

Updates to the PM_{2.5} and Lead National Ambient Air Quality Standards (NAAQS)

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Presenters:

Chris Ward, PE // Technical Manager

Dan Dix // Technical Director

Roy Rakiewicz // Senior Consultant

Moderator: Amy Marshall, PE // Air Practice Director



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PM NAAQS Background

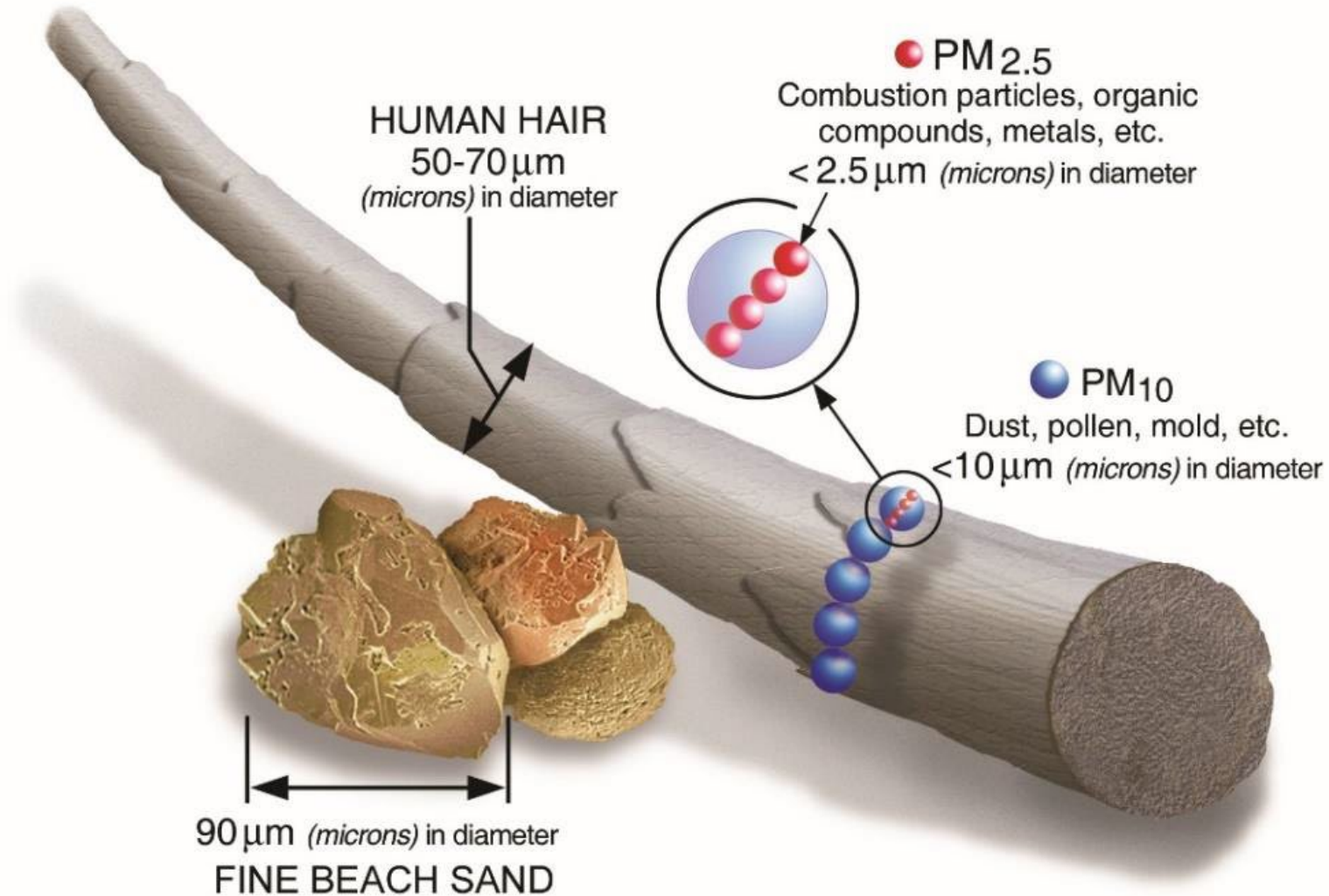
- What is Particulate Matter (PM)
- History of PM National Ambient Air Quality Standards (NAAQS)
- PM Reconsideration Progress
- Potential PM_{2.5} Nonattainment Areas



What is PM

- United States Environmental Protection Agency (U.S. EPA) refers to particulate matter as a complex mixture of extremely small particles and liquid droplets.
- The following subcategories of particulate matter are regulated:
 - Coarse particles – particles between 2.5 micrometers and 10 micrometers in diameter, referred to as particulate matter less than 10 microns (PM_{10}).
 - Fine particles – particles less than 2.5 micrometers in diameter ($PM_{2.5}$)
 - Primary $PM_{2.5}$ – directly emitted into air as solid or liquid particles
 - Secondary $PM_{2.5}$ – formed by chemical reactions of gases in the atmosphere

