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Evaluation of Ambient Air Quality

In The State of Kansas

Based on Monitoring Data Through 1983

Final

EVALUATION OF AMBIENT AIR QUALITY

IN THE STATE OF KANSAS

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EXECUTIVE SUMMARY

This report presents an evaluation of recent ambient air quality in Kansas, based on 1982 and 1983 monitoring data for the criteria pollutants [Total Suspended Particulates (TSP), Sulfur Dioxide (SO_2), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Ozone (O_3) and Lead (Pb)]. Trend evaluations are based on five years of data, 1979-1983. All monitoring data used were retrieved from the Storage and Retrieval of Aerometric Data (SAROAD) system.

The report presents the following information in graphical form:

- Recent air quality and trends
- Boundaries of designated non-attainment areas
- Spatial scale of representativeness and data completeness by monitor
- Emissions and stack height relative to monitor locations
- Population within designated non-attainment areas.

Tabular summaries in the Appendices show the numerical data on which the graphics are based.

The findings and recommendations of the evaluation can be summarized in three categories: Attainment/Non-Attainment Designations; Areas of Continuing Air Quality Concern; and Monitor Operation.

A. Attainment/Non-Attainment Designations

Recent data show sufficient air quality improvement to clearly meet the National Ambient Air Quality Standards in two areas which have been designated non-attainment. Redesignations are recommended for:

TSP in Topeka (Secondary Non-Attainment to Attainment);
TSP in Kansas City (significant size reductions for the Primary and Secondary Non-Attainment areas)

B. Areas of Continuing Air Quality Concern

Relatively few serious air quality problems were found in the State, based on the monitoring data available in SAROAD. The recent data show violation of the health-related (primary) standards in only one area of the State:

° CO in Wichita (in 1982, but not in 1983).

This area is still under review by the State of Kansas. The exceedences of the secondary TSP standard in Johnson County were not anticipated and review by the State has commenced.

C. Monitor Operation

The overall picture of monitor operation in Kansas shows commendable performance by State and local agency personnel in ensuring data completeness, in performing the quality control checks required by the regulations of 40 CFR 58, Appendix A.

ACKNOWLEDGEMENTS

This report draws on the work and talents of several people in addition to the author.

State and local agency personnel collected, processed and reported the monitoring data which forms the basis of this evaluation. Based on their first-hand experience at the monitoring locations, they have also provided valuable insights into local conditions, both in cooperative discussions and in formal reports which they have prepared. We appreciate their help.

Dr. Thomas T. Holloway of EPA Region VII, his insights and organization of previous reports have made this report easier to compile. Carl Hess, a former employee of Computer Sciences Corporation, wrote the software to translate air quality data and emissions data into symbols for the maps in the text.

Mary LaSala Region VII typed the manuscript. Rob Ireson of Systems Applications, Inc., developed software which we requested for computing population estimates for designated non-attainment areas. Tim Matzke of the Environmental Results Branch, OMSE, EPA Headquarters, provided coordination for the funding of that software.

The unique contributions of each of those individuals to this project are gratefully acknowledged.

CONTENTS

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I. INTRODUCTION

The Environmental Services Division of EPA Region VII prepares an evaluation of ambient air quality for each State within the Region, periodically. The evaluation report serves as a basic reference document which summarizes the following information for the State:

- recent monitoring data
- current attainment and non-attainment area designations
- air quality trends
- ambient monitor locations
- emissions
- population
- data completeness
- monitor scales of representativeness
- precision and accuracy estimates

Data summaries are presented both in graphical form (on maps) and in tabular form.

This evaluation is based on information available as of May 1, 1984. That information includes non-attainment area designation changes which were made during 1983. Emissions data reflect the latest National Emissions Data System (NEDS) update supplied by the State. Ambient monitoring data for 1982 and 1983 are included for all pollutants. In addition, since the ozone standard is based on a three-year average, 1981 data are included for ozone.

II. GRAPHICAL EVALUATION PROCEDURES

A primary goal of the Clean Air Act is the protection of public health and welfare through the attainment and maintenance of National Ambient Air Quality Standards (NAAQS's). Those standards have been set for six "criteria pollutants" [total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2) and lead (Pb).] Before the standards were set, studies of the effects of each pollutant were carefully reviewed and evaluated. Primary standards are designed to protect human health, and are required by law to provide a margin of safety in order to protect sensitive segments of the population. Secondary standards protect public welfare (crops, building materials, animals, etc.). Numerical values of those standards are given in Table 1.

The regulations which implement the Clean Air Act require that public announcement be made and that measures be taken to reduce pollutant emissions when the ambient concentration exceeds the alert level for that pollutant. Numerical values for these alert levels are also given in Table 1.

The evaluation of air quality presented in this report is based on the National Ambient Air Quality Standards. So that the results of the evaluation may be readily seen, the body of the text is designed around graphic presentations which summarize a wide variety of air quality information. Those presentations include two different types of maps. Detailed numerical data summaries, from which the graphical summaries were prepared, are included as appendices to the report.

The first type of maps show:

- the boundaries of designated non-attainment and unclassified areas,
- the locations and scales of representativeness of ambient monitors,
- the comparison of ambient data with the standards,
- the specific standard(s) exceeded (if any) at each site,
- the statistical trend observed at each site (subject to data availability), and
- data completeness (relative to the National Aerometric Data Branch data summary criteria.)

The second type of maps show:

- the locations of large point sources (emitting 100 or more tons/year)
- the magnitude of emissions for each source
- the stack height for each source, if available from NEDS
- the locations of ambient monitors
- the monitor type designation--National Air Monitoring Station (NAMS), State and Local Air Monitoring Station (SLAMS) or Special Purpose Monitoring Station (SPMS)--for each monitor

TABLE 1

SUMMARY OF NATIONAL AMBIENT AIR QUALITY STANDARDS AND ALERT LEVELS

POLLUTANT	AVERAGING TIME	PRIMARY STANDARDS	SECONDARY STANDARDS	ALERT LEVEL
Particulate Matter	Annual (Geometric Mean)	75 ug/m^3		
	24-hour*	260 ug/m^3	150 ug/m^3	375 ug/m^3
Sulfur Dioxide	Annual (Arithmetic Mean)	80 ug/m^3 (0.03 ppm)	-	
	24-hour*	365 ug/m^3 (0.14 ppm)	-	800 ug/m^3 (0.3 ppm)
	3-hour*	-	1300 ug/m^3 (0.5 ppm)	
Carbon Monoxide	8-hour*	10 mg/m^3 (9 ppm)	(Same as primary)	17 mg/m^3 (15 ppm)
	1-hour*	40 mg/m^3 (35 ppm)		
Nitrogen Dioxide	Annual (Arithmetic Mean)	100 ug/m^3 (0.05 ppm)	(Same as primary)	
	1-hour	-		1130 ug/m^3 (0.6 ppm)
	24-hour	-		282 ug/m^3 (0.15 ppm)
Ozone	1-hour**	0.12 ppm (235 ug/m^3)	(Same as primary)	400 ug/m^3 (0.2 ppm)
Lead	Calendar Quarter	1.5 ug/m^3	(Same as primary)	

* Not to be exceeded more than once per year, for primary and secondary standards.

** Not more than 1.0 expected exceedance per year, three-year average.

The above items are illustrated in the legends to the maps (Tables 2 and 3). The following paragraphs explain in detail the interpretation of the maps. For convenience, an extra copy of the legends, a map with county names, and a map of population density by county are inserted unbound at the back of this report.

A. Monitoring Data Maps

For each monitor, the symbol location on the map shows the monitor location. The symbol size displays the scale of representativeness of the monitor - microscale, middle scale, neighborhood scale, urban scale or regional scale. Symbol shading indicates data completeness. If the data did not meet the completeness criteria described in Section III.F in any one year evaluated, an open symbol "O" is shown. If the data met the criteria in each year included in the evaluation, a filled circle is shown. The symbol color presents the comparison of recent monitoring data with the NAAQS's. Green indicates no violation of the standards. Blue depicts violation of the secondary standard, but no violation of the primary standard. Red highlights violation of the primary standard. If the alert level was exceeded during the years evaluated, a red flag is placed on top of the symbol. If any violation of standards was observed, annotations next to the symbol specify which standard(s) was (were) violated. Red annotations specify primary standards, while blue annotations specify secondary standards. Where the primary and secondary standards are identical, only the primary standard is shown. Possible annotations include A, Q, 24, 8, 3 and 1, signifying annual, quarterly, 24-hour, 8-hour, 3-hour and 1-hour standards, respectively.

The boundaries of the designated non-attainment areas and unclassified areas are shown as lines on the map. Red solid lines outline primary non-attainment areas, blue solid lines outline secondary non-attainment areas, and dashed lines show unclassified areas. Consequently, if the attainment status designations are consistent with recent data, red monitor symbols should appear only in red-outlined areas, and blue monitor symbols only in blue-outlined areas.

For monitors which have recorded sufficient data during the five years from 1979 through 1983, trends are presented as an additional annotation. The trend labels and their respective symbols are: increasing trend ($\uparrow$), probable increasing trend ($\wedge$), no trend (-), probable decreasing trend ($\vee$), and decreasing trend ($\downarrow$). For pollutants which have only short-term standards (CO and O_3), the trend presented is for the 90th percentile hourly concentrations observed each month over those five years. For NO_2, which has only an annual standard, the trend presented is for the monthly average concentrations. For pollutants which have both short-term and long-term standards (TSP and SO_2), two trend symbols are presented. The first symbol is for long-term averages, the second for 90th percentile concentrations. For lead, lack of sufficient data and software precludes trend analysis at this time. Further details of the trend analysis procedure are given later in this report (Section III. C).

TABLE 2

LEGEND FOR AMBIENT MONITORING DATA MAPS

Boundaries

- Primary Nonattainment Area
- Secondary Nonattainment Area
- Unclassified Area

Monitor Symbol Colors and Flag

- No Violation of Standard
- Violation of Secondary Standard
- Violation of Primary Standard
- Exceedance of Alert Level

Annotation for Standards Violated

- A — Annual Primary Standard
- Q — Quarterly Primary Standard
- 24 — 24-hour Primary Standard
- 24 — 24-hour Secondary Standard
- 8 — 8-hour Primary Standard
- 3 — 3-hour Secondary Standard
- 1 — 1-hour Primary Standard

Annotation for Trends

- ↑ Increasing Trend
- ∧ Probable Increasing Trend
- – No Trend
- ∨ Probable Decreasing Trend
- ↓ Decreasing Trend

(Where two trend symbols are shown, the first is for long-term averages, the second for 24-hour observations.)

Monitor Symbol Sizes

- Microscale
- Middle Scale
- Neighborhood Scale
- Urban Scale
- Regional Scale

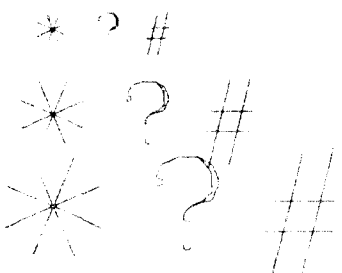
Data Completeness

- Data met completeness criteria each year.
- Data did not meet completeness criteria one or more years.

TABLE 3

LEGEND FOR EMISSIONS DATA MAPS

POINT SOURCE SYMBOL SIZE – EMISSIONS (TONS/YEAR)



	NON-LEAD	LEAD
	100 - 1000	5 - 25
	1001 - 5000	26 - 100
	OVER 5000	OVER 100

POINT SOURCE SYMBOL COLOR – STACK HEIGHT (METERS)

	UNKNOWN
	1 - 45
	46 - 120
	121 - 305

AMBIENT MONITOR SYMBOLS

	NAMS
	SLAMS
	SPMS

B. Emissions Data Maps

The emissions data maps provide an overview of the monitoring network. No State maps were produced due to incomplete coordinates for sources outside major metropolitan areas. If the locations and stack heights can be included in the next NEDS update which the State submits, those overviews can be prepared for the FY-85 air quality evaluation report.

The locations of large point sources are shown by an asterisk. The size of the symbol indicates the magnitude of the emissions, in three ranges: 100-1000 tons/year, 1001-5000 tons/year and over 5000 tons/year The symbol color indicates the stack height as follows: red for 1-45 meters, blue for 46-120 meters, and green for 121 meters or taller. If the stack height is shown as zero in NEDS, a red question mark replaces the asterisk.

Ambient monitor locations are shown as squares, circles or triangles indicating NAMS, SLAMS and SPMS monitors, respectively.

III. DATA DESCRIPTION - Information Sources, Limitations and Analysis Procedures

The evaluation procedure described above requires detailed examination of various kinds of data from various sources. The following paragraphs describe the information sources, the limitations and the analysis procedures for the necessary data.

A. Ambient Air Monitoring Data

A network of ambient air monitoring stations has been established by the State of Kansas, as required by 40 CFR §58.20 and §58.30. The network includes not only the required National Air Monitoring Stations (NAMS) and State and Local Air Monitoring Stations (SLAMS), but also a number of Special Purpose Monitoring Stations (SPMS) designed to address short-term monitoring needs or special situations of interest to the State.

During the early and mid-1970's, an extensive air monitoring network was maintained across the State, including monitors for all five pollutants for which NAAQS's had been established by that time. (The NAAQS for lead was promulgated in 1978, and siting criteria for lead monitors were published as final rules in 1981.) Because the observed concentrations at most sites were well below the respective standards, the extent of the network was reduced considerably such that monitoring resources were focused on populous areas where higher concentrations had been monitored. The current network includes monitoring for several pollutants in Kansas City, Lawrence, and Wichita, plus particulate sampling in Topeka, Goodland, Concordia and Dodge City.

The locations of those monitors, shown in the graphical presentations of this report, were obtained from the site file of the Storage and Retrieval of Aerometric Data (SAROAD) system.

The ambient data used in this report were obtained from the SAROAD data base. A copy of the SAROAD Quick Look Summary is included as Table A1 of the Appendix. The recorded values were compared with the alert levels, the primary standards and the secondary standards for graphical display on the maps. Data for 1982 and 1983 were used in the analysis of recent air quality for all six criteria pollutants. Since the ozone standard is based on a three-year average, 1981 data were also included for ozone. For the analysis of trends, five years of data (1979 through 1983) were used.

B. Precision and Accuracy

Each organization which reports air monitoring data is required to calculate and report 95 percent probability limits for precision and accuracy for all NAMS data collected after January 1, 1981, and for all SLAMS data collected after January 1, 1983. Those probability limits, which are calculated using specific equations from 40 CFR 58

Appendix A, summarize the results of quality control checks which those same regulations require. The meaning of the probability limits and the procedures for performing the quality control checks are discussed below in Section X.

The precision and accuracy reports available in SAROAD as of May 1984 are provided as Table A2 of the Appendix.

C. Trends

The trend analyses were performed on data from 1979 through 1983, using the same statistical procedure as in prior years. That procedure calculates the Sen non-parametric statistic, using the NADB*TRENDRUN programs on the UNIVAC computer associated with the National Aerometric Data Branch (NADB).

The analysis procedure can be visualized as follows. From all the data for a given month, one single value is computed. The monthly values are adjusted to account for seasonal variation. Each month's adjusted value is compared with the value for every preceding month in the measurement period. Next, for each month, tallies are made of how many preceding months' values were higher and how many were lower than the month in question. Those tallies are then summed to give grand totals of months with higher readings and months with lower readings. Those two grand totals are compared using the Sen statistic to determine whether or not a statistically significant trend existed. Appendix B gives the detailed step-by-step procedure, including the mathematical equation for the Sen statistic. That appendix also provides a sample calculation.

The values used for each month were selected as follows. Two trend calculations were performed for TSP. For the first calculation, the value used for a month was the geometric mean of all values measured during the month. For the second calculation, the value used was the 90th percentile 24-hour concentration for all concentrations measured during the month. (Because of the small number of TSP samples each month, the 90th percentile concentration is also the maximum concentration.) Two calculations were likewise performed for SO_2. The first used the monthly arithmetic mean, the second the 90th percentile 24-hour concentration. For NO_2 and Pb, the monthly arithmetic mean was used. For CO and O_3, which have only short-term standards, the value used was the 90th percentile 1-hour concentration.

As noted above, the trend evaluations for short-term high concentrations use 90th percentile concentrations, rather than maximum concentrations. The reason for that choice is that the 90th percentile values give more stable trend estimates, and minimize the bias which would result from extreme values caused by data handling errors, unusual weather conditions, etc.

Since the trend evaluation uses a statistical technique, erroneous results could be obtained if a limited amount of data were used. Minimum criteria chosen were at least 50% complete data for the five years 1979-1983, and at least 75% complete data for at least three of those years. These criteria disallowed trend evaluation at many monitoring sites.

The results of recent pollution abatement actions may not be reflected in the five-year trend analysis, since concentration increases early in the time period could mask recent short-term improvements. As mentioned before, the trends are based on 1979 through 1983 data. The data used in reviewing attainment or non-attainment of the NAAQS's, however, cover only the periods 1981-1983 for ozone and 1982-1983 for the other pollutants.

D. Scale of Representativeness

Spatial Scales of Representativeness are described in 40 CFR Part 58, Appendix D. The scale of representativeness identifies the size of an air parcel around a monitor which is homogeneous in terms of pollutant concentrations, population density and geographical features. The scales pertinent to the present analysis are, in order of increasing size: microscale (part of a city block); middle scale (a few square blocks); neighborhood scale (a few square kilometers); urban scale (the size of an entire city); and regional scale (several hundred to several thousand square kilometers, generally in rural areas). The air quality analysis includes the scale of representativeness for each monitor in order to depict the expected geographical extent of the concentrations monitored. The scales of representativeness for the monitors were obtained from the report entitled "Annual Ambient Air System Audit of Kansas..." for calendar year 1984, which was prepared by Richard Tripp of the United States Environmental Protection Agency.

E. Attainment Status Designations

The designations of attainment, non-attainment and unclassified areas are found in 40 CFR §81.317. The designations used in the analysis are included as Table A3 of Appendix A. Because of the logistics of graphics preparation, a cut-off date of May 1, 1984 was used. The map presentations show boundaries for non-attainment areas and unclassified areas, obtained from those designations. In cases where the wording of 40 CFR §81.317 does not provide specific boundaries, the boundaries were obtained from maps which the state submitted to EPA with the designation requests. Where non-attainment or unclassified area boundaries follow county lines, those lines on the map do not precisely coincide, in order that both lines can be clearly seen. In some cases, larger discrepancies in the boundaries are evident, because the county boundaries in the ZMAP computer mapping system are not exact.

F. Data Completeness

If monitoring data for a site are incomplete, they may give a distorted picture of air quality. Annual or quarterly averages calculated from incomplete data may be biased either high or low, making comparisons with long-term NAAQS's uncertain. Where the NAAQS's are based on short-term averages (1, 3, 8 or 24 hours), incomplete data may reduce the number of detected exceedances of the standard. For all such pollutants except ozone, any bias resulting from incomplete data would make short-term air quality appear better than it actually was. For ozone, the standard is based on "expected exceedances," which consider both the number of measured exceedances and the time period over which they were measured, in order to project the number of exceedances expected for a full year of monitoring. Therefore, incomplete ozone data could make the air quality appear either better or worse. For the analysis presented in this report, the data are considered "complete" if they include enough observations (reported as valid) to meet the minimum NADB data requirements for calculating average concentrations. (Sites which do not meet these criteria are indicated by a question mark in Table A1 of Appendix A). Those criteria are applied by the NADB to pollutants which have NAAQS's based on annual or quarterly averages (TSP, SO_2, NO_2 and Pb). For CO and O_3, however, annual averages are not computed by the NADB. For those two pollutants, a minimum criterion of 75% complete data for the entire year is chosen for the analysis in this report.

G. Emissions Data

The emissions data used in this report were obtained from the National Emissions Data System (NEDS). The graphical analysis procedure applied to those data shows the locations and stack heights of large point sources. The emission estimates stored in NEDS for Kansas sources were hand-calculated by the KDHE.

On the maps, a single symbol is shown for each plant. If a plant has two or more stacks, it is still treated as a single source. In that case, the stack height used is a weighted average of the heights of the individual stacks. The weighting factors are the fractions of the total emissions coming from each stack.

H. Population Data

Population data are used in two contexts in the report. First, a map of population density by county is provided at the back of the report. That map is based on 1980 population data which was obtained directly from the U.S. Bureau of the Census. Second, population exposure estimates are presented in Section XII for non-attainment areas, based on 1970 census data which are available at a higher level of spatial resolution. Those estimates were produced by Systems Applications, Inc., using block group and enumeration district population data, and were scaled to approximate 1978 values using county-level growth factors. Appendix C describes the procedures used for those calculations.

IV. TOTAL SUSPENDED PARTICULATES (TSP)

A. Ambient Data and Attainment Status Designations

The State map shows an extensive TSP monitoring network in Kansas City, Topeka and Wichita, and additional monitors in three smaller cities in the central and western portions of the State. This review will focus first on the smaller cities, then on information presented for the larger cities on inset maps.

Data from Concordia show an annual geometric mean of 79 ug/m^3 in 1983 (an apparent violation of the annual primary standard of 75 ug/m^3). The data showed one and four 24-hour observations in 1982 and 1983, respectively, in excess of 150 ug/m^3 (apparent violations of the secondary standards) and one value in 1983 in excess of 260 ug/m^3. Trend analysis at this site showed no trend in particulate concentration.

Data from Dodge City show no violation of any of the particulate standards in 1982 or 1983. However, the 1982 data from Dodge City were only about 50% complete.

Data from Goodland show six and four 24-hour observations in 1982 and 1983, respectively, in excess of 150 ug/m^3 (apparent violations of the secondary standards). Trend analysis at this site showed a decreasing trend in particulate concentration.

The fugitive dust policy was described in the Federal Register, Volume 3, Number 43 (Friday, March 3, 1978) page 8963.

> "EPA's fugitive dust policy recognizes the generally greater health impact due to fugitive dust in urban areas in contrast to rural areas. In urban areas, the windblown soil contains various man-made toxic pollutants. But, rural windblown dust is usually not significantly contaminated by industrial pollutants. Therefore, for the purposes of these designations [TSP attainment status designations], any rural areas experiencing TSP violations which could be attributed to fugitive dust could claim attainment of the TSP NAAQS. Rural areas for this purpose are defined as those which have: (1) a lack of major industrial development or the absence of significant industrial particulate emissions, and (2) low urbanized population densities."

The following comments highlight the detailed analyses presented on the inset maps. The abbreviations PNA and SNA are used for "primary non-attainment area" and "secondary non-attainment area," respectively, based on current designations.

Kansas City - Data throughout the area show attainment of the primary standards. The data showed four and fourteen 24-hour observations in 1982 and 1983, respectively, in excess of 150 ug/m^3 (apparent violations of the secondary standards) at four of the seven monitors in the Kansas City area.

Three years ago, sample savers were added to TSP monitors in Kansas City. Data collected with and without the sample savers (since 1981) are not really comparable for trend analysis, yet the trend analysis covers a

five year period. Also, the Air Pollution Mapping System runs trends on the entire State. Therefore, the trend indicators shown on the map for the Kansas City sites may not be accurate. However, the use of recent data is valid for assessing compliance with the NAAQS.

Based on the 1982-1983 data, significant reductions in the sizes of the non-attainment areas appear justified. We recommend redesignating the Fairfax and Ann Street areas to secondary non-attainment and shrinking the PNA to the Armourdale area. After industrial production increases again, the most current monitoring data should be reviewed to verify that the primary NAAQS's are still being met in the Fairfax area. Redesignation of the remaining area to attainment is supported by the data with the exception of the 8715 west 49th Street site. The data show six 24-hour observations in 1983 in excess of 150 ug/m^3 (apparent violations of the secondary standards). If continued monitoring indicates observations in excess of 150 ug/m^3, designation to SNA would be justified.

Topeka - Data continue to show no violation of the NAAQS's during 1982 or 1983. Those data meet the NADB summary criteria for completeness and trend analysis show probable decreasing to decreasing pollutant concentrations at three of the four sites. Therefore, redesignation of the SNA to attainment would be supported by the data.

Wichita - Data show three 24-hour observations in 1983 in excess of 150 ug/m^3 (apparent violations of the secondary standard), all occurring at one site. Trend analysis show no trend has developed at this site. If continued monitoring indicates observations in excess of 150 ug/m^3, designation to SNA would be justified.

