Ozone National Ambient Air Quality Standard Health Exceedances on July 29, 2019

Exceedance Locations and Levels

On Monday, July 29, 2019, there was one (1) exceedance in New Jersey of the National Ambient Air Quality Standard (NAAQS) for ozone (daily maximum 8-hour average of 70 ppb). See Table 1.

Table 1. New Jersey Ozone Concentrations on 7/29/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	61
Bayonne	57
Brigantine	50
Camden Spruce St	64
Chester	62
Clarksboro	68
Colliers Mills	74
Columbia	53
Flemington	64
Leonia	67
Millville	61
Monmouth University	62
Newark Firehouse	64
Ramapo	56
Rider University	64
Rutgers University	64
Washington Crossing*	65
TOTAL EXCEEDANCES	1

*The Washington Crossing station is operated and maintained by EPA as part of the nationwide Clear Air Status and Trends Network (CASTNET).

From the out-of-state stations within New Jersey's ozone non-attainment areas, there were nine (9) exceedances of the ozone NAAQS. See Table 2.

Table 2. Ozone Concentrations at Out-of-State Monitoring Stations in New Jersey's Ozone Non-Attainment Areas on 7/29/2019

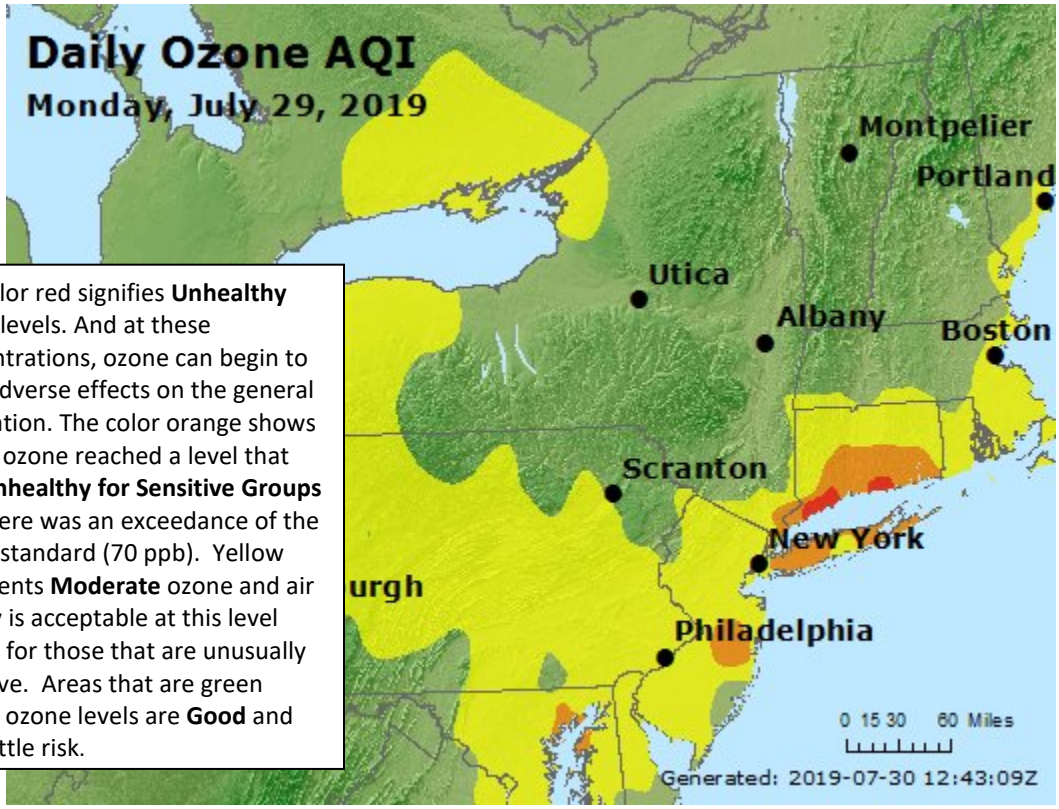
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	64
CT	Greenwich	84
CT	Madison-Beach Road	86
CT	Middletown-CVH-Shed	82
CT	New Haven	83
CT	Stratford	87
CT	Westport	88
DE	BCSP (New Castle Co.)	55
DE	BELLFNT2 (New Castle Co.)	62
DE	KILLENS (Kent Co.)	58
DE	LEWES (Sussex Co.)	49
DE	LUMS 2 (New Castle Co.)	67
DE	MLK (New Castle Co.)	63
DE	SEAFORD (Sussex Co.)	53
MD	Fair Hill	64
NY	Babylon	71
NY	Bronx - IS52	69
NY	CCNY	65
NY	Fresh Kills	60
NY	Holtsville	67
NY	Pfizer Lab	68
NY	Queens	71
NY	Riverhead	71
NY	Rockland Cty	No Data
NY	White Plains	70
PA	BRIS (Bucks Co.)	65
PA	CHES (Delaware Co.)	63
PA	NEWG (Chester Co.)	61
PA	NORR (Montgomery Co.)	61
PA	LAB (Philadelphia Co.)	60
PA	NEA (Philadelphia Co.)	63
PA	NEW (Philadelphia Co.)	64
	TOTAL EXCEEDANCES	9

