

Air Quality Monitoring in Philadelphia

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Commissioner

Philadelphia Department of Public Health



Air Pollution

- **EPA “Criteria” Pollutants**

- Particulate Matter (PM2.5 and PM10)
- Nitrogen dioxide (NO₂), Ozone (O₃), Carbon monoxide (CO), Sulfur dioxide (SO₂)
- Lead

- Harmful to human health

- Heart and lung disease, reduced life expectancy

- Mainly produced by combustion

- Stationary sources
 - PES and other industrial sources
 - Building furnaces and boilers
- Mobile sources
 - Cars, trucks, buses
 - Ships, airplanes, construction equipment

- **“Air Toxics”**

- Chemicals that may have long-term risks for cancer or other biologic/environmental
 - E.g. benzene, formaldehyde
- Produced by chemical release (e.g. gasoline stations, dry cleaners)

- **Greenhouse gases**

- Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O)
- Flourinated gases like hydroflourocarbons
- Produced by burning, production, transport of fossil fuels
- Contribute to global warming, climate change, severe weather events, sea level rise

Air Quality Has Improved Since Regulation

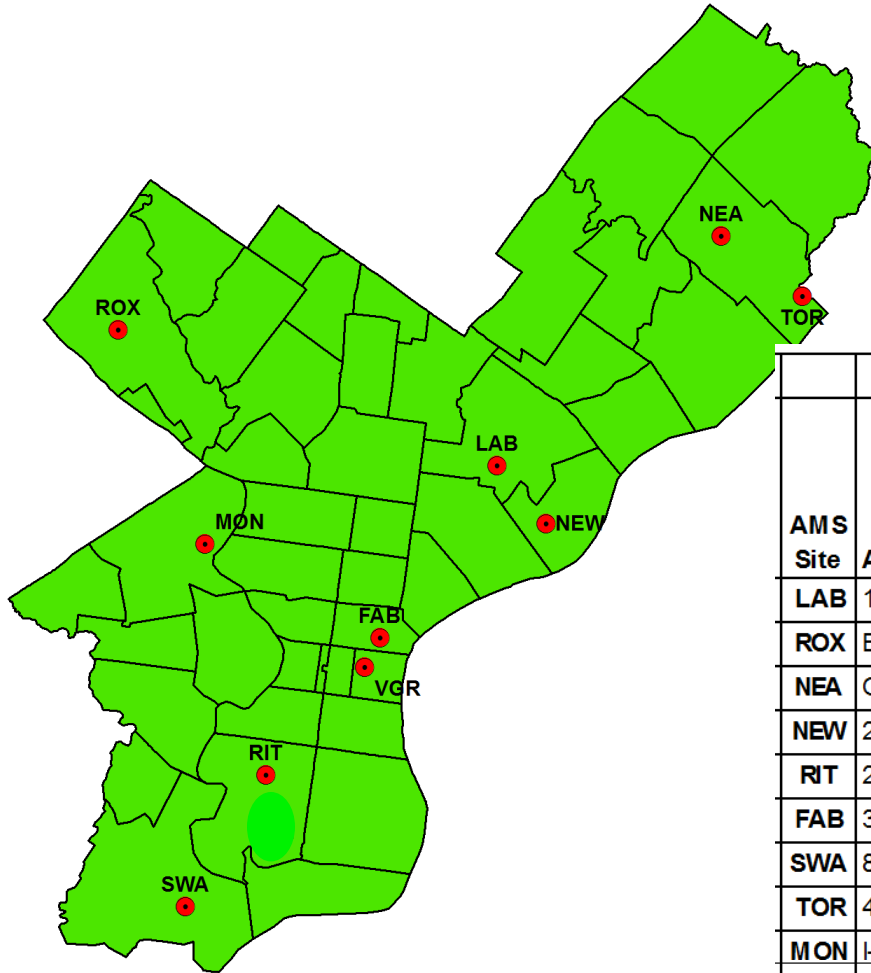


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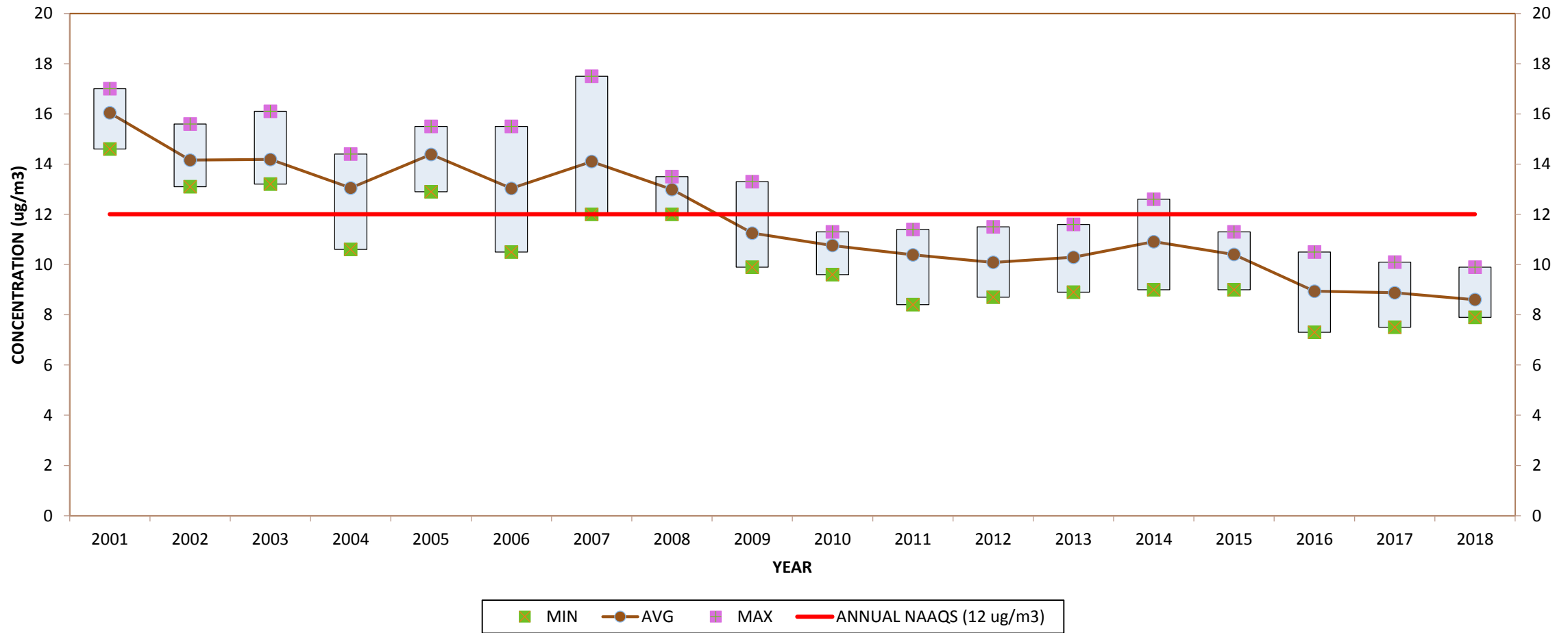
2010s

