Address-specific Historical Air Quality Report

For

LIRR, 214 W 34th St., New York, NY 10119, USA

Prepared by:

Environmental Health Analytics, LLC

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Introduction

We are pleased to share with you information about air quality at your address. Historical information (data over time in the past) on air quality is more important than current "snapshots" because poor air quality occurs in episodes and has cyclical seasonal patterns, which are important for understanding air quality at a location but which may be missed by "snapshots" of current levels because they are not currently occuring.

This report provides information on air quality at thousands of points around your address for over 20 years and provides you with several summaries of the data. Please be aware that the information presented in this report on air quality levels is based on estimates produced by statistical models, similar in some ways to weather forecasts. As such, they necessarily contain some error. Statistical modeling of air quality levels is necessary because nearly all addresses in the US are not at or adjacent to an air quality monitoring site that uses US EPA-approved measurement methods.

Atmospheric particle pollution (also known as particulate matter or "PM") consists of a mixture of solids and liquid droplets in the air and is one component of smoke (the other component of smoke is a mixture of gases such as carbon monoxide, nitrogen oxides, and many others). Airborne particles exist in a range of sizes. Very small particles (those 2.5 micrometers or less in aerodynamic

diameter ("aerodynamic diameter" refers to how the particles behave in an airstream)) are called $PM_{2.5}$ and can penetrate deeply into the lungs when inhaled. The US EPA has established two health-based air quality standards (called a National Ambient Air Quality Standard, or NAAQS) for $PM_{2.5}$, one for daily (short-term) levels and another for annual (long-term) levels. The US EPA has also created a color-coded scale for air quality called the Air Quality Index (AQI). Please see Section 5 of this report for more information about the AQI, and for additional details regarding the definition, properties, and sources of $PM_{2.5}$ in the atmosphere.

The level of $PM_{2.5}$ in the air is measured in units of micrograms (μg) of particulate matter per unit volume of air, usually one cubic meter of air. Micrograms are a measure of the amount of material, and one microgram is one-millionth of one gram. So the units of $\mu g/m^3$ correspond to the number of micrograms of very small solid or liquid particles suspended in each cubic meter of air. Please see Section 5 of this report for more information about the units of $PM_{2.5}$ values.

Executive Summary

Air quality at your address is briefly summarized in the remainder of this section. Further details about air quality at your address are presented in the later sections of this report.

$PM_{2.5}$ Air Quality At Your Address In One Number:

Across years 1999-2019, the long-term average $PM_{2.5}$ level at your address was: 11.6 $\mu g/m^3$. This value can be compared to the US EPA annual standard of 12.0 $\mu g/m^3$. For more information on which years are highest, the trend in the annual-average values over time, and what the levels are in recent years at your address, see Section 3.

Also, at your address, the percentage of individual days that had acceptable (either "Good" or "Moderate" based on the EPA's Air Quality Index (AQI) and 24-hr health-based air quality standard) air quality was 98.7%. Please note this information may seem contradictory with the above, because a given location may meet the annual standard but not the 24-hr standard or vice versa (the two standards have different levels as well as averaging times). See Section 5 and Table 5.1 for further details on the EPA's Air Quality Index (AQI) and on the proportions of days that meet EPA's 24-hr health-based air quality standard.

Sections of this report

Below, Section 1 of this report presents estimated daily air pollutant levels over 1999-2019 (2019 is the most recent year currently available). Section 2 shows estimated daily levels over the most-recent three years over which data are available (2017-2019 inclusively) and Section 3 shows estimated annual levels

over 1999-2019. Section 4 shows estimated air pollutant levels in the area around your address. Finally, Section 5 discusses the health effects of air pollution.

Section 1. Estimated daily levels over 1999-2019 at your address

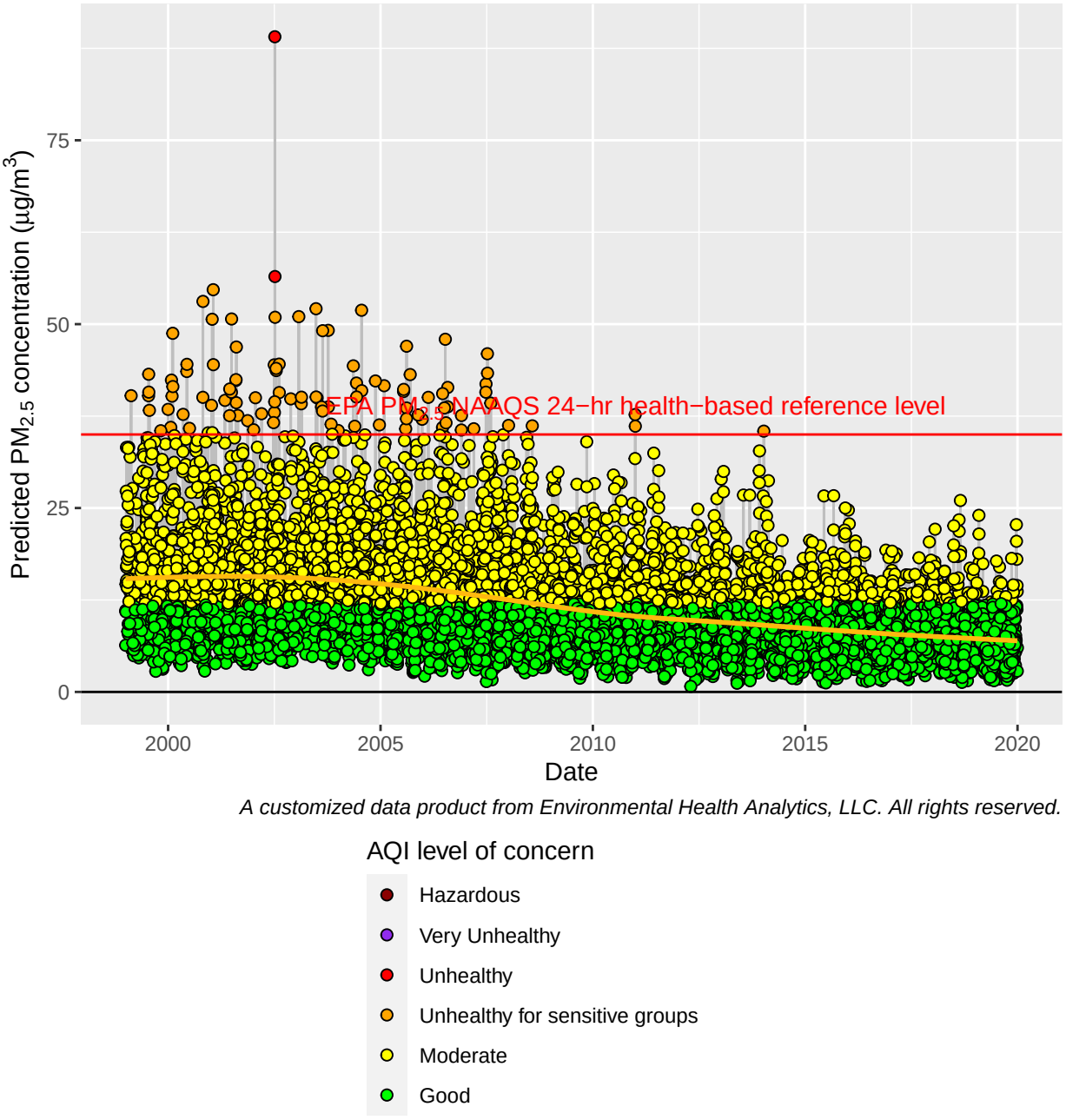
Below, we present estimated 24-hr levels of the air pollutant $PM_{2.5}$ at the address you provided, daily over the time period 1999-2019 (2019 is the most recent year currently available). The values are color-coded according to the US EPA Air Quality Index (AQI).

Figure 1.A. Daily air pollutant levels at your address over time.

Parameter: $PM_{2.5}$. Time period: All years, 1999-2019.

24-hr values. Units are: $\mu g/m^3$.

Yellow line shows the long-term average at your address.



In the plot above, values above the red line indicate that the estimated air pollutant concentration was above US EPA's health-based 24-hr air quality standard for that day (called the 24-hr National Ambient Air Quality Standard, or NAAQS). Refer to Section 5 for more information on EPA's health-based reference levels.