B. Emissions Data and Monitor Locations

Particulate point sources are shown for the three cities (Kansas City, Topeka and Wichita) where coordinates were available. (The numbers beside the point source symbols refer to the left-most column of Table A4 of Appendix A.) The three areas of interest have numerous point sources with emissions in the range 100 to 1000 tons/year. Only one plant emits over 1000 tons/year, based on the NEDS printout, and none emit over 5000 tons/year. Stack heights are not available in NEDS for most of the sources. The monitoring network includes monitors in most areas with large emissions.

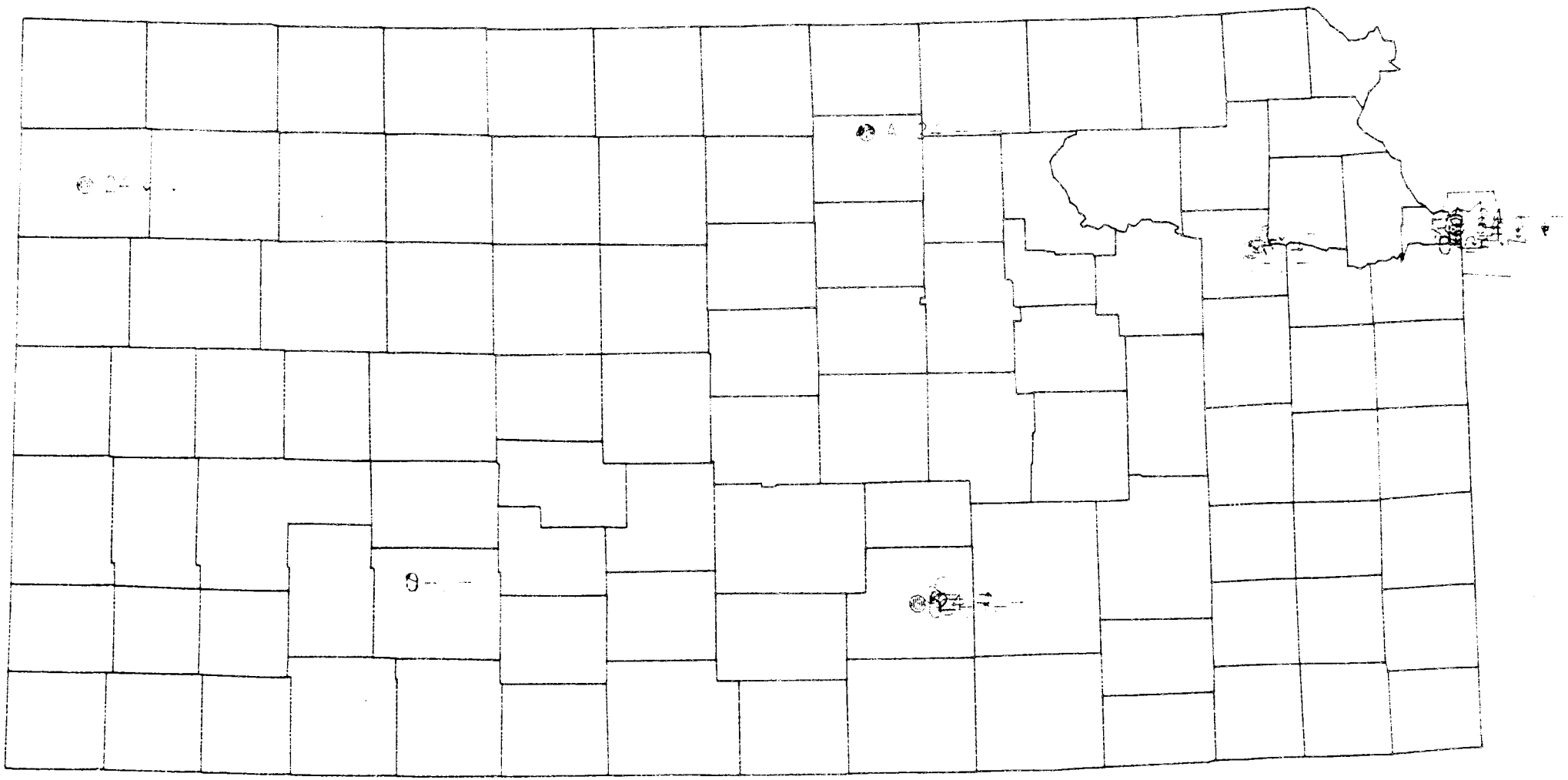
Synopsis and Recommendations

Decreases in monitored TSP concentrations have been observed in recent years in each of the designated non-attainment areas, but two sites in urban areas show an increase in TSP concentrations. Based on the recent data, several changes in attainment status designations are recommended, as shown in Table 4.

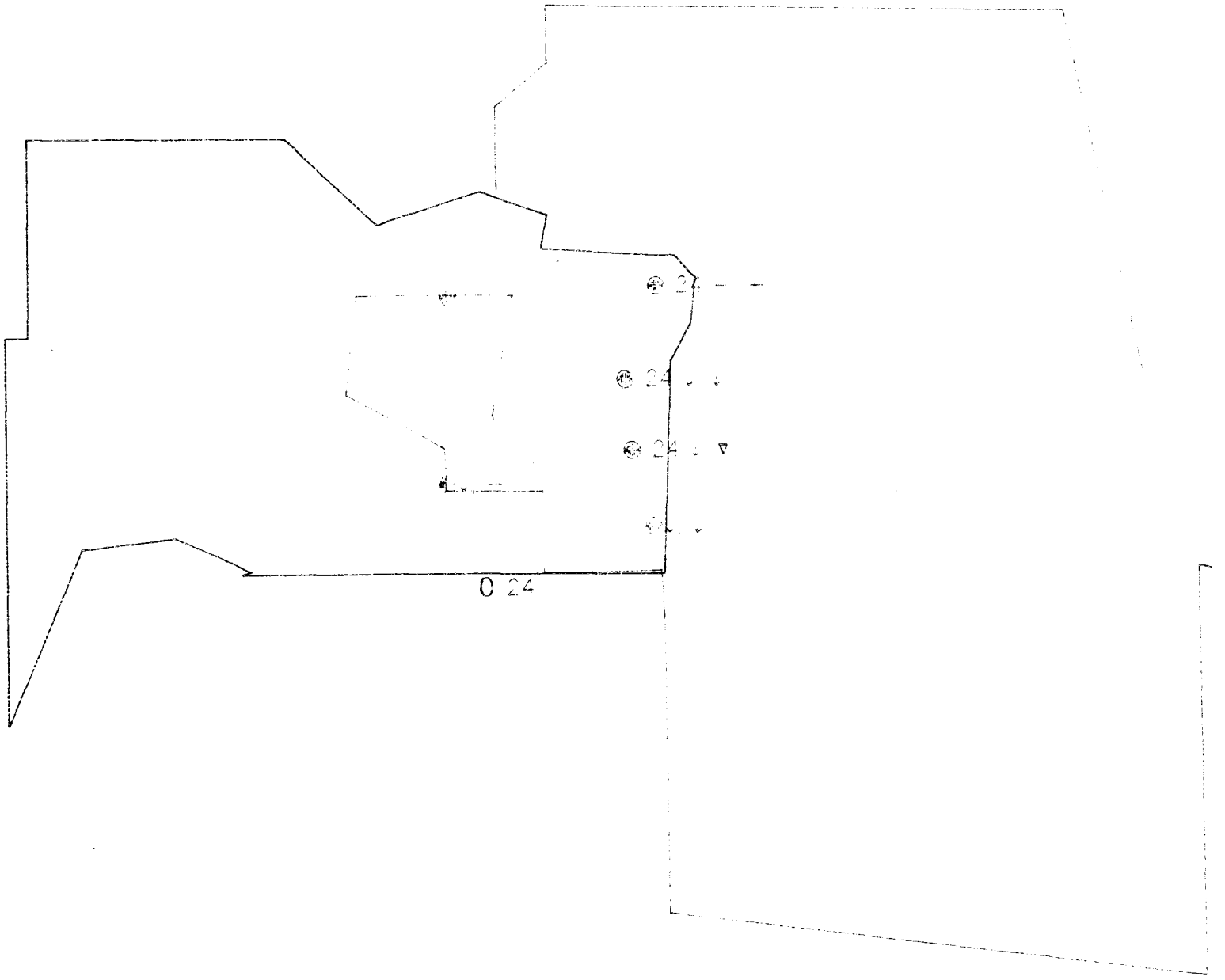
TABLE 4

SUMMARY OF TSP RECOMMENDATIONS

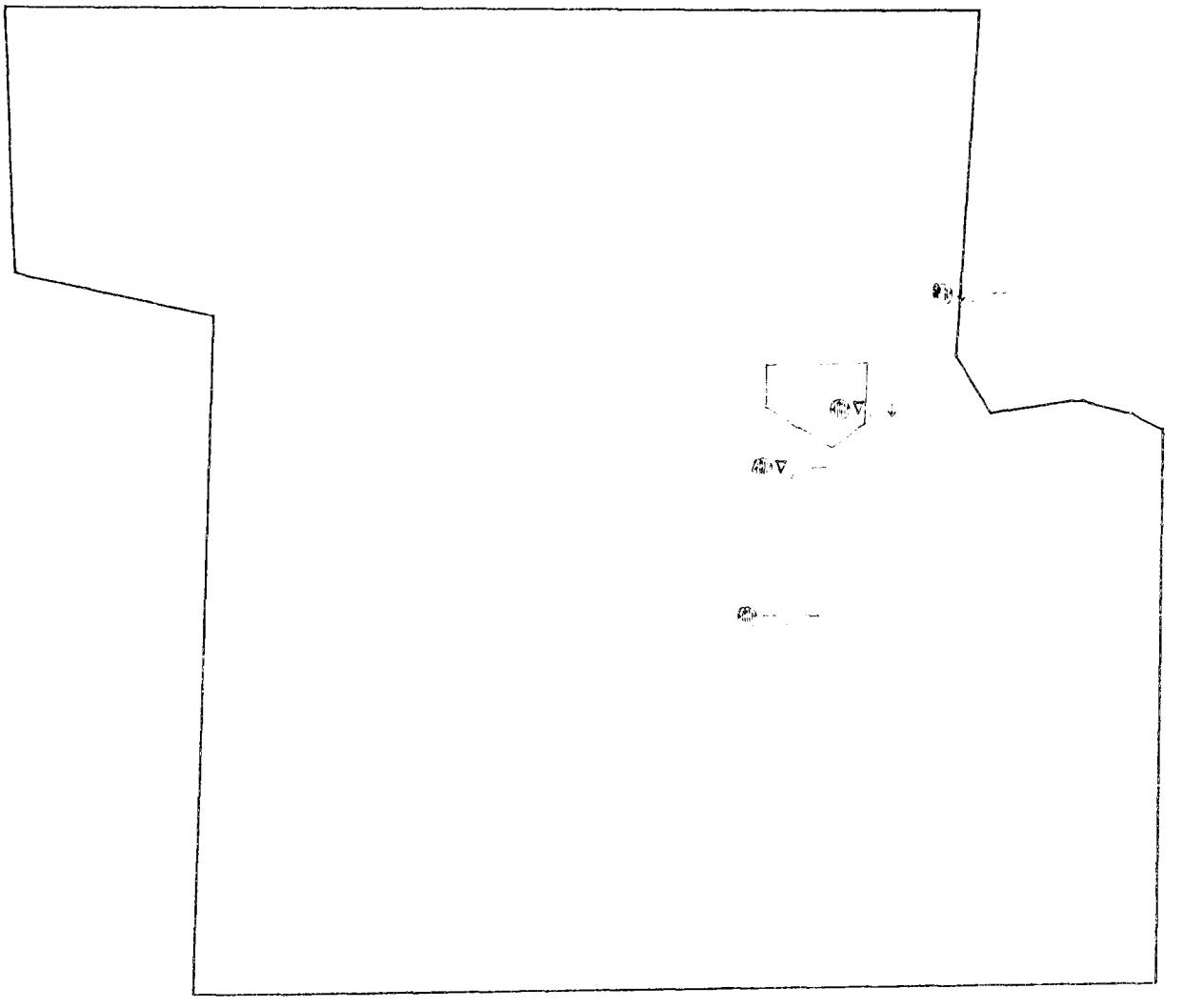
Kansas City	Redesignate Fairfax and the Ann Street areas from primary non-attainment to secondary non-attainment. Shrink the primary non-attainment area to the industrial-residential area around the 420 Kansas Avenue site. Redesignate the area around 8715 West 49th Street to secondary non-attainment if exceedances recur.
Topeka	Redesignate the secondary non-attainment area to attainment.
Wichita	Redesignate the area around 401 South Tyler Road to secondary non-attainment if exceedances recur.



