

# AIR DISPERSION MODELING

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ALBUQUE  
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# Using Air Dispersion Modeling

1. Models estimate impacts of pollution emitted by industry
2. Compare the estimated impacts to air quality standards
3. Air quality standards limit emissions from industry

## Connection to Permitting

- Modeling used to set permit conditions
  - Require control strategies
  - Hours of operation
  - Emission rates
  - Distance of equipment from fence

# ANALOGY

- Sprinkler system surrounded by buckets
- Wind is important in distributing water
- Depth of water in buckets ~ concentrations at receptors



## Dispersion Model Inputs

### Meteorology

- Wind speed
- Wind direction
- Temperature

### Terrain & Land Use

- Rural or urban
- Elevations

### Emissions

- Rates
- Hrs of operation

### Sources

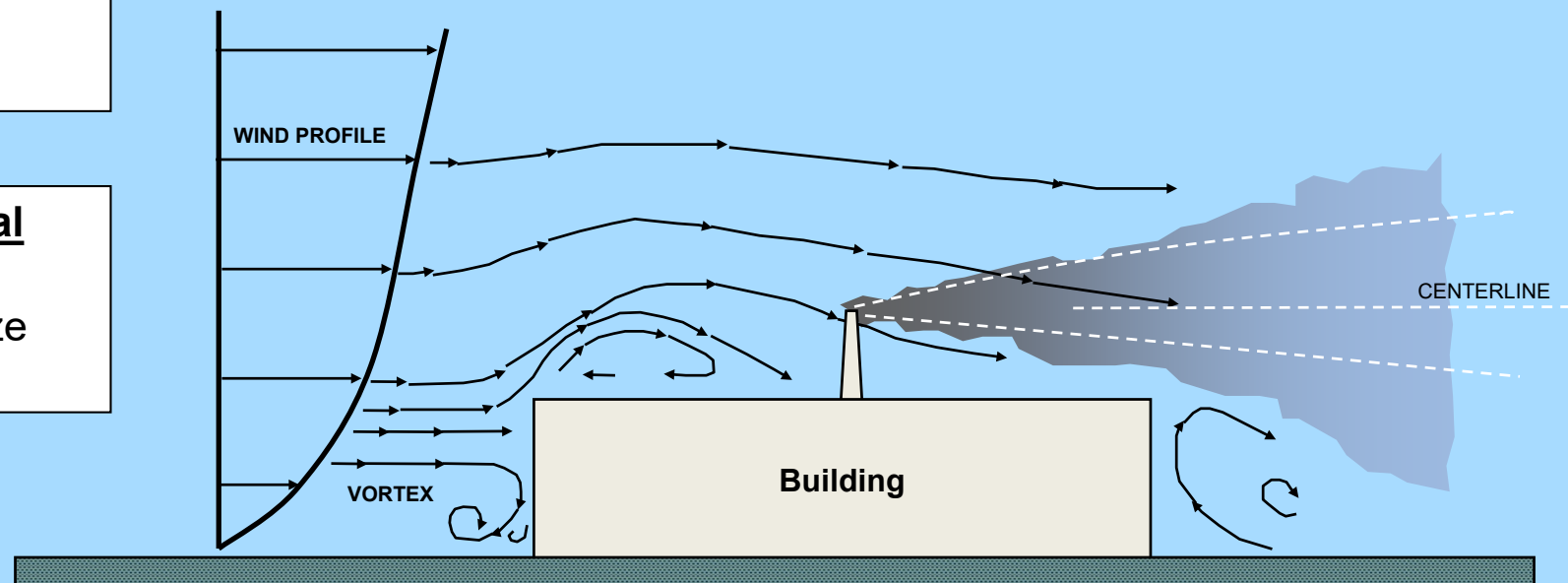
- Source type
- Parameters

### Downwash

- Buildings

### Gravitational Settling

- Particle Size
- Density



# Point Source





## Volume Source



## Federal, State, & Local Guidelines

- Federal: 40 CFR 51, a.k.a. Appendix W
- NMED's Air Dispersion Modeling Guidelines
- Air Quality Program's Air Dispersion Modeling Guideline



