PM2.5 National Ambient Air Quality Standard Health Exceedances on November 8, 2020

Exceedance Locations and Levels

On Sunday, November 8, 2020, there were no exceedances in New Jersey of the National Ambient Air Quality Standard (NAAQS) for PM2.5 (24-hour average of 35 micrograms/cubic meter, ug/m3). See Table 1.

Table 1. New Jersey PM2.5 Concentrations on November 8, 2020

STATION	24-Hour Average (ug/m3)
Brigantine	14.3
Camden Spruce St	25.1
Columbia WMA	No Data
Elizabeth Lab	29.5
Flemington	22.8
Fort Lee Near Road	No Data
Jersey City Firehouse	22.5
Millville	20.2
Newark Firehouse	31.7
Rahway	28.3
Rider University	20.8
Rutgers University	29.8
Toms River	20.3
TOTAL EXCEEDANCES	0

From the out-of-state stations adjacent to New Jersey, there were four (4) exceedances of the PM2.5 NAAQS. See Table 2.

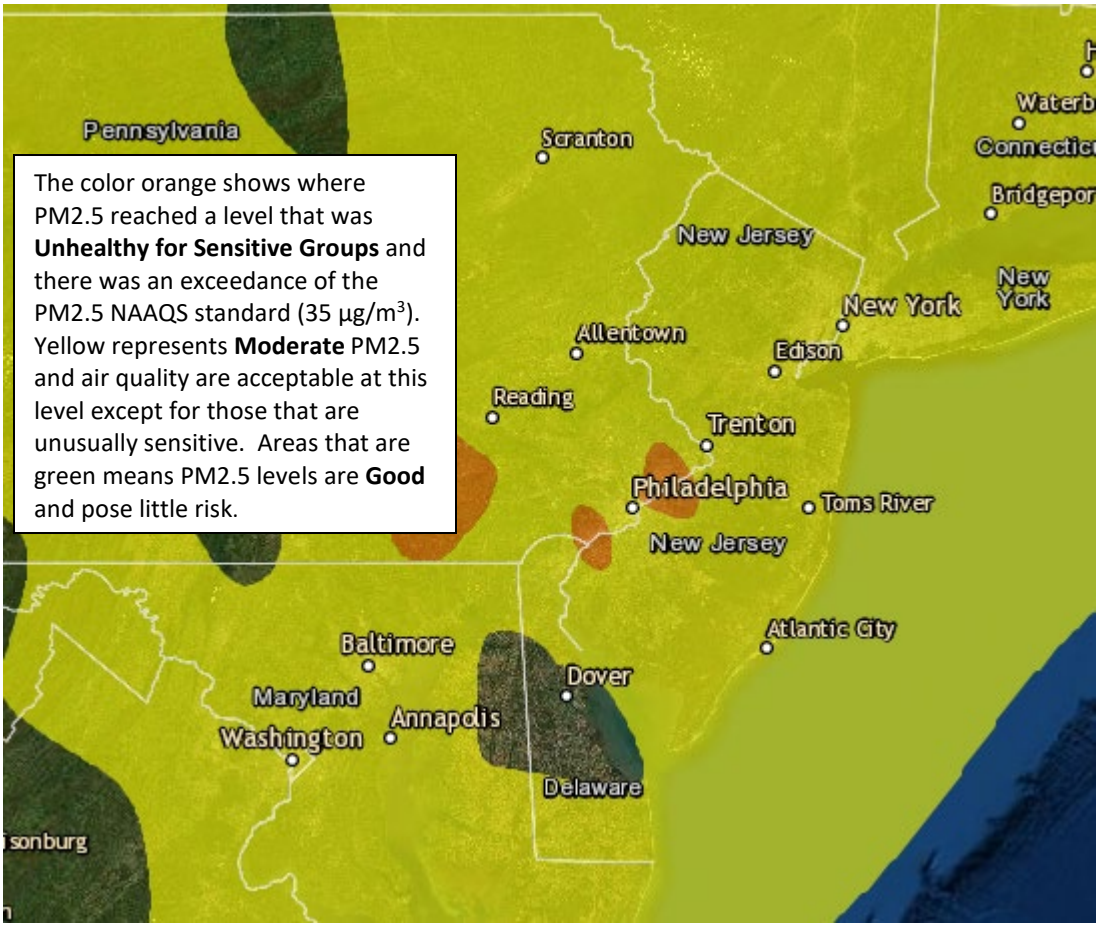
Table 2. PM2.5 Concentrations at Out-of-State Monitoring Stations Adjacent to New Jersey on November 8, 2020

