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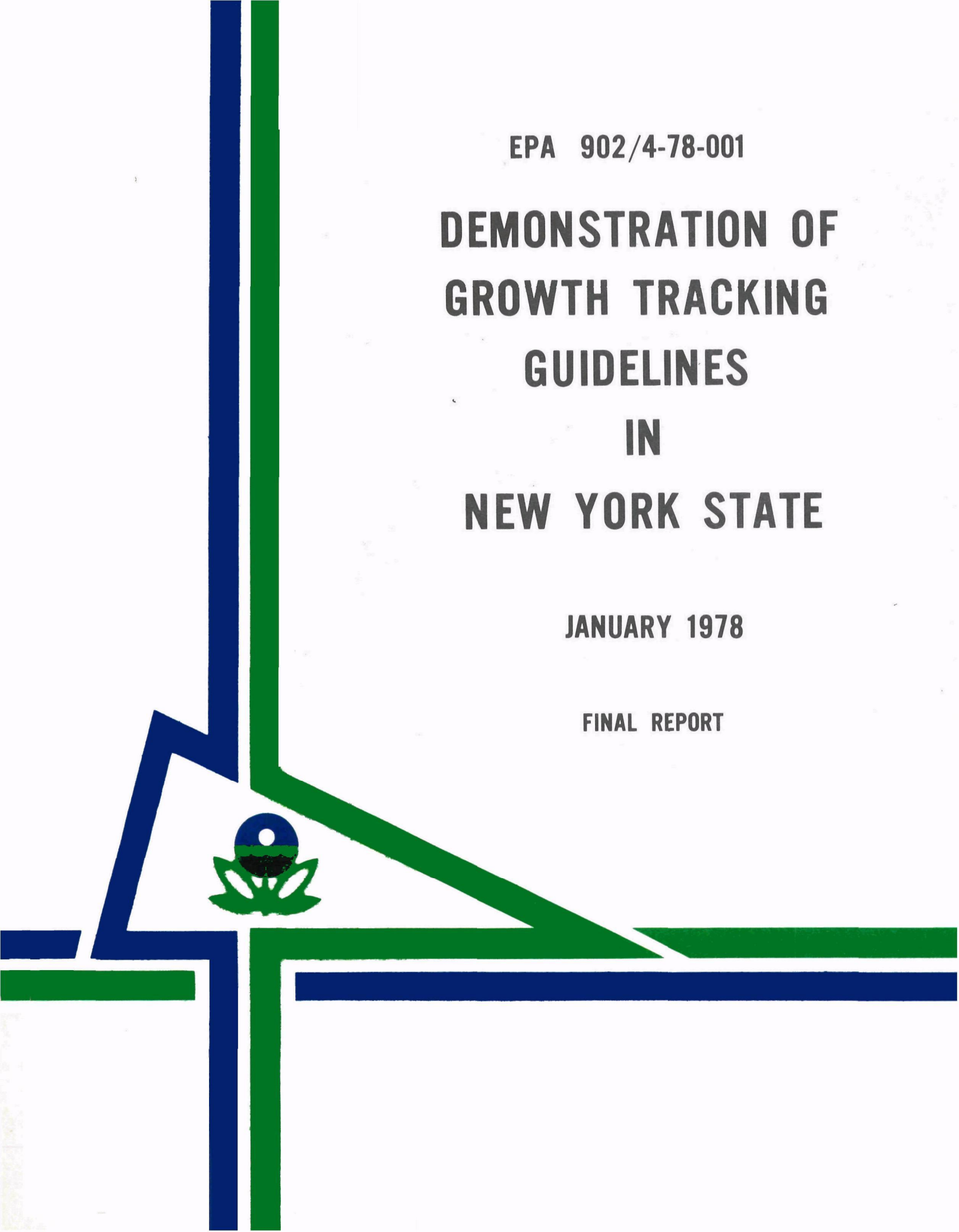
# DEMONSTRATION OF GROWTH TRACKING GUIDELINES IN NEW YORK STATE

JANUARY 1978

FINAL REPORT



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FINAL REPORT

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## A B S T R A C T

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## SUMMARY AND CONCLUSIONS

The development of guidelines for growth tracking to assess potential violations of national ambient air quality standards is an admittedly difficult task. To be of value, the guidelines should be uncomplicated, require a relatively small amount of manpower, and yet be capable of identifying areas of potential violations for more detailed analysis.

