



# **Fine Particulate Matter in the San Francisco Bay Area**

## **An Update on Regional and Local Assessments**



Stationary Source Committee Meeting  
July 8, 2019  
Judith Cutino, DO, PE  
Phil Martien, PhD

# Overview

- Recent science findings reaffirm significant health impacts of fine particulate matter (PM<sub>2.5</sub>)
- Bay Area PM<sub>2.5</sub> concentrations trending down
- However, important near-source exposures remain
- What sources drive PM<sub>2.5</sub> exposures?
  - For the region
  - Near sources (West Oakland example)
- Innovating methods for determining PM<sub>2.5</sub> impacts to support emission reductions

# What is the Integrated Science Assessment for Particulate Matter (PM ISA)?

- Assesses scientific information on health effects of PM
- Scientific basis for the PM National Ambient Air Quality Standard (NAAQS)
- Clean Air Act requires Environmental Protection Agency (EPA) to set standards for PM and five other pollutants harmful to public health and the environment
- Requires EPA to review standards to provide adequate health and environmental protection, and update standards as necessary
- Draft ISA PM was issued October 2018

# Key Findings of the Draft PM ISA

- Increased health impacts with increased exposure to PM<sub>2.5</sub>
- No safe level of exposure
- Health benefits from exposure reductions at levels below the current standard
- Insufficient evidence to support any types or sources of particulate matter being more strongly related to health effects than just the total amount of PM<sub>2.5</sub>

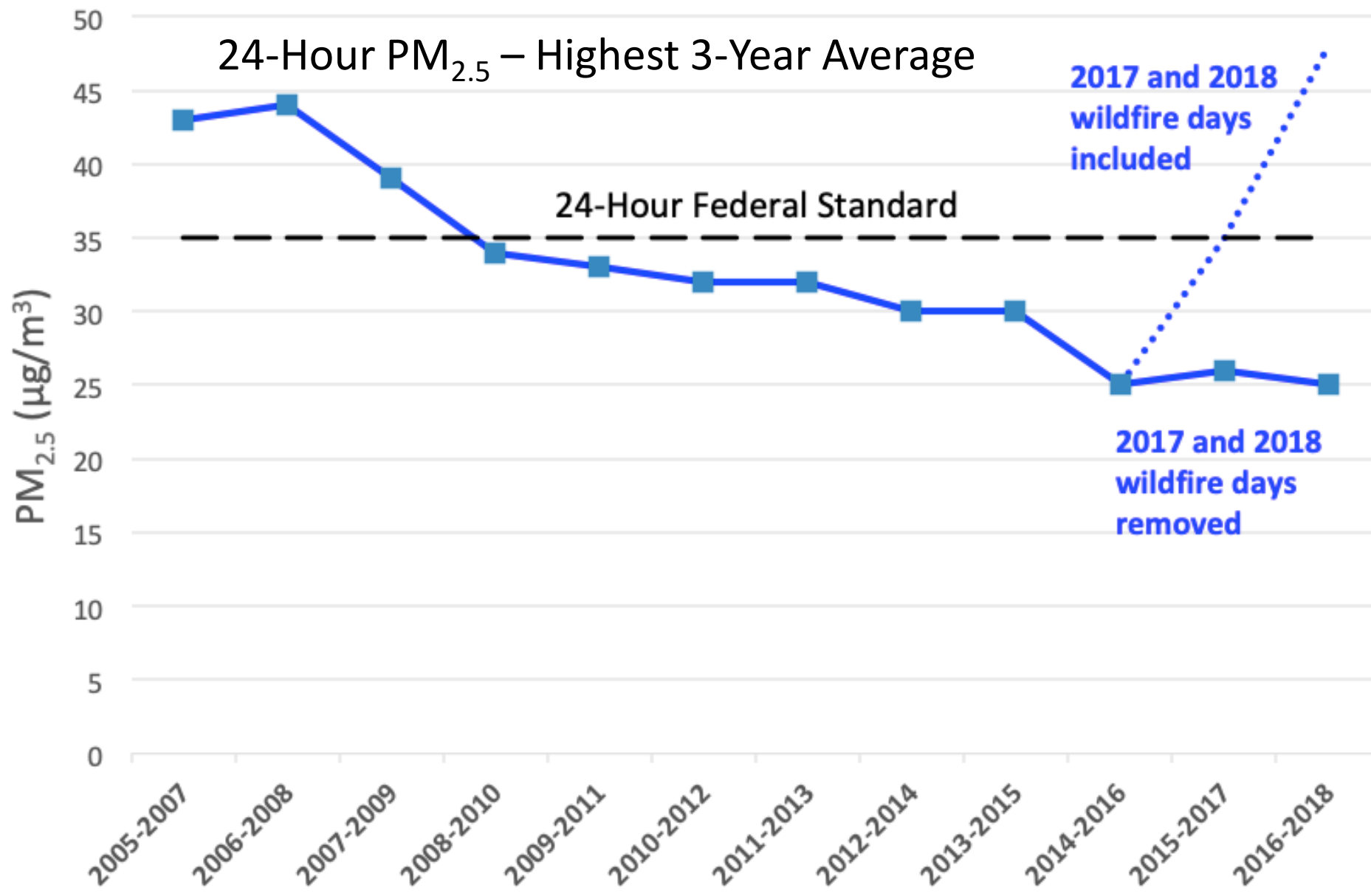
# Draft PM ISA Human Health Effects: Causal and Likely Causal Determinations

Health Outcome	PM <sub>2.5</sub> Exposure	Determination
Cardiovascular	Short-term and long-term	Causal
Mortality	Short-term and long-term	Causal
Respiratory	Short-term and long-term	Likely Causal
Cancer	Long-term	Likely Causal *
Nervous System **	Long-term	Likely Causal *

\* New determination or change in causality determination from 2009 PM ISA

\*\* Also Likely Causal relationship for ultrafine particles

# Bay Area PM<sub>2.5</sub> Trending Down



# However, Near-Source Exposures to PM<sub>2.5</sub> Remain

- Bay Area close to attaining PM<sub>2.5</sub> standards
- However in some areas, near-source exposures still impact health
- Innovative work underway at the Air District to assess near-source PM<sub>2.5</sub> exposures
  - Beyond attaining PM standards
  - For increased health protection, especially in Assembly Bill (AB) 617 communities
  - Exploring a risk-assessment type approach for PM<sub>2.5</sub>

# What Sources Drive PM<sub>2.5</sub> Exposures?

- For the region as a whole
- For areas near to emissions sources
  - Expect larger stationary sources with high stacks do not have significant local impacts, but need to assess this
  - Smaller stationary sources near residents—both permitted and non-permitted—may be having local impacts, also need to assess this
  - Exploring a risk-assessment approach for PM<sub>2.5</sub> from permitted sources

