construction practices can reduce street level particulate matter levels and benefit both the workers and community residents. Clean construction utilizes cleaner equipment and limits idling, lowering pollution at and near work sites. Chicago has a clean construction ordinance that applies to a subset of city government projects, but neighborhoods could benefit by advocating for clean construction practices at both city and private developments.

ELPC will work with the Greater Auburn Gresham Development Corporation to advocate for clean construction. Near term opportunities include the Green Era Digester, The Auburn Gresham Healthy Lifestyle and Technology Hub, and other potential INVEST South/West projects.



Federal Advocacy

Particulate Matter is a [nationwide problem](#), which the Environmental Protection Agency is tasked with regulating under its mission “to protect human health and the environment.” The EPA is required to update PM standards regularly, to reflect the latest scientific research, which continually shows more evidence of the dangers of PM exposure. Unfortunately, this year the EPA decided not to strengthen the PM_{2.5} annual and 24-hour standards, despite the findings of scientists and the recommendations of a panel of experts. ELPC field organizer Tiffany Werner [testified](#) before the EPA in June 2020 to highlight the impact of PM pollution on the Midwest and advocate for stronger standards.



Continued monitoring and community outreach

ELPC planned to continue work with GAGDC in 2020, expanding coverage to 76th Street and 95th Street, with focused data collection and note-taking around buses due to the high levels of PM frequently recorded around bus stops. However, in light of the COVID-19 situation, our air quality monitoring program had to function differently in 2020. Under Illinois’ stay-at-home order, we could not ask our traditional partners to leave their homes for non-essential trips, and youth could not gather in groups for collective air quality monitoring days, as in prior years.

For the 2020 monitoring season, we shifted to individual volunteer monitoring, encouraging safe social distancing, mask usage, and home-based air quality advocacy. Moving forward, should COVID-10 remain a threat to our communities, we are exploring other ways to collect data. We might work towards stationary monitoring networks or providing volunteers with planned routes focused on areas that need the most monitoring. With many of our long-standing partners, we are also working with them to analyze data, examine neighborhood hazards, and educate additional neighbors.

In Conclusion

Air pollution is an invisible killer. In a [recent study](#), researchers documented a 5% increase in PM2.5 between 2016 to 2018, after years of decline. This increase in PM was also associated with 9,700 additional premature deaths in the United States. As the world faces a respiratory pandemic that has been disproportionately effecting communities with [higher levels](#) of particulate matter, leading to higher coronavirus death rates, it is even more important to understand and tackle the sources of air pollution that plague our city. While it may seem expensive to alter vehicles or construction equipment, it costs us far more to do nothing. ELPC remains committed to protecting clean air and healthy communities in Chicago and across the Midwest.



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We protect the Great Lakes and defend the Midwest's wild and natural places, and we fight for safe, clean water and healthy air for all. We combine effective public interest litigation with strategic policy advocacy, sound science, and economic analysis. ELPC produces strong results for the environment in the courtrooms, boardrooms, and legislative hearing rooms across the pivotal Midwest and in Washington, D.C.

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