## Cumulative Impacts Modeling

- Background levels are from monitored data
- Background data added to modeled impact
- Inclusion of nearby facilities depends on
  - Distance from applicant's facility
  - Amount of emissions from nearby facilities
  - What the background monitor is sampling

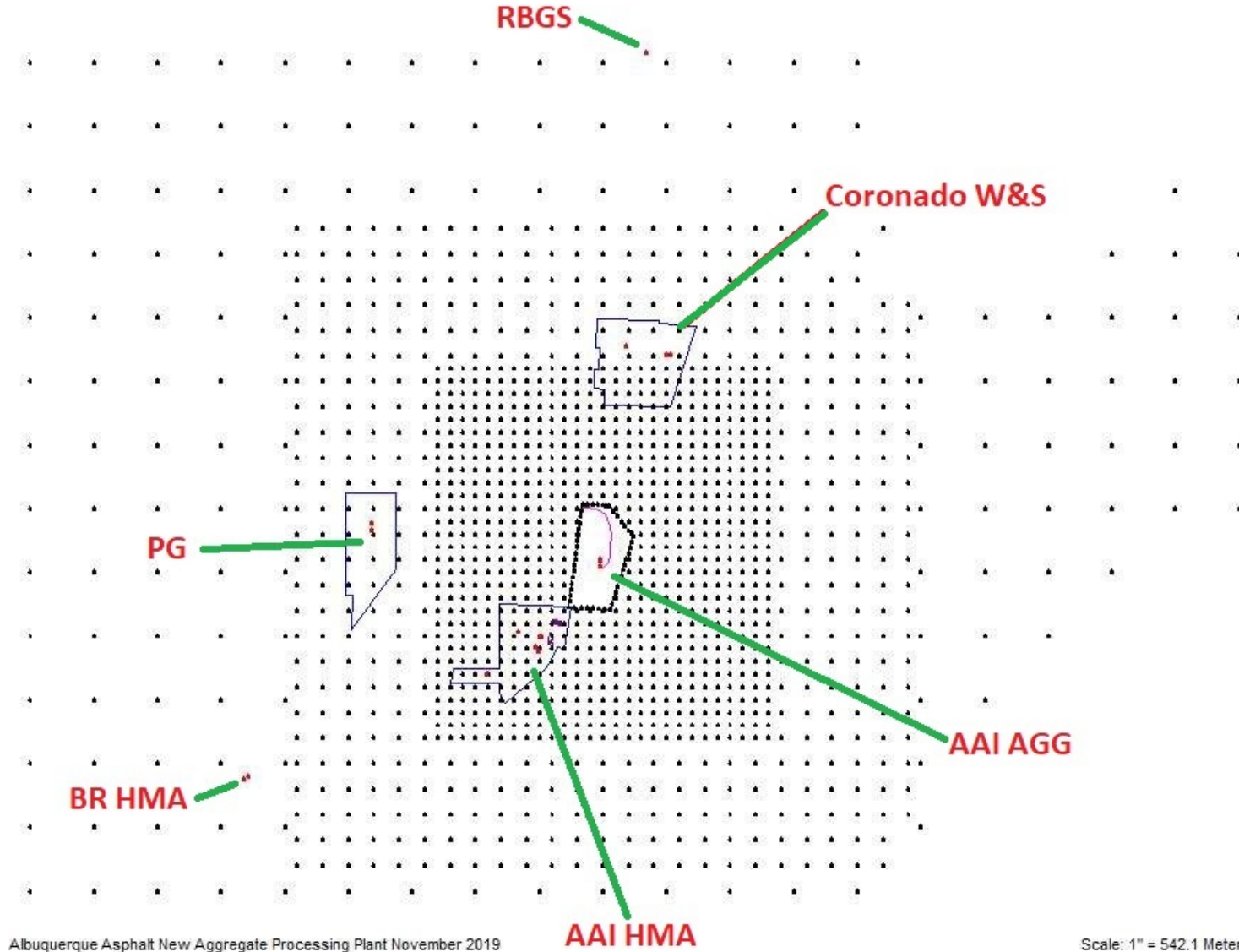
# EXAMPLE

## Recent modeling review





## NO<sub>2</sub> model for the same facility



# More on cumulative modeling

- “...the question of which nearby sources to include in the cumulative modeling is inextricably linked to the question of what the ambient monitoring data represents within the project area.” –Section 8.3.3(a), p. 5221
- Cumulative impact is compared to air quality standards