The number of days in 2019 on which exceedances of the ozone NAAQS were recorded for all the states within New Jersey's ozone non-attainment areas is summarized in Table 3.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Non-Attainment Areas in 2019

STATE	# of Days NAAQS was Exceeded January 1 – July 29, 2019 NAAQS = 70 ppb
Connecticut	14
Delaware	3
Maryland	2
New Jersey	11
New York	9
Pennsylvania	6

Figure 1. Ozone Air Quality Index for July 29, 2019



The color red signifies **Unhealthy** ozone levels. And at these concentrations, ozone can begin to have adverse effects on the general population. The color orange shows where ozone reached a level that was **Unhealthy for Sensitive Groups** and there was an exceedance of the ozone standard (70 ppb). Yellow represents **Moderate** ozone and air quality is acceptable at this level except for those that are unusually sensitive. Areas that are green means ozone levels are **Good** and pose little risk.

Source: www.airnow.gov

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

Weather

On Monday July 29, 2019, a strong swath of persistent high pressure remained over the eastern half of the United States, resulting in a continued period of sunny skies, hot temperatures, and light southwesterly winds. These favorable meteorological conditions along with a heavily polluted air mass from days prior resulted in several exceedances of the 8-hour average NAAQS for ozone in southern New Jersey, New York City, Long Island, New York, and the majority of Connecticut.

Early on Monday, a strong high-pressure center remained over the northern Appalachian Mountains bringing in west-southwest winds and clear skies to the region. This allowed temperatures to climb into the low to mid 90's for the majority of New Jersey and New York City, with mid to upper 80's in Long Island and Connecticut. A surface trough developed along the I-95 corridor and lingered throughout much of the morning into early afternoon, which allowed polluted upper level air to mix down to the surface. By early afternoon, high pressure began to push east off the Mid-Atlantic coast, resulting in a southwesterly wind shift. However, fair-weather cumulus clouds began to develop throughout much of the area, as well as a sea breeze front along the coastal regions of New Jersey, Long Island, and Connecticut. In New Jersey, the onshore flow from the sea breeze front met with the southwesterly winds further inland, causing pollutants to converge in southern portions of the state. In Long Island and Connecticut, a strong southerly flow from the enhanced sea breeze effect kept cumulus clouds from developing along the coast, allowing for the continued production of ozone well into the late afternoon and early evening.

Based on this weather analysis, the exceedance episode can be attributed to multiple days of moderate and scattered unhealthy for sensitive groups (USG) ozone levels throughout the non-attainment area in combination with widespread southwesterly transport and a surface trough along the I-95 corridor. This resulted in several ground level ozone exceedances well into the USG category with a few areas reaching the unhealthy category in coastal Connecticut.

Where Did the Air Pollution that Caused Ozone Come From?

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedance on July 29, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Nine (9) monitoring stations with an 8-hour average ozone exceedance was used to run back trajectories. The selected site and 8-hour average ozone levels recorded are listed in Table 4 below.

Table 4. Monitoring Stations with an 8-hr Ozone Exceedance that Were Selected to Run 48-hr Back Trajectories

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Greenwich	84
CT	Madison-Beach Road	86
CT	Middletown-CVH-Shed	82
CT	Stratford	87
CT	New Haven	83
CT	Westport	88

NJ	Colliers Mills	74
NY	Babylon	71
NY	Queens	71
NY	Riverhead	71

Backward trajectories from July 29th show that air was influenced by a high-pressure system located in the Southeastern United States. This high-pressure system provided transport from the Ohio River Valley with winds generally from the westerly direction picking up emissions from industry and peak demand electric generating units (EGUs) along the way. Transport of air pollutants from industry operating to the west, in combination with favorable weather conditions mentioned above, led to ten exceedances in the nonattainment area.