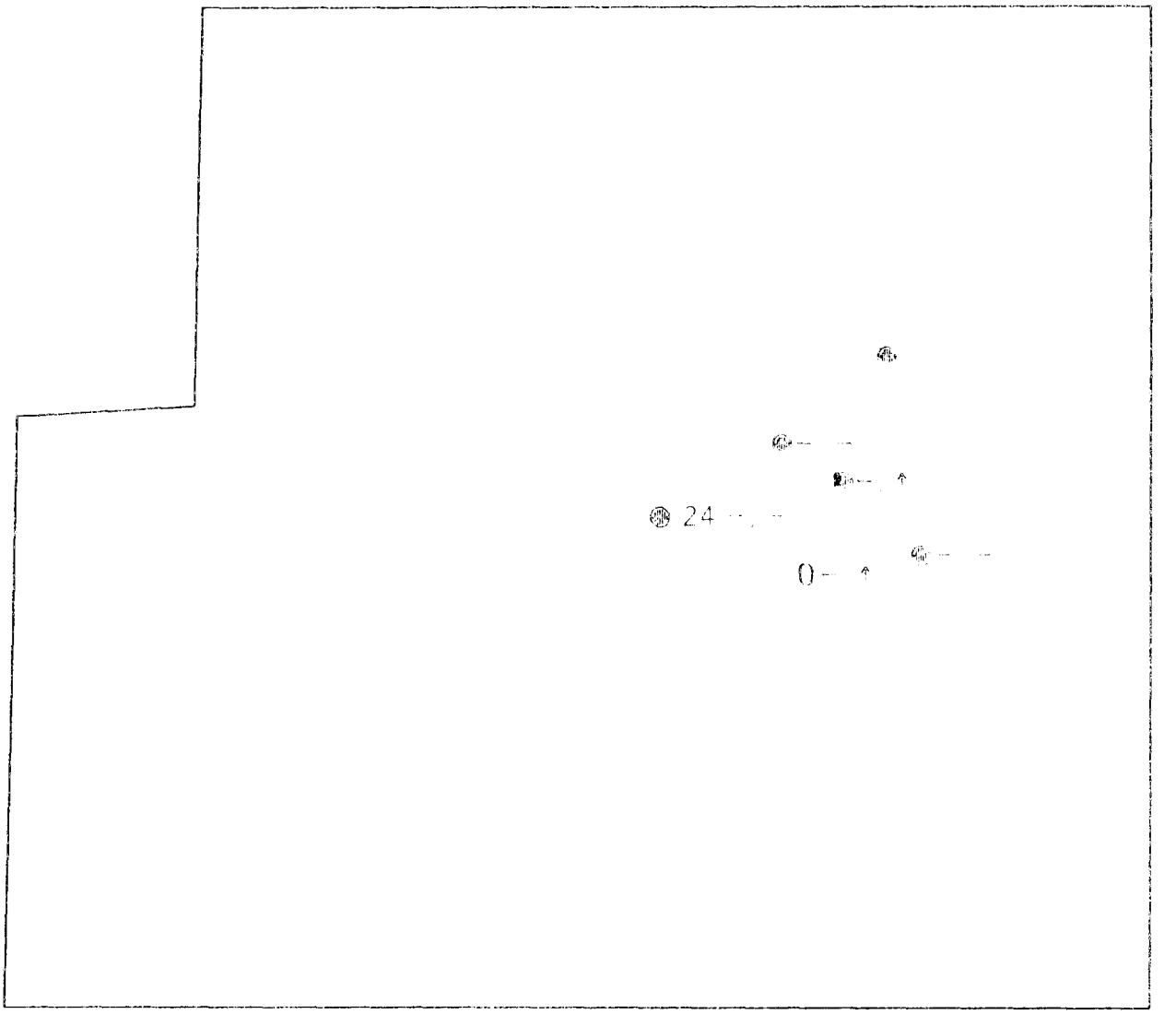
AMBIENT TSP DATA



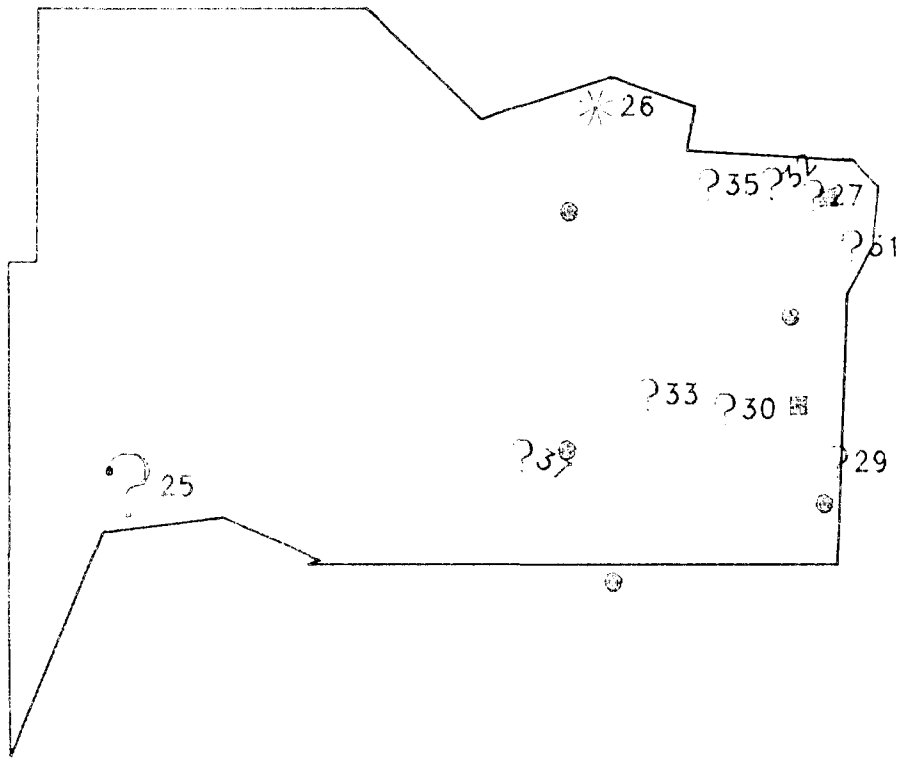
AMBIENT TSP DATA – KANSAS CITY AREA



AMBIENT TSP DATA – TOPEKA AREA

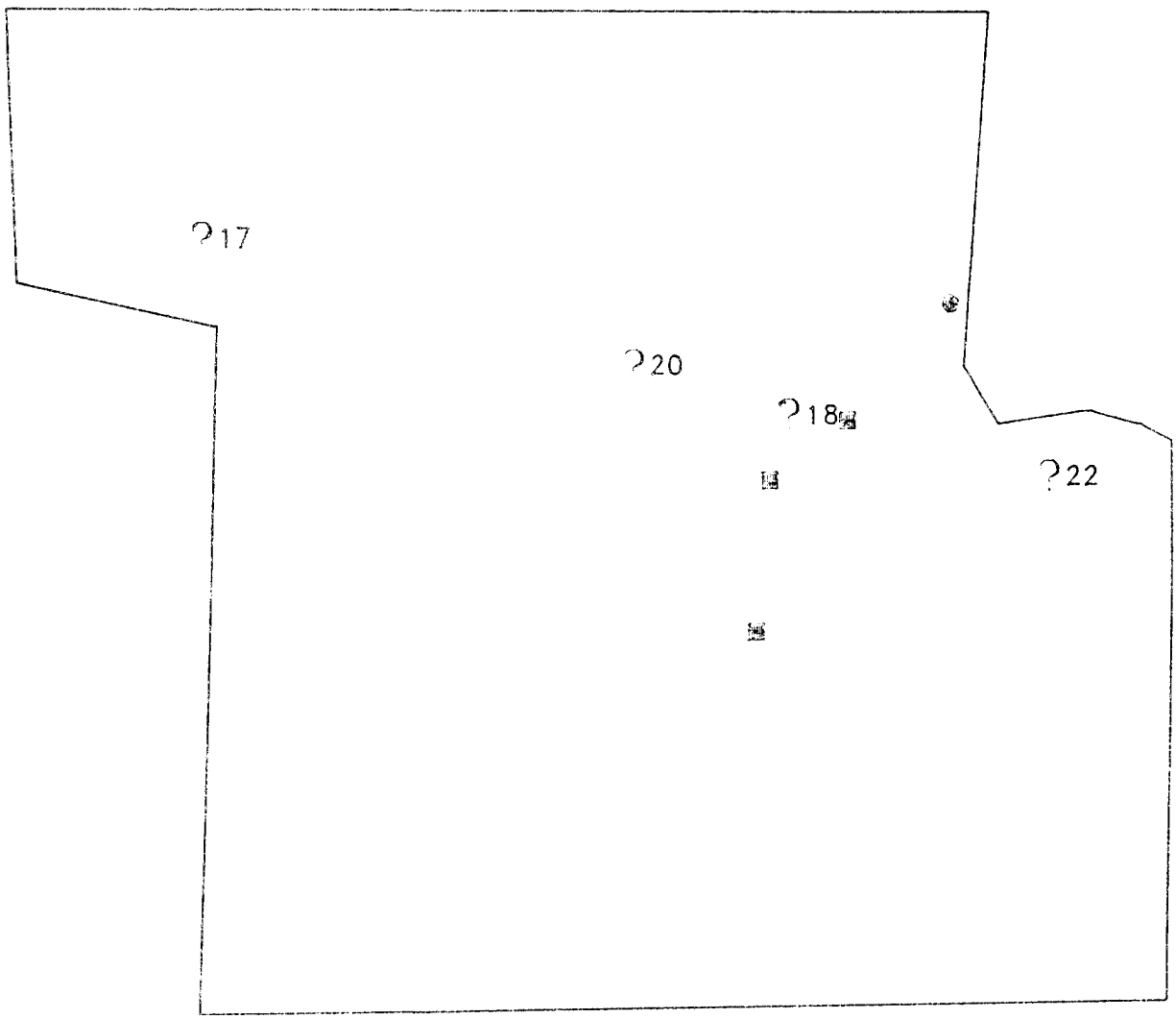


AMBIENT TSP DATA – WICHITA AREA

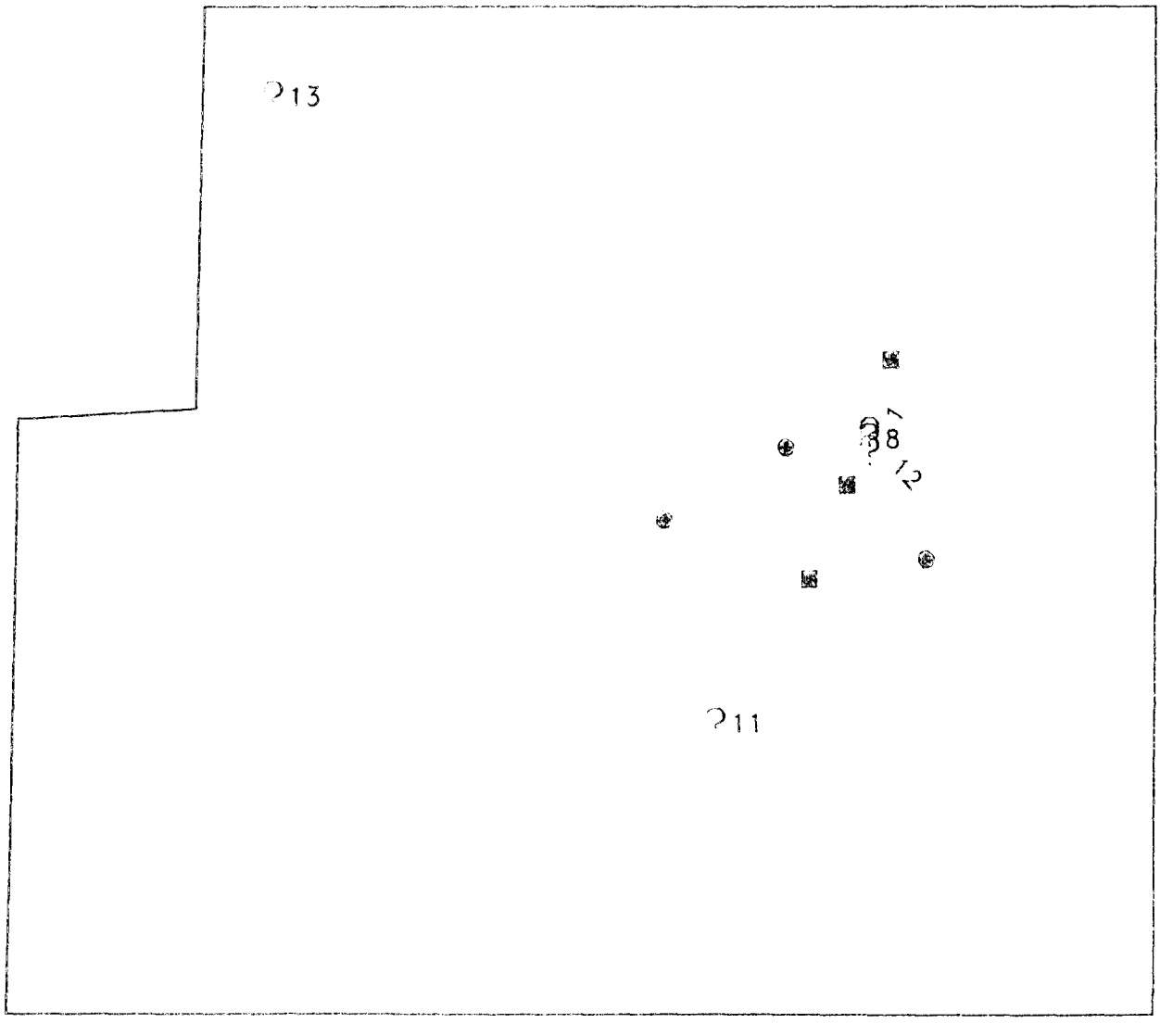


TSP EMISSIONS AND TSP MONITORS

KANSAS CITY AREA



TSP EMISSIONS AND TSP MONITORS – TOPEKA AREA



TSP EMISSIONS AND TSP MONITORS – WICHITA AREA

V. SULFUR DIOXIDE (SO_2)

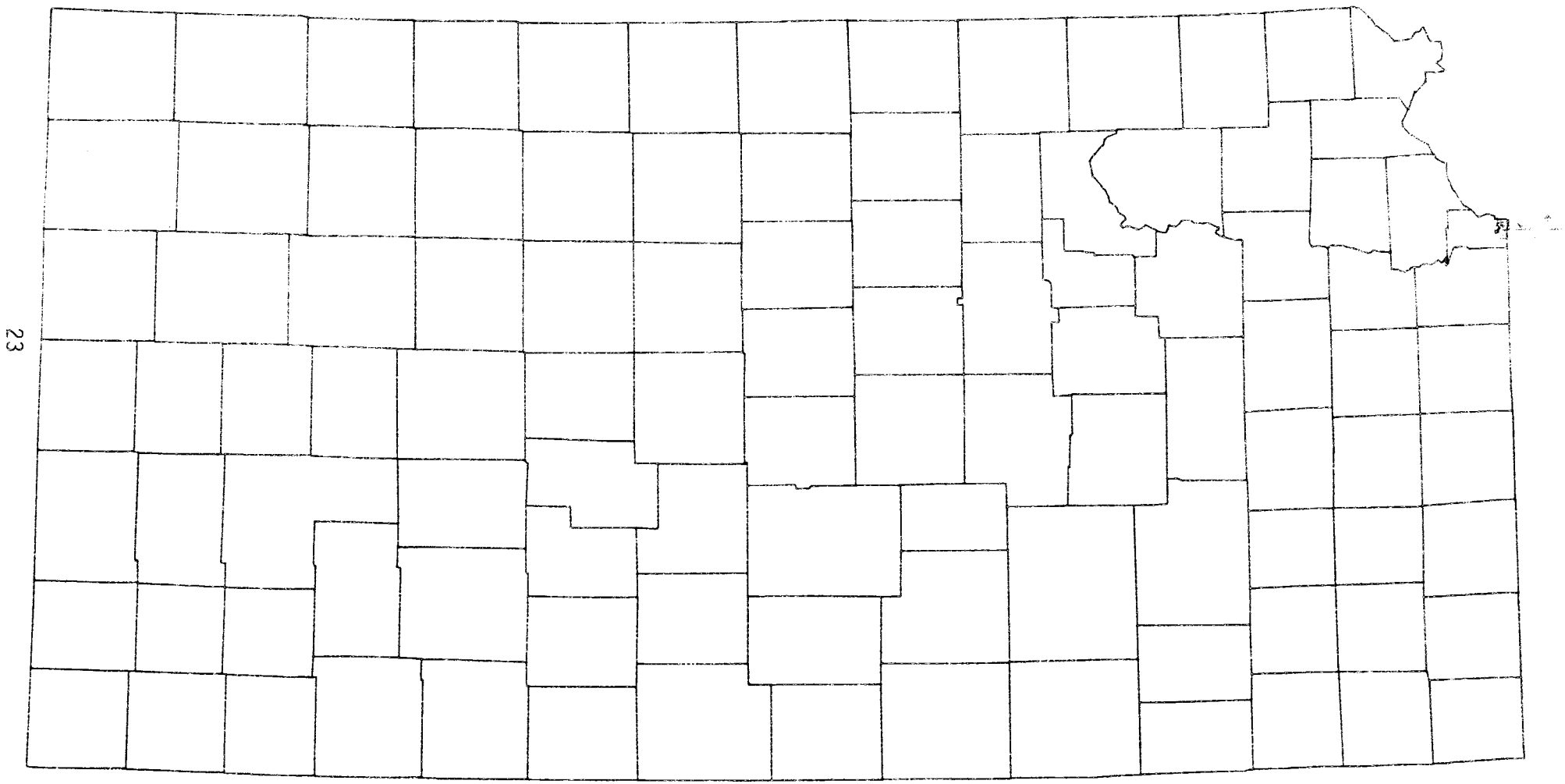
A. Ambient Data and Attainment Status Designations

Sulfur dioxide monitoring is conducted at two SLAMS locations in the Kansas City area. The entire area is designated as "Better Than National Standards" for SO_2. Since recent monitoring data show no violation of standards, that designation remains consistent with the data. The site on Fairfax Road shows an increasing trend in 90th percentile concentrations over the period 1979 through 1983. However, since the second maximum 24-hour concentrations do not exceed half of the NAAQS, it seems unlikely that the present SO_2 standards will be exceeded in the Kansas City area in the near future.

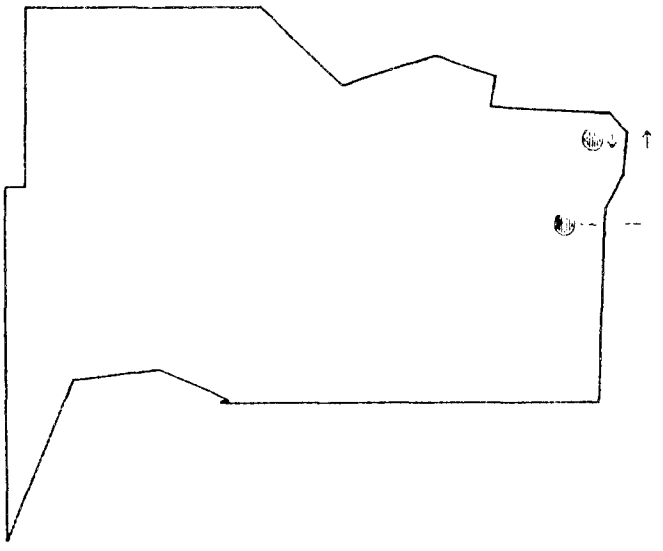
B. Emissions Data and Monitor Locations

Sulfur dioxide point sources for the Kansas City area are shown. (The numbers beside the point source symbols refer to the left-most column of Table A4 of Appendix A.) Those sources show two points emit in the range of 100 to 1000 tons/year, three in the 1000 to 5000 tons/year, and two emit over 10,000 tons/year. Stack heights are not available in NEDS for most of the sources. The two monitors are located near the two largest sources of emissions.

Review of the emissions data for Topeka and Wichita show three sources emitting in the range of 100-1000 tons/year and two in the range of 1000-5000 tons/year.

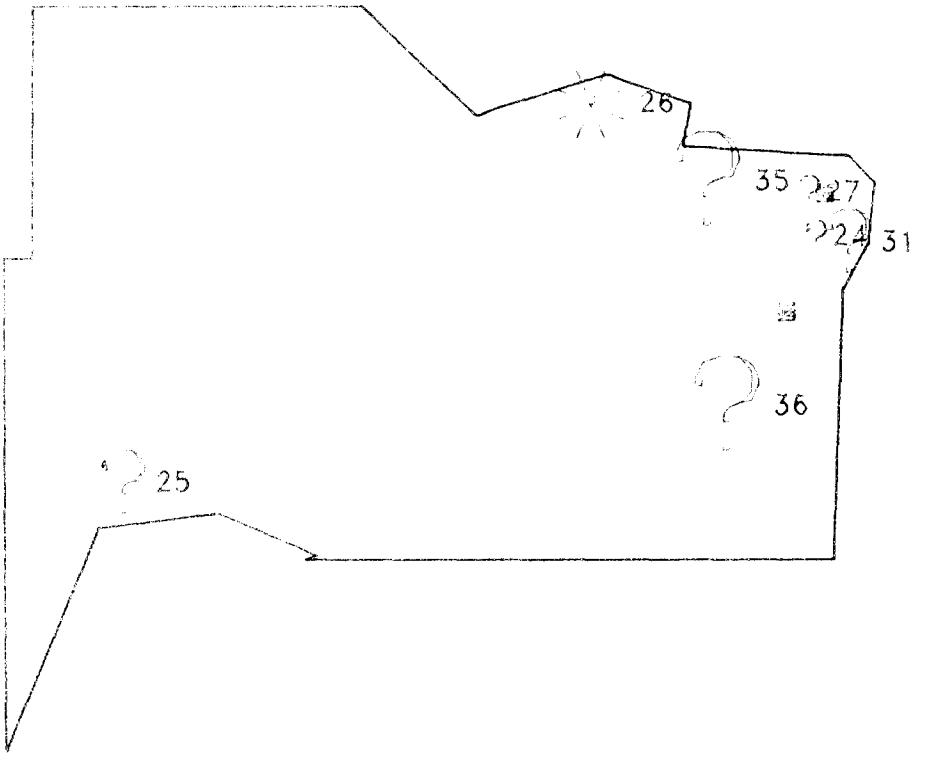


AMBIENT SO2 DATA



AMBIENT SO2 DATA – KANSAS CITY AREA

042584



SO2 EMISSIONS AND SO2 MONITORS

KANSAS CITY AREA

VI. CARBON MONOXIDE (CO)

A. Ambient Data and Attainment Status Designations

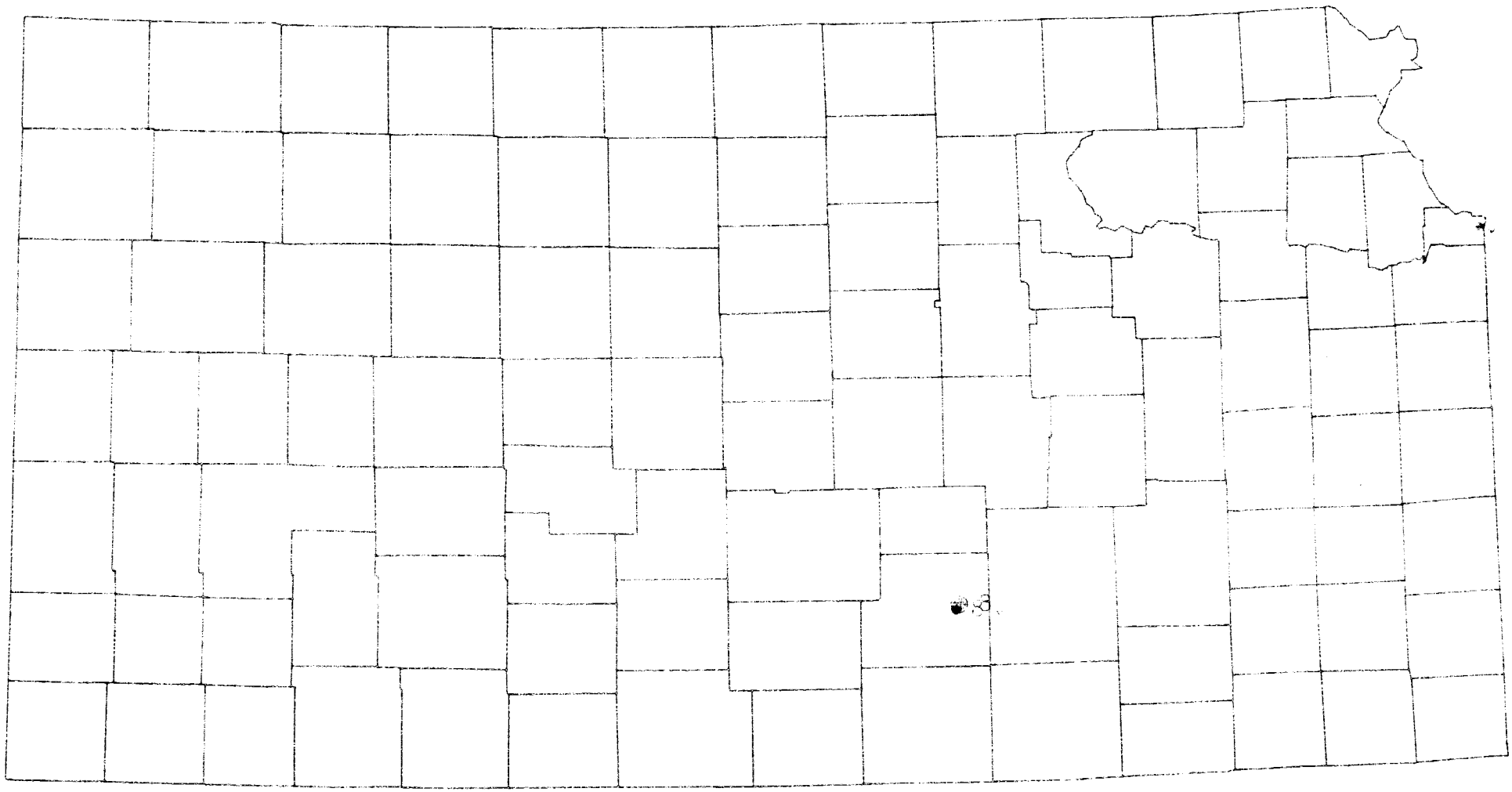
Carbon monoxide monitoring is conducted in the Kansas City and Wichita areas. The following comments refer to the detailed analyses presented on the inset maps.

Kansas City - Data show no violation of the NAAQS's during 1982 or 1983. Furthermore, those data meet the NADB summary criteria for completeness. The entire area is designated as "Better Than National Standards".

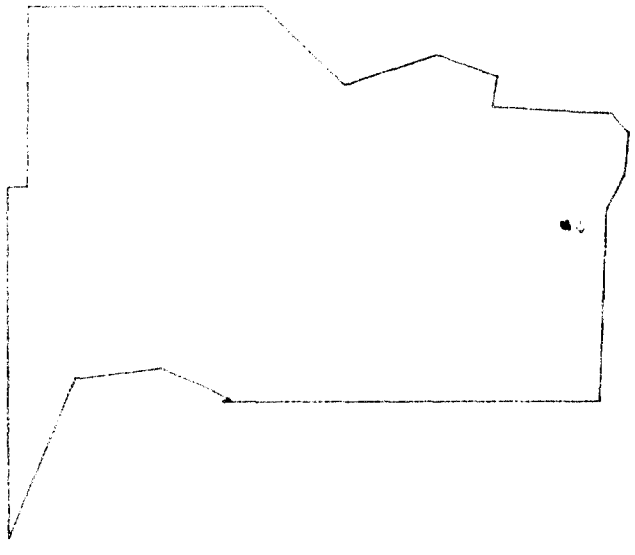
Wichita - Part of Wichita, including the downtown area, is designated as non-attainment for CO. Monitoring data are available in SAROAD from two SLAMS monitors in the non-attainment area. In addition, a special purpose monitor (SPM) was established in July of 1982 to determine whether or not maximum CO concentrations were being measured by the SLAMS monitors. Data from the SPM are not available in SAROAD. The 1982 data show a few exceedances, but 1983 data show no exceedances of the standard. Data from a peak concentration CO monitoring site should be included in SAROAD for purposes of determining attainment status.

B. Emissions Data and Monitor Locations

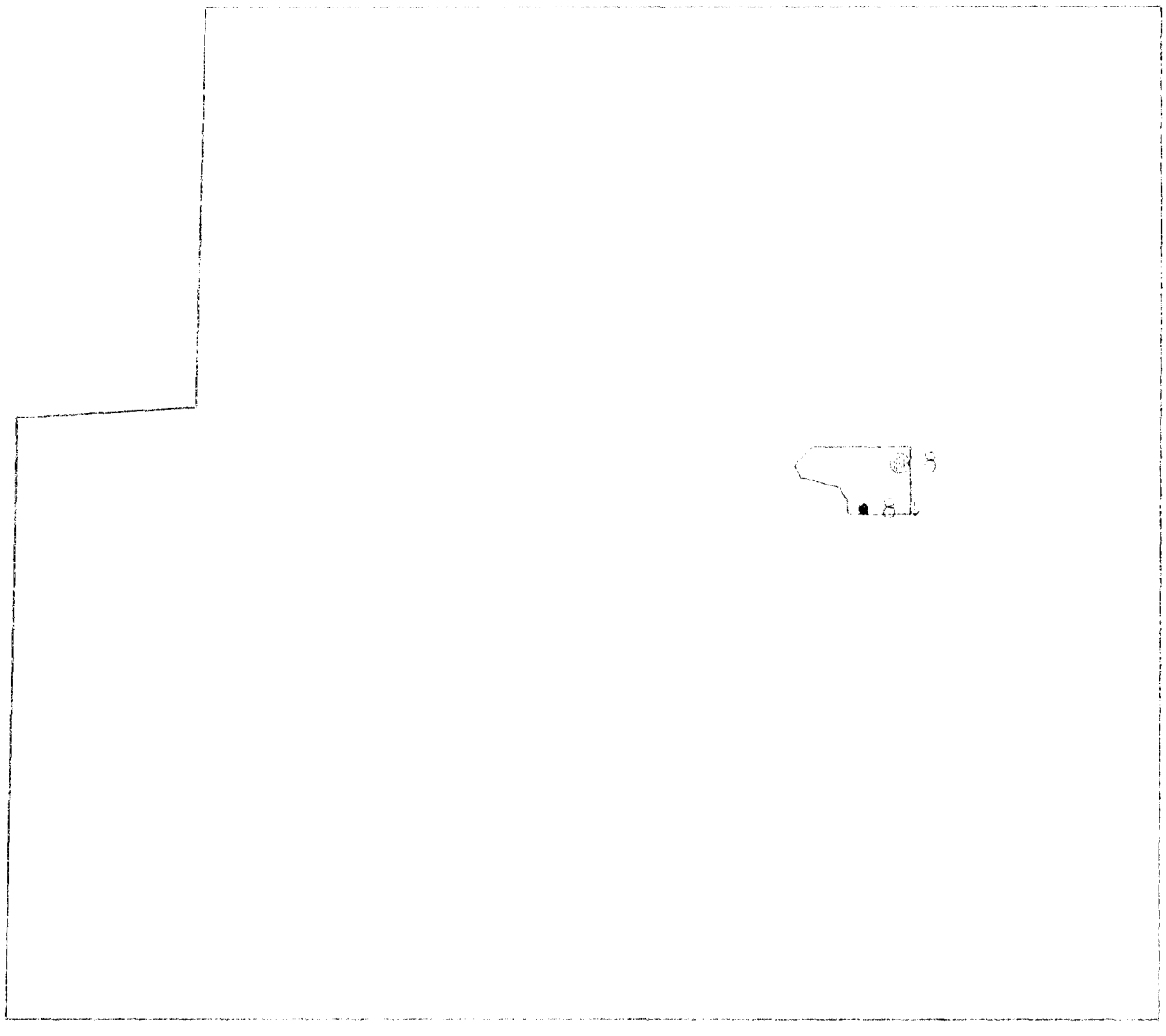
The emissions maps for Kansas City and Wichita show all point sources emit less than 1000 tons/year. As would be expected for CO, area sources are much more significant than point sources in the largest cities. The current CO monitoring network includes monitors in Kansas City and Wichita, and addresses the highest priority CO monitoring needs.