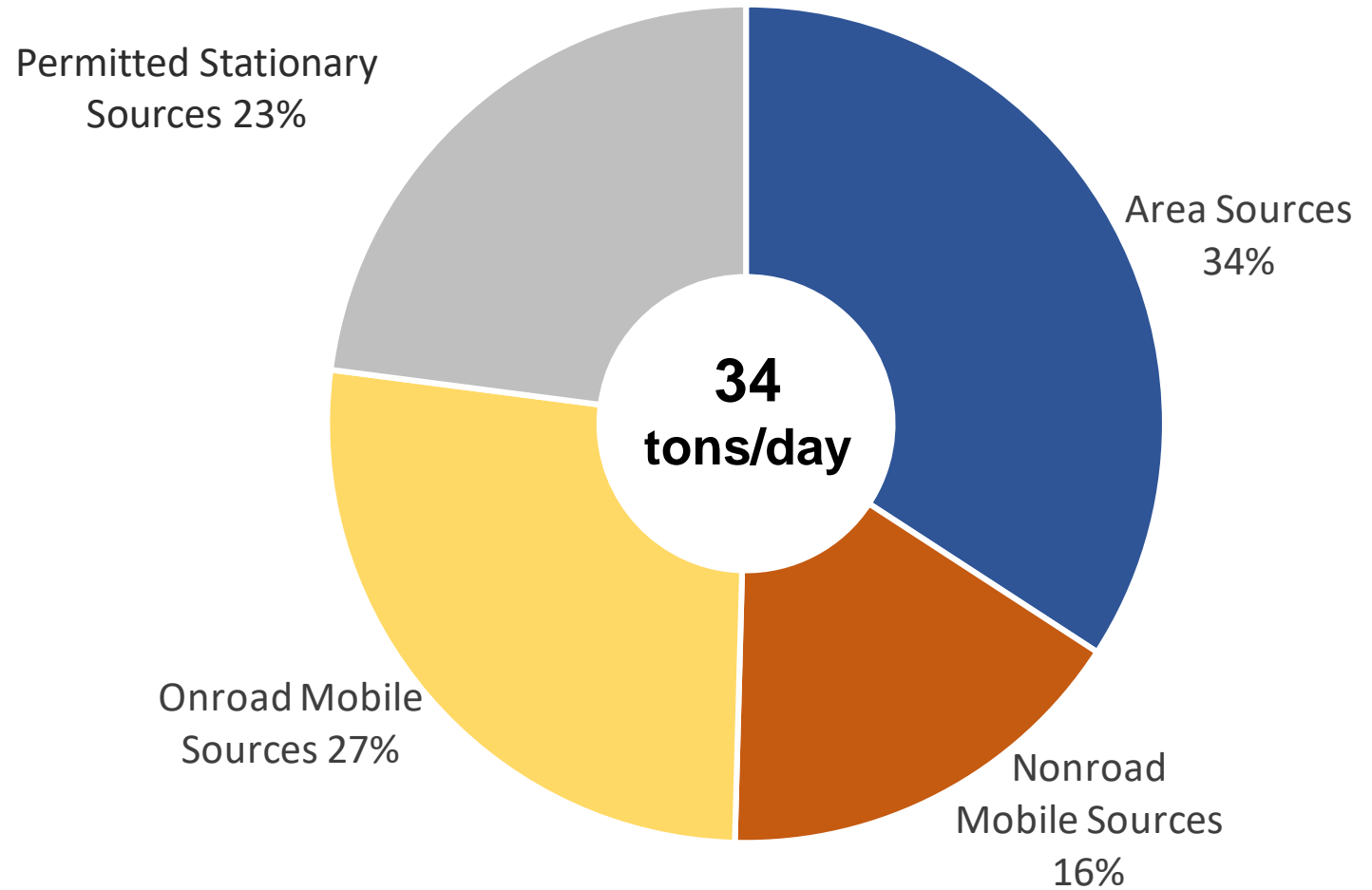


# Sources Contributing to Regional PM<sub>2.5</sub> Exposures in the Bay Area

- **Primary PM<sub>2.5</sub>:** Emitted directly from sources
- **Secondary PM<sub>2.5</sub>:**
  - Forms in the atmosphere from the reaction of precursor pollutants such as ammonia and nitrogen oxides
  - Accounts for about 47% of total annual average PM<sub>2.5</sub> in the Bay Area
- **Transport:** Primary and secondary PM<sub>2.5</sub> from the Central Valley can impact Bay Area, especially in winter

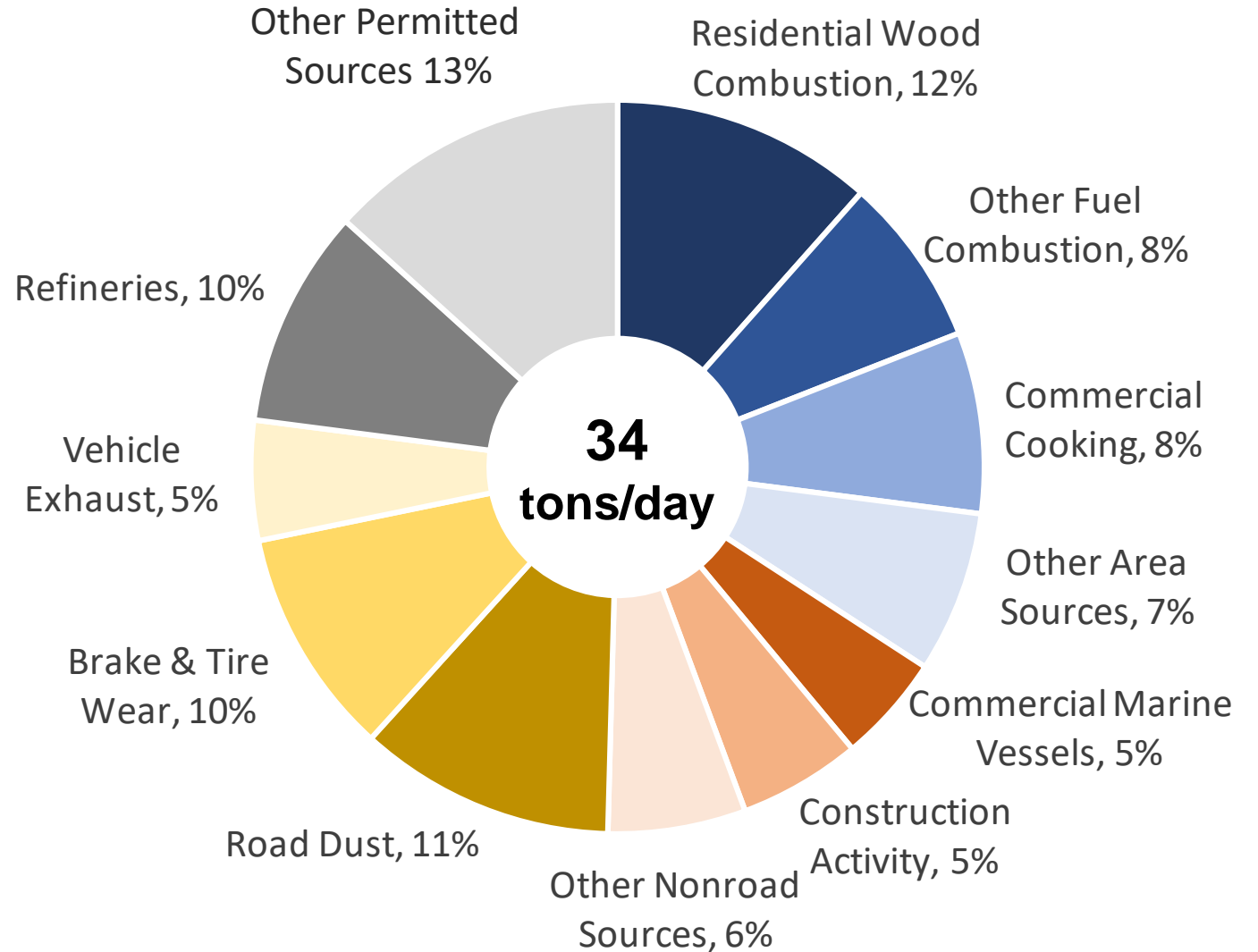
# PM<sub>2.5</sub> Bay Area Emissions Summary (Primary PM<sub>2.5</sub>)