City-Wide Air Monitoring Network



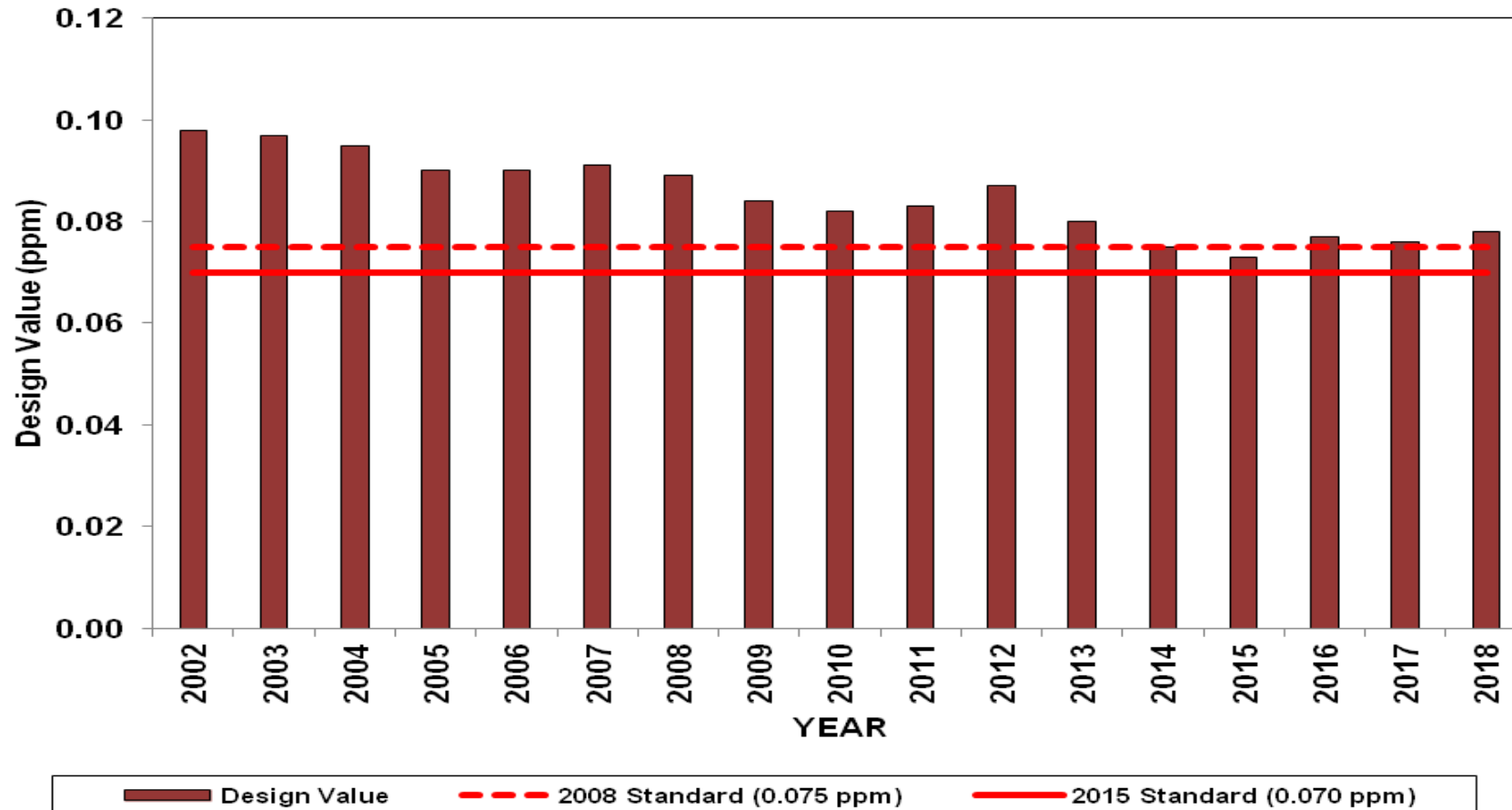
		Parameter																	
AMS Site	Address	CO	SO ₂	Ozone	NO ₂	NOy/NO	PM ₁₀	PM _{2.5}	Speciated PM _{2.5}	PM Coarse	Black Carbon / Ultrafine PM	Carbonyls	PAMS VOC	BaP	TSP Metals (Be, Cr, Mn, Ni, As, Cd, Pb)	Toxics TO15	MET	Comm. Air Toxics	OPEN PATH
LAB	1501 E Lycoming St			X															
ROX	Eva & Dearnley Sts											X				X			
NEA	Grant Ave & Ashton Rd			X															
NEW	2861 Lew is St	X	X	X	X	X	X	X	X	X		X	X			X	X		
RIT	24th & Ritner Sts		X					X	X			X			X	X			
FAB	3rd & Spring Garden Sts							X											
SWA	8200 Enterprise Ave											X				X			
TOR	4901 Grant Ave & James St	X			X			X									X		
MON	I-76 & Montanomerv Drive	X			X			X			X			X	X		X		
VGR	6th & Arch Sts			X				X									X		

Trends in Annual PM2.5 (Fine Particles)