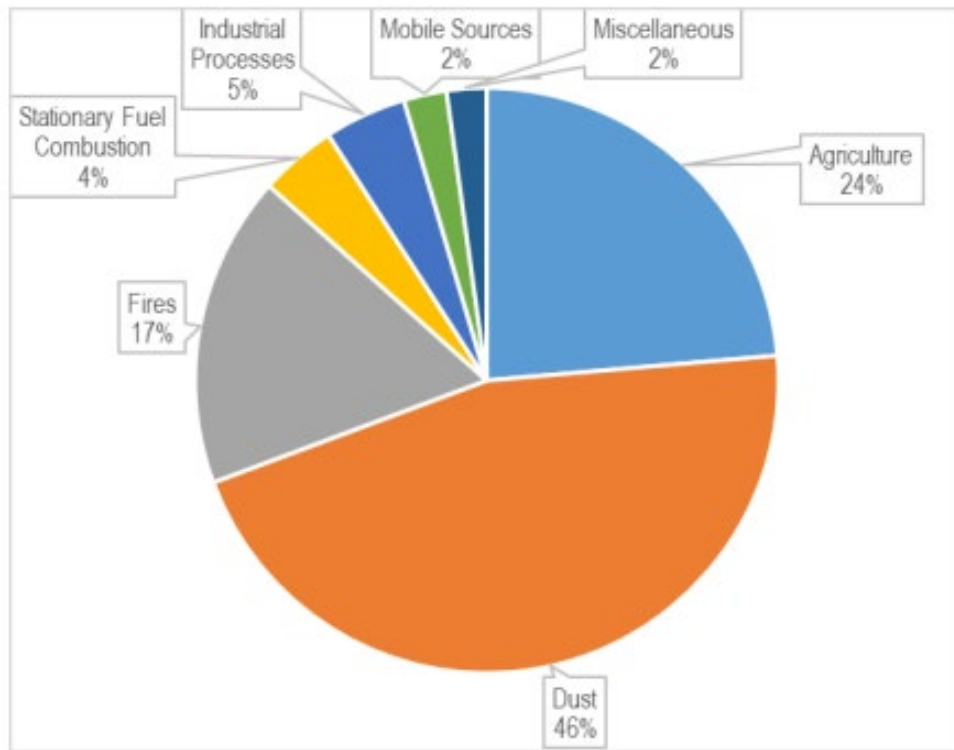
What is PM



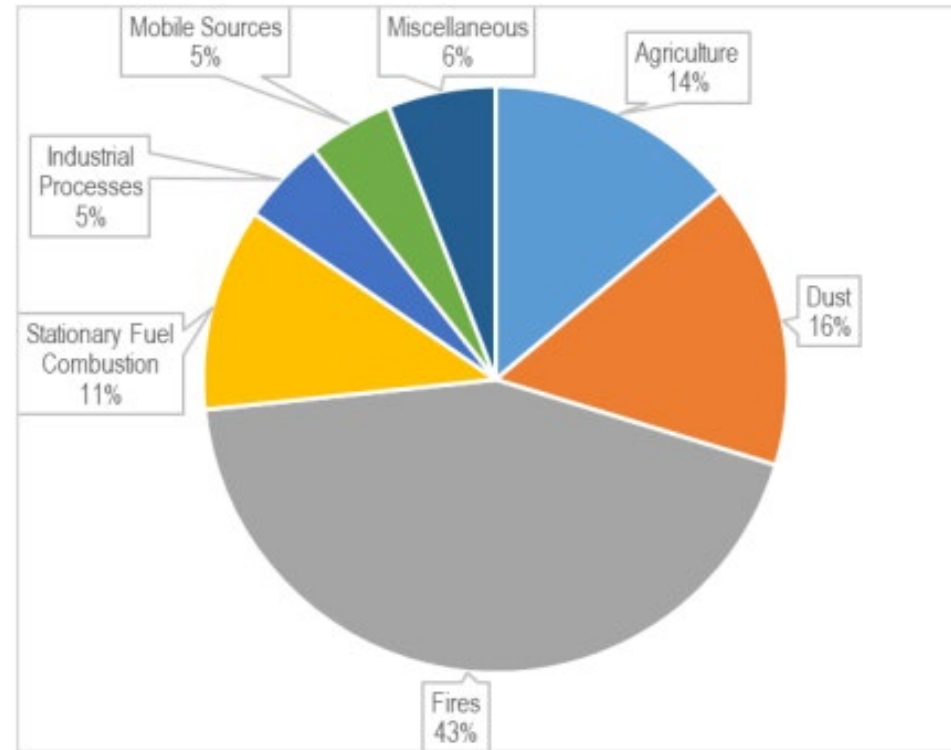
Source: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>

