SMOG MONITORING AND CONTROL IN THE LOS ANGELES AREA
SOME FACTS AND SOME IMPLICATIONS

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In the Los Angeles Area, as in many other parts of the nation, air pollution monitoring and control has been primarily a local responsibility. As smog spread into neighboring counties in the 1950's and 1960's, the pioneering Air Pollution Control District of Los Angeles County was joined by similar districts in the nearby counties of Orange, Riverside, and San Bernardino. In this paper, evidence will be presented to substantiate the intuitive notion that because smog is no respecter of county boundaries, it should be monitored and controlled on a regional basis.

In a recent paper[1] the writer described seasonal variations in air pollution in Los Angeles County via maps of principal atmospheric contaminants and a summary air pollution index. It was noted that "any air pollution index is only as sound as the air quality standards on which it is based."[2] It could have been argued further that development of meaningful air quality standards requires the availability of accurate and comparable air quality data so that accurate correlations between observed toxic effects and exposure to particular contaminant levels might be calculated. Unfortunately, the implicit assumption that the Los Angeles County Air Pollution Control District oxidant data, upon which the U.S. Environmental Protection Agency and the California Air Resources Board developed their oxidant air quality standards, are accurate and comparable to those of other pollution control agencies, is in doubt.

The accuracy and/or comparability problem arises from the differing techniques utilized by various authorities to calibrate

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oxidant monitoring instruments. The Los Angeles County A.P.C.D. utilizes one, the Environmental Protection Agency, California Air Resources Board, and California counties other than Los Angeles, use another. Which method is correct is not yet certain but it is clear that oxidant readings taken at the same site by identical instruments calibrated by two techniques differ by 20 to 30 percent.[3] This, in the words of James N. Pitts, Director of the University of California at Riverside Statewide Air Pollution Research Center, "has a lot of implications."[4]

One obvious implication is that the Environmental Protection Agency's air quality standards developed with reference to Los Angeles County oxidant data are meaningful only in Los Angeles County. In other locations they should be adjusted by a factor of 20 to 30 percent to bring them into line with the Los Angeles oxidant values upon which they are based. An adjustment of 25 percent has already been made by the California Air Resources Board. Under its authority,

> Health advisories for photochemical oxidant, including ozone, will be issued by the Los Angeles County APCD at hourly averages of 0.20 ppm (Stage 1), 0.40 ppm (Stage 2) and 0.60 ppm (Stage 3). APCD's in surrounding counties will issue advisories when levels reach 0.25, 0.50 and 0.75 ppm.[5]

A related implication is that past comparisons between oxidant levels in Los Angeles and neighboring counties were inaccurate because true oxidant levels in Los Angeles were understated by approximately 25 percent or those in neighboring counties were overstated by approximately 25 percent, depending on which calibration technique proves most accurate. Thus it may well be that the identification of the inland cities of San Bernardino and Riverside as summer "smog capitals," with markedly worse oxidant pollution than is experienced in inland valley areas of Los Angeles County, is based not on reality but on the non-comparability of data described above. Such is the hypothesis of the writer.

This hypothesis was tested by summarizing 1973 oxidant data recorded at county and Air Resources Board air monitoring

stations in Southern California (Fig. 1).[6] To avoid the conundrum of which data to adjust up and which down to attain "absolute" oxidant values, the writer followed the example of the California Air Resources Board and adjusted upward by 25 percent the federal air quality standard for oxidant in the counties surrounding Los Angeles. Los Angeles oxidant readings were then mapped as a percentage of the unadjusted oxidant standard of 0.08 ppm, whereas oxidant readings from surrounding counties were mapped as a percentage of the adjusted oxidant standard, that is 0.10 ppm. The isoline map provides a macro view of the spatial distribution of oxidant in the study area.[7]

