Air Dispersion Modeling
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Jim Haywood
Michigan Department of Environmental Quality
HaywoodJ@Michigan.gov
517 284-6745

Why Model?

- Identify impacts from the construction or modification of facilities that are seeking a permit to install/operate air emission sources.
- AQD Policy and Procedure AQD-22 (March 3, 2015)

When to Model?

- You are a major **OR** minor source
- Emissions submitted do not demonstrate protection of Air Quality standards
- Examples:
  - Poor dispersion
  - Close proximity to sensitive groups
  - Potential existing problems in the area

What is modeling and how it is done?

- Mission: Determine Impacts from Emissions
- Measuring Impacts: Pre-Permit/Construction
- Monitor Impacts: Coverage Area
  - How to do it and what are should be looked at

Can Air Quality Models help with these Problems?

- Air Quality Models are computer simulations of pollutants in the atmosphere
  - Virtual Monitors look at the entire effected area
  - Predicts magnitude and location of maximum impact

Basic Modeling Elements

- Act 451, Michigan Natural Resources & Environmental Protection Act:
  - Building Wake Effects
  - Stack Parameters
  - Meteorology
  - Terrain Features

Stack Parameters

- Emission Rate
- Stack Height
  - Building wake effect – taller stack has better distribution of emissions
- Temperature
- Flow Rate
- Stack Diameter
- Stack Orientation
  - Unobstructed vertically upward
  - Angled

Meteorology

- Wind Speed
- Wind Direction
- Temperature
- Precipitation
- Upper Air Data
- Surface Features
- Representativeness
  - Does the information you are looking at reflect the actual situation

Terrain Features

- Siting is important!
    - Physical obstructions not associated with the facility
    - Height of any nearby objects

Other Considerations:

- Ambient Air
    - Where do you model - "the portion of the atmosphere, external to buildings, to which the public has general access"
- Receptor Spacing
    - Virtual Monitors - Area Coverage and Spacing Sufficient to Identify the Location and Magnitude of the Highest Ambient Impact
- Fugitive Dust
- Secondary Pollutants
- Background Concentrations
- Other Nearby Sources
- Additional Impacts
    - Soil deposition
    - Vegetative Damage
    - Fogging and Icing
    - Odors
- Total Ambient Impact = Your proposed process + Nearby Sources + Background

AQD Creates and Input File for the Model

- A giant calculator takes your information and creates the model

What happens after the model is complete?

- Model Predictions Pass: Permit Process Continues!
- Model Predictions Fail: Then what?
    - Implement strategies to reduce impacts
        - Raise stack height
        - Take other restrictions

How Accurate are the Models?

- Good data in = good data out
- Bad data in = bad data out
- Applies to colleges, universities, or college - university affiliated teaching hospitals and non-profit research institutes.

Aermod: EPA's Preferred Model

- Steady state plume dispersion model for assessment of pollutant concentrations from a variety of sources;
- Simulates transport and dispersion from multiple points, area, and volume sources;
- Employs hourly sequential meteorological data to estimate concentrations for averaging times ranging from one hour to one year
- From EPA = Free

Other Software Options

- BeeLine - $1350
- Lakes Environmental - $1599
- Breeze - $1495

Thank you!