Ozone National Ambient Air Quality Standard Health Exceedances on July 21, 2020

Exceedance Locations and Levels

On Tuesday, July 21, 2020, 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 7/21/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	56
Bayonne	55
Brigantine	44
Camden Spruce St	66
Chester	54
Clarksboro	71
Colliers Mills	52
Columbia	45
Flemington	51
Leonia	56
Millville	54
Monmouth University	48
Newark Firehouse	56
Ramapo	43
Rider University	61
Rutgers University	58
Washington Crossing*	53
TOTAL EXCEEDANCES	1

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

From the out-of-state stations within New Jersey's ozone non-attainment areas, there were four (4) 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 7/21/2020

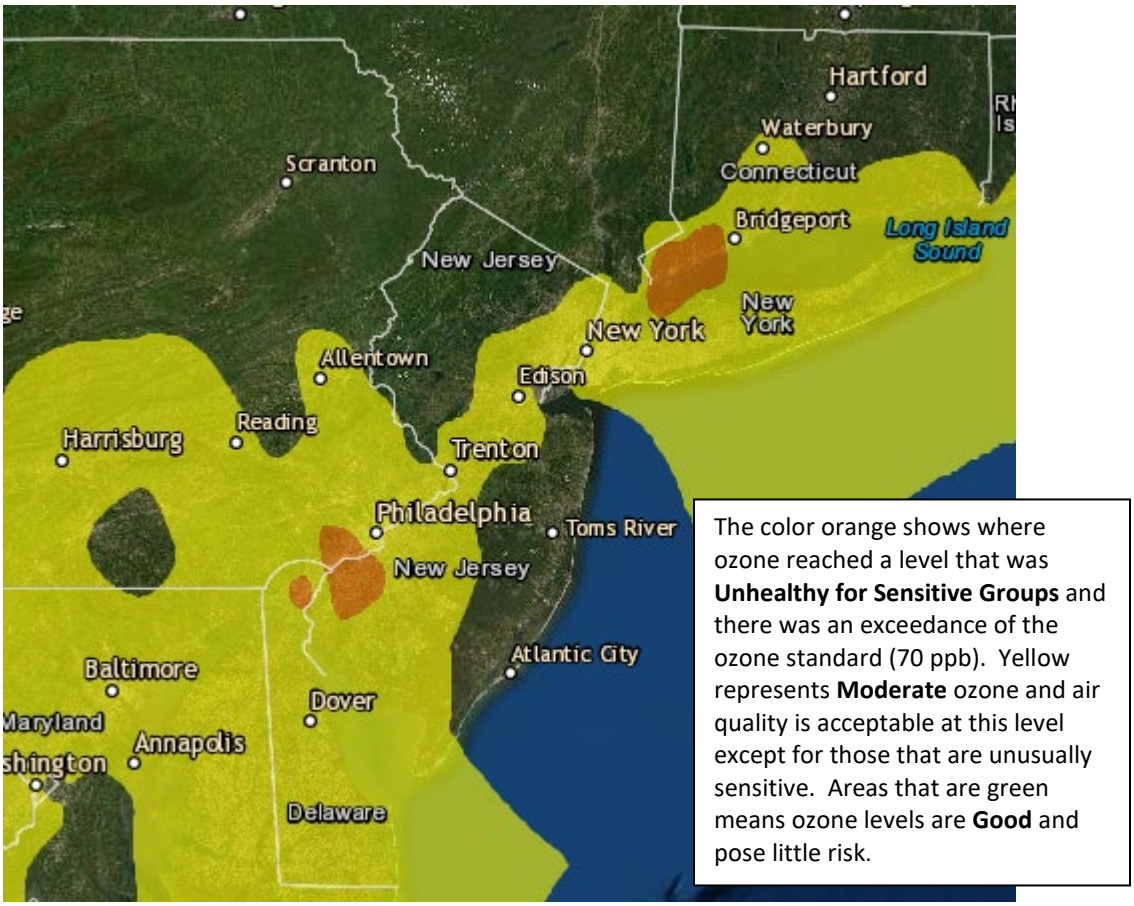
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	46
CT	Greenwich	77
CT	Madison-Beach Road	66
CT	Middletown-CVH-Shed	51
CT	New Haven	65
CT	Stratford	65
CT	Westport	72
DE	BCSP (New Castle Co.)	59
DE	BELLFNT2 (New Castle Co.)	67
DE	KILLENS (Kent Co.)	59
DE	LEWES (Sussex Co.)	66
DE	LUMS 2 (New Castle Co.)	62
DE	MLK (New Castle Co.)	72
DE	SEAFORD (Sussex Co.)	57
MD	Fair Hill	69
NY	Babylon	55
NY	Bronx - IS52	58
NY	CCNY	64
NY	Fresh Kills	53
NY	Holtsville	54
NY	Pfizer Lab	62
NY	Queens	58
NY	Riverhead	54
NY	Rockland Cty	41
NY	White Plains	50
PA	BRIS (Bucks Co.)	63
PA	CHES (Delaware Co.)	79
PA	NEWG (Chester Co.)	57
PA	NORR (Montgomery Co.)	61
PA	LAB (Philadelphia Co.)	62
PA	NEA (Philadelphia Co.)	65
PA	NEW (Philadelphia Co.)	66
	TOTAL EXCEEDANCES	4

