REPORT FOR CONSULTATION ON THE METROPOLITAN OMAHA INTERSTATE AIR QUALITY CONTROL REGION (NEBRASKA AND IOWA)

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service

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National Air Pollution Control Administration
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PREFACE

The Clean Air Act, as amended, directs the Secretary of Health, Education, and Welfare to designate "air quality control regions" to provide a basis for the adoption of regional air quality standards and the implementation of those standards. The Act stipulates that the designation of a region shall be preceded by consultation with appropriate State and local authorities. This report is intended to provide the basic background information needed for the consultation. It proposes boundaries for the Metropolitan Omaha Interstate Air Quality Control Region and discusses the factors which are the basis of the proposed boundaries.

The Region* boundaries proposed in this report remain subject to revisions suggested during consultation with State and local authorities. Formal designation of the Region will be made only after a careful review of all opinions and suggestions submitted during the consultation process.

The National Air Pollution Control Administration appreciates assistance received from the States of Nebraska and Iowa, and the local governments and planning agencies in the area.

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*For the purposes of this report, the word "region," when capitalized, will refer to the Metropolitan Omaha Interstate Air Quality Control Region.

INTRODUCTION

THE REGIONAL APPROACH

Air pollution in the urban areas of the United States is a regional problem which frequently extends across governmental boundaries. Since air pollution problems are rarely confined to any single municipality or county, and are often not confined within a single State, successful control requires coordinated planning, standard setting, and enforcement by the several political jurisdictions which share a common problem. To date, State and local governments across the Nation have only begun to develop a regional approach to air pollution control.

The Clean Air Act, as amended, provides a regional approach which depends upon coordination and cooperation among all levels of government--municipal, county, State, and Federal. To set in motion the machinery for regional air pollution control, the Department of Health, Education, and Welfare designates air quality control regions (following consultation with State and local officials), issues air quality criteria, and publishes reports on control techniques. The designation of region boundaries indicates which State and local jurisdictions will be involved in a regional air pollution control effort. The air quality criteria indicate the extent to which various concentrations of air pollutants are harmful to health and damaging to

property. The reports on control techniques provide information on the costs and effectiveness of various techniques for controlling air pollutant emissions.

After the Department of Health, Education, and Welfare completes these initial steps, State governments develop air quality standards and plans for implementation of such standards within the boundaries of designated air quality control regions. An air quality standard for a region defines the desired limit of concentration of a pollutant in its ambient air. It represents the level of air quality which the regional control program will attempt to achieve. An implementation plan is a blueprint of the steps which will be taken to attain chosen regional air quality standards within a reasonable time. The Clean Air Act requires that within 90 days after the Secretary of Health, Education, and Welfare has designated the region, State Governors must submit letters indicating that they intend to set air quality standards for those pollutants for which criteria and control technology documents have been issued. They have an additional 180 days to set the standards. The procedure for setting standards includes a public hearing which allows residents of a region to express their views concerning the proposed standards. The Governors are required to submit to the Secretary, within an additional 180 days, plans for the implementation of the standards which have been adopted.

The Department of Health, Education, and Welfare reviews air quality standards and implementation plans in order to ascertain their consistency with the provisions of the Act.

When air quality standards and implementation plans are approved, States proceed to prevent and control air pollution in accordance with those standards and plans. This system for establishing a regional approach to air pollution control is outlined in Figure 1.

DESIGNATION OF AIR QUALITY CONTROL REGIONS

Designation of an air quality control region is one of the first steps in the regional approach to air pollution control. Section 107 (a) (2) of the Clean Air Act, as amended, directs the Secretary, Department of Health, Education, and Welfare to make such designations. The portions of the section relevant to this discussion state:

> "...The Secretary, after consultation with appropriate State and local authorities shall...designate air quality control regions based on jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards. The Secretary may...revise the designation of such regions...The Secretary shall immediately notify the Governor or Governors of the affected State or States of such designation."

Procedure for Designation of Regions

Figure 2 illustrates the procedures used by the National Air Pollution Control Administration (NAPCA) for designating air quality control regions.

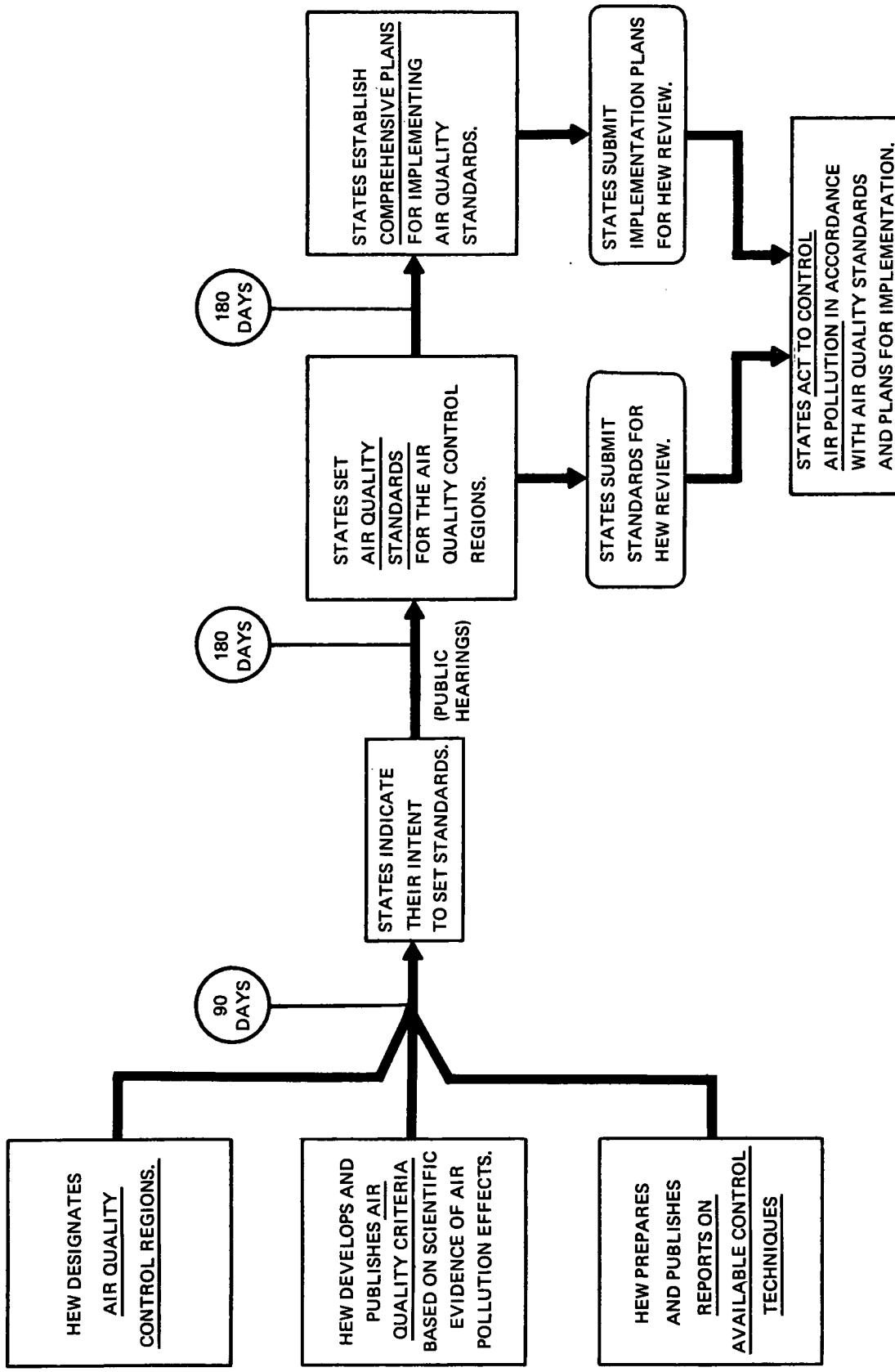

FIGURE 1 - Flow Diagram for Action to Control Air Pollution on a Regional Basis, Under the Clean Air Act

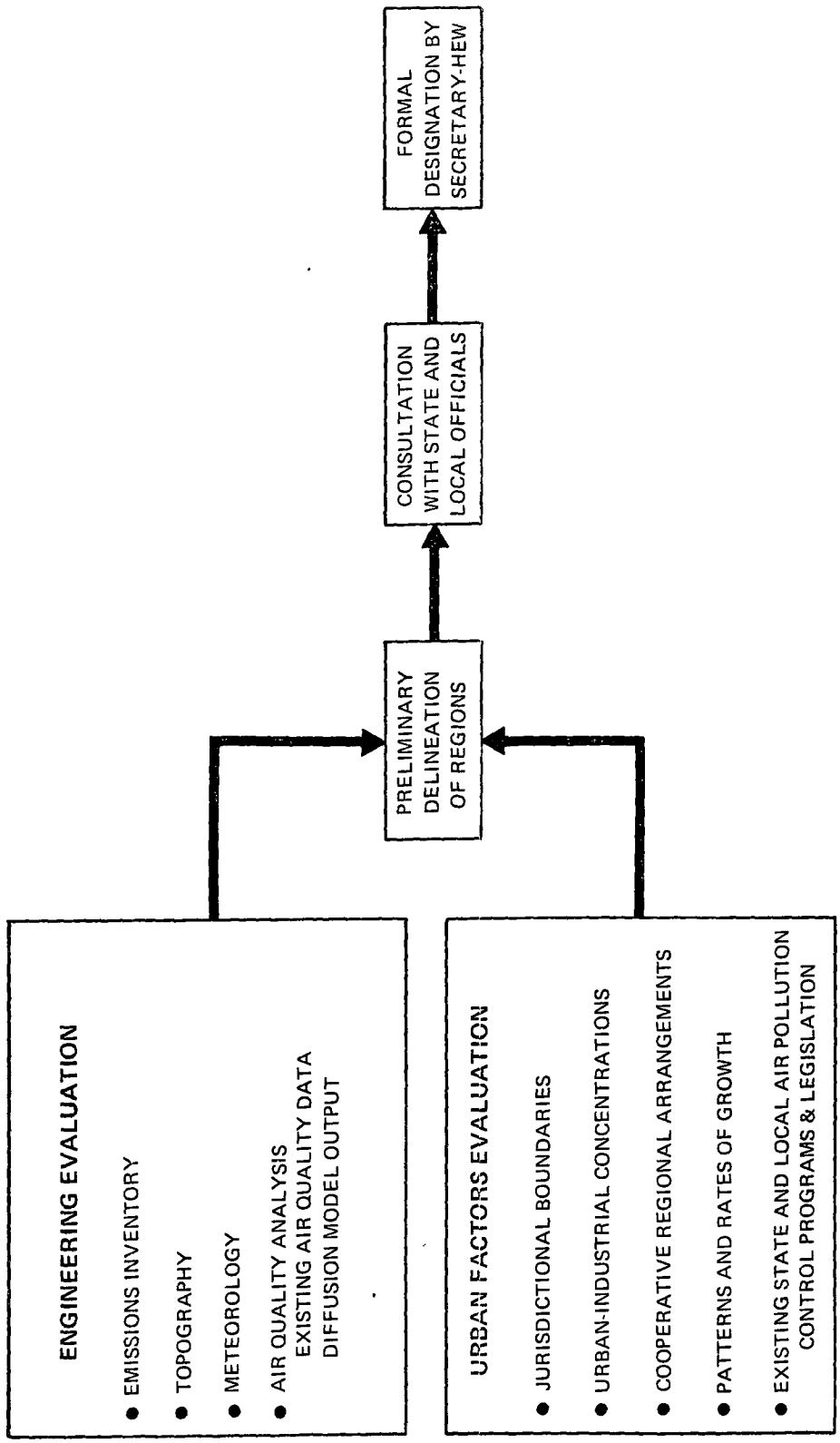

FIGURE 2 - Flow Diagram for the Designation of Air Quality Control Regions

After evaluating relevant technical and urban factors in a region, the National Air Pollution Control Administration publishes a proposed delineation of its boundaries. At the same time, NAPCA sets a time and place for a consultation meeting and distributes to State and local authorities a report of the evaluation study (such as this "Report for Consultation") which includes the boundary proposal. At the consultation meeting State and local authorities are encouraged to present fully their views and suggestions concerning the proposed boundaries of the region. Interested parties who do not have official status may submit comments in written form for the record. After careful review of all suggestions and opinions submitted for the record by interested parties, the Secretary of Health, Education, and Welfare makes a formal designation of the region boundaries and notifies the Governor(s) of the State(s) affected by the designation.

The Size of a Region

As stipulated in Section 107 (a) (2), the designation of air quality control regions should be based on "jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards." This language suggests a number of objectives which are important in determining

how large an air quality control region should be. Basically, these objectives can be divided into three separate categories.

First, a region should be self-contained with respect to air pollution sources and receptors. Unfortunately, since air pollutants can travel long distances, it is impractical if not impossible to delineate regions which are completely self-contained. The air over a region will usually have at least trace amounts of pollutants from external sources. During episodic conditions, such contributions from external sources may even reach significant levels. Conversely, air pollution generated within a region and transported out of it can affect external receptors to some degree. It would be impractical and inefficient to make all air quality control regions large enough to encompass these low-level trace effects. The geographic extent of trace effects overestimates the true problem area which should be the focus of air pollution control efforts. Thus, the first objective, that a region be self-contained, becomes a question of relative magnitude and frequency. The dividing line between "important influence" and "trace effect" will be a matter of judgment. The judgment should be based on estimates of the impact a source has upon a region, and the level of pollution to which receptors are subjected. In this respect, annual and seasonal data on pollutant emissions and ambient air concentrations are a better measure of relative

influence than short term data on episodic conditions. In summary, a region should include most of the important sources in the area as well as most of the people and property affected by those sources.

The second general objective requires that regional boundaries be designed to meet not only present conditions but also future conditions. In other words, the region should include areas where industrial and residential expansion are likely to create air pollution problems in the foreseeable future. This objective requires careful consideration of existing metropolitan development plans, expected population growth, and projected industrial expansion. Such considerations should result in the designation of regions which will contain the sources and receptors of regional air pollution for a number of years to come. Of course, regional boundaries need not be permanently fixed, once designated. Boundaries should be reviewed periodically and altered when changing conditions warrant readjustment.

The third objective is that regional boundaries should be compatible with and even foster unified and cooperative governmental administration of the air resource throughout the region. Because air pollution usually extends across governmental boundaries, the cooperation of several governmental bodies is required for the solution of a common set of air pollution problems. In this regard, the established patterns of governmental coopera-

tion on a range of urban problems is an important consideration, and the pattern of cooperation among existing air pollution control programs is a particularly relevant factor. In general, administrative considerations would argue against the division of governmental jurisdictions. Although it would be impractical to preserve State jurisdictions undivided, usually it is possible to preserve the unity of county governments by including or excluding them in their entirety. Occasionally, even this would be impractical due to a county's large size, wide variation in level of development, or striking topographical features.

To the extent that any two of the above three objectives lead to incompatible conclusions concerning region boundaries, the region must represent a reasonable compromise. A region should represent the best way of satisfying the three objectives simultaneously.

As noted above, the evaluations of relevant technical, urban, and governmental factors form the basis of the boundary proposals published by NAPCA. The technical factors study takes account of the location of pollution sources and the geographic extent of serious pollutant concentrations in the ambient air. Pollution sources are identified through an inventory of emissions from power generation, industrial operations, space heating, waste disposal, and other pollution-causing activities. The transport and distribution of pollutants in the

ambient air are analyzed on the basis of measured air quality data, the location of emissions, meteorological data, and topographic information. A mathematical diffusion model which predicts ambient pollution concentrations from information on emissions and meteorology can be used in areas where irregular topographical features would not invalidate the theoretical model. As a whole, the technical factors study indicates how large the air quality control region should be in order to encompass most pollution sources and most people and property affected by those sources.

The study of urban factors takes account of a different set of considerations. It discusses the location of urban and industrial concentrations and expected patterns of urban growth. As a whole, the urban factors study indicates how large a region should be in order to encompass expected regional growth.

The evaluation of the regional governmental organizations discusses the planning agencies, councils of government, and state and local air pollution control programs. This study attempts to define the combination of counties which, through cooperative regional arrangements, would best work together towards achieving clean air in the region.

The body of this report contains a proposal for the boundaries of the Metropolitan Omaha Interstate Air Quality Control Region, following evaluation of technical, urban, and governmental factors. The report is intended to serve as the back-

ground document for the formal Consultation between the National Air Pollution Control Administration and the appropriate State and local authorities.

EVALUATION OF URBAN FACTORS

Factors of major importance in considering boundaries for an air quality control region are those which have to do with the size, shape, nature, and dynamics of urbanization within the region. It is the concentration of population and work in urban centers that creates many sources of air pollution and exposes large numbers of people and valuable property to their effects.

In this discussion of the Metropolitan Omaha area, the geography of the region is reviewed since its locational and physical characteristics can affect both the scale and direction of urban growth. Also considered are the area's population and economic activity patterns, both at present and as they appear likely to be in the future. Future growth and its implications for the physical configuration of the urban area are of particular importance in determining the size of the air quality control region.

GEOGRAPHY OF THE REGION

The Metropolitan Omaha Study Area is defined for the purposes of this report as the Omaha Standard Metropolitan Statistical Area (SMSA) counties--Douglas and Sarpy Counties in Nebraska, and Pottawattamie County in Iowa--and five adjacent

counties--Cass, Dodge, Saunders, and Washington in Nebraska and Mills in Iowa (Figure 3).

