

# Update on Secondary PM<sub>2.5</sub> Formation in the San Joaquin Valley and Research on Potential Controls

November 16, 2017



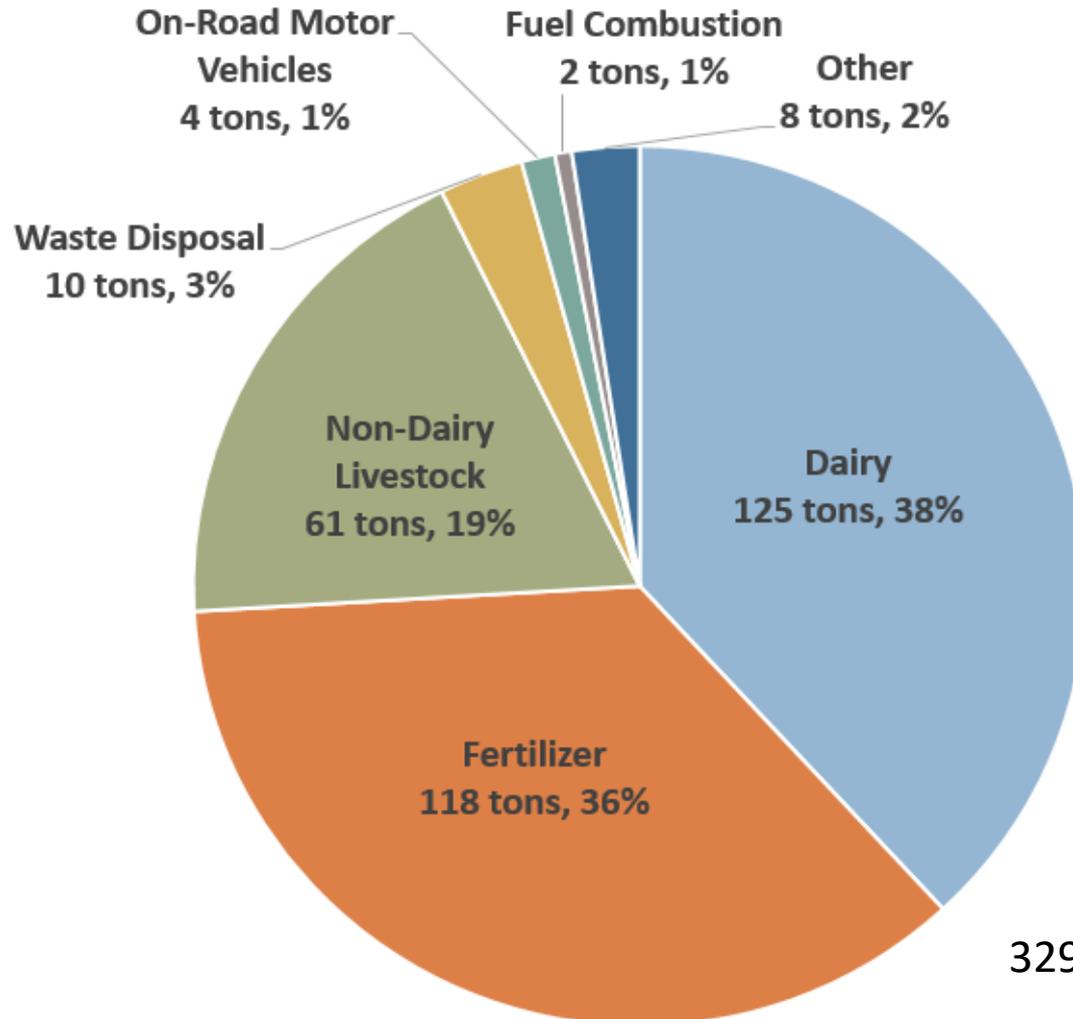
# Presentation Outline

2

- Role of ammonia in forming PM2.5
- Required SIP precursors analysis
- District controls reducing ammonia
- Connection of ammonia and methane

