Ozone National Ambient Air Quality Standard Health Exceedances on September 5, 2018

Exceedance Locations and Levels

On Wednesday, September 5, 2018, 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 8-hr Maximum Ozone Concentrations on September 5, 2018

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	43
Bayonne	52
Brigantine	38
Camden Spruce St	53
Chester	47
Clarksboro	64
Colliers Mills	48
Columbia	18
Flemington	56
Leonia	58
Millville	41
Monmouth University	46
Newark Firehouse	48
Ramapo	62
Rider University	51
Rutgers University	69
Washington Crossing*	63
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 were three (3) exceedances of the ozone NAAQS. See Table 2.

Table 2. 8-hr Maximum Ozone Concentrations for Out-of-State Monitoring Stations in New Jersey's Ozone Non-Attainment Areas on September 5, 2018

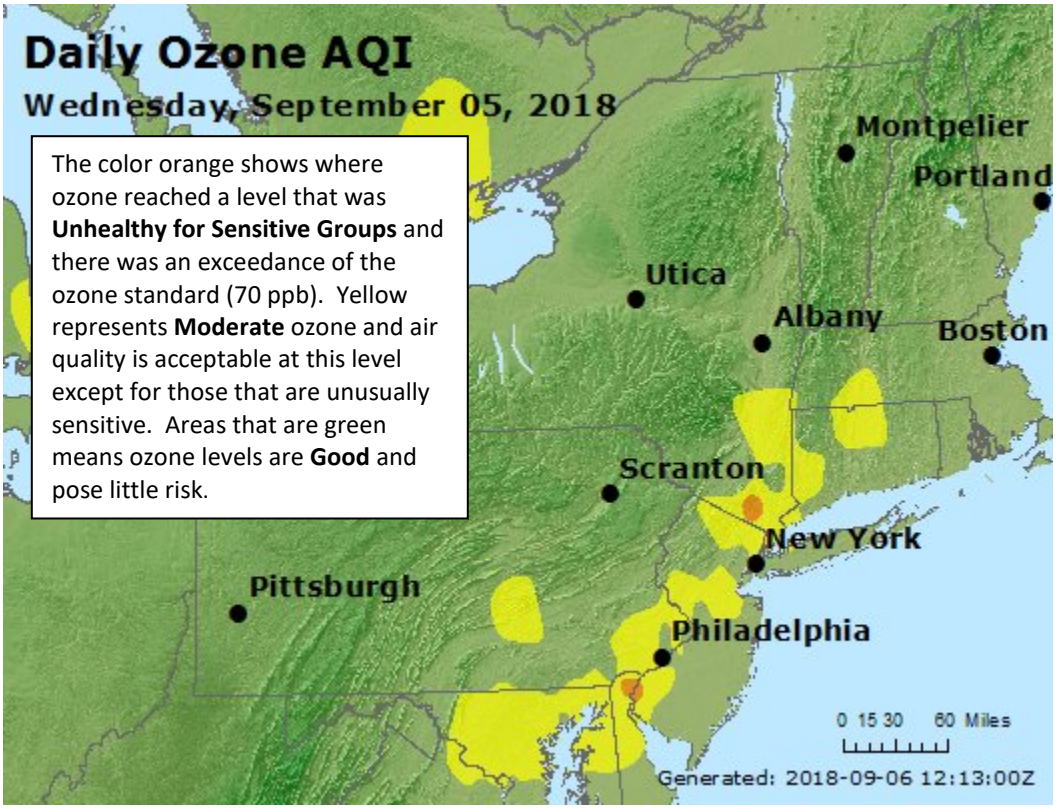
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	63
CT	Greenwich	58
CT	Madison-Beach Road	42
CT	Middletown-CVH-Shed	52
CT	New Haven	46
CT	Stratford	53
CT	Westport	52
DE	BCSP (New Castle Co.)	55
DE	BELLFNT2 (New Castle Co.)	No Data
DE	KILLENS (Kent Co.)	54
DE	LEWES (Sussex Co.)	48
DE	LUMS 2 (New Castle Co.)	62
DE	MLK (New Castle Co.)	77
DE	SEAFORD (Sussex Co.)	51
MD	Fair Hill	58
NY	Babylon	49
NY	Bronx - IS52	52
NY	CCNY	52
NY	Fresh Kills	36
NY	Holtsville	44
NY	Pfizer Lab	56
NY	Queens	51
NY	Riverhead	44
NY	Rockland Cty	71
NY	White Plains	70
PA	BRIS (Bucks Co.)	52
PA	CHES (Delaware Co.)	80
PA	NEWG (Chester Co.)	52
PA	NORR (Montgomery Co.)	60
PA	LAB (Philadelphia Co.)	52
PA	NEA (Philadelphia Co.)	57
PA	NEW (Philadelphia Co.)	52
	TOTAL EXCEEDANCES	2