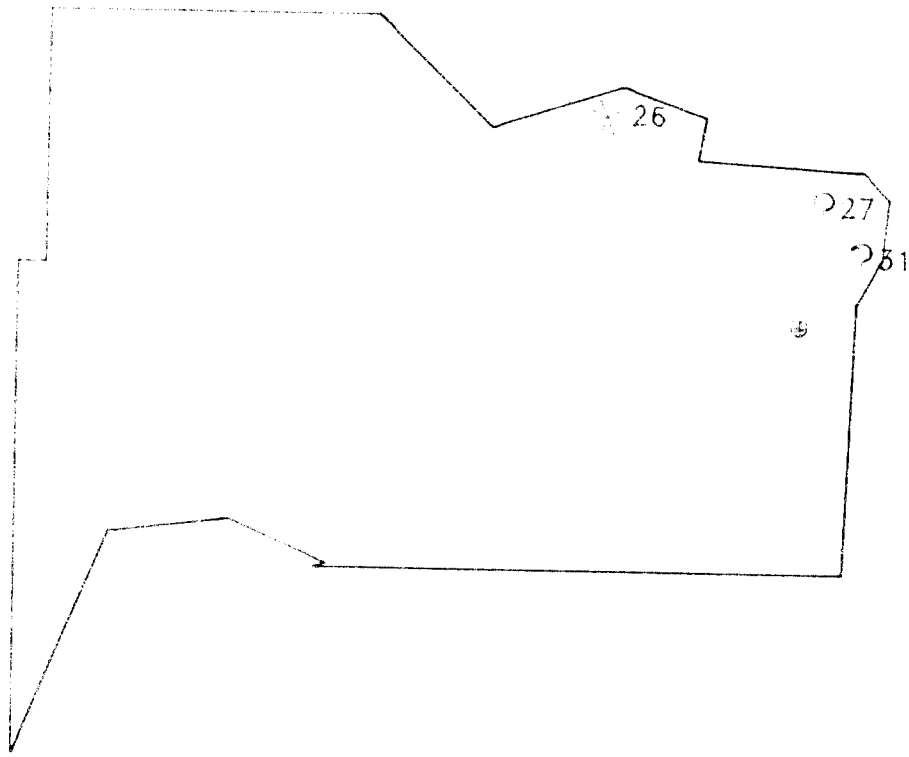
AMBIENT CO DATA



AMBIENT CO DATA – KANSAS CITY AREA

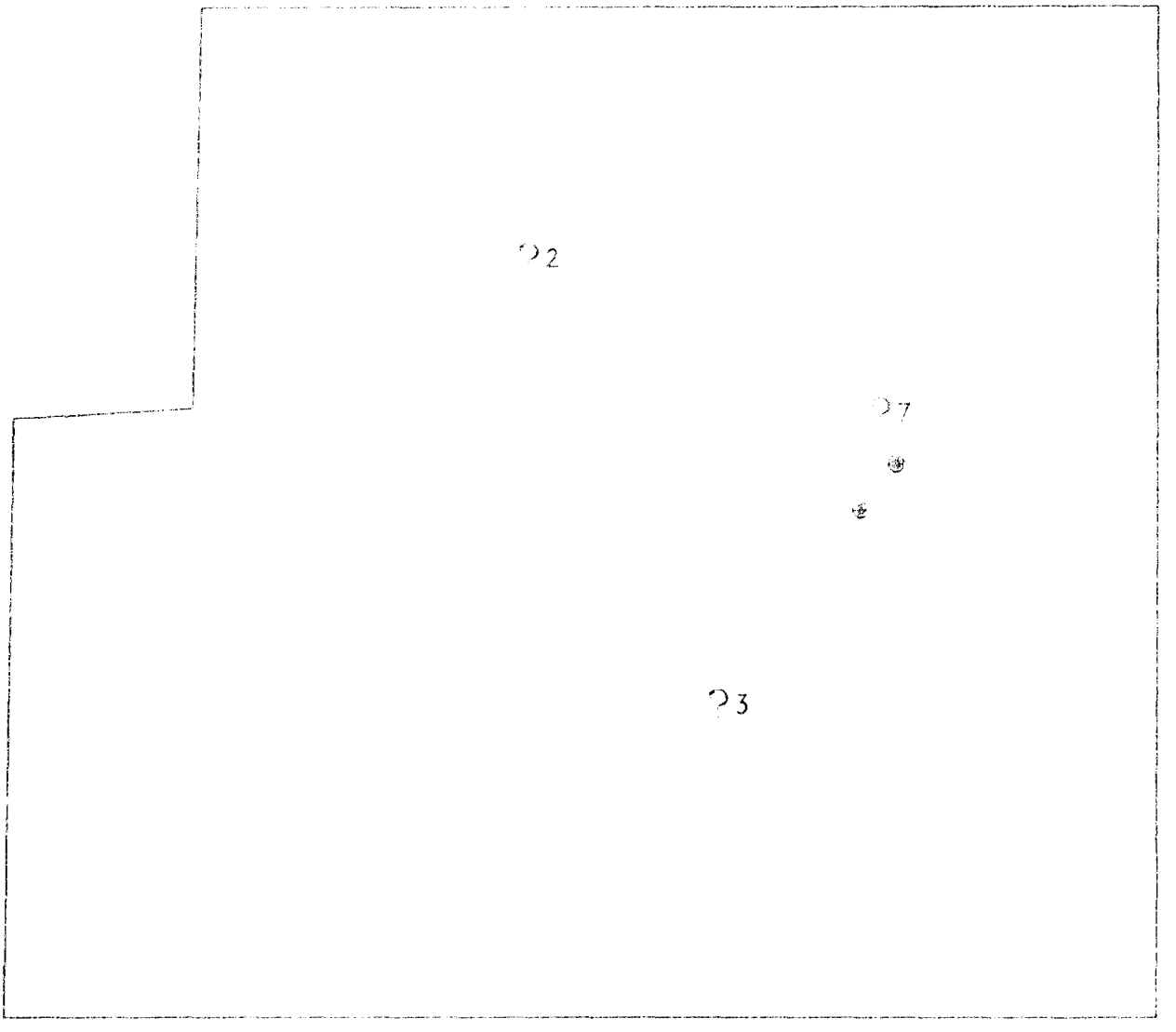


AMBIENT CO DATA -- WICHITA AREA



CO EMISSIONS AND CO MONITORS

KANSAS CITY AREA



CO EMISSIONS AND CO MONITORS -- WICHITA AREA

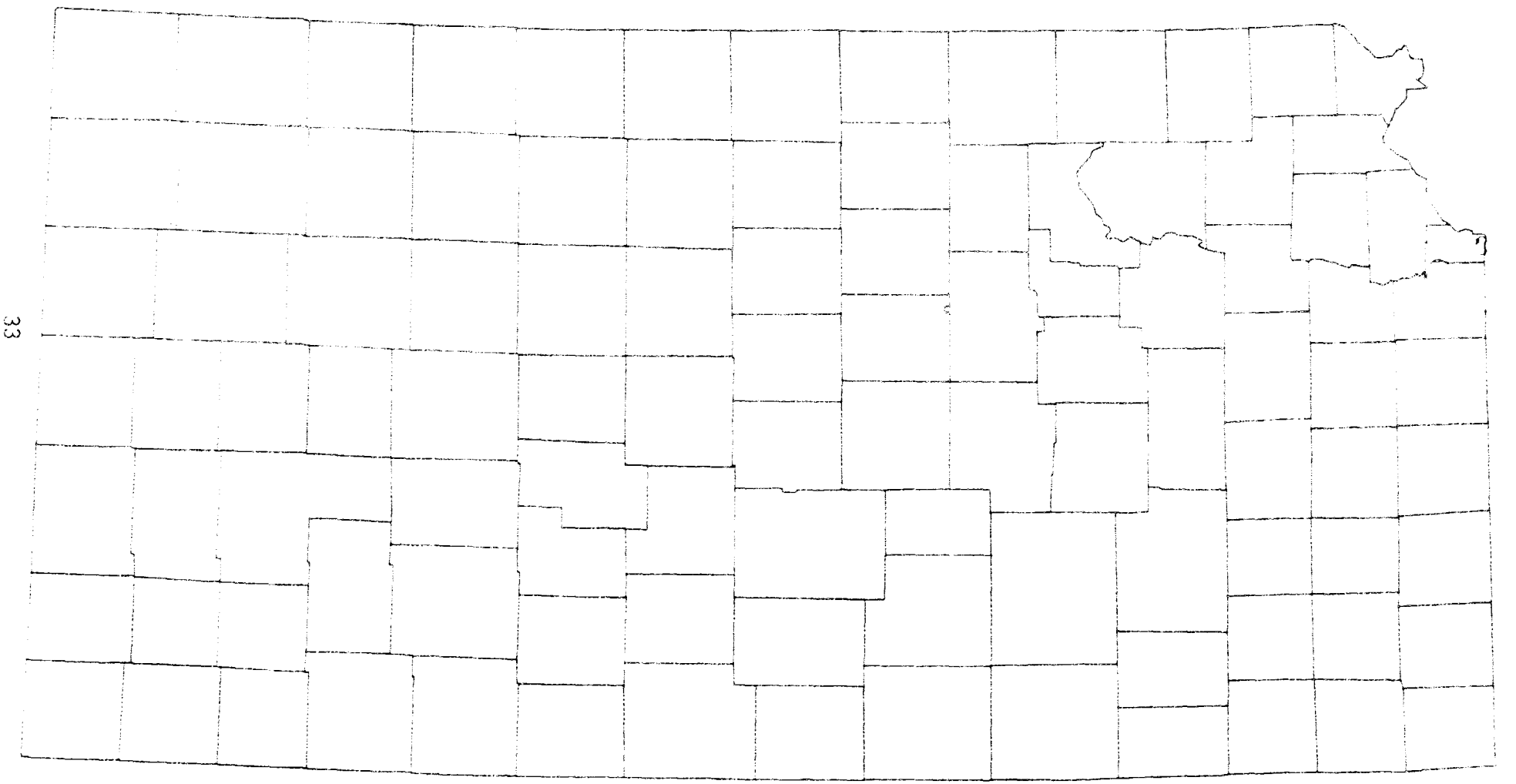
VII. NITROGEN DIOXIDE (NO_2)

A. Ambient Data and Attainment Status Designations

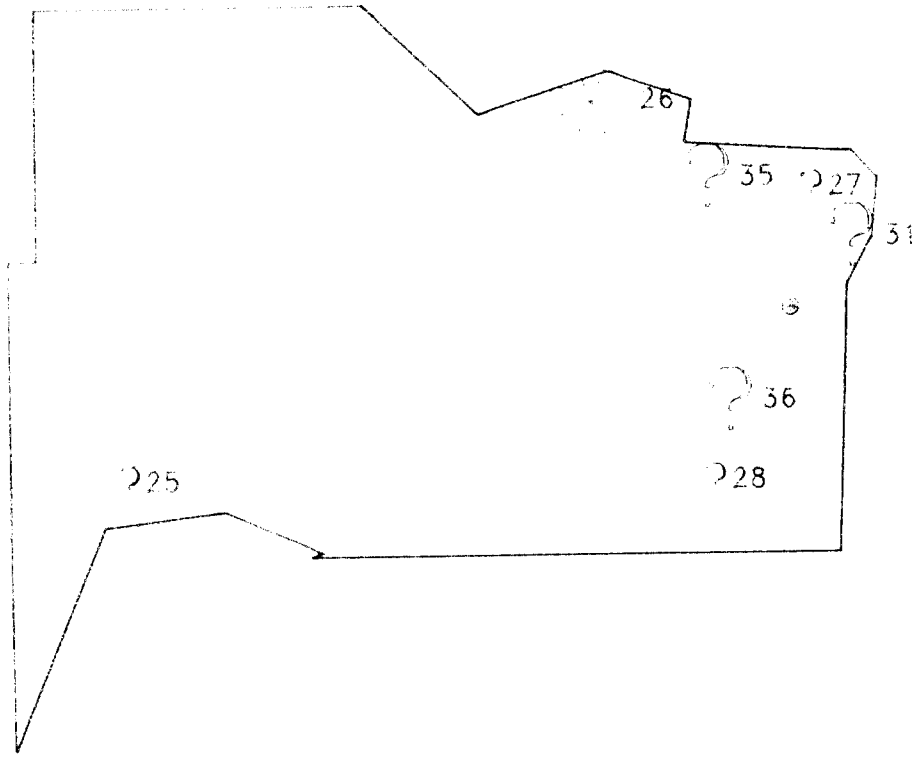
Monitoring for NO_2 is conducted in the Kansas City area only at 619 Ann Street. Monitoring was resumed in April, 1982, after being discontinued in 1979. Data from the last three quarters of 1982 show an average of about one-third of the standard. No data was reported for the last quarter of 1983 due to the monitor not running properly. The entire area is designated as "Better Than National Standards" for NO_2, which is consistent with the most recent data.

B. Emissions Data and Monitor Locations

Review of Table A4 of the Appendix for the three largest cities (Kansas City, Topeka and Wichita) show that the largest emissions came from power plants with 45% of the NOX emissions occurring in the Kansas City area. Stack heights for most sources are not available in NEDS. The current NO_2 monitoring network appears adequate to address the NO_2 monitoring needs.



AMBIENT NO2 DATA



NOX EMISSIONS AND NO2 MONITORS

KANSAS CITY AREA

VIII. OZONE (O_3)

A. Ambient Data and Attainment Status Designations

Three counties in Kansas (Wyandotte and Johnson Counties in the Kansas City area, and Douglas County surrounding Lawrence) are designated as non-attainment areas for ozone. SLAMS monitors are operated in the Kansas City and Wichita areas. A special purpose monitor has been established in Lawrence to resolve the question of whether or not that non-attainment designation should be changed.

Ozone is formed by a complex photochemical reaction among non-methane hydrocarbons, oxides of nitrogen and oxygen in the atmosphere. The reaction time is measured in hours, and during that time the wind usually carries the pollutants tens of miles from the locations where the precursors were emitted. Therefore, ozone concentrations measured at a point some 25-50 miles downwind of a city may indicate a need for emission reductions throughout the city. Consequently, the following ozone evaluations focus on entire metropolitan areas, rather than on limited areas around specific monitors. Furthermore, the inset map for Kansas City includes both Kansas and Missouri counties, in order to show that broader perspective.

Kansas City - The inset map shows limited monitoring data on the Kansas side. The monitor in Wyandotte County was established early in 1982, and reported over 98% complete data for 1982 and 1983. During 1983, one exceedance of the standard was observed. (That was not a violation of the standard, since one exceedance per year is allowed.)

Data on the Missouri side show one exceedance each at two sites in 1981, no exceedance at any site in 1982, and three exceedances at one site in 1983. Atypical meteorological conditions have been suggested as the predominant cause of the exceedances in 1983. The non-attainment designation remains consistent with the data.

Lawrence - Since the SPMS data have not been reported to SAROAD, this report makes no recommendations regarding changes in the non-attainment designation. The data would be included with any redesignation request submitted by the State, and will be reviewed when such a request is received.

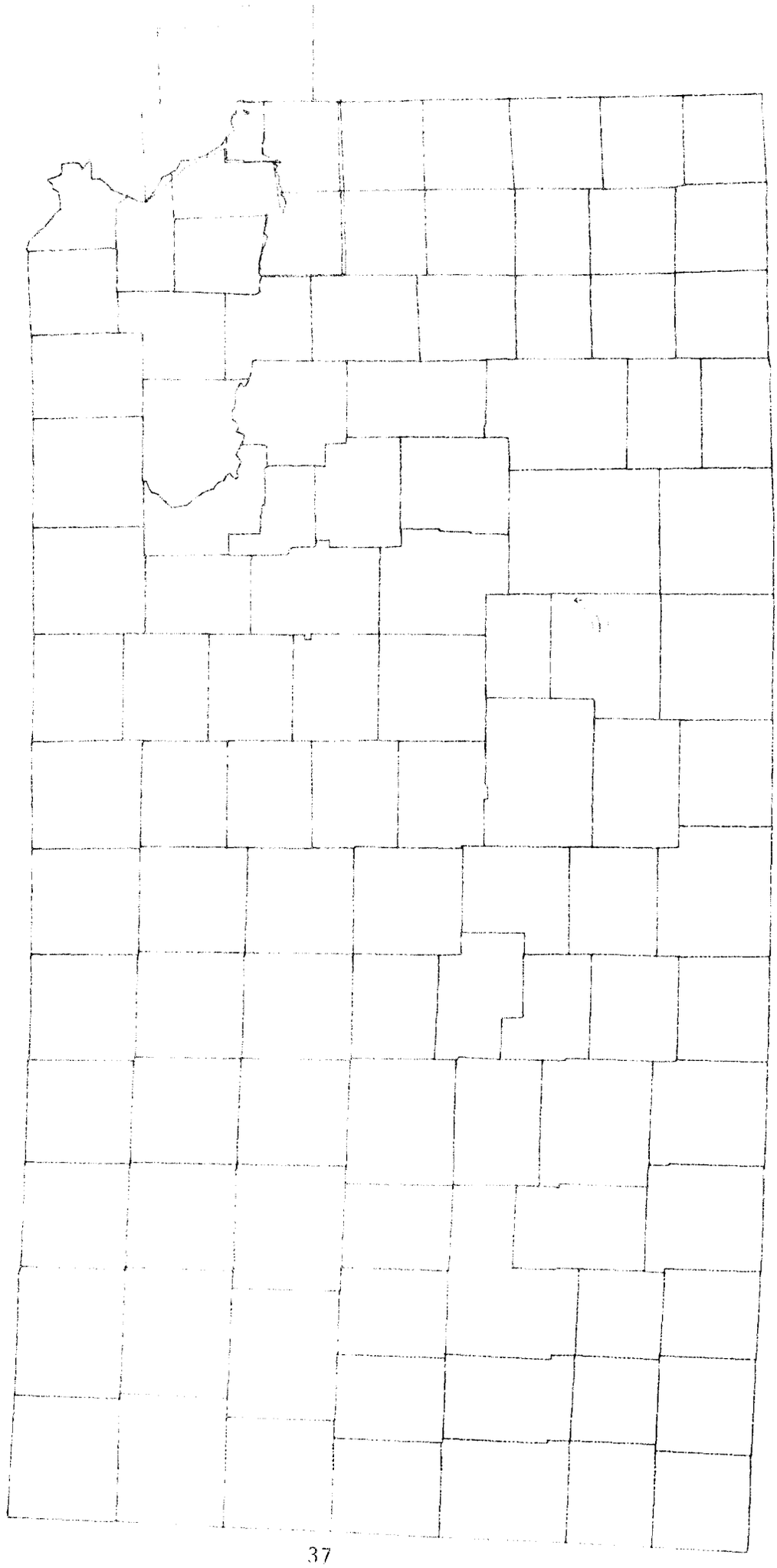
Wichita - Data from both monitoring sites in the Wichita area show no violation of the ozone standard, but increasing trends in concentrations. Continued monitoring is suggested to validate the trends findings.

B. Emissions Data and Monitor Locations

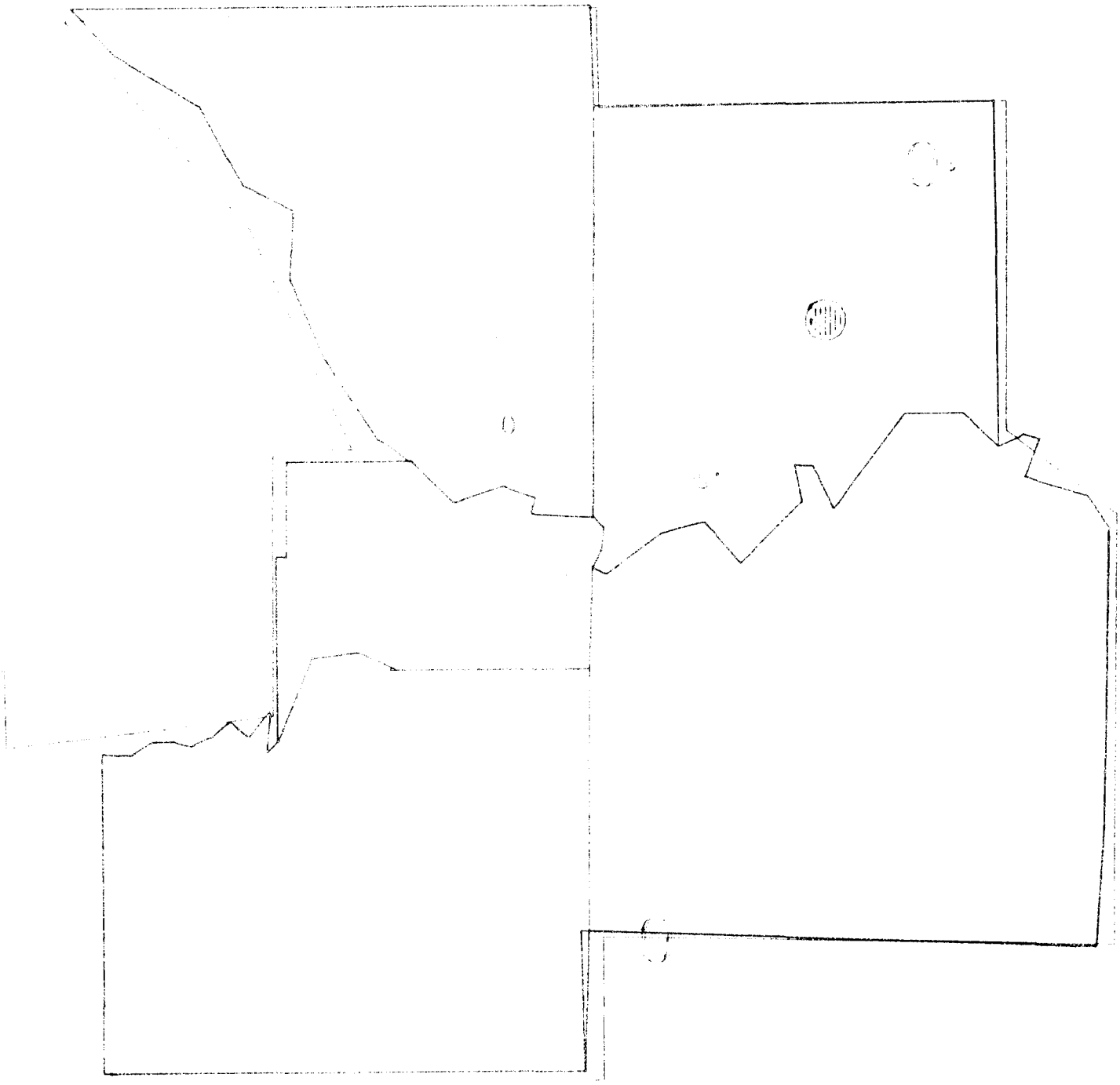
Ozone is formed in the atmosphere by a complex photochemical reaction involving hydrocarbons, oxides of nitrogen, oxygen and sunlight. The reaction may take several hours, resulting in maximum concentrations well downwind of the locations where the precursors were emitted.

Review of Table A4 of the Appendix for the three largest cities (Kansas City, Topeka and Wichita) show that 66% of the VOC emissions occur in the Kansas City area. Stack heights for most sources are not available in NEDS. Due to the locations of the sources (Kansas City area) and the State border, a downwind site operated by the State is not possible.

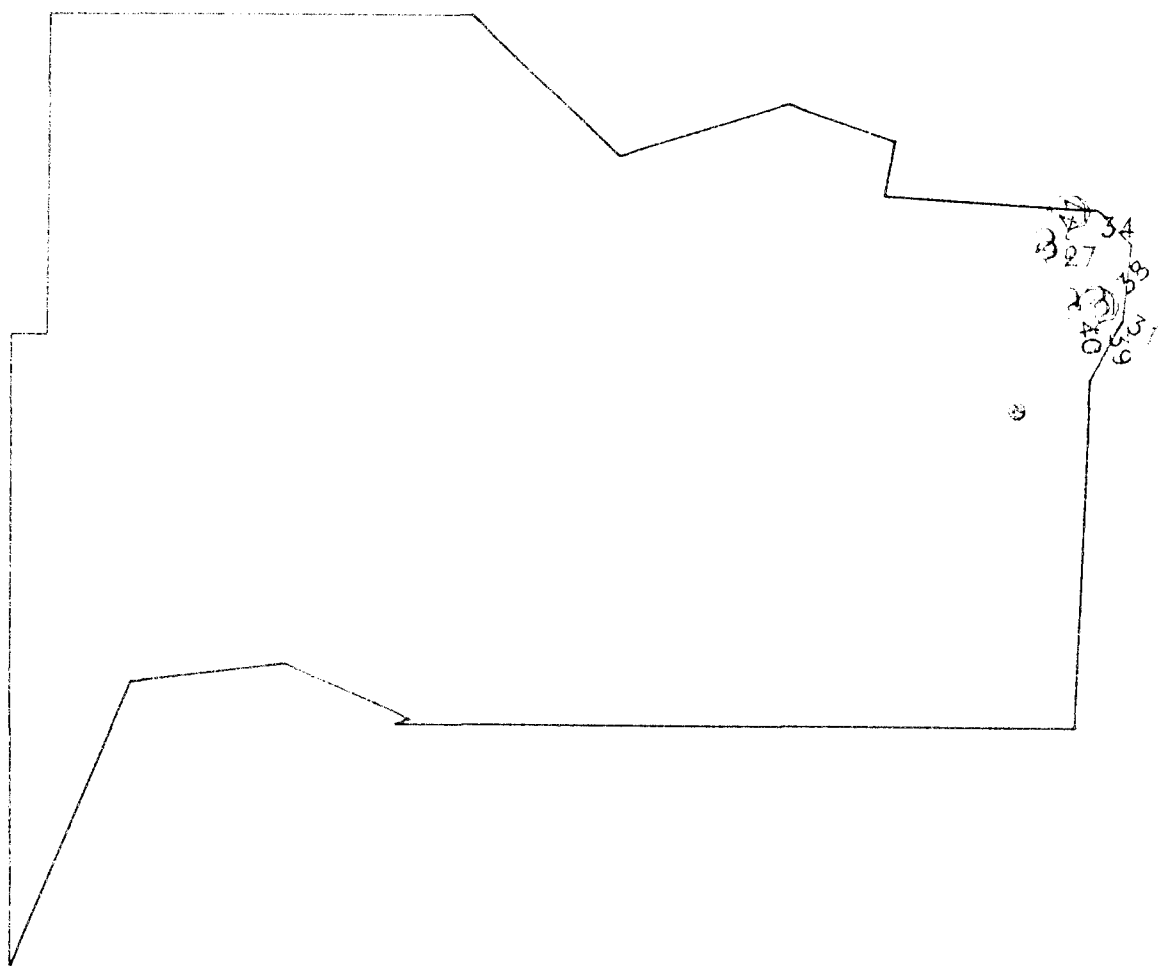
Close coordination between the State of Kansas and the State of Missouri is encouraged to continue the decrease in emissions of the precursors.