Surface level back trajectories (Figure 2) had different transport pathways. Surface trajectories traveling to New York City and Connecticut originated in West Virginia before crossing through southeastern Pennsylvania. At this time, trajectories traveled through the cities of Harrisburg, Lancaster, Reading and New York City picking up emissions from cars, trucks, local industry and EGUs along the way. Meanwhile, trajectories traveling to New Jersey, Long Island, and central Connecticut originated in the Chesapeake Bay and coastal Virginia. Some surface trajectories traveled northeastward, passing over the Chesapeake Bay, Washington, DC, and Baltimore. These trajectories continued northeastward, passing over Long Island and the Sound. At the surface, trajectories originated at higher levels of the atmosphere and were mixed down to the surface via a developing surface trough.

Mid and upper level trajectories (Figure 3 & 4) followed similar transport pathways. Trajectories originated in the Mid-West and traversed the Ohio River Valley following the periphery of the high-pressure system. This region is recognized for its heavily industrialized cities where widespread moderate air quality was observed in the days leading up to this high ozone event. Air at higher levels then passed over Pittsburg, central Pennsylvania, and Scranton, picking up emissions from local industry and power plants. Before reaching their endpoints, air at the mid and upper levels passed through the New York City Metropolitan area, picking up additional emissions from cars, trucks, industry and power plants. The mid and upper level trajectories for the exceedance location at Colliers Mills, New Jersey passed over southern Pennsylvania and the metropolitan Philadelphia area.

Figure 5 shows the national Air Quality Index observed on July 28th, the day prior to this exceedance episode. As shown in the figure, widespread locations of moderate air quality were observed throughout the Ohio River Valley with a few isolated areas reaching the unhealthy for sensitive groups (USG) category. Back trajectories for July 29th suggest that previously polluted air was transported into the non-attainment area at all levels of the atmosphere. In addition, dilute smoke was noted over the Great Lakes, Ohio River Valley, and the non-attainment area for a second day, and may have enhanced ozone production across the region. Localized transport of industrial emissions, favorable meteorological conditions, and deteriorated air quality from days prior led to multiple exceedances in the non-attainment area.