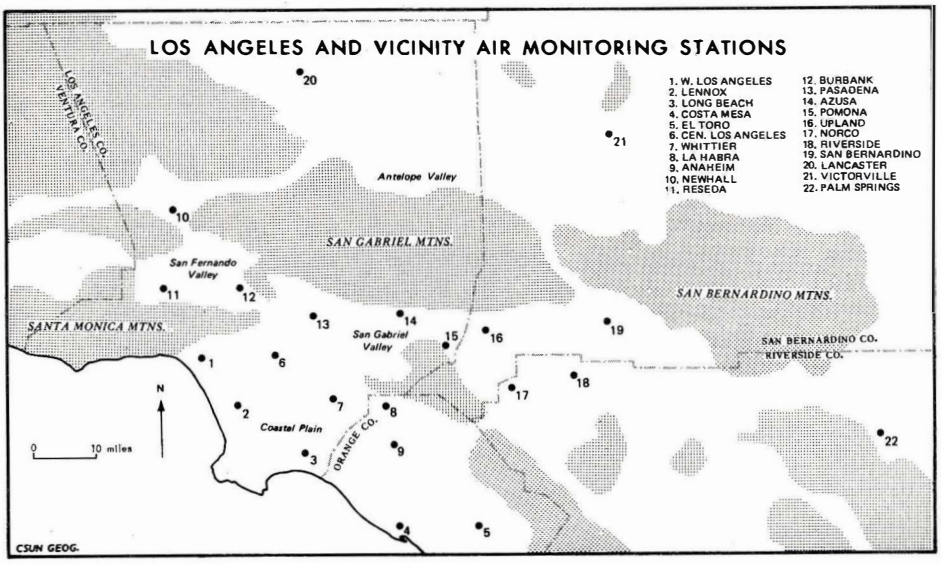

Figure 1. Los Angeles and Vicinity Air Monitoring Stations

SPATIAL PATTERNS OF OXIDANT IN 1973

Like the previous two summers, the summer of 1973 was a season of relatively light air pollution in Southern California. Conditions had been worse in the late 1950's and early 1960's, before California's program to control automotive emissions was implemented.[8] Even so, the federal oxidant standard of 0.08 ppm (one hour average) or 0.10 ppm (adjusted one hour average), to be exceeded on nor more than one day per year, was surpassed on the

average summer day in 1973 in all but coastal sections of the Los Angeles Basin (Fig. 2). Conditions were much worse inland; oxidant averages 2 to 2.5 times the oxidant standard were recorded in the San Gabriel and San Bernardino valleys. As hypothesized, oxidant levels were no worse (indeed were slightly lower) in the cities of San Bernardino and Riverside than in much of Los Angeles County's San Gabriel Valley. Farther inland, atmospheric dispersion of contaminants resulted in somewhat lower readings at monitoring stations; however, the areal enormity of Southern California's photochemical smog problem is underlined by the fact that even the desert communities of Lancaster and Palm Springs, respectively 45 and 100 miles from central Los Angeles, had average oxidant readings equal to those of downtown Los Angeles.

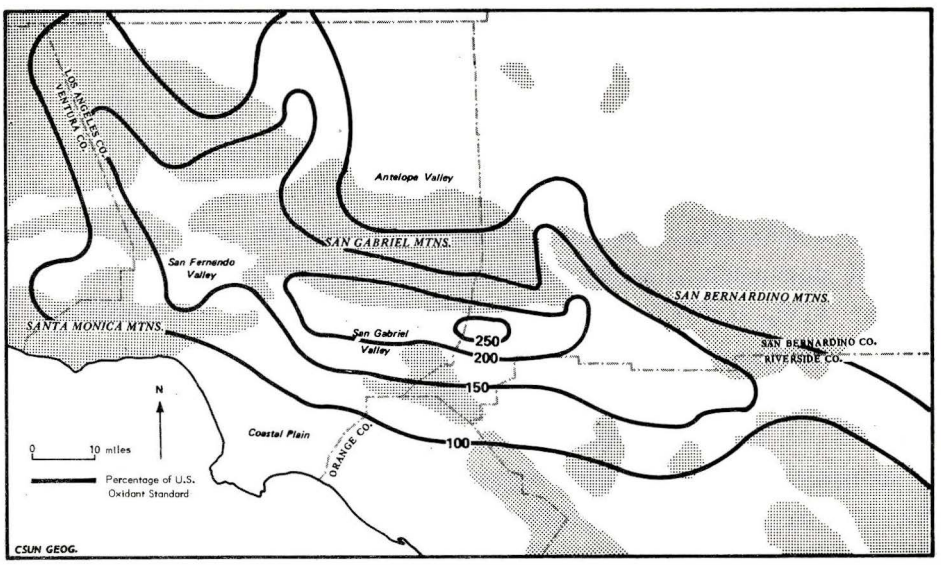

Figure 2. Oxidant Concentrations as a Percentage of U.S. Oxidant Air Quality Standard, Summer (May 1-Oct. 31) 1973.