Below we compare the maximum 24-hr level at your address over the time period 1999-2019 with the health-based air quality standard set by the US EPA and with the US EPA Air Quality Index. The US EPA provides the Air Quality Index, called the AQI, as a means to interpret the healthiness of air quality levels and to describe what actions should be taken as air quality worsens. The AQI focuses

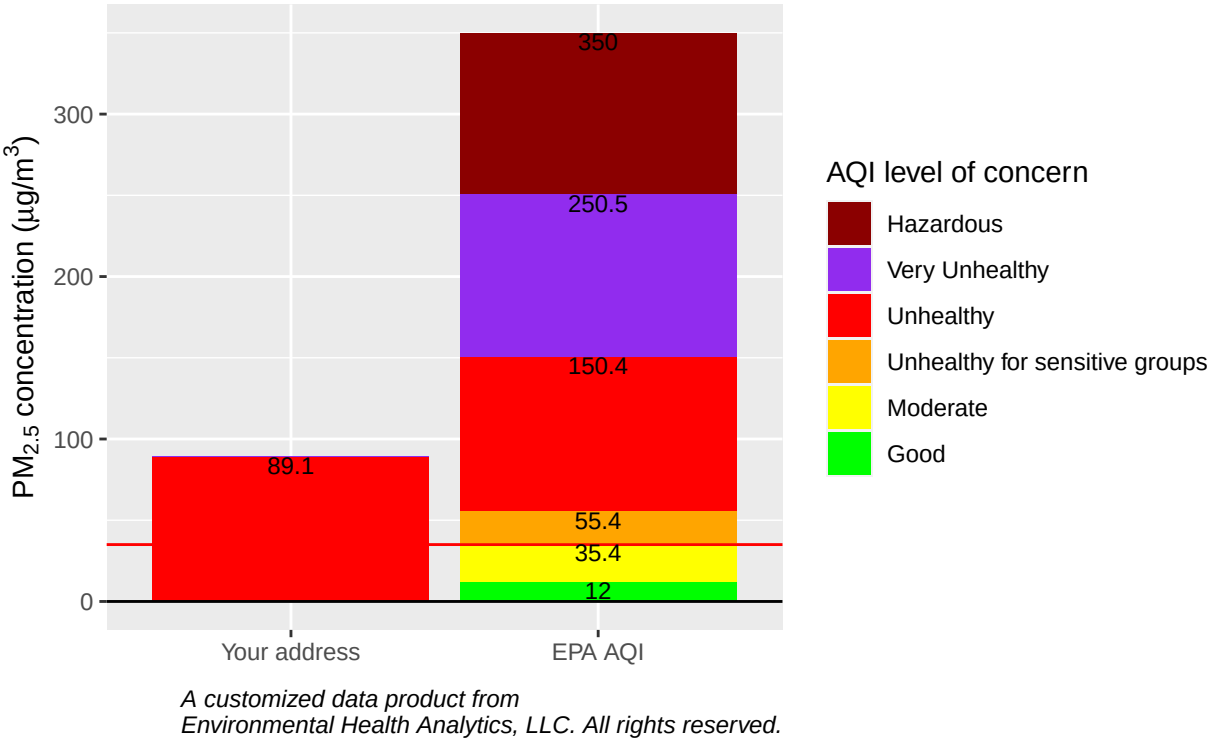
on health effects that may be experienced within hours or days after exposure to polluted air and provides health-related categories of air quality based on the concentration of a given air pollutant.

In this report, AQI values are based on the pollutant $PM_{2.5}$. The categories of the AQI are "Good", "Moderate", "Unhealthy for sensitive groups,"Unhealthy",Very unhealthy", and"Hazardous". See Table 5.1 in Section 5 for more information on the AQI categories.

For $PM_{2.5}$, 24-hr levels below 12.0 correspond to the AQI "Good" category. Levels above that but below 35.4 are considered "Moderate", and between 35.5 and 55.4 are "Unhealthy for sensitive groups". Even higher 24-hr levels, between 55.5 and 150.4, are considered "Unhealthy", and between 150.5 and 250.4 are "Very unhealthy". Finally, 24-hr levels above 250.5 are considered "Hazardous". For more information about US EPA's AQI, see Section 5 of this document and https://www.airnow.gov/aqi/aqi-basics.

Figure 1.B. Comparison of the maximum 24-hr level at your address to EPA's Air Quality Index (AQI).

Parameter: Maximum $PM_{2.5}$ 24-hr value. Time period: All years, 1999-2019. Units are: $\mu g/m^3$.



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For $PM_{2.5}$, the maximum 24-hr value over 1999-2019 at this location corresponds to the AQI category "Unhealthy". If you were to spend 24-hr outdoors at this location, some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects. See Section 4 for more information.

Table 1.1. Five highest estimated 24-hr $PM_{2.5}$ values and their dates and AQI categories, 1999-2019.

Rank	Date	Predicted pollutant concentration	AQI level of concern
Maximum value	2002-07-07	89.1	Unhealthy
2nd highest value	2002-07-08	56.5	Unhealthy
3rd highest value	2001-01-23	54.7	Unhealthy for sensitive groups
4th highest value	2000-10-27	53.1	Unhealthy for sensitive groups
5th highest value	2003-06-26	52.1	Unhealthy for sensitive groups

Each one of the estimated daily values in Section 1 has a corresponding AQI

category. The below pie chart shows the proportions of the AQI categories that these values fall into:

Figure 1.C. Proportions of AQI categories based on 24-hr values at your address.

Parameter: $PM_{2.5}$. Time period: All years, 1999-2019.

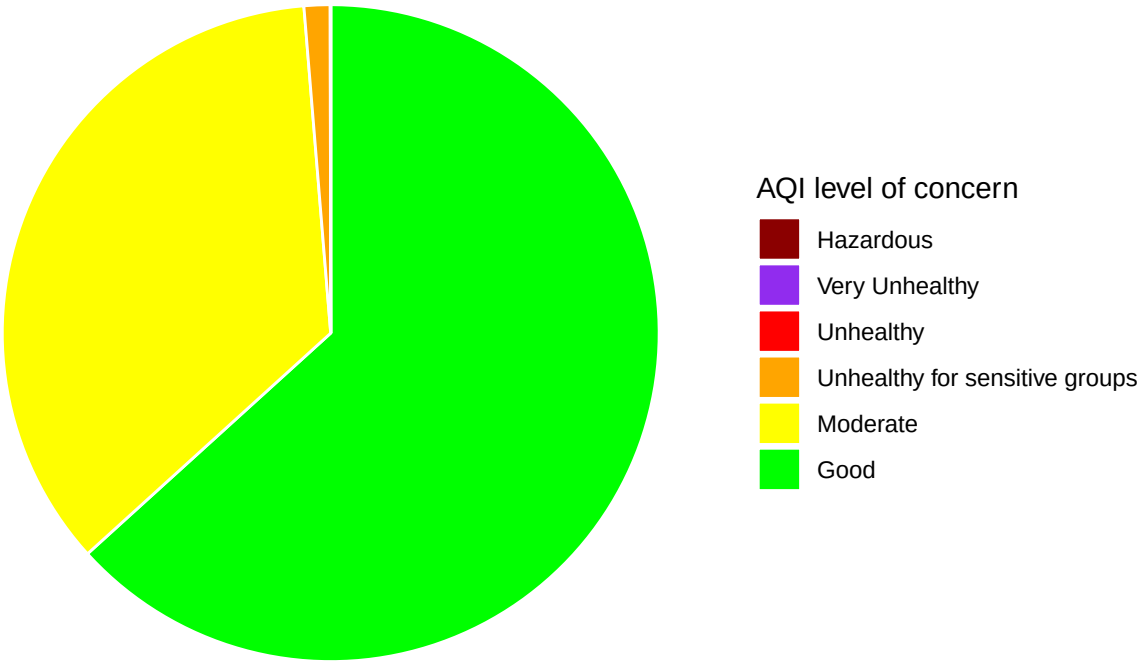

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Table 1.2. Percentages of 24-hr values in each AQI category, 1999-2019.

AQI level of concern	Number of values	Percentage (%)
Good	4853	63.27
Moderate	2717	35.42
Unhealthy for sensitive groups	98	1.28
Unhealthy	2	0.03
Very Unhealthy	0	0.00
Hazardous	0	0.00