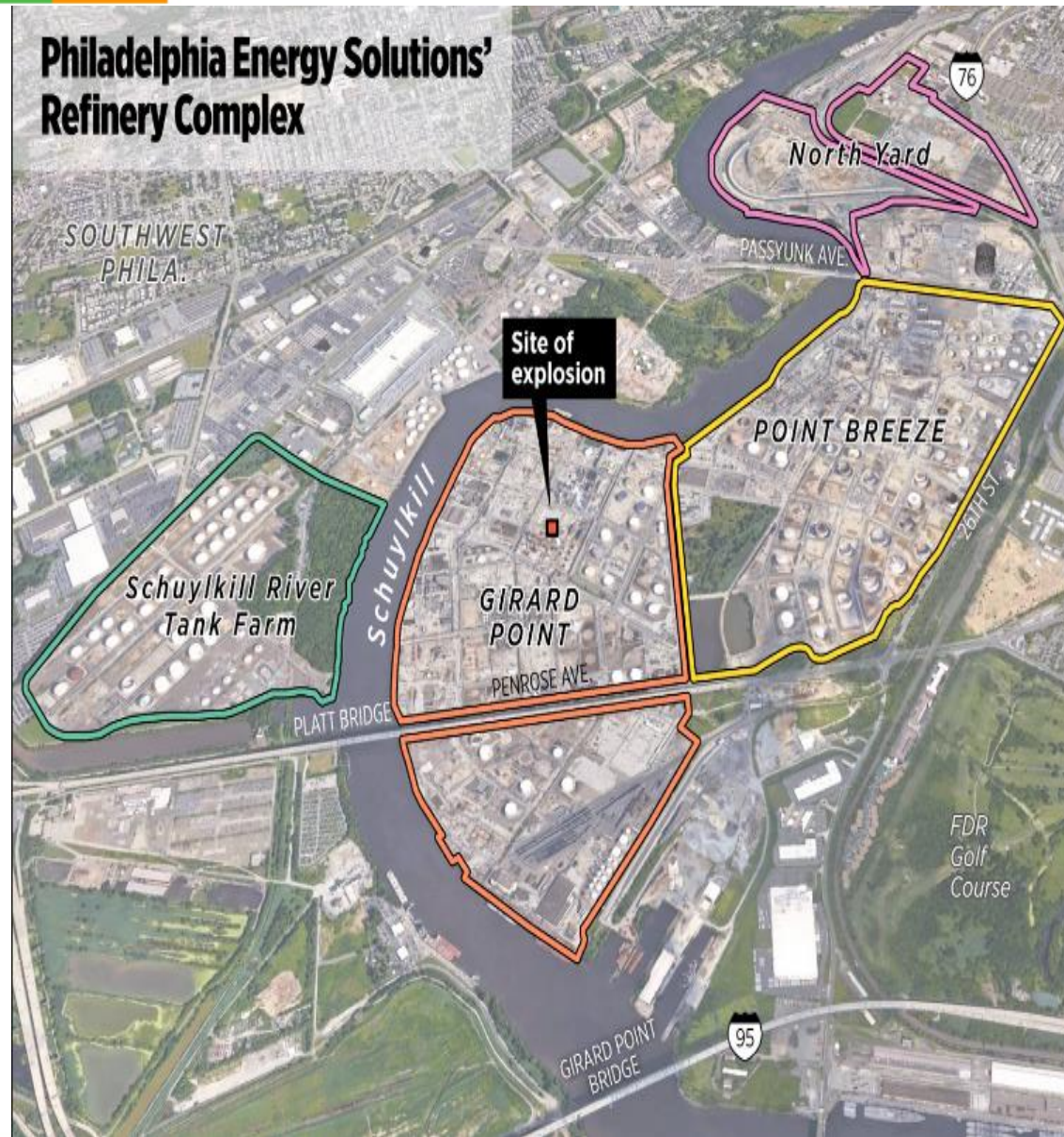


Trends in Annual Ozone

Ozone Design Value at NEA



Philadelphia Energy Solutions' Refinery Complex



Source: Philadelphia Inquirer, 6-29-2019 (<https://www.inquirer.com/business/philadelphia-refinery-fire-plan-to-close-20190626.html>)

