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# Eagle Rock Enrichment Facility Mandatory Hearing on Environmental Matters

July 12-14, 2011

## NRC Staff Presentation Topic 4
## Construction Air Quality Impacts

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# Overview of AERMOD Air Dispersion Model

- Developed jointly by American Meteorological Society (AMS) and U.S. Environmental Protection Agency (EPA).

  **A**MS/**E**PA **R**egulatory **Mod**el (NRC000198)

- Preferred model for understanding impacts of released pollutants in Planetary Boundary Layer (PBL).
- Primary model for demonstrating compliance with EPA regulations and for State air quality protection planning.

# Overview of AERMOD Air Dispersion Model (cont.)

Model Applicability/Flexibility:

- Rural and urban areas
- Flat and complex terrain
- Surface-level and elevated releases
- Single or multiple sources
- Point, area, line, and volume sources
- One-hour to annual (or period) averaging time

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# AERMOD Model Architecture

AERMOD consists of one main program, two primary pre-processing programs (AERMET & AERMAP), and other pre-processing programs that can be used when relevant.

- AERMET pre-processes meteorological data inputs to calculate boundary layer parameters.
- AERMAP pre-processes terrain data using digital elevation data from U.S. Geologic Survey (USGS).
- AERSURFACE pre-processes surface characteristics.
- Other capabilities (not applicable to EREF scenario):
  - Modeling for ozone and lead
  - BPIP/PRIME algorithm for modeling downwash from nearby tall structures

# AERMOD Inputs

Surface Hourly Meteorological Data:

- Ambient temperature
- Wind speed and direction at one- or multi-levels
- Station pressure (estimate for density of dry air)
- Sky condition (ceiling height and opaque [or total] sky cover)
- Standard deviation of wind direction fluctuations
- Upper sounding data

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# AERMOD Inputs (cont.)

Surface Characteristics Data (at measurement site):

- Surface roughness length (height of obstacles to the wind flow)
- Albedo (reflection coefficient of solar radiation)
- Bowen Ratio (indicator of surface moisture)

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# Identifying Sources of Meteorological Data Inputs

- Onsite Data:
  - National Weather Service (NWS) Station: Materials and Fuels Complex (MFC) at Idaho National Laboratory
- Hourly Surface Data:
  - NWS Station at Idaho Falls Regional Airport (Fanning Field)
- Upper Soundings Data:
  - NWS Station in Boise, Idaho

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# Identifying Sources of Surface Characteristics Data Inputs

- Terrain: USGS Digital Elevation Model Data for MFC
- Land Cover: USGS Land Cover Data for MFC

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# EREF Major Preconstruction and Construction Air Pollution Sources

**Source: FEIS, Section 4.2.4.1, Pages 4-12 to 4-22 (NRC000134)**

- Internal combustion engines of construction vehicles/equipment and vehicles for workforce commuting and material deliveries
- On-site comfort heating systems
- Ground disturbance and wind erosion on bare soil and stockpiles of soils and materials
- Travel on unpaved roads
- On-site concrete batch plant
- On-site petroleum fuel storage and handling and application of corrosion control coatings
- Welding, brazing, etc.
- Use of explosives for grade alteration

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# EREF Preconstruction- and Construction- Related Air Pollution Factors

**Sources: FEIS, Section 4.2.4.1, Table 4-2, Page 4-14 (NRC000134); ER Rev. 2, Section 4.6.1, Page 4.6-1 and Table 4.6-1 (AES000070)**

- Construction schedules/season and duration of activities
- Sizes of active construction zones and scale of activities
- Number, type, and condition of equipment
- Workforce size
- Fuel logistics and consumption
- Soil type and moisture content (with & without mitigation)
- Intended mitigation measures and Best Management Practices (BMPs)

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# Additional Modeling Assumptions

**Source: FEIS, Section 4.2.4.1, pages 4-12 to 4-22 (NRC000134)**

- Vehicles and equipment maintained in proper condition.
- Low-sulfur diesel fuel used in diesel-powered vehicles/equipment.
- Majority of materials/equipment delivered to site from Idaho Falls.
- Workforce commutes from Idaho Falls; no credit assigned for buses or carpools.
- Best Management Practices are implemented.
- Particle size for surface soils consistent with high-silt content soils.
- Average disturbed area of 89.4 hectares (221 acres).
- Average daily 10-hour workday for 21 days each month.