What is PM

Percent contribution of PM₁₀ national emissions by source sectors, 2017 NEI Data



Percent contribution of Primary PM_{2.5} national emissions by source sectors, 2017 NEI Data



Source: Figures 2-2 and 2-3 from Policy Assessment for Reconsideration of National Ambient air Quality Standards for Particulate Matter



History of PM NAAQS

- 1971 – 24-hour and annual (Total suspended particulate (TSP) standards (260 and 75 $\mu\text{g}/\text{m}^3$)
- 1987 – replaced TSP with 24-hour and annual PM_{10} (150 and 50 $\mu\text{g}/\text{m}^3$)
- 1997 – added 24-hour and annual $\text{PM}_{2.5}$ standards (65 and 15 $\mu\text{g}/\text{m}^3$)
- 2006 – lowered 24-hour $\text{PM}_{2.5}$ NAAQS to 35 $\mu\text{g}/\text{m}^3$, revoked annual PM_{10} NAAQS
- 2012 – lowered the annual $\text{PM}_{2.5}$ NAAQS to 12 $\mu\text{g}/\text{m}^3$



History of PM NAAQS

- December 2020 – the existing primary 24-hour PM_{10} , 24-hour and annual $PM_{2.5}$ NAAQS were retained without revision. The secondary PM_{10} and $PM_{2.5}$ standards were also retained without revision.
- June 2021 – U.S. EPA announces it will reconsider the December 2020 decision to retain all the existing primary and secondary PM_{10} and $PM_{2.5}$ standards.

History of PM NAAQS

□ Current PM NAAQS

Pollutant	Primary/Secondary	Averaging Time	Level	Form of the Standard
PM ₁₀	Primary and secondary	24 hours	150 ug/m ³	Not to be exc >1/yr avg over 3 yr
PM _{2.5}	Primary Secondary Primary and secondary	1 year 1 year 24 hours	12.0 ug/m ³ 15.0 ug/m ³ 35 ug/m ³	Ann mean avgd over 3 years Ann mean avgd over 3 years 98 th percentile avgd over 3 years

*Note that some states have TSP standards



Reconsideration Progress

- Clean Air Act (CAA) requires the following steps to be conducted by EPA when reviewing the NAAQS:
 - **Planning**
 - **Integrated Science Assessment (ISA)**
 - **Risk/Exposure Assessment (REA)**
 - **Policy Assessment (PA)**
 - **The Clean Air Scientific Advisory Committee (CASAC)** provides consultation and peer review.
 - **Rulemaking:** Taking into consideration the information in the ISA, REA(s), and PA and the advice of CASAC, EPA proposes a rule, takes comment, and promulgates a final rule.



Reconsideration Progress

- Draft Supplement to the ISA – September 2021
- Final Supplement to the ISA – May 2022
- Draft Policy Assessment for Reconsideration of PM NAAQS – October 2021
- Final Policy Assessment for Reconsideration of PM NAAQS – May 2022
 - Updated policy assessment continues to support no change to PM₁₀ standards
 - Consensus among CASAC members that annual PM_{2.5} standard should be lowered, somewhere between 8-12 ug/m³.
 - Difference in opinion among CASAC members on whether 24-hour PM_{2.5} standard should be lowered, with some members arguing for as low as 25 ug/m³.



Reconsideration Progress

- Final step is to take CASAC and public comments into consideration and draft a rulemaking for a proposed revised PM_{2.5} NAAQS.
- Proposal was originally planned for Summer 2022. Has been at Office of Management and Budget (OMB) for review since August 16, 2022. The proposed rulemaking is imminent.
- Final rule originally planned for Spring 2023.



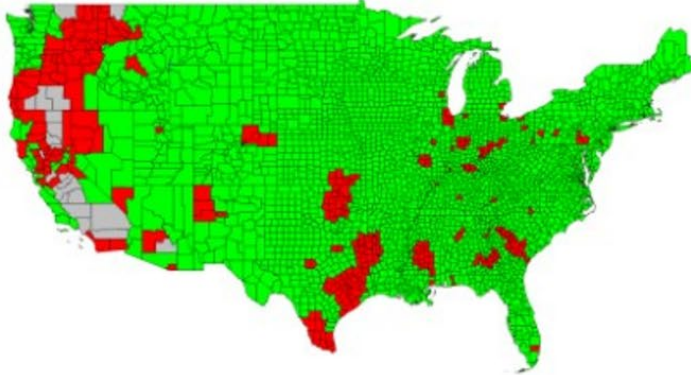
Potential Nonattainment Areas

- Currently only 18 of 518 PM_{2.5} ambient monitors have a 2019-2021 annual design value that is greater than the current annual PM_{2.5} NAAQS (12 µg/m³).
- If the PM_{2.5} annual NAAQS were lowered to 8 µg/m³ the number would jump to 229 of 518 PM_{2.5} ambient monitors being greater. These would mostly be located around major metropolitan areas and most of the west coast.