STATE	STATION	24-Hour Average (ug/m3)
CT	Bridgeport	28.8
CT	Danbury	28.5
CT	New Haven - Criscuolo Park	33.3
CT	Waterbury	22.2
DE	KILLENS (Kent Co.)	5.6
DE	LUMS 2 (New Castle Co.)	18.0
DE	MLK (New Castle Co.)	31.0
DE	Rte 9 Del City	17.9

DE	SEAFORD (Sussex Co.)	17.0
MD	Fair Hill	13.4
NY	Bklyn - PS274	22.3
NY	CCNY	No Data
NY	Division Street	No Data
NY	Eisenhower Park	21.4
NY	Fresh Kills	21.4
NY	Holtsville	21.3
NY	Manhattan/IS143	23.2
NY	Maspeth	No Data
NY	Queens Near-road	24.5
NY	Queens	22.2
NY	White Plains	16.4
PA	Allentown	28.3
PA	Chester	36.9
PA	Freemansburg	34.6
PA	Marcus Hook	36.0
PA	New Garden	17.1
PA	Norristown	34.8
PA	FAB	No Data
PA	MON	21.1
PA	NEW	37.2
PA	RIT	29.3
PA	TOR	38.0
	TOTAL EXCEEDANCES	4

Figure 1 shows the widespread nature of this event with moderate PM2.5 levels noted in yellow throughout the region. Locally, the highest PM2.5 levels were noted over southeastern portions of Pennsylvania, reaching the Unhealthy for Sensitive Groups category (noted in orange) in the greater Philadelphia metropolitan area.

Figure 1. PM2.5 Air Quality Index for November 8, 2020



Source: www.airnow.gov

For PM2.5 terminology definitions see NJDEP Air Quality Planning's Glossary and Acronyms webpage: http://nj.gov/dep/baqp/glossary.html

Weather

A large high-pressure system was settled over the Mid-Atlantic region for a third day and was the dominant weather feature for New Jersey and adjacent states on Sunday November 8, 2020. Favorable weather conditions for elevated PM2.5 levels were observed, including unseasonably warm temperatures and calm winds at the surface and aloft. In addition, a strong surface inversion was observed on this day. A surface inversion can be defined as a reversal of normal temperature behavior in the troposphere. Instead of temperatures decreasing with height, temperatures increase with height and limit mixing in the atmosphere. These conditions allowed for emissions to accumulate near the surface, leading to a regional increase in PM2.5 levels and in turn, multiple NAAQS exceedances in southeastern Pennsylvania.

Where Did the Air Pollution that Caused an Exceedance in PM2.5 Come From?

High pressure anchored over the Mid-Atlantic region and corresponding strong surface inversion allowed for a regional increase of fine particulate (PM2.5) levels on November 8th. Given limited mixing heights for a third day in a row, emissions from cars, trucks, and industry, as well as from potential seasonal burnings, were able to accumulate close to the surface, leading to multiple NAAQS PM2.5 exceedances in portions of southeastern Pennsylvania. States adjacent to New Jersey still allow for the open burning of vegetation while New Jersey bans this practice and encourages composting and reuse of these materials.

High PM2.5 events are typically associated with a very stable atmosphere and low mixing heights. The planetary boundary layer (PBL) can be considered the lowest part of the troposphere where atmospheric mixing occurs and is known to change along with the weather pattern. Under the influence of strong high pressure on November 8th, relatively low mixing heights were observed, trapping PM2.5 toward the surface, enhancing levels. Figure 2 shows the PBL heights over the region on the morning of November 8th. As shown in the figure, low mixing heights between 200-400 m above ground level (AGL) were observed throughout the northeast on this day.