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# Estimating Emissions

- EPA Emission factors published in AP-42, Compilation of Air Pollutant Emission Factors were used to estimate emissions from on-site construction vehicles and equipment.
  - Chapter 3.3, Gasoline and Diesel Industrial Engines (NRC000199)
  - Chapter 7.1, Organic Liquid Storage Tanks (NRC000200)
  - Chapter 13.2.2, Unpaved roads (NRC000201)
  - Chapter 13.2.3, Heavy Construction Operations (NRC000202)
  - Chapter 13.2.4, Aggregate Handling and Storage Piles (NRC000203)
- EPA model MOBILE 6.2, Vehicle Emission Modeling Software (NRC000204) and EPA data (NRC000205) were used to estimate engine exhaust emissions from commuting and delivery vehicles.
- EPA model TANKS Emissions Estimation Software (NRC000206) was used to augment the determination of emissions from on-site fuel storage tanks.

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# Modeling Results

**Source: FEIS, Table 4-5, Page 4-21 (NRC000134)**

Table 4-5 Estimated Air Quality Impacts at the Proposed EREF Property Boundary Associated with Initial Preconstruction and Construction [a]

| | | | Concentration (μg/m$^3$, except ppm for CO) | | | | Percent of Standard | |
|---|---|---|---|---|---|---|---|---|
| Pollutant | Emission Rate (g/s) | Averaging Time | Background | Modeled Maximum* | Total | NAAQS/ SAAQS[b] | Modeled Maximum | Total |
| CO | 3.55 | 1-hour | 4.3 | 0.8 | 5.1 | 35 | 2.4 | 14.6 |
| | 3.55 | 8-hour | 2.1 | 0.1 | 2.2 | 9 | 1.5 | 24.9 |
| $NO_2$ | 1.3 | Annual | 11.3 | 1.0 | 12.3 | 100 | 1.0 | 12.3 |
| $SO_2$ | 0.1 | 3-hour | 159.7 | 11.3 | 171.0 | 1300 | 0.9 | 13.2 |
| | 0.1 | 24-hour | 62.8 | 1.8 | 64.6 | 365 | 0.5 | 17.7 |
| | 0.1 | Annual | 15.7 | 0.1 | 15.8 | 80 | 0.1 | 19.7 |
| $PM_{10}$ | 24.3 | 24-hour | 52.0 | 355.2 | 407.2 | 150 | 236.8 | 271.5 |
| | 24.3 | Annual | 22.0 | 15.9 | 37.9 | 50 | 31.8 | 75.8 |
| $PM_{2.5}$ | 2.4 | 24-hour | 21.0 | 15.9 | 36.9 | 35 | 45.3 | 105.3 |
| | 2.4 | Annual | 6.4 | 1.6 | 8.0 | 15 | 10.5 | 53.2 |

[a] AERMOD model uses the following:

- The highest of the second-highest concentrations over 5 years for CO and for 30-hr and 8-hr sulfur dioxide ($SO_2$).
- The highest of the annual averages over 5 years for nitrogen dioxide ($NO_2$) and $SO_2$.
- The high-6th-high concentration over 5 years for 24-hr $PM_{10}$.
- The highest of multiyear average of high-8th-high at each receptor for 24-hr $PM_{2.5}$, the highest of the annual averages over 5 years for $NO_2$ and $SO_2$, and with a wind speed measurement sensitivity of 0.134 m/s and no default value applied for low wind speed.

[b] SAAQS = State Ambient Air Quality Standards.

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# Interpreting EREF Air Dispersion Modeling Results

- Assumptions regarding modeling inputs were conservative in all instances.
- All NAAQS except for particulate were met at EREF property boundary.
- Particulates exceed the standard at EREF property boundary primarily as a result of fugitive dust.
- Particulate concentrations sensitive to wind speed; low wind speeds result in least amount of dust dispersion and, therefore, higher fugitive dust concentrations.
- EPA has announced that very low wind speeds introduce a positive bias in AERMOD for near field impacts for particulates (70 Fed. Reg. 68245-6).