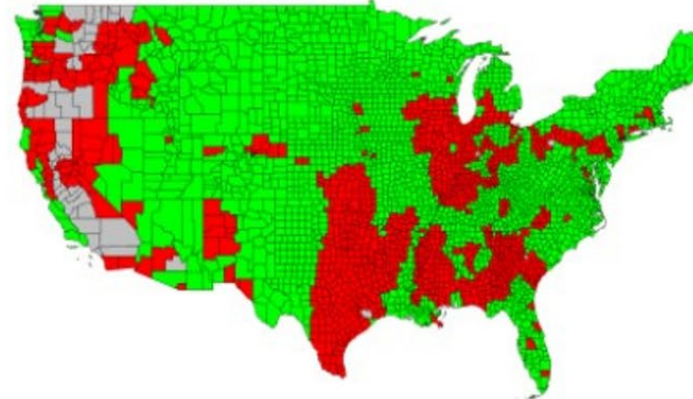
Potential Nonattainment Areas

Headroom at various annual PM_{2.5} standards

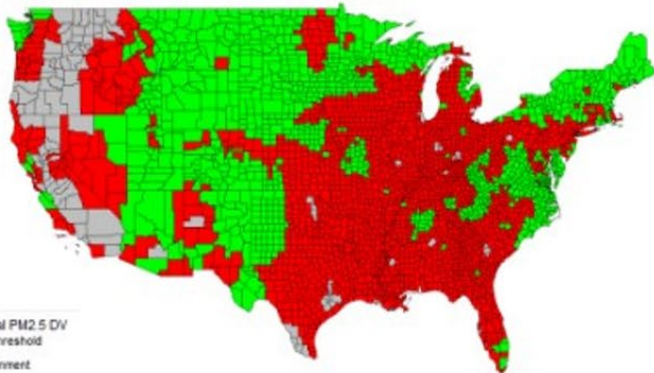
Headroom to 12 µg/m³



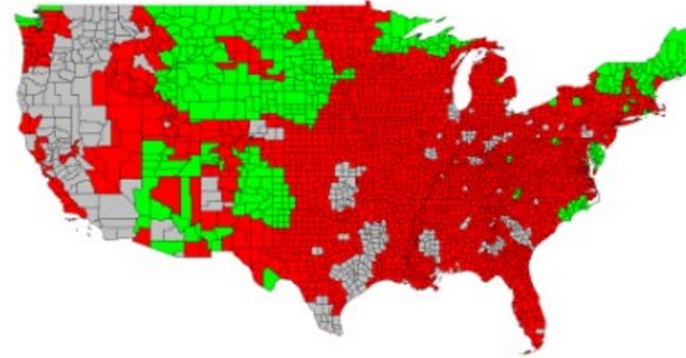
Headroom to 11 µg/m³



Headroom to 10 µg/m³



Headroom to 9 µg/m³



Grey – nonattainment
Red – 1-3 µg/m³ difference
Green – 3+ µg/m³ difference

2019-2021 Annual PM_{2.5} DV
Headroom to Threshold
Grey – Nonattainment
Red – 1-3 µg/m³
Green – 3+ µg/m³

Non-monitored county values are calculated using inverse distance weighting average of five closest monitored values

Source: Greg Stella, Alpine Geophysics

Implications of PM_{2.5} NAAQS Revisions

- Nonattainment Area Requirements
- Trouble Determining Accurate Emissions
- Air Dispersion Modeling



Nonattainment Area Requirements

- For nonattainment areas, states will develop SIPs that will contain specific rules and provisions aimed at bringing the areas back into compliance with the standard.
- Nonattainment new source review (NNSR) permits include additional requirements, including offsets, lowest achievable emissions rate, and the alternative sites analysis.



Trouble Determining Accurate Emissions

- ❑ There are no currently approved U.S. EPA test methods for measuring emissions of $PM_{2.5}$ from a wet stack.
- ❑ There is positive bias in Method 202.
- ❑ There isn't very good emissions factor data for a lot of sources. There will be a lot of work needed to refine existing emissions rates as most facilities have been using a conservative approach for many years.



PM_{2.5} NAAQS Modeling Implications

- ❑ Lowered annual PM_{2.5} NAAQS will impact air quality modeling permitting requirements immediately upon finalization of a new standard.
- ❑ Depending on where you're located air quality modeling is not just required for large PSD permitting projects.
- ❑ Many states have “minor NSR” NAAQS modeling requirements for state level permitting.
- ❑ Some states have NAAQS modeling requirements as part of the Title V renewal process that may only be triggered by a change in the NAAQS.