The number of days in 2020 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 2020

STATE	# of Days NAAQS was Exceeded January 1 – July 21, 2020 NAAQS = 70 ppb
Connecticut	6
Delaware	1
Maryland	0
New Jersey	3
New York	3
Pennsylvania	2

Figure 1. Ozone Air Quality Index for July 21, 2020



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

A complex frontal pattern over the northeastern United States influenced weather conditions in the non-attainment area on Tuesday, July 21, 2020. Sunny skies, hot temperatures, and varying winds associated with localized weather features allowed for widespread moderate levels of ozone throughout the region with levels reaching the unhealthy for sensitive groups category (USG) along portions of the Connecticut coastline as well as in the Philadelphia metropolitan area.

A weak cold front remained stalled south of the non-attainment area, over the Mid-Atlantic region, on July 21st, while a secondary front, draped from the Great Lakes region, across New York into New England, similarly moved little throughout the day. This complex atmospheric setup kept the non-attainment area situated between these two frontal systems. Sunny skies, and temperatures near 90 degrees were observed throughout the non-attainment area while wind directions differed slightly across the region.

Along the Connecticut coastline, southerly winds were observed which can be attributed to a seabreeze that developed during the afternoon hours. This seabreeze allowed any pollutants or elevated levels of ozone that had been building up over the NYC metropolitan area and the Long Island Sound to be pushed inland, increasing ozone levels in this region. Meanwhile, a second seabreeze was observed over New Jersey. This seabreeze front pushed west throughout the afternoon and evening hours toward the Delaware River. Locations east of the seabreeze experienced winds with a cleaner easterly component while locations west, including the Philadelphia metropolitan area, observed more of a westerly flow in the afternoon hours. These light westerly winds allowed for the localized transport of air from locations that experienced moderate levels of ozone the days prior to this event. Additionally, a surface trough developed over this region late in the day, triggering evening thunderstorms. These thunderstorms caused vertical mixing in the atmosphere, allowing any ozone aloft to be mixed toward the surface potentially enhancing already rising levels of ozone.

The ozone exceedances noted along the Connecticut coastline and in the Philadelphia metropolitan area can be attributed to favorable weather conditions for ozone formation as well as localized transport that was enhanced by various small scale weather features.

Where Did the Air Pollution that Caused Ozone Come From?

Please note, this exceedance is occurring while COVID-19 restrictions in New Jersey are in place, which have impacted transportation, business operations and energy use. As more data becomes available, the Department may have a better characterization of the conditions that influenced elevated ozone pollution levels in 2020.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on July 21, 2020. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. Four monitoring stations were chosen to run back trajectories and 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	77
CT	Westport	72
NJ	Clarksboro	71
DE	MLK	72
PA	Chester	79

Back trajectories from July 21st show that the exceedances observed across the nonattainment area were heavily influenced by the transport of local emissions from the Philadelphia and New York City metropolitan centers. The favorable meteorological conditions mentioned above along with transport of ozone precursors from the Ohio River Valley resulted in exceedances of the 8-hr average Ozone NAAQS.