2016 annual  
average PM<sub>2.5</sub>  
emissions



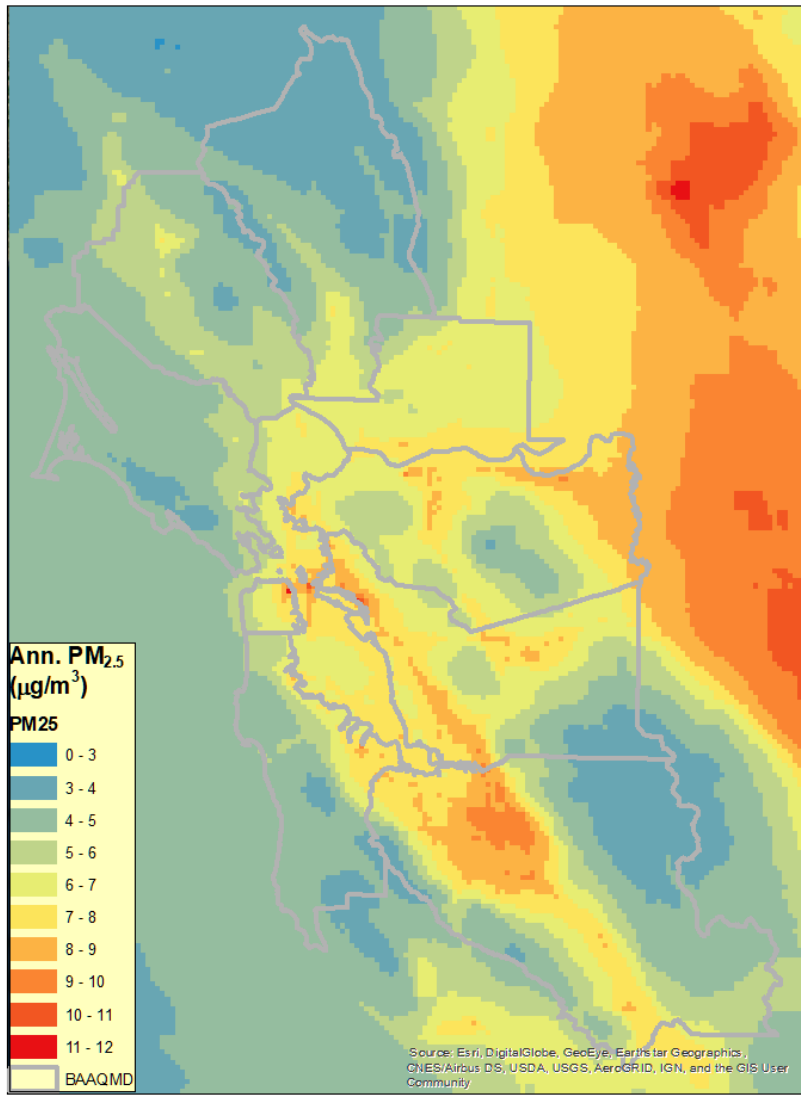
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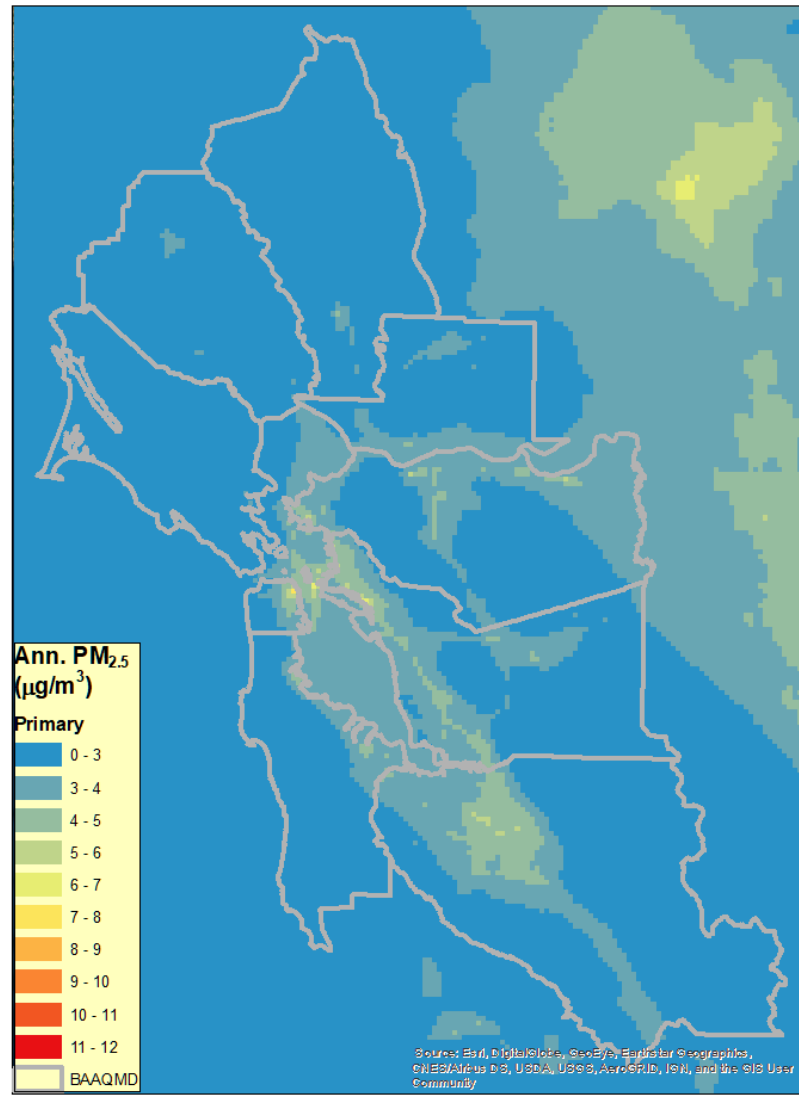


# Regional Modeling: Shows Primary and Secondary Contributions

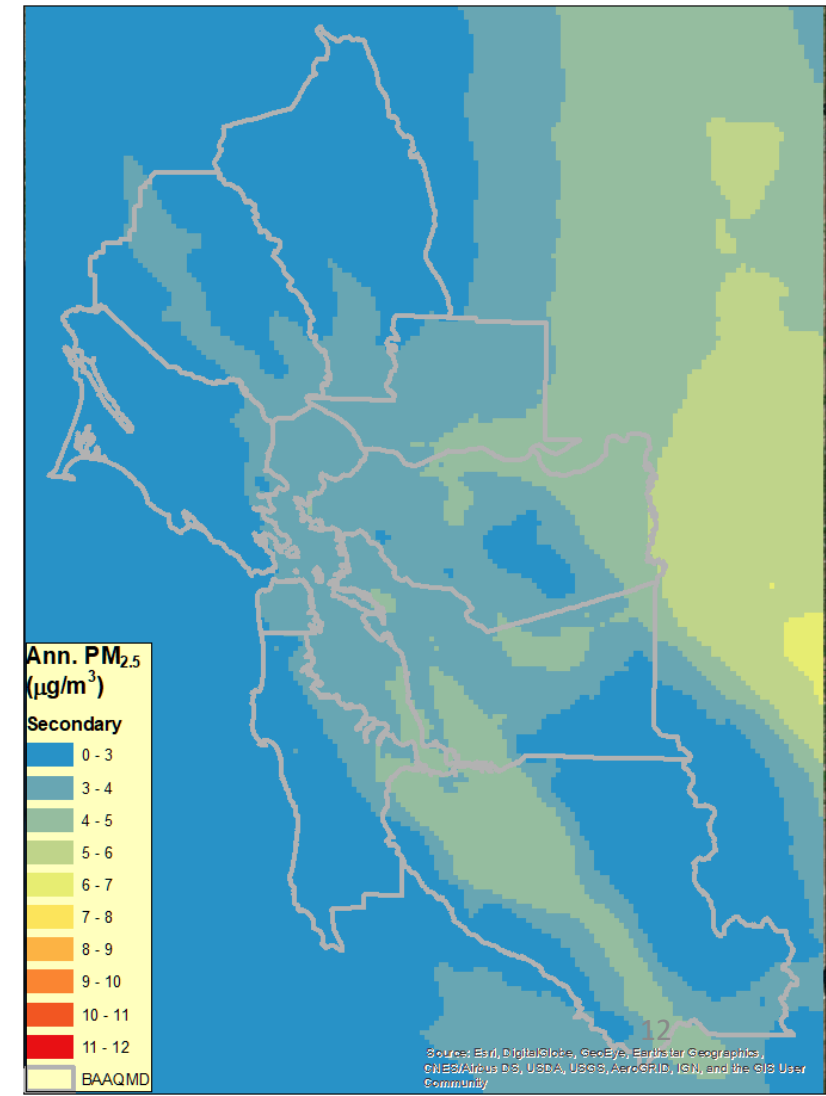
Total PM<sub>2.5</sub>



Primary PM<sub>2.5</sub> (about 53%)

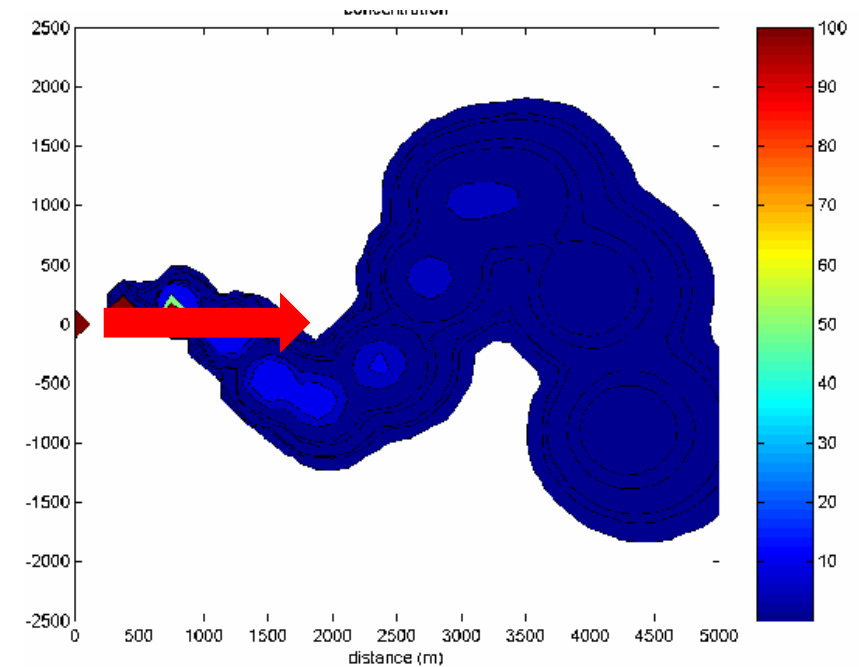


Secondary PM<sub>2.5</sub> (about 47%)



# Assessing Impacts from Large Stationary Sources

- Standard regional-scale models cannot track near-field impacts from individual sources—not fine-grained enough
- Standard community-scale models cannot track emissions in areas with complex wind patterns from hilly terrain or wind shear
- Air District staff are currently evaluating alternative modeling approaches:
  - Sub-grid plume tracking or puff models



## Examples:

- Refineries
- Large cement plant

# Assessing Impacts from Multiple Smaller Sources

- Air District conducted community-scale dispersion modeling for the West Oakland AB 617 Action Plan Technical Assessment
- For West Oakland, first-of-its-kind modeling was conducted for a variety of emissions sources to support source apportionment:



**Port of Oakland**



**Trains**



**Permitted stationary sources**



**Cars and trucks**



**Truck-related businesses**



**Ships, ferries, harbor craft**

# How Much is Local?

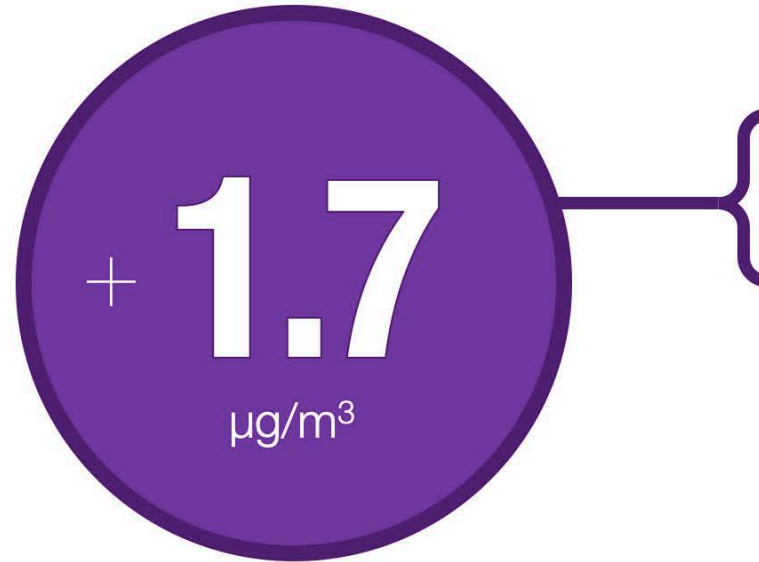
DRAFT 2019-06-21

Modeled Impact, on Residential  $PM_{2.5}$ , of Local (versus Regional) Emissions

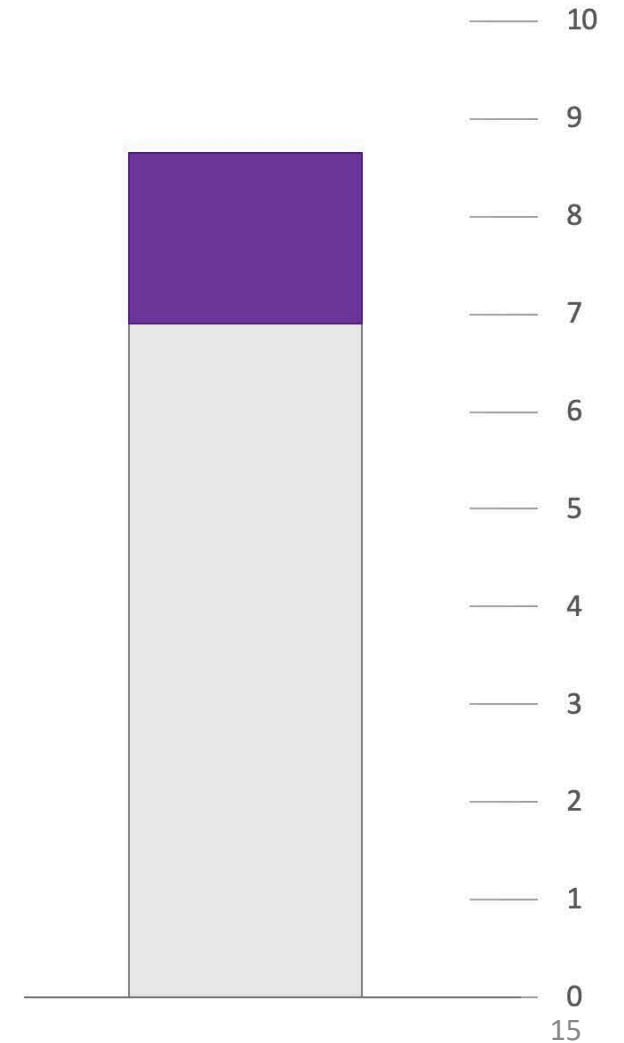
## Top Local Contributors\*

- Road Dust ( 38% )
- On-Road Vehicles ( 27% )
- Permitted ( 17% )

# $PM_{2.5}$



■ Local model – mapped impacts  
□ Regional model (minus West Oakland)

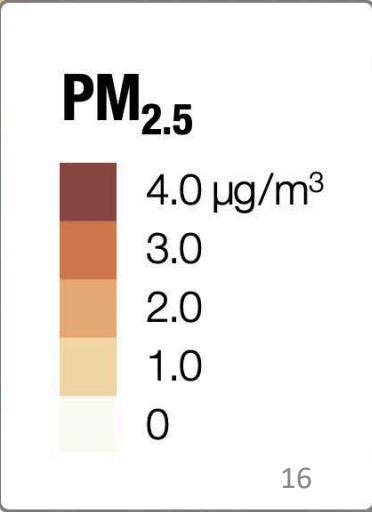


\*  $PM_{2.5}$  from cooking and construction not modeled

# Local Impacts

## Top Local Contributors\*

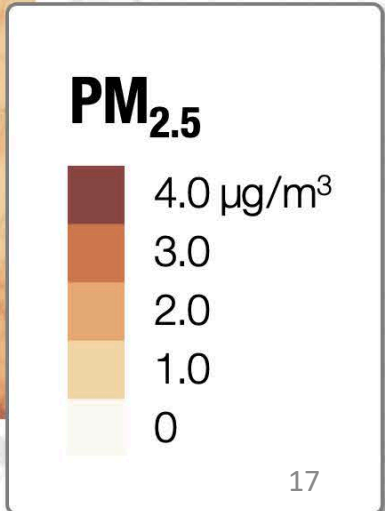
- Trucks ( 40% )
- Marine Vessels ( 31% )
- Rail ( 17% )