Figure 2. Regional Planetary Boundary Layer Height on November 8th (mAGL)

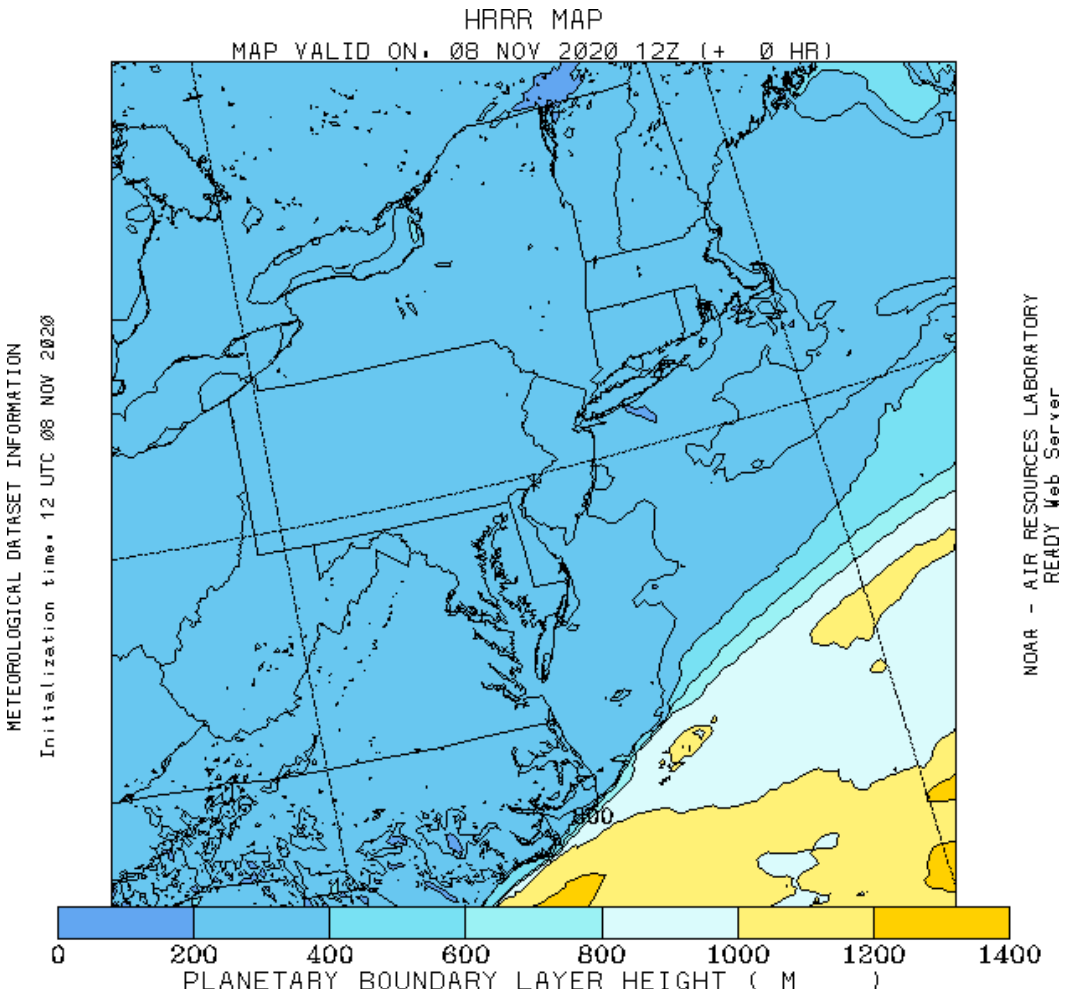


Figure 3 below shows surface level back trajectories for the monitored exceedances on November 8, 2020. This figure illustrates where surface winds came from during the 48 hours preceding the high PM2.5 event. With the low mixing heights and limited vertical mixing on this day, surface wind back trajectories will help provide the best visual of PM2.5 transport. Four (4) monitoring stations in the region with 24-hr PM2.5 NAAQS exceedances were used to run back trajectories. The selected sites and the 24-hr average PM2.5 level recorded are listed in Table 3 below:

Table 3. Monitoring Stations in New Jersey and Adjacent States with a 24-hr PM2.5 NAAQS Exceedance that were Selected to Run 48-hr Back Trajectories

STATE	STATION	24-Hour Average ($\mu g/m^3$)
PA	Chester	36.9
PA	Marcus Hook	36.0
PA	NEW	37.2
PA	TOR	38.0

Backward trajectories from Sunday, November 8th show localized transport at the surface from the industrialized areas of Pennsylvania where Unhealthy for Sensitive Groups PM2.5 levels were recorded on the day preceding this high PM2.5 event.