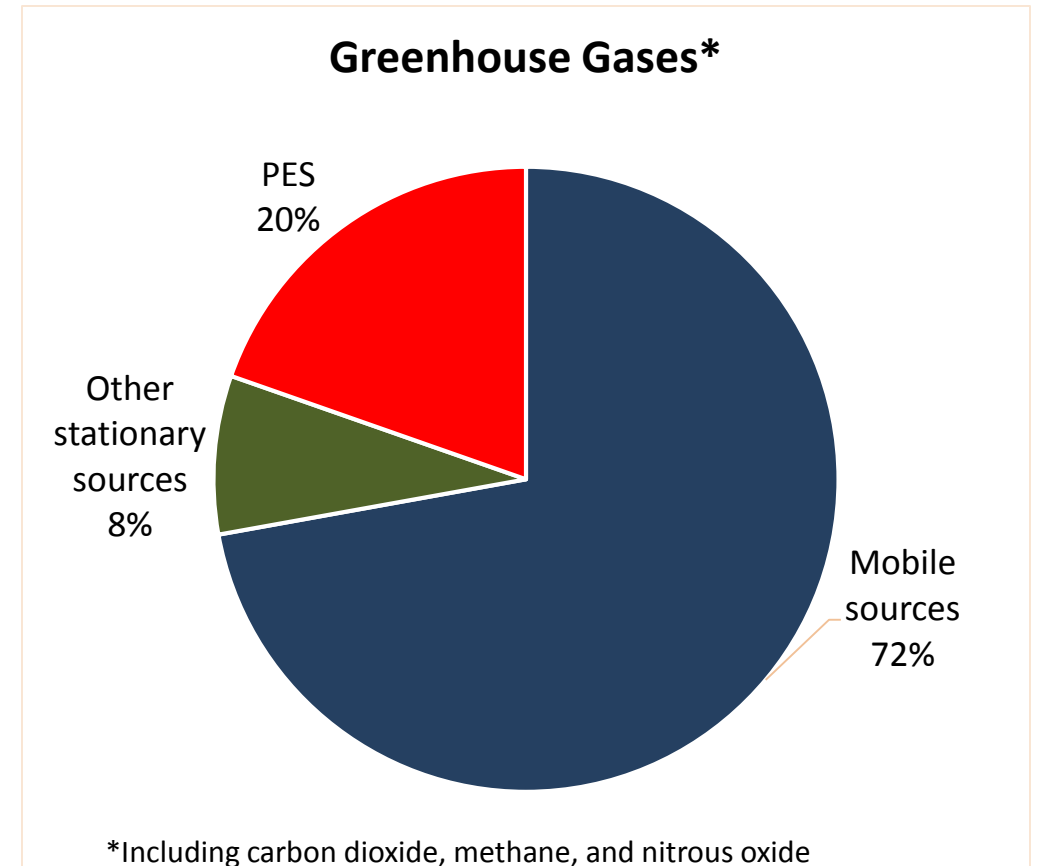
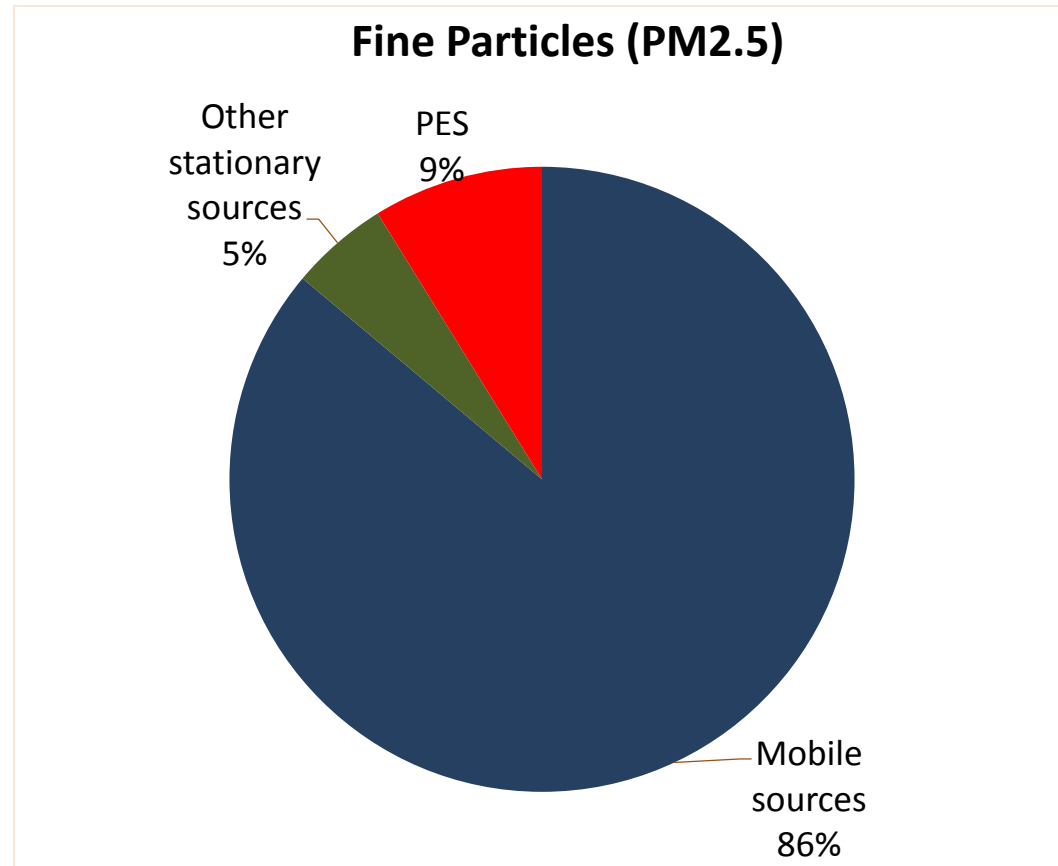
Sources of Air Pollution at PES

- Distillation Unit
- Alkylation Unit
- Pumps, air compressor, fans
- Steam generating boilers
- Process heaters
- Flares
- Cracking units
- Sulfur recovery unit
- Catalytic reforming unit
- Hydrogen production unit
- Storage tanks
- Wastewater treatment
- CO Boilers

