Ozone National Ambient Air Quality Standard Health Exceedances on July 20, 2019

Exceedance Locations and Levels

On Saturday, July 20, 2019, there were no exceedances 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 7/20/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	59
Bayonne	46
Brigantine	45
Camden Spruce St	62
Chester	46
Clarksboro	56
Colliers Mills	59
Columbia	No Data
Flemington	52
Leonia	54
Millville	54
Monmouth University	No Data
Newark Firehouse	50
Ramapo	44
Rider University	51
Rutgers University	49
Washington Crossing*	53
TOTAL EXCEEDANCES	0

*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 was one (1) 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 7/20/2019

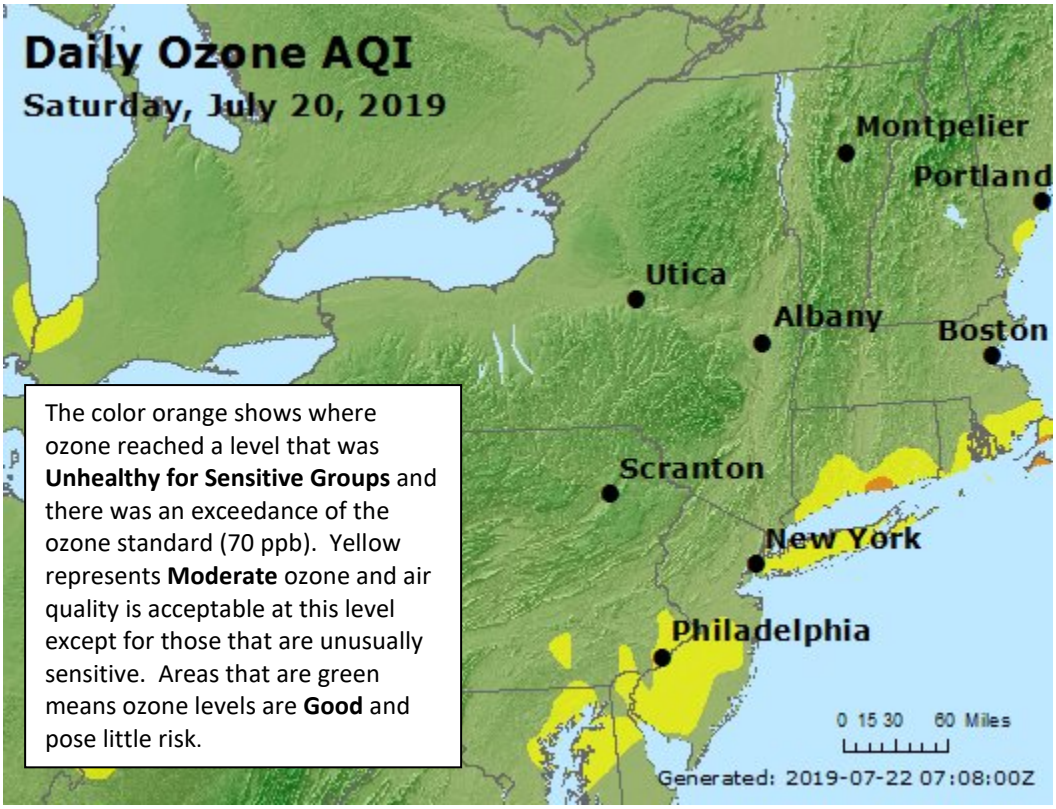
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	50
CT	Greenwich	54
CT	Madison-Beach Road	73
CT	Middletown-CVH-Shed	53
CT	New Haven	60
CT	Stratford	67
CT	Westport	58
DE	BCSP (New Castle Co.)	55
DE	BELLFNT2 (New Castle Co.)	59
DE	KILLENS (Kent Co.)	53
DE	LEWES (Sussex Co.)	47
DE	LUMS 2 (New Castle Co.)	53
DE	MLK (New Castle Co.)	60
DE	SEAFORD (Sussex Co.)	51
MD	Fair Hill	54
NY	Babylon	69
NY	Bronx - IS52	55
NY	CCNY	51
NY	Fresh Kills	47
NY	Holtsville	64
NY	Pfizer Lab	52
NY	Queens	63
NY	Riverhead	67
NY	Rockland Cty	39
NY	White Plains	46
PA	BRIS (Bucks Co.)	58
PA	CHES (Delaware Co.)	47
PA	NEWG (Chester Co.)	52
PA	NORR (Montgomery Co.)	52
PA	LAB (Philadelphia Co.)	54
PA	NEA (Philadelphia Co.)	55
PA	NEW (Philadelphia Co.)	67
	TOTAL EXCEEDANCES	1