Low level (10 m) back trajectories followed similar transport pathways during the 48 hours of transport preceding this event (Figure 3). Originating in northern portions of West Virginia, trajectories at the surface traveled in a gentle northeasterly direction, through the city of Pittsburgh and its surrounding suburbs. The trajectories also traveled through industrialized portions of central Pennsylvania before making a sharp turn southward, traveling through portions of southcentral Pennsylvania. This portion of Pennsylvania includes the cities of Harrisburg and Lancaster, where Unhealthy for Sensitive Groups air quality was recorded in the days preceding the high PM2.5 event. At this time, air traveling at ground level likely picked up emissions from cars, trucks, and industrial facilities. In addition to these sources, air traveling along the ground may have also picked up emissions from wood-, coal-, and oil-burning equipment, which are all common sources of PM2.5. Surface trajectories continued to travel in a general easterly direction through southeastern Pennsylvania including the Philadelphia metropolitan center and its surrounding suburbs. All trajectories at the surface traveled a very short distance over the 48 hours allowing particle levels to accumulate along their path.

Figure 4 shows national PM2.5 concentrations observed on November 7, 2020, the day prior to this high PM2.5 event. As shown in the figure, widespread moderate, and isolated USG air quality were observed throughout much of the eastern United States. This widespread plume of elevated PM2.5 concentrations extended from North Carolina to Maine and into portions of the Mid-West including Wisconsin and Illinois. In addition, the trajectories suggest that transport from western and central Pennsylvania in combination with favorable weather conditions mentioned above enhanced levels of PM2.5 leading to a widespread regional event.