Figure 2. 48-hour Back Trajectories for July 29, 2019 at 10 meters

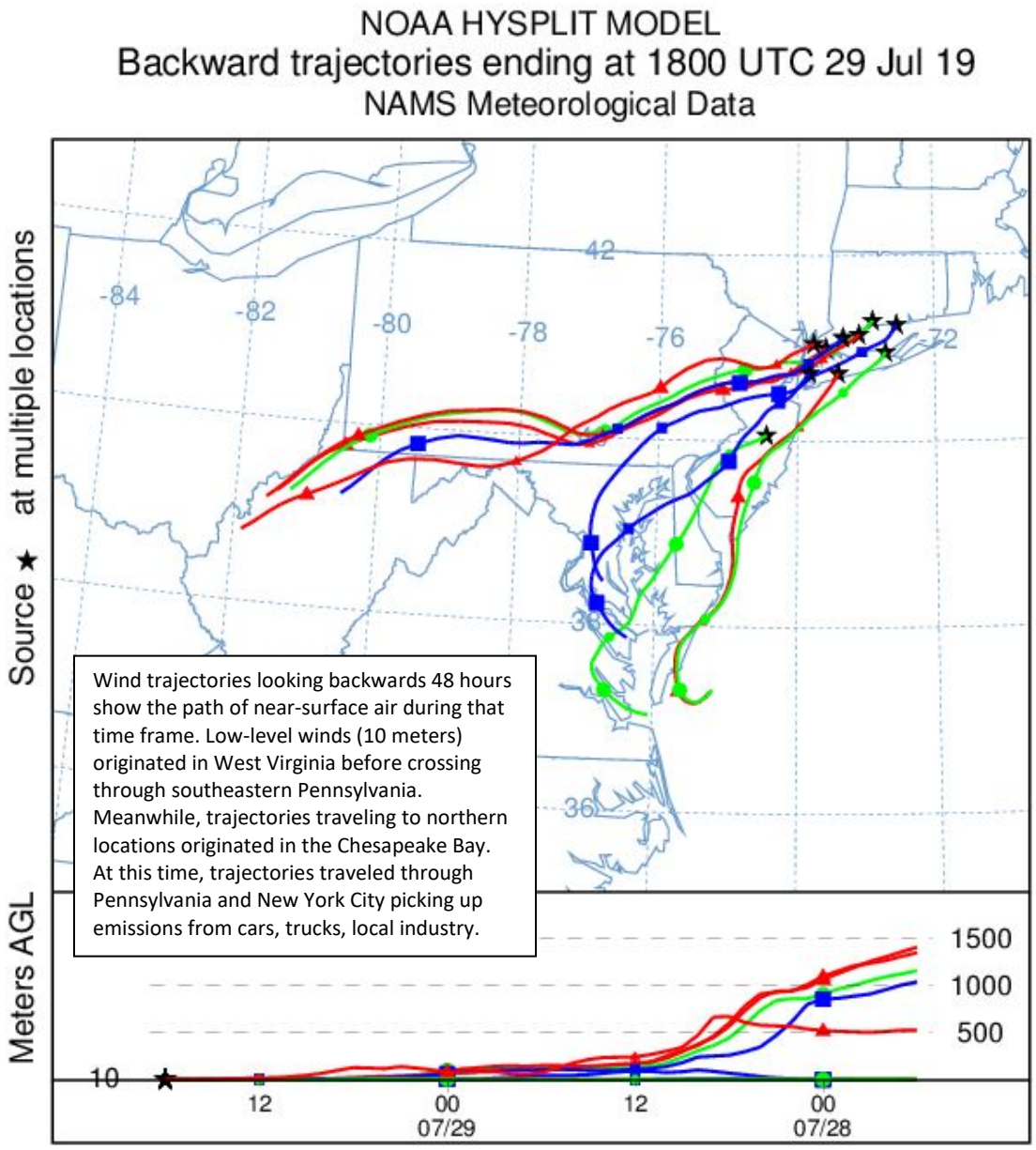


Figure 3. 48-hour Back Trajectories for July 29, 2019 at 500 meters

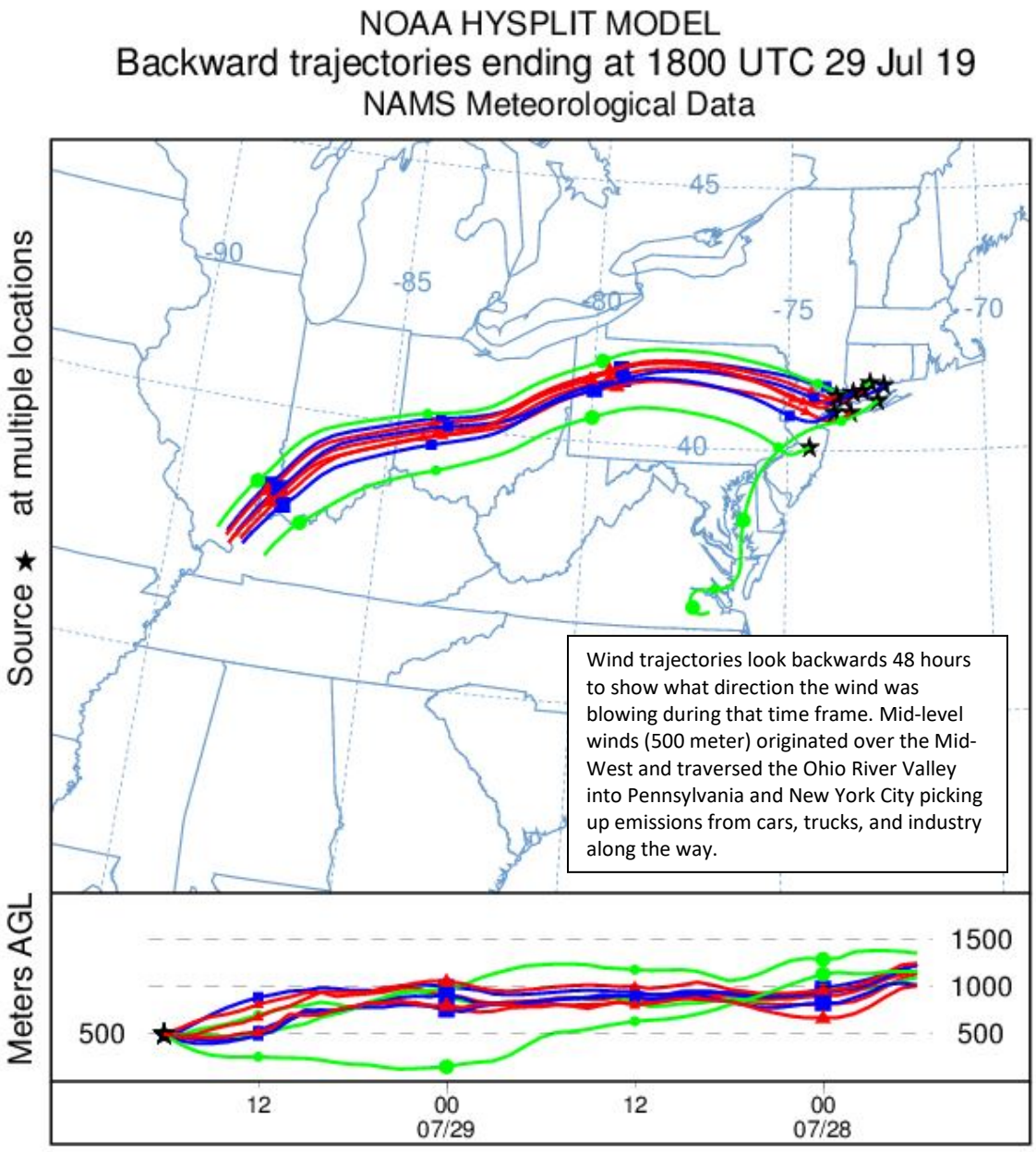


Figure 4. 48-hour Back Trajectories for July 29, 2019 at 1500 meters

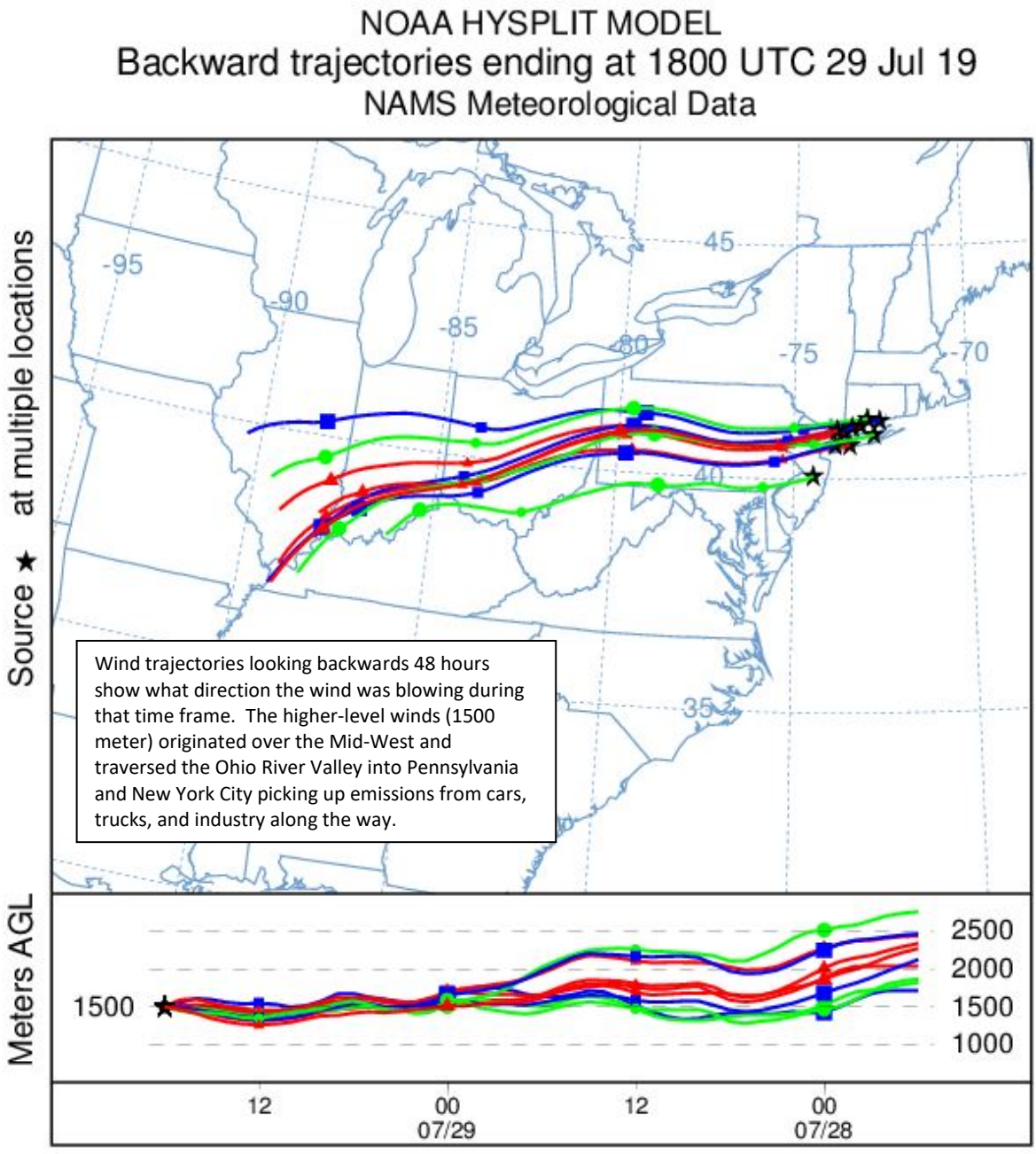