ABSENT OR DATA



AMBIENT O3 DATA -- KANSAS CITY AREA

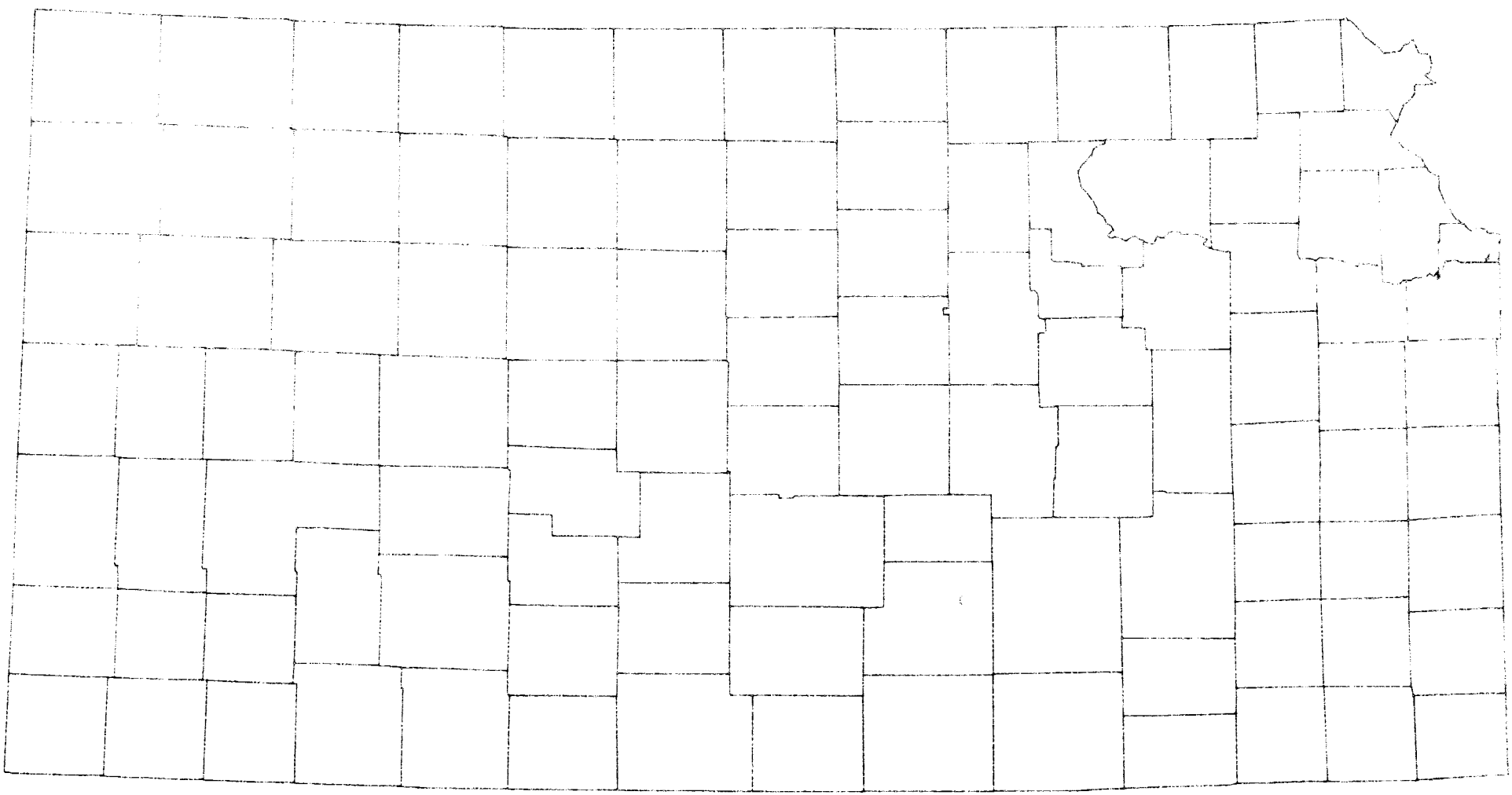


HYDROCARBON EMISSIONS AND O3 MONITORS

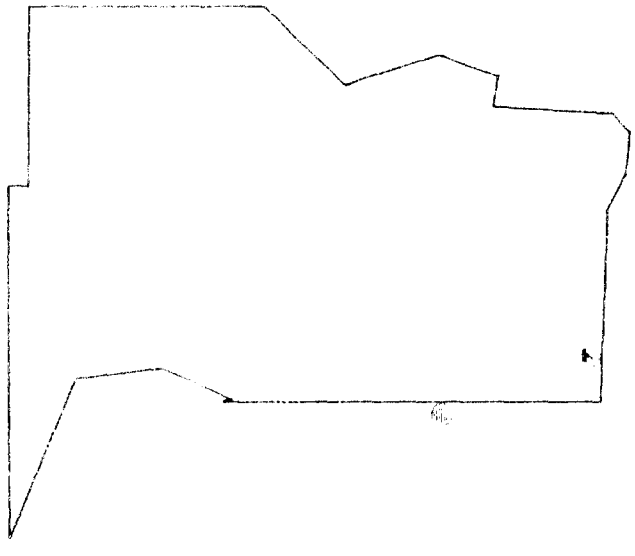
KANSAS CITY AREA

IX. LEAD (Pb)

The State established two SLAMS lead monitoring sites (including one NAMS site) by March 1, 1982, well ahead of the deadlines of July 1, 1982 for NAMS and January 1, 1983 for SLAMS. In addition, data were reported to SAROAD in 1982 for lead analyses performed by EPA Headquarters on TSP Hi-vol filters from one site in Wichita. None of the data showed any violation of the lead standard.



AMBIENT PB DATA



AMBIENT PB DATA -- KANSAS CITY AREA

X. PRECISION AND ACCURACY

For continuous monitors (CO, SO_2, NO_2, and O_3), the regulations of 40 CFR Part 58, Appendix A require precision checks in order to assess precision for each pollutant, and audits in order to assess accuracy.

Precision checks are performed by introducing a gas of known concentration into the analyzer, and comparing the concentration reading from the monitor with the known concentration of the gas. These checks are required every two weeks, and involve one gas concentration. Audits likewise involve comparison of known gas concentrations with the analyzer readings. Audits are more extensive than precision checks, requiring at least three different concentrations of gases. Audit of each analyzer is required annually, and audit of at least 25% of the SLAMS analyzers for each pollutant is required each quarter.

For manual methods (TSP, Pb, SO_2 bubblers and NO_2 bubblers), the regulations require duplicate (collocated) sampling to assess precision and audits to assess accuracy. Each collocated sampler is operated at the same time and in the same manner as the SLAMS monitor at the same site. The percent difference between the two sample concentrations forms the basis for precision estimates. For lead, analysis of duplicate portions of a single Hi-vol filter may be substituted for collocated sampling.

Audits for manual methods differ by method. For TSP, the audits are performed by comparing the flow rate indicated by the Hi-vol sampler to the true flow rate determined from a flow standard. The audit frequency required for Hi-vol samplers is the same as that required for continuous monitors.

Audit procedures for SO_2 bubblers, NO_2 bubblers and Pb, require that the analytical measurement process be audited. Details of those procedures are found in 40 CFR Part 58, Appendix A.

Use of specific equations is required for the calculation of precision and accuracy. Each organization which reports data is required to calculate and report precision and accuracy estimates for all NAMS data collected after January 1, 1981, and for all SLAMS data collected after January 1, 1983.

Table A2 of Appendix A summarizes the precision and accuracy estimates reported by the State during 1982 and 1983. The numbers under the heading "YR-Q" near the left of each printout specify the year and calendar quarter to which the precision and accuracy data apply. (For example, 82-2 refers to the second quarter of 1982.) Composite data for the entire year are identified as quarter number 5. (For example, 82-5 gives the estimates for the full calendar year 1982).

The accuracy estimates are arranged by concentration levels L1 (low concentration) through L4 (high concentration). Specific ranges for the concentration levels are required by 40 CFR 58, Appendix A, as follows:

	NO_2, O_3, SO_2 (ppm)	CO (ppm)	TSP (cfm)	Pb (ug/strip)
L1	.03 to .08	3 to 8	---	100-300
L2	.15 to .20	15 to 20	40-60	600-1000
L3	.35 to .45	35 to 45	---	---
L4	.80 to .90	80 to 90	---	---

The precision and accuracy estimates are expressed as 95% probability limits, as required by the same regulations. The meaning of those limits is illustrated by the following three examples taken from Table A2.

a. The precision data for CO show composite limits of -07 and +04 for calendar year 1983 (line 83-5), based on a total of 64 precision checks. Therefore, 95% of the precision checks would be expected to fall between 7% below and 4% above the known concentration of the test gas used for the precision checks.

b. The accuracy data for SO_2 show limits of -20 and +01 for the audits performed at concentration level 2 (column L2) during the fourth quarter of 1982 (line 82-4). Therefore, 95% of the audits performed at that time at that concentration level would be expected to fall between 20% below and 1% above the known concentration of the audit gas.

c. The precision data for TSP show probability limits of -20 and +09 for the first quarter of 1982 (line 82-1), based on 23 valid collocated data pairs. Therefore, 95% of the concentrations measured by the collocated sampler would be expected to fall between 20% lower and 9% higher than the corresponding concentrations measured at the same time by the SLAMS monitor at the same site.

The following observations are drawn from Table A2.

TSP — The precision and accuracy data reflect conscientious performance of the required collocated sampling and monitor audits.

SO_2 — The number of audits have doubled since 1982 showing a conscientious performance of the required monitor audits.

CO — The total number of audits is more than the minimum number required by 40 CFR 58 Appendix A, an encouraging trend.

NO_2	Precision and accuracy estimates are required for SLAMS monitors beginning on January 1, 1983. Precision checks were performed, however, no audits were. We encourage the State to ensure that at least the required minimum number of NO_2 audits are performed.
O_3	The precision and accuracy data reflect conscientious performance of the required monitor audits.
Pb	The precision and accuracy data reflect conscientious performance of the required collocated sampling and monitor audits.

The overall conclusion which emerges from the precision and accuracy summaries is that the State has conscientiously performed the data assessment and reporting activities required by 40 CFR 58, Appendix A. We commend the State personnel, and encourage them to continue those efforts to provide timely assessments of precision and accuracy.

XI. TRENDS

The results of trend analyses were presented graphically in the preceding sections for each monitor whose data met the required completeness criteria (described in Section III.C). The following table gives a summary of the trend evaluations, with the last column designed to highlight areas of concern.

Pollutant	Total Monitors	Monitors with Sufficient Data for Trend Analysis	Monitors with Decreasing or Probable Decreasing Trend	Monitors with Increasing or Probable Increasing Trend	Monitors with Violations and Increasing or Probable Increasing Trend
TSP	20	18	9	2	0
SO_2	2	2	1 (A mean)	1 (90%-A)	0
CO	3	2	2	0	0
NO_2	1	0	0	0	0
O_3	3	1	0	1	0
Pb	3	1	1	0	0

The SO_2 site in Fairfax showed an increasing trend in the 90th percentile and a decreasing trend in the monthly arithmetic mean.

In last years report (EPA 907/9-83-004), the CO site at 1900 East Ninth Street in Wichita showed violations of the 8-hour primary standard and an increasing trend in the 90th percentile. This site showed no exceedances in 1983 and, due to a problem in the trends software, we were unable to run trends at this site this year.

In summary, the trend analyses show more sites with improving trends than with worsening trends.

XII. POPULATION EXPOSURE

Population exposure to elevated pollutant concentrations is difficult to measure accurately. (People spend varying amounts of time in different parts of a city which may have localized areas with high pollutant concentrations. Population estimates within such localized areas are difficult to compute manually because that calculation requires locating and summing the populations of numerous small, detailed geographical areas.) Previous attempts to estimate population exposure have focused on populations of entire counties or metropolitan areas, even though the designated non-attainment areas were only portions of those counties or cities. While such approximations are understandable, given the difficulty of obtaining and using population data with more detailed spatial resolution, they may greatly overestimate the populations exposed to elevated pollutant concentrations. A better approximation of exposed population would be a determination of just that segment of the population living within the designated non-attainment areas. (For O_3, while that number may over-estimate the population actually exposed to high ozone concentrations, it should closely approximate the population affected by pollution control measures.) At our request, Systems Applications, Inc. (SAI) has developed software to estimate the population within any given closed polygon, using the detailed census Block Group/Enumeration District data in their computer data base. The non-attainment areas shown on the maps in Sections IV through VIII of this report were sent to SAI for computation of the enclosed populations. Table 5 summarizes the results of those calculations. The population density maps from which the table was prepared are shown in Appendix C. That Appendix also describes the calculation procedure more fully.

It should be noted that redesignations were recommended which would reduce the size of some non-attainment areas. The populations in the table show that significant numbers of people have benefitted from the recent reductions in pollutant concentrations.

TABLE 5

POPULATIONS WITHIN DESIGNATED NON-ATTAINMENT AREAS

TSP	Primary	Secondary
Kansas City	90,000	117,000 (includes PNA)
Topeka	-	7,000
CO	Primary and Secondary	
Wichita	22,000	
O_3	Primary and Secondary	
Kansas City	434,000	
Lawrence	67,000	

XIII. SUMMARY AND RECOMMENDATIONS

A. Attainment Status Designations

The evaluations of ambient air quality based on recent monitoring data found the attainment status designations to be generally consistent with recent data. Recommendations were made in this report for attainment status changes for TSP. The TSP recommendations, which were summarized in Table 4, would redesignate the remaining secondary non-attainment area in Topeka to attainment, and would significantly reduce the size of the primary and secondary non-attainment areas in Kansas City.

B. Air Quality Concern Areas

One area of the State exceeded the primary (health-related) NAAQS's for the period of this study.

- CO data collected at two sites in Wichita show a few exceedances of the 8-hour primary standard in 1982, but not in 1983.

We encourage the State personnel to continue their efforts to reduce the CO concentrations in Wichita.

In recent years, there have been reductions in both the number and the size of areas which exceed the primary standards. Those reductions are encouraging indications of progress made by the State and local agencies.

C. Monitor Operation

The monitors were operated in such a way that the data from those monitors generally meet or exceed the minimum completeness criteria used by the National Aerometric Data Bank. The precision and accuracy data generally indicate a conscientious effort toward meeting the data assessment and reporting requirements of 40 CFR 58, Appendix A. The overall picture of monitor operation shows commendable performance by State and local agency personnel.

APPENDIX A

Tabular Summaries of Data

Table	Description
A1	Ambient Air Monitoring Data
A2	Precision and Accuracy Estimates for Ambient Air Monitoring Data
A3	Attainment Status Designations
A4	Emissions Data

ABBREVIATIONS AND SYMBOLS USED IN TABLE A1

SITE ID	Site identification number
YR	Year
REP ORG	Reporting organization
# OBS	Number of observations
MAX 24-HR 1ST	Highest value recorded in a 24-hour period
MAX 24-HR 2ND	Second highest value recorded in a 24-hour period
OBS >260	Number of observations greater than 260
OBS >150	Number of observations greater than 150
ARIT MEAN	Arithmetic mean
GEO MEAN	Geometric mean
GSD	Geometric standard deviation
METH	Method
QTRLY ARITH MEAN 1ST	First quarter arithmetic mean
QTRLY ARITH MEAN 2ND	Second quarter arithmetic mean
QTRLY ARITH MEAN 3RD	Third quarter arithmetic mean
QTRLY ARITH MEAN 4TH	Fourth quarter arithmetic mean
MEANS >1.5	Number of quarterly means greater than 1.5
MAX VALUES 1ST	Highest value recorded for the year
MAX VALUES 2ND	Second highest value recorded for the year
MAX 1-HR 1ST	Highest value recorded in a one-hour period
MAX 1-HR 2ND	Second highest value recorded in a one-hour period
OBS >40	Number of observations greater than 40
MAX 8-HR 1ST	Highest value recorded in an eight-hour period
MAX 8-HR 2ND	Second highest value recorded in an eight-hour period
OBS >10	Number of observations greater than 10
OBS >365	Number of observations greater than 365
MAX 3-HR 1ST	Highest value recorded in a three-hour period
MAX 3-HR 2ND	Second highest value recorded in a three-hour period
OBS >1300	Number of observations greater than 1300
DAILY MAX 1-HR 1ST	Maximum hourly ozone value for a day
DAILY MAX 1-HR 2ND	Second maximum hourly ozone value for a day
DAILY MAX 1-HR 3RD	Third maximum hourly ozone value for a day

ABBREVIATIONS AND SYMBOLS USED IN TABLE A1 (Continued)

VALS >.125 MEAS	Number of measured values greater than .125
VALS >.125 EST	Number of expected violations
NBR VALID DAILY MAX	Number of valid daily maximum values
MISS DAYS ASS < STD	Number of missing days assumed to be less than the standard
?	The mean does not satisfy summary criteria

QUICK LOOK REPORT

SUSPENDED PARTICULATE MATTER (UG/M3) KANSAS 82-83

METHOD: GRAVIMETRIC, 24-HOUR HI-VOLUME FILTER SAMPLE-91

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	#OBS	MAX 24-HR 1ST	MAX 24-HR 2ND	OBS> 260	OBS> 150	ARIT MEAN	GEO MEAN	GSD
170680001F01	CONCORDIA	CLOUD CO	135 EAST 6TH ,CI	82	001	55	214	126		1	78	70	1.6
170680001F01	CONCORDIA	CLOUD CO	135 EAST 6TH ,CI	83	001	46	285	213	1	4	93	79	1.8
170800001F01	DODGE CITY	FORD CO	PUMP STA.,2100 1	82	001	29	286	150	1	1	62?	49?	1.9
170800001F01	DODGE CITY	FORD CO	PUMP STA.,2100 1	83	001	43	114	107			45	37	2.0
171240001F01	GOODLAND	SHERMAN CO	CITY FIRE STA 10	82	001	56	231	231		6	90	75	1.8
171240001F01	GOODLAND	SHERMAN CO	CITY FIRE STA 10	83	001	42	164	163		4	64	48	2.4
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	82	001	53	177	140		1	65	59	1.5
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	83	001	54	156	152		2	68	61	1.6
171800007F01	KANSAS CITY	WYANDOTTE CO	1312 S 55TH ST	82	001	58	118	116			53	48	1.5
171800007F01	KANSAS CITY	WYANDOTTE CO	1312 S 55TH ST	83	001	55	157	137		1	57	51	1.7
171800011F02	KANSAS CITY	WYANDOTTE CO	3105 FAIRFAX RD	82	001	53	153	151		2	68	61	1.6
171800011F02	KANSAS CITY	WYANDOTTE CO	3105 FAIRFAX RD	83	001	40	204	144		1	78	66	1.9
171800014F01	KANSAS CITY	WYANDOTTE CO	36TH & RAINBOW B	82	001	61	131	121			58	54	1.5
171800014F01	KANSAS CITY	WYANDOTTE CO	36TH & RAINBOW B	83	001	56	117	117			56	50	1.6
171800015F02	KANSAS CITY	WYANDOTTE CO	420 KANSAS AVE.	82	001	61	183	147		1	77	71	1.5
171800015F02	KANSAS CITY	WYANDOTTE CO	420 KANSAS AVE.	83	001	56	236	193		4	80	70	1.7
171800018F01	KANSAS CITY	WYANDOTTE CO	5429 LEAVENWORT	82	001	54	110	87			50	47	1.5
171800018F01	KANSAS CITY	WYANDOTTE CO	5429 LEAVENWORT	83	001	54	118	106			50	45	1.6
172340001F01	MERRIAM	JOHNSON CO	8715 WEST 49TH,S	82	001	41	120	110			50?	45?	1.6
172340001F01	MERRIAM	JOHNSON CO	8715 WEST 49TH,S	83	001	48	195	195		6	75	63	1.8
173320004F01	SEDGWICK CO	SEDGWICK CO	CO.FIRE STA#3,40	82	001	61	167	140		1	75	69	1.5
173320004F01	SEDGWICK CO	SEDGWICK CO	CO.FIRE STA#3,40	83	001	58	234	191		3	73	61	1.8
173380003F01	SHAWNEE CO	SHAWNEE CO	1941 NE 39TH	82	001	53	113	90			47	43	1.5
173380003F01	SHAWNEE CO	SHAWNEE CO	1941 NE 39TH	83	001	58	116	96			44	36	2.1
173560002F01	TOPEKA	SHAWNEE CO	HEALTH CENTER 16	82	001	57	142	128			66	60	1.6
173560002F01	TOPEKA	SHAWNEE CO	HEALTH CENTER 16	83	001	55	130	119			57	50	1.7
173560005F01	TOPEKA	SHAWNEE CO	37TH & BURLINGAM	82	001	61	131	120			56	51	1.5
173560005F01	TOPEKA	SHAWNEE CO	37TH & BURLINGAM	83	001	57	142	131			58	51	1.7
173560007F02	TOPEKA	SHAWNEE CO	1500 N.QUINCY	82	001	56	186	125		1	70	64	1.6
173560007F02	TOPEKA	SHAWNEE CO	1500 N.QUINCY	83	001	53	144	124			64	56	1.7
173740001F01	WICHITA	SEDGWICK CO	FIRE STA #1 402	82	001	55	173	135		1	71	66	1.5
173740001F01	WICHITA	SEDGWICK CO	FIRE STA #1 402	83	001	56	133	129			62	54	1.7
173740007F01	WICHITA	SEDGWICK CO	ST PAUL & WEST 1	82	001	58	151	139		1	69	63	1.5
173740007F01	WICHITA	SEDGWICK CO	ST PAUL & WEST 1	83	001	59	147	134			63	55	1.8
173740008F01	WICHITA	SEDGWICK CO	GEO WASH BLVD &	82	001	61	116	112			61	57	1.5
173740008F01	WICHITA	SEDGWICK CO	GEO WASH BLVD &	83	001	60	121	116			56	51	1.6
173740009F01	WICHITA	SEDGWICK CO	GLEN & WEST PAWN	82	001	30	131	118			71?	67?	1.4
173740009F01	WICHITA	SEDGWICK CO	GLEN & WEST PAWN	83	001	59	139	136			62	55	1.6
173740012F02	WICHITA	SEDGWICK CO	COLEMAN CO 3600	82	001	54	191	146		1	75	68	1.6

? INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA

QUICK LOOK REPORT

SUSPENDED PARTICULATE MATTER (UG/M3) KANSAS 82-83

METHOD: GRAVIMETRIC, 24-HOUR HI-VOLUME FILTER SAMPLE-91

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	#OBS	MAX 24-HR 1ST	MAX 24-HR 2ND	OBS> 260	OBS> 150	ARIT MEAN	GEO MEAN	GSD
173740012F02	WICHITA	SEDGWICK CO	COLEMAN CO 3600	83	001	45	129	125			60	52	1.8

? INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA

QUICK LOOK REPORT

SULFUR DIOXIDE (UG/M3) KANSAS 82-83

METHODS: HOURLY VALUES WEST-GAEKE COLORIMETRIC-11, CONDUCTIMETRIC-13, COULOMETRIC-14, FLAME PHOTOMETRIC-16, HYDROGEN PEROXIDE NAOH TITRATION-18, CATALYST FLAME PHOTOMETRIC-19, PULSED FLUORESCENT-20, SECOND DERIVATIVE SPECTROSCOPY-21, CONDUCTANCE ASARCO-22, ULTRA VIOLET STIMULATED FLUORESCENCE-23,SEQUENTIAL CONDUCTIMETRIC-33, 24-HOUR GAS BUBBLERS PARAROSANILINE-SULFAMIC ACID-91, PARAROSANILINE SULFAMIC ACID TEMPERATURE CONTROLLED-97

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	#OBS	MAX 24-HR 1ST	MAX 24-HR 2ND	OBS> 365	MAX 3-HR 1ST	MAX 3-HR 2ND	OBS> 1300	MAX 1-HR 1ST	MAX 1-HR 2ND	ARIT MEAN	MTH
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	82	001	8470	198	183		593	543		1000	1000	26	23
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	83	001	7916	114	111		340	273		430	400	29	23
171800011F02	KANSAS CITY	WYANDOTTE CO	3105 FAIRFAX RD	82	001	8083	165	131		353	333		790	500	15	16
171800011F02	KANSAS CITY	WYANDOTTE CO	3105 FAIRFAX RD	83	001	8681	52	50		207	167		250	250	12	16

QUICK LOOK REPORT

CARBON MONOXIDE (MG/M3) KANSAS 82-83

METHOD: NONDISPERSIVE INFRARED (NDIR) CONTINUOUS, HOURLY VALUES-11, FLAME IONIZATION-21

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	#OBS	MAX 1-HR 1ST	MAX 1-HR 2ND	OBS> 40	MAX 8-HR 1ST	MAX 8-HR 2ND	OBS> 10	METH
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	82	001	7897	11.0	11.0		6.9	6.5		11
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	83	001	8520	12.0	11.0		5.8	5.1		11
173740003F01	WICHITA	SEDGWICK CO	FIRE STA TOPEKA	82	001	8640	22.0	19.0		13.5	11.4	2	11
173740003F01	WICHITA	SEDGWICK CO	FIRE STA TOPEKA	83	001	8138	13.0	13.0		9.0	6.0		11
173740010F01	WICHITA	SEDGWICK CO	1900 E NINTH ST	82	001	8717	20.0	20.0		13.4	12.3	4	11
173740010F01	WICHITA	SEDGWICK CO	1900 E NINTH ST	83	001	8455	14.0	13.0		8.3	8.1		11