PM_{2.5} NAAQS Modeling Implications

- While lowered PM_{2.5} NAAQS will result in new/more nonattainment designations and resulting NNSR permitting requirements that don't include air quality modeling requirements the NNSR permitting provisions include requirements to ensure sources in nearby attainment counties don't contribute "significantly" in nonattainment areas.
- This usually requires applicants to demonstrate that PM_{2.5} impacts are less than the PM_{2.5} SILs in nearby nonattainment areas.

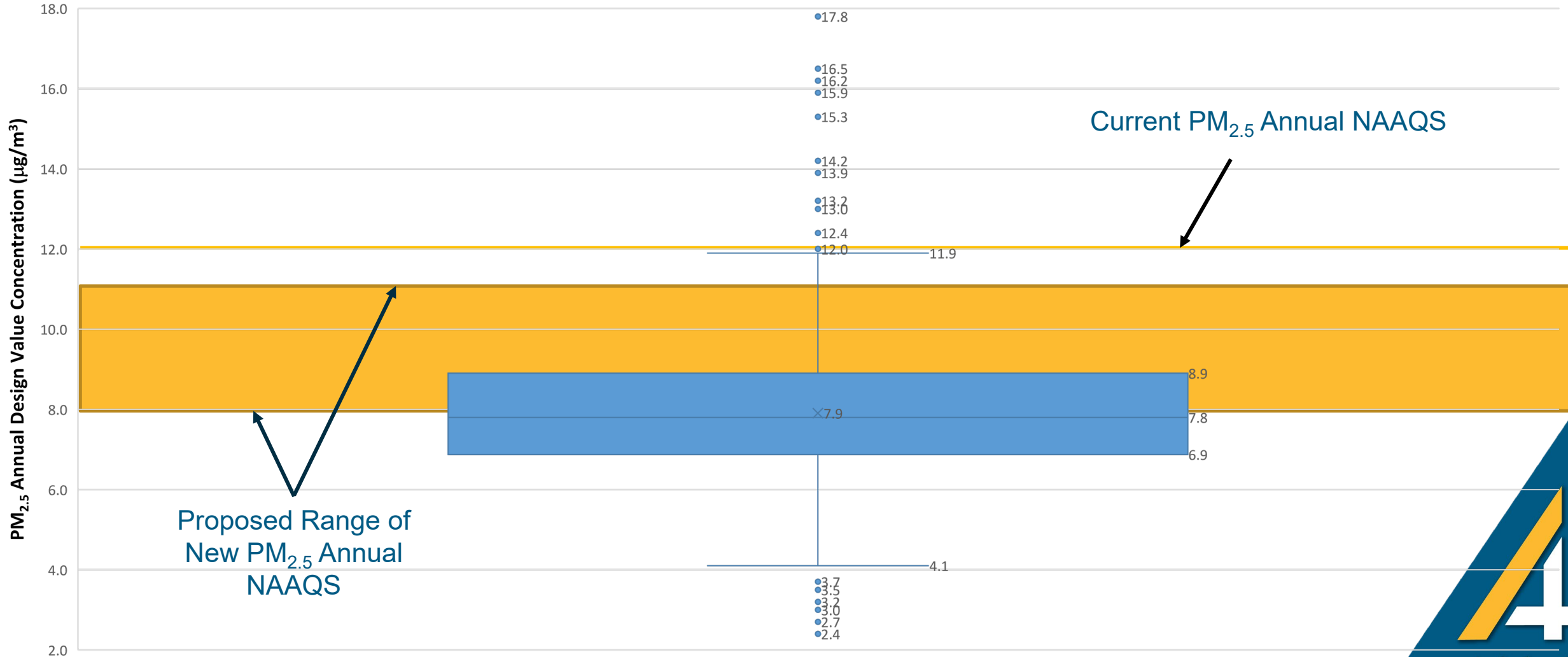


PM_{2.5} NAAQS Modeling Implications

- Biggest impact will be the reduced “headroom” when conducting NAAQS air quality modeling demonstrations that require the inclusions of background concentrations from representative ambient monitoring stations.
- The current 2019-2021 average annual design value across all U.S. PM_{2.5} ambient monitors is 7.9 µg/m³.
- U.S. EPA’s current modeling guidance requires addition of design concentration to peak annual modeled concentration.

PM_{2.5} NAAQS Modeling Implications

U.S. - Wide Annual PM_{2.5} Monitored Design Values (2019-2021 Average)





PM_{2.5} NAAQS Modeling Implications

- This means that the U.S. wide PM_{2.5} annual NAAQS headroom will shrink to between 0.1 µg/m³ and 3.1 µg/m³.
- A headroom below the current annual PM_{2.5} SIL (0.2 µg/m³) has further implications because a SIL modeling demonstration may no longer be allowed which is often a modeling strategy to avoid more difficult NAAQS modeling.