Section 2. Estimated daily levels over 2017-2019 at your address

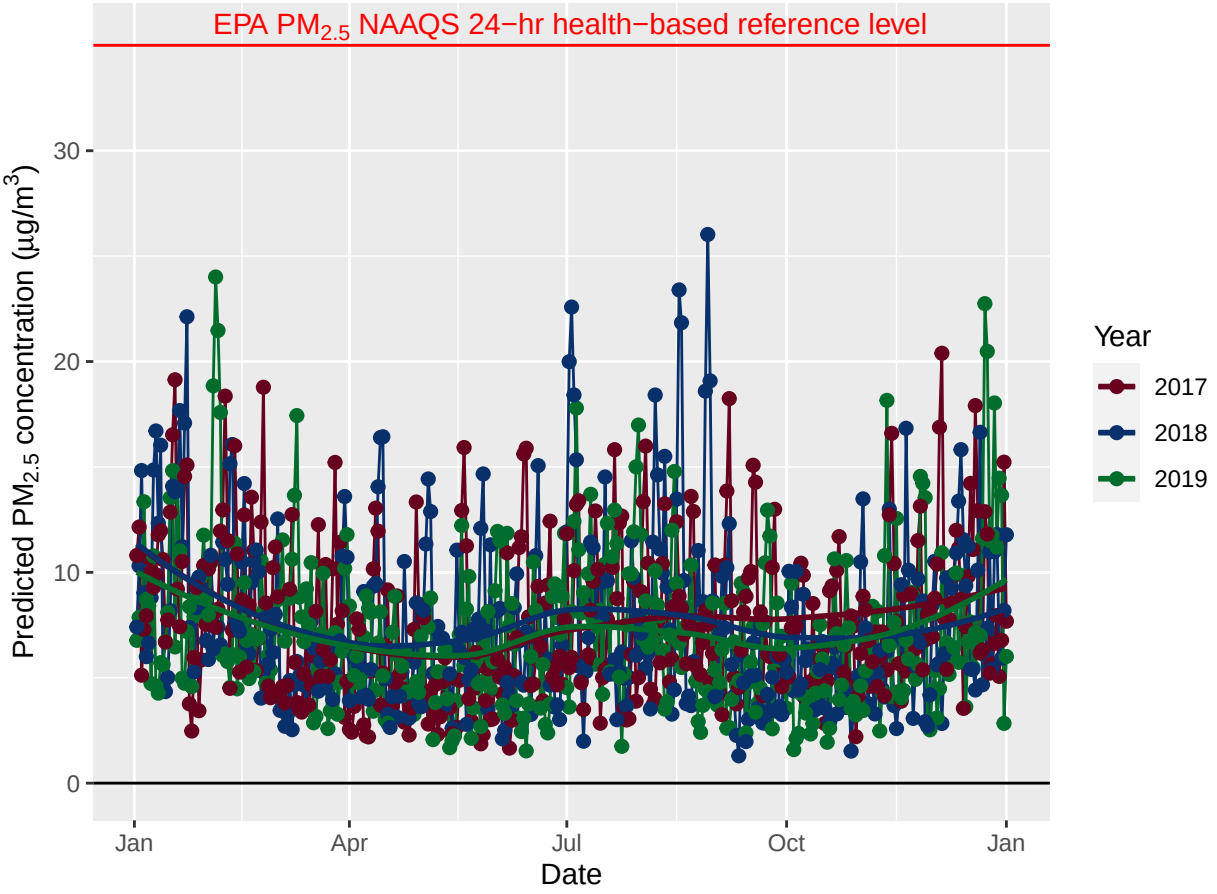
Below is the same information as in Section 1, but over only the most recent three years, with a separate line for each year. Each year's data is color-coded according to the legend on the right.

Figure 2.A. Daily air pollutant levels at your address over time.

Parameter: $PM_{2.5}$. Time period: Most recent three years available, 2017-2019.

24-hr values. Units are: $\mu g/m^3$.

Colored lines show the average for each year at your address.

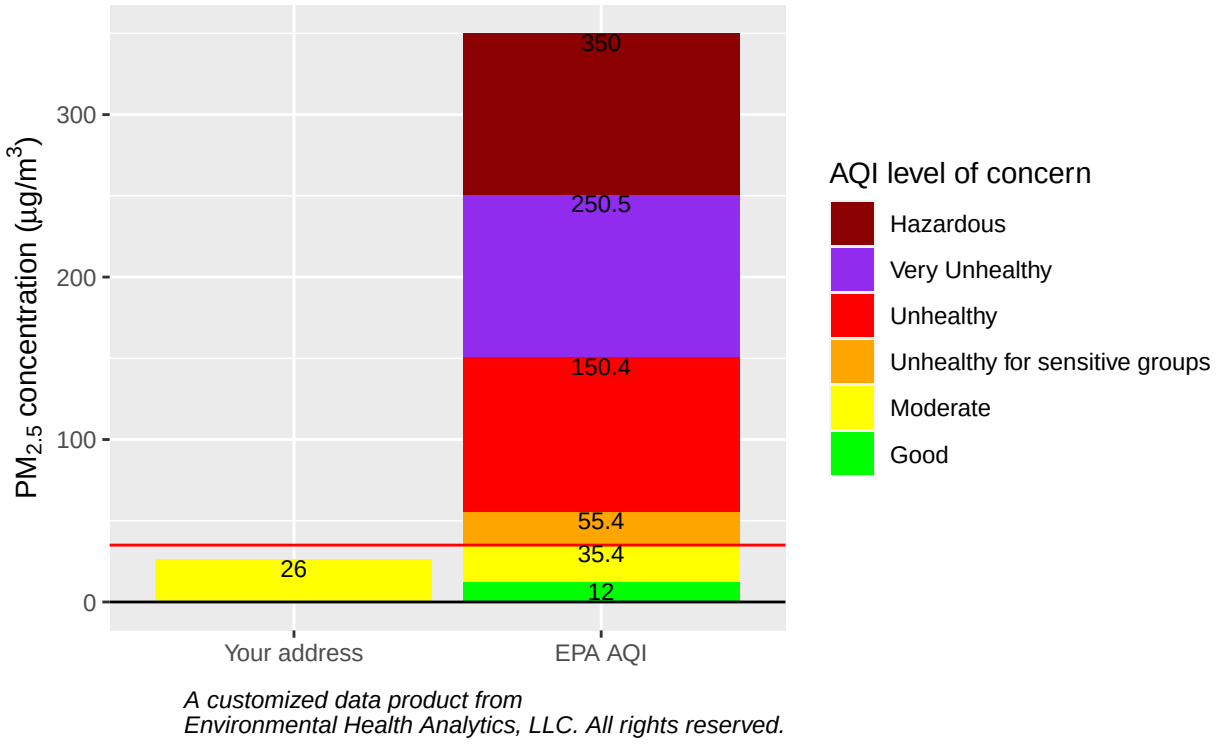


Below we compare the maximum 24-hr level at your address over the most recent three-year time period available, 2017-2019, with the health-based 24-hr air quality standard set by the US EPA.

Figure 2.B. Comparison of the maximum 24-hr level at your address to EPA's Air Quality Index (AQI).

Parameter: Maximum $PM_{2.5}$ 24-hr value. Time period: Most recent three years available, 2017-2019.

Units are: $\mu g/m^3$.



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Each one of the daily values over the last three years has a corresponding AQI category. The below pie chart shows the proportions of the AQI categories that these values fall into:

Figure 2.C. Proportions of AQI categories based on 24-hr values at your address.

Parameter: $PM_{2.5}$. Time period: Most recent three years available, 2017-2019.

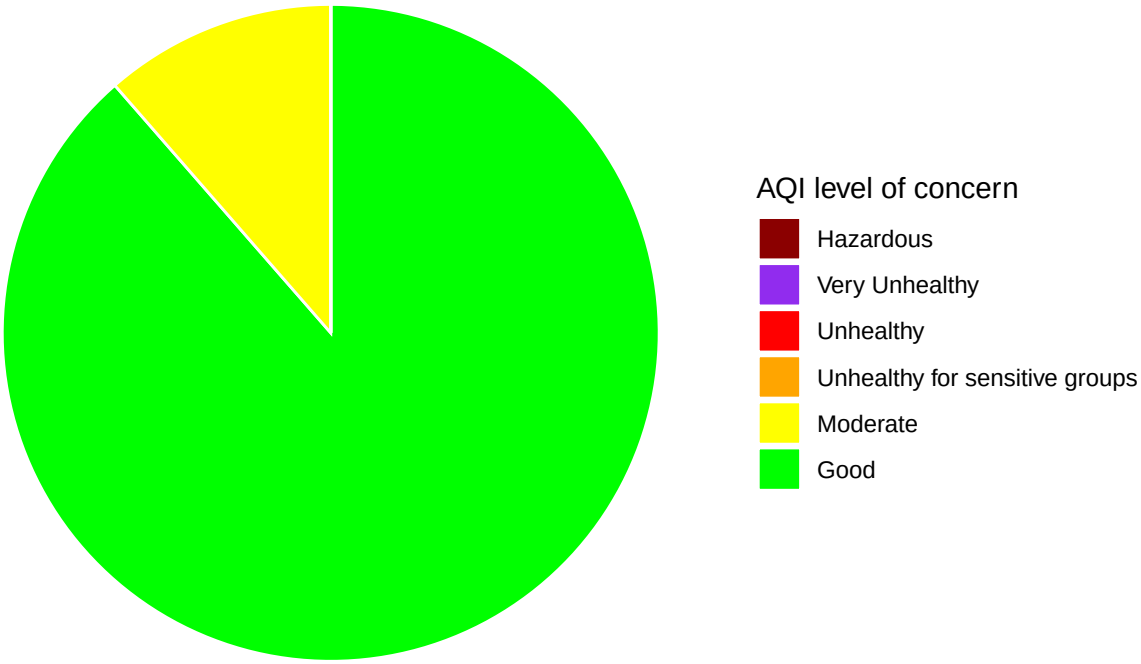


Table 2.1. Percentages of 24-hr values in each AQI category, 2017-2019.