# Sources of Ammonia in the Valley

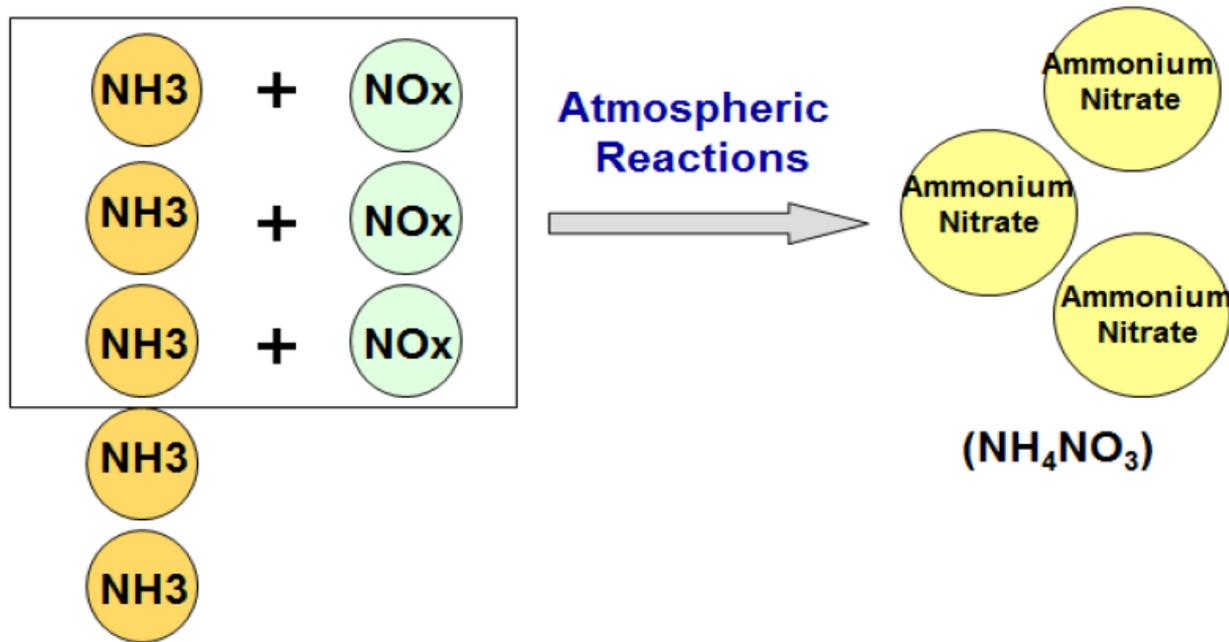
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329 tons per day, 2013

# Role of Ammonia in PM2.5 Formation

4



Limiting precursor: Target the gas in least supply to provide the most effective improvement in air quality

# US EPA 'Significant' Precursor Guidance

5

PM SIP must determine significance of four precursors:

SO<sub>2</sub>    NO<sub>x</sub>    ROG    Ammonia

## Step 1:

Determine the air quality impact of emission reductions in the base year



## Step 2:

Further assess significance in impact of existing and new controls on the relative abundance of in atmospheric reactions

# Ammonia Precursor Analysis in the Valley

6

## Step 1:

Determine the air quality impact of emission reductions in the base year

- PM2.5 impact at Bakersfield above threshold with 30% reduction of ammonia emissions

	Modeled Impact		EPA Recommended Threshold
24-hour	3.3 $\mu\text{g}/\text{m}^3$	>	1.3 $\mu\text{g}/\text{m}^3$
Annual	0.41 $\mu\text{g}/\text{m}^3$	>	0.2 $\mu\text{g}/\text{m}^3$

## Step 2:

Further assess significance in impact of existing and new controls on the relative abundance of in atmospheric reactions

- CARB mobile controls provide about 58% reduction in NOx emissions in future
- PM2.5 impact at Bakersfield below threshold with 30% reduction of ammonia emissions in future