Surface-level back trajectories (Figure 2) show that air at the surface originated in various states in the Mid-West. Initially, surface trajectories traveled at a moderate pace through the heavily industrialized Ohio River Valley picking up emissions from local industry along the way. Trajectories entering the northern nonattainment area traveled through southern New York State before making at turn southeastward through the Lower Hudson Valley and the New York City metropolitan center. Here, trajectories slowed to a crawl picking up emissions from cars, trucks, and industry. Essentially, these trajectories remained in the same location for the final 6 hours of their path, ultimately reaching their endpoint just outside New York City in Connecticut. Meanwhile, trajectories traveling to the southern nonattainment area traversed central Pennsylvania and the Philadelphia suburbs where moderate air quality was observed the previous day. Similar to northern trajectories, southern trajectories slowed to a crawl over Philadelphia before eventually reaching their endpoints.

Mid-level back trajectories (Figure 3) originated over the Great Lakes region and traveled in a southeasterly direction through Michigan, southern Ontario, and New York State. Trajectories traveling into Connecticut made a turn southward into the New York City metropolitan center where they remained for the final hours of their path, picking up locally generated and residual emissions from the previous day. At this time, trajectories remained stalled just outside New York City before reaching their endpoints in southern Connecticut. Trajectories traveling into the southern nonattainment area also made a turn southward down the I-95 corridor and stalled over Philadelphia before gradually dispersing to nearby locations at the monitored exceedance locations.

Upper-level back trajectories (Figure 4) originated in the Mid-West and traveled in a westerly direction through the Ohio River Valley. Both sets of trajectories passed through Pennsylvania where moderate air quality was observed the previous day. Here, southern trajectories passed through Philadelphia while northern trajectories passed through New York City before reaching their endpoints.

Figure 5 shows the National Air Quality Index observed on July 20th, the day prior to the high ozone event. As shown in the figure, moderate and USG air quality were observed within the nonattainment area on this day indicating that a buildup of pollutants from previous days and weak circulation in urban locations allowed ozone levels to reach the USG category in isolated locations on July 21st.