AQI level of concern	Number of values	Percentage (%)
Good	970	88.58
Moderate	125	11.42
Unhealthy for sensitive groups	0	0.00
Unhealthy	0	0.00
Very Unhealthy	0	0.00
Hazardous	0	0.00

Section 3. Estimated annual levels over 1999-2019 at your address

In this section we show the result of averaging daily estimated $PM_{2.5}$ air pollutant levels over the year to produce estimated annual $PM_{2.5}$ levels and compare these to the US EPA annual health-based air quality standard.

$PM_{2.5}$ Air Quality At Your Address In One Number:

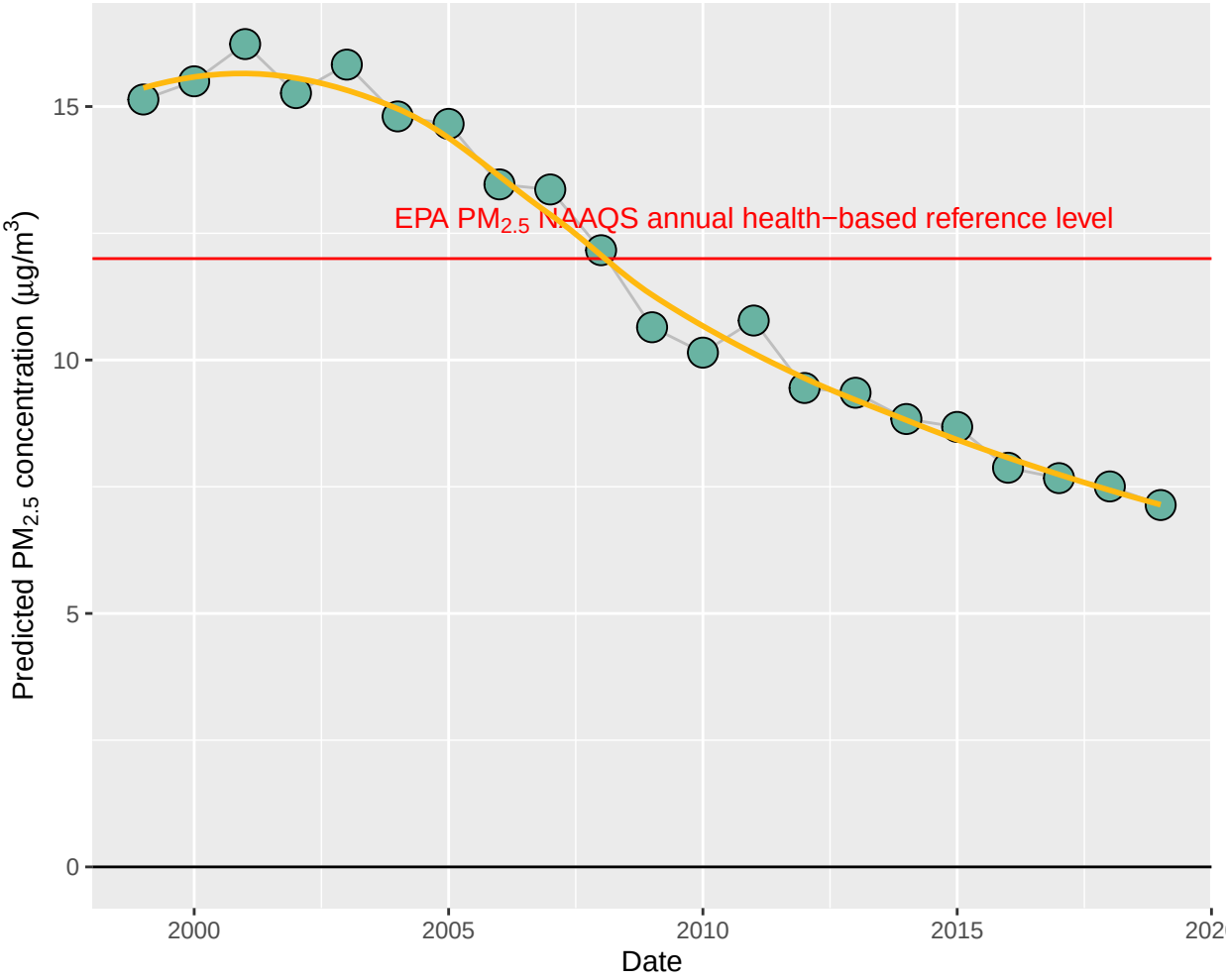
Across years 1999-2019, the long-term average $PM_{2.5}$ level at your address was: 11.6 $\mu g/m^3$. This value can be compared to the US EPA annual standard of 12.0 $\mu g/m^3$. For more information on which years are highest, the trend in the annual-average values over time, and what the levels are in recent years at your address, see the remainder of this section.

Figure 3.A. Annual air pollutant levels at your address over time.

Parameter: $PM_{2.5}$. Time period: All years, 1999-2019.

Annual-average values. Units are: $\mu g/m^3$.

Yellow line shows the long-term average at your address.



Trend analysis of annual levels over 1999-2019:

Overall, based on the profile of the annual values across 1999-2019, trend analysis shows that the levels at your address are generally improving (going lower).

Table 3.1. Minimum and maximum annual values at your address over 1999-2019.

Year	Type	Annual value
2019	Minimum	7.1
2001	Maximum	16.2

Each one of the annual values shown above is either under or over the US EPA annual health-based air quality standard. The below pie chart shows the proportions that are under and over the standard:

Figure 3.B. Proportions of annual values over or under the US EPA health-based annual air quality standard at your address.

Parameter: $PM_{2.5}$. Time period: All years, 1999-2019.

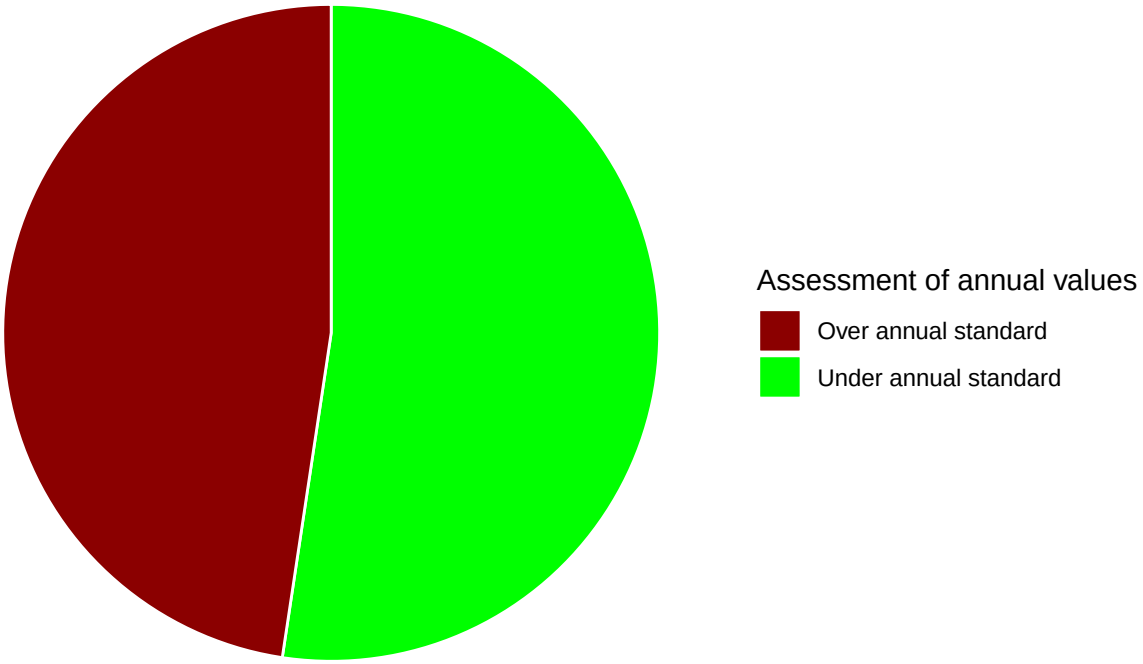


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Table 3.3. Percentages of annual values over or under the US EPA health-based annual air quality standard, 1999-2019.

Assessment of annual values	Number of values	Percentage (%)
Under annual standard	11	52.38
Over annual standard	10	47.62

Section 4. Pollutant levels in the area around your address

Below are three maps (Figures 4.A, 4.B, and 4.C) of the area around your address. The first is a road map of your address and the surrounding area, the second shows estimated long-term average pollutant levels (across 1999-2019) in this area, and the third shows the same pollutant levels but makes them transparent.

Figure 4.A. Map showing the area around your address.