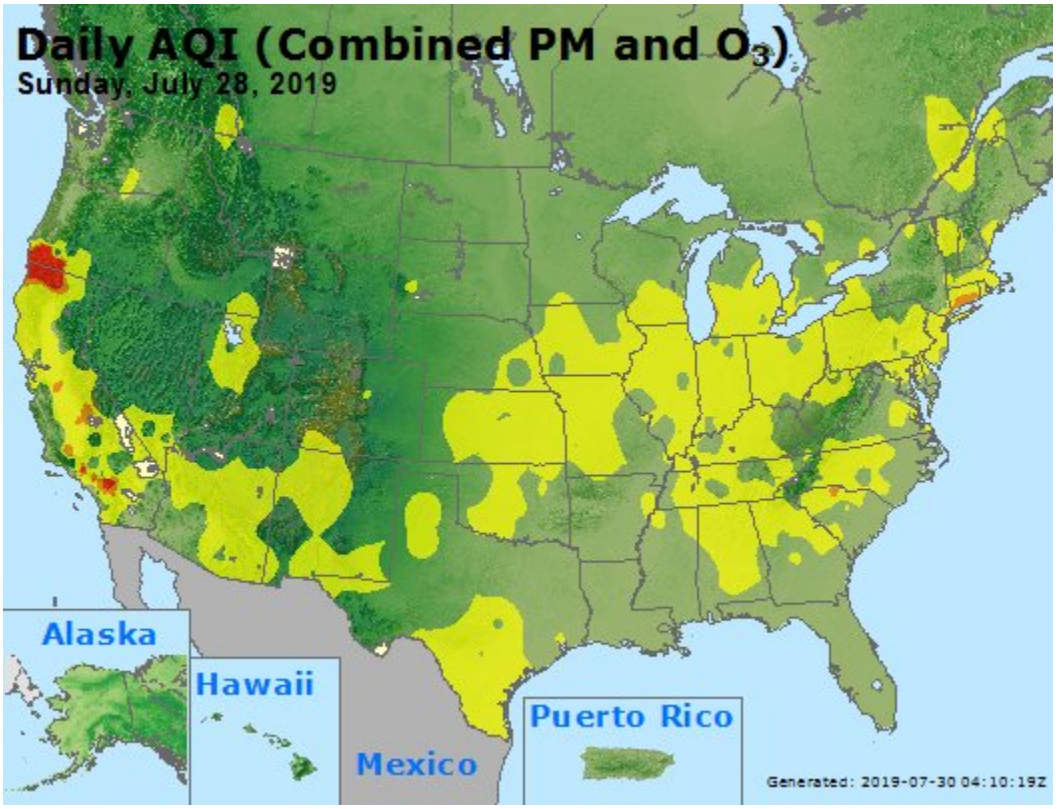


Figure 5. Combined Air Quality Index for the United States on July 28, 2019



Source: www.airnow.gov

How is Ozone Created?

Ground-level ozone is an air pollutant known to cause a number of health effects and negatively impact air quality and the environment in New Jersey. Ozone is formed when oxides of nitrogen (NOx) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone can irritate any person's lungs, but the effect may be more pronounced for those with existing lung-related deficiencies, and therefore, one should take extra precautions on bad ozone days.

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.