QUICK LOOK REPORT

NITROGEN DIOXIDE (UG/M3) KANSAS 82-83

METHODS: HOURLY VALUES COLORIMETRIC-LYSHKOW-11, COLORIMETRIC-GRIESS-SALTZMAN-12, COULOMETRIC-13, CHEMILUMINESCENCE-14, 24-HOUR GAS BUBBLERS NASN SODIUM ARSENITE ORIFICE-84, NASN SODIUM ARSENITE FRIT-94, TEA METHOD-95, TGS METHOD-96

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	#OBS	MAX 1-HR 1ST	MAX 1-HR 2ND	MAX 24-HR 1ST	MAX 24-HR 2ND	ARIT MEAN	METH
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	82	001	6550	180	170			32?	14
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	83	001	6515	190	180			31?	14

? INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA

NATIONAL AEROMETRIC DATA BANK
QUICK LOOK REPORT

OZONE (PARTS PER MILLION) KANSAS 81-83

OZONE SEASON: APRIL TO OCTOBER

METHODS: HOURLY VALUES CHEMILUMINESCENCE-11, ULTRA VIOLET DASIBI CORPORATION-14, CHEMILUMINESCENCE RHODAMINE B DYE-15

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	* VALID # MEAS	VALID # REQ	DAILY 1ST	DAILY 2ND	DAILY 3RD	1-HR MAXIMUM VALS > .125 MEAS	1-HR MAXIMUM VALS > .125 EST	* MISS DAYS * ASS < STD	ME
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	82	001	209	214	.112	.102	.097			1	14
171800001F01	KANSAS CITY	WYANDOTTE CO	619 ANN ST	83	001	210	214	.127	.107	.097	1	1.0	1	14
171800017J03	KANSAS CITY	WYANDOTTE CO	2815 NORTH 115TH	81		184	214	.155	.124	.110	1	1.2	2	14
173320001F01	SEDGWICK CO	SEDGWICK CO	200 E 53RD NORTH	81	001	198	214	.090	.089	.087			6	11
173320001F01	SEDGWICK CO	SEDGWICK CO	200 E 53RD NORTH	82	001	203	214	.090	.075	.075			2	11
173320001F01	SEDGWICK CO	SEDGWICK CO	200 E 53RD NORTH	83	001	213	214	.095	.095	.095			1	11
173740010F01	WICHITA	SEDGWICK CO	1900 E NINTH ST	81	001	206	214	.100	.095	.095			3	11
173740010F01	WICHITA	SEDGWICK CO	1900 E NINTH ST	82	001	205	214	.115	.095	.085			2	11
173740010F01	WICHITA	SEDGWICK CO	1900 E NINTH ST	83	001	214	214	.120	.105	.100				11

QUICK LOOK REPORT

LEAD (UG/M3) KANSAS 82-83

METHODS: JARRELL-ASH EMISSION SPECTRA ICAP-90, EMISSION SPECT MUFFLE FURNACE-91, ATOMIC ABSORPTION-92, DITHIOZONE METHOD-93
EMISSION SPECT (LOW TEMP ASH)-95, X-RAY FLUORESCENCE-96, FLAMELESS ATOMIC ABSORPTION-97

SITE ID	LOCATION	COUNTY	ADDRESS	YR	REP ORG	#OBS	METH	QTRLY 1ST	ARITH 2ND	ARITH 3RD	MEAN 4TH	MEANS> 1.5	MAX VALUES 1ST	MAX VALUES 2ND
171800014F01	KANSAS CITY	WYANDOTTE CO	36TH & RAINBOW B	82	001	61	92	.15	.14	.08	.12		.30	.28
171800014F01	KANSAS CITY	WYANDOTTE CO	36TH & RAINBOW B	83	001	56	92	.11	.11	.15	.13		.40	.34
172340001F01	MERRIAM	JOHNSON CO	8715 WEST 49TH,S	82	001	41	92	.05?	.22	.13	.10		.44	.38
172340001F01	MERRIAM	JOHNSON CO	8715 WEST 49TH,S	83	001	48	92	.16	.15	.15	.13		.40	.36
173740012A02	WICHITA	SEDGWICK CO	WICHITA	82		11	90	.29	.11				.75	.43

? INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA

KANSAS
STATE OF KANSAS
MANUAL METHODS

NATIONAL AEROMETRIC DATA BANK
ENVIRONMENTAL PROTECTION AGENCY
SAROAD/PRECISION-ACCURACY REPORT

APR 13, 1984
NA273/NAP000

PRECISION-ACCURACY DATA KEY		PRECISION DATA						ACCURACY DATA			
RG ST RO TYP POLL	YR-Q	# OF SAMPLRS	COLLOC SITES	PROB LIM LO	PROB LIM UP	COLL SAMP BELOW LIM	VAL COLL DATA PRS	# AUDITS LEV 1-3	PROB LIM LO-L1-UP	PROB LIM LO-L2-UP	PROB LIM LO-L3-UP
07 17 001 I 11101	82-1	20	2	-20	+09	0	23	004		-10 +08	
**** PARTICULATE ****	82-2	20	2	-12	+04	0	27	007		-13 +08	
	82-3	20	2	-19	+21	0	28	005		-14 +12	
	82-4	20	2	-18	+62	0	26	017		-12 +20	
	82-5	20	2	-17	+24	0	104	0033		-12 +12	
	83-1	20	3	-06	+22	0	33	004		-15 +22	
	83-2	20	3	-07	+18	0	30	003		-06 -04	
	83-3	20	2	-07	+09	0	29	005		-10 +03	
	83-4	20	2	-39	+53	2	26	006		-05 +04	
	83-5	20	3	-15	+26	2	118	0018		-09 +06	

TABLE A2
PRECISION AND ACCURACY ESTIMATES FOR AMBIENT AIR MONITORING DATA

PRECISION-ACCURACY DATA KEY		PRECISION DATA				ACCURACY DATA									
RG ST RO TYP POLL	YR-Q	# OF ANLYZRS	PRECIS CHECKS	PROB LIM LO	UP	SOURCE AUD	GAS TRACE ABLTY	# AUDITS L1-3	L4	PROB LIM LO-L1-UP		PROB LIM LO-L2-UP		PROB LIM LO-L3-UP	PROB LIM LO-L4-UP
07 17 001 C 42401	82-1	002	0011	-20	-01										
** SULFUR DIOXIDE ***	82-2	002	0011	-24	+02										
	82-3	002	0008	-36	-04										
	82-4	002	0011	-38	+06	C	2	002	000	-25	+04	-20	+01	-10	-00
	82-5	002	0041	-30	+01			0002	0000	-25	+04	-20	+01	-10	+00
	83-1	002	0010	-31	+03										
	83-2	002	0011	-40	+38	C	2	002	000	-28	-20	-19	-14	-18	-05
	83-3	002	0011	-13	+15										
	83-4	002	0011	-20	+42	C	2	002	000	-23	+15	+01	+08	-02	+06
	83-5	002	0043	-26	+25			0004	0000	-26	-03	-09	-03	-10	+01

PRECISION-ACCURACY DATA KEY		PRECISION DATA				ACCURACY DATA											
RG ST RO TYP POLL	YR-Q	# OF ANLYZRS	PRECIS CHECKS	PROB LIM LO	PROB LIM UP	SOURCE AUD GAS	TRACE ABLTY	# AUDITS L1-3	# AUDITS L4	PROB LIM LO-L1-UP		PROB LIM LO-L2-UP		PROB LIM LO-L3-UP		PROB LIM LO-L4-UP	
07 17 001 C 42101	82-1	003	0016	-07	+03	B	2	005	000	-21	+09	-04	+06	-03	+03		
** CARBON MONOXIDE **	82-2	003	0019	-06	+03												
	82-3	003	0020	-09	+13												
	82-4	003	0017	-05	+07	C	2	002	000	-15	+10	-09	+08	-04	-01		
	82-5	003	0072	-07	+07			0007	0000	-18	+10	-07	+07	-04	+01		
	83-1	003	0017	-02	+03												
	83-2	003	0016	-12	+03	C	2	003	000	-11	+01	-09	+03	-08	+03		
	83-3	003	0017	-06	+05												
	83-4	003	0014	-07	+05	C	2	006	000	-08	+08	-06	+04	-04	+03		
	83-5	003	0064	-07	+04			0009	0000	-10	+05	-08	+04	-06	+03		

PRECISION-ACCURACY DATA KEY						PRECISION DATA				ACCURACY DATA						
RG	ST	RO	TYP	POLL	YR-Q	# OF ANLYZRS	PRECIS CHECKS	PROB LIM LO	PROB LIM UP	SOURCE AUD GAS	TRACE ABLTY	# AUDITS L1-3	# AUDITS L4	PROB LIM LO-L1-UP	PROB LIM LO-L2-UP	PROB LIM LO-L3-UP	PROB LIM LO-L4-UP
07	17	001	C	42602	82-3	001	0004	-58	-01								
** NITROGEN DIOXIDE *					82-4	001	0006	-53	+19								
					82-5	001	0010	-56	+09			0000	0000				
					83-1	001	0004	-59	+16								
					83-2	001	0007	-50	+14								
					83-3	001	0006	-55	+05								
					83-5	001	0017	-55	+12			0000	0000				

PRECISION-ACCURACY DATA KEY		PRECISION DATA				ACCURACY DATA									
RG ST RO TYP POLL	YR-Q	# OF ANLYZRS	PRECIS CHECKS	PROB LIM LO	UP	SOURCE AUD	GAS	TRACE ABLTY	# AUDITS L1-3	L4	PROB LIM LO-L1-UP		PROB LIM LO-L2-UP		PROB LIM LO-L3-UP	PROB LIM LO-L4-UP
07 17 001 C 44201	81-1								002		-47	+17	-12	-07	-08 -06	
******* OZONE *******	81-2	002	0004	-13	+04											
	81-3	002	0006	-50	+33											
	81-4	002	0005	-55	+25											
	81-5	002	0015	-39	+21				0002	0000	-47	+17	-12	-07	-08 -06	
	82-1	003	0018	-11	+12	D		2	002	000	-02	+08	+03	+04	-07 +05	
	82-2	003	0018	-12	+16	D		2	002	000	-17	+14			-01 -01	
	82-3	003	0017	-29	+14											
	82-4	003	0017	-28	+04	D		2	003	000	-16	+11	-02	+04	-08 +10	
	82-5	003	0070	-20	+12				0007	0000	-12	+11	+01	+04	-05 +05	
	83-1	003	0016	-23	+08											
	83-2	003	0016	-19	+06	D		2	003	000	-39	+11	-09	+04	-05 +05	
	83-3	003	0016	-03	+18											
	83-4	003	0017	-09	+11	D		2	003	000	-20	+21	-16	+16	-13 +16	
	83-5	003	0065	-14	+11				0006	0000	-30	+16	-13	+10	-09 +11	

PRECISION-ACCURACY DATA KEY						PRECISION DATA						ACCURACY DATA					
RG	ST	RO	TYP	POLL	YR-Q	# OF SAMPLRS	COLLOC SITES	PROB LIM LO	PROB LIM UP	COLL SAMP BELOW LIM	VAL COLL DATA PRS	# AUDITS LEV 1-3	PROB LIM LO-L1-UP		PROB LIM LO-L2-UP		PROB LIM LO-L3-UP
07	17	001	I	12128	82-1							024	-21	-01			
*******	LEAD	********			82-2							002	-31	+08	-05	-05	
					82-3	2	1	-29	+38	4	6	005	-34	+08	-21	-01	
					82-4	2	1	-43	+78	13	15	006	-30	+06	-25	-04	
					82-5	2	1	-36	+58	17	21	0037	-29	+05	-17	-03	
					83-1	2	1	-29	+23	5	11	006	-25	+05	-25	-10	
					83-2	2	1	-15	+17	8	13	004	-17	+10	-14	-03	
					83-3	2	1	-42	+57	7	11	006	-27	+14	-14	+01	
					83-4	2	1	-95	+99	7	12	006	-06	+08	-20	+02	
					83-5	2	1	-45	+49	27	47	0022	-19	+09	-18	-03	

Iowa—TSP

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Jefferson Township			X	
Remainder of Polk County				X
The western portion of Council Bluffs and Carter Lake		[1] X		
Lake Township			X	
Lewis Township			X	
Remainder of Pottawattamie County				X
The central portion of Davenport	X	X		
Portions of Buffalo, Davenport, Bettendorf and Riverdale		[1] X		
Remainder of Scott County				X
Center Township			X	
Remainder of Wapello County				X
The central portion Fort Dodge		[1] X		
Otho Township			X	
Remainder of Webster County				X
The central and southern portions of Sioux City		[1] X		
Liberty Township			X	
Woodbury Township			X	
Remainder of Woodbury County				X
Remainder of State				X

[1] EPA designation replaces State designation.

Iowa—SO_2

Designated area	Primary standard exceeded § (d)(1)(B)	Secondary standard exceeded § (d)(1)(C)	Unclassifiable § (d)(1)(D)	Attainment
Entire State				X

Iowa—Ozone (O_3)

Designated area	Primary standard exceeded § (d)(1)(A)	Unclassifiable and/or attainment § (d)(1)(E)
Entire State		X

Iowa—CO

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Des Moines Township	X	
Lee Township	X	
Remainder of Polk County		X
Remainder of State		X

Iowa—NO_2

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Entire State		X

[43 FR 8964, Mar. 3, 1978, as amended at 45 FR 14574, Mar. 6, 1980; 46 FR 17558, Mar. 19, 1981; 46 FR 48930, Oct. 5, 1981; 47 FR 19526, May 6, 1982; 47 FR 38322, Aug. 31, 1982; 47 FR 43061, Sept. 30, 1982]

§ 81.317 Kansas.

Kansas—TSP

Designated Area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Wyandotte County:				
a. Most of the area between I-635 and the Missouri state line	X			
b. An area extending about three miles west of the above area		X		
Topeka, Kansas, area bounded by: Kansas River on the east and south, Vail Avenue on the west and Lyman Avenue on the north		X		
Remainder of State				X

Kansas—SO_2

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Entire State				X

Kansas—Ozone (O_3)

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Kansas City AQCR (094):		
Wyandotte County	[1] X	
Johnson County	[1] X	
South Central AQCR (099): Sedgwick County		X
Northwest AQCR (095): Douglas County	[1] X	
Remainder of State		X

[1] EPA designation replaces State designation.

Kansas—CO

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Kansas City, Kansas area, bounded by: 6th Street on the east, Washington Street on the north, 18th Street on the west, and Barnett Street on the south		X

TABLE A3 ATTAINMENT STATUS DESIGNATIONS

Kansas—CO

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Wichita, Kansas area, bounded by: Grove Street on the east, 13th Street on the north, the Arkansas River on the west, and Kellogg Avenue on the south	X	
Remainder of State		X

Kansas—NO_2

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Entire State		X

[43 FR 8964, Mar. 3, 1978, as amended at 45 FR 73048, Nov. 4, 1980]

§ 81.318 Kentucky.

Kentucky—TSP

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
Bell County	X			
Boyd County	X			
That portion of Bullitt Co. in Shepherdsville	X			
That portion of Cambell Co. in Newport	X			
That portion of Daviess Co. in Owensboro	X			
That portion of Henderson Co. in Henderson	X			
Jefferson County	X			
That portion of Lawrence Co. in Louisa	X			
McCracken County	X			
Marshall County		X		
That portion of Madison Co. in Richmond	X			
Muhlenberg County		X		
That portion of Perry Co. in Hazard	X			
That portion of Pike Co. in Pikeville	X			
That portion of Whitley Co. in Corbin	X			
Rest of State				X

Kentucky—SO_2

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
That portion of Boyd County south of UTM northing line 4251 km	X			
Jefferson County	X	X		
Muhlenberg County		X		
Rest of State				X

Kentucky—O_3

Designated area	Does not meet primary standards	Cannot be classified or better than national standards [1]
Boyd County	X	
Cincinnati Area—Boone, Kenton, and Campbell Counties	X	
Fayette County	X	
Jefferson County	X	
Rest of State	X	
		X

[1] Designations of "Cannot be classified or better than national standards" were reaffirmed on July 23, 1982.

Kentucky—CO

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Jefferson County	X	
Rest of State		X

Kentucky—NO_2

Designated area	Does not meet primary standards	Cannot be classified or better than national standards
Statewide		X

(Secs. 107, 171, 301 of the Clean Air Act (42 U.S.C. 7407, 7501, 7601))

[43 FR 8964, Mar. 3, 1978, as amended at 43 FR 40425, Sept. 11, 1978; 44 FR 41783, July 18, 1979; 44 FR 63105, Nov. 2, 1979; 46 FR 46325, Sept. 18, 1981; 46 FR 57047, Nov. 20, 1981; 47 FR 18862, May 3, 1982; 47 FR 31878, July 23, 1982; 48 FR 5728, Feb. 8, 1983; 48 FR 28989, June 24, 1983]

§ 81.319 Louisiana.

Louisiana—TSP

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
AQCR 019				X
AQCR 022				X
AQCR 106				X

Louisiana—SO_2

Designated area	Does not meet primary standards	Does not meet secondary standards	Cannot be classified	Better than national standards
AQCR 019				X
AQCR 022				X

STATE: KS MAJOR POINT SOURCE IDENTIFICATION

NO.	NAME	COUNTY	PLANT	PART. EMISS.	AVG. HT.	SO2 EMISS	AVG. HT.	CO EMISS.	AVG. HT	NOX EMISS.	AVG. HT	VOC EMISS.	AVG. HT	PB EMISS.	AVG. HT
1	CEREAL FOOD PROCESSO	3320	0001	103.	.0	0.	.0	0.	.0	2.	.0	0.	.0	0	.0
2	KANSAS G&E GORDON EV	3320	0012	35.	.0	90.	.0	387.	.0	5316.	.0	13.	.0	0	.0
3	KANSAS G&E MURRY GIL	3320	0014	45.	.0	410.	.0	165.	.0	2262.	.0	6.	.0	0	.0
4	PEOPLES NATURAL GAS-	3320	0017	0.	.0	0.	.0	41.	.0	323.	.0	133.	.0	0	.0
5	NORTHWEST CENTRAL PI	3320	0018	0.	.0	0.	.0	33.	.0	264.	.0	6.	.0	0	.0
6	CESSNA AIRCRAFT CO.(	3320	0019	0.	.0	0.	.0	2.	.0	9.	.0	161.	.0	0	.0
7	DERBY REFINING CO. 1	3320	0020	55.	.0	421.	.0	281.	.0	1284.	.0	1683.	.0	0	.0
8	CARGILL INC. 1501	3320	0029	157.	.0	4.	.0	5.	.0	20.	.0	0.	.0	0	.0
9	PHILLIPS PIPE LINE C	3320	0045	1.	.0	1.	.0	14.	.0	106.	.0	137.	.0	0	.0
10	THE COLEMAN CO.,INC.	3320	0058	0.	.0	0.	.0	2.	.0	10.	.0	143.	.0	0	.0
11	GARVEY GRAIN(DIV.-GA	3320	0062	247.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
12	ROSS IND.(DIV.OF CAR	3320	0064	134.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
13	MCCURRY BROS. ELEVAT	3320	0066	124.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
14	THE COLEMAN CO.,INC.	3320	0067	0.	.0	0.	.0	1.	.0	5.	.0	111.	.0	0	.0
15	THE COLEMAN CO.,INC.	3320	0068	0.	.0	0.	.0	0.	.0	2.	.0	113.	.0	0	.0
16	VULCAN MATERIALS CHE	3320	0070	10.	.0	24.	.0	92.	.0	593.	.0	133.	.0	0	.0
17	ROSSVILLE GRAIN CO	3380	0003	124.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
18	C-G-F GRAIN CO. - TO	3380	0004	144.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
19	GOODYEAR TIRE&RUBBER	3380	0007	36.	.0	461.	.0	17.	.0	173.	.0	0.	.0	0	.0
20	FAR-MAR-CO TOPEKA	3380	0021	106.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
21	WILLIAMS PIPE LINE C	3380	0023	0.	.0	0.	.0	0.	.0	0.	.0	323.	.0	0	.0
22	KS POWER&LIGHT TECUM	3380	0030	196.	.0	4627.	.0	107.	.0	3650.	.0	12.	.0	0	.0
23	E.I. DU PONT DE NEMO	3380	0035	0.	.0	1636.	.0	0.	.0	0.	.0	0.	.0	0	.0
24	CERTAIN-TEED (CSG)PL	3840	0001	86.	.0	286.	.0	37.	.0	70.	.0	83.	.0	0	.
25	LONE STAR INDUSTRIES	3840	0002	1104.	.0	4246.	.0	0.	.0	345.	.0	0.	.0	0	.0
26	BOARD OF PUBLIC UTIL	3840	0008	168.	106.6	4008.	106.6	211.	106.6	2140.	106.6	25.	106.6	0	.0
27	OWENS-CORNING,SUNSHI	3840	0010	287.	.0	296.	.0	135.	.0	280.	.0	189.	.0	0	.0
28	PROCTER&GAMBLE 1900	3840	0011	4.	.0	29.	.0	26.	.0	273.	.0	1.	.0	0	.0

NO.	NAME	COUNTY	PLANT	PART. EMISS.	AVG. HT.	SO2 EMISS	AVG. HT.	CO EMISS.	AVG. HT	NOX EMISS.	AVG. HT	VOC EMISS.	AVG. HT	PB EMISS.	AVG. HT
29	CEREAL FOOD PROCESSO	3840	0017	714.	.0	1.	.0	0.	.0	0.	.0	0.	.0	0	.0
30	SMOOT GRAIN CO.-WOLC	3840	0019	189.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
31	PHILLIPS PETROLEUM,	3840	0022	137.	.0	1463.	.0	548.	.0	1152.	.0	1277.	.0	0	.0
32	FAR-MAR-CO INC 940 K	3840	0023	150.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
33	CARGILL INC. 52ND &	3840	0042	155.	.0	0.	.0	0.	.0	0.	.0	P.	.0	0	.0
34	GM ASSEMBLY DIV 100	3840	0046	2.	.0	27.	.0	9.	.0	38.	.0	3270.	.0	0	.0
35	BOARD OF PUBLIC UTIL	3840	0048	495.	.0	14636.	.0	86.	.0	4423.	.0	11.	.0	0	.0
36	BOARD OF PUBLIC UTL,	3840	0049	92.	.0	10637.	.0	50.	.0	2947.	.0	6.	.0	0	.0
37	THOMPSON-STRAUSS QUA	3840	0057	147.	.0	0.	.0	0.	.0	0.	.0	0.	.0	0	.0
38	WILLIAMS PIPE LINE	3840	0060	0.	.0	0.	.0	0.	.0	0.	.0	552.	.0	0	.0
39	PHILLIPS PIPE LINE C	3840	0075	0.	.0	0.	.0	0.	.0	0.	.0	134.	.0	0	.0
40	SEALRIGHT CO.INC.-KC	3840	0087	0.	.0	0.	.0	0.	.0	2.	.0	115.	.0	0	.0
41	INTERNATIONAL PAPER	3840	0090	0.	.0	0.	.0	0.	.0	0.	.0	119.	.0	0	.0

APPENDIX B
Statistical Evaluation of Trends

The trend evaluation procedure used in the air quality evaluation is based on the Sen non-parametric statistic. The procedure was recommended by Vector Research, Incorporated, in a study performed under contract with the U.S. Environmental Protection Agency. It was selected over other candidate methods as the method which gives the highest probability of detecting real trends. Essential advantages of the method include the following:

1. It takes the seasonality of data into account.

2. It deals with autocorrelation effects in data collected at frequent intervals e.g., hourly. (Autocorrelation is the tendency for data measured at nearby times to be more similar than data measured at more distant times).

3. It does not assume that the data are normally distributed.

4. It identifies continuing trends, even if there is some oscillation around the trend line.

The latest draft report of the study, "Methods for Classifying Changes in Environmental Conditions" [VRI-EPA 7.4-FR80-1(R)] describes in more detail the other candidate methods and the advantages of the Sen statistical test.

A step-by-step summary of the trend evaluation procedure is given in the following paragraphs, which were adapted from the above report.

1. Compute one data value for each month of each year. For high-frequency data series in which autocorrelation may be present (e.g., continuous monitor data), a monthly average will correct for that autocorrelation. Alternatively, if trends in high pollutant concentrations at a site are of greater interest, the 90th percentile concentration for each month is used. (The 90th percentile concentration produces a more stable statistical estimate than would the maximum concentration.)