PM_{2.5} NAAQS Modeling Implications

□ Is there any good news?

- We don't anticipate that the PM_{2.5} SIL (0.2 μg/m³) would be lowered based on how U.S. EPA established the PM_{2.5} SILs. It's not based on a % of the NAAQS and already lower % of NAAQS than other pollutants.
- There is no precedent for lowering the PSD increment concentrations when a NAAQS is lowered. Current PM_{2.5} PSD increment concentrations are
 - 4 μg/m³ Annual
 - 9 μg/m³ 24-Hour



PM_{2.5} NAAQS Modeling Implications

□ Final thoughts:

- Current NAAQS modeling approach of adding the monitored design value to the modeled design value is overly conservative and needs to be revisited with a lowered PM_{2.5} NAAQS.
- An approach similar to the Tier 2 approaches for PM_{2.5} 24-hour, 1-hour NO₂, and 1-hour SO₂ which allow for combination of modeled and monitor concentrations that account for seasonal variations should be considered.
- Still have up to a year until the PM_{2.5} annual NAAQS will be finalized so there is time to get your project permitted under the existing NAAQS levels, but time is running out quickly!

PM_{2.5} NAAQS Modeling Implications

- Final thoughts (continued):
 - If an air quality modeling demonstration can't be achieved, it may be time to consider an ambient monitoring demonstration.
 - There is precedent for ambient monitoring demonstrating compliance with the PM_{2.5} NAAQS to meet a Title V Permit condition where the state required an air quality modeling demonstration as part of the Title V renewal.





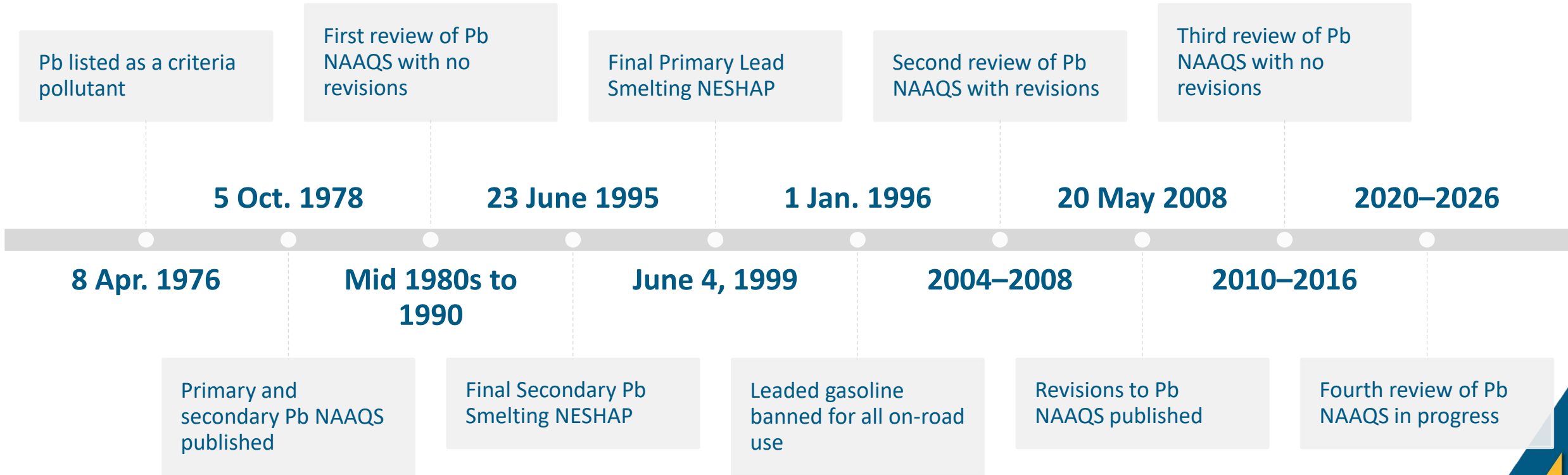
Lead NAAQS Updates



Why is Pb Different?

- Pb is a neurotoxin:
 - *“Additionally, within the range of blood Pb levels investigated for such effects - mean blood Pb levels below 10 µg/dL in variously aged children, extending from 8 down to 2 µg/dL - a threshold level for neurocognitive effects was not identified” (73 FR 66976, November 12, 2008)*
- Pb presents multi-media exposure issues
 - Emitted to air and dispersed as particulate matter
 - Deposited Pb can be resuspended in air
 - Pb is persistent and can contribute to multimedia exposure for many years
- Pb is a Hazardous Air Pollutant (HAP)
- Pb nonattainment areas are generally stationary source centric
 - Affected industries are highly regulated but emissions still occur