This area lies east and west of the Missouri River which forms the boundary between the States of Nebraska and Iowa. At this location, the River is about 965 feet above sea level. The terrain extending west into Nebraska and east into Iowa is gently rolling with maximum elevations of about 1,300 feet above sea level in westernmost Dodge and Saunders Counties, Nebraska. Running generally southeastward toward the Missouri River, through the Nebraska side of the area, are the drainage basins of the Platte and its tributary, the Elkhorn.

Iowa and the eastern half of Nebraska are in the western reaches of the Corn Belt, a region whose geographic characteristics are responsible for making it one of the Nation's major centers for feed grain and livestock production. Deep, fertile soils, ample rainfall, and favorable growing season temperatures, combined with the region's expanses of level or gently rolling topography, make it exceptionally well-adapted to corn and other feed grain production. These crops in turn provide a basis for concentrated feed-lot production of hogs, beef cattle, and other livestock.

Iowa today leads the Nation in the output of corn and hogs; it is second only to Texas in cattle production and ranks high

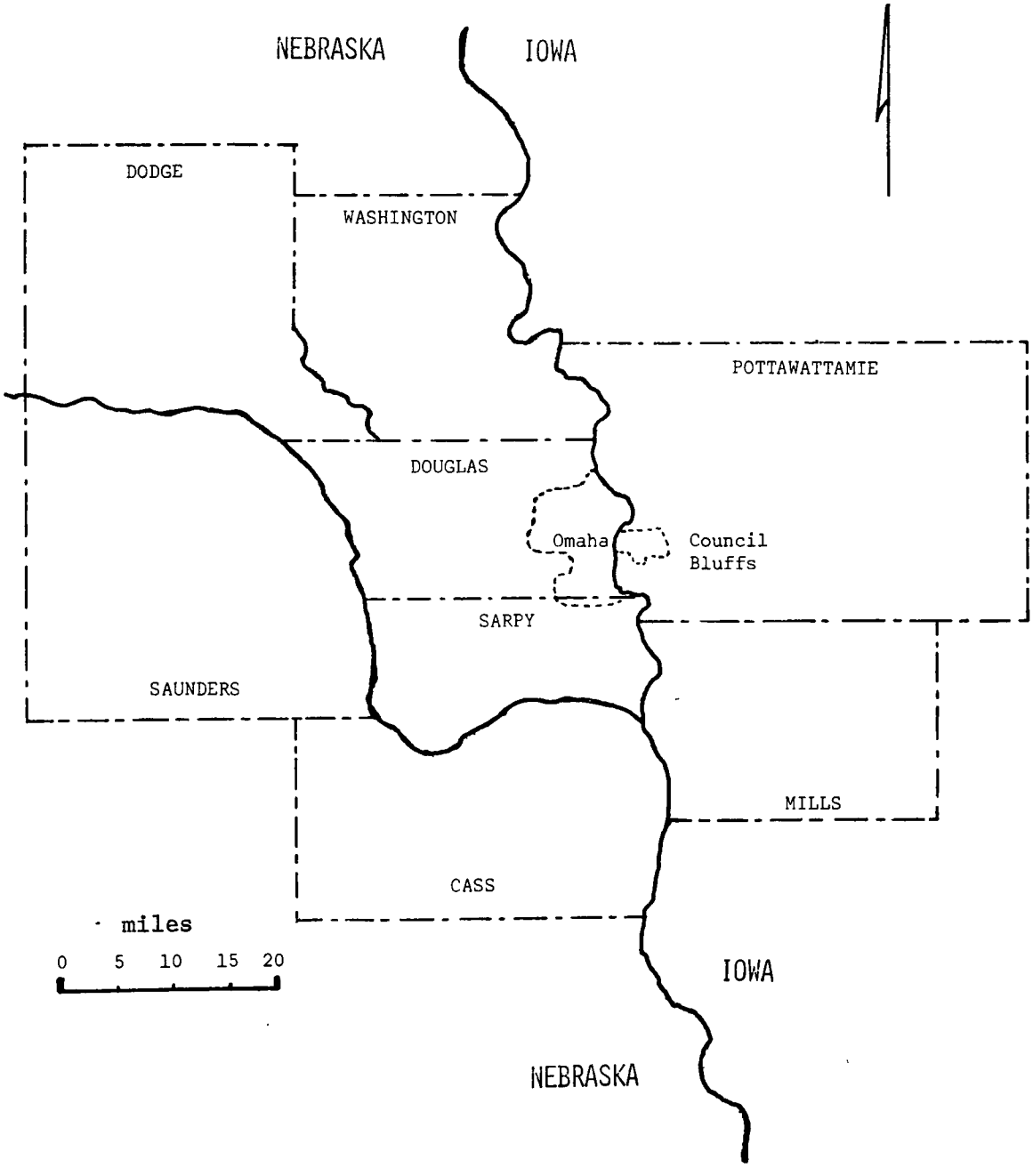

FIGURE 3 - Nebraska and Iowa Counties Included in Metropolitan Omaha Study Area

in soybean output. Nebraska is a major producer of winter wheat and one of the leading producers of beef cattle and hogs.

Metropolitan Omaha, at the center between the two States, has therefore had ample local resources as incentives in the development of meat packing, food preparation, and a variety of feed processing industries.

The area's industrial development has been further stimulated by exceptional transportation advantages. In the nineteenth century period of transcontinental railroad construction, major east-west railroads were built through Omaha. It was also chosen as a junction for rail lines connecting the north, southeast, and south with the mid-continent and points to the west.

The combination of rich land and good rail transportation resulted in growth spurts in the two States during the nineteenth century which has not been equaled in more recent times. Nebraska's population soared from 29,000 in 1860, to about 450,000 in 1880, and to over a million in 1900. Iowa, with an 1860 population of 675,000, increased its population to 1,625,000 in 1880, and to 2,232,000 in 1900. Between 1900 and 1960, Nebraska's population had expanded to only 1,411,000, and Iowa's to 2,758,000.

Although Nebraska has natural gas and petroleum deposits in the western part of the State, production has been declining. No mineral resources of significance, except limestone, exist

in the immediate vicinity of the Metropolitan Omaha area. However, because of the City's accessibility by barges on the Missouri River and its rail transportation connections with inland points, raw materials from outside the area have provided a basis for industries in the Omaha area like lead smelting, steel casting, and metals fabrication.

In the period following World War II, Omaha's location was a factor in its selection as a Strategic Air Command base. Offutt Air Force Base, established in the southern part of the Metropolitan Omaha area, currently accounts for employment of about 12,800 and a total population, including dependents, of about 35,000.

PRESENT POPULATION AND ECONOMIC ACTIVITY PATTERN OF REGION

Table I summarizes the most recent available population estimates for the Metropolitan Omaha study area counties. The Omaha/Council Bluffs Metropolitan Area Planning Agency (MAPA) estimates the 1968 population of the Omaha SMSA as 528,800, with a major concentration of 395,800 in Douglas County, Nebraska, a secondary concentration in Pottawattamie County, Iowa, of 85,800, and the remainder in Sarpy County, Nebraska. According to estimates of the Nebraska Department of Economic Development and the U. S. Bureau of the Census, five adjoining

Table I

Estimated Population of Metropolitan Omaha Area Counties, 1968

Counties	Total (thousands)
Omaha SMSA Counties, Total	(528.8)
Douglas (Nebraska)	395.8
Sarpy (Nebraska)	47.2
Pottawattamie (Iowa)	85.8
Adjoining Counties, Total	(94.8)
Cass (Nebraska)	17.0
Dodge (Nebraska)	36.5
Saunders (Nebraska)	15.8
Washington (Nebraska)	13.0
Mills (Iowa)	12.5

Sources: Standard Metropolitan Statistical Area (SMSA) estimates are those of the Metropolitan Area Planning Agency (MAPA); estimates for adjoining Nebraska counties are those of Nebraska Department of Economic Development; and estimate for Mills County, Iowa, is that of the U. S. Bureau of the Census for 1966.

counties in Nebraska and Iowa had a combined 1968 population of 94,800, over a third of whom were in Dodge County, Nebraska.

One index of the relative urbanization of any area is population density. If the estimated Metropolitan Omaha population is considered in relation to total county area, the Douglas County average density of 1,181 persons per square mile provides a clue to its urbanization, but the relatively low density averages for the remaining counties are not revealing measures of the existence or non-existence of urban growth (Figure 4).

Another index of urbanization is the percentage of land in farms. By this measure, the Metropolitan Omaha counties are predominantly rural, rather than urban in character. A very high share of their total land area was classified as farmland in the 1964 agricultural census--ranging from 70 percent in Douglas County to 97 percent in Dodge and Washington Counties. But this index, too, can be deceptive since farms are increasing in average size and farm labor force needs declining. Many residents of predominantly rural areas are not, therefore, actually engaged in farm operations or farm work. Instead, whether they live on farms or in towns and cities providing services to farms, many rural residents have nonfarm occupations.

This appears to be the case in the Metropolitan Omaha area which, though predominantly rural in land classification terms, is mainly urban in terms of the occupations of its labor force.

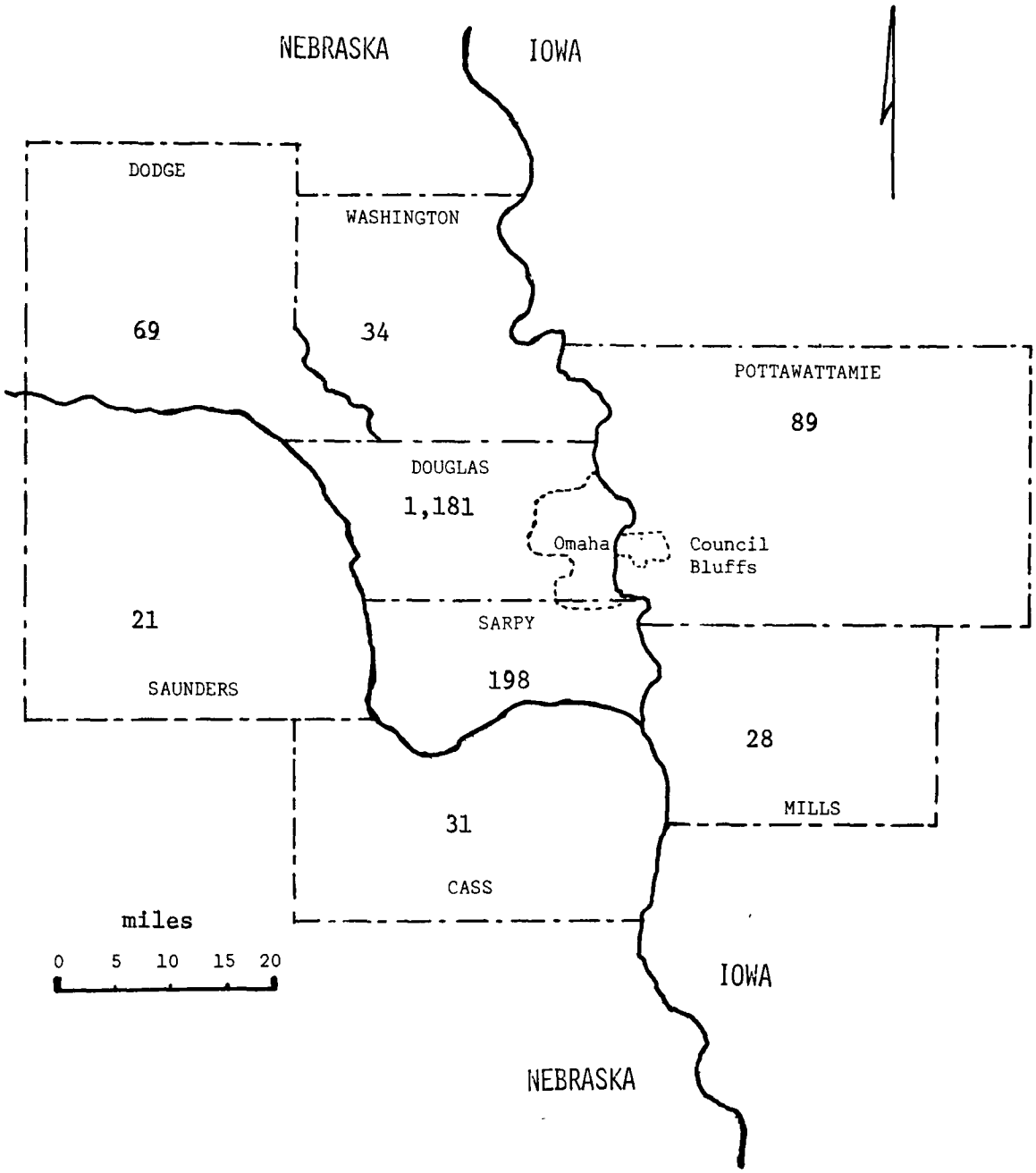

FIGURE 4 - Population Per Square Mile of Metropolitan Omaha Area Counties, 1968

In 1968, more than 97 percent of all employment in the three-county SMSA and 70 to 85 percent of employment in the adjoining counties was in nonfarm categories (Table II).

A better idea of the extent of urbanization in an area can be obtained by examining maps of actual residential densities and locations of population clusters.

Figure 5, prepared by MAPA, shows the present residential concentrations in the contiguous area of Omaha-Council Bluffs. The black areas, representing higher densities, are all on the west bank of the River, generally in the center of the City, but also in scattered locations north and south. One significant high density concentration is in the extreme southern part of the present metropolitan area, adjacent to the city of Bellevue and the Offutt Air Force Base. Medium density areas on both the west bank of the River in Omaha and on the east bank in Council Bluffs constitute a rough oblong ring around the principal high density concentrations. Beyond the medium density areas, low residential densities extend in all directions. The most marked extensions are, however, to the west and northwest of the Omaha portion of the Metropolitan Area within Douglas County.

Figure 6 shows in lesser detail the approximate locations and sizes of urban population clusters outside the present contiguous Metropolitan Omaha area. Of these, it should be noted

Table II

Total Land Area, Percent of Area in Farms, and Percent, Non-farm Employment, Metropolitan Omaha Area Counties

Counties	Total Land Area (Sq. Mi.)	Percent, Area in Farms 1964	Percent, Non-farm Employment, 1968
Omaha SMSA Counties:			
Douglas (Neb.)	335	70.0)	
Sarpy (Neb.)	239	86.4)	97.3
Pottawattamie (Iowa)	963	91.6)	
Adjoining Counties:			
Cass (Neb.)	557	95.4	74.6
Dodge (Neb.)	528	97.0	87.8
Saunders (Neb.)	759	95.8	70.9
Washington (Neb.)	386	97.4	74.8
Mills (Iowa)	447	93.9	NA

Sources: Land area data from U. S. Department of Commerce, Bureau of the Census, County and City Data Book, 1967; non-farm employment percentages derived from data provided by Nebraska Department of Labor, Division of Employment. Non-farm employment for Mills County not available.

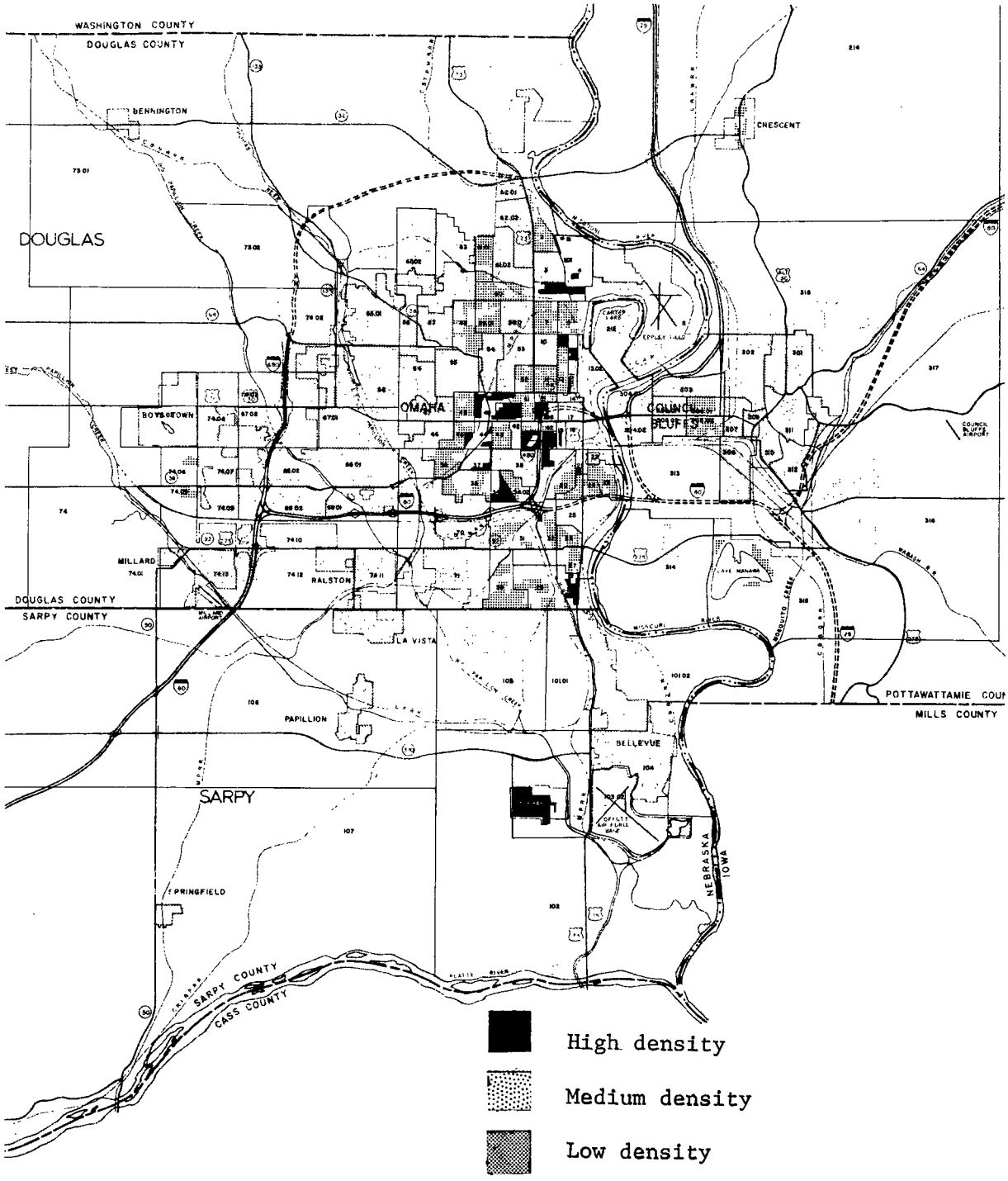

FIGURE 5 - Estimated Metropolitan Omaha Residential Population Density, 1968

Source: Omaha/Council Bluffs Metropolitan Area Planning Agency.