2. Compute the seasonal average of the data for each calendar month, (i.e., compute the average of all January values, the average of all February values, etc.). Subtract the appropriate seasonal average from the value for each month to obtain seasonally adjusted data.

3. Rank the seasonally adjusted data. Replace each adjusted datum with its rank. (This step makes the procedure non-parametric. It eliminates the requirement for different statistical methods for different series of data with different distributional laws governing their random behavior. It also limits the potential error-producing effects of outliers.)

4. Compute the Sen test statistic, S, from the formula

$$S = \sqrt{\frac{12\,T^2}{Y(Y+1)\sum_{y=1}^{Y}\sum_{t=1}^{T}(R_{yt} - R_{.t})^2}} \sum_{y=1}^{Y}\left(y - \frac{Y+1}{2}\right)\left(R_{y.} - \frac{TY+1}{2}\right)$$

where

Y = number of years
y = the index of the year (the index of first year is 1, of the second year, 2, etc.)
T = number of periods per year (12)
t = the index of the month (the index for January is 1, for February 2, etc.)
R_{yt} = the rank of the seasonally adjusted value for month t of year y
$R_{.t}$ = the mean rank for month t over all the years
$R_{y.}$ = the mean rank over all months for year y

The significance of the individual parts of that formula is described as follows.

a) For each year, $R_{y.}$ is computed by averaging the ranks of the seasonally adjusted data for that year. This will be large if the data in that year are higher than that in other years, small if the data are smaller. Thus, an increasing trend in this mean rank indicates an increasing trend in the data through the years. Likewise, a decreasing trend in the mean ranks indicates a decreasing trend in the data.

b) The term

$$\sum_{y=1}^{Y} \left(y - \frac{Y+1}{2}\right)\left(R_{y.} - \frac{TY+1}{2}\right)$$

represents the covariance between the mean rank for a year and the index of that year. When large annual mean ranks ($R_{y.}$ - (TY + 1)/2 positive) occur in late years (y-(Y+1)/2 positive) or small annual mean ranks ($R_{y.}$ - (TY + 1)/2 negative) occur in early years (y-(Y+1)/2 negative) a positive product will result. Thus, an accumulation of positive products, and therefore, a large positive result, is associated with a positive trend. Similarly, an accumulation of negative products, and a large negative result, is associated with a negative trend.

c) The first term of the equation is a scale factor which normalizes the covariance calculated above. It is a data-based estimate of the expected standard deviation of the covariance statistic if there were no trend. The scaling adjusts the covariance statistic so that it may be compared with tabulated percentile values of the normal probability distribution, rather than requiring the generation of special tables uniquely applicable to this statistic.

5. If the statistic exceeds (in either direction) the appropriate percentile values of the tabulated normal probability distribution, a statistically significant trend is present. If it does not exceed those values, no statistically significant trend is present.

Specifically, if the Sen statistic exceeds ± 1.645 (the 90th percentile values of the normal distribution for a two-tailed test), we conclude that the data show a trend. If the statistic does not exceed those limits, but does exceed ±1.28 (the 80th percentile values), we conclude that the data show a probable trend. Otherwise, we conclude that no statistically significant trend is shown by the data.

The following example illustrates the above process. While the trend calculations are usually performed by a computer, and include five years of data, the example shows how the calculations can be done manually. The example uses only three years of data, so that the calculation can be more easily followed.

Monthly geometric mean TSP data provide the starting point for the calculation. The monthly values and the seasonal averages are:

Year	Jan	Feb	Mar	Apr	May	Jun
1	102	126	142	150	92	112
2	136	107	144	68	80	100
3	70	67	84	125	112	83
Monthly (Seasonal) Average	102.67	100.0	123.33	114.33	94.67	98.33

Year	Jul	Aug	Sep	Oct	Nov	Dec
1	124	122	126	117	93	136
2	90	104	125	125	102	63
3	95	105	107	101	68	98
Monthly (Seasonal) Average	103.0	110.33	119.33	114.33	87.67	99.0

The seasonally adjusted data are obtained by subtracting the appropriate seasonal average from each monthly value.

Year	Jan	Feb	Mar	Apr	May	Jun
1	-.67	26	18.67	35.67	-2.67	13.67
2	33.33	7	20.67	-46.33	-14.67	1.67
3	-32.67	-33.0	-39.33	10.67	17.33	-15.33

Year	Jul	Aug	Sep	Oct	Nov	Dec
1	21.0	11.67	6.67	2.67	5.33	37.0
2	-13.0	-6.33	5.67	10.67	14.33	-36.0
3	-8.0	-5.33	-12.33	-13.33	-19.67	-1.0

The seasonally adjusted data are ranked from lowest to highest and replaced by the ranks R_{yt}, as shown in the next table. Ties are handled by assigning the same average rank to each of the tied values. (Ranks 24 and 25 are tied, so both months are ranked as 24.5). The mean rank for each season ($R_{.t}$) and the mean rank for each year ($R_{y.}$) are also shown.

Year	Jan	Feb	Mar	Apr	May	Jun
1	17	33	30	35	15	27
2	34	23	31	1	8	18
3	5	4	2	24.5	29	7
$R_{.t}$	18.67	20	21	20.17	17.33	17.33

Year	Jul	Aug	Sep	Oct	Nov	Dec	$R_{y.}$
1	32	26	22	19	20	36	26.0
2	10	13	21	24.5	28	3	17.875
3	12	14	11	9	6	16	11.625
$R_{.t}$	18	17.67	18	17.5	18	18.33	

The individual terms $(R_{yt}-R_{.t})^2$ in the summation of the scale factor are listed in the following table. The summation over all three years for each individual month, is shown in the last line of the table.

Year	Jan	Feb	Mar	Apr	May	Jun
1	2.8	169	81	219.9	5.4	93.5
2	235.1	9	100	367.5	87.0	0.4
3	186.8	256	361	18.7	136.2	106.7
$\sum_{y=1}^{3} (R_{yt}-R_{.t})^2$	424.7	434	542	606.1	228.7	200.6

Year	Jul	Aug	Sep	Oct	Nov	Dec
1	196	69.4	16	2.25	4	312.2
2	64	21.8	9	49.	100	235.0
3	36	13.5	49	72.25	144	5.4
$\sum_{y=1}^{3} (R_{yt}-R_{.t})^2$	296	104.7	74	123.5	248	552.6

Summing across the last line of the table, we have

$$\sum_{t=1}^{12} \sum_{y=1}^{3} (R_{yt} - R_{.t})^2 = 3834.9$$

Substituting into the formula for the Sen statistic, we have

$$S = \sqrt{\frac{12\,(12)^2}{3(4)\,(3834.9)}} \left[(1 - \tfrac{4}{2})\,(26.0 - \tfrac{37}{2}) + (2 - \tfrac{4}{2})\,(17.875 - \tfrac{37}{2}) + (3 - \tfrac{4}{2})\,(11.65 - \tfrac{37}{2}) \right]$$

$$= .1938\ [\ -7.50 + 0 - 6.85\ ] = -2.78$$

Since the test statistic is below the range $\pm$ 1.645 (the 90th percentile values of the normal distribution), we conclude (with greater than 90% confidence) that the data show a decreasing trend.

APPENDIX C
Population Exposure Estimates

As Section XIV of this report described, previous estimates of population exposure to elevated concentrations have focused on county-level populations in areas where all or portions of a county had been designated as not meeting the NAAQS's for specific pollutants. Those approximations tend to overestimate, and sometimes greatly so, the population exposure. In order to refine those estimates, populations within the designated non-attainment areas were desired. Systems Applications, Inc. (SAI), of San Rafael, California has written the software necessary to compute population estimates within any arbitrary closed polygon at any location in the United States. The procedure used is based in part on the high resolution population gridding program used in the SHEAR model for estimating population exposure to air pollutants (Anderson and Lundberg, 1983). Robert G. Ireson was the SAI project manager for the current study. Funding for the project came through EPA Headquarters. Tim Matzke (Environmental Results Branch, OMSE) provided the necessary coordination. The assistance of both of those individuals is gratefully acknowledged.

This Appendix gives a general description of the software, and provides copies of the program outputs, including population density maps. Since those maps show approximate population densities by square kilometer, they may be useful as a reference for other analyses, in addition to the population exposure estimates. The abbreviations PNA and SNA in the map titles stand for "Primary Non-Attainment Area" and "Secondary Non-Attainment Area," respectively.

The starting point for the population estimation is a set of points which define a closed polygon (the non-attainment area). These points were initially obtained by digitizing the outline of each non-attainment area from appropriate maps. Those points were used both in constructing the non-attainment area boundaries shown in the body of the report, and as input to the population estimation software.

The SAI software checks each polygon to verify closure, and selects a cell size which is appropriate to the size of the non-attainment area of interest. Map scale is also adjusted according to the size of the area. Comparison of the Kansas City O_3 map (2 km x 2 km cells) with the Topeka TSP map (1 km x 1 km cells) illustrates both effects. Maps are plotted with Universal Transverse Mercator coordinate axes, and include a border extending four cell widths beyond the boundary of the area of interest.

The program searches the population data file, which contains the locations of the centroids of all census block groups and enumeration districts (BG/ED's), and the population of each BG/ED. It assigns each centroid to the appropriate cell in the final grid, and distributes the population for each BG/ED according to the density of centroids and the size of the cells. It then calculates the population density for each cell. Individual cells are classified as being inside the polygon, outside the polygon, or divided by the polygon. The population within the

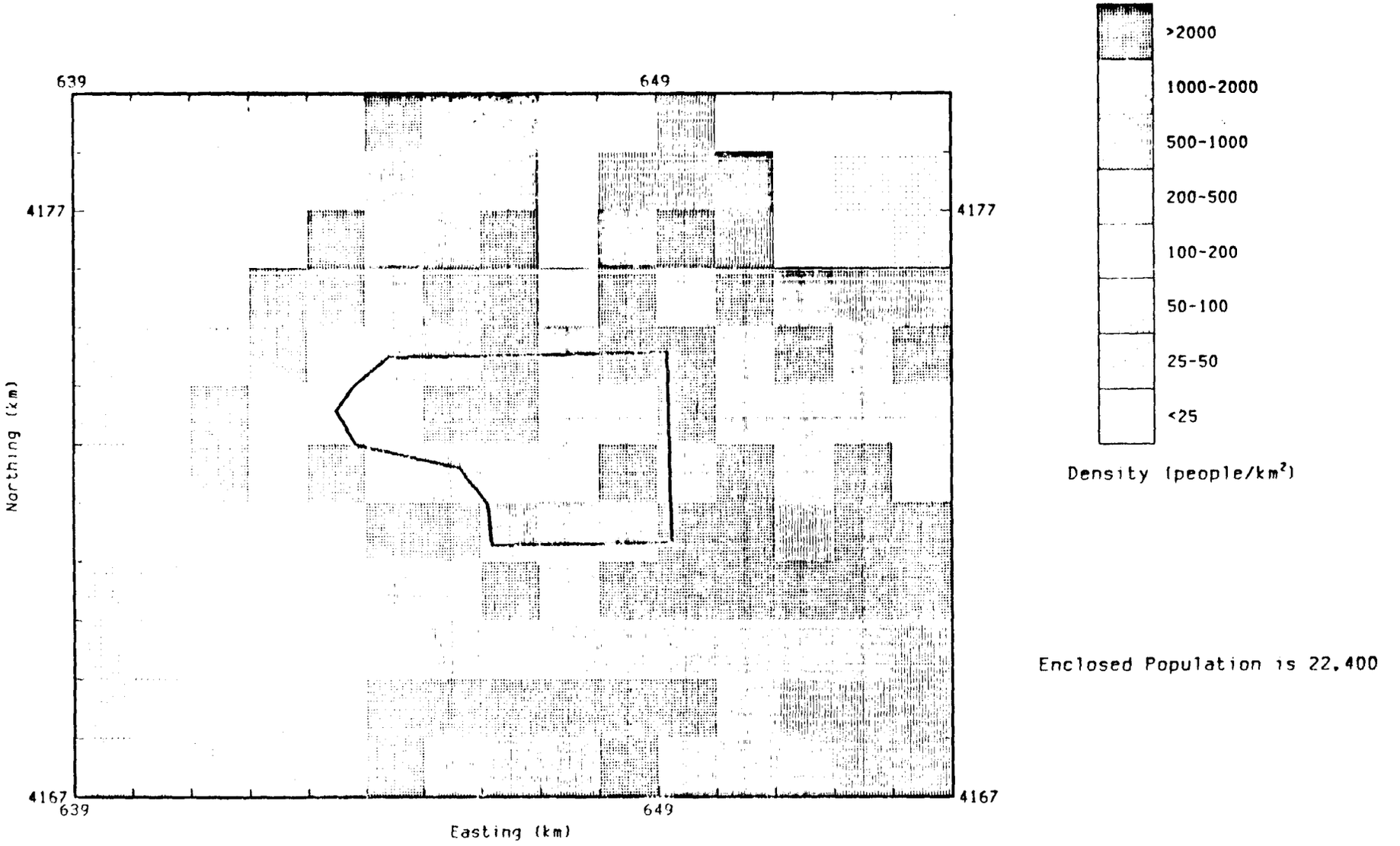
polygon is estimated by adding up the populations of all cells in the polygon. For cells divided by the polygon, the relative areas inside and outside are used to estimate the population inside.

The population extraction and gridding program produces a listing, by county, of the number and total population of the BG/ED's extracted for the grid. For completeness, those listings are also included. Where the geographical density of the BG/ED's centroids is low, the populations may be spread over a large number of cells, especially near the edges of the final grid. In those cases, (which appear on the map as large areas with uniform low density), population density estimates may be shifted into or out of the polygon. If the total population is small, that effect may significantly change the estimate for population within the polygon.

Because of the approximations discussed above, the population estimates in the text were rounded to the nearest 1000. Where total population is low, and the non-attainment area boundary coincides with the city limits, the city population from census tables was used, rather than the estimate from the computer-produced population density map.

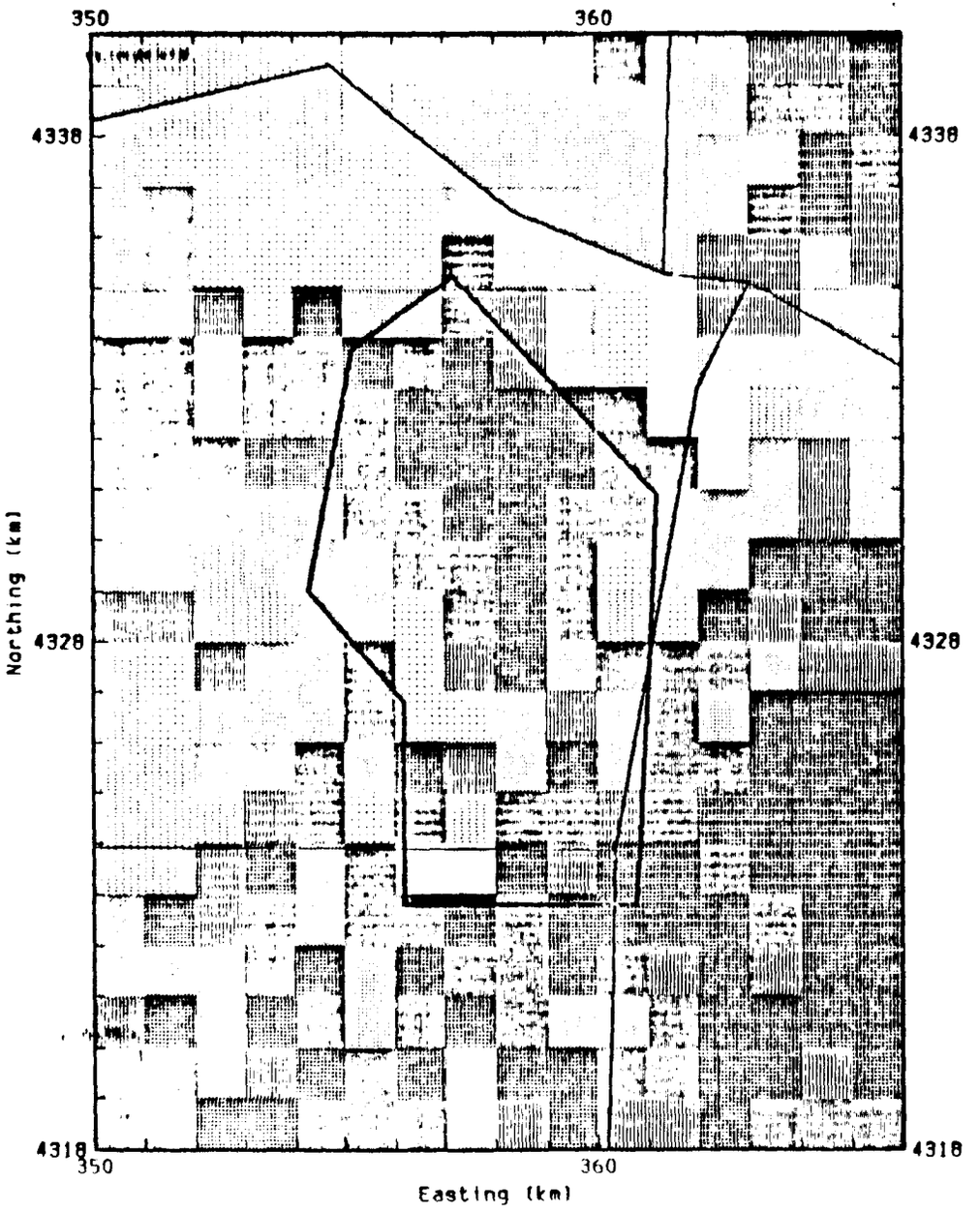
Reference

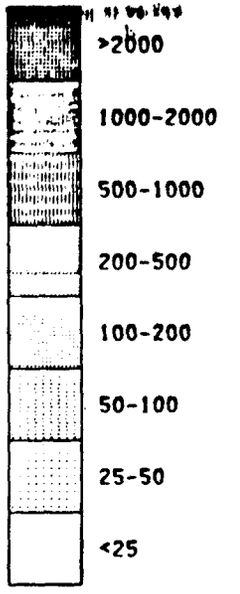
Anderson, Gerald E., and Lundberg, Gary W. 1983. User's Manual for SHEAR. A Computer Code for Modeling Human Exposure and Risk from Multiple Hazardous Air Pollutants in Selected Regions. Report SYSAPP-83/124, Systems Applications, Inc., San Rafael, California.



Enclosed Population is 22,400

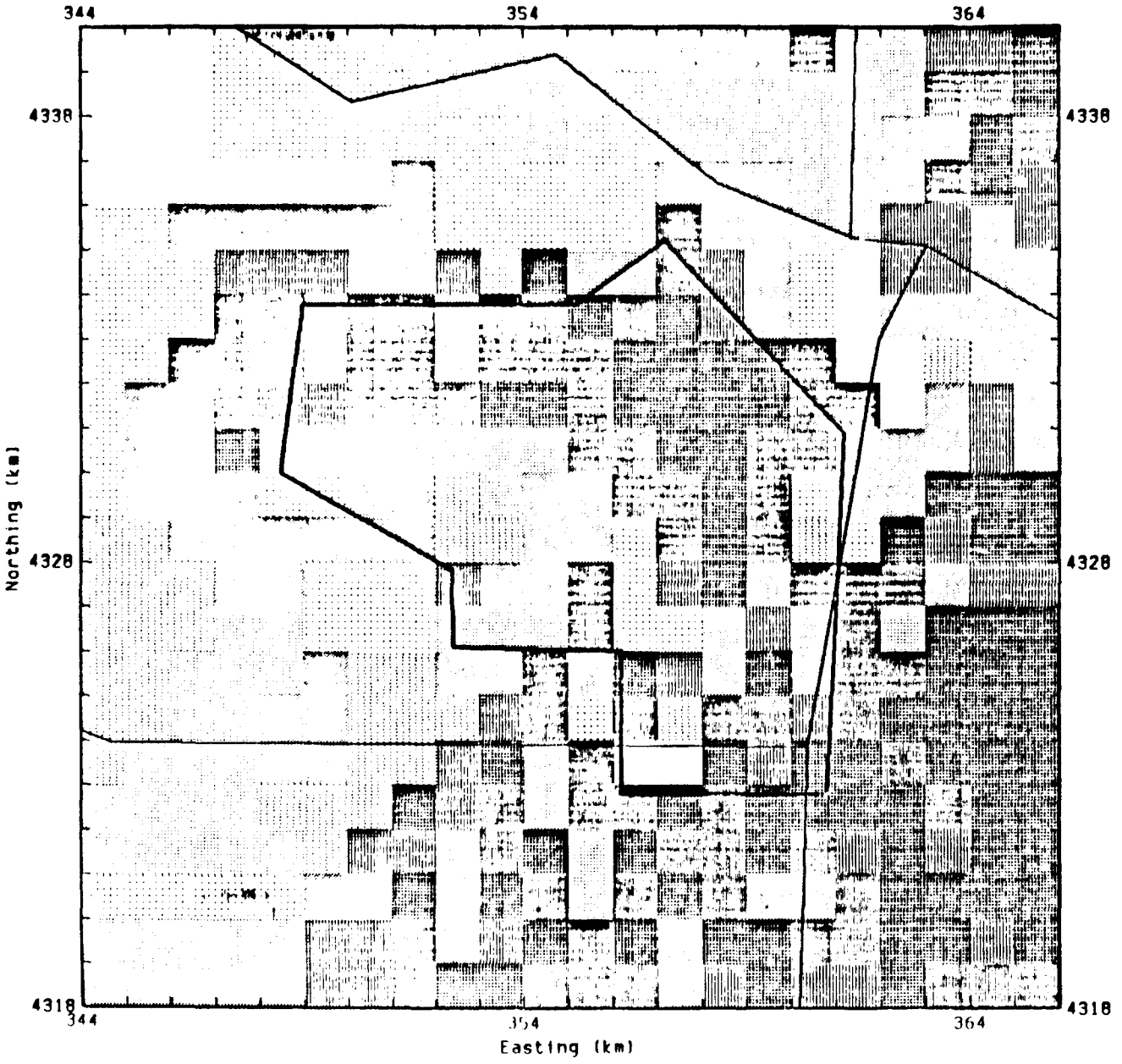
Population Density Map for Polygon 1
Wichita CO PNA