The number of days in 2018 on which exceedances of the ozone NAAQS were recorded for all the states is summarized in Table 3. Figure 1 shows graphically the regions ozone concentrations on September 5, 2018.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Non-Attainment Areas in 2018

STATE	# of Days NAAQS was Exceeded January 1 – Sept. 5, 2018 NAAQS = 70 ppb
Connecticut	22
Delaware	9
Maryland	6
New Jersey	21
New York	21
Pennsylvania	15

Figure 1. Ozone Air Quality Index for September 5, 2018



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 few exceedances were noted in the nonattainment area on September 5th as the region continued to be influenced by a strong, high pressure system. Localized transport throughout the region for several days allowed emissions to accumulate in isolated locations. Multiple days of favorable ozone conditions in addition to localized transport enhanced ozone levels at the surface leading to these exceedances.

This ozone event occurred on the third of a four-day late season heat wave impacting much of the nonattainment area. High pressure was stretching over much of the eastern United States on September 5th and remained in place before migrating eastward out to sea later that day. This large, high pressure system was the source of mostly sunny skies, temperatures reaching the mid-90s, and light southerly winds throughout the nonattainment area. During the day, spotty clouds formed in many locations throughout New Jersey, which likely helped to limit ozone formation. In addition, high pressure provided an opportunity for localized transport throughout the region for multiple days prior to the exceedance. Despite a regionally clean air mass, several days of light winds and sunny skies allowed the air mass to grow increasingly polluted. As a result, isolated exceedances were observed throughout the nonattainment area.

Based on this weather analysis, the observed exceedances on September 5th can be attributed to multiple days of favorable weather conditions enhancing ozone levels at the surface and locally generated emissions being transported throughout the nonattainment 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 September 5, 2018. The figures illustrate where the winds came from during the 48 hours preceding the high ozone event. Three (3) monitoring stations with 8-hr ozone exceedances were used to run back trajectories. The selected sites and the maximum 8-hr 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)
NY	Rockland Cty	71
DE	MLK	77
PA	Chester (Delaware Co.)	80

Back trajectories from September 5th show that air, at all levels of the atmosphere, was highly influenced by high pressure circulation over the northeastern United States. Localized transport throughout the region, in the presence of multiple days of favorable weather conditions, led to two exceedances in the nonattainment area.

Surface-level back trajectories (Figure 2) affecting the Rockland County, NY monitor originated over eastern Pennsylvania and traveled generally southeastward through northern New Jersey, emerging

offshore early on September 4th. Air then recirculated over Long Island and the New York City Metropolitan area through arrival. It is worth note, this area saw moderate levels of ozone the day prior to this exceedance. Meanwhile, surface air affecting northern Delaware originated much further away, over southeastern Ontario/Lake Erie. Air traveled east through western New York before making a turn southward early on September 4th. Air then traveled through eastern Pennsylvania before recirculating near the Philadelphia and Wilmington Metropolitan areas through arrival. In both scenarios, air originated higher in the atmosphere but quickly descended to the surface on September 4th, in the presence of high pressure. Air then remained at the surface for the duration of its path, picking up emissions from cars, trucks, and industry along the way.