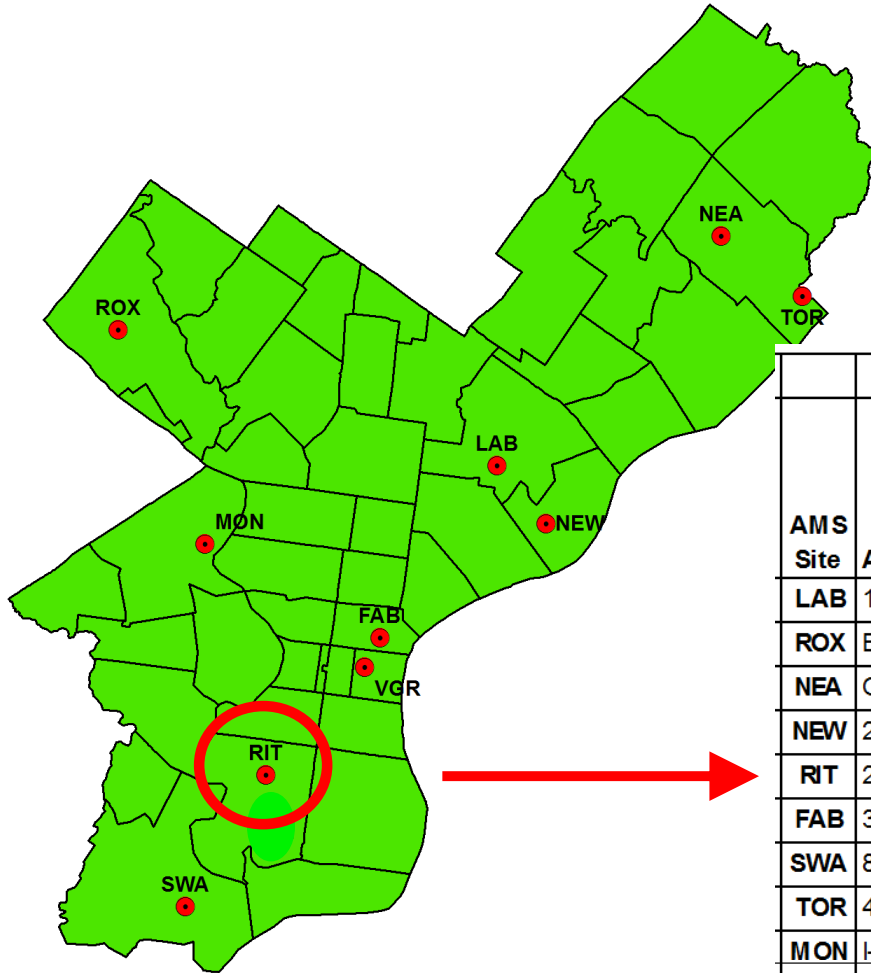
Monitoring of Emissions from PES

- Stack tests when source is installed or modified and generally repeated every 5 years.
- Continuous Emission Monitors (CEMs) that measure certain pollutants on continuous basis
 - Quarterly reports submitted to AMS -> DEP, EPA
- Inspections by AMS and EPA
- Fence line air monitors:
 - Particulate matter (PM_{2.5} and PM₁₀), ozone, SO₂, lead, CO, NO_x, H₂S
 - Benzene