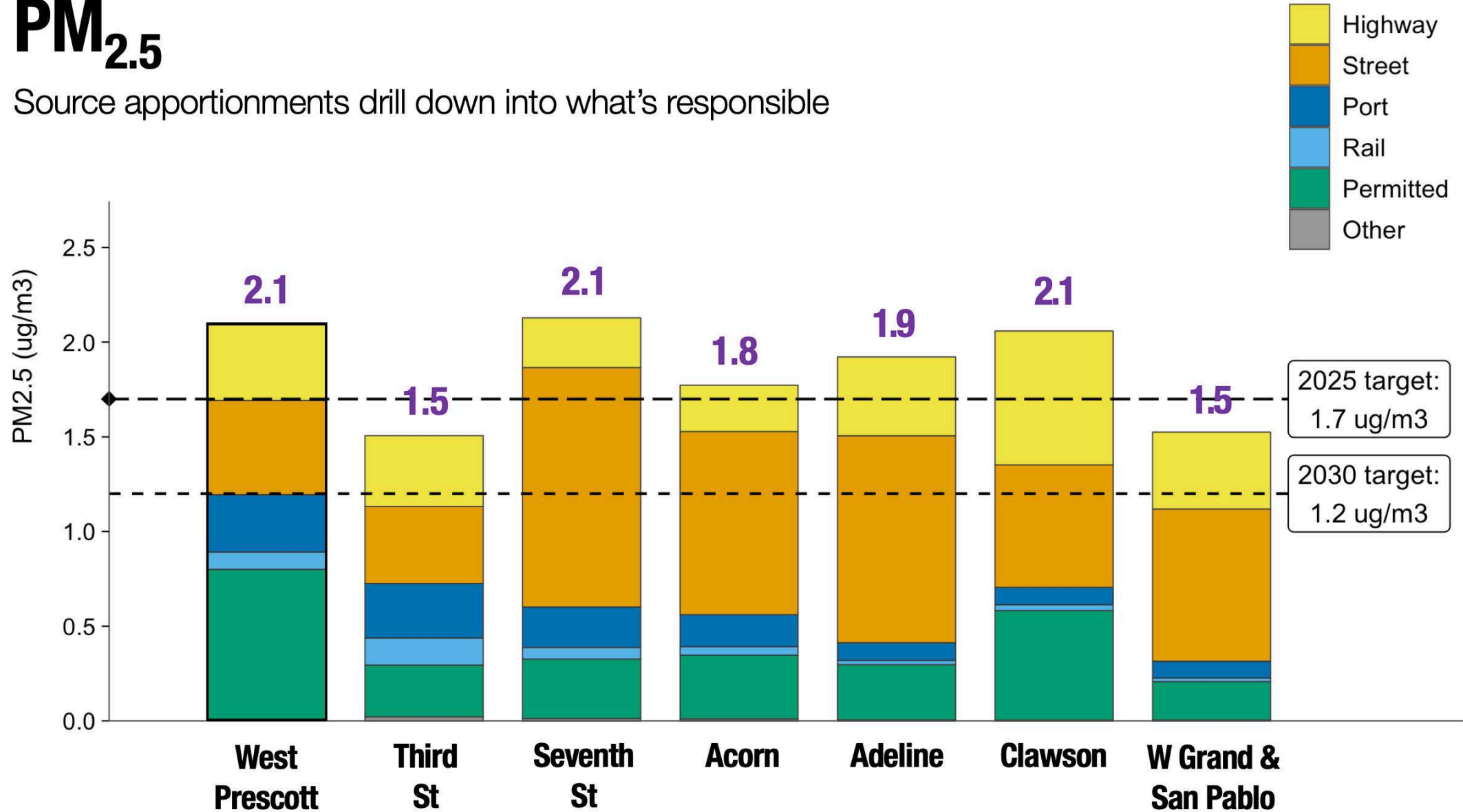
# Local Impacts

**Source apportionments**  
drill down into what's responsible, block by block



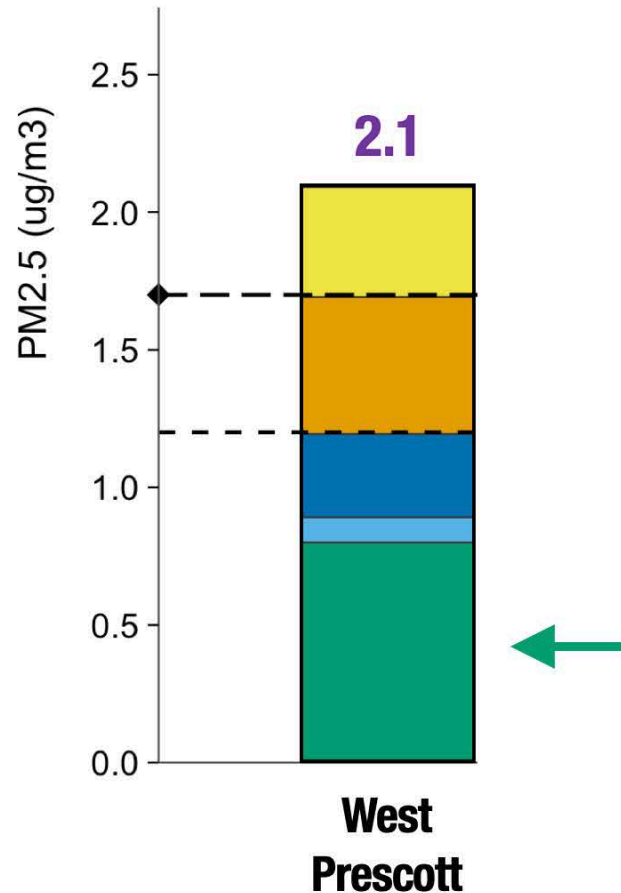
# PM<sub>2.5</sub>

Source apportionments drill down into what's responsible



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Source apportionments drill down into what's responsible

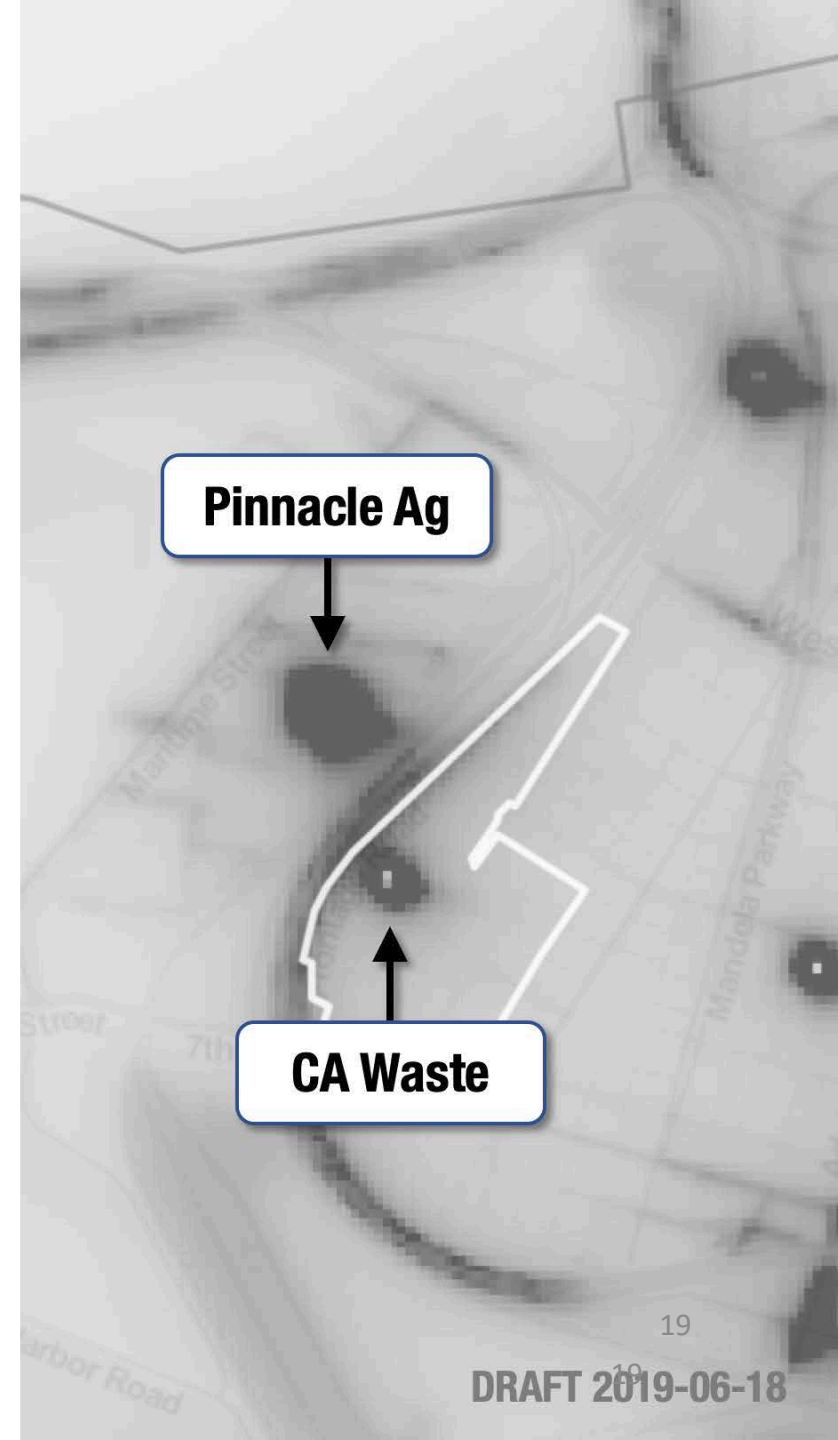


## 38%

... of these\* PM<sub>2.5</sub> impacts on **West Prescott** are attributed to **stationary sources**.

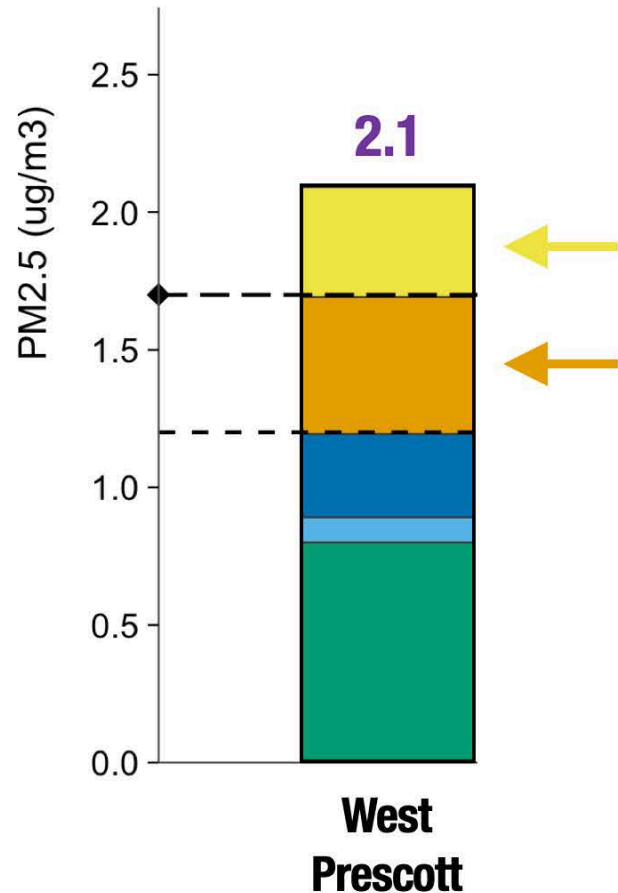
**CA Waste** and **Pinnacle Ag** (indicated on the map at right) account for four-fifths of that.

\* PM<sub>2.5</sub> impacts from “modeled local sources”, as depicted in maps. Excludes construction dust and commercial cooking. (See Draft Plan for details.)