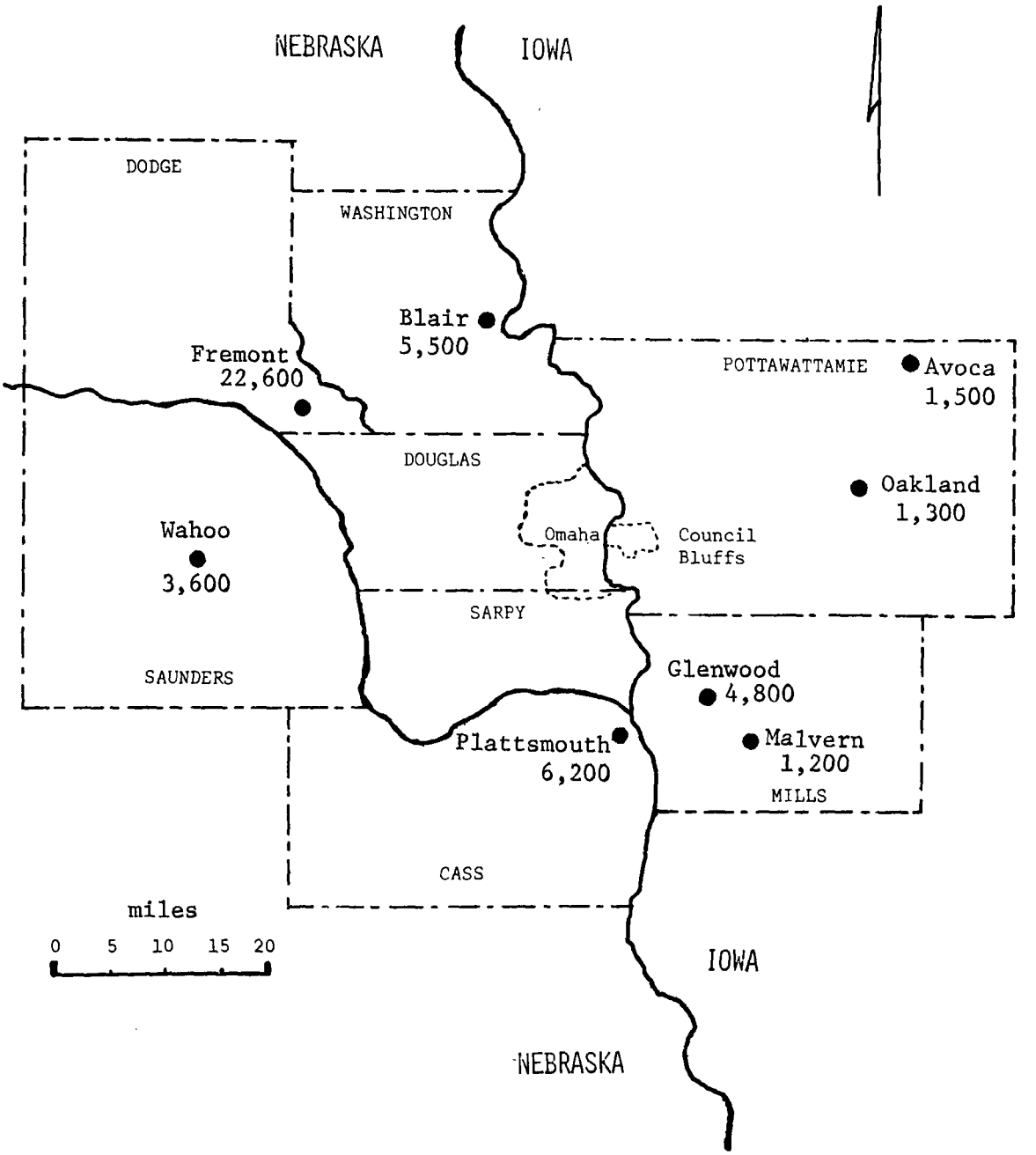

FIGURE 6 - Population of Towns and Cities in Outlying Locations of Metropolitan Omaha Area, 1969

Source: Population estimates are those of Rand McNally Corporation.

that the City of Fremont in the southeast corner of Dodge County where it adjoins Douglas County has an estimated present population of 22,600.

The broad pattern of present economic activity in the three-county SMSA and four adjoining counties is shown in the summary analysis of employment in Table III. (Similar data are not available for Mills, the fifth study area county adjoining the SMSA). Exeept for agriculture, the SMSA accounts for the bulk of the economic activity of the area. However, in terms of employment, Dodge County is of significantly greater importance than the other counties adjoining the SMSA.

The distribution of SMSA activity among the broad sectors of employment (Figure 7) indicates that Omaha is primarily a regional center in which trade, transportation, finance, and other services are of dominant importance. This characteristic of the economy is also evident in the analysis of personal income shown in Table IV which compares personal income estimates for 1959 and 1967.

The table also reveals a number of structural shifts in the economy between 1959 and 1967. Property income became a more significant source of total income at the expense of all sources of earned income. Farm income declines and nonfarm sources rose correspondingly. However, within the nonfarm income total, there was a marked rise in the shares of the Federal military, state and local government, and services, and a substantial decline in the share of manufacturing. The shares of construction; transportation, communication, and public utilities; trade; and finance also declined.

Table III

Employment in Metropolitan Omaha Area Counties, 1968

(Number of Employees)

	Omaha SMSA Counties	Cass	Dodge	Saunders	Washington
Total Employment	216,800	4,220	13,230	4,400	4,640
Agriculture	5,800	1,070	1,610	1,280	1,170
Manufacturing	37,900	300	3,010	240	610
Wholesale and Retail Trade	48,900	760	2,810	750	660
Government	27,900	580	1,480	700	470
Transportation and Public Utilities	20,900	130	540	100	200
Finance, Insurance, and Real Estate	15,600	70	310	100	70
All Other Nonagricultural employment	59,800	1,310	3,470	1,230	1,460

Source: Nebraska Department of Labor, Division of Employment.

Notes: "SMSA" Counties are Douglas and Sarpy in Nebraska and Pottawattamie in Iowa. Data are not available for Mills County, Iowa.

	Percent of Total Employment
Agriculture	2.7
Manufacturing	17.5
Wholesale and Retail Trade	22.6
Government	12.9
Transportation and Public Utilities	9.6
Finance, Insurance, and Real Estate	7.2
All Other Nonagricultural Employment	27.6

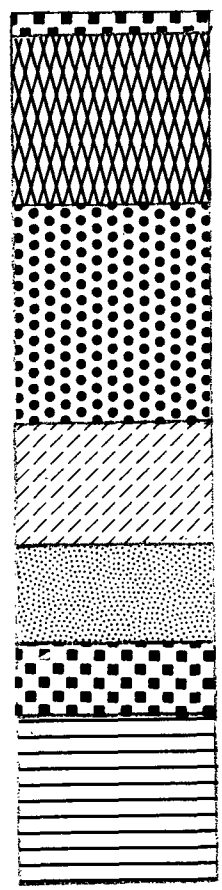

FIGURE 7 - Distribution of Omaha SMSA Employment, 1968

Source of data: Nebraska Department of Labor Division of Employment.

Table IV

Sources of Personal Income in the Omaha Standard Metropolitan Area,* 1959 and 1967

(Percent of total personal income)

	1959	1967
Total Personal Income	100.0	100.0
Property Income	11.7	14.5
Transfer Payments Less Personal Contributions for Social Insurance	3.5	3.3
Total Earnings	84.8	82.2
Farm Earnings	2.4	1.8
Total Nonfarm Earnings	82.4	80.4
Government Earnings	11.3	13.4
Total Federal	6.8	8.1
Federal Civilian	3.6	3.3
Military	3.3	4.8
State and Local	4.5	5.3
Private Nonfarm Earnings	71.1	67.1
Manufacturing	18.9	16.5
Mining	.2	.1
Contract Construction	6.7	6.0
Transportation, Communication and Public Utilities	11.3	9.8
Wholesale and Retail Trade	16.5	15.7
Finance, Insurance, and Real Estate	7.2	6.6
Services	10.2	12.1
Other	.2	.2

Source: Unpublished analysis obtained from the U. S. Department of Commerce.

* Douglas and Sarpy Counties, Nebraska, and Pottawattamie County, Iowa.

Manufacturing, which accounted for 17.5 percent of SMSA employment in 1968 and 16.5 percent of its personal income in 1967, is dominated by meat packing and the food products industry generally. According to the Nebraska Manufacturers' Directory for 1968-69, there are 19 meat packing plants in Omaha, including two employing over 1,000 workers. Among plants engaged in other branches of food processing, there are a large cereals plant and a soup manufacturing plant in the employment categories of over 500 and over 1,000 workers, respectively.

Three heavy industry groups--primary metals, metal fabricating, and machinery--together now account for a higher proportion of manufacturing employment than the food products group. Among the important plants are a steel foundry; three lead smelters; three aluminum casting establishments; a metal can manufacturer; a computer components plant; a truck trailer manufacturer; a manufacturer of pumps; and a manufacturer of telephone cable and switching equipment.

The chemicals industry in Omaha is not large, but it is represented by three major national companies in the manufacture of ammonia, fertilizers, and pesticides.

The significant small manufacturing center in Fremont (Dodge County) is engaged mainly in the food products and feed preparation industries. Two food products plants employ over 500 workers; there are nine feed preparation establishments of which

three are alfalfa dehydrating and pelletizing plants. Also, however, there are two ammonia fertilizer plants, a gray iron castings foundry, and a large woolen apparel manufacturer.

No similar clusters of manufacturing exist at other locations in the study area. However, in Cass County, there is a large portland cement plant in operation near the County's northern border with Sarpy County and a number of lime and limestone plants in Weeping Water, a small town in the center of the County.

PROSPECTIVE POPULATION AND ECONOMIC GROWTH

MAPA's estimate of 1968 population in the Omaha SMSA of 528,750 reflects an average annual growth rate of 1.8 percent since 1960 when the U. S. Census total for the area was 457,873. In the period ahead, MAPA foresees a moderation in SMSA growth to annual rates of between 1.4 and 1.6 percent. At these rates of increase, SMSA population in 1995, the MAPA target year for planning purposes, would range between 747,000 and 797,000, roughly 50 percent larger than in 1968.

The MAPA future annual growth rate estimates are similar to that of the National Planning Association, Washington, D.C., [1/] 1.6 percent for the period 1966-80, and to those of

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1/ National Planning Association, Economic and Demographic Projections for States and Metropolitan Areas, Regional Economic Projections Series, Report No. 68-R-1, January, 1969.

the U. S. Census Bureau, which range between 1.3 - 1.7 percent for the period 1965-75. [2/]

The actual population growth in the years ahead will depend in large part on the area's economic growth since in-migration responding to the pull of job opportunities accounts for a major share of population increases in the most rapidly growing urban areas.

Recent economic expansion, as measured by personal income gains, has been somewhat slower in the Omaha SMSA than in all U. S. metropolitan areas of the United States (Table V), and part of the growth was due to an unusual expansion in Federal military payrolls. In the future, the area's demonstrated capacity to shift its manufacturing base away from meat packing and other traditional food and feed industries toward a diversified range of the more rapidly growing industries, may accelerate growth. The financial advantages extended to corporations by the State of Nebraska's industrial revenue bond law could assist in the process. The area's natural gas and oil fields, though declining in total output, could provide raw materials for expansion of the local chemicals industry. A prospective 50 percent addition to local electric power supply provides another essential ingredient for industrial expansion.

2/ U. S. Department of Commerce, Bureau of the Census, Projections of the Population of Metropolitan Areas - 1975, Series P-25, No. 415, January 31, 1969.

Table V

Growth in Personal Income and Per Capita Personal Income, Omaha SMSA Area,* and All Metropolitan Areas of the United States, 1959-67

	Personal Income			Per Capita Personal Income		
	1959 (millions of dollars)	1967 (millions of dollars)	Percent Increase, 1959-67	1959 (dollars)	1967 (dollars)	Percent Increase, 1959-67
All U.S. Metropolitan Areas	290,062	473,246	63.2	2,448	3,511	43.4
Omaha SMSA	1,084	1,751	61.5	2,358	3,349	42.0
Nebraska	2,760	4,424	60.3	1,976	3,066	55.2
Iowa	5,319	8,442	58.7	1,949	3,045	56.2

Source: U.S. Department of Commerce, "Metropolitan Area Income in 1967," Survey of Current Business, May, 1969, Part I, pp. 13 - 33, and "Total and Per Capita Income by Regions and States," Survey of Current Business, August, 1969, pp. 13 - 24.

* Douglas and Sarpy Counties, Nebraska, and Pottawattamie County, Iowa.

In 1971, a 455-megawatt nuclear power plant is scheduled to go on stream in Fort Calhoun in Washington County. 3/ A negative factor in the economic outlook is the vulnerability of the military portion of present Federal Government employment in the SMSA.

Data are inadequate for assessing prospective population and economic growth of counties adjoining the Omaha SMSA.

PROBABLE DIRECTIONS OF PHYSICAL GROWTH

To accommodate 50 percent more people in the Omaha SMSA by 1995, MAPA foresees intensification of industrial and commercial development in spokes radiating outward from the center of Omaha but confined well within the three counties of the SMSA. Between and beyond these spokes would be low density residential areas, typical now of outlying sections of the City, which would cover most of Douglas County and extending farther than at present into Sarpy and Pottawattamie Counties (Figure 8). In support of this plan, MAPA recommends a highway network of concentric beltways which would utilize the framework of existing and planned road construction in the SMSA (Figure 9).

3/ Unpublished data furnished by Federal Power Commission, Washington, D. C.

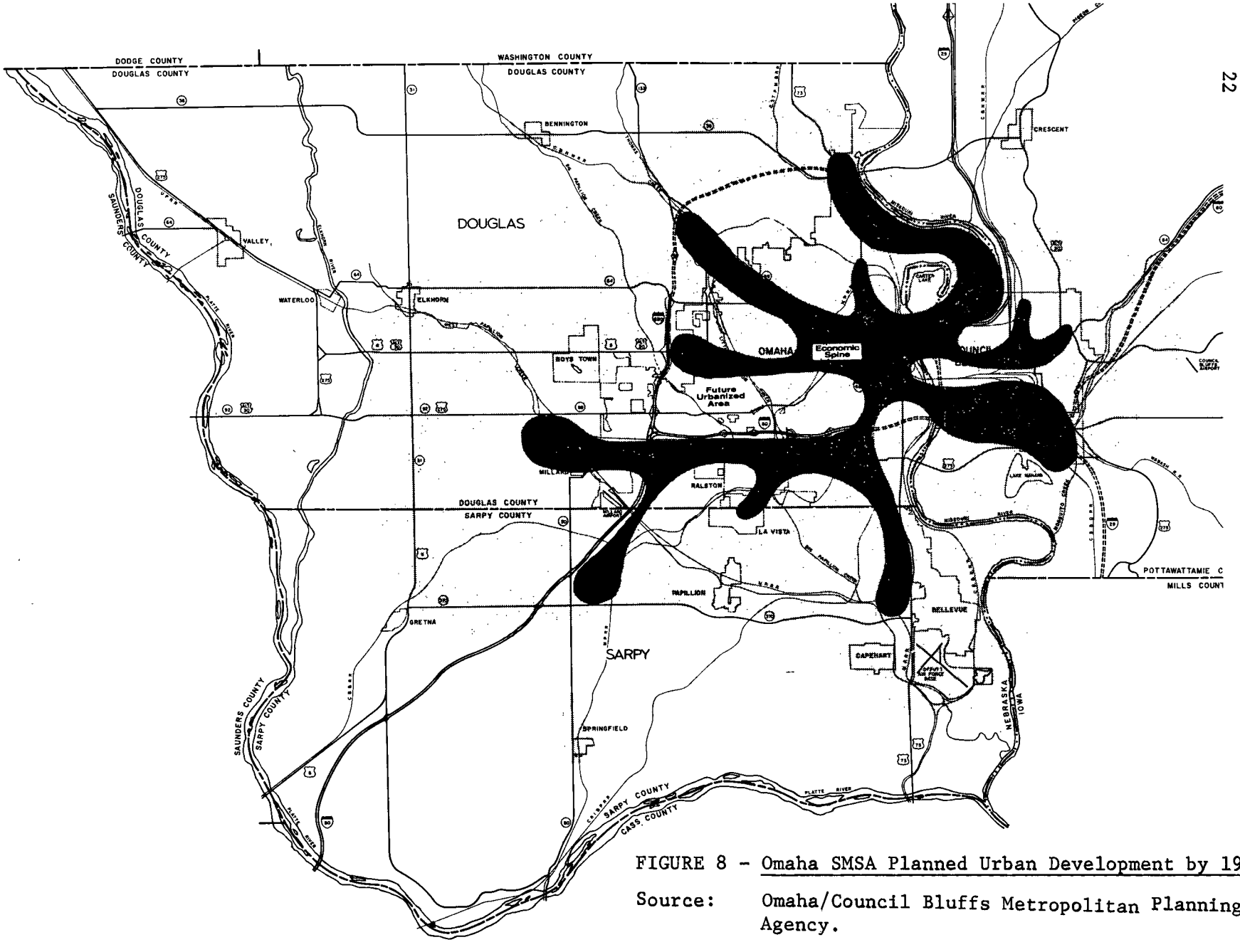

FIGURE 8 - Omaha SMSA Planned Urban Development by 1995

Source: Omaha/Council Bluffs Metropolitan Planning Agency.