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 20, 2019 NAAQS = 70 ppb
Connecticut	11
Delaware	3
Maryland	2
New Jersey	8
New York	8
Pennsylvania	5

Figure 1. Ozone Air Quality Index for July 20, 2019



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 large area of high pressure was in place over the Eastern United States on Saturday July 20th, providing hot temperatures, southwesterly winds, and sunny skies to the Northeast. In addition, a surface trough created a mechanism for polluted air aloft to mix down to the surface and combine with local emissions generated during the day. Favorable weather conditions in combination with transport from central Pennsylvania and New York City led to an exceedance in Connecticut.

Beginning on Friday, July 19th, a large area of high pressure was anchored over the Atlantic Ocean and began merging with multiple high-pressure centers over the Southeastern United States. This large area of high pressure was largely responsible for the hot temperatures, sunny skies, and light southwesterly winds throughout the region. This persistent pattern of high pressure is historically favorable for ozone formation. Meteorological data for Connecticut shows temperatures reaching the low 90s with clear skies and light winds for the entire day. In addition, the surface trough from the previous day remained in place through the 20th and continued to influence the mixing of polluted air aloft down to the surface. This pattern continued to deliver hot, uncomfortable, and increasingly moist air to the Northeast for a second day. The ozone exceedance that occurred exclusively in Connecticut was partially a result of patchy cumulus and cirrus clouds from convection developing to the northwest. This cloud cover was scattered through the morning and afternoon hours for much of the southern region. In addition, a slight sea breeze was detected in portions of Long Island and coastal New Jersey, which may have helped to provide cleaner air to much of the region.

Light southwesterly winds, in combination with abundant sunshine, enhanced ozone formation for this polluted segment of the air mass that migrated northeastward into Connecticut. Based on this weather analysis, the observed exceedance on July 20th can be attributed to favorable weather conditions, upwind air pollution, and locally generated emissions being transported into/throughout the non-attainment area.

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 exceedances on July 19, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. One (1) monitoring station 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 Station with an 8-hr Ozone Exceedance that Was Selected to Run 48-hr Back Trajectories

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Madison-Beach Road	73

The back trajectory from July 20th shows that the transport of air at the surface and upper levels was highly influenced by the high-pressure system over the southeastern United States. This allowed for the transport of polluted air at all levels to the exceedance location of Madison, Connecticut.

Air at the surface (Figure 2) originated over the Pennsylvania-West Virginia border and traveled eastward through southern Pennsylvania before following high pressure circulation to the northeast and arriving in Connecticut. The surface air also showed a general sinking motion under the influence of high pressure. This air passed over Lancaster, Reading, Allentown, the Lower Hudson Valley, and Westchester region, picking up additional emissions from cars, trucks, local industry, and power plants, which may have included peak demand electric generating units (EGUs).

Air at mid and upper levels (Figures 3 and 4) originated over western Missouri and eastern Kansas before traveling over the southern Great Lakes. The air then began traveling southeastward following the clockwise high-pressure circulation, passing over southern New York state and northeastern Pennsylvania. Along the way, the air passed over the urban areas of Chicago, Detroit, Buffalo, and the lower Hudson Valley. The air at these levels also showed a sinking motion as a result of the high pressure, causing polluted air aloft to mix down to the surface.

Figure 5 shows the national Air Quality Index observed on July 19th, the day prior to this exceedance episode. As seen in the figure, multiple areas in the southern Great Lakes and Ohio River Valley regions showed moderate air quality the day before. Looking at the trajectories, air at all levels originated in these regions, indicating that the air that entered our non-attainment area was previously polluted. In addition, the air mass in portions of Connecticut reached the unhealthy for sensitive groups category on July 19th. Influence from industrial locations in these regions, including possible peak demand EGUs , combined with favorable meteorological conditions resulted in the exceedance at Madison, Connecticut.

Figure 2. 48-hour Back Trajectories for July 19, 2019 at 10 meters

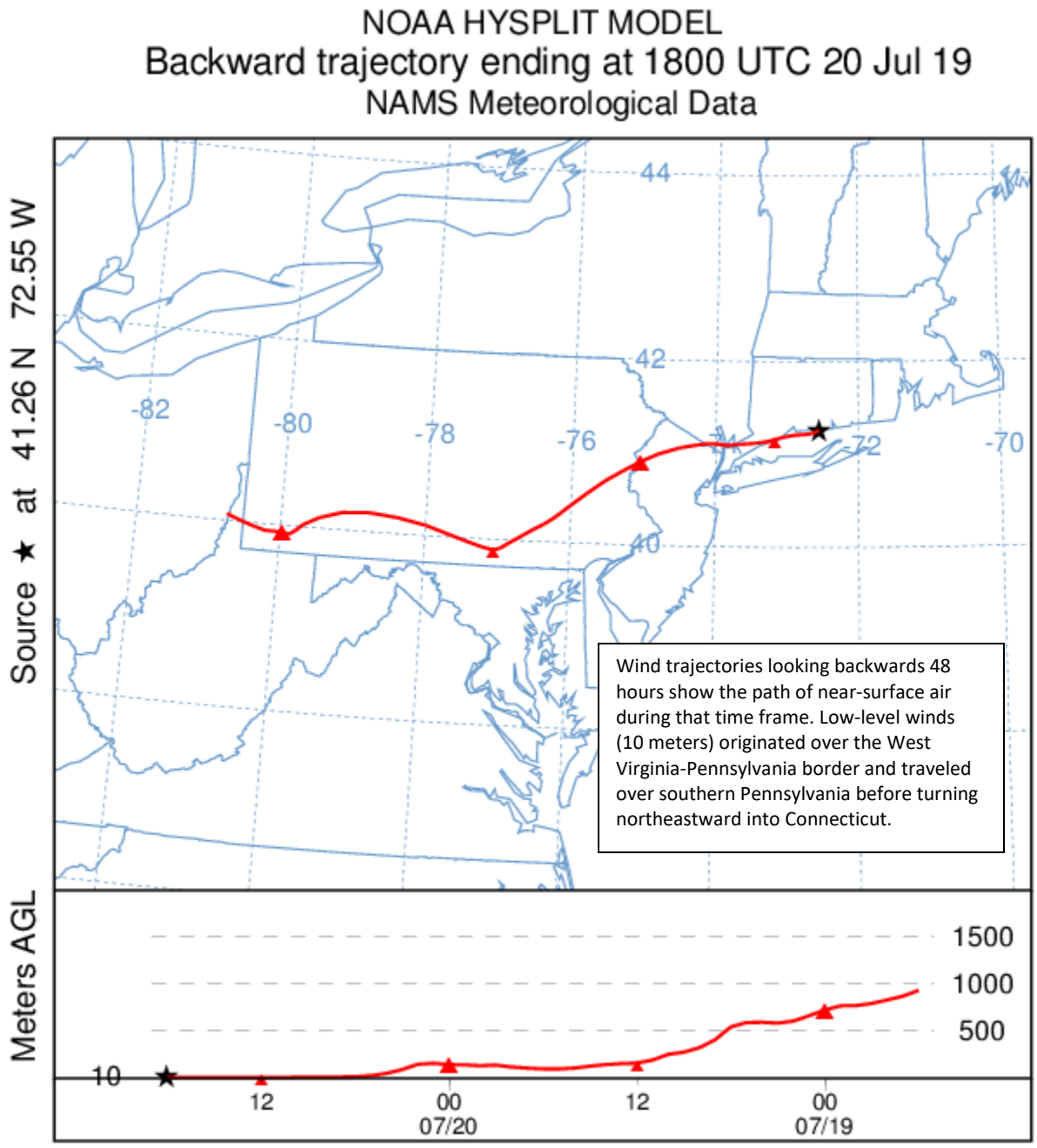


Figure 3. 48-hour Back Trajectories for July 19, 2019 at 500 meters

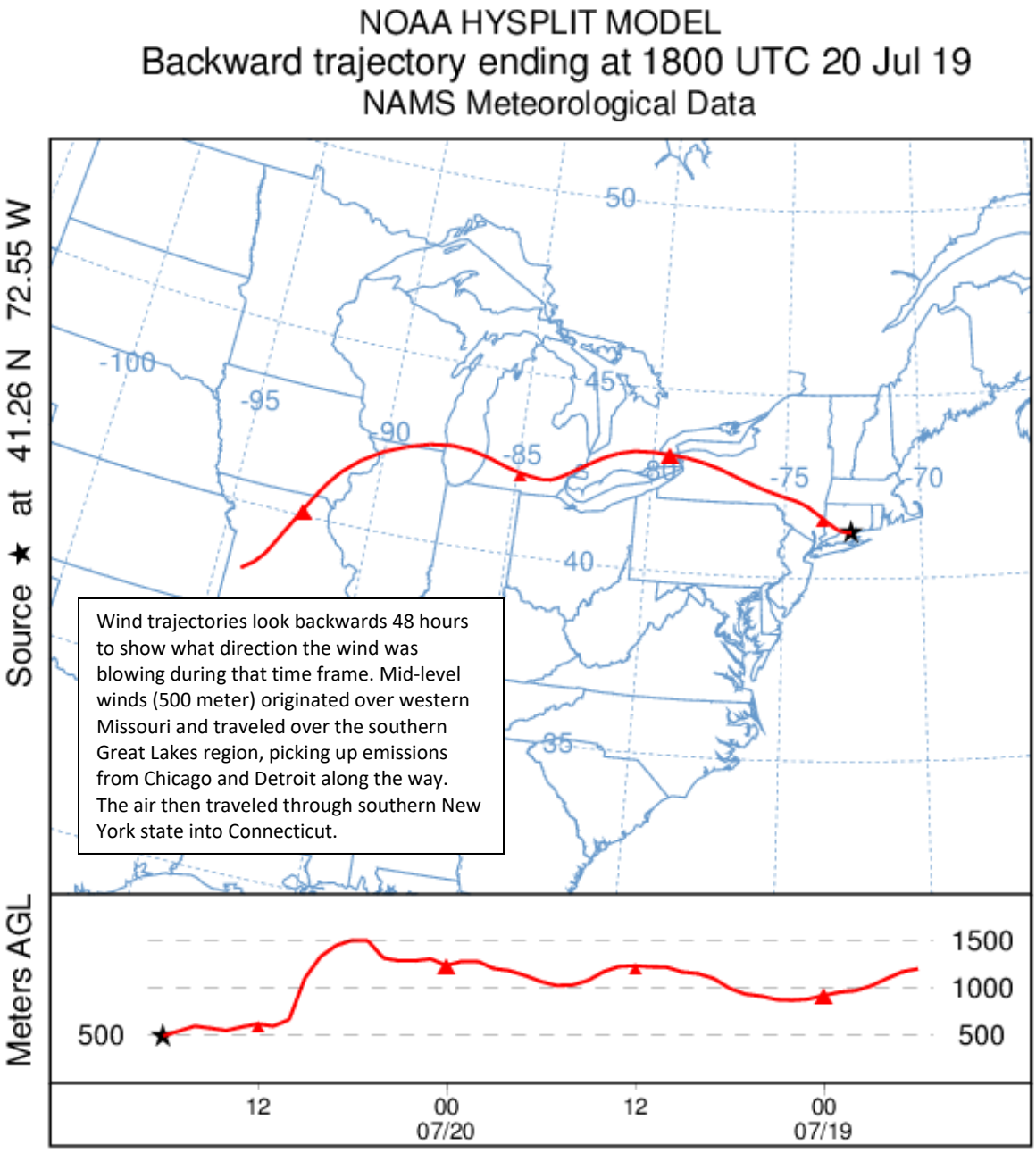


Figure 4. 48-hour Back Trajectories for July 19, 2019 at 1500 meters

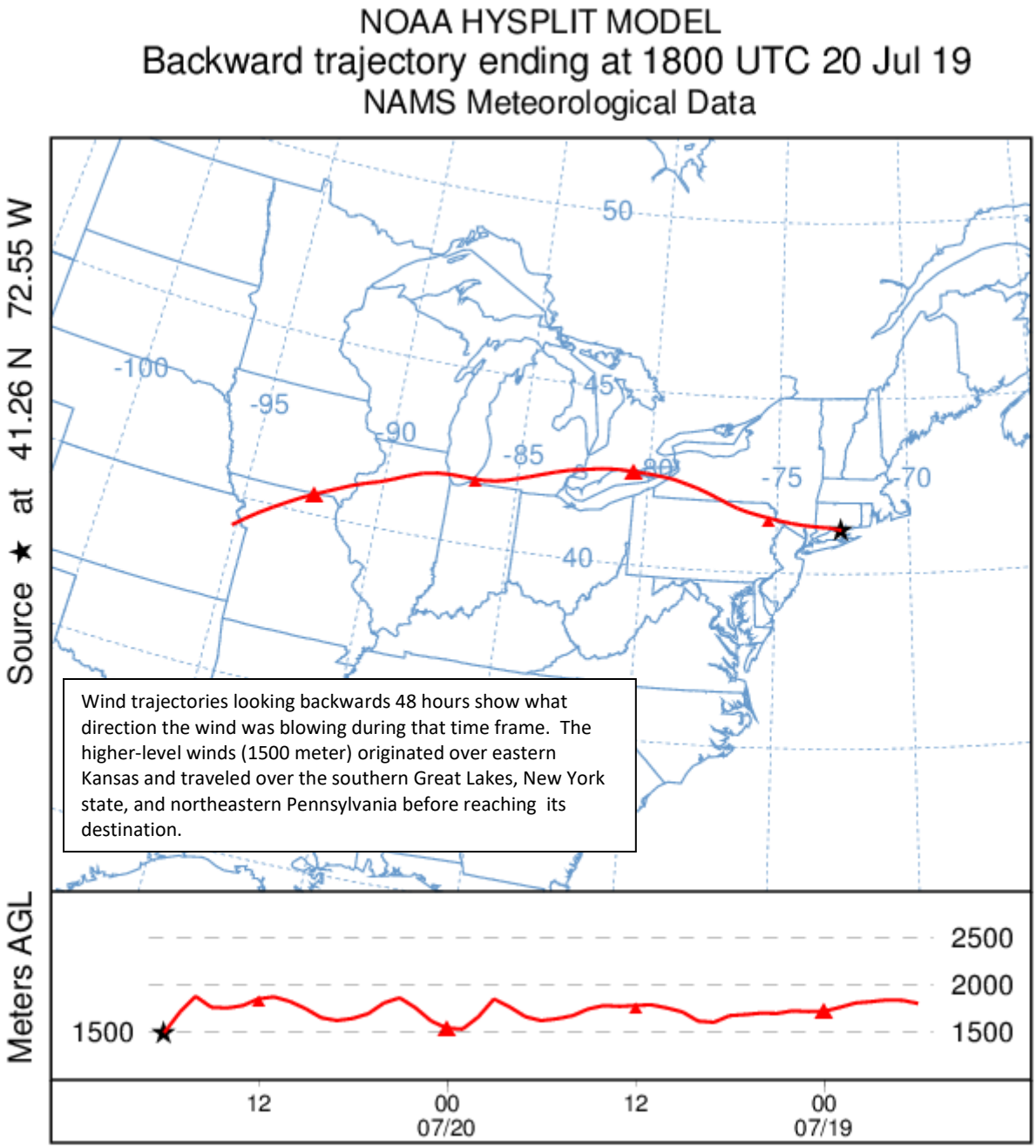
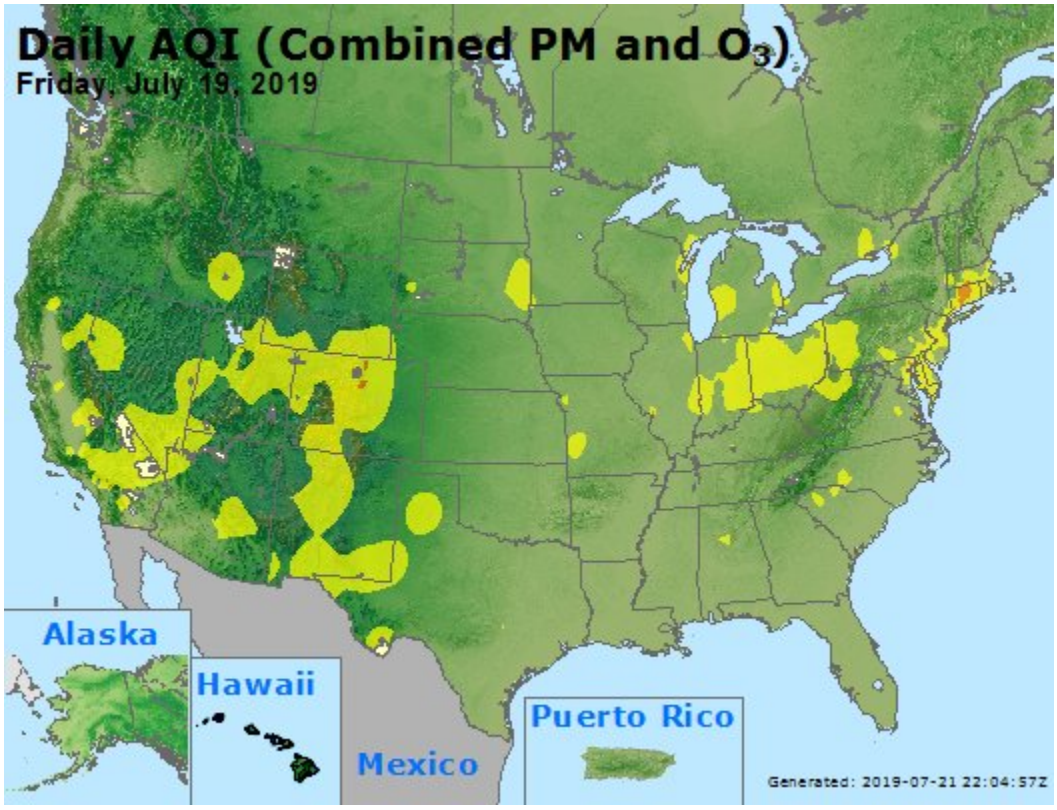


Figure 5. Combined Air Quality Index for the United States on July 19, 2019



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.