# PM<sub>2.5</sub>

Source apportionments drill down into what's responsible

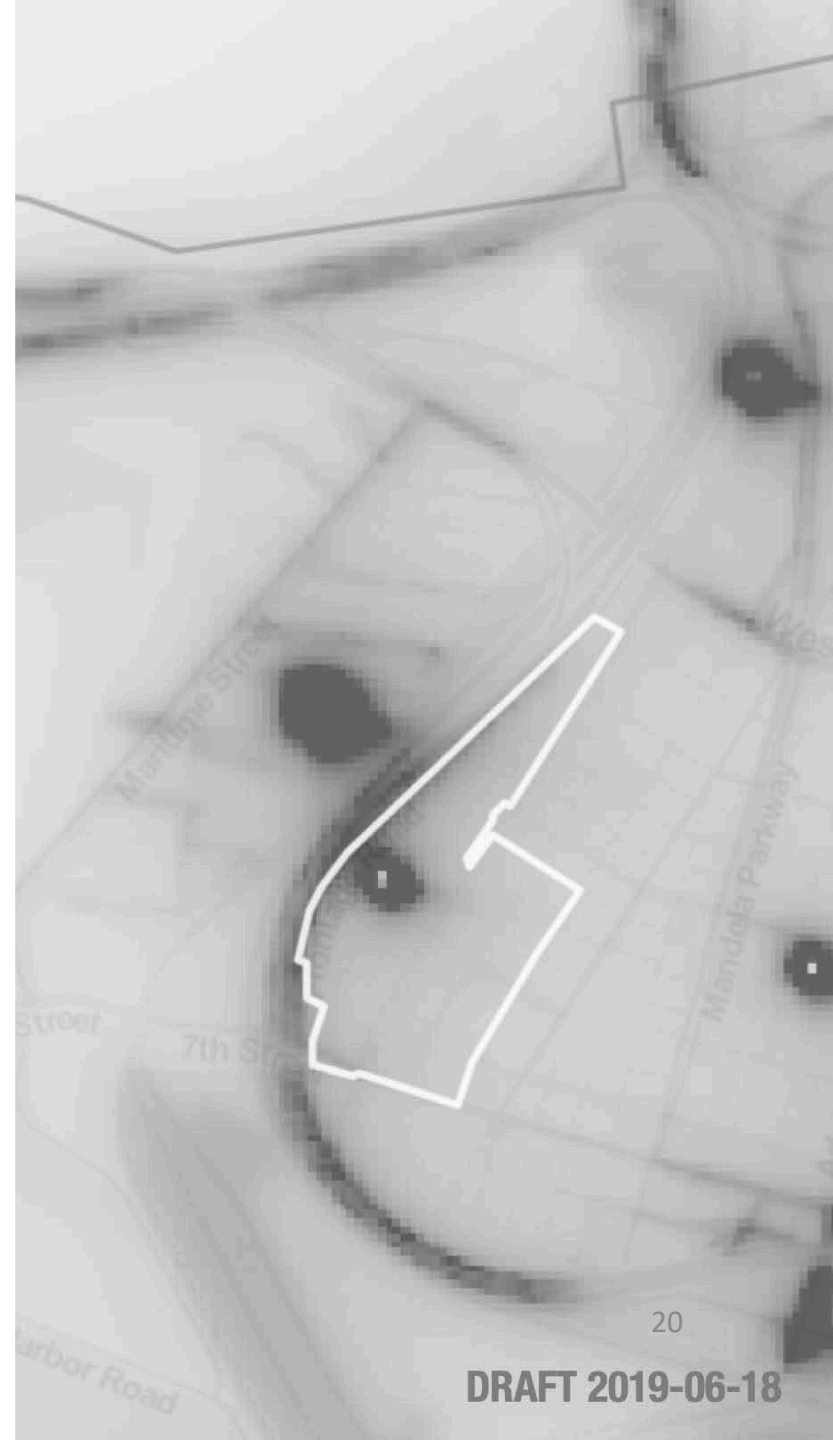


## 43%

... of these\* PM<sub>2.5</sub> impacts on **West Prescott** are attributed to **highways** and **streets**.

**Road dust** accounts for half of that. (The rest is from tailpipe exhaust, brake wear, and tire wear.)

\* PM<sub>2.5</sub> impacts from “modeled local sources”, as depicted in maps. Excludes construction dust and commercial cooking. (See Draft Plan for details.)



# Risk-Assessment Approach for PM<sub>2.5</sub>

- The Air District is working with the Advisory Council, US EPA, and the Office of Environmental Health Hazard Assessment (OEHHA) to develop a *new approach* to assess health risks from facility PM<sub>2.5</sub> releases
  - Similar to health risk assessments from toxic air contaminants conducted for facilities
- New approach to account for *existing community health* records and *PM<sub>2.5</sub> levels* to assess
  - Increased risk of death
  - Increase risk of heart attack

# Next Steps

- Finalize an approach to assess the potential for near-source impacts from large permitted sources with tall stacks in areas with complex winds
- Use community-scale modeling with enhanced emission estimates to assess potential impacts from many smaller sources on nearby residents
- Working with others, develop a risk assessment approach for PM<sub>2.5</sub>
- Use the results of the above to inform and support rule development efforts to adopt additional regulations on PM<sub>2.5</sub>



# **Update on the Implementation of Regulation 11, Rule 18 (Rule 11-18): Reduction of Risk from Air Toxic Emissions at Existing Facilities**

**Stationary Source Committee  
Meeting  
July 8, 2019**

**Irma Salinas**  
Principal Air Quality Engineer

# OUTLINE

## Update on Rule 11-18 Implementation

- Review of Rule 11-18 Requirements
- Summary of Implementation Process
- Current Implementation Status
- Schedule for Phase I Sites
- Actions to Date
- Next Steps



## REGULATION 11, RULE 18 REQUIREMENTS

<b>Risk Action Levels</b>	<b>2018</b>	<b>2020</b>
Cancer Risk	25 per million	10 per million
Non-Cancer:		
Chronic Hazard Index	2.5	1.0
Acute Hazard Index	2.5	1.0

Facilities with Health Risk Assessment (HRA) results above a Risk Action Level (RAL) must:

- Submit a Risk Reduction Plan (RRP) that demonstrates:
  - Site risks will be reduced below the 2020 RALs or
  - All significant risk sources will meet Best Available Retrofit Control Technology for Toxics (TBARCT)
- Obtain Air District approval of this RRP
- Implement this RRP within five years