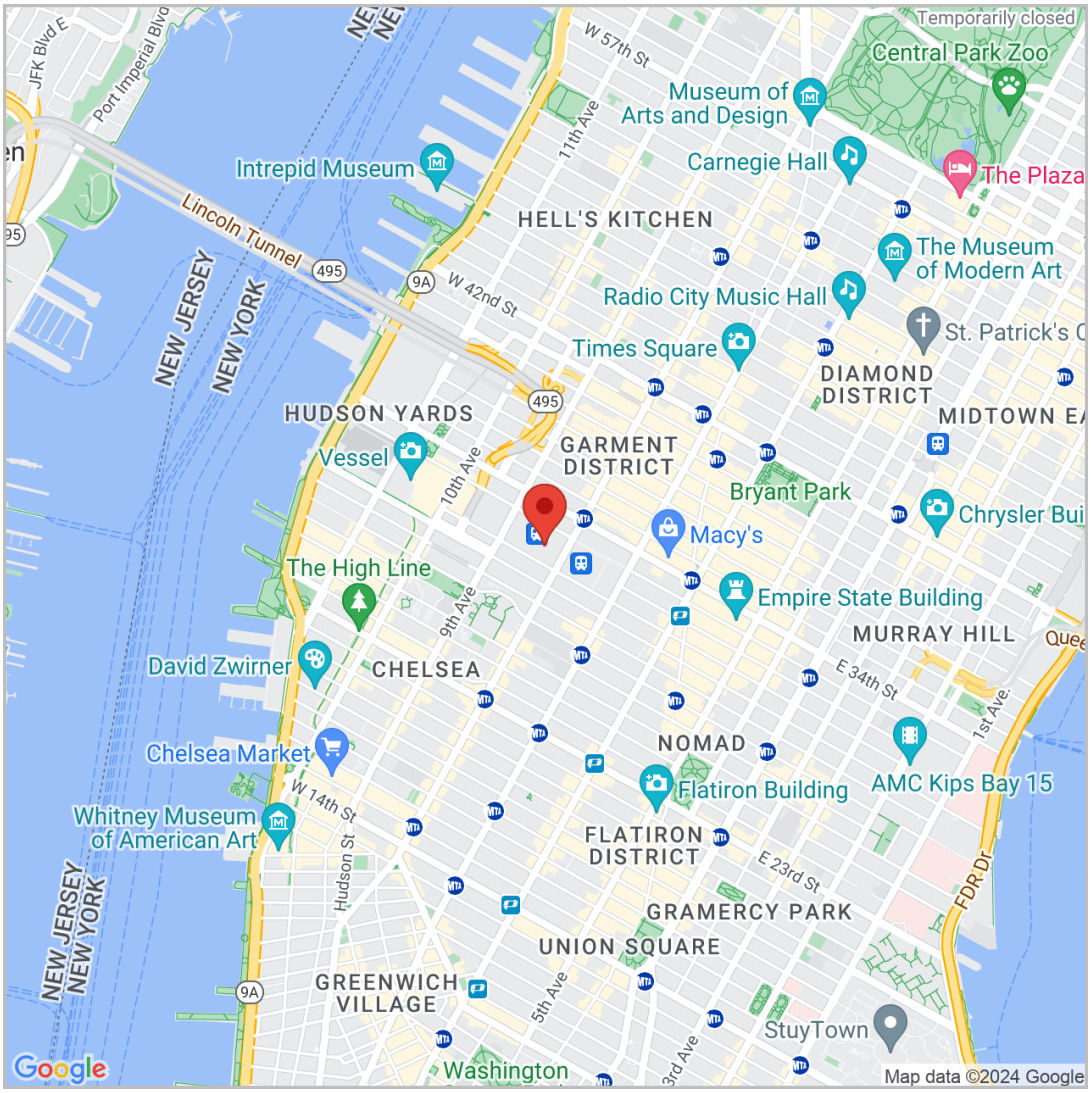


Figure 4.B. Map showing long-term average pollutant levels, 1999-2019.

Parameter: $PM_{2.5}$. Time period: All years, 1999-2019.

Long-term average values. Units are: $\mu g/m^3$.

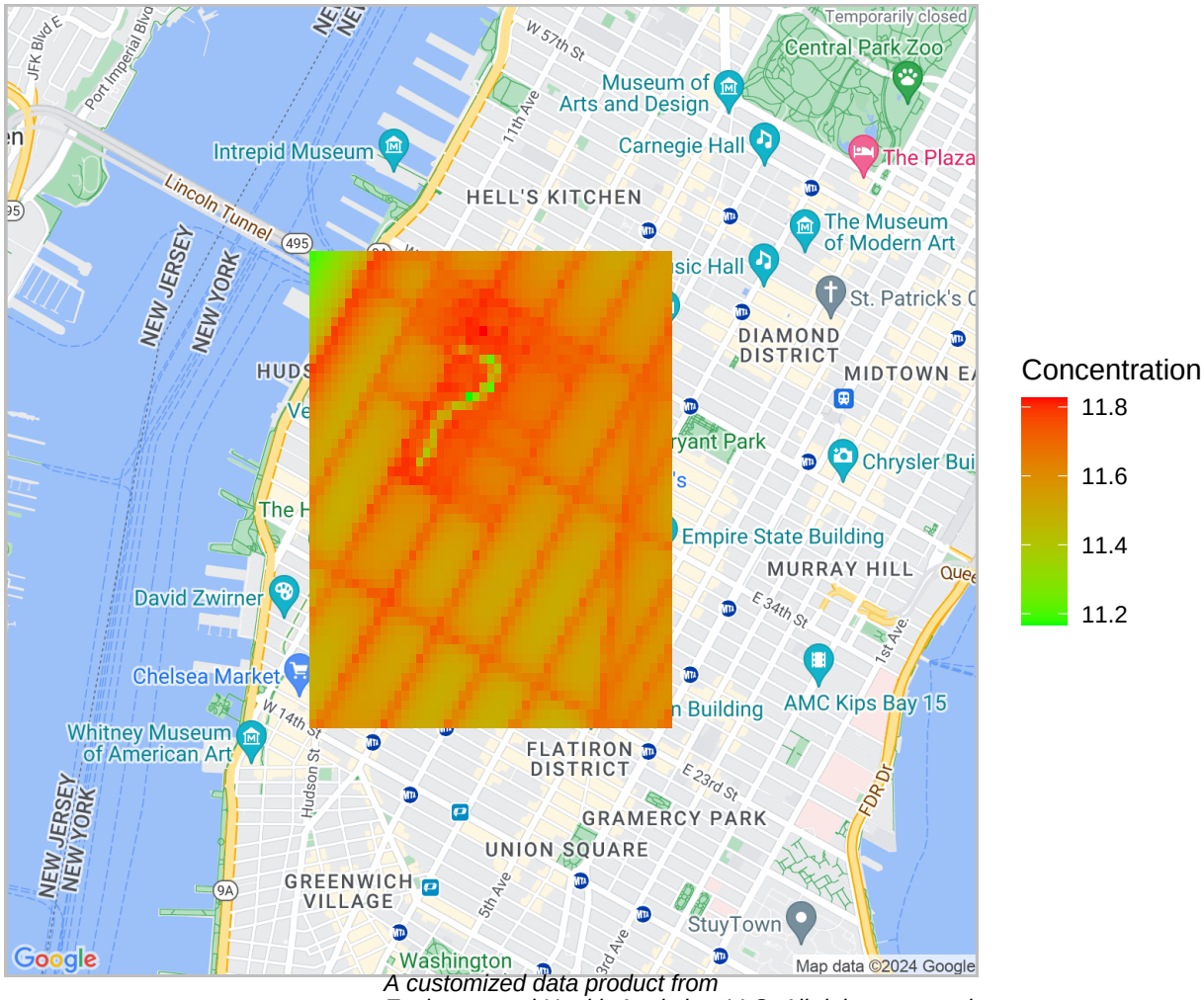


Table 4.1. Estimated long-term average pollutant levels in your area, 1999-2019.

Number of points in grid	Minimum	Maximum
2601	11.2	11.8

The map above shows that long-term average $PM_{2.5}$ levels, averaged over 1999-2019, vary from the minimum value to the maximum value shown in Table 4.1.