Lead NAAQS History



Forms of the Pb Standard

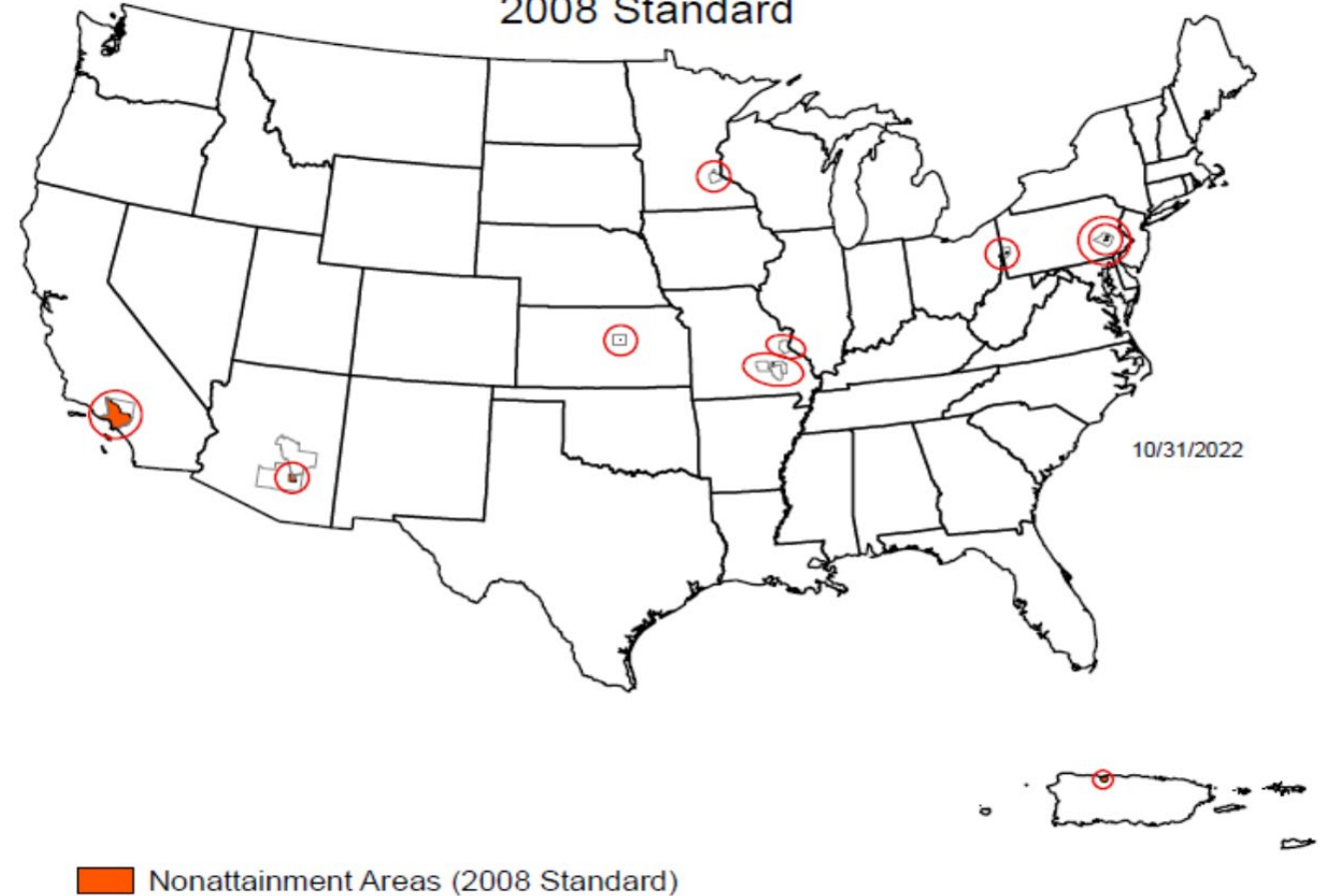


- 1978 Pb NAAQS
 - **1.5 $\mu\text{g}/\text{m}^3$** - primary and secondary standards
 - Maximum arithmetic mean concentration averaged over a calendar quarter
- 2008 Pb NAAQS
 - **0.15 $\mu\text{g}/\text{m}^3$** - primary and secondary standards
 - Maximum rolling three-month average evaluated over a three-year period
- Ambient Monitoring
 - High volume air sampler
 - Measured as Pb in total suspended particles (Pb-TSP)
 - 1 in 6-day sampling frequency
- 2008 Monitoring Network Changes
 - Source-oriented monitors in core based statistical areas
 - Sources emitting > 1.0 tpy of Pb