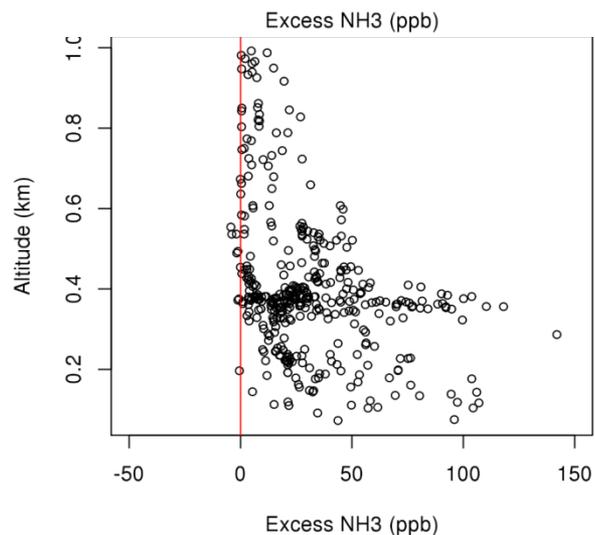
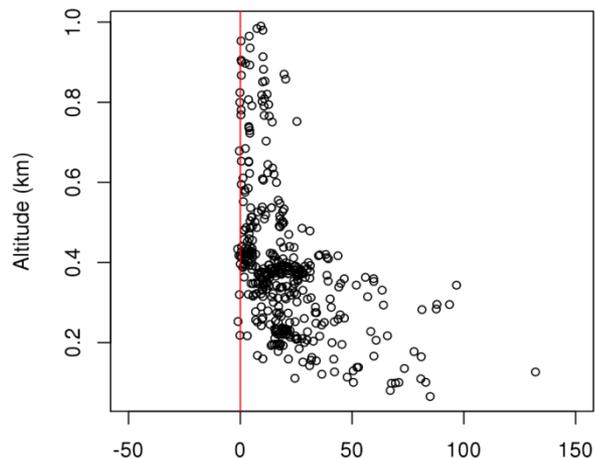
	Modeled Impact		EPA Recommended Threshold
24-hour	0.9 $\mu\text{g}/\text{m}^3$	<	1.3 $\mu\text{g}/\text{m}^3$
Annual	0.11 $\mu\text{g}/\text{m}^3$	<	0.2 $\mu\text{g}/\text{m}^3$

- 30% reduction of ammonia emissions is about 100 tons per day

# Significance Analysis Supported by Empirical Data

7

- Field study measurements indicate ammonia is in excess in the Valley
- Ammonia concentrations in SJV and SoCAB have increased
- NO<sub>x</sub> reductions are the most effective path to reduce PM concentration
  - Can provide some PM reductions
  - Ammonia is eye and respiratory irritant at low concentrations
- Continue to look for opportunities to reduce ammonia



Excess NH<sub>3</sub> in the SJV on Jan 18 (Top) and Jan 20 (Bottom) based on NASA aircraft measurements in 2013

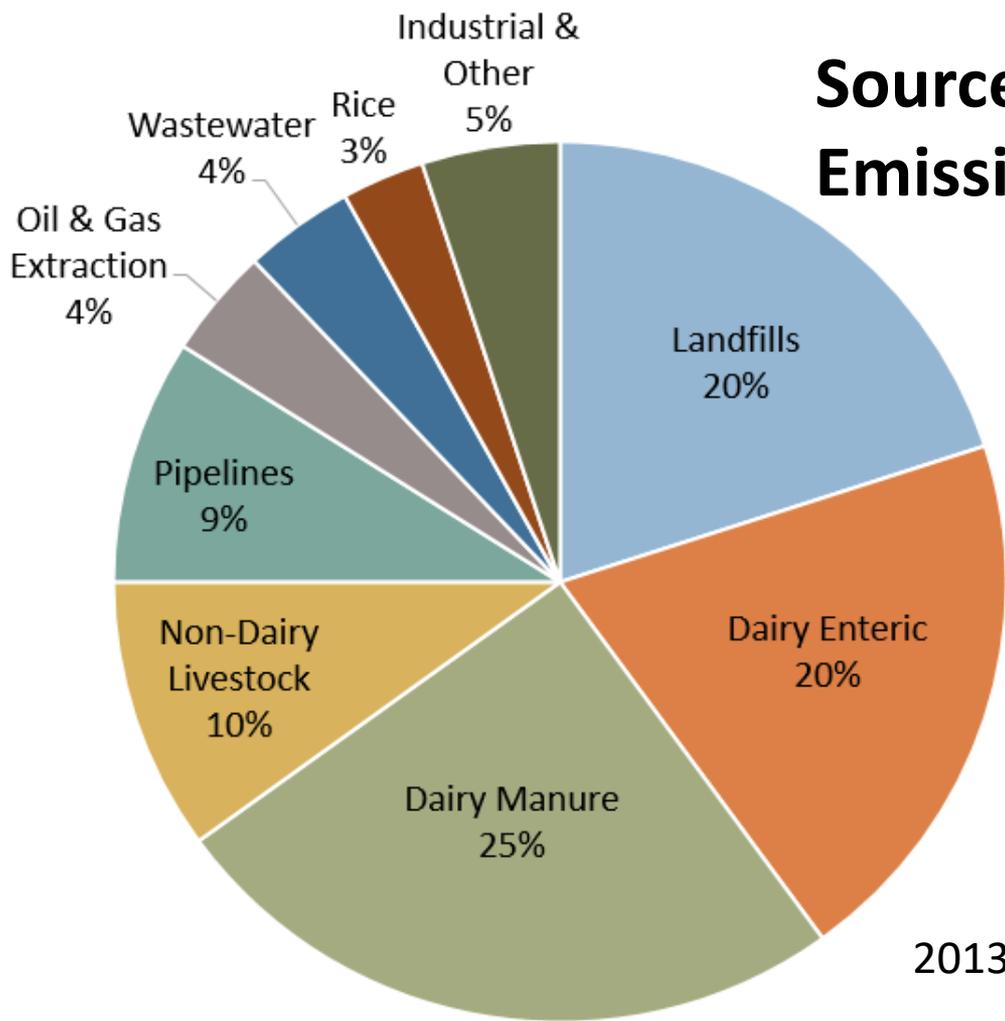
# District Controls on Ammonia from Dairies