Mid-level back trajectories (Figure 3) show that air affecting the exceedance locations traveled very little in the 48 hour time period as it was greatly affected by a mid-level ridge of high pressure directly over the region. Air affecting the Rockland County, NY monitor originated over western New York before traveling southeast through the New York City Metropolitan area and Long Island late on September 4th. Air then recirculated off the New Jersey coast and traveled northwest through arrival, passing through the New York City vicinity for a second time. Meanwhile, air affecting northern Delaware originated over the Chesapeake Bay, an area that saw moderate levels of ozone the day prior, before traveling generally east across southern New Jersey and recirculating late on September 4th. Air then traveled north and west through arrival.

Finally, Upper-level back trajectories (Figure 5) show that air affecting both exceedance monitors originated over the Great Lakes region before traveling east and southeast to their destinations. In the last 12-18 hours of travel, upper level air affecting the Rockland County, NY monitor traveled through the Hudson Valley while air affecting northern Delaware traveled along the Pennsylvania/New Jersey boarder through the Philadelphia and Wilmington Metropolitan areas.

It should be noted that September 5th, 2018 was deemed a High Electric Demand Day (HEDD) for power plants within the PJM Mid-Atlantic sector. A HEDD is called when (HEDD, i.e., peak hourly loads will be greater than 50,000 MWh). During HEDD events, additional generating units are called upon to operate to meet the demand on the electrical grid caused by increased cooling needs. The addition of ozone precursor emissions from these upwind generating units to satisfy that demand likely contributed to more ozone production, which was then transported into the region and contributed to the ozone exceedances.

Figure 5 shows the national ozone concentrations observed on September 4th, the day prior to this exceedance episode. As shown in the figure, scattered moderate levels of ozone were noted over western Long Island and portions of coastal New Jersey as well as in the Chesapeake Bay vicinity. Back trajectories for September 5th suggest that localized transport, under influence of high pressure circulation and in favorable weather conditions, led to two isolated exceedances in the nonattainment area.