Estimated emissions from PES vs. other sources in Philadelphia

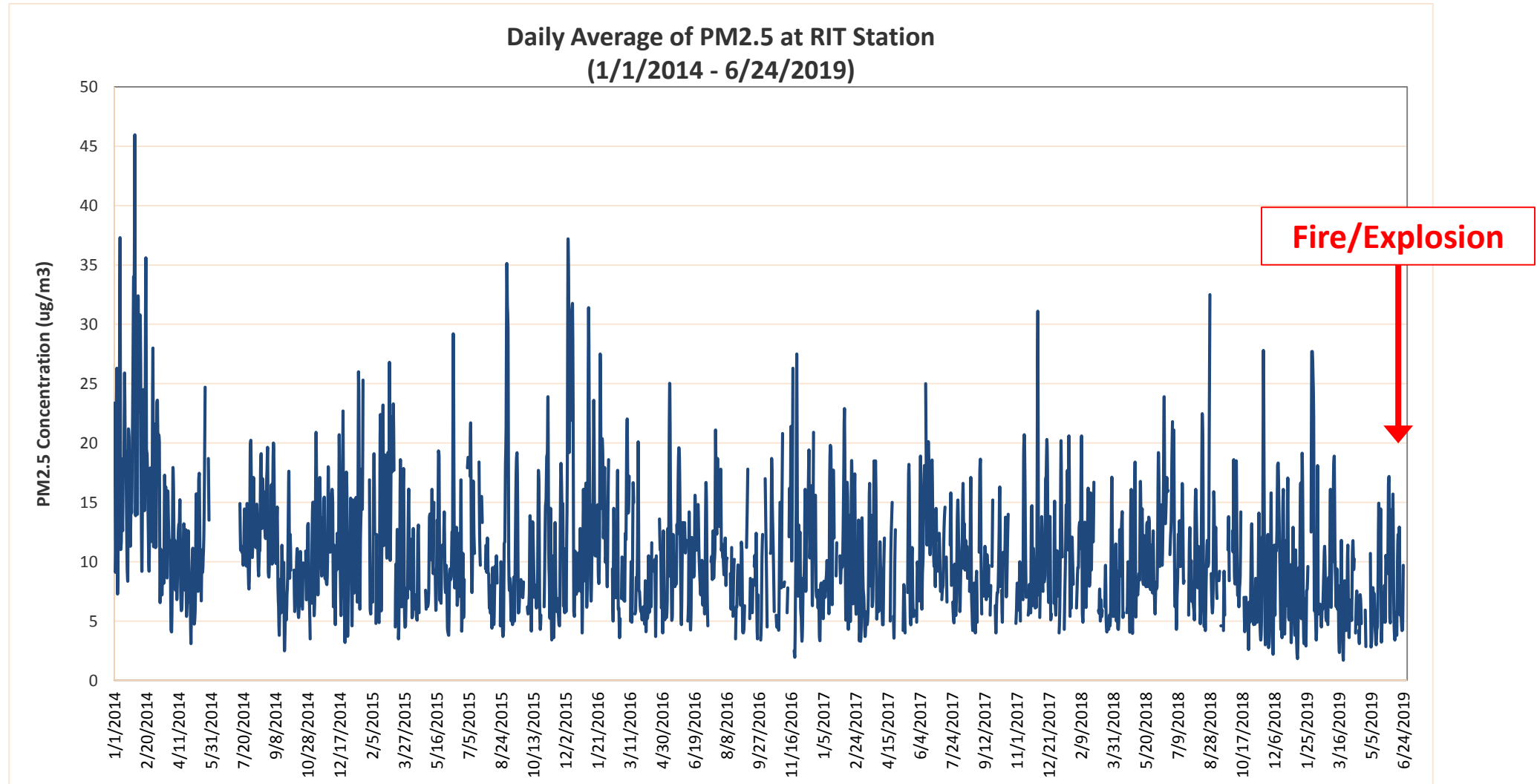


City-Wide Air Monitoring Network

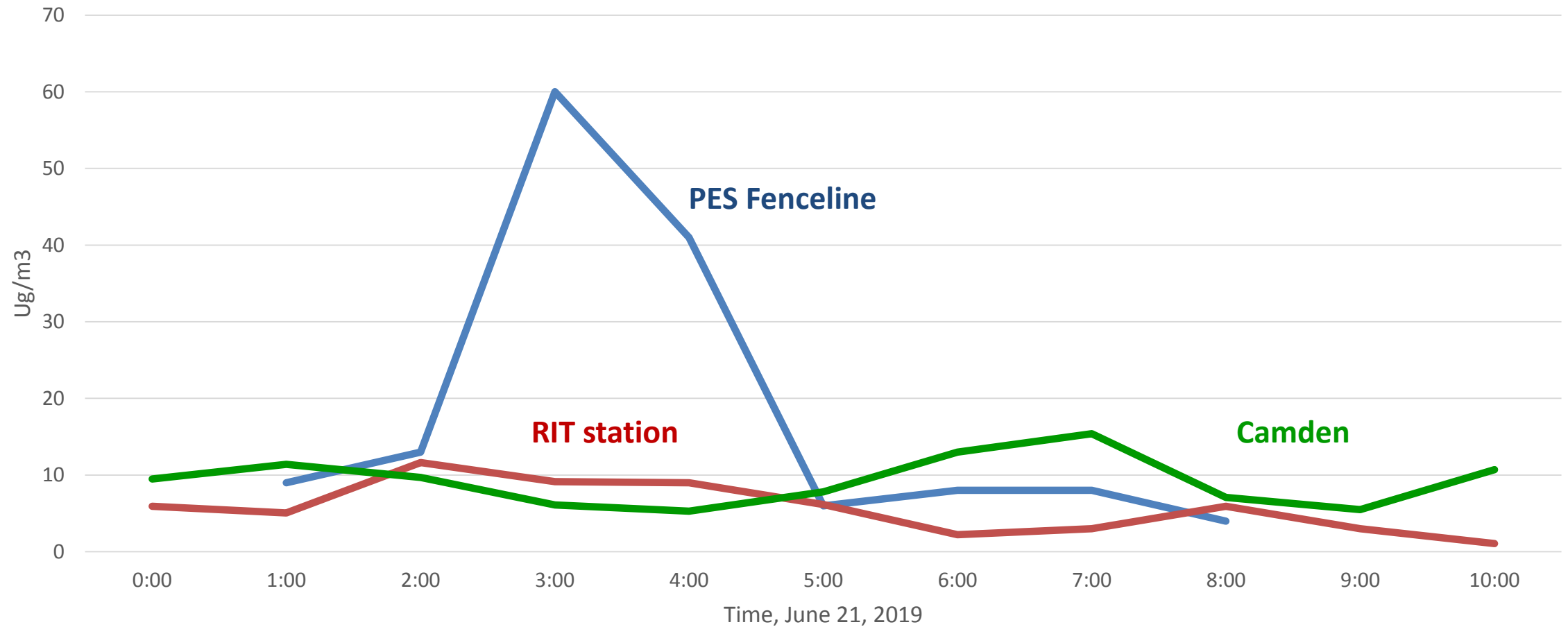


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PM2.5 at RIT Station



Fine Particle Pollution at PES and Nearby Stations On Morning of Fire/Explosion

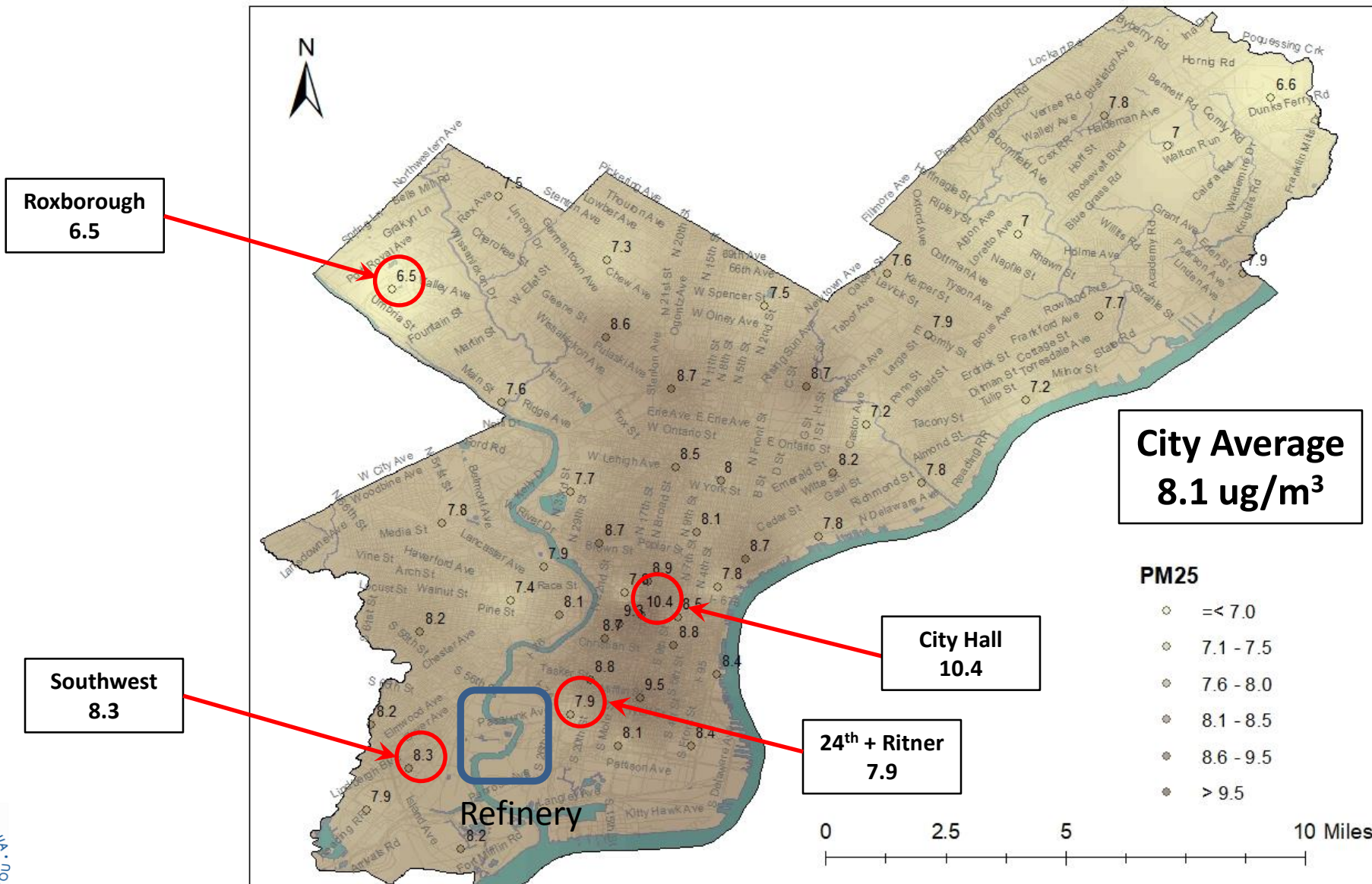


Philadelphia Air Quality Survey Sampling Units



Annual Average PM2.5 in Monitoring Sites

Preliminary Results from PAQS



Summary

- Air pollution levels in Philadelphia far lower than previously, but further improvements would help human health
- PES is a significant source of air pollution and greenhouse gases in Philadelphia
 - Mobile sources (vehicles and equipment) are cumulatively far greater contributors
- Levels of PM_{2.5} in neighborhoods near PES similar to city-wide average
- No evidence that fire/explosion on June 21 increased levels of air pollutants in neighborhoods nearby