8

District Rule	Measures to Select From Include...
Conservation Management Practices <i>(Rule 4550)</i>	<ul style="list-style-type: none"><li>• Frequent manure removal</li><li>• Scraping and harrowing</li></ul>
Biosolids, Animal Manure, and Poultry Litter Operations <i>(Rule 4565)</i>	<ul style="list-style-type: none"><li>• Timely incorporation or injection of manure into soil</li><li>• Rapid covering of biosolid piles</li><li>• Installation of aerated static piles</li></ul>
Confined Animal Facilities <i>(Rule 4570)</i>	<ul style="list-style-type: none"><li>• Nutritional management to reduce nitrogen intake</li><li>• Timely incorporation or injection of manure into soil</li><li>• Increased frequency and effectiveness of manure removal from animal housing area</li><li>• Covering of manure piles</li></ul>

# Methane and Ammonia often Emitted by Same Sources

## Sources of Methane Emissions Statewide



2013

- Effective methane mitigation strategies may also deliver reductions in local air pollutants

# New Research

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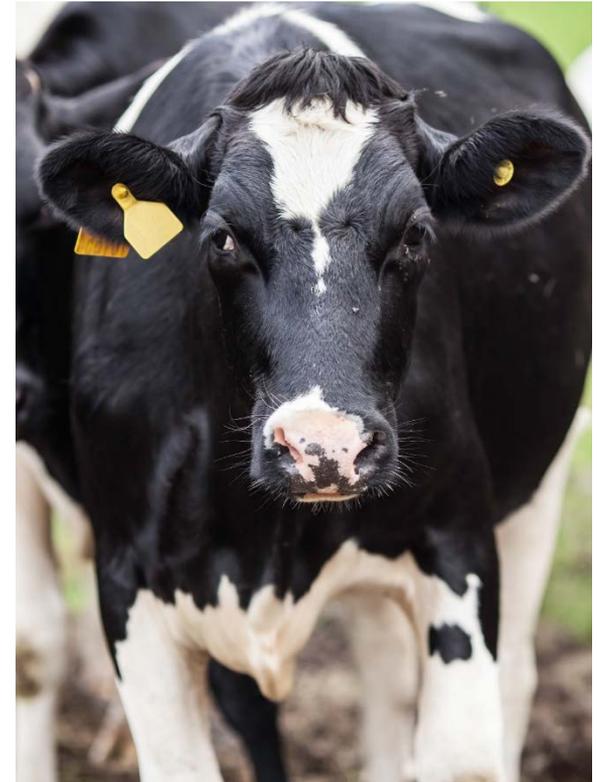
- Characterize source attribution of local and regional ammonia emissions using mobile surveyors
- Investigate dynamics of ammonia in complex urban environments
- Assess ammonia measurement capabilities at ambient monitoring stations
- Identify methane and ammonia sources using remote sensing technology



# Research Spotlight

11

- Evaluate real-world impact of various dairy manure management practices (e.g., digesters) on methane and ammonia emissions
- Expected deliverables:
  - Guidelines for alternative manure management practices with ammonia advantages
  - Understanding of how changes in dairy manure management practices affect emissions of methane and ammonia



# Integrated Methane and Ammonia Approach

12

- Dairy and Livestock Working Group evaluations of methane and ammonia issues
- CARB research on effect of dairy manure management practices on methane and ammonia emissions
- \$99 million from Greenhouse Gas Reduction Fund
- SLCP Reduction Strategy implementation with greenhouse gas and air pollutant co-benefits