Figure 2. 48-hour Back Trajectories for September 5, 2018 at 10 meters

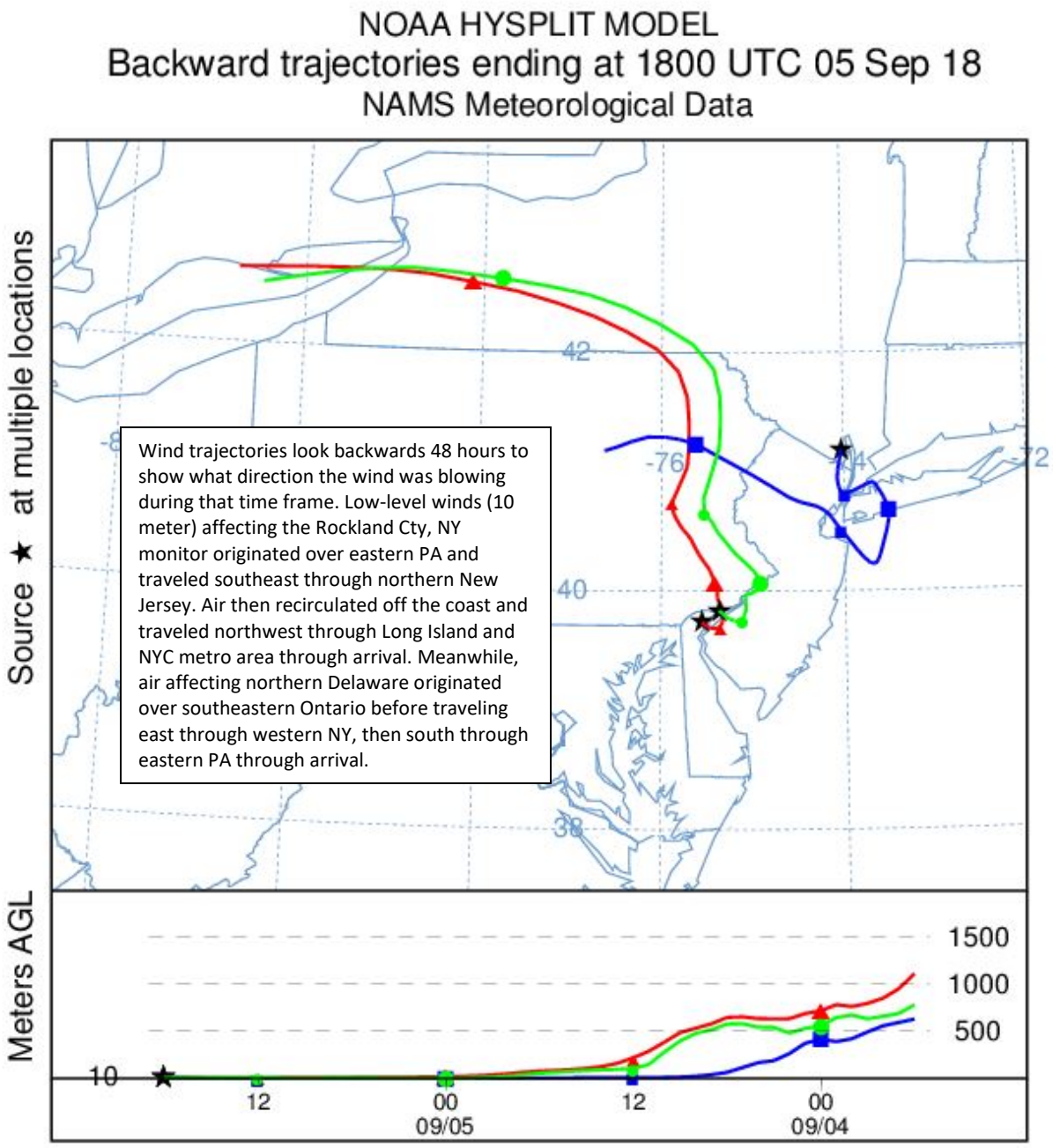


Figure 3. 48-hour Back Trajectories for September 5, 2018 at 500 meters