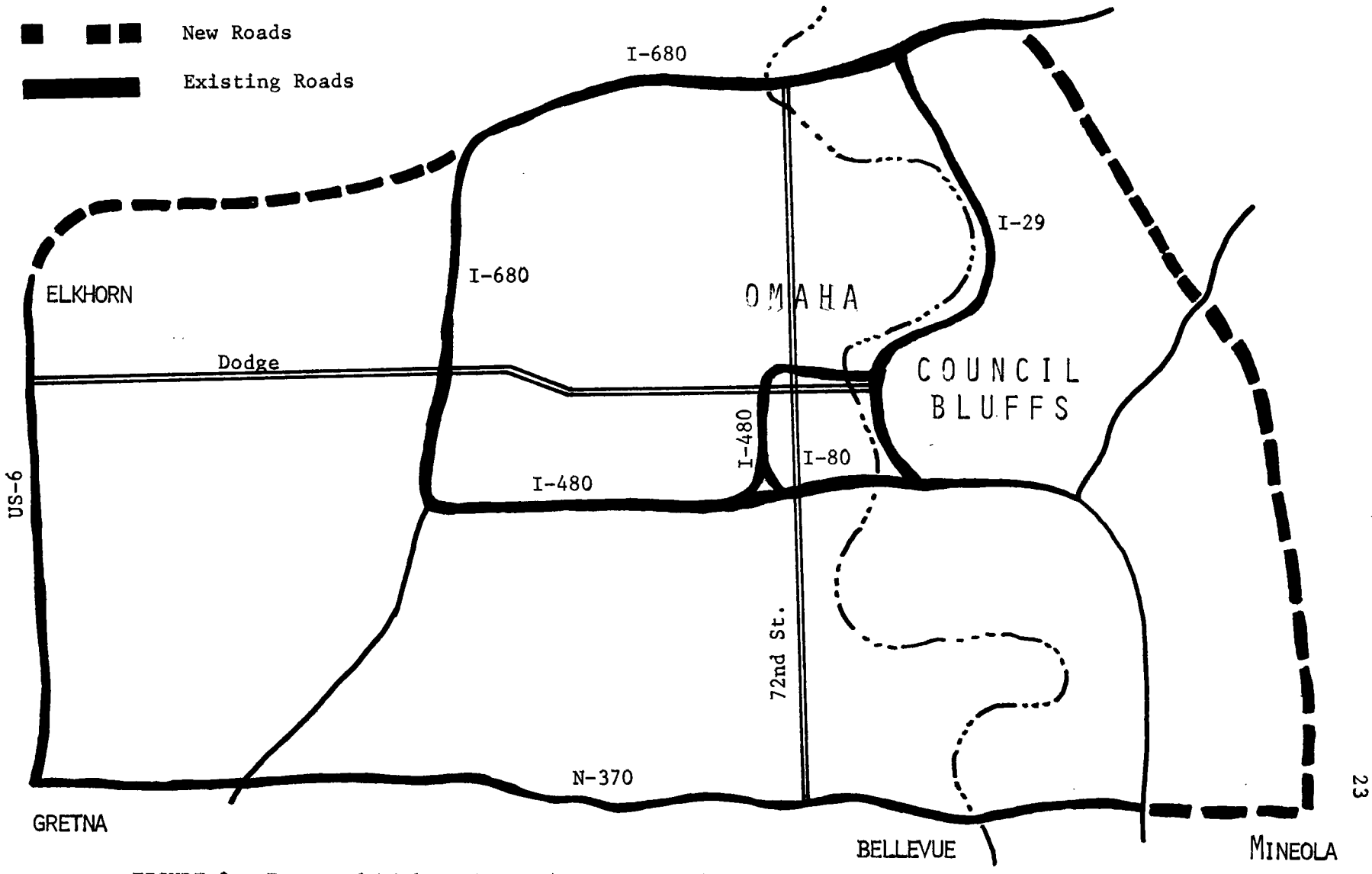

FIGURE 9 - Proposed Highway Network in Metropolitan Omaha Area

Source: Omaha/Council Bluffs Metropolitan Planning Agency.

If Omaha's urban area extends outward in Douglas County as shown in Figure 8, its residential areas will approach the County's boundaries on the northwest and north. In the case of the development northwest to Dodge County, Omaha's residential areas will be moving in the direction of the manufacturing center of Fremont. Fremont's location in Dodge County is a mere seven miles from the Dodge-Douglas County border.

EVALUATION OF TECHNICAL FACTORS

The technical factors of importance in considering the boundaries of an air quality region are the following: the total quantity of pollutants emitted, the geographic pattern of emission sources, and pattern of pollutant dispersion.

In the Omaha study region, information with respect to these factors was obtained from an emission inventory conducted by the National Air Pollution Control Administration (NAPCA), air quality data from the Omaha-Douglas County Health Department, and a theoretical diffusion model developed from the inventory data.

THE EMISSION INVENTORY

The emission inventory, based on 1968 data, included estimates from the three-county Standard Metropolitan Statistical Area (SMSA) of Douglas (Omaha) and Sarpy Counties in Nebraska and Pottawattamie (Council Bluffs) County in Iowa, as well as from the adjoining counties of Cass, Dodge, Saunders, and Washington in Nebraska and Mills County, Iowa.

The NAPCA emission inventory is available as a separate publication. 4/ Significant findings are summarized here.

4/ Omaha-Council Bluffs Metropolitan Area Air Pollutant Emission Inventory. Division of Air Quality and Emission Data, National Air Pollution Control Administration, Environmental Health Service, Public Health Service, U. S. Department of Health, Education, and Welfare, Durham, North Carolina, 1970.

The quantity of emissions in the study area was estimated individually for point sources and areawide for other sources by use of a survey technique developed by the Public Health Service.[5/] Major point sources included electric power generating plants, large industrial plants, major solid waste disposal sites, and airports. Area sources included transportation, residential space heating, smaller industrial plants, and generalized solid waste burning.

Emission estimates were derived by applying average emission factors to indicators of pollutant emissions such as production data or type of fuel burned.[6/] Because these are average factors, estimates from a particular source may vary from actual emissions to the extent that its operating characteristics vary from the average. Estimates of a large number of sources are likely to approximate actual conditions, however, since their characteristics as a group will average out.

Five types of pollutants were inventoried: sulfur oxides, particulate matter, carbon monoxide, hydrocarbons, and oxides of nitrogen. These pollutant types were estimated for five categories of sources: transportation, stationary fuel combustion,

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5/ Public Health Service, Rapid Survey Technique for Estimating Community Air Pollution Emissions. Publication No. 999-AP-29, Environmental Health Series, U.S.D.H.E.W., Division of Air Pollution, Cincinnati, Ohio, 1966.

6/ Public Health Service, Compilation of Air Pollutant Emission Factors. Publication No. 999-AP-42, Environmental Health Series, U.S.D.H.E.W., NAPCA, Durham, North Carolina.

solid waste disposal, industrial process losses, and evaporation losses. The five pollutants and their sources are graphically represented in Figure 10, 11, and 11 continued. These figures show that:

1. Sulfur oxides (57,300 tons per year) are emitted principally from fuel combustion (64 percent) and industrial process losses (32 percent).
2. Particulate matter (31,030 tons per year) is emitted from all source categories, with industrial process losses constituting over 60 percent.
3. Carbon monoxide (298,000 tons per year) is principally and characteristically a road vehicle problem (88 percent).
4. Hydrocarbons (53,700 tons per year) also relate closely to road vehicles. Tail pipe emissions produce 41 percent, and most of the 39 percent from evaporation losses can be attributed either to the vehicle itself or to the handling and storage of motor fuel.
5. Oxides of nitrogen (39,300 tons per year) are produced both by road vehicles (44 percent) and stationary fuel combustion (39 percent--the five steam electric generating plants produce 27 percent of this total, according to the NAPCA inventory).

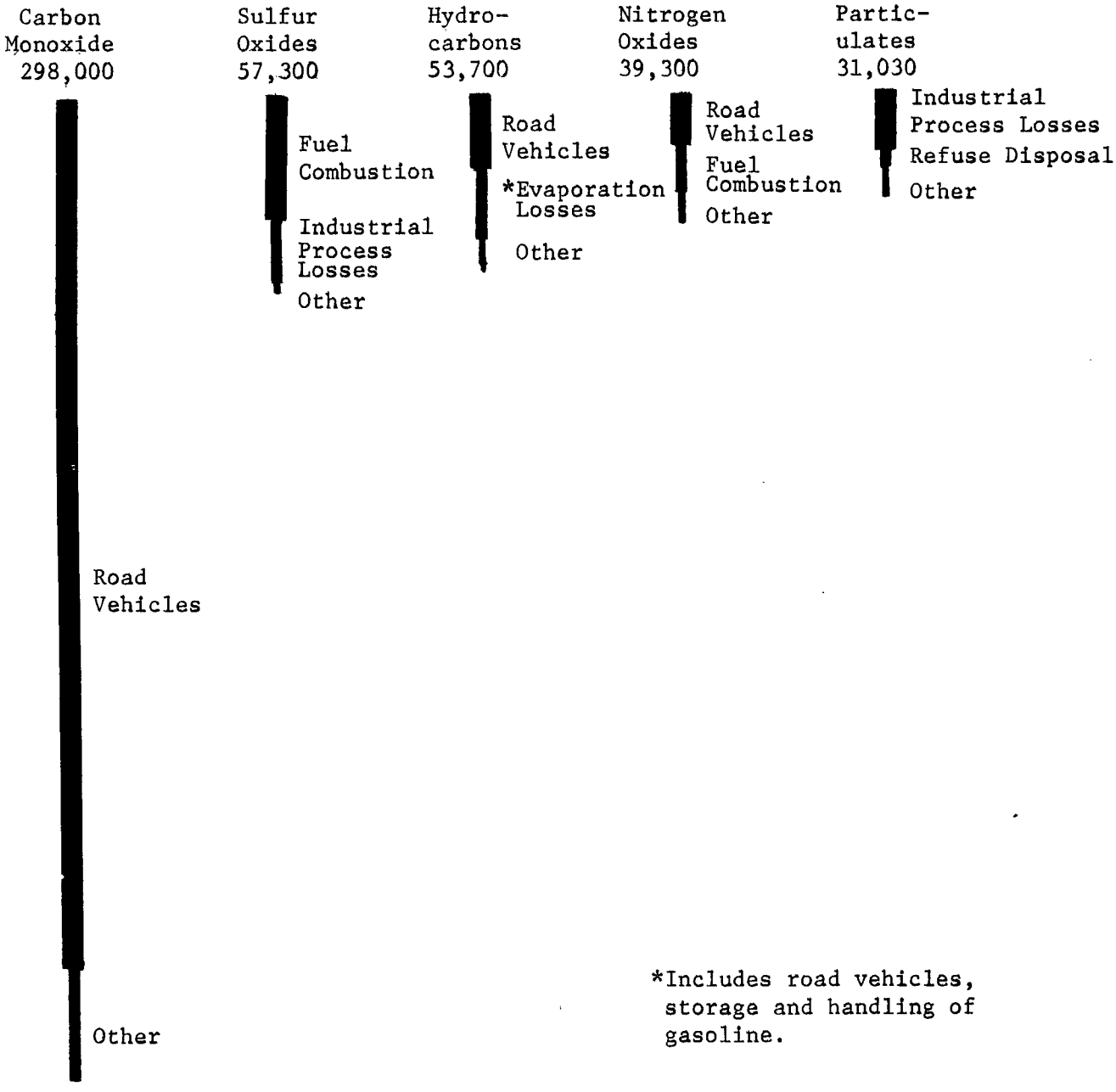

FIGURE 10 - Air Pollutant Emissions in the Omaha-Council Bluffs Study Area, 1968 (tons per year)

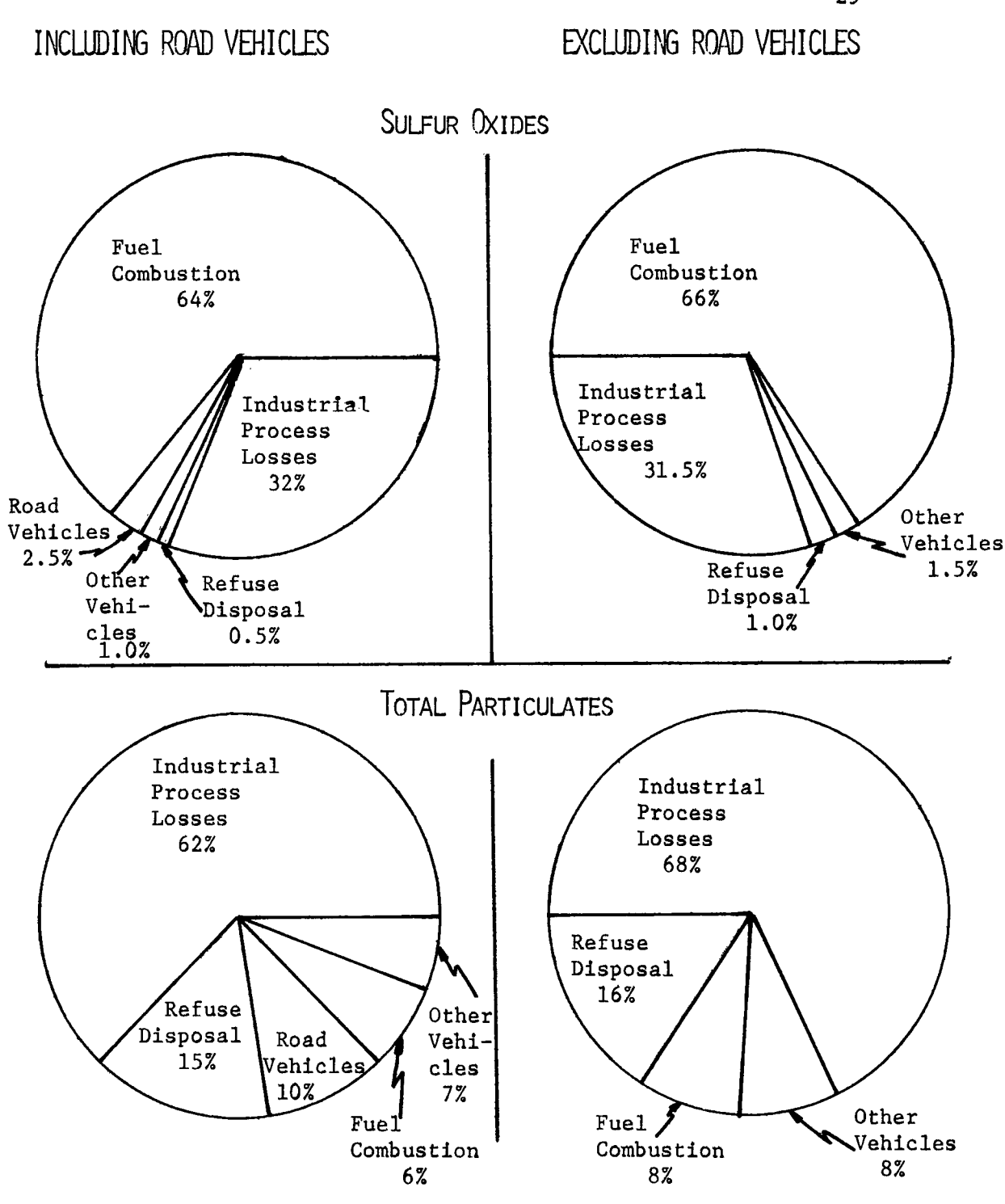

FIGURE 11 - Estimated Distribution of Emissions by Source, Inclusive and Exclusive of Road Vehicles, Omaha-Council Bluffs Study Area, 1968