Figure 2. 48-hour Back Trajectories for July 21, 2020 at 10 meters

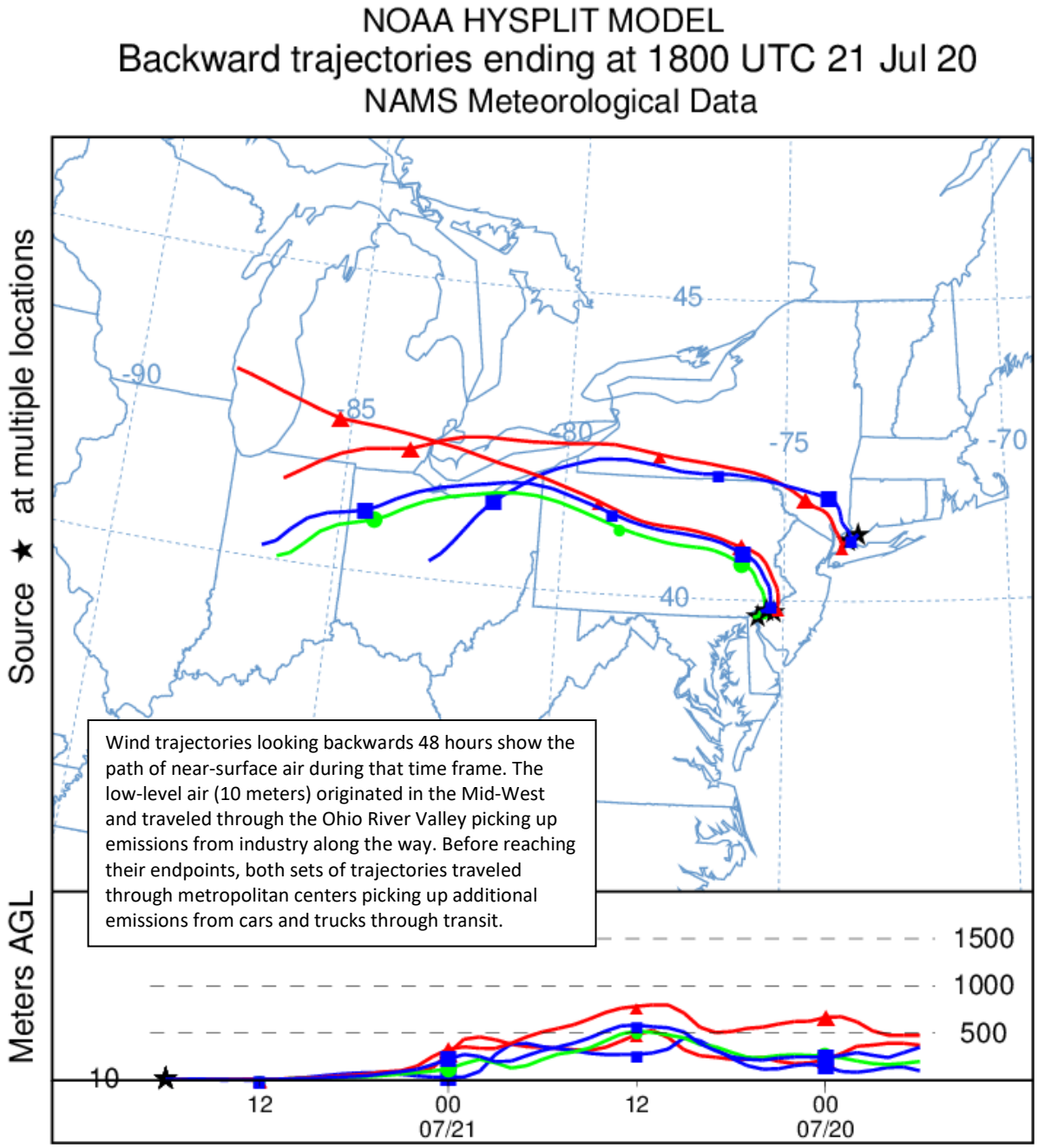


Figure 3. 48-hour Back Trajectories for July 21, 2020 at 500 meters

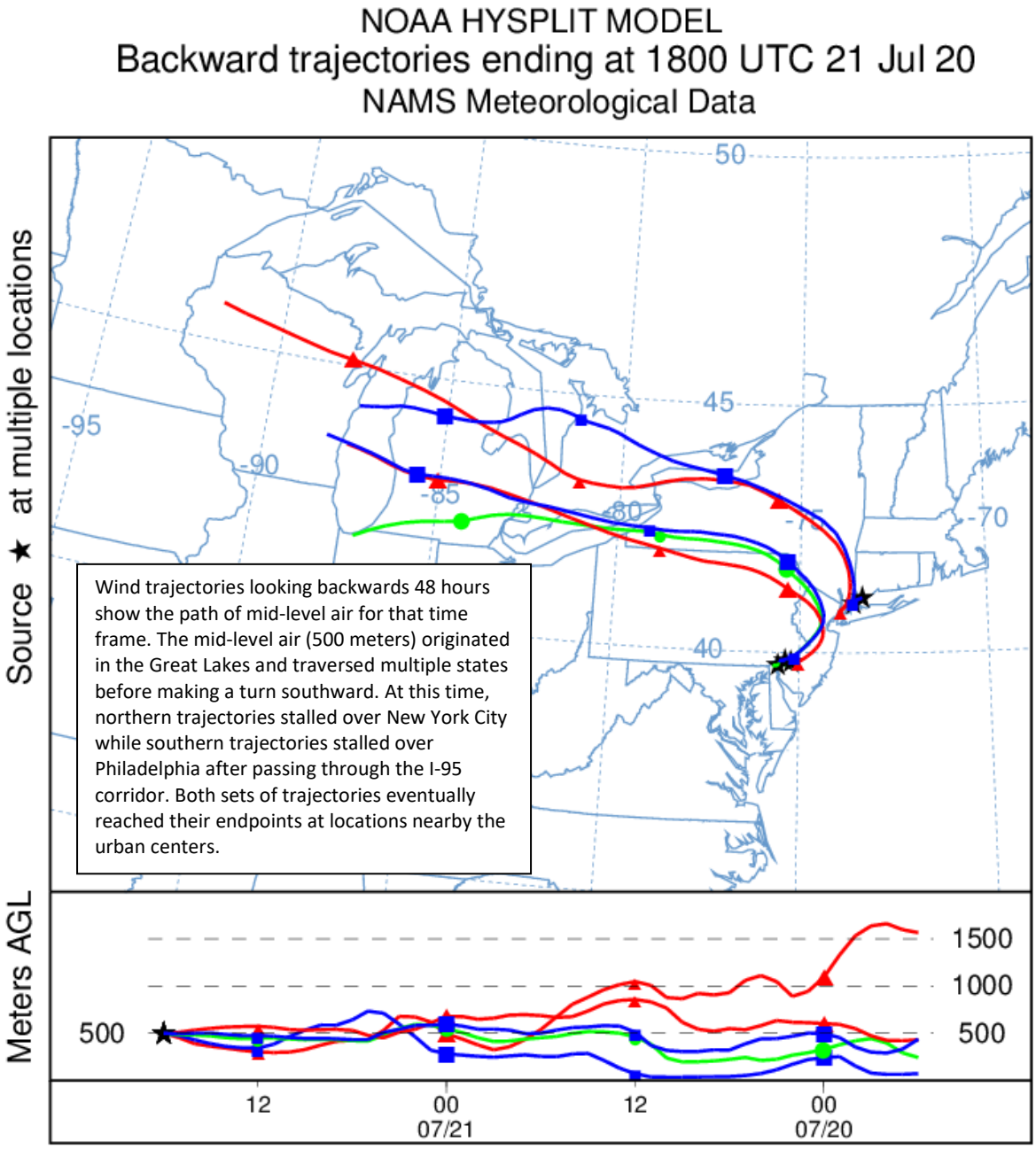