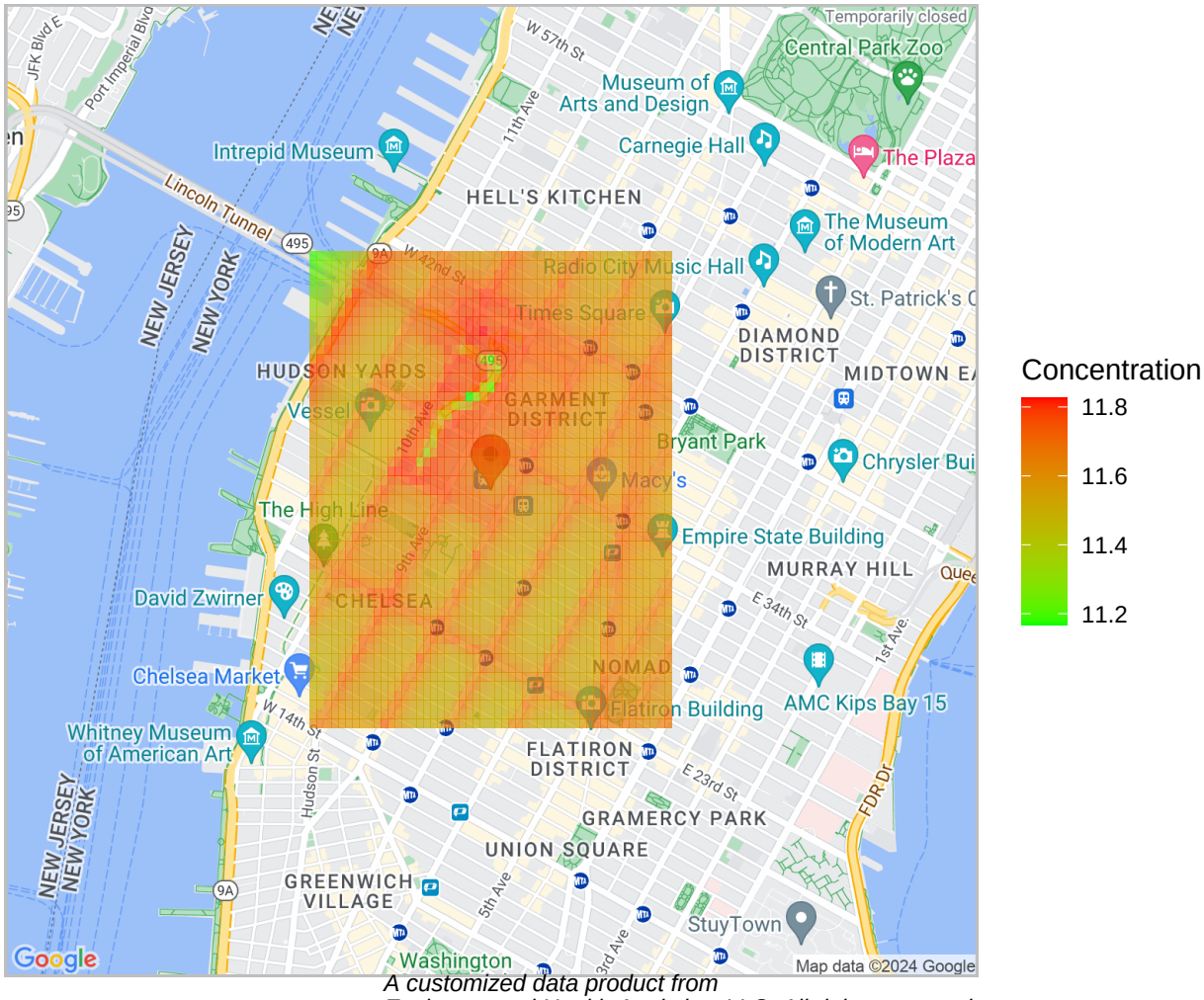
These values can be compared to the US EPA annual standard of 12 μg/m^3. A number of features may be evident in the plot of estimated pollutant levels, such as the influences of nearby roads, urban areas, changes in elevation, and/or meteorological factors. Short-term extreme events such as wildland fires may also influence the pollutant levels shown, but to a lesser extent due to long-term averaging.

It should be noted that the maximum $PM_{2.5}$ value of 11.8 in Table 4.1 is less than the US EPA annual standard of 12 μg/m^3.

Figure 4.C. Map showing transparent long-term average pollutant levels, 1999-2019.

Parameter: $PM_{2.5}$. Time period: All years, 1999-2019.

Long-term average values. Units are: $\mu g/m^3$.



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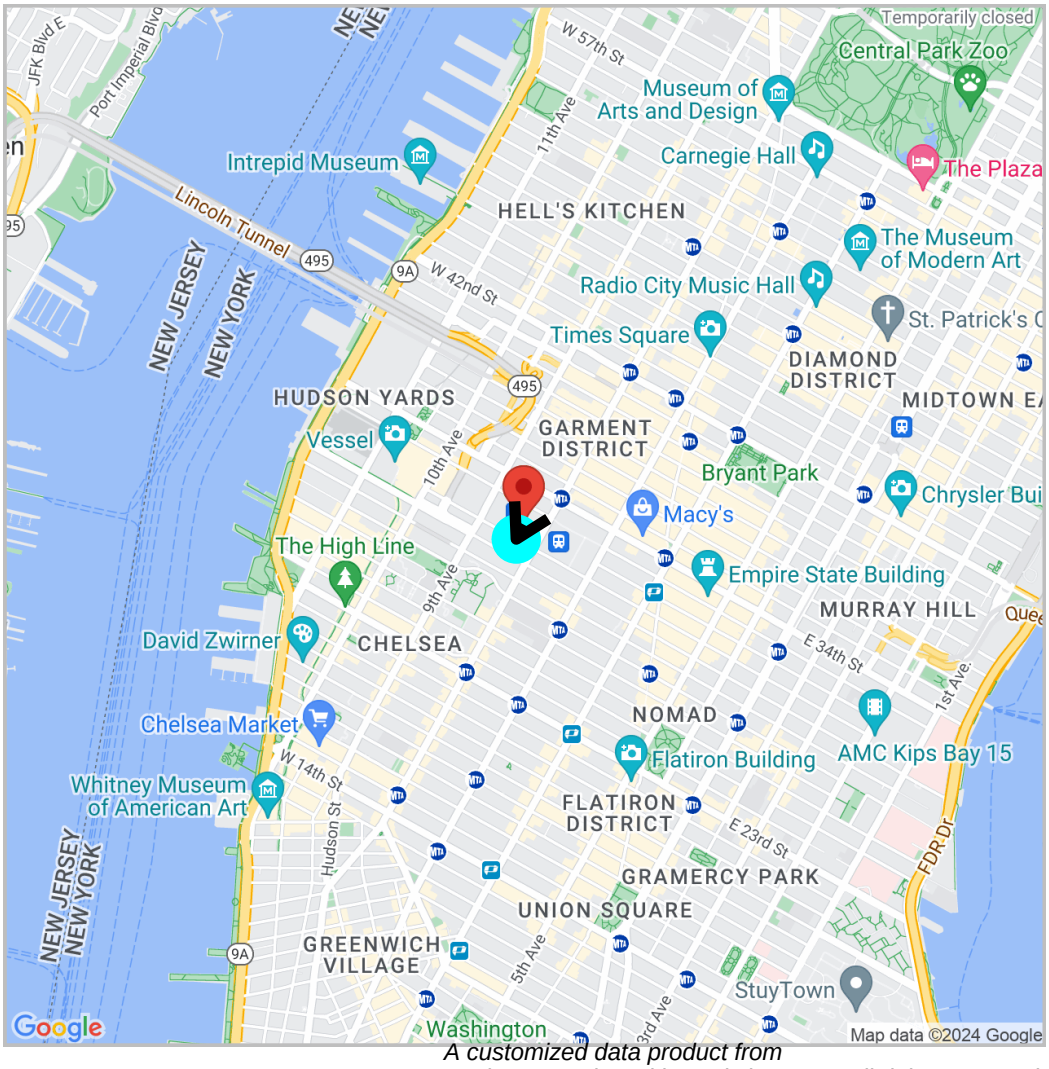
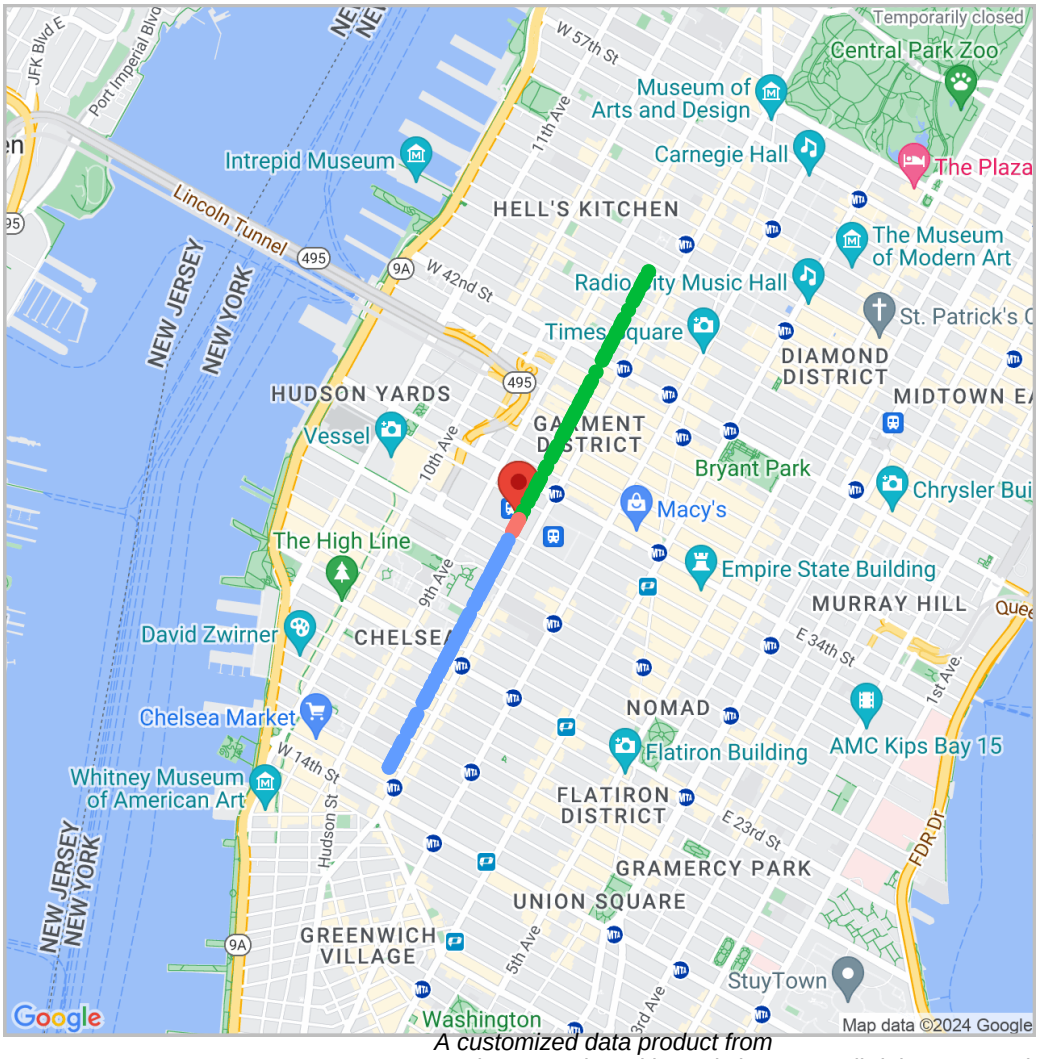
Below are two maps (Figures 4.D and 4.E) of the area around your address with information about nearby roads. The first shows a light blue point along the major roadway that is nearest to your address and a black arrow from your address to that point.