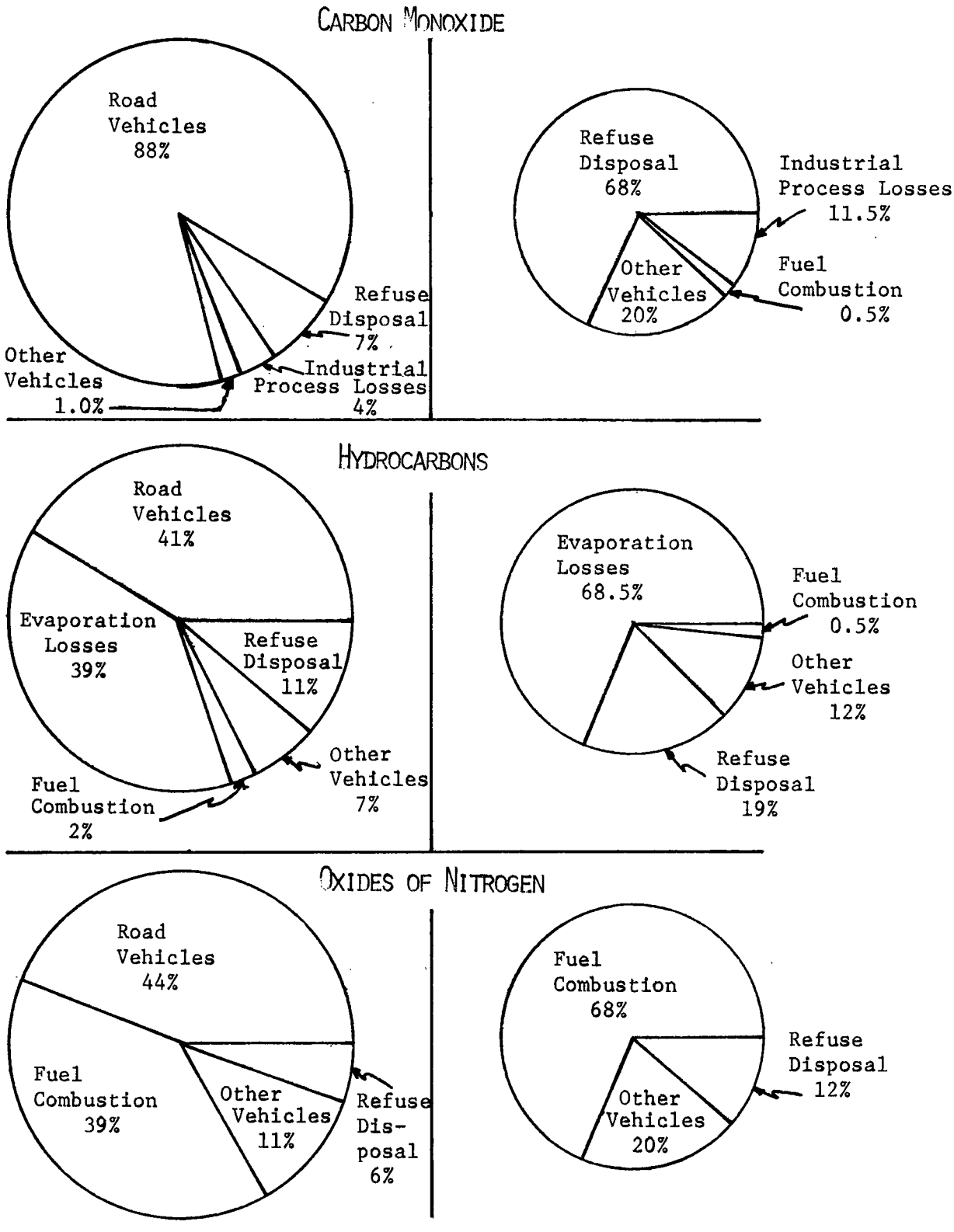

FIGURE 11 (continued) - Estimated Distribution of Emissions by Source, Inclusive and Exclusive of Road Vehicles, Omaha-Council Bluffs Study Area, 1968

To determine the geographic distribution of these emissions, the study area was divided into grid zones (Figure 12), and the estimated point and area source emissions apportioned to their respective grid zones. Principal point sources are shown in Figure 13. The density variations among the grid zones are shown in Figures 14-a, 14-b, 14-c, 14-d, and 14-e.

Emissions by county and source are detailed in Table VI. This table shows that Douglas County, Nebraska, and Pottawatamie County, Iowa, contribute most of the pollutants. This would be expected as these counties have the highest degree of urbanization in the study area.

The percentage contribution of each county to total air pollution emission is shown in Table VII.

The outstanding exception to the relationship between pollutant emissions and extent of urbanization is the 22 percent of particulates originating in Cass County, Nebraska, with less than 3 percent of the total population. A large cement plant in the county accounts for this.

In evaluating these data, patterns of fuel consumption are important. All three of the major fuels (coal, oil, and natural gas) are used, with gas the most important. Gas and distillate fuel oil are the principal fuels for space heating; residual fuel oil is used by one power plant and some industrial consumers; coal is used in power plants when the gas supply is interrupted.

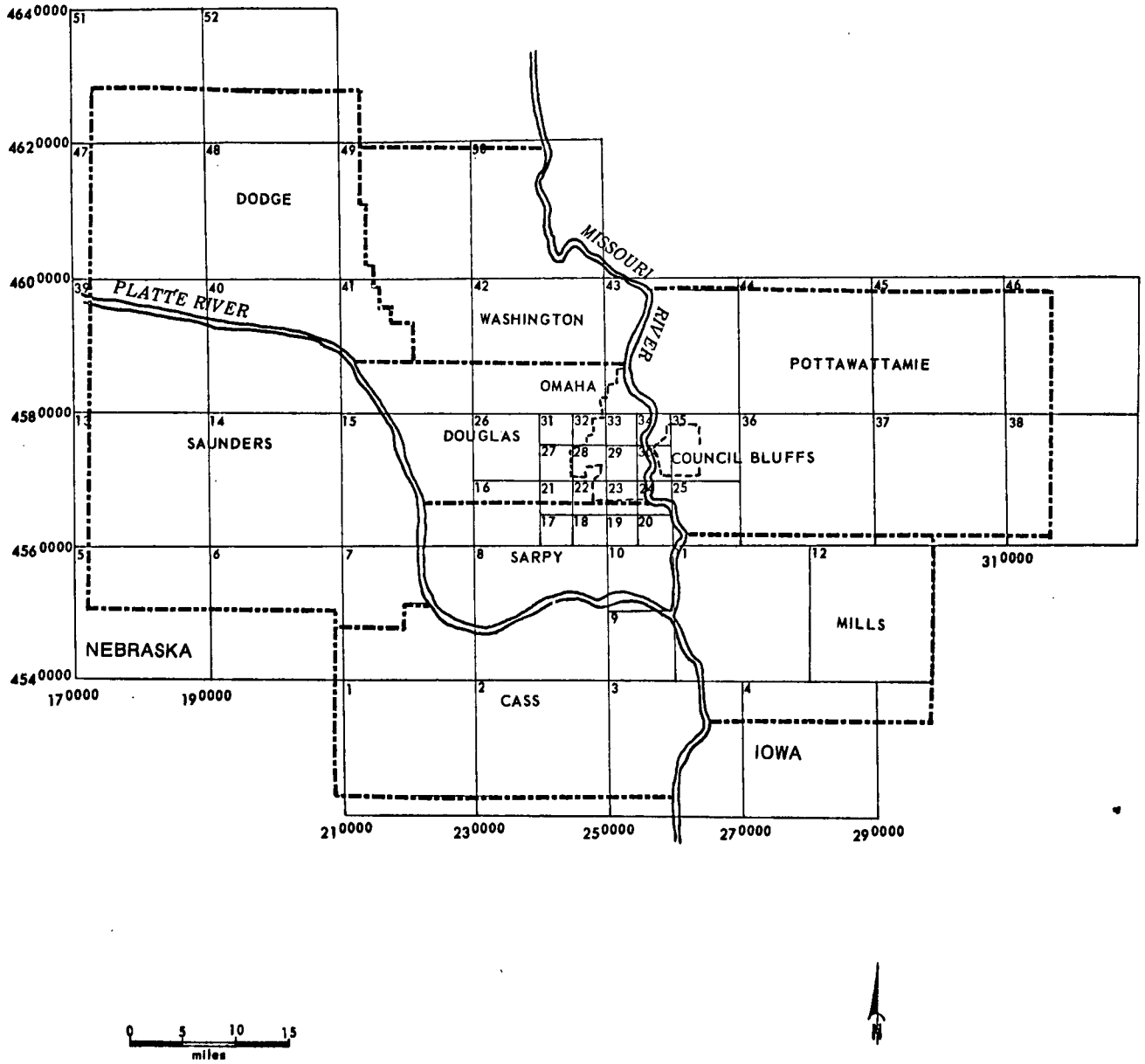

FIGURE 12 - Omaha-Council Bluffs Grid Coordinate System

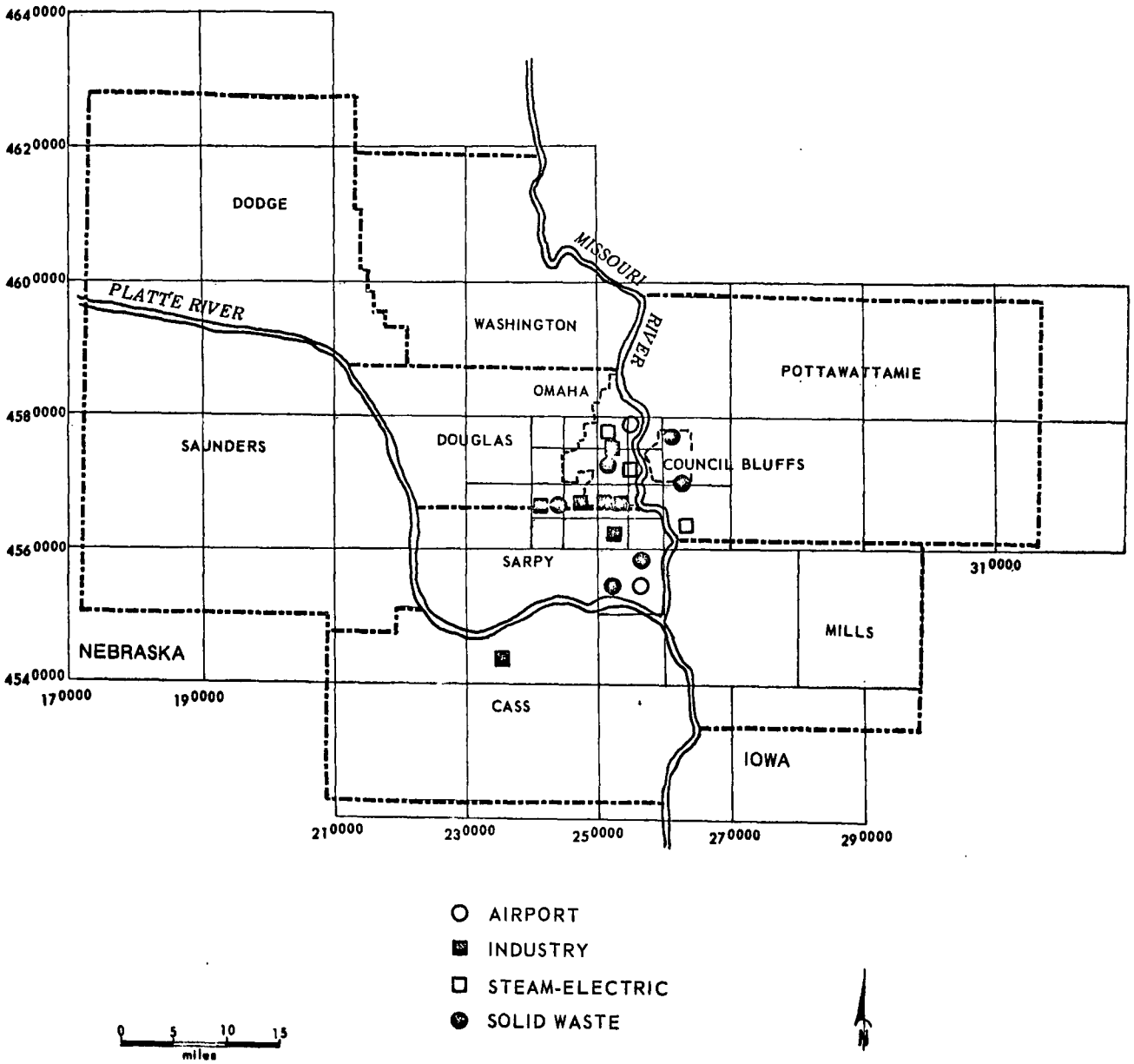

FIGURE 13 - Location of Point Sources in the Omaha-Council Bluffs Study Area, 1968

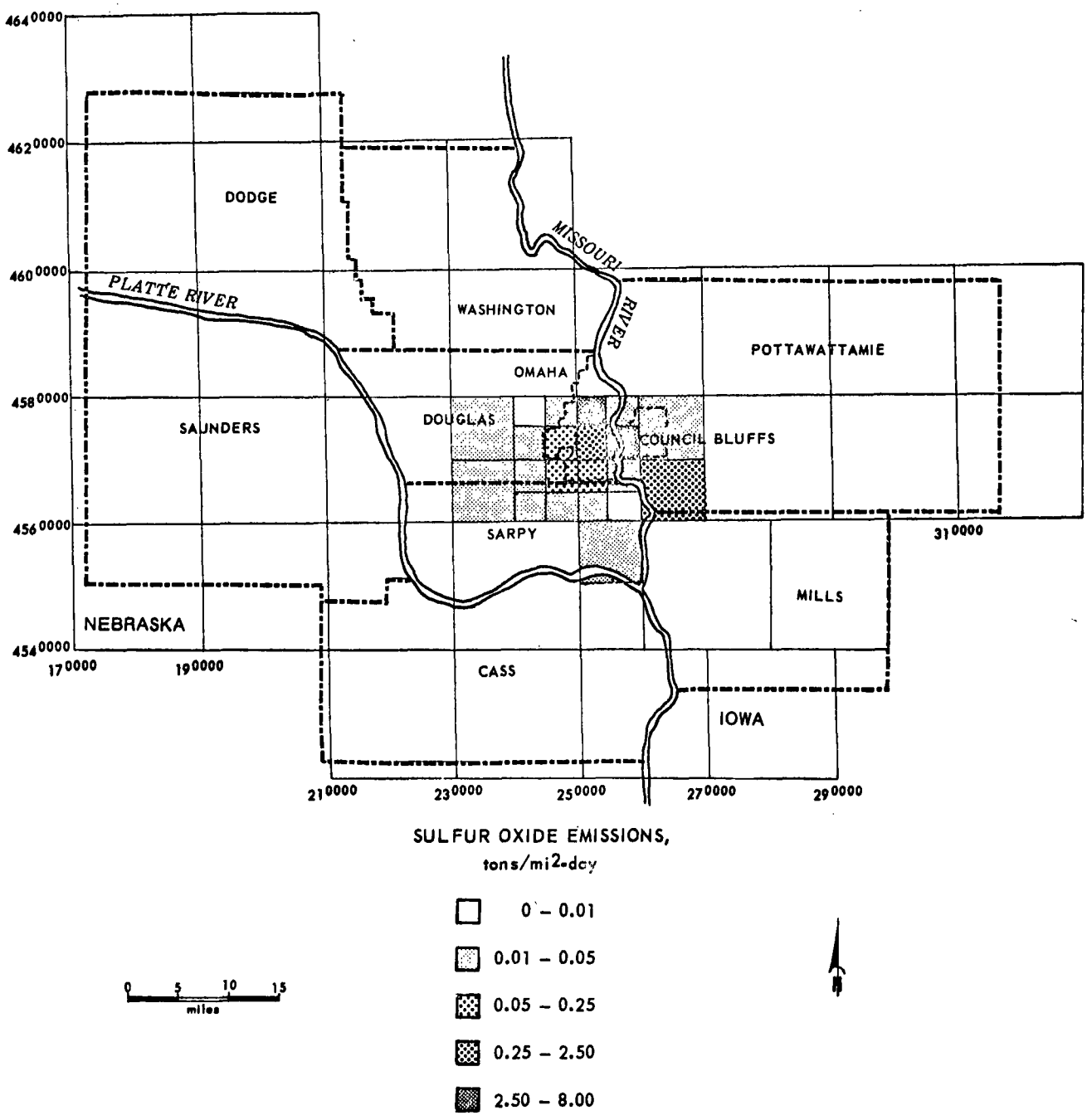

FIGURE 14-a - Sulfur Oxide Emission Density for the Omaha-Council Bluffs Study Area, 1968