Figure 4. 48-hour Back Trajectories for July 20, 2020 at 1500 meters

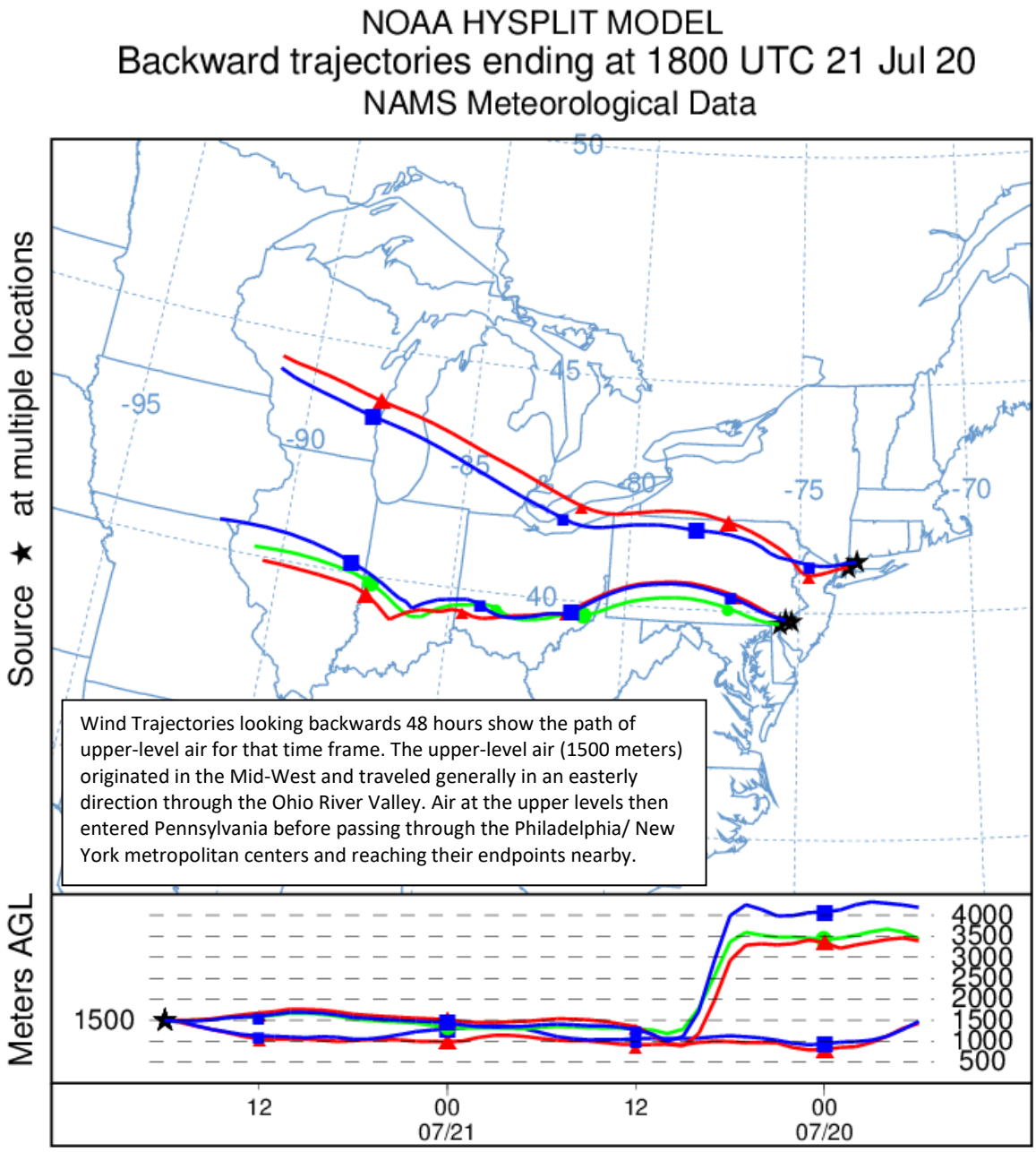
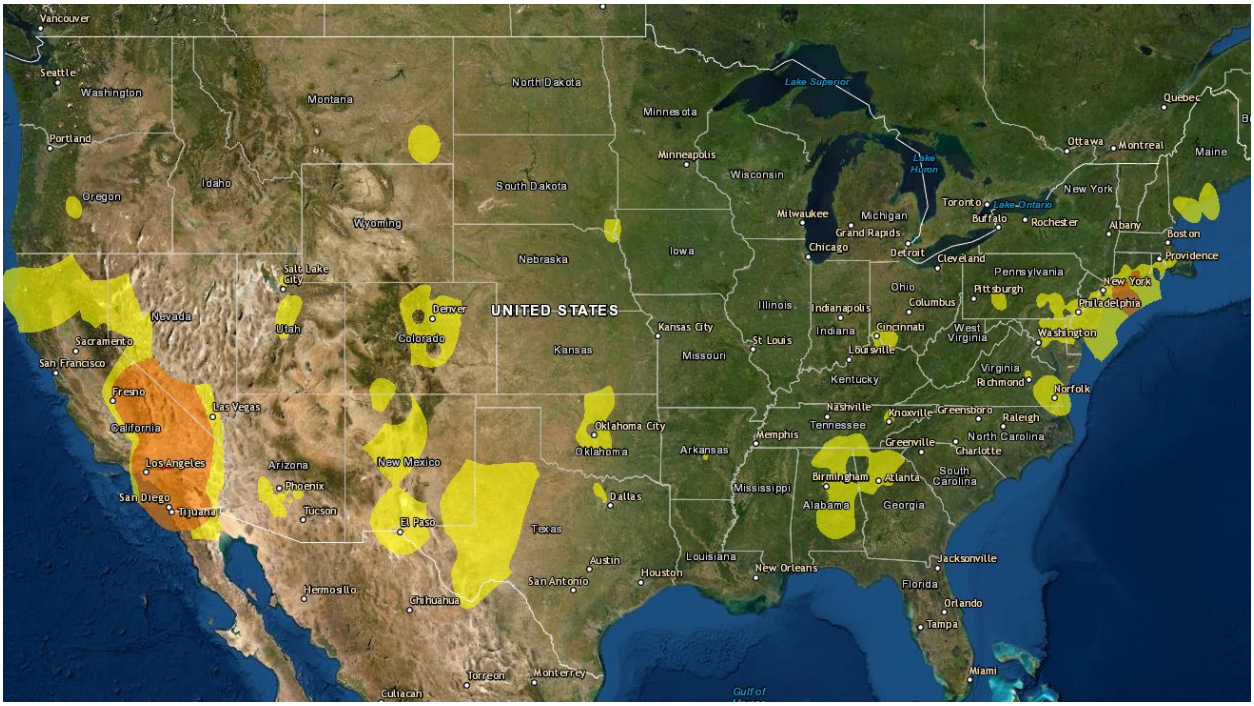


Figure 5. Combined Air Quality Index for the United States on July 20, 2020



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

Learn more about your local ozone air quality forecast by visiting the "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ .