Ozone National Ambient Air Quality Standard Health Exceedances on July 20, 2020

Exceedance Locations and Levels

On Monday, July 20, 2020, 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 7/20/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	59
Bayonne	50
Brigantine	52
Camden Spruce St	58
Chester	47
Clarksboro	59
Colliers Mills	63
Columbia	47
Flemington	53
Leonia	53
Millville	61
Monmouth University	56
Newark Firehouse	54
Ramapo	40
Rider University	55
Rutgers University	56
Washington Crossing*	55
TOTAL EXCEEDANCES	0

*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 three (3) 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 7/20/2020

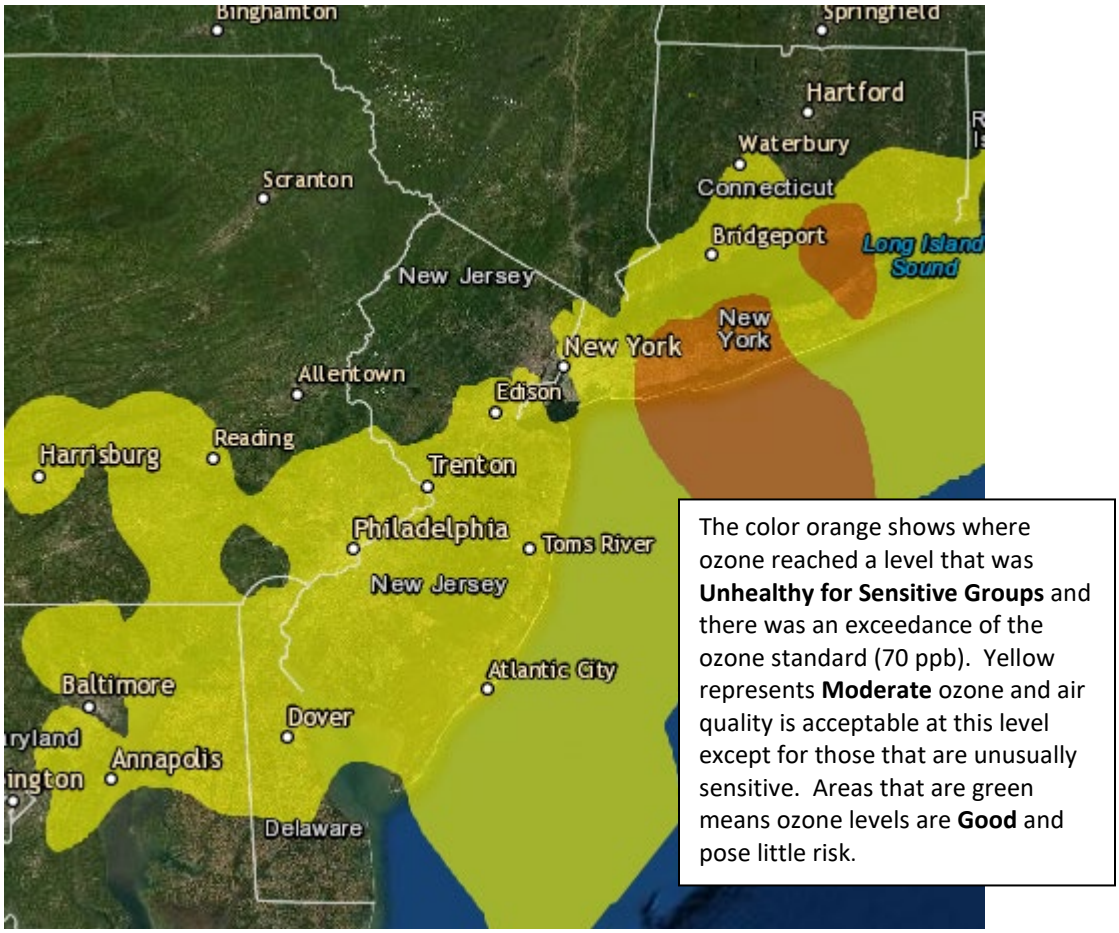
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	46
CT	Greenwich	61
CT	Madison-Beach Road	75
CT	Middletown-CVH-Shed	52
CT	New Haven	59
CT	Stratford	66
CT	Westport	60
DE	BCSP (New Castle Co.)	51
DE	BELLFNT2 (New Castle Co.)	60
DE	KILLENS (Kent Co.)	59
DE	LEWES (Sussex Co.)	52
DE	LUMS 2 (New Castle Co.)	61
DE	MLK (New Castle Co.)	63
DE	SEAFORD (Sussex Co.)	51
MD	Fair Hill	62
NY	Babylon	80
NY	Bronx - IS52	56
NY	CCNY	56
NY	Fresh Kills	55
NY	Holtsville	80
NY	Pfizer Lab	57
NY	Queens	No Data
NY	Riverhead	69
NY	Rockland Cty	44
NY	White Plains	49
PA	BRIS (Bucks Co.)	60
PA	CHES (Delaware Co.)	59
PA	NEWG (Chester Co.)	52
PA	NORR (Montgomery Co.)	66
PA	LAB (Philadelphia Co.)	57
PA	NEA (Philadelphia Co.)	63
PA	NEW (Philadelphia Co.)	63
	TOTAL EXCEEDANCES	3

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 20, 2020 NAAQS = 70 ppb
Connecticut	5
Delaware	0
Maryland	0
New Jersey	2
New York	3
Pennsylvania	1

Figure 1. Ozone Air Quality Index for July 20, 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

In the days leading up to this high ozone event, high pressure was in control of the northeastern United States. For several days, the nonattainment area experienced hazy, hot, and humid conditions which are historically favorable for ozone production. These conditions in combination with localized transport at the surface allowed for ozone concentrations in Long Island and Connecticut to reach the unhealthy for sensitive groups category (USG) on July 20th.

For much of the day on July 20th, high pressure remained the primary weather feature allowing temperatures to reach the low 90s with mostly sunny skies at the monitored exceedance locations. Meteorological data from across the region show that winds for much of the day remained light and variable leading to limited ventilation at the surface. As a result, light winds created a favorable environment for a seabreeze to develop along the Long Island coast where pollutants over the water from the previous day may have been pushed inland. Additionally, the previously established surface trough in the days prior that extended from New England into the Mid-Atlantic region remained in place providing the continued opportunity for any ozone aloft to mix down to the surface. This feature likely enhanced any residual ozone occurring at the surface from previous days. As high pressure continued to drift eastward, a slow-moving cold front entered the region from the Great Lakes in the early evening hours, which may have aided in transporting polluted air along the leading edge of the frontal boundary into Long Island. Meanwhile, locations behind the front, experienced a much cleaner air mass that assisted the northwestern portion of New Jersey to remain clean on this day.

In conclusion, favorable conditions for ozone formation in combination with localized meteorology assisted the current air mass in growing increasingly polluted over several days. Based on this weather analysis, the recorded exceedances on July 20th can be attributed to the above-mentioned weather features and transport of pollutants from the Mid-West.

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 20, 2020. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. Three 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	Madison-Beach Road	75
NY	Babylon	80

NY	Holtsville	80

Back trajectories from July 20th show that the exceedances observed in Connecticut and New York were heavily influenced by localized transport of emissions at the surface from the Long Island Sound and the New York City metropolitan area. The favorable meteorological conditions mentioned above, along with the transport of ozone precursors from local industry resulted in exceedances of the 8-hr average Ozone NAAQS in Connecticut and New York

Surface-level back trajectories (Figure 2) show air at the surface originated off the Virginia and North Carolina coasts and traveled north along the New Jersey coastline before reaching their destinations. One of the trajectories traveled through Long Island and the Sound before reaching its destination along the Connecticut coastline. Here, it may have picked up additional emissions from peaking units that may have been operating due to a prolonged period of heat and humidity. Another trajectory also traveled through the Philadelphia metropolitan area as it moved northward before eventually turning eastward and arriving at its destination in New York City, picking up local emissions. The surface trajectories also indicate that air was moving very slowly along the surface, which enhanced the build-up of pollutants in these areas.

In Figure 3, we see that air at mid-levels (500 meters) originated in the Mississippi river valley region and traveled in a northeasterly direction under the influence of a southeastern U.S. high pressure system. Along its path, mid-level air traversed through the Ohio River Valley, Pennsylvania, and eventually through the New York City metropolitan area, picking up emissions aloft from transportation, local industry, and possible peaking EGU's. Despite the lack of moderate air quality in upwind states, pollution aloft over the NYC metropolitan area from days prior was able to mix down to the surface in Long Island and Connecticut.

In Figure 4, air at upper levels (1500 meters) originated in the Mississippi River valley as well and followed a similar trajectory path as the mid-level air. The air parcel was steered in a clockwise direction around the southeastern U.S. high, and then traveled in a straight easterly direction through the Ohio River Valley, Pennsylvania, and again over the NYC metropolitan area before arriving at its endpoints. Both mid and upper level air parcels were steered by strong upper level winds, traveling from as far as Oklahoma to our non-attainment zone in less than 48 hours. This indicates that the exceedances in Long Island and Connecticut most likely occurred as a localized event due to a buildup of pollutants over several days in our region.

Figure 5 shows the National Air Quality Index observed on July 19th, the day prior to the exceedances in Connecticut and New York. As shown in the figure, widespread moderate air quality, with an isolated area of unhealthy for sensitive groups ozone, was observed throughout the northeast on this day. This was likely enhanced by favorable weather conditions, and weak circulation which led to several exceedances throughout our nonattainment area.

Figure 2. 48-hour Back Trajectories for July 20, 2020 at 10 meters

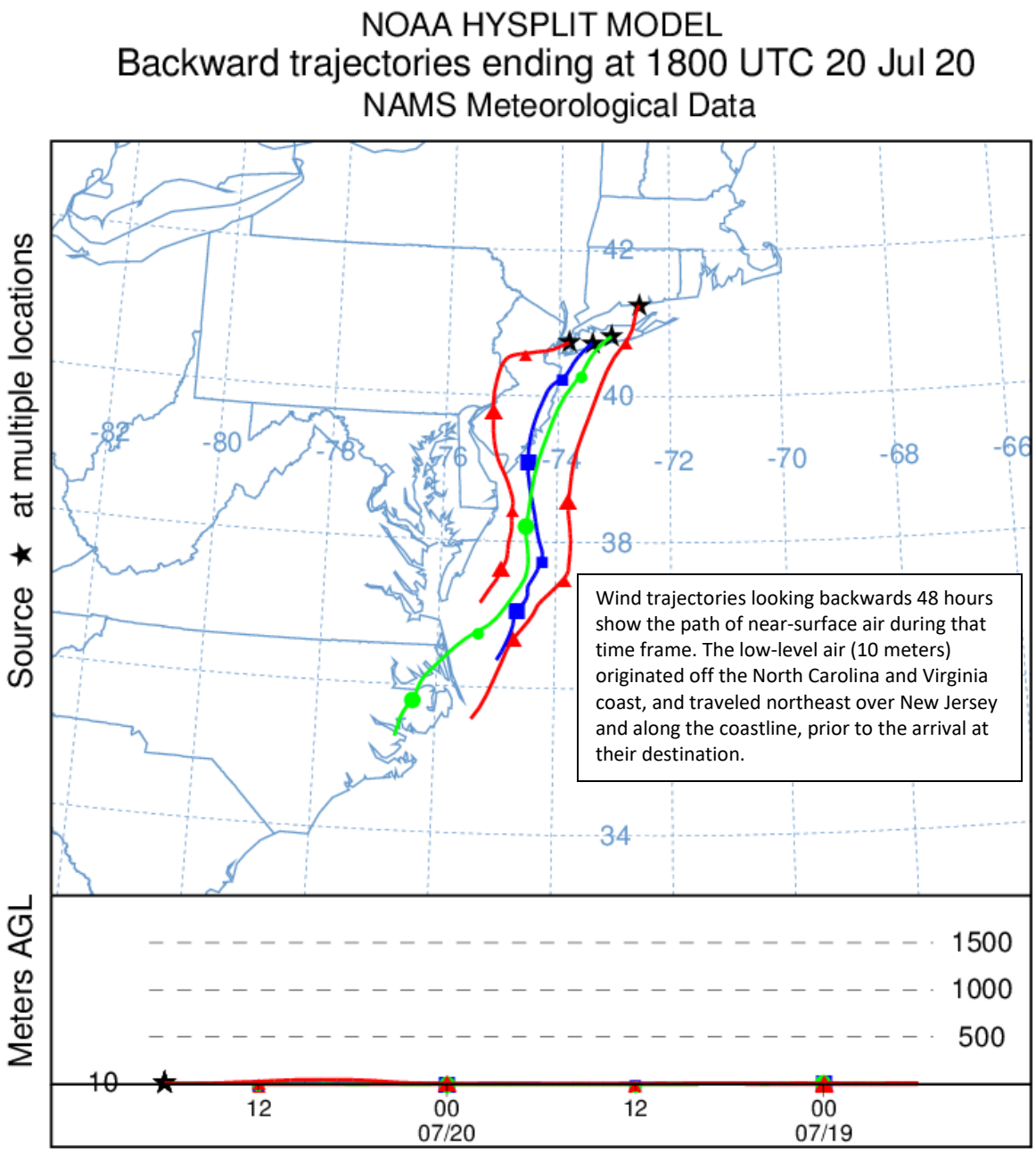


Figure 3. 48-hour Back Trajectories for July 20, 2020 at 500 meters

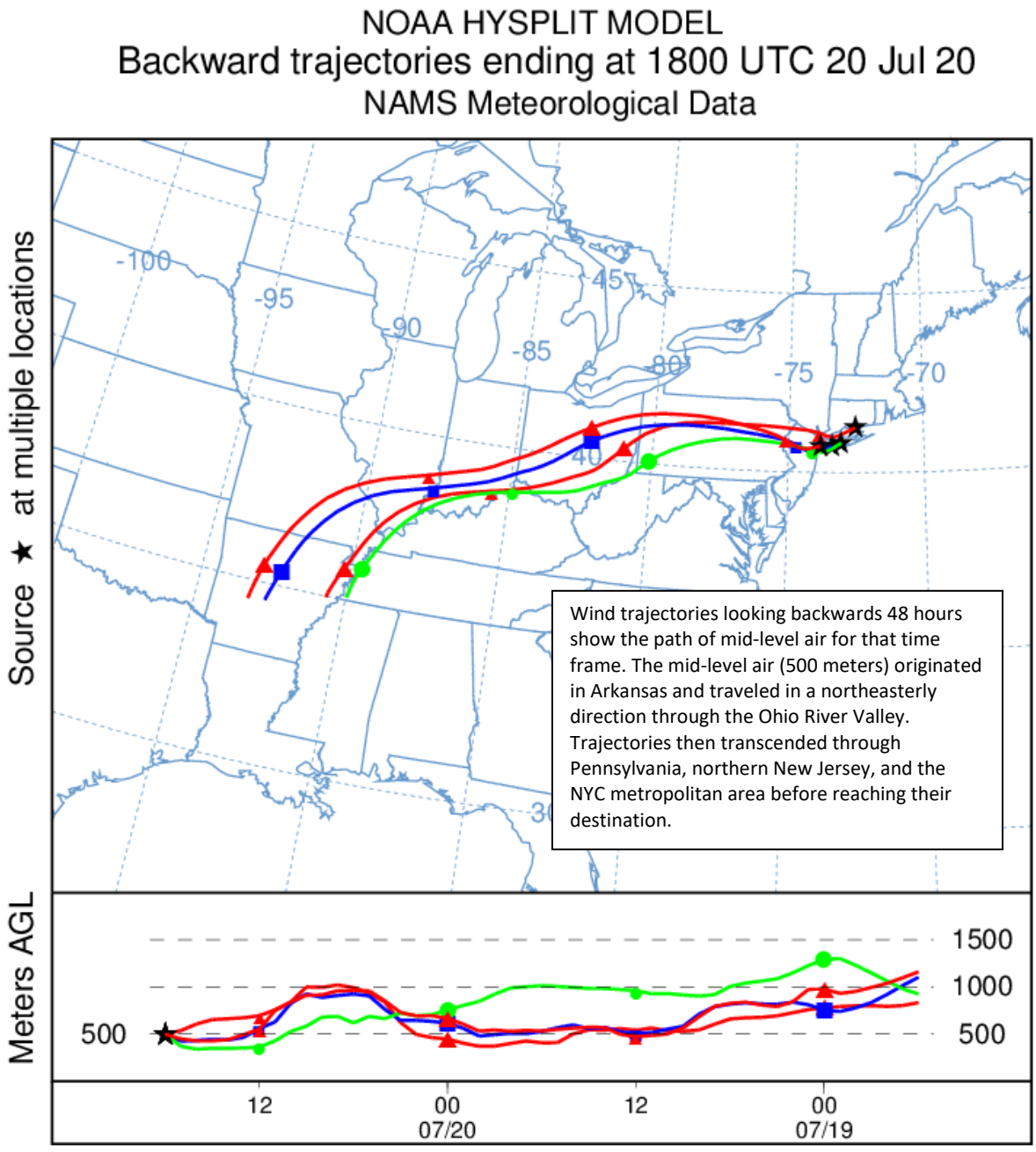


Figure 4. 48-hour Back Trajectories for July 20, 2020 at 1500 meters

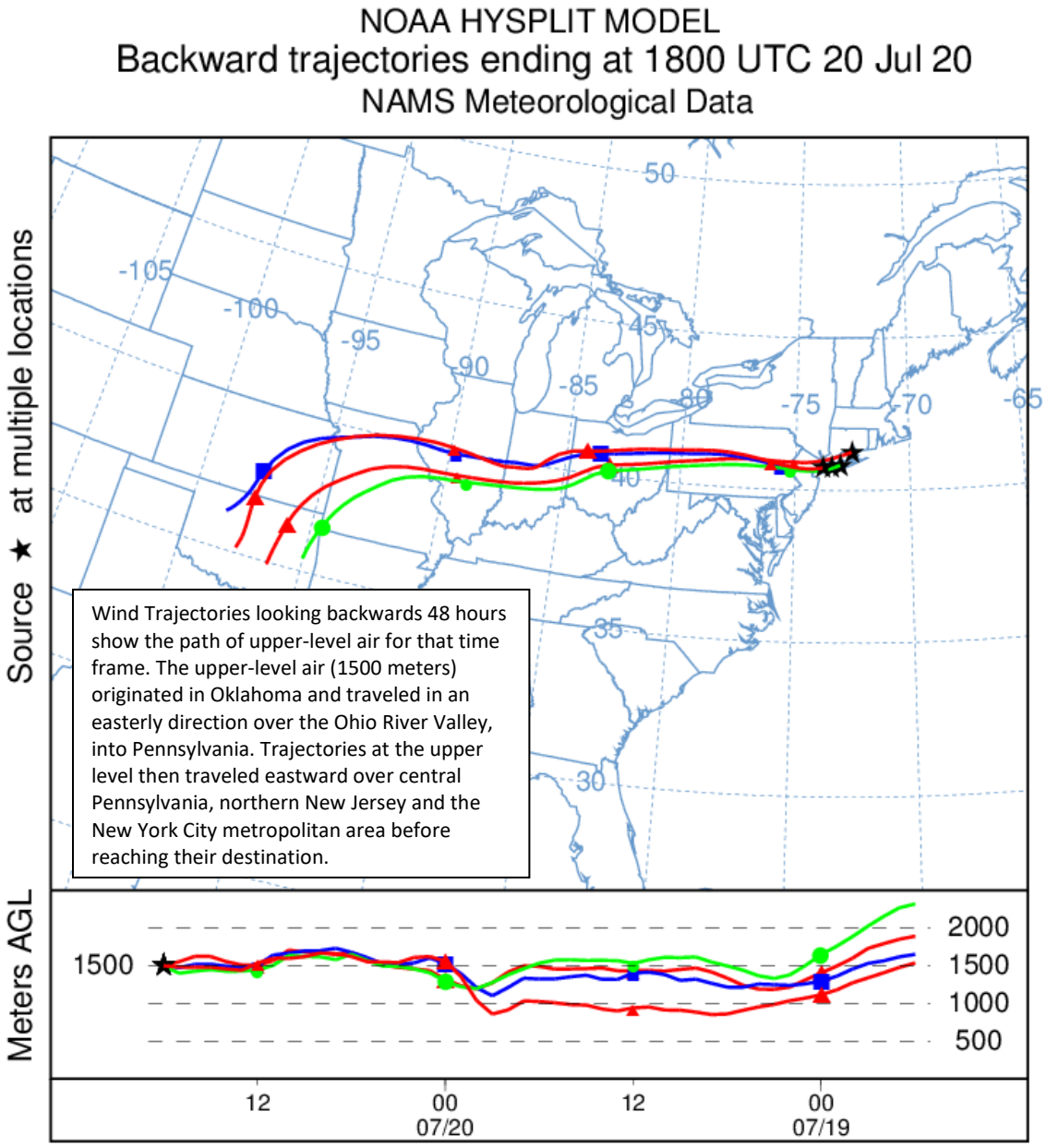
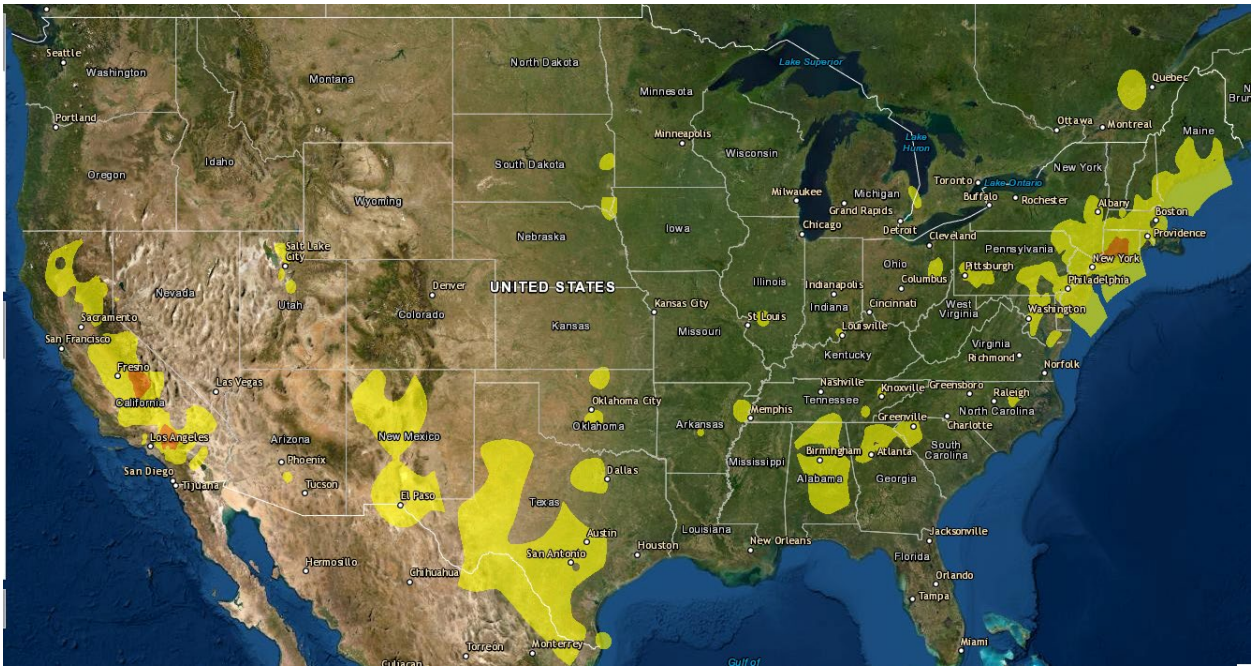


Figure 5. Combined Air Quality Index for the United States on July 19, 2020



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/ .