Figure 4.D. Map showing nearest major road and arrow from your address to nearest major road.



The second map shows a line that extends along the arrow in the map above from your address towards the nearest major road, and extends forwards and backwards in the direction of that arrow. This line is called the transect line.

Figure 4.E. Map showing the transect line from your address to the nearest major road, extending forwards and backwards.



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Point location

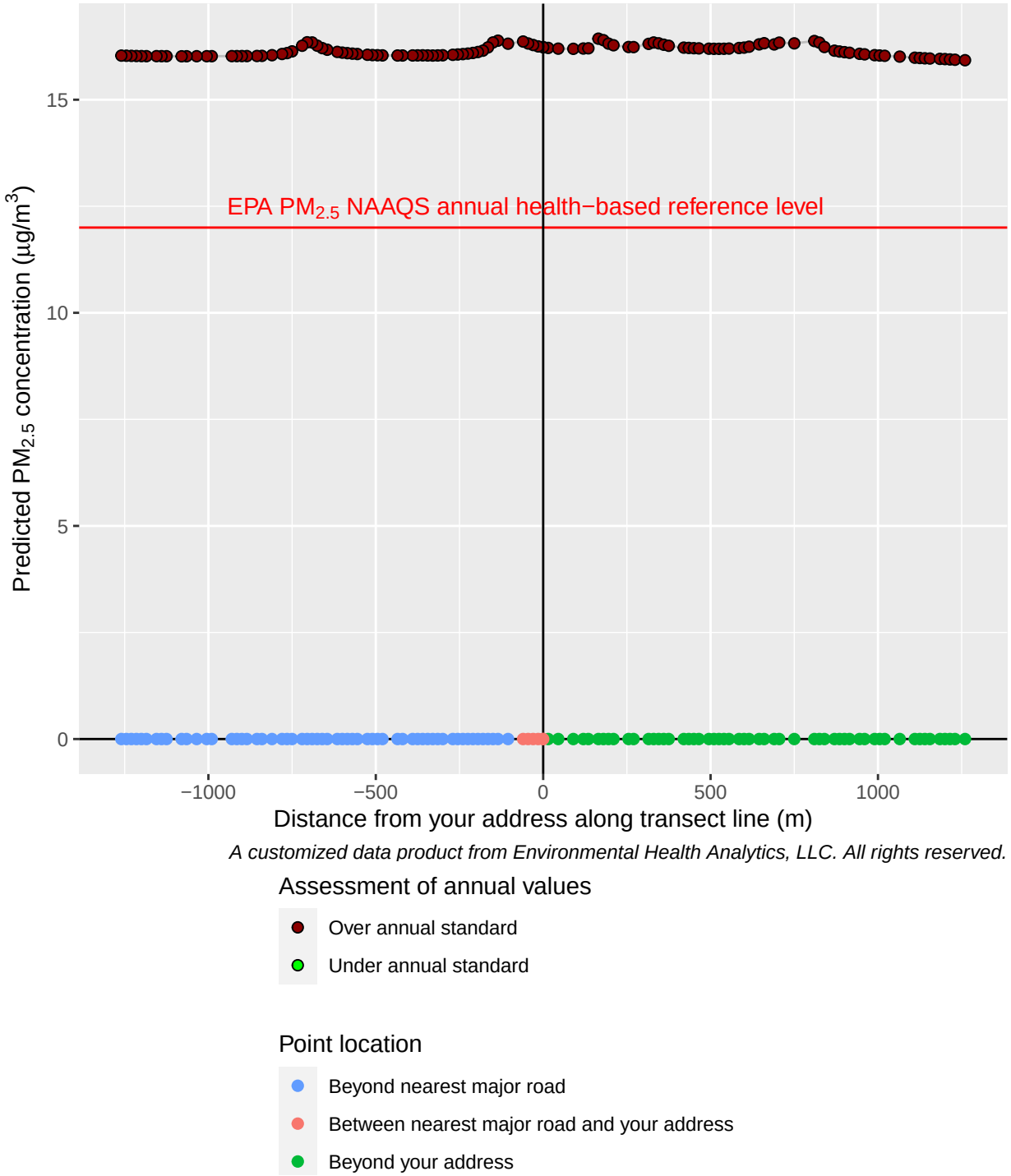
- Beyond nearest major road
- Between nearest major road and your address
- Beyond your address

The plot below shows the estimated annual-average pollutant levels along the transect line for the highest single year, among the years 1999-2019, which at your address was 2001. Also shown on the x-axis (with an artificial value of zero concentration) are the color-coded locations of the points along the transect line, using the same colors and categories as in Figure 4.E. Please be aware, that, although $PM_{2.5}$ levels are often higher in general downwind of large, busy

roadways, there is sometimes a decrease in levels very near roadways due to a phenomonon called "vehicle induced turbulence". This means that the motion of the vehicles stir and mix the air causing dilution, and this can result in lower air pollutant levels in the area very near the roadway. Beyond that, levels generally increase in the downwind direction, then decrease again due to dilution.

Figure 4.F. Air pollutant levels along the transect line for the highest year.

Parameter: $PM_{2.5}$. Time period: 2001, the highest single year among 1999-2019. Annual-average values. Units are: $\mu g/m^3$.