# REGULATION 11, RULE 18 IMPLEMENTATION PROCESS

**1. Screen and Classify Facilities**

**2. Validate Inventories and HRA Input Data**

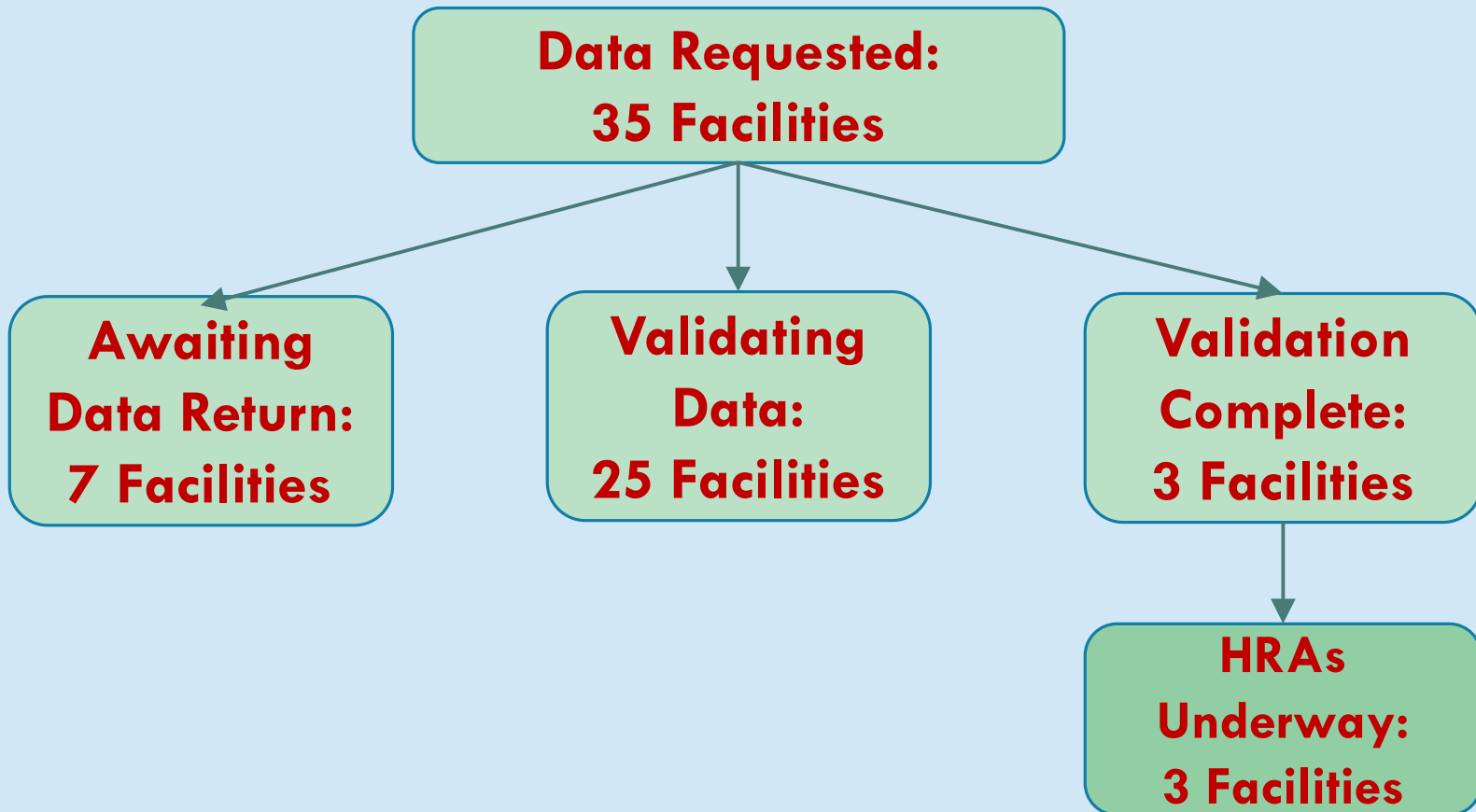
**3. Conduct Health Risk Assessments**

**4. Approve Risk Reduction Plans**

**5. Implement Risk Reduction Measures**

# REGULATION 11, RULE 18 IMPLEMENTATION STATUS

## Phase I – High Priority Facilities



# RULE 11-18 SCHEDULE FOR PHASE I SITES

## Rule 11-18 Implementation Schedule for Phase I Sites

Implementation Steps:	2018				2019				2020				2021				2022				2023 - 2027						
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Y1	Y2	Y3	Y4	Y5		
Build Additional Infrastructure																											
Step 1. Classify Facilities																											
Step 2. Validate Data																											
Step 3. Conduct Preliminary HRAs																											
Facility Review of Preliminary HRAs																											
Public Review of draft HRAs																											
Respond, Correct, Post Final HRA																											
Step 4. Approve Risk Reduction Plans																											
Step 5. Implement Risk Reduction Measures																											

7/8/2019

## RULE 11-18: ACTIONS TO DATE

- Rule 11-18 Implementation Work Group
  - Held Three (3) Meetings
  - Discussed Plans, Schedules, and Review Processes
  - Reviewing Guidance Documents
- New Data Collection and Management Process
  - Update Annual Inventories
  - Add One Hour Emissions Data
  - Collect and Verify HRA Inputs
- Enhanced Web Site
- Updated Fee Structure

## RULE 11-18: NEXT STEPS

- Post Guidance Documents on Web Site
  - Emission Factors
  - One Hour Inventories
  - Modeling Protocol
- Schedule Next Implementation Work Group Meeting

## RULE 11-18: NEXT STEPS (CONT'D)

- Update Web Site
  - Design Opt-In for Rule 11-18 Related Notifications
  - Add Public Notice Posting Page for Draft HRAs
- Complete Data Validation for Phase I Facilities
- Complete and Publish HRAs for Phase I Facilities



# QUESTIONS



# UPDATE ON RULE DEVELOPMENT FOR AMENDMENTS TO REGULATION 12, RULE 15 (RULE 12-15): PETROLEUM REFINERY EMISSIONS TRACKING RULE

Stationary Source Committee Meeting  
July 8, 2019

MARK H. GAGE  
AIR QUALITY ENGINEER  
PERMITTING AND REFINERIES

# ANNUAL EMISSIONS INVENTORIES

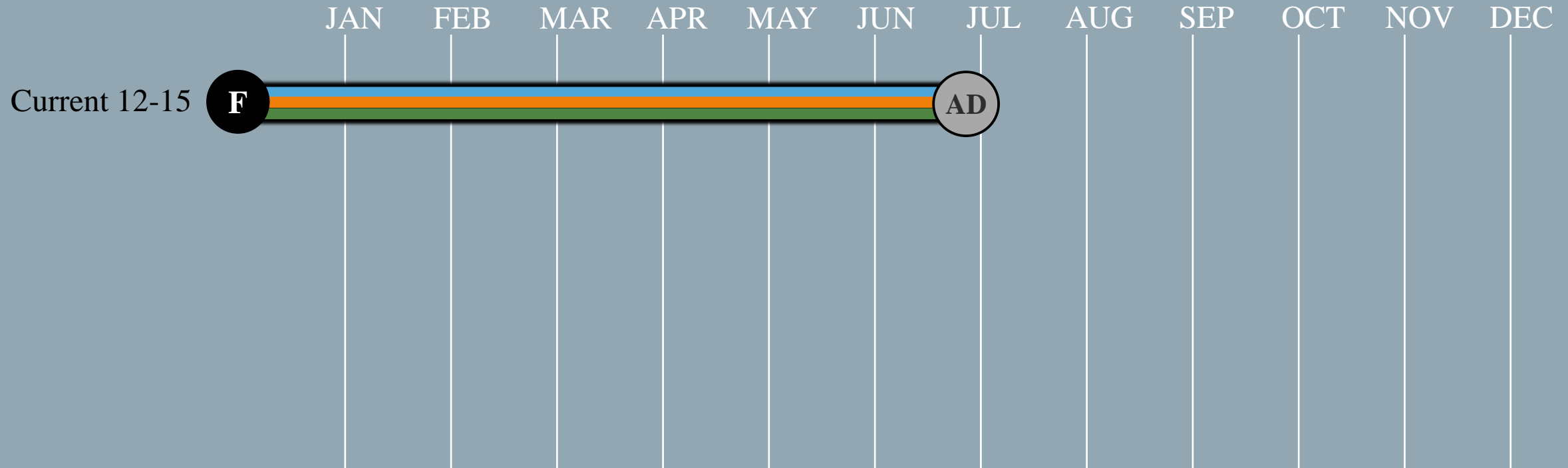
- Rule 12-15 requires all Petroleum Refineries and Support Facilities to submit Annual Emissions Inventories to the Air District
- There are four (4) different Annual Emissions Inventories for different pollutant types

<b>Annual Emissions Inventory by Pollutant Type</b>
Criteria
Toxic Air Contaminants (TAC)
Greenhouse Gas (GHG)
Third-Party Verified Greenhouse Gas (GHG)

# CURRENT RULE 12-15 REPORTING REQUIREMENTS

Criteria	Due to Air District JUNE 30
TAC	
GHG	
Third-Party Verified GHG	No Requirement

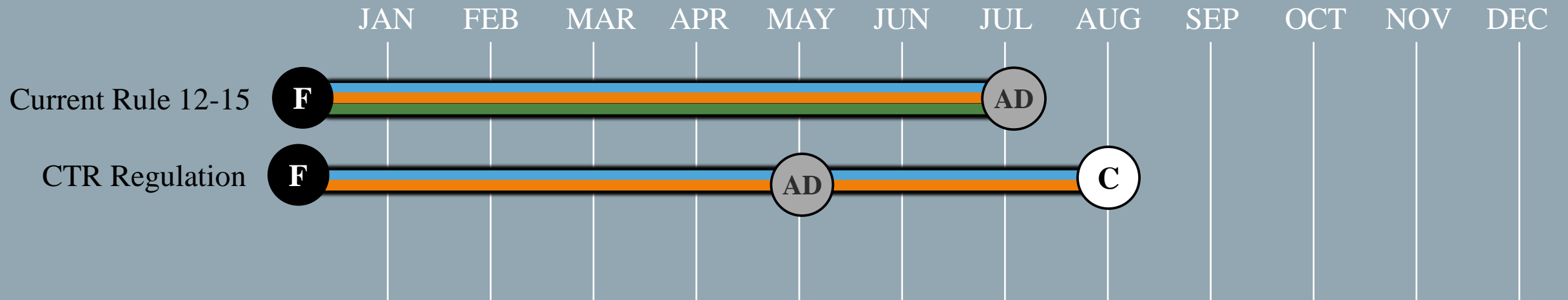
- F** = Facility
- AD** = Air District
- C** = California Air Resources Board (CARB)



# CALIFORNIA AIR RESOURCES BOARD (CARB) ADOPTS CRITERIA AIR POLLUTANTS AND TOXIC AIR CONTAMINANTS (CTR REGULATION) – DECEMBER 2018

Criteria	Due To Air District MAY 1	Due to CARB AUGUST 1
TAC		
GHG	No Requirement	
Third-Party Verified GHG		