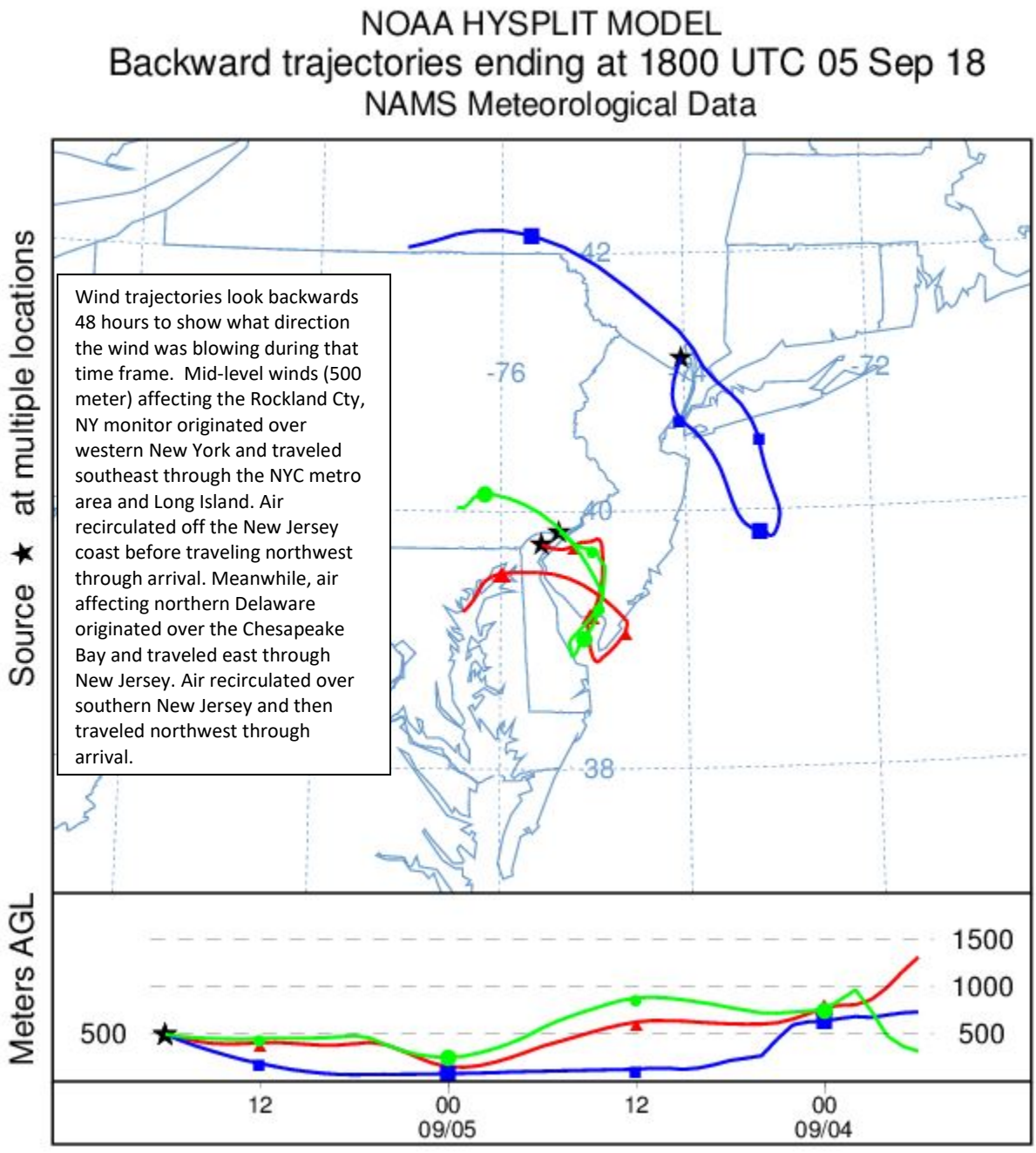


Figure 4. 48-hour Back Trajectories for September 5, 2018 at 1500 meters

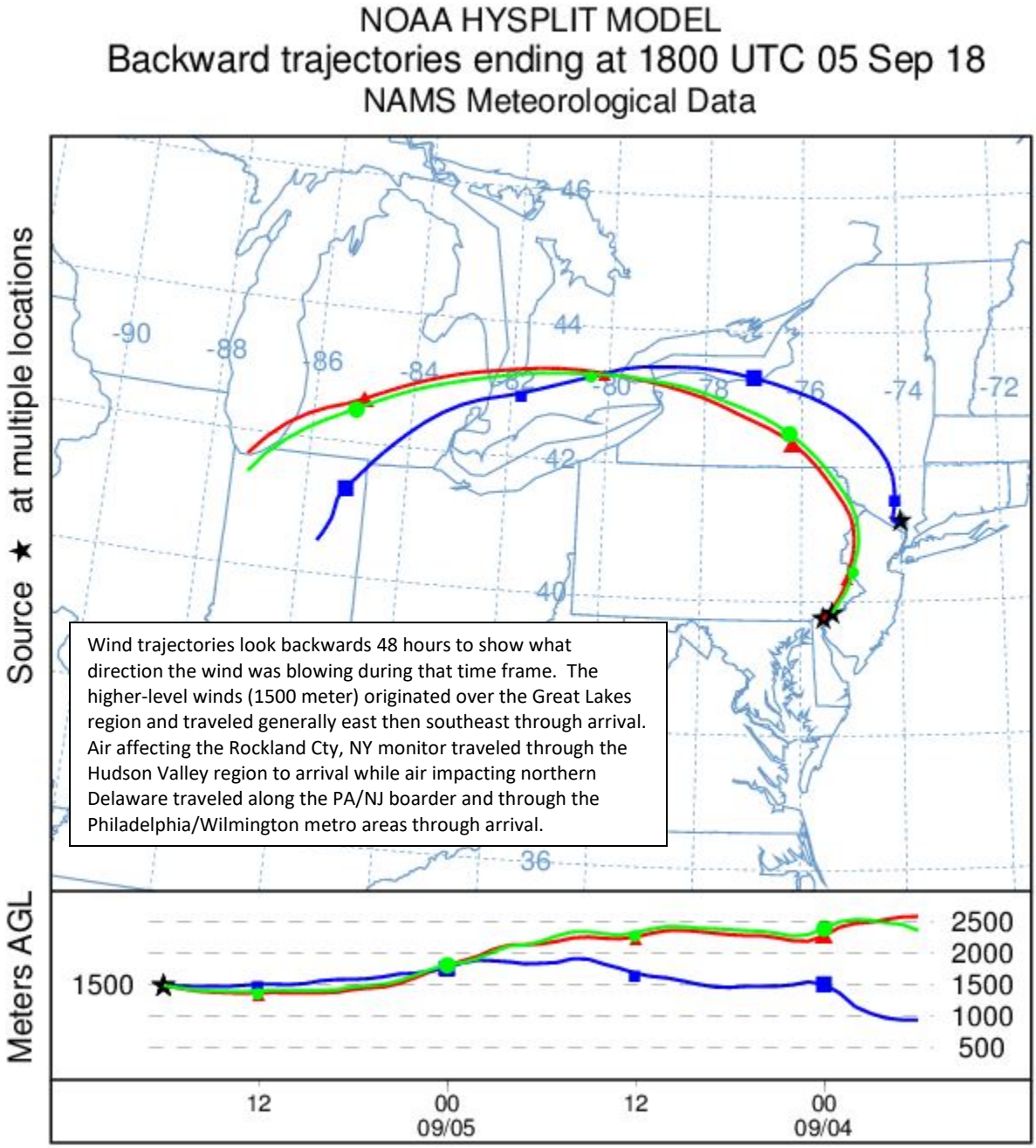