The table below shows the percentage of annual values in the plot above (which

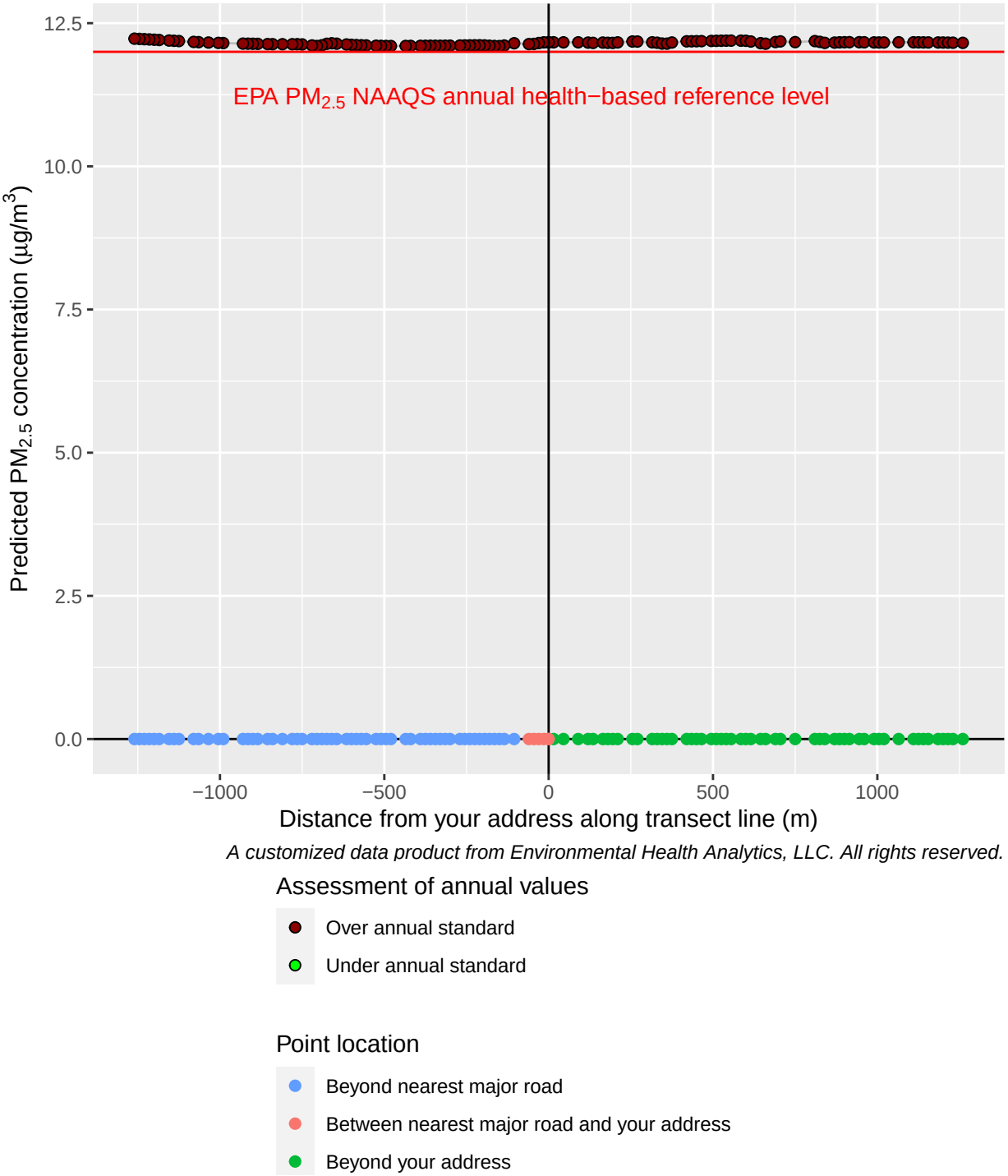
is Figure 4.F) that are over or under the US EPA health-based annual air quality standard, for the highest year shown in Figure 3.A, which is 2001.

Table 4.2. Percentages of annual values over or under the US EPA health-based annual air quality standard along the transect line for the highest year.

Assessment of annual values	Number of values	Percentage (%)
Under annual standard	0	0.00
Over annual standard	120	100.00

Figure 4.G. Air pollutant levels along the transect line for a typical year.

Parameter: $PM_{2.5}$. Time period: 2008, a typical single year from 1999-2019. Annual-average values. Units are: $\mu g/m^3$.



The table below shows the percentage of annual values in the plot above (Figure

4.G) that are over or under the US EPA health-based annual air quality standard, for a typical year from 1999-2019 (the year closest to the long-term average), which is 2008.

Table 4.3. Percentages of annual values over or under the US EPA health-based annual air quality standard along the transect line for a typical year from 1999-2019.

Assessment of annual values	Number of values	Percentage (%)
Under annual standard	0	0.00
Over annual standard	120	100.00

Section 5. Health effects of atmospheric particle pollution

What is atmospheric particle pollution?

Atmospheric particle pollution (also known as particulate matter or "PM") consists of a mixture of solids and liquid droplets in the air and is one component of smoke (the other component of smoke is a mixture of gases such as carbon monoxide and nitrogen oxides). Airborne particles exist in a range of sizes. The smallest particles (those 2.5 micrometers or less in aerodynamic diameter) are called $PM_{2.5}$. These are so small (much smaller than the width of a single human hair) that they can get deep into the lungs, where they can cause serious health problems. Major sources of fine particles include motor vehicles, power plants, home heating, residential wood burning, forest fires, agricultural burning, some industrial processes, and other combustion processes. Some particles are emitted directly, while others are formed when gaseous pollutants emitted by combustion sources react in the atmosphere. Particle pollution can be very unhealthy and even hazardous during events such as forest fires. There is also scientific evidence that particle pollution can also be unhealthy at lower levels, such as commonly occur in polluted urban areas.

What are the health effects and who is most at risk from atmospheric particle pollution?

Particles smaller than 2.5 micrometers ($PM_{2.5}$) in diameter in the air can cause or aggravate a number of health problems and have been linked with illnesses and deaths from heart diseases, lung diseases, and many other health outcomes. These effecs have been associated with both short-term exposures (usually over 24 hours, but possible as short as one hour) and long-term exposures (years). Sensitive groups for atmospheric particle pollution include people with heart or lung disease (including heart failure, coronary artery disease, asthma, and chronic obstructive pulmonary disease), older adults (who may have undiagnosed heart or lung disease), and children. The risk of heart attacks, and thus the risk from atmospheric particle pollution, may begin as early as the mid-40s for men and mid-50s for women.

When exposed to high levels of atmospheric particle pollution, people with heart or lung diseases and older adults are more likely to visit emergency rooms, be admitted to hospitals, or in some cases, even die. Exposure to atmospheric particle pollution may cause people with heart disease to experience chest pain, palpitations, shortness of breath, and fatigue. Atmospheric particle pollution has also been associated with cardiac arrhythmias and heart attacks. When exposed to high levels of atmospheric particle pollution, people with existing lung disease may not be able to breathe as deeply or vigorously as they normally would. They may experience respiratory symptoms such as coughing and cardiovascular symptoms such as shortness of breath. Healthy people may also experience these effects, although they are unlikely to experience more serious effects at

levels below the "Unhealthy" category of the AQI (see Table 5.1 above for more information). Atmospheric particle pollution can also increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis, increasing the need for medication use and potentially doctor and hospital visits.

Table 5.1. AQI Categories

AQI Level of Concern	Who Needs to be Concerned?	What Should I Do?
Good	No one need be concerned.	It's a great day to be active outside.
Moderate	Some people who may be unusually sensitive to particle pollution.	**Unusually sensitive people:** Consider reducing prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to reduce exertion and seek shelter indoors. **Everyone else:** It's a good day to be active outside.
Unhealthy for Sensitive Groups	Sensitive groups include **people with heart or lung disease, older adults, children, and teenagers.**	**Sensitive groups:** *Reduce* prolonged or heavy exertion. It's OK to be outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. **People with asthma** should follow their asthma action plans and keep quick relief medicine nearby. **If you have heart disease:** Symptoms such as palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these, contact your health care provider.
Unhealthy	Everyone	**Sensitive groups:** *Avoid* prolonged or heavy exertion. Move activities indoors or reshedule to a time when air quality is better. **Everyone else:** *Reduce* prolonged or heavy exertion. Take more breaks during all outdoor activities.
Very Unhealthy	Everyone	**Sensitive groups:** *Avoid all* physical activity outdoors. Move activities indoors or reschedule to a time when air quality is better. **Everyone else:** *Avoid* prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.
Hazardous	Everyone	**Everyone:** *Avoid all* physical activity outdoors. **Sensitive groups:** Remain indoors and keep activity levels low. Follow suggestions for keeping particle levels low indoors.

How can I avoid being exposed to unhealthy outdoor air?

There are some simple steps you can take to reduce your exposure to unhealthy outdoor air. If the air quality at your address is above the US EPA health-based reference level, you can protect your health by avoiding outdoor activities and avoiding prolonged and heavy exertion outdoors. Prolonged exertion includes any outdoor activity that you're doing intermittently for several hours that makes you breathe slightly harder than normal. A good example of prolonged exertion is working outdoors in the yard for part of the day. When air quality is unhealthy, you can protect your health by reducing the amount of time spent doing these types of activities. Heavy exertion includes intense outdoor activities that cause you to breathe hard. When air quality is unhealthy, you can protect

your health by reducing the amount of time you spend on this type of activity or by substituting a less intense activity, for example walking instead of jogging. Be sure to reduce your activity level if you experience any unusual coughing, chest discomfort, wheezing, breathing difficulty, or more fatigue than normal. For information on current air quality levels in your state or local area (though not specifically at your address), see https://www.airnow.gov.

To reduce indoor levels of $PM_{2.5}$, you may also want to consider purchasing an indoor particulate filter or using a HEPA filter in your furnace or HVAC system.

What do the units of $PM_{2.5}$ mean?

The level of $PM_{2.5}$ in the air is measured in units of micrograms (μg) of particulate matter per unit volume of air, usually one cubic meter of air. Micrograms are a measure of the amount of material, and one microgram is one-millionth of one gram. So the units of $\mu g/m^3$ correspond to the number of micrograms of very small solid or liquid particles suspended in one cubic meter of air. On average, humans breathe about 11 cubic meters of air every day, though of course some people breath more and some less.

If you have any questions about the information in this document, please use the Contact page at https://www.envha.com.