

# **APPENDIX A**

## **Deciview Calculation Methodology**

The California Regional Haze Plan uses the Haze Algorithm II for estimating the deciview values used in this plan. Haze pollutants are particles that have the ability to absorb and reflect light radiation; both actions extinguish light and decrease visibility. Particle mass, humidity, and temperature influence the amount of light extinction caused by haze species. Rayleigh scattering is affected by elevation and temperature. The following explains the process for estimating the deciview values.

1. The "HAZE ALGORITHM" uses Species Mass → to determine Light Extinction → which is converted to a Deciview Value.
2. Every third day, 24-hour mass measurements are made of all the haze species collected at each IMPROVE monitor and the Haze Algorithm is used to deliver individual species and total species Light Extinction in inverse megameters (Mm<sup>-1</sup>).
3. The Haze Algorithm for calculating Light Extinction (*b<sub>ext</sub>*) weights the Species Mass (ug/m<sup>3</sup>) measured at the IMPROVE monitors using particle size, humidity, and elevation as follows:

$$b_{\text{Sulfate}} = 2.2 \times f_{\text{S}}(\text{RH}) \times [\text{small SO}_4] + 4.8 \times f_{\text{L}}(\text{RH}) \times [\text{large SO}_4]$$

$$b_{\text{Nitrate}} = 2.4 \times f_{\text{S}}(\text{RH}) \times [\text{small NO}_3] + 5.1 \times f_{\text{L}}(\text{RH}) \times [\text{large NO}_3]$$

$$b_{\text{Organic Material Carbon}} = 2.8 \times [\text{Small OM}] + 6.1 \times [\text{Large OM}]$$

$$b_{\text{Elemental Carbon}} = 10 \times [\text{EC}]$$

$$b_{\text{Fine Soil}} = 1 \times [\text{Fine Soil}]$$

$$b_{\text{Sea Salt}} = 1.7 \times f_{\text{SS}}(\text{RH}) \times [\text{Sea salt}]$$

$$b_{\text{Coarse Mass}} = 0.6 \times [\text{CM}]$$

$$b_{\text{Rayleigh}} = (\text{Site Specific factor, related to elevation, ranging from 7+ to 11+ in California})$$

$$b_{\text{Nitric Oxide gas}} = 0.33 \times [\text{NO}_2 \text{ (ppb)}] \text{ (not measured at most IMPROVE monitors).}$$

4. The sum of the weighted extinction values gives the total daily extinction (Total *b<sub>ext</sub>*) for each day of measurement:

$$\text{Total } b_{\text{ext}} = b_{\text{Sulfate}} + b_{\text{Nitrate}} + b_{\text{EC}} + b_{\text{OMC}} + b_{\text{Soil}} + b_{\text{CM}} + b_{\text{SS}} + b_{\text{Rayleigh}} + b_{\text{NO}_2}$$

5. The deciview scale was created to describe the total light extinction capability of all haze species in the ambient air at a given time at a given location. The Deciview Value (dv) is the natural logarithm of the total calculated light extinction on each day of measurement. Mass measurements for all species must be available to calculate the dv for a given day.

$$\text{Deciview Value (dv)} = 10 \ln (\text{Total } b_{\text{ext}} / 10)$$