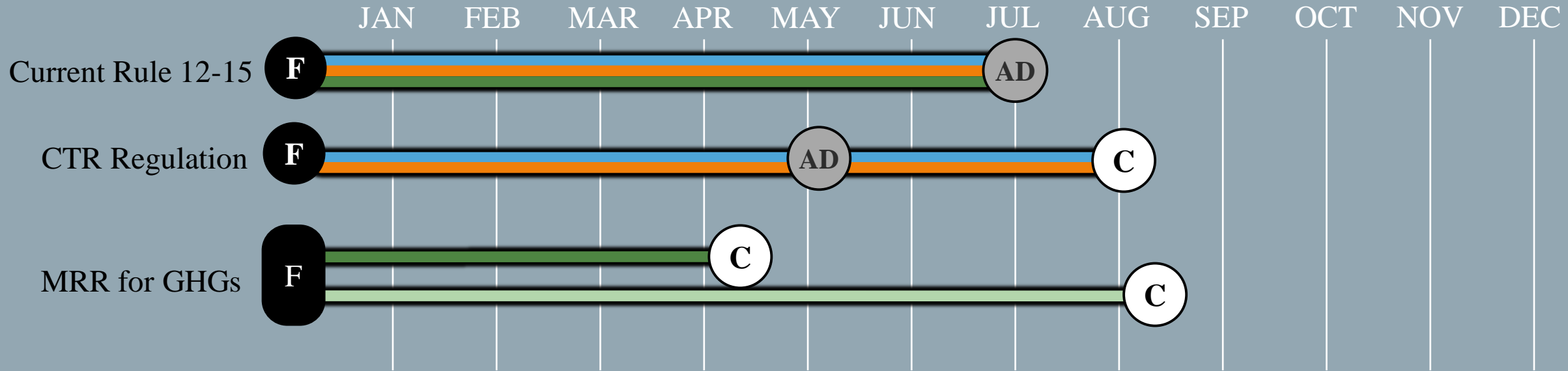
- F** = Facility
- AD** = Air District
- C** = CARB



# CARB'S MANDATORY REPORTING REGULATION (MRR) FOR GREENHOUSE GASSES (GHGS) – Amended 2018

<b>Criteria</b>	No Requirement
<b>TAC</b>	
<b>GHG</b>	Due to CARB APRIL 10
<b>Third-Party Verified GHG</b>	Due to CARB AUGUST 10

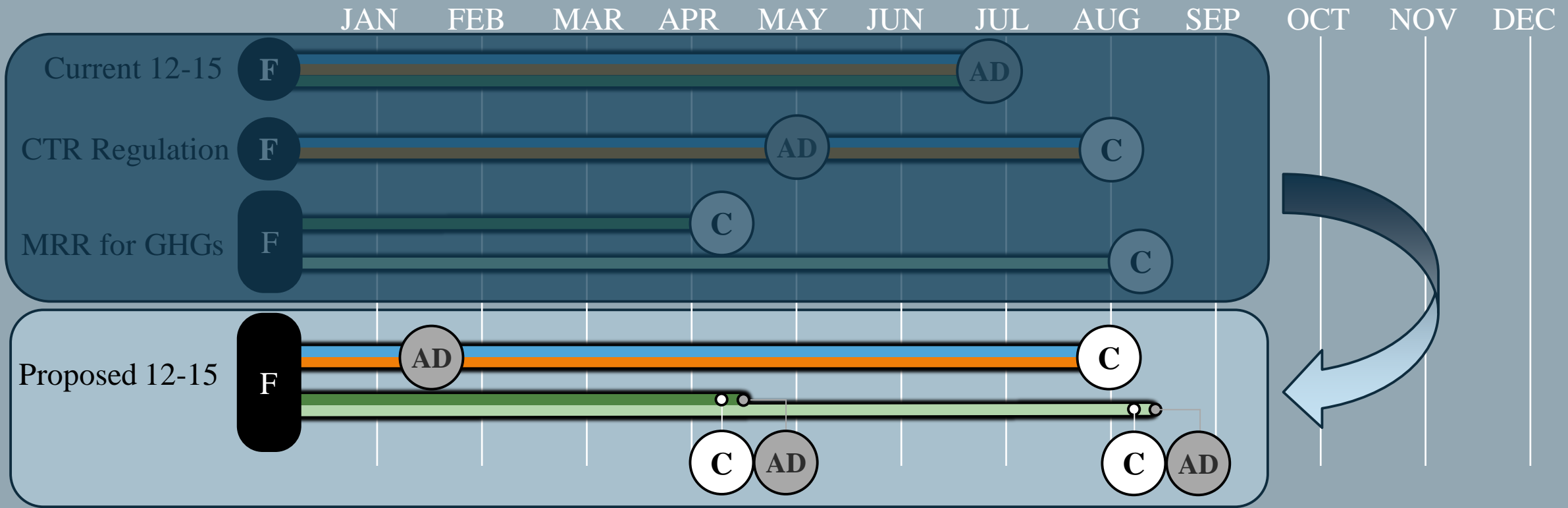
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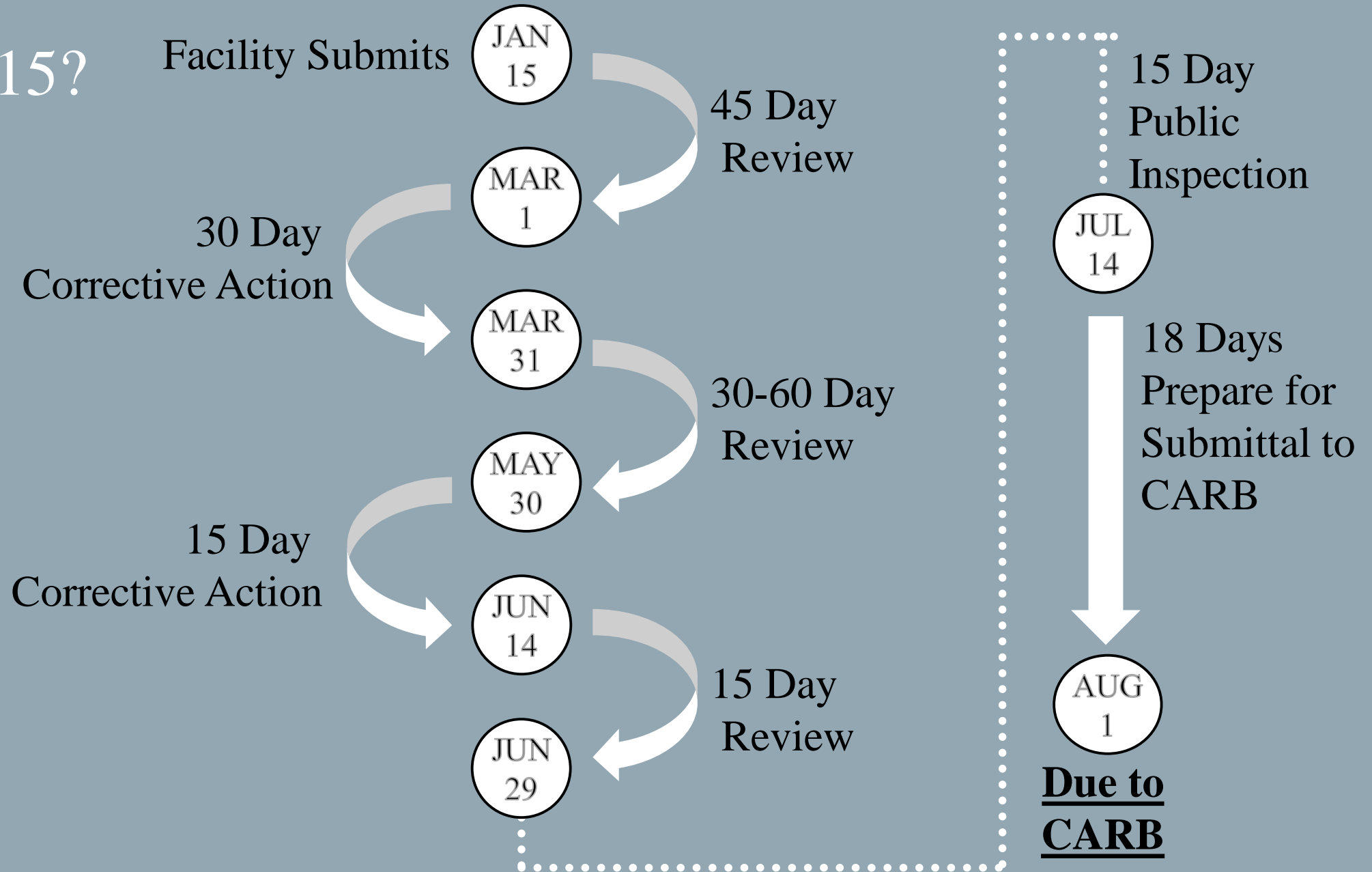
# PROPOSED RULE 12-15

<b>Criteria</b>	Due to CARB	Due to Air District
<b>TAC</b>	AUGUST 1	JANUARY 15
<b>GHG</b>	Due to CARB APRIL 10	Due to Air District APRIL 15
<b>Third-Party Verified GHG</b>	Due to CARB AUGUST 10	Due to Air District AUGUST 15

- F** = Facility
- AD** = Air District
- C** = CARB



# WHY JANUARY 15?



# PUBLICATION STATUS

- Request for comments on Draft Amendments posted June 5, 2019
- Comment period open until July 15, 2019  
(extended from July 8, 2019: 40 days total)



# QUESTIONS