## Compare to Standards

NAAQS	Modeled Impact ( $\mu\text{g}/\text{m}^3$ )	Background ( $\mu\text{g}/\text{m}^3$ )	Model + Background ( $\mu\text{g}/\text{m}^3$ )	Level of the standard ( $\mu\text{g}/\text{m}^3$ )
NO <sub>2</sub> 1-hour	117.1	62.8	179.9	188
PM <sub>10</sub> 24-hour	65.7	35	100.7	150



## AERMOD

- U.S. EPA's preferred air dispersion model since Nov. 2005
- Standard among all regulatory clean air agencies
- Confidence that AERMOD doesn't underestimate
  - EPA is concerned about underestimation
  - LOWWIND options have not been accepted for regulatory modeling

## AERMOD Reliability

- EPA SCRAM website
- Databases used to evaluate AERMOD performance
- Documents on AERMOD performance and formulation
- Support Center for Regulatory Atmospheric Modeling ([www.epa.gov/scram](http://www.epa.gov/scram))

# Example of EPA Testing AERMOD

Excerpts from description of EPA experiment:

“...near-surface, non-buoyant tracer release”  
experiments with “surface sampling arrays positioned 50  
meters to 800 meters downwind...”

- Empire Abo, NM field study mentioned in  
March 1, 2011 EPA clarification memo

## Furthering the Margin of Safety

- Rural dispersion coefficients
- Continuous full bore operations for all sources on property
- Lack of NO<sub>2</sub>/NO<sub>x</sub> data □ often results in worst-case assumptions

## Reasons EHD Rejects Modeling

- Discrepancy between model & application
  - E.g. Application requests operations 7 days/wk; only modeled 6 days a week
- Inappropriate modeling techniques
  - Outdated downwash algorithm
  - Inappropriate use of urban dispersion
- Incorrect modeling
  - Sources, roads, fence don't match up with aerial imagery



# Example of Incorrect Mapping

EXAMPLE



## In Conclusion

- AQP uses checklists for protocol reviews, preliminary reviews, final reviews, and peer reviews as a matter of quality assurance and quality control.
- AERMOD- a reliable tool for keeping Bernalillo County within the standards for particulates, H<sub>2</sub>S, lead, NO<sub>2</sub>, SO<sub>2</sub>, and CO



# QUESTIONS?

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# REFERENCES

- **AERMOD User's Guide,**  
[https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod\\_userguide.pdf](https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_userguide.pdf)
- **AERMOD: Latest Features and Evaluation Results, EPA-454/R-03-003, June 2003,**  
[https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod\\_mep.pdf](https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_mep.pdf)
- **Guideline on Air Quality Models (aka Appendix W),**  
[https://www.epa.gov/sites/production/files/2020-09/documents/appw\\_17.pdf](https://www.epa.gov/sites/production/files/2020-09/documents/appw_17.pdf)

# REFERENCES

- **Additional Clarification Regarding Applicability of Appendix W Modeling Guidance for the 1-hour NO<sub>2</sub> NAAQS (EPA Clarification Memo, 01Mar2011), [https://www.epa.gov/sites/production/files/2020-10/documents/additional\\_clarifications\\_appendixw\\_hourly-no2-naaqs\\_final\\_03-01-2011.pdf](https://www.epa.gov/sites/production/files/2020-10/documents/additional_clarifications_appendixw_hourly-no2-naaqs_final_03-01-2011.pdf)**



# REFERENCES

- **City of Albuquerque Environmental Health Department Air Dispersion Modeling Guidelines,**  
<https://documents.cabq.gov/environmental-health/airquality/ADM/final%20COA%20Oct2019%20guidelines.pdf>
- **New Mexico Environment Department Air Dispersion Modeling Guidelines,**  
<https://www.env.nm.gov/air-quality/modeling-publications/>