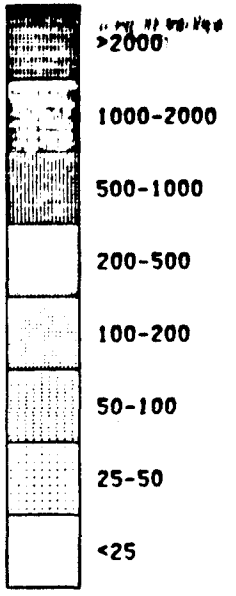




Enclosed Population is 90,200

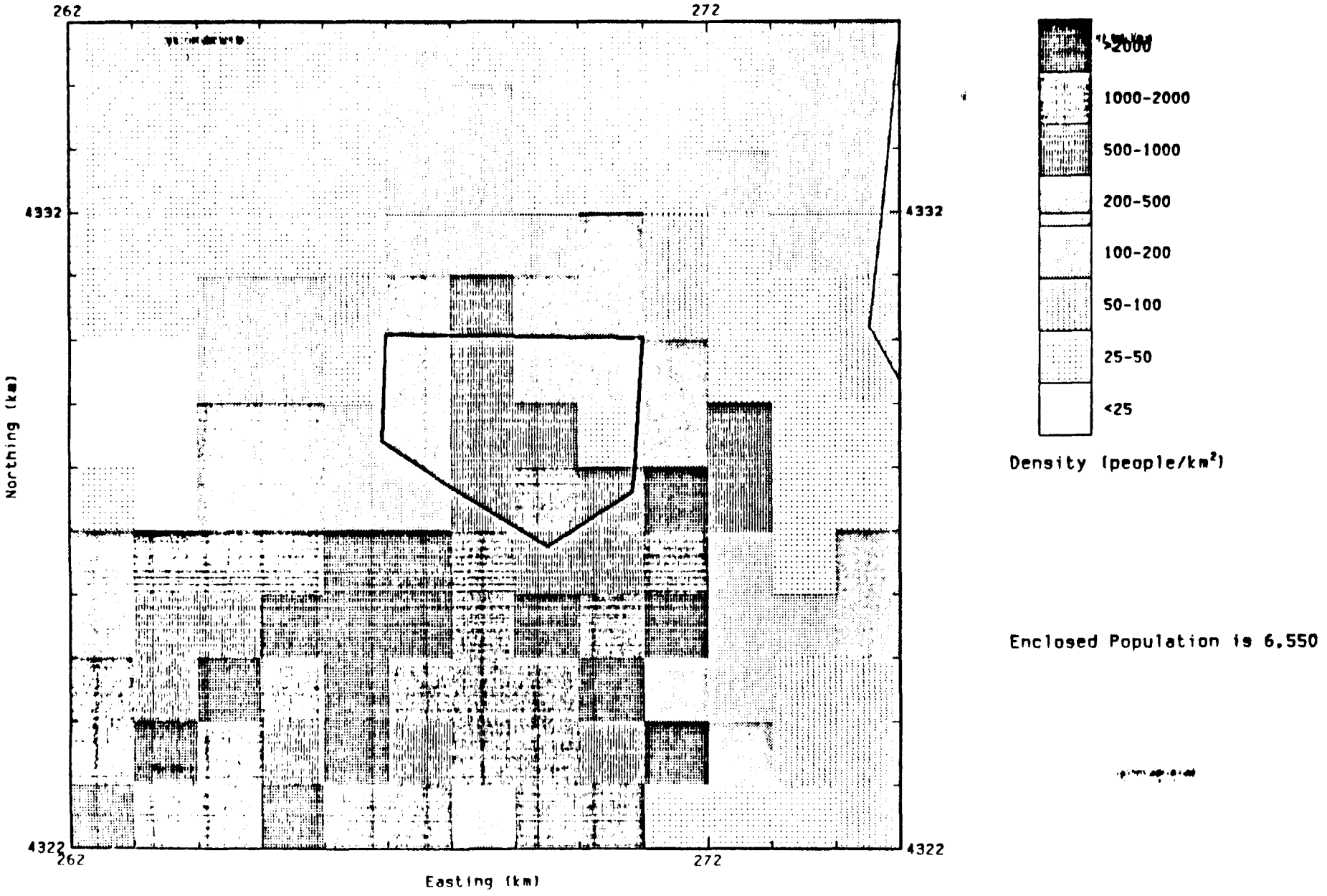
Population Density Map for Polygon 68
Kansas City TSP PNA



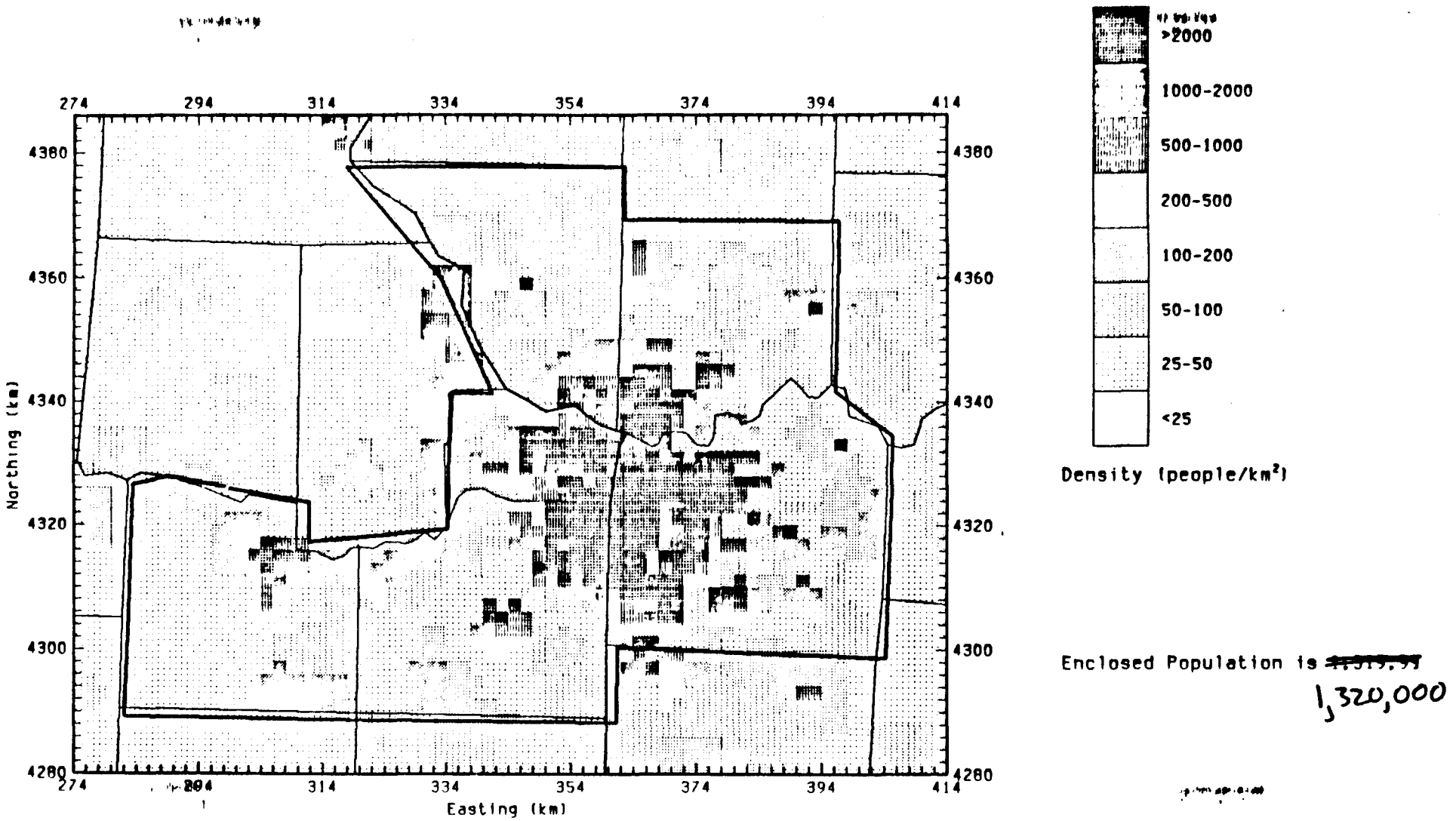


Enclosed Population is 117,000

Population Density Map for Polygon 67
Kansas City TSP SNA



Population Density Map for Polygon 43
Topeka TSP SNA



Enclosed Population is ~~41319.99~~
1,320,000

Population Density Map for Polygon 42

Kansas City and Lawrence O_3 PNA's

1

SAI/MEDX POPULATION GRIDDING PROGRAM

REGION - /
REGION ORIGIN (UTM COORDINATES/METERS)
EASTING - 639000.
NORTHING - 4167000.
ZONE - 14
REGION SIZE (METERS)
EAST-WEST - 15000.
NORTH-SOUTH - 12000.

POPULATION YEAR - 1978

51 STATES FOUND ON POPULATION-FILE INDEX,
3141 COUNTIES,
232567 BG/ED'S,
1000 BG/ED'S PER PAGE IN POPFILE.

283 BG/ED-S WITH A TOTAL POPULATION OF 230270 EXTRACTED FROM COUNTY 20173

283 BG/ED-S WITH A TOTAL POPULATION OF 230270 EXTRACTED

[illegible] BG/ED-S WITH A TOTAL POPULATION OF [illegible] EXTRACTED

REGION - 42

REGION ORIGIN (UTM COORDINATES/METERS)

EASTING -	274000
NORTHING -	4280000
ZONE -	15

REGION SIZE (METERS)

EAST-WEST -	140000
NORTH-SOUTH -	106000

1

POPULATION YEAR - 1978

51 STATES FOUND ON POPULATION-FILE INDEX.
3141 COUNTIES.
232567 BG/ED'S.
1000 BG/ED'S PER PAGE IN POPFILE.

26	BG/ED-S WITH A TOTAL POPULATION OF	16124	EXTRACTED FROM COUNTY 20005
51	BG/ED-S WITH A TOTAL POPULATION OF	66790	EXTRACTED FROM COUNTY 20045
5	BG/ED-S WITH A TOTAL POPULATION OF	2886	EXTRACTED FROM COUNTY 20059
2	BG/ED-S WITH A TOTAL POPULATION OF	559	EXTRACTED FROM COUNTY 20085
20	BG/ED-S WITH A TOTAL POPULATION OF	14479	EXTRACTED FROM COUNTY 20087
293	BG/ED-S WITH A TOTAL POPULATION OF	256977	EXTRACTED FROM COUNTY 20091
49	BG/ED-S WITH A TOTAL POPULATION OF	57106	EXTRACTED FROM COUNTY 20103
3	BG/ED-S WITH A TOTAL POPULATION OF	2950	EXTRACTED FROM COUNTY 20121
3	BG/ED-S WITH A TOTAL POPULATION OF	1753	EXTRACTED FROM COUNTY 20139
5	BG/ED-S WITH A TOTAL POPULATION OF	4688	EXTRACTED FROM COUNTY 20177
241	BG/ED-S WITH A TOTAL POPULATION OF	176666	EXTRACTED FROM COUNTY 20209
8	BG/ED-S WITH A TOTAL POPULATION OF	3288	EXTRACTED FROM COUNTY 29021
3	BG/ED-S WITH A TOTAL POPULATION OF	1285	EXTRACTED FROM COUNTY 29025
38	BG/ED-S WITH A TOTAL POPULATION OF	32506	EXTRACTED FROM COUNTY 29037
190	BG/ED-S WITH A TOTAL POPULATION OF	137056	EXTRACTED FROM COUNTY 29047
12	BG/ED-S WITH A TOTAL POPULATION OF	7483	EXTRACTED FROM COUNTY 29049
830	BG/ED-S WITH A TOTAL POPULATION OF	624447	EXTRACTED FROM COUNTY 29095
4	BG/ED-S WITH A TOTAL POPULATION OF	2316	EXTRACTED FROM COUNTY 29101
6	BG/ED-S WITH A TOTAL POPULATION OF	2834	EXTRACTED FROM COUNTY 29107
69	BG/ED-S WITH A TOTAL POPULATION OF	42332	EXTRACTED FROM COUNTY 29165
16	BG/ED-S WITH A TOTAL POPULATION OF	9483	EXTRACTED FROM COUNTY 29177

1874 BG/ED-S WITH A TOTAL POPULATION OF 1464013 EXTRACTED
REGION - 43
REGION ORIGIN (UTM COORDINATES/METERS)
EASTING - 262000.
NORTHING - 4322000
ZONE - 15
REGION SIZE (METERS)
EAST-WEST - 13000
NORTH-SOUTH - 13000.

POPULATION YEAR - 1978

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51 STATES FOUND ON POPULATION-FILE INDEX.
3141 COUNTIES.
232567 BG/ED'S.
1000 BG/ED'S PER PAGE IN POPFILE.

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146 BG/ED-S WITH A TOTAL POPULATION OF 103773 EXTRACTED FROM COUNTY 20177

63 BG/ED-S WITH A TOTAL POPULATION OF 25081 EXTRACTED

REGION - 67

REGION ORIGIN (UTM COORDINATES/METERS)

EASTING - 344000

NORTHING - 4318000.

ZONE - 15

REGION SIZE (METERS)

EAST-WEST - 22000.

NORTH-SOUTH - 22000.

POPULATION YEAR - 1978

51 STATES FOUND ON POPULATION-FILE INDEX.

3141 COUNTIES.

232567 BG/ED'S.

1000 BG/ED'S PER PAGE IN POPFILE.

121 BG/ED-S WITH A TOTAL POPULATION OF 87877 EXTRACTED FROM COUNTY 20091

227 BG/ED-S WITH A TOTAL POPULATION OF 167503 EXTRACTED FROM COUNTY 20209

30 BG/ED-S WITH A TOTAL POPULATION OF 24436 EXTRACTED FROM COUNTY 29047

244 BG/ED-S WITH A TOTAL POPULATION OF 179433 EXTRACTED FROM COUNTY 29095

11 BG/ED-S WITH A TOTAL POPULATION OF 8658 EXTRACTED FROM COUNTY 29165

633 BG/ED-S WITH A TOTAL POPULATION OF 467907 EXTRACTED

REGION - 69

REGION ORIGIN (UTM COORDINATES/METERS)

EASTING -	350000.
NORTHING -	4318000.
ZONE -	15

REGION SIZE (METERS)

EAST-WEST -	16000.
NORTH-SOUTH -	22000.

1

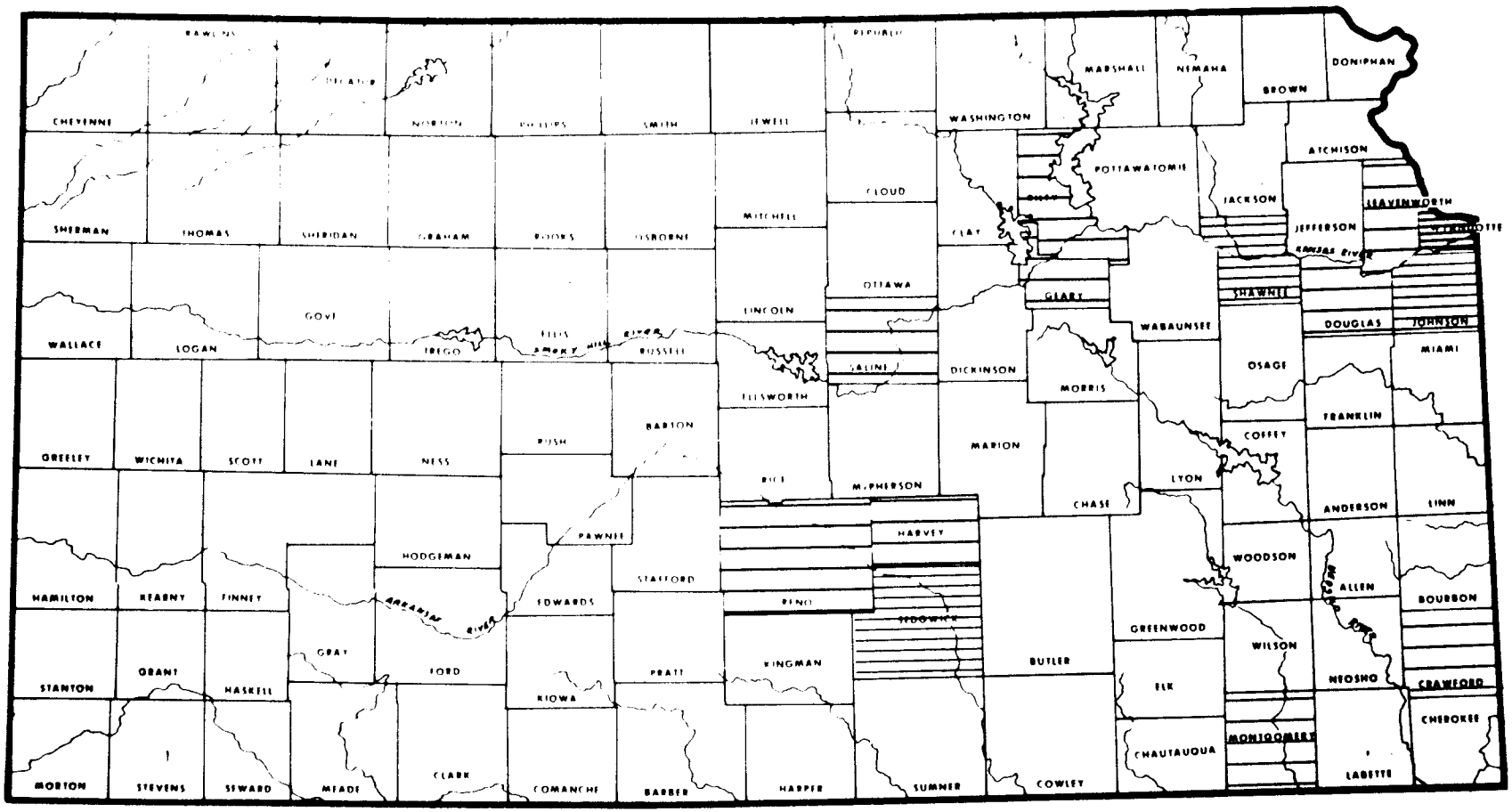
98

POPULATION YEAR - 1978

51 STATES FOUND ON POPULATION-FILE INDEX.
3141 COUNTIES.
232567 BG/ED'S.
1000 BG/ED'S PER PAGE IN POPFILE.

114	BG/ED-S WITH A TOTAL POPULATION OF	84399	EXTRACTED FROM COUNTY 20091
201	BG/ED-S WITH A TOTAL POPULATION OF	142265	EXTRACTED FROM COUNTY 20209
30	BG/ED-S WITH A TOTAL POPULATION OF	24436	EXTRACTED FROM COUNTY 29047
244	BG/ED-S WITH A TOTAL POPULATION OF	179433	EXTRACTED FROM COUNTY 29095
10	BG/ED-S WITH A TOTAL POPULATION OF	8568	EXTRACTED FROM COUNTY 29183

Population Density (People/mi²)



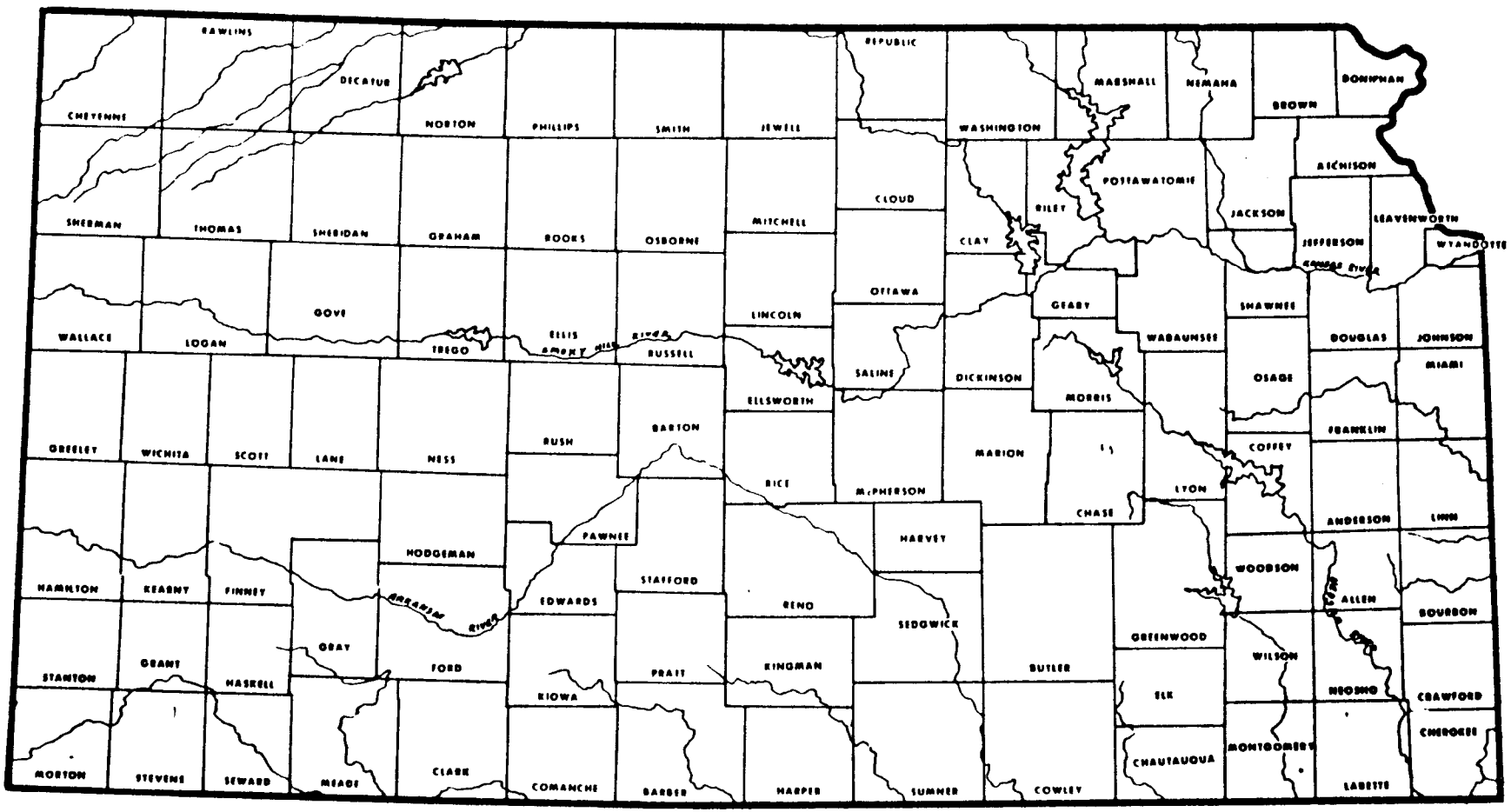

RAWLINS
CHEYENNE
DECATUR
NORTON
PHILLIPS
SMITH
JEWELL
REPUBLIC
WASHINGTON
MARSHALL
NEMAHA
BROWN
DONIPHAN
ATCHISON
SHERMAN
THOMAS
SHERIDAN
GRAHAM
ROOKS
OSBORNE
MITCHELL
CLOUD
POTTAWATOMIE
RILEY
JACKSON
LEAVENWORTH
JEFFERSON
WYANDOTTE
CLAY
OTTAWA
WALLACE
LOGAN
GOVE
TREGO
ELLIS
RUSSELL
LINCOLN
GEARY
WABAUNSEE
SHAWNEE
DOUGLAS
JOHNSON
SALINE
DICKINSON
OSAGE
MIAMI
ELLSWORTH
MORRIS
GREELEY
WICHITA
SCOTT
LANE
NESS
RUSH
BARTON
MARION
FRANKLIN
COFFEY
RICE
McPHERSON
CHASE
LYON
HAMILTON
KEARNY
FINNEY
HODGEMAN
PAWNEE
HARVEY
ANDERSON
LINN
WOODSON
STAFFORD
EDWARDS
RENO
ALLEN
BOURBON
SEDGWICK
GREENWOOD
STANTON
GRANT
HASKELL
GRAY
FORD
PRATT
KINGMAN
BUTLER
WILSON
NEOSHO
CRAWFORD
ELK
MORTON
STEVENS
SEWARD
MEADE
CLARK
KIOWA
COMANCHE
BARBER
HARPER
SUMNER
COWLEY
CHAUTAUQUA
MONTGOMERY
LABETTE
CHEROKEE

TABLE 2

LEGEND FOR AMBIENT MONITORING DATA MAPS

Boundaries

- Primary Nonattainment Area
- Secondary Nonattainment Area
- Unclassified Area

Monitor Symbol Colors and Flag

- No Violation of Standard
- Violation of Secondary Standard
- Violation of Primary Standard
- Exceedance of Alert Level

Annotation for Standards Violated

- A — Annual Primary Standard
- Q — Quarterly Primary Standard
- 24 — 24-hour Primary Standard
- 24 — 24-hour Secondary Standard
- 8 — 8-hour Primary Standard
- 3 — 3-hour Secondary Standard
- 1 — 1-hour Primary Standard

Annotation for Trends

- ↑ Increasing Trend
- ∧ Probable Increasing Trend
- — No Trend
- ∇ Probable Decreasing Trend
- ↓ Decreasing Trend

(Where two trend symbols are shown, the first is for long-term averages, the second for 24-hour observations.)

Monitor Symbol Sizes

- Microscale
- Middle Scale
- Neighborhood Scale
- Urban Scale
- Regional Scale

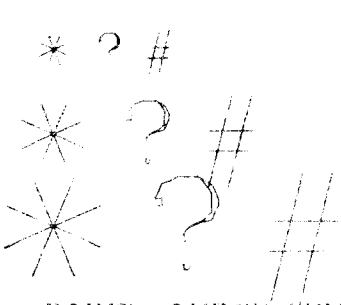
Data Completeness

- Data met completeness criteria each year.
- Data did not meet completeness criteria one or more years.

TABLE 3

LEGEND FOR EMISSIONS DATA MAPS

POINT SOURCE SYMBOL SIZE – EMISSIONS (TONS/YEAR)



	NON-LEAD	LEAD
	100 - 1000	5 - 25
	1001 - 5000	26 - 100
	OVER 5000	OVER 100

POINT SOURCE SYMBOL COLOR – STACK HEIGHT (METERS)

	UNKNOWN
	1 - 45
	46 - 120
	121 - 250

AMBIENT MONITOR SYMBOLS

	NAMS
	SLAMS
	SPMS