UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
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DENVER, COLORADO 80202-2413

REF: 8AT-AP

JAN 28 1988

MEMORANDUM

SUBJECT: The Use of a Box Model for CO, Rollback Calculations

TO: Joseph Tikvart, Chief
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MD-14

FROM: John Notar
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8AT-AP

The Colordo Department of Health (CDH) has requested EPA approval for the use of a box model approach in developing rollback calculations in order to update the 1982 SIP for Carbon Monoxide (CO). This methodology would be applied to two small urban areas, Ft. Collins and Greeley, Colorado. These areas have populations of 64,632 and 53,006 respectively (1980 Census).

According to EPA guidance, strategies for an urban area-wide CO reduction may be evaluated using a unified rollback or proportional model. Significant contributions of CO from area type sources such as residental fireplaces and motor vehicle emissions trapped under a strong inversion can be better addressed in a box type model than from Caline 3.

CDH has proposed to use a box model approach, with the BOXRB model. This model is an improvement over the simiplistic XTRACT3 model used in the 1982 SIP. The improvements over XTRACT3 contained in BOXRB, includes the ability to use site specific wind speed, wind direction and mixing height on an hourly basis. Additionally, dispersion from an area or line source is a function of stability and source orientation with respect to wind direction. This is similiar to the concept found in the PAL model. The BOXRB model also allows for the buildup of pollutants within the box if wind speed is reported as calm. This is a very important concept especially along the Rocky Mountain Front Range, which has winter conditions dominated by the Great Basin high pressure cell, that is characterized by low wind speed, clear night skies, and strong surface based inversions especially in low lying areas. The strong inversions are formed by the rapid nightime radiative cooling due to clear skies and low humidity. Additionally, nightime inversions may be trapped and strengthened from aloft the following day by warm downslope winds that cap the inversion. As explained in the CDH memo, BOXRB takes into account the effects of area source dimensions more precisely than the simple inverse distance factor. This can assist in the development of control strategies by better apportionment of source contribution at the various receptors.

On site data for the analysis includes meteorological and CO monitoring data. In Ft. Collins, CDH operates a co-located CO monitor along with a 10m meteorological tower. Additional meteorological data is available from the station operated by Colorado State University located in central Ft. Collins. Also additional CO monitoring data from a monitor operated by ERT for a PSD applicant is available. CDH plans to calibrate the BOXRB model using its own CO monitor data and to use the ERT CO data for validation of predicted values.

The Greeley site does not have as an extensive data base as does Ft. Collins. CDH operates the only CO monitor in the town. This will be used for calibration, but validation will have to be proven in the Ft. Collins scenerio since there is not a second CO monitor in the Greely area. Meteorological data for Greeley will be taken from the 300 meter BAO tower in Erie Colorado, which is about 10 miles southwest of Greeley. Mixing heights will be developed from the available on site surface stations and the BAO tower, or if needed, CDH can access NWS data from Denver to determine mixing heights.

In conclusion, Region VIII agrees with CDH that the proposed BOXRB methodology is an improvement over previous work and that it will provide sufficent data to allow reductions in CO emission though roll back caculations. Region VIII requests comment on this decision, to allow the use of the BOXRB model.