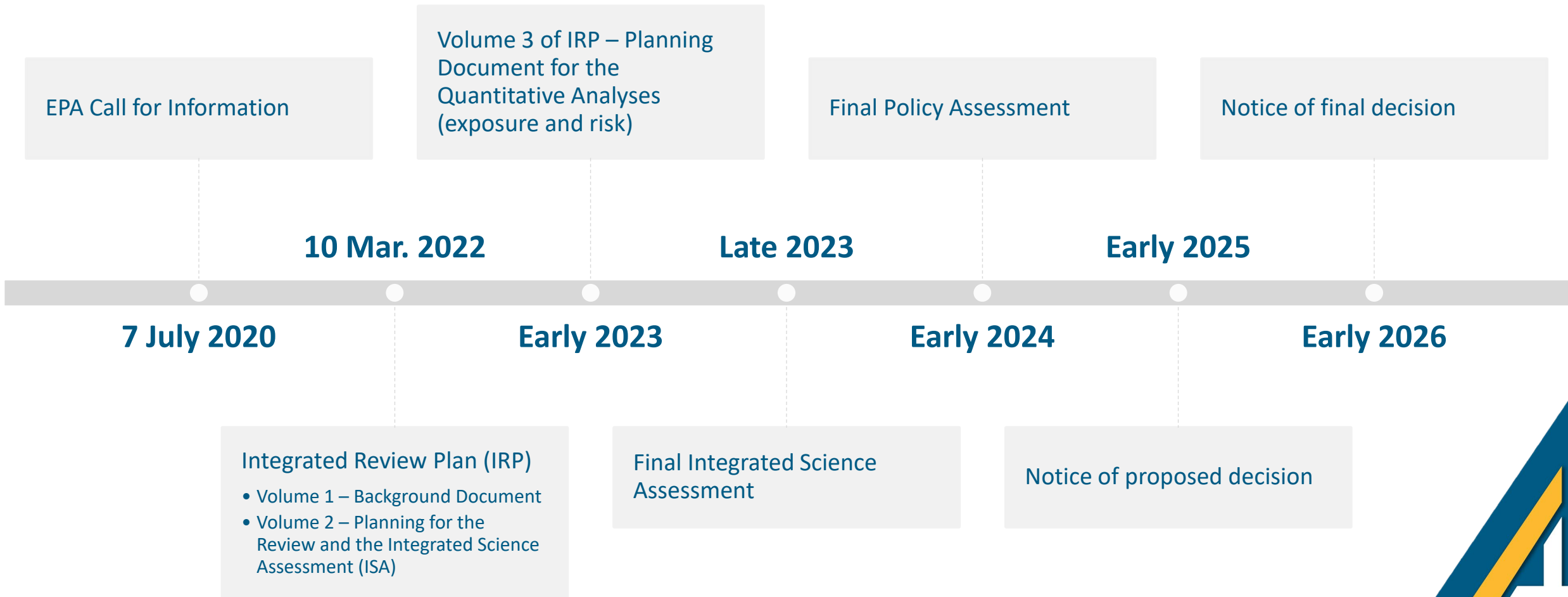
Pb Sources/Nonattainment Areas

Sources (2017 NEI)	Tons
Aircraft	468
Industrial Processes - NEC	44
Ferrous Metals	40
Non-ferrous metals	25
Industrial Boilers (coal/oil/biomass)	19
Waste Disposal	11
Electric Generation (coal)	8
Chemical Manufacturing	4
Marine Vessels	4
Pulp and Paper	4
Petroleum Refineries	4
Mining	4

Counties Designated Nonattainment for Lead
2008 Standard



Current Pb NAAQS Review Timeline





Possible Implications of a Tighter Pb NAAQS

- ❑ New Pb Nonattainment Areas
- ❑ Expansion of Ambient Pb Monitoring Locations
 - Coal-fired power plants, steel mills, municipal waste combustors
- ❑ Increased Pb Sampling Frequency
- ❑ More Stringent Regulations
- ❑ Intangibles
 - Environmental Justice



Conclusion



Webinar Key Takeaways

- A proposed rule reconsidering the 2020 PM NAAQS decision is imminent, likely resulting in a reduction in the annual PM_{2.5} standard.
- Many facilities will need to refine emissions estimates of PM_{2.5} to obtain permits.
- PM_{2.5} modeling will be more challenging but monitoring could be an alternative.
- The Pb standard will likely decrease in the next few years and Pb emissions could be more important to more types of facilities.



Conclusion of Series

- ❑ Final webinar of our NAAQS updates webinar series and our final webinar of 2022.
- ❑ Many interesting topics will be covered during webinars in 2023 – let us know what you would like to hear about.
- ❑ Stay tuned for our 2023 Lookahead series of articles in January!



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Questions or Comments?

Chris Ward, PE // Technical Manager
720-894-0829 // cward@all4inc.com

Dan Dix // Technical Director
610-422-1118 // ddix@all4inc.com

Roy Rakiewicz // Senior Consultant
610-422-1127 // rrakiewicz@all4inc.com

www.all4inc.com