Figure 3. 48-hour Back Trajectories for November 8, 2020 at 10 meters

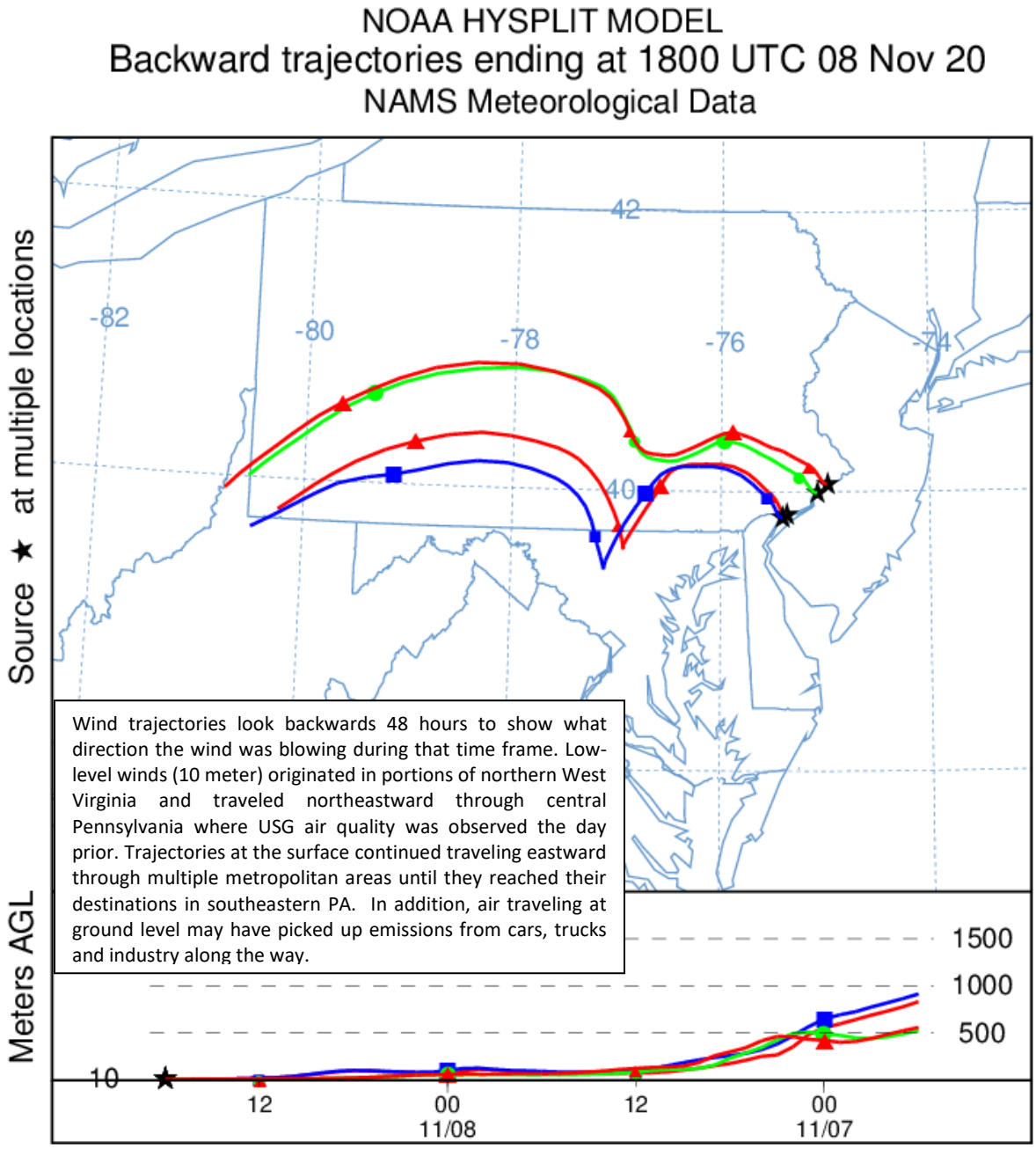
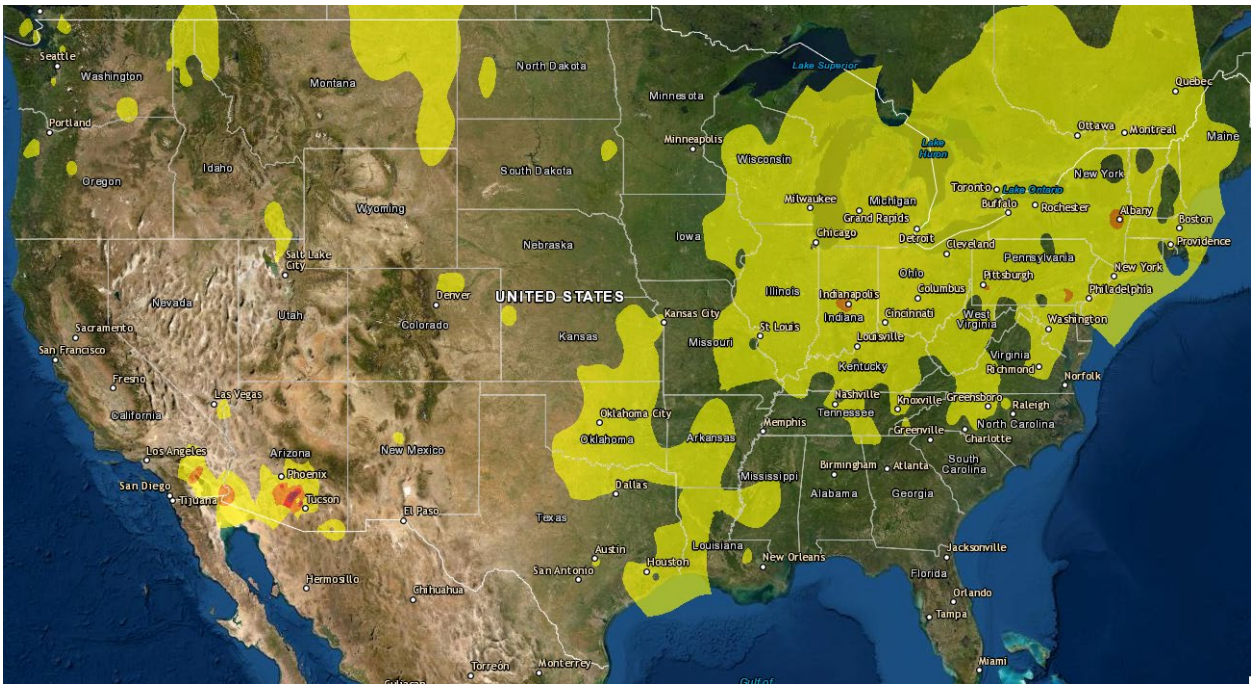


Figure 4. National PM2.5 Air Quality Index for November 7, 2020



Find Out About Air Quality Every Day

The "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ tells you how to sign up to receive notifications and find out when your local air has reached unhealthy ozone levels.