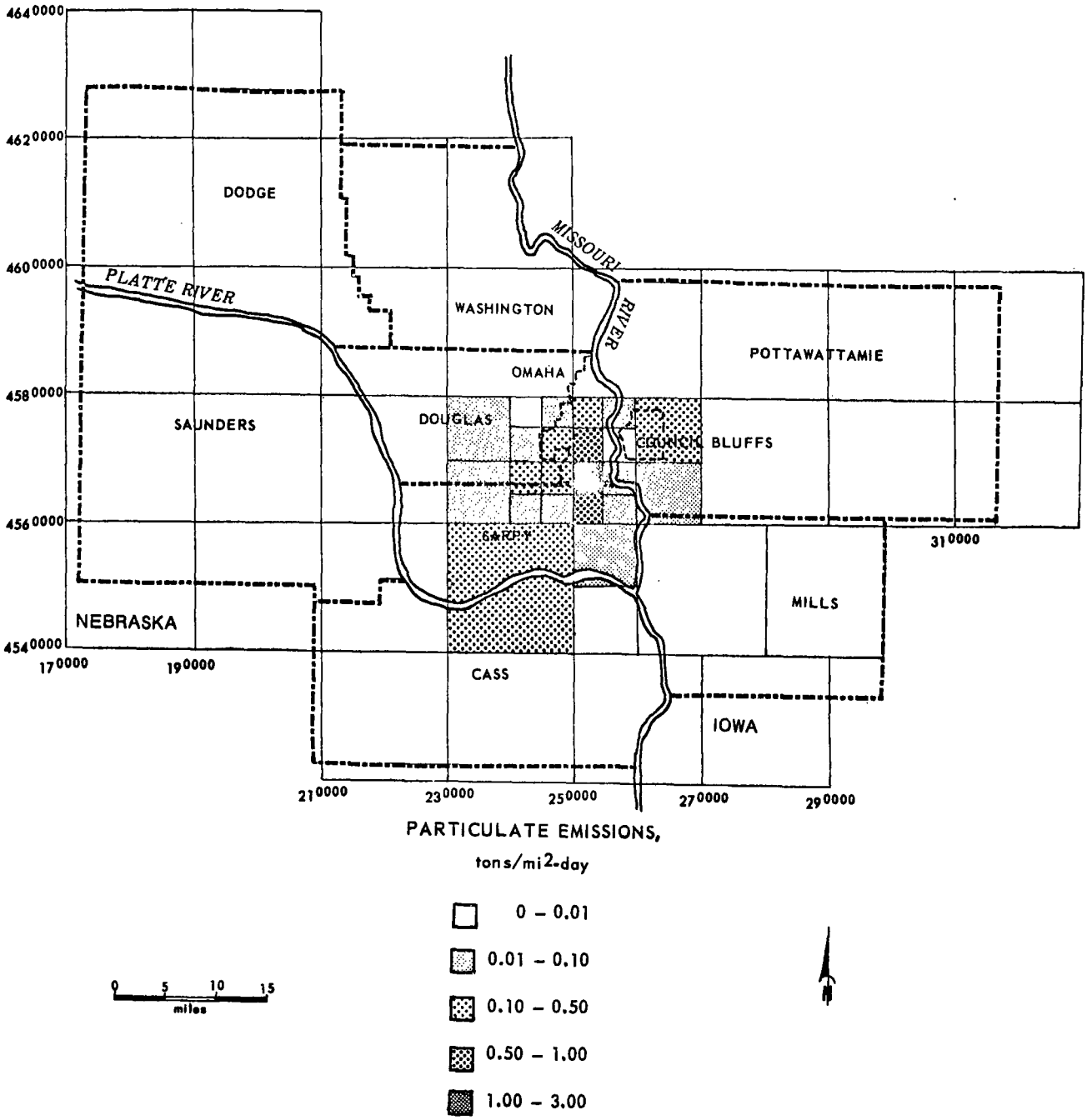

FIGURE 14-b - Particulate Emission Density for the Omaha-Council Bluffs Study Area, 1968

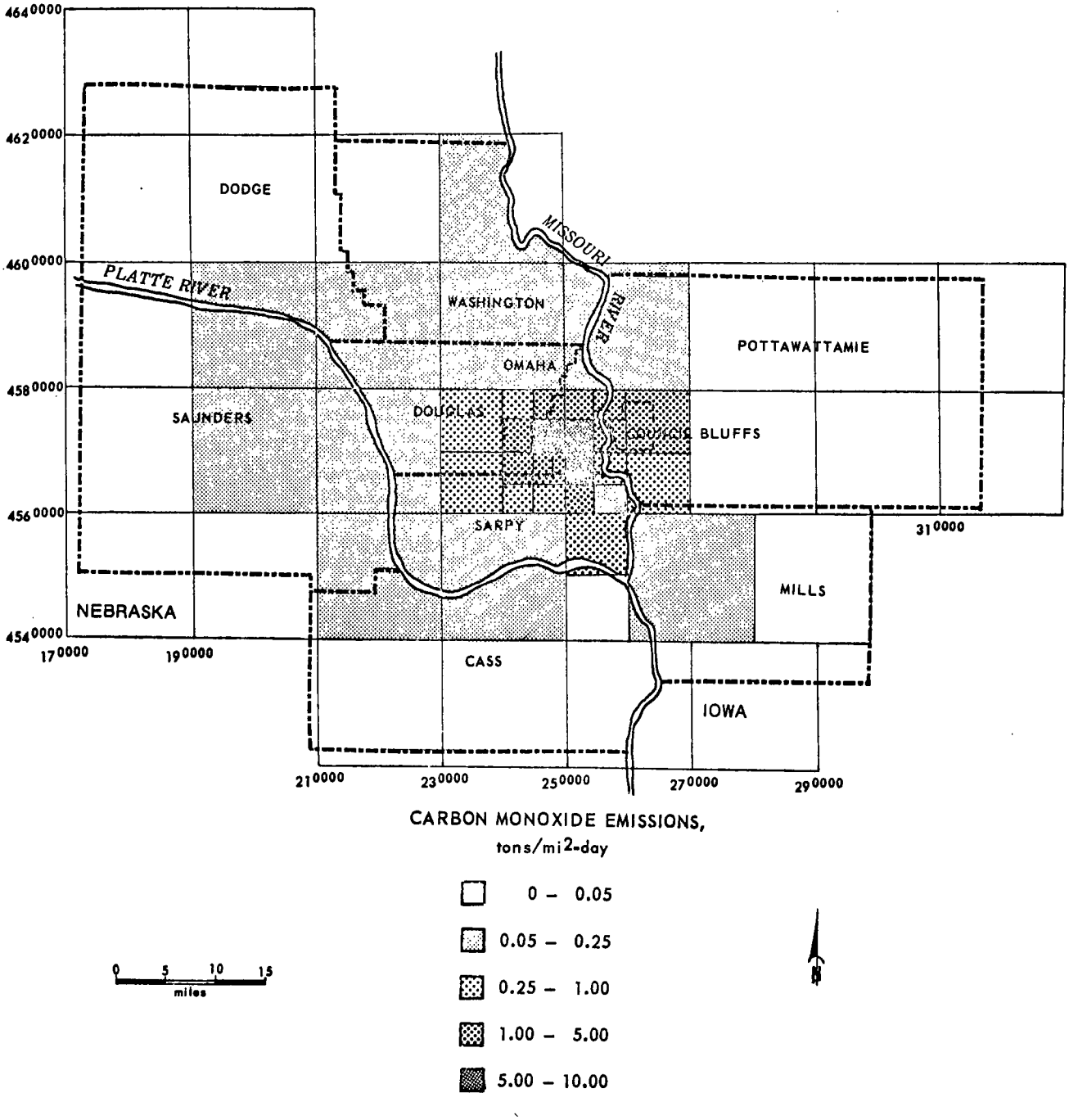

FIGURE 14-c - Carbon Monoxide Emission Density for the Omaha-Council Bluffs Study Area, 1968

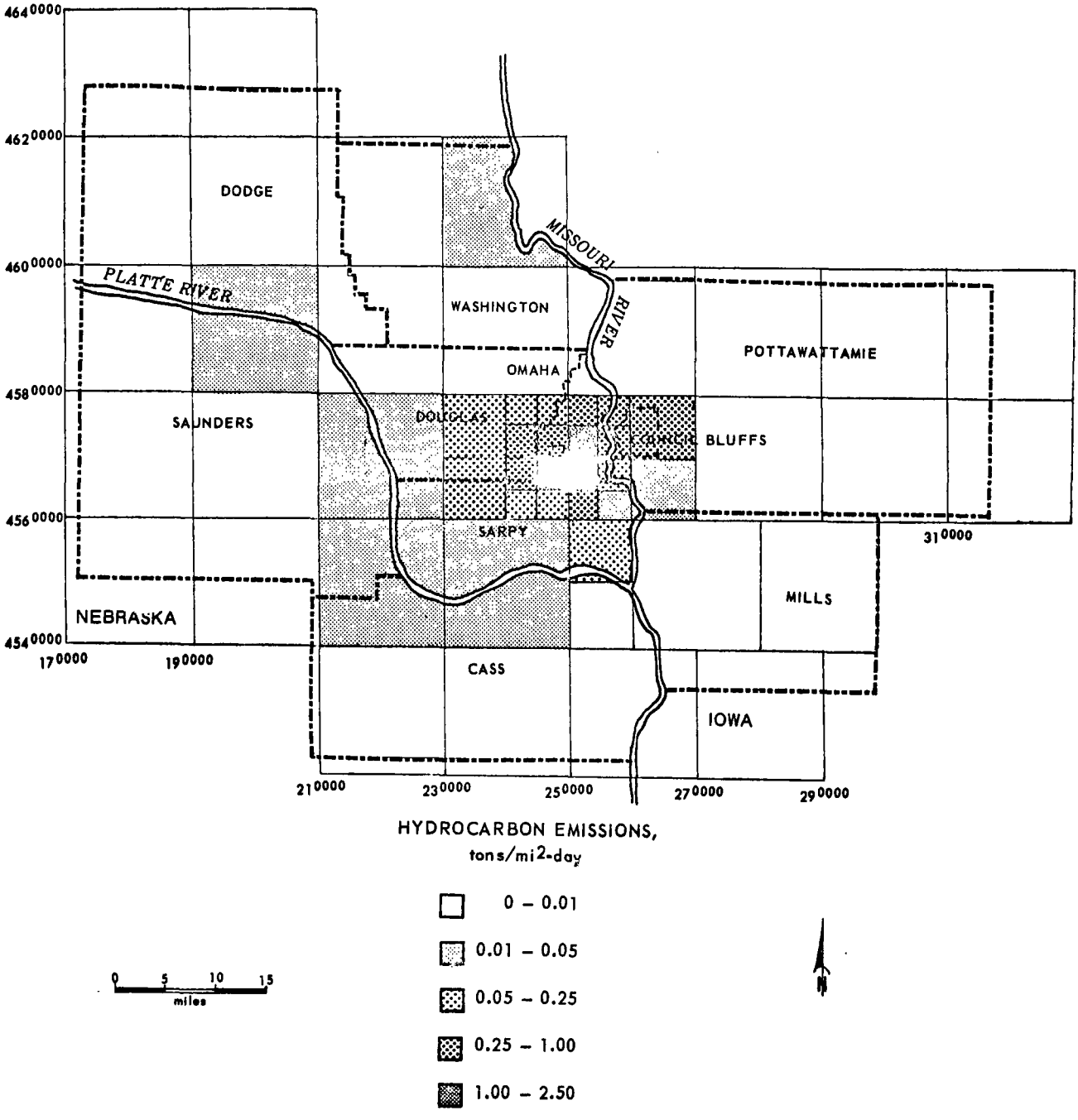

FIGURE 14-d - Hydrocarbon Emission Density for the Omaha Council Bluffs Study Area, 1968

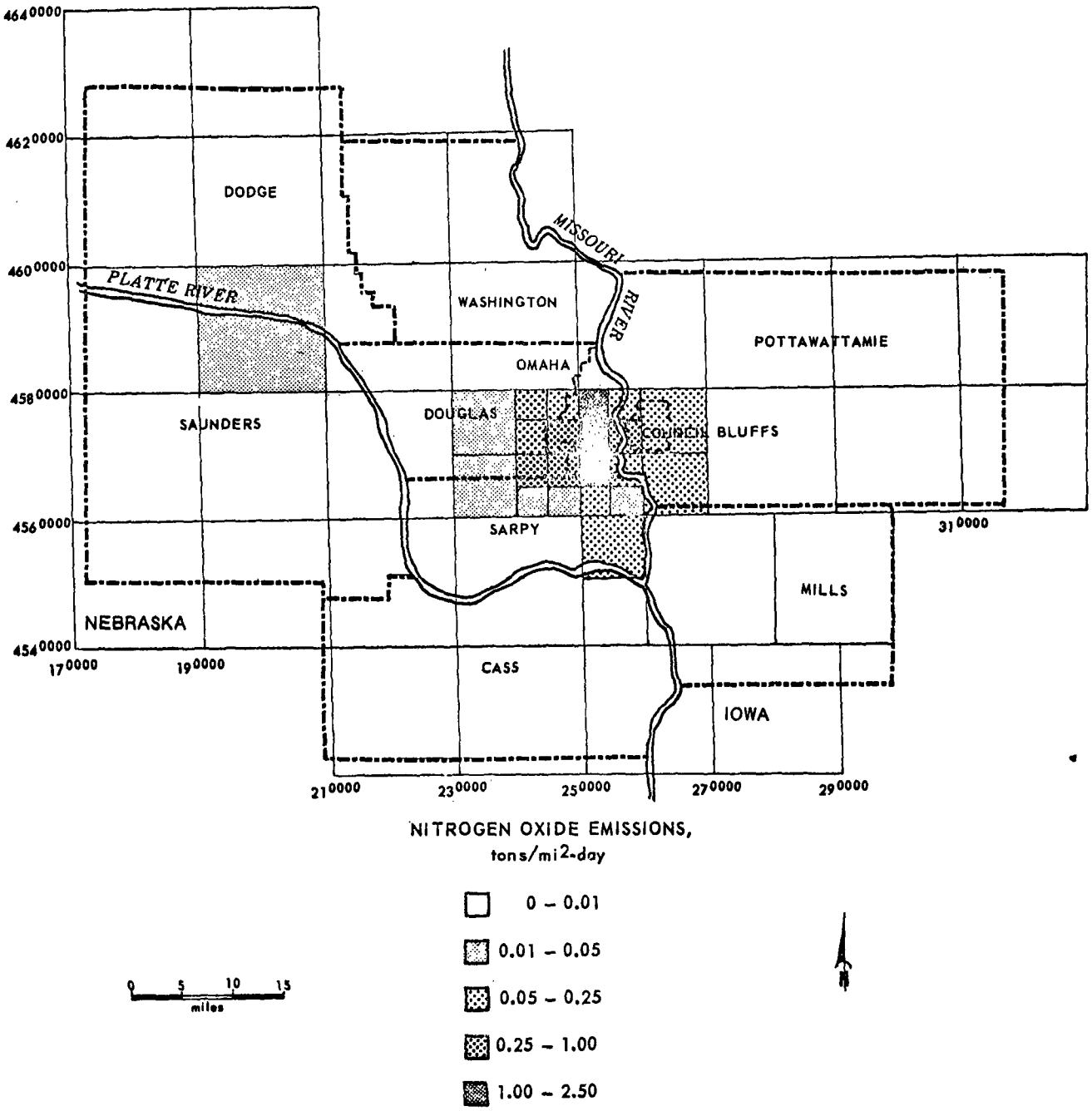

FIGURE 14-e - Nitrogen Oxide Emission Density for the Omaha-Council Bluffs Study Area, 1968

Table VI

Air Pollutant Emissions in the Omaha - Council Bluffs Study Area
by Emissions Sources and by County, 1968
(tons per year)

		Fuel Combustion								
	County	Industrial	Institutional	Residential	Power Plants	Total, Fuel Combustion	Industrial Process Losses	Transportation	Refuse Disposal	Grand Total[a/]
Particulates	Cass	30	N	10	0	40	6,640	80	140	6,900
	Dodge	60	10	30	0	100	0	250	290	640
	Douglas	160	50	250	1,100	1,560	12,370	3,480	1,870	19,280
	Mills	N	N	10	0	10	N	70	110	190
	Pottawattamie	20	10	50	240	320	50	720	1,460	2,550
	Sarpy	10	10	30	0	50	50	520	430	1,050
	Saunders	N	N	20	0	20	N	100	130	250
	Washington	N	N	10	0	10	N	50	110	170
Sulfur Oxides	Cass	N	N	40	0	40	N	40	10	90
	Dodge	N	N	40	0	40	0	130	20	190
	Douglas	650	N	430	27,970	29,050	18,000	1,470	190	48,700
	Mills	N	N	30	0	30	N	40	10	80
	Pottawattamie	50	N	70	7,180	7,300	N	340	110	7,750
	Sarpy	N	N	70	0	70	N	230	30	330
	Saunders	N	N	50	0	50	N	50	10	110
	Washington	N	N	30	0	30	N	30	0	60
Carbon Monoxide	Cass	N	N	N	0	0	N	7,270	730	8,000
	Dodge	N	N	0	0	0	0	22,200	1,160	23,800
	Douglas	10	N	30	100	140	2,500	159,560	7,800	170,000
	Mills	N	N	N	0	0	N	6,400	550	6,950
	Pottawattamie	N	N	10	20	30	N	41,230	7,640	48,900
	Sarpy	N	N	N	0	0	N	23,470	2,230	25,700
	Saunders	N	N	N	0	0	N	9,170	680	9,850
	Washington	N	N	N	0	0	N	4,240	560	4,800

Notes: "N", negligible; a/, totals have been rounded.

Source: National Air Pollution Control Administration Air Pollutant Emission Inventory.