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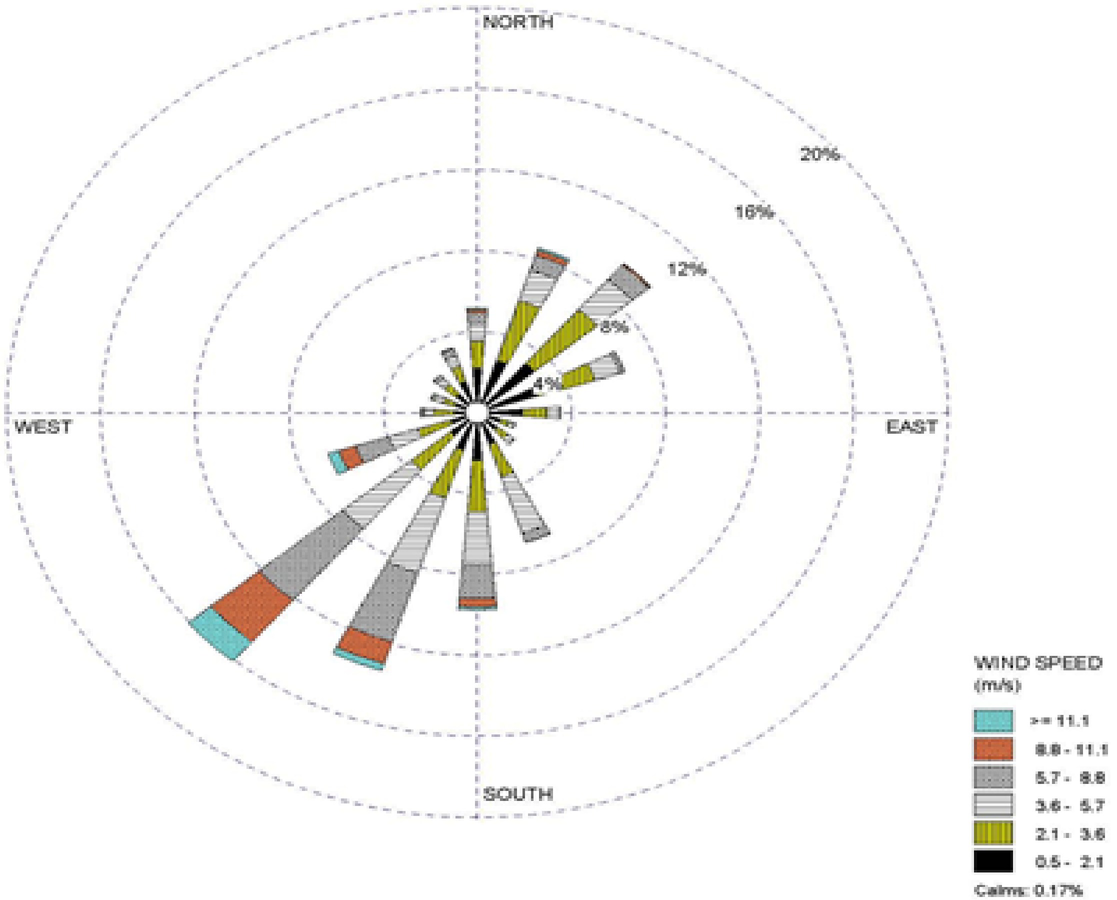
# Near Field Calm-Wind Bias

**Source: FEIS, Table 4-6, Page 4-23 (NRC000134)**

| Pollutant | Averaging Time | NAAQS/ SAAQS (*ug*/m³) | Back Ground (*ug*/m³) | Modeled Maximum at Calm Wind Speed Value of 0.134 m/sec (*ug*/m³) | Total *ug*/m³ | Percent of Standard | Modeled Maximum at Calm Wind Default Value of 1.0 m/sec (*ug*/m³) | Total *ug*/m³ | Percent of Standard |
|---|---|---|---|---|---|---|---|---|---|
| **$PM_{10}$** | 24-hour | 150 | 52.0 | 355.2 | 407.2 | 271.5 | 189.9 | 241.9 | **161.3** |
| | Annual | 50 | 22.0 | 15.9 | 37.9 | 75.8 | 13.1 | 35.1 | **70.2** |
| **$PM_{2.5}$** | 24-hour | 35 | 21.0 | 15.9 | 36.9 | 105.3 | 12.0 | 33.0 | **94.1** |
| | **Annual** | **15** | **6.4** | **1.6** | **8.0** | **53.2** | **1.3** | **7.7** | **51.3** |

# Interpreting EREF Modeling Results: EREF Wind Rose

**Sources: FEIS, Section 3.5.2, Page 3-15, and Figure 3-11, Page 3-23 (NRC000134)**



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# Conclusions

- The staff used AERMOD for evaluating the impacts to ambient air quality of EREF preconstruction and construction.
- The results presented in the FEIS were based on the application of adequate and representative inputs and conservative assumptions.
- Modeling demonstrated that particulate concentrations could be greater than the NAAQS standard at the EREF property boundary.
- Successful execution of Best Management Practices and appropriate mitigation will minimize or prevent NAAQS exceedances.

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