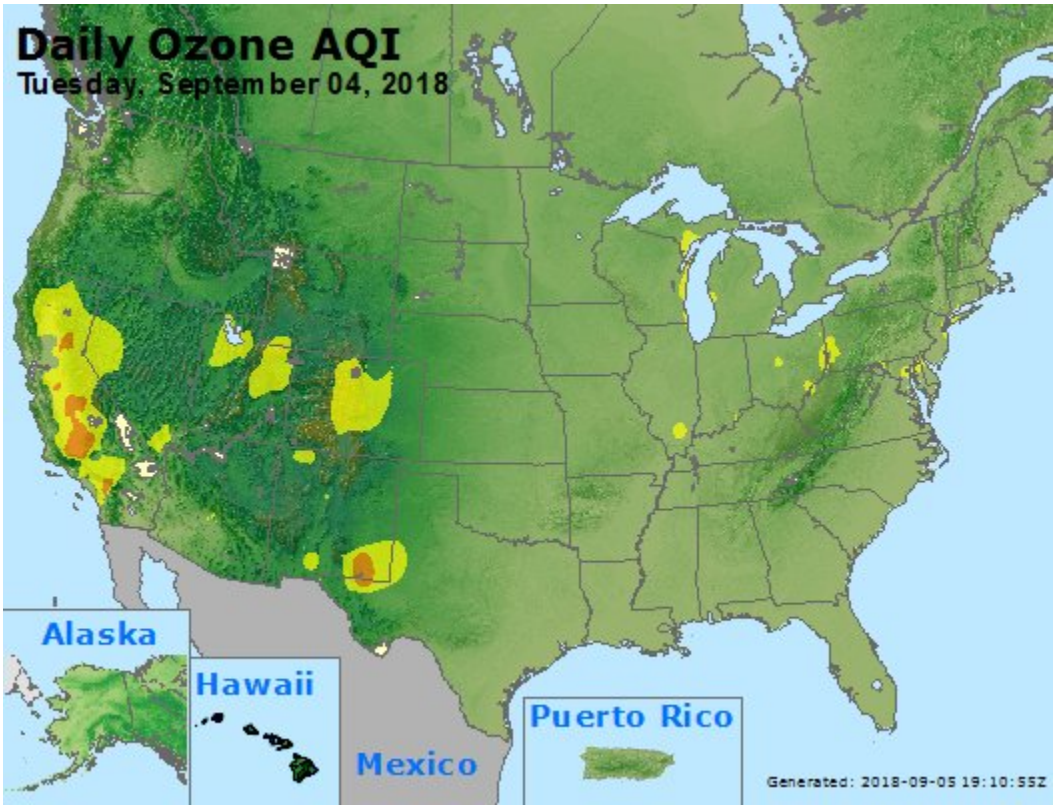


Figure 5. Ozone Air Quality Index for the United States on September 4, 2018



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.