Table VII

Percentage Contribution of Each County to Total Air Pollutant Emissions

County	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Cass	N	22	3	2	2
Dodge	<1	2	8	7	6
Douglas	85	62	57	61	64
Sarpy	<1	3	9	8	6
Saunders	N	1	3	3	2
Washington	N	1	1	1	1
Pottawattamie	14	8	17	16	17
Mills	N	1	2	2	2

Source: National Air Pollution Control Administration
Air Pollutant Emission Inventory

Notes: "N", negligible

Coal combustion, less than 10 percent of the total energy input, accounts for a large part of the emission from fuel combustion in stationary sources; natural gas combustion, however, accounts for most of the stationary source emissions of oxides of nitrogen.

Additional stationary sources are solid waste disposal operations. Solid wastes in the area are predominantly handled by sanitary landfills or open burning. There are no municipal incinerators. Open burning, either on site or at dumps, contributes significant amounts of pollution and is the subject of comment by residents in the area.

AIR QUALITY ANALYSIS

The boundaries of an air quality control region should be designed to include both pollution sources and people and property affected by these sources. The inventory identifies pollution sources but does not provide information about people and property affected. The atmospheric distribution of pollutants from the sources should be determined in order to satisfy this requirement.

The best way to do this is to review air quality sampling data at sufficient points and over enough time to be useful. Data supplied from the Omaha-Douglas County Health Department has been extremely useful in this analysis, although it is limited primarily to Omaha and the immediate surrounding area.

In order to extend estimates of atmospheric districution over the study area, a meteorological diffusion model has been used to describe theoretical concentrations of pollutants in the ambient air. This model is based on a mathematical treatment of pollutant emissions and meteorological factors such as wind speed, wind direction, and mixing depths. Although the model has certain inherent limitations, it can be used to map probable long term (seasonal and annual) average pollutant dispersion patterns.

Meteorology and Climatology

The Study Area, on the Missouri River, consists of gently rolling hills rising from a river level of 965 feet above sea level to about 1,300 feet. Its climate is typically continental with warm summers and cold, dry winters. To the east, humid climate is found, and to the west, dry. The area is in the path of most "lows," or storms, that cross the country and is usually affected by the cold, dry, winter Canadian air masses. As a result, the area experiences periodic and rapid weather changes. The prevailing winds are north-northwest in the winter and at about 13 miles per hour on the average, and soth-southeast in the summer, averaging 10 miles per hour (Figure 15). Storm winds over 40 miles per hour are not uncommon.

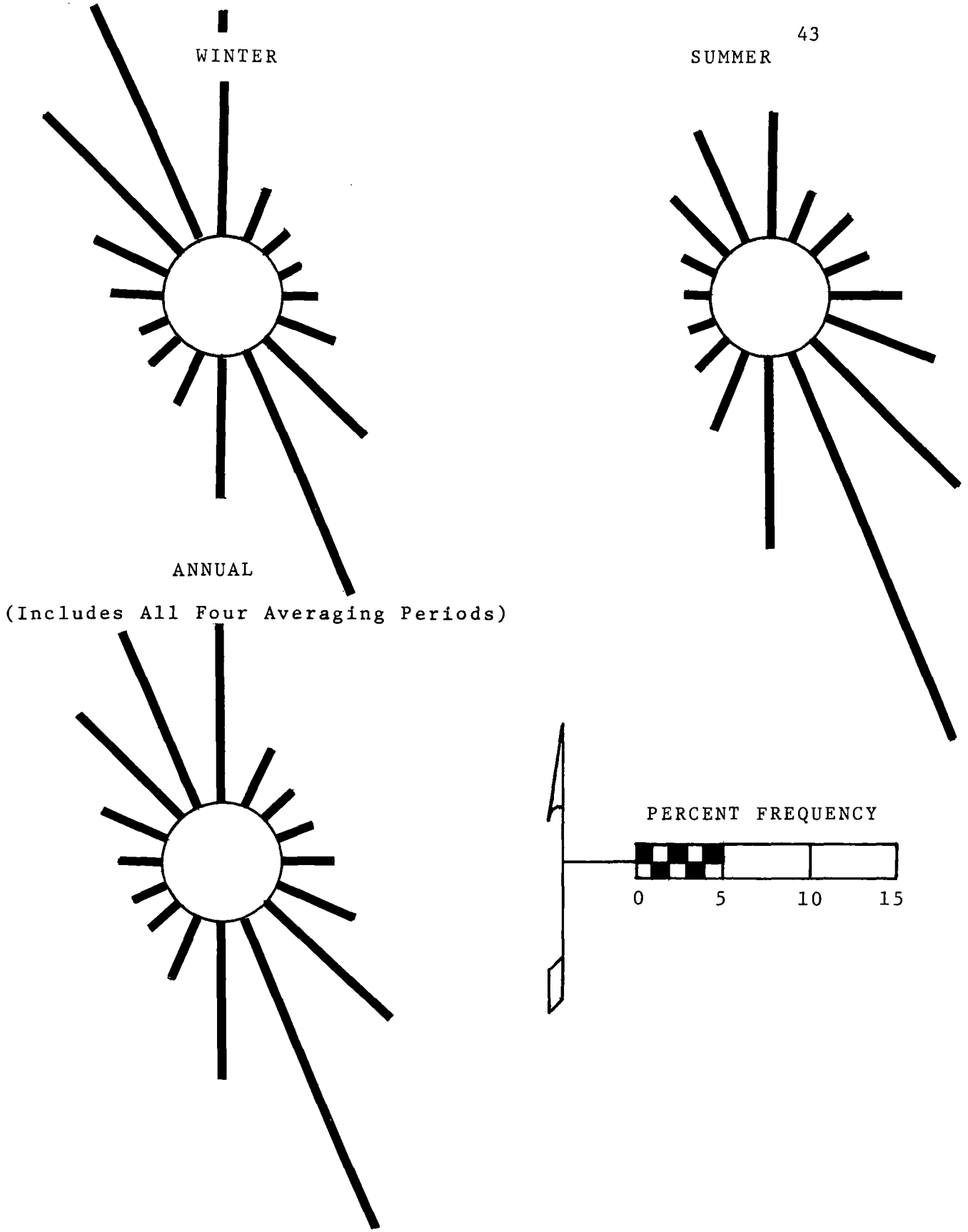

FIGURE 15 - Wind Direction Percent Frequency of Occurrence for Various Averaging Times

An important factor in the dispersion of pollution is the depth of the air layer through which pollutants mix (Table VIII).

Table VIII

Air Mixing Depths, Omaha-Council Bluffs Study Area

(meters)

	Winter	Summer	Annual
MORNING	280	365	340
AFTERNOON	680	1550	1200
AVERAGE	480	960	770

The low mixing depths on winter mornings, coupled with increases in coal consumption and residential space heating with natural gas, can be expected to cause periodic high concentrations of pollutants during times of low wind speeds. Prolonged periods of stagnation, with low mixing depths and little wind, are rarely seen in the study area.

Modeling Results

Contours defined by the diffusion model for sulfur oxides and particulates are shown in Figures 16 and 17. Note that the diffusion of pollutants is relatively well contained within the

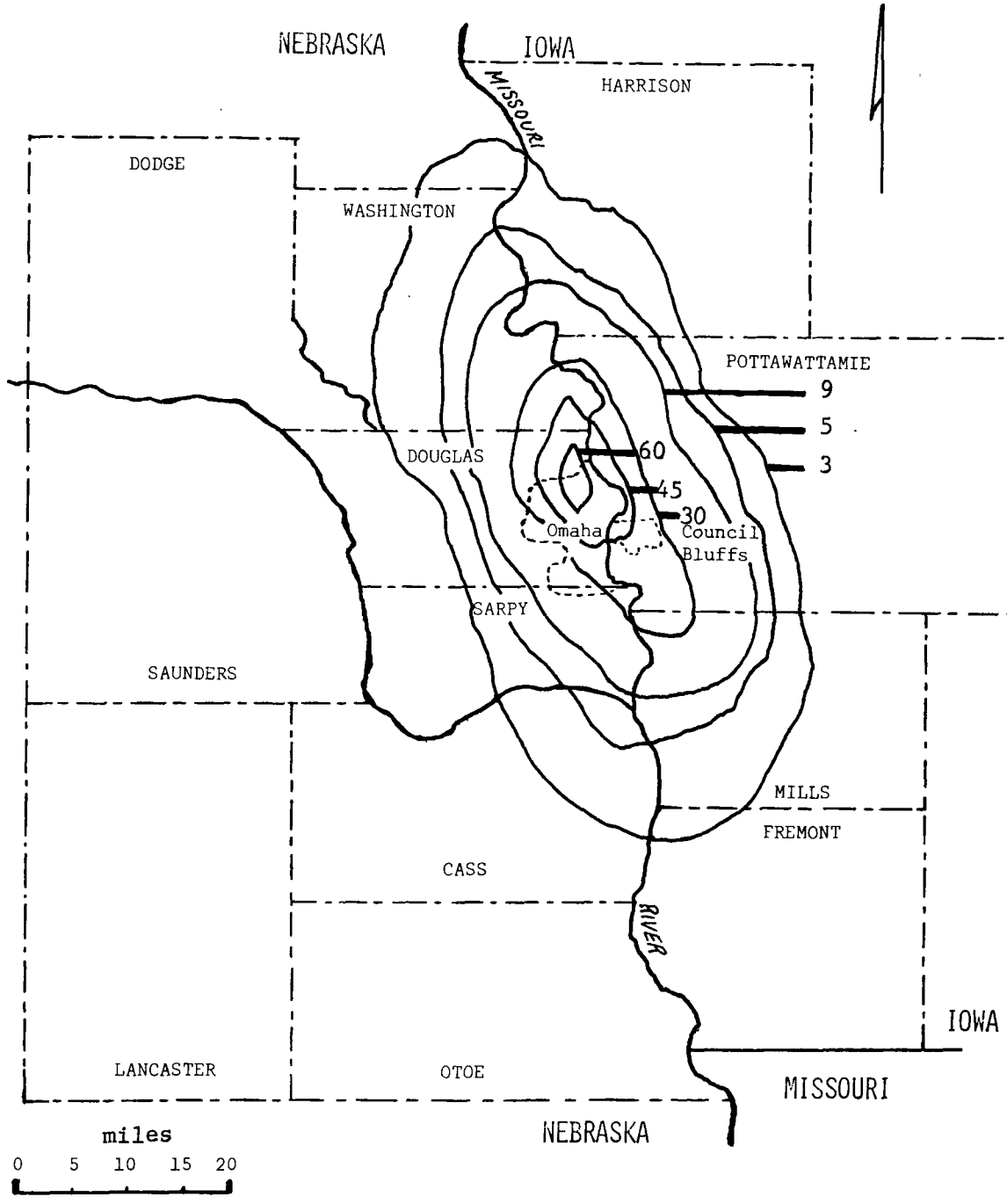

FIGURE 16 - Theoretical Annual Average Concentrations of Sulfur Oxides. Values in Micrograms per Cubic Meter

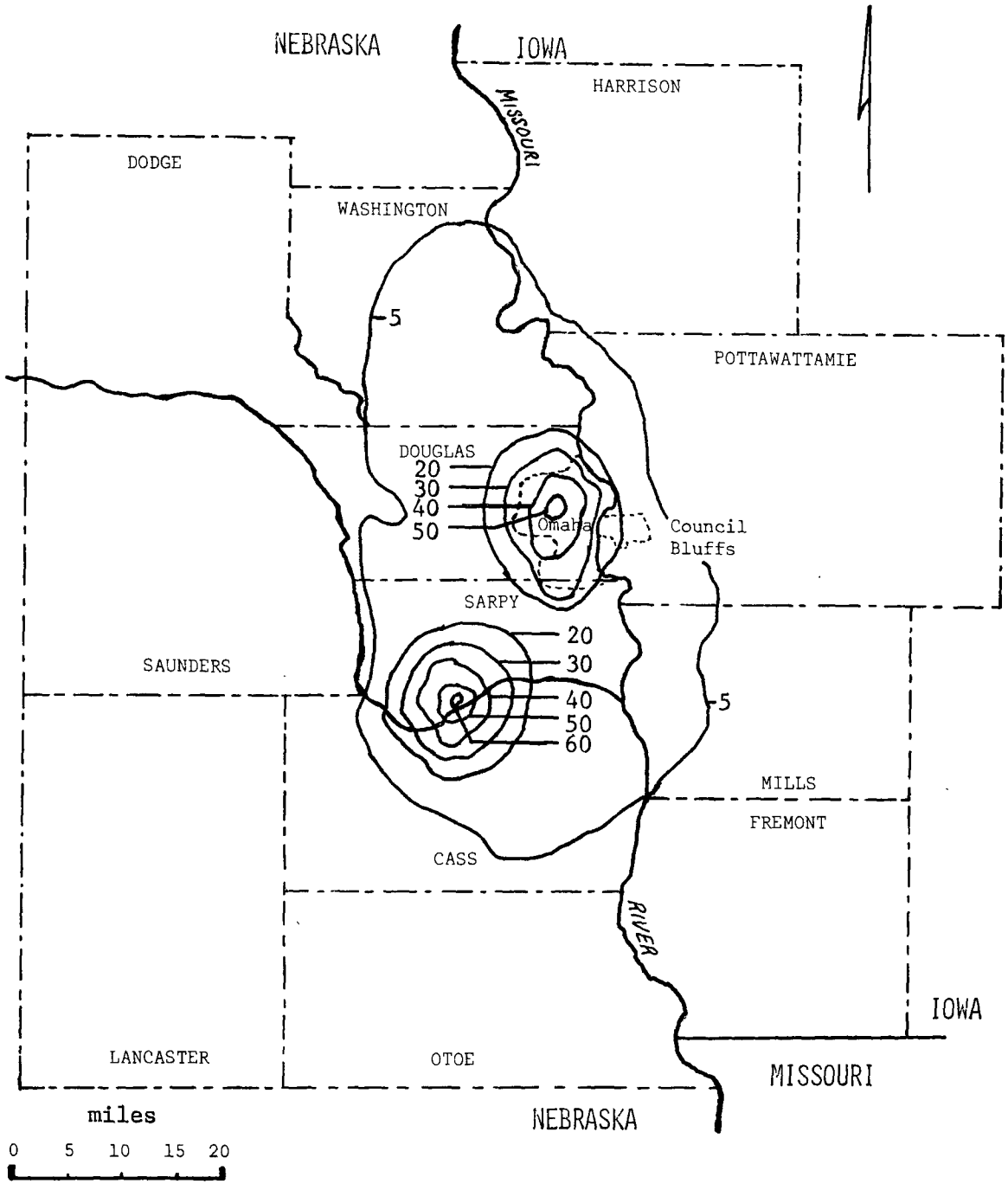

FIGURE 17 - Theoretical Annual Average Concentrations of Particulates. Values in Micrograms per Cubic Meter

urbanized areas with the single exception of a particulate concentration in Cass County, probably related to the operations of a large cement plant.

Air Sampling Data

The Division of Environmental Health, Omaha-Douglas County Health Department, maintains sampling stations in the City of Omaha and areas of the county immediately adjoining. Station locations are indicated on Figure 18. Data gathered from these stations have been used to compile an emissions inventory for the immediate area of Omaha-Douglas County which shows generally higher tonnages of carbon monoxide, hydrocarbons, and nitrogen oxides than the NAPCA inventory, and slightly lower tonnages of sulfur oxide and particulates. Both inventories, however, appear to be consistent within the limits of estimation. As might be expected, local air quality data show greatest concentrations in the downtown Omaha areas and industrial areas along the river to the south. Typical downtown measures of suspended particulates were in the range of 85-100 micrograms per cubic meter. The station at 11th and Nicholas, in a heavy industrial area, measured 150 to 250 micrograms per cubic meter. Dustfall measured in the range of 28 - 40 tons per square mile per month downtown, under 10 in the residential areas to the west, and in the 30's in the industrial areas with peak months as high as 135 tons per square mile per month.