It is worth noting the lack of congruency between areas of peak emissions of the raw materials of smog, hydrocarbons and oxides of nitrogen, and areas of peak oxidant concentrations. Highest emissions of hydrocarbons and oxides of nitrogen occur in central and western parts of Los Angeles and Orange counties, where

population densities, automobile traffic, and industrialization are greatest. However, several hours pass between the time heavy emissions of hydrocarbons and oxides of nitrogen are injected into the air mass above coastal and central Los Angeles by morning rush-hour traffic, and the time maximum oxidant concentrations accumulate.[9] During this time span the sea breeze ventilates coastal areas of Los Angeles with relatively clean marine air, and carries the contaminant cloud inland. Consequently, oxidant levels are relatively low in coastal and central Los Angeles in summer and relatively high in inland "receptor areas" even though emission levels are considerably lower inland. It is sad but true that residents of otherwise pleasant small inland cities such as Pomona, San Bernardino, and Riverside are literally choking on aerial effluents not of their own creation but delivered by the sea breeze from metropolitan Los Angeles.[10]

CONCLUSION

This study has shown that serious oxidant air pollution is a widespread phenomenon in Southern California, shrouding contiguous areas of five counties in eye-stinging haze on the average summer day. In this context and because the daily sea breeze typically spreads smog effects from peak emissions source areas in coastal areas of Los Angeles and Orange counties far inland to receptor areas in neighboring counties, the present political fragmentation of Southern California into several county-operated air pollution control districts is undesirable. Because each district can declare pollution alerts and request remedial actions, such as reduced driving, only for its own territory, the effectiveness of the alert system is reduced. An oxidant advisory called in Riverside at 5 p.m. is a result of emissions occuring in Los Angeles or Orange counties eight or nine hours earlier. Any request for reduced driving in Riverside would have little effect on local oxidant levels. If meteorological conditions favored repetition of the "smog episode" in Riverside the next day, the

action needed would be reduced driving not in Riverside but in emission source areas in Los Angeles and Orange counties. Unfortunately, until the several local county air pollution control districts are replaced by one with responsibility for air quality in the entire South Coast Air Basin, such emergency emission control action is difficult if not impossible to implement. For that reason, and to rationalize operations in general, the autonomous air pollution control districts of Southern California should be amalgamated.

NOTES

[1]Warren R. Bland, "Seasonal Variations in Air Pollution in Los Angeles County," *The Professional Geographer*, Vol. 26 (August, 1974), pp. 277-282.

[2]*Ibid.*, p. 278.

[3]Larry Pryor, "L.A. Smog Gauges Wrong, Scientists Say: State Upheld," *Los Angeles Times*, September 5, 1974, Part 2, p. 5. The accuracy of Pryor's article was confirmed by Mel Zeldin, Air Pollution Analyst for the San Bernardino County A.P.C.D., and by William Falkner, Public Information Officer of the Los Angeles County A.P.C.D., in personal communications with the writer.

[4]*Ibid.*

[5]*Los Angeles Times*, December 27, 1974, Part 1, p. 24.

[6]Unadjusted oxidant data were obtained from: California, Air Resources Board, *Air Quality Data*, Vol. 5, 1973.

[7]For a discussion of the technique of macro-scale mapping of air pollution and its limitations, see: Bland (1974), pp. 278-279.

[8]Warren R. Bland, "The Impact of Contaminant Emission Controls on Photochemical Smog Levels in Los Angeles County, 1956-1972," Paper Delivered to the Third Pacific Regional Science Conference, Honolulu, Hawaii, August 26, 1973.

[9]Bland, 1974, p. 281.

[10]Larry Pryor, "Polluted Air Moves Far, Wind Patterns Variable, Study Finds," *Los Angeles Times*, August 28, 1974, Part 1, pp. 1, 3.