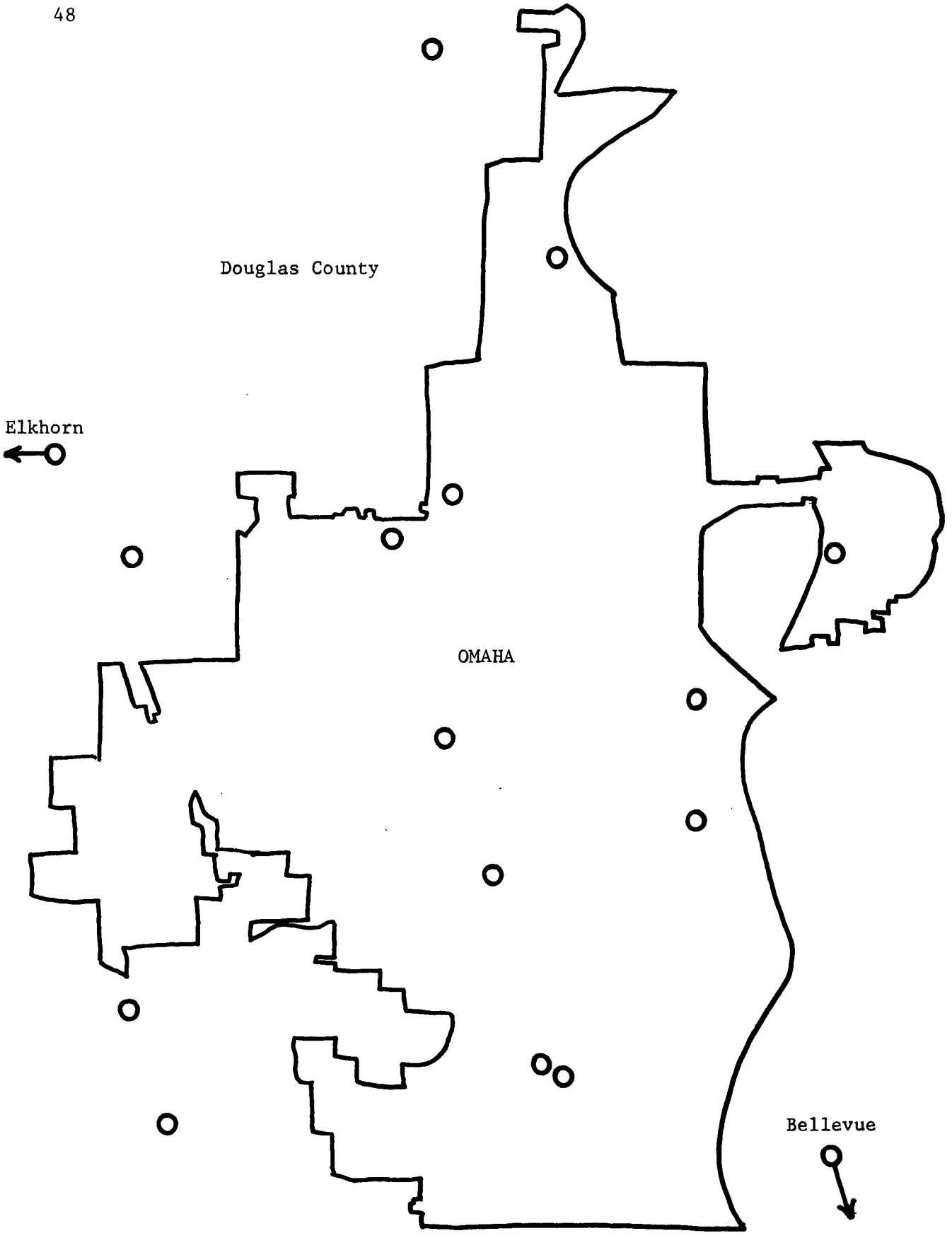

FIGURE 18 - Location of Air Sampling Stations, Omaha, Nebraska

Source: Omaha-Douglas County Health Department.

Analysis of the emission inventory, the diffusion model, and the local air sampling data indicate that pollutant concentrations are heaviest in the urbanized parts of the study area with the notable exception of particulate emissions from industrial operations in Cass County, thinly populated and rural.

REGIONAL GOVERNMENTAL ORGANIZATION

1. The SMSA

The study area is centered on the Omaha-Council Bluffs Standard Metropolitan Statistical Area (SMSA), which contains most of the population and air pollution sources. The SMSA consists of Douglas and Sarpy Counties, Nebraska, and Pottawattamie County, Iowa. Major cities are Omaha and Bellevue in Nebraska and Council Bluffs in Iowa. Included in the SMSA are a total of 27 incorporated cities, towns, and villages. Offutt Air Force Base, headquarters of the Strategic Air Command, is an important Federal government facility in the SMSA.

2. Planning Activities in the SMSA

The Omaha-Council Bluffs Metropolitan Area Planning Agency (MAPA) was established in 1968 to coordinate all planning for the SMSA. Policy direction for MAPA is through a Council of Elected Officials, with members from the three counties, ten municipalities, four school boards, and six special agencies. MAPA is the official review agency for Federal grant-in-aid programs. The agency's work plan is in three phases: Phase I, recently submitted to the Council of Elected Officials, outlines a Metropolitan Area Comprehensive Plan. Phase II will deal with housing, and Phase III with an economic base study.

The need for a regional planning agency is stated in the MAPA Phase I plan:

> "Frequently, the growth and development of the various communities (within the planning area) exerts overlapping influences on economic, political, social and physical activities of each other. This arrangement of numerous governmental agencies has failed to achieve the coordination necessary to solve metropolitan problems. As a result of this profusion of agencies, responsible public officials recognized the need to establish a metropolitan area comprehensive plan to coordinate and guide the planning efforts of many agencies."

Previous to completion of the proposed Phase I plan, MAPA prepared (1969) a detailed analysis of solid waste disposal problems and practices in the area. Other SMSA agencies were responsible for the Omaha Metropolitan Area Plan of 1960, and Pottawattamie County Regional Plan of 1968. In addition are the Omaha City Master Plan (1961), the Omaha Metropolitan Area Transportation Study (1966), and plans prepared by planning agencies in other municipalities in the SMSA. An indication of the complexity of this process is shown in Figure 19.

3. Planning in Study Area Counties Outside the SMSA

Consideration is being given to the development of planning policy for an "Eastern Nebraska Urban Region," involving the area extending around an axis between the Omaha-Council Bluffs urban area and the Lincoln urban area. The State of Nebraska has established planning and development regions through the State Office of Planning and Programming. Douglas and Sarpy Counties are in region 1, Saunders,

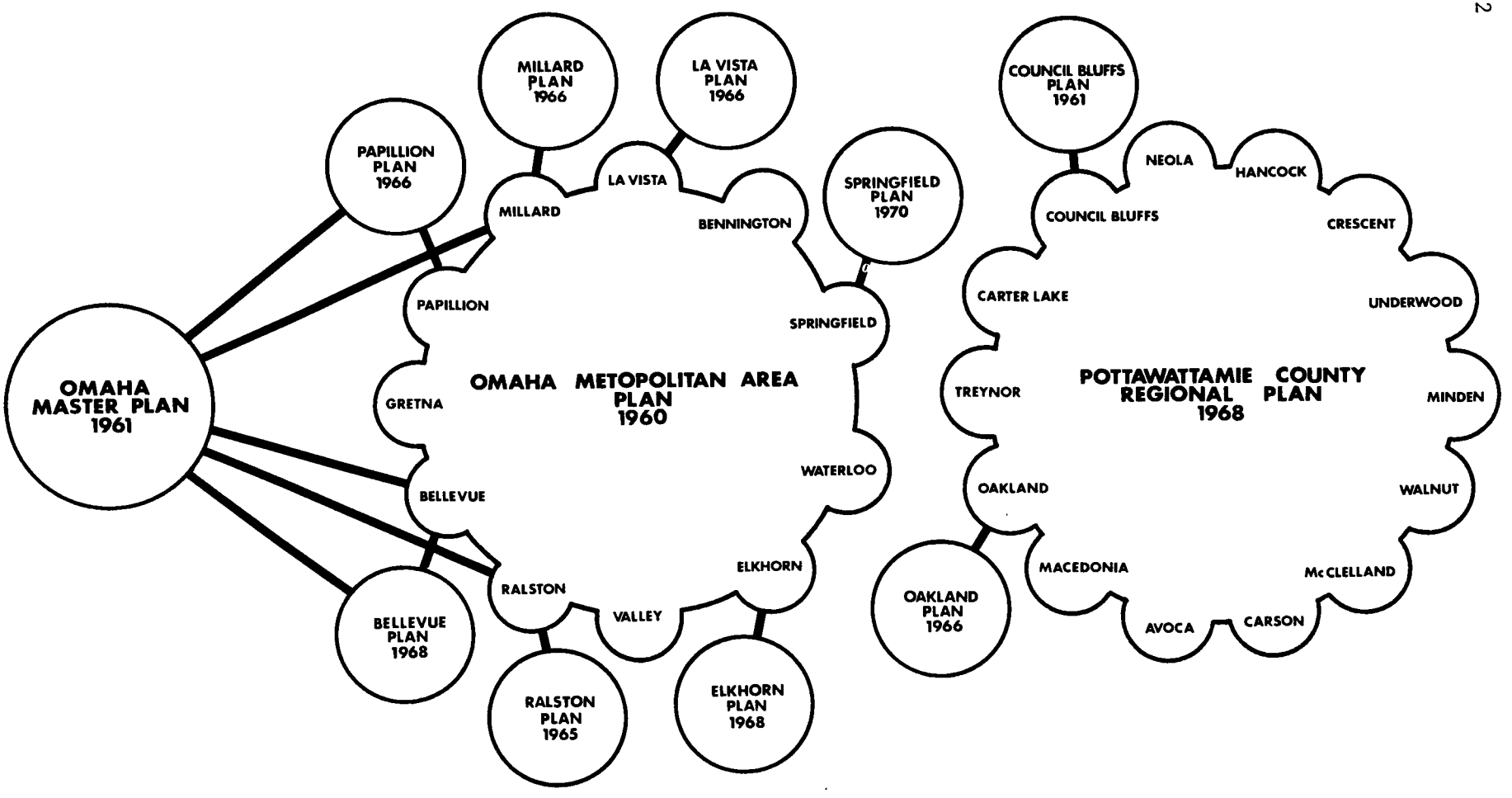

FIGURE 19 - Interrelationships Among City and County Planning Bodies, Metropolitan Omaha Study Area

Source: Omaha/Council Bluffs Metropolitan Area Planning Agency.

Cass and Otoe in region 4, and Dodge and Washington in region 5. The Iowa counties in the study area are included in the eight-county region 13 established by the Iowa Office of Planning and Development. These larger planning regional proposals have been stimulated by the need for broader area consideration of water management, airport development, transportation, and the like. County-wide planning commissions exist in Washington, Saunders, and Cass Counties, Nebraska, and in Mills County, Iowa.

4. Air Pollution Control Activities

Both Iowa and Nebraska have enacted air pollution control legislation.

The Iowa Air Pollution Control Act (1967) created an Air Pollution Control Commission within the State Department of Health. It provides for broad State powers and enables the establishment of local programs.

The Nebraska Air Quality Act (1969) creates an Air Pollution Control Council within the State Department of Health, and among other powers, mandates the Council to designate air pollution control areas within the State. Like the Iowa statute, it enables the establishment of local control programs. The Omaha-Douglas County Department of Health, through the Division of Environmental Health, administers the local control programs.

The State of Iowa's current annual budget for its air pollution control program is $100,000, consisting entirely of State funds. One

full-time engineer and part-time specialists in the State Hygienic Laboratory assist the director of the program. Nebraska's current budget totals $45,000, including Federal funds of $30,000. Assisting the director of the program on a part-time basis are four professional Health Department personnel.

The City of Omaha has enacted an air pollution control ordinance, which at this time has not been implemented by budget or staff. Ordinances against open burning are generally in effect in the study area, and Omaha-Douglas County are proceeding to enforce these ordinances.

There are no other active air pollution control programs in the rest of the study area.

PROPOSED AIR QUALITY CONTROL REGION

Subject to the scheduled consultation, it is proposed that consideration be given to an air quality control region in the Metropolitan Omaha area consisting of the following counties (Figure 20):

Douglas (Nebraska)

Sarpy (Nebraska)

Pottawattamie (Iowa)

Discussion

An air quality control region should meet three basic criteria:

1. It should encompass most pollution sources as well as most people and property affected by the sources.
2. It should include those areas where industrial and residential growth may create significant future problems.
3. It should be consistent with unified and cooperative administration of the region's air resources.

The proposed three-county Region for the Metropolitan Omaha area would satisfy the broad requirements of these criteria.

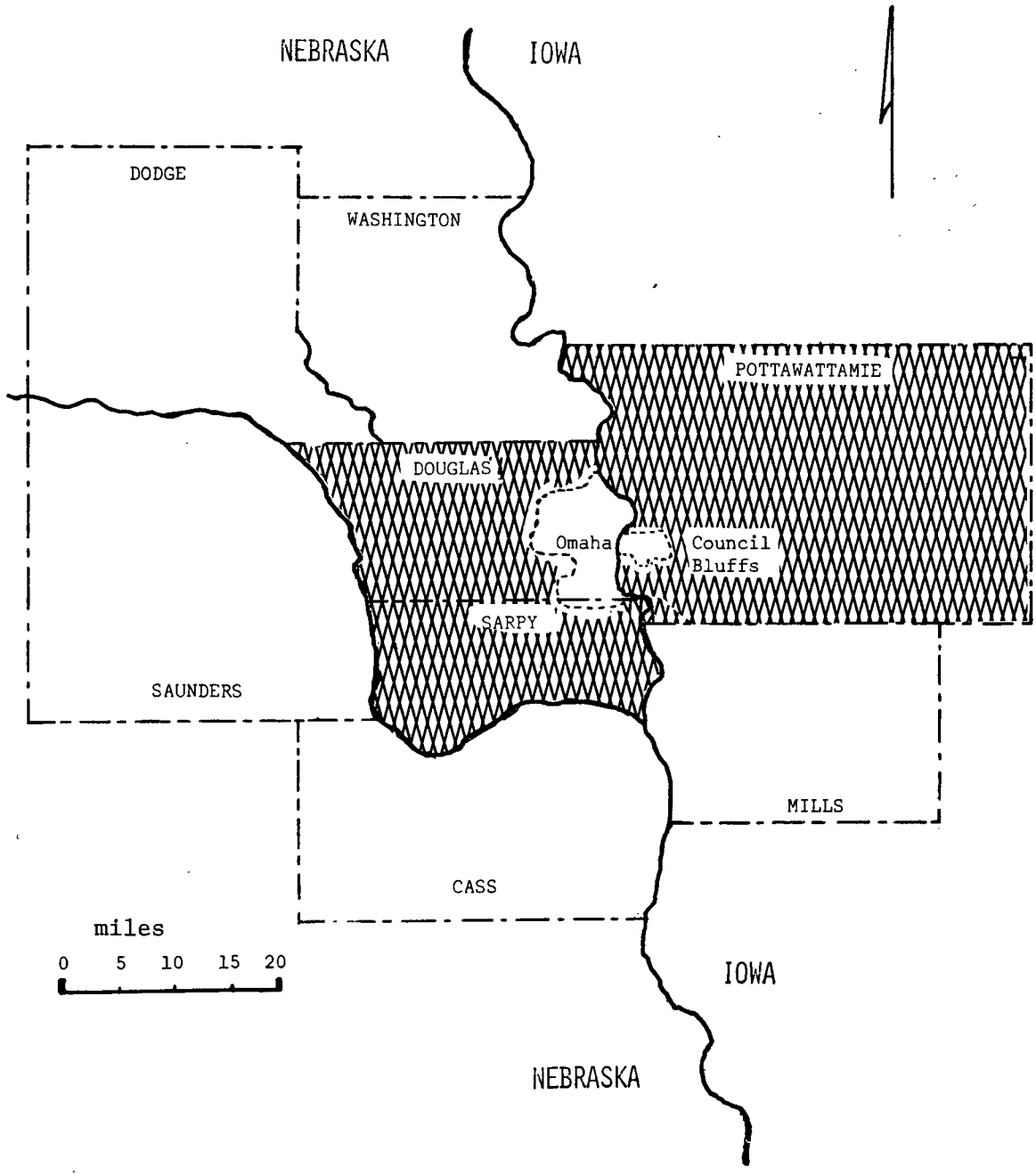

FIGURE 20 - Proposed Air Quality Control Region

The discussions above of technical, urban, and governmental factors relevant to determination of the Region's boundaries, lead to the following principal conclusions.

1. Pollution sources are primarily concentrated in the Omaha-Council Bluffs area of Douglas and Pottawattamie Counties. Most of the people and property affected by these sources are located in these two counties and in Sarpy County.

2. Future industrial and residential growth is expected to proceed at a moderate pace and to be confined within the three counties. A proposed highway plan, if adopted, would tend to reinforce these expectations. Hence, pollution sources and most people and property affected in the future are likely to continue to be within the three-county area.

3. The three counties constitute the Omaha Standard Metropolitan Statistical Area. They are actively engaged in cooperative coordination of all planning for the SMSA through MAPA and its Council of Elected Officials. MAPA is also the official review agency for Federal grant-in-aid programs. Thus, the three counties have a basis for unified and cooperative administration of the region's air resources.

In addition to the proposed three-county Region, consideration appears warranted of possible inclusion within the Region of Cass, Dodge, and Washington Counties in Nebraska, and Mills County, in Iowa. The reasons are the following:

1. In Cass County, a particulates pollutant source exists in a sparsely settled rural area. Thus, while many people are not affected by the source, possible serious effects on people who do live in the area or on their property might justify inclusion of the County in the Region.

2. Dodge County's established small manufacturing center at Fremont is only seven miles north of its boundary with Douglas County. If urban development in Douglas proceeds vigorously in a northwesterly direction toward that boundary, new residential neighborhoods would be affected by any present or future pollution sources in Fremont. Inclusion of Dodge County in the Region might therefore be justified to take account of future air quality problems.

3. Both Washington and Mills Counties have areas close to present pollution sources in Omaha and Council Bluffs. Although these areas are not developed at present, they may share in the future extension of both industrial and residential growth and thus add to potential pollution sources as well as to the affected population. These might be grounds for including the two Counties within the Region.

The final decision on the inclusion or exclusion of Cass, Dodge, Washington, and Mills Counties will be made only after

careful review of comments submitted to the Consultation record by State and local officials.

The boundaries proposed for the Metropolitan Omaha Interstate Air Quality Control Region in this report will serve as a starting point for discussion with State and local officials at the scheduled Consultation.