The guidelines developed by the GCA Corporation are essentially a condensation of the established EPA methods for projecting emissions and air quality, although new approaches are provided in a few instances. The emphasis is on making use of those growth factors that, hopefully, will be easy to obtain and will be indicative of actual emissions increases. Some sections, however, do not appear to work as well as others.

An initial problem is the text of the guidelines itself. The guidelines are often difficult to follow; if readability were improved, possible confusion could be avoided. Also, the treatment of the material presented is somewhat uneven. For example, Appendix B, Sources of Data, and Appendix C, Geographic Information Systems, may well be superfluous for the typical guideline user. However, Appendix A, Screening Methods for Projecting Emissions and Air Quality, is quite brief although it is a key part of the guideline procedures. Additional information, such as discussion of the choice of constants for the simplified form of the Hanna-Gifford model for annual average concentrations, would be useful.

General comments that pertain to the instructions for each of the category groupings are as follows:

Category 1 includes counties or air quality control regions (AQCRs) that do not have monitoring and have not had any analysis of projected air quality for a specified pollutant. These instructions are generally the weakest part of the guidelines. Since there is no monitoring information available, there is an attempt to establish a basis for comparison for future years. For particulate matter and sulfur oxides, the Hanna-Gifford model is used dependent upon the development of an error-prone theoretical maximum emission density. For oxidants, the basis is gasoline sales, and/or vehicle miles traveled; for nitrogen oxides, a statistical analysis of possible violation sites based upon population and population density. Except for the case of nitrogen oxides, these methods do not appear to work very well.

Category 2 includes counties or AQCRs that do have monitoring, but have not had any analysis of projected air quality for a specified pollutant. In contrast, the guidelines for this category are quite efficient. A form of the proportional roll-forward model is used with an appropriate growth indicator as the proportional factor. Once the data is compiled, this method can be completed very quickly.

Category 3 includes counties or AQCRs that have been subjected to a condensed level of analysis, i.e., equivalent to an Air Quality Maintenance Area (AQMA) designation analysis. These instructions are the most difficult to follow, particularly those under Step 1(a). It is recommended that the instructions be simplified so that if either current estimates of growth

indicators or new projections are greater than previous estimates or projections respectively, air quality must be modelled per Appendix A.

Category 4 includes counties or AQCRs that have undergone a detailed level of analysis of projected air quality in accordance with Subpart D, 40CFR51. These guidelines were precluded from a direct test in this demonstration due to the fact that the initial Subpart D analyses have not been completed at this time. However, the procedure is quite similar to that used in Category 3. It is recommended that these guidelines be used with one important modification. When it is necessary to revise a Subpart D analysis, it is questionable whether a simple substitution of new growth projections will always be adequate. Growth in an area will not necessarily be concentrated at the same locations; shifts of population and other related activities within an area are common as well. The results of Subpart D analyses completed thus far indicates, for example, that transportation sources could be the crucial factor in the control of total suspended particulates. Thus, to obtain an accurate picture of air quality, at some point in the future it will be necessary to reallocate emissions rather than just substitute new growth projections. This could be a significant effort depending upon the particular circumstances. It is suggested, therefore, that since the federal regulations specify five year analysis intervals, the validity of a well prepared Subpart D analysis be assumed for the five year period with a minimal annual review. In this way, states could schedule and prepare for a more comprehensive updating of Subpart D analyses.

More specific comments resulting from implementation of the instructions for the first three guideline categories are presented in the body of this report. All of the guidelines, however, share one other fault that should be mentioned here. Often the initial step in the analysis is a comparison of either current year estimates versus previous projections or of new versus previous long-term growth rates. According to the guidelines, an unanticipated increase of any magnitude warrants further analysis regardless of its significance to the county's air quality status. Thus, Clinton County (per Table 4, current population estimate of 85,100 versus a previous projection of 85,000) and Herkimer County (per Table 7, a new ten year population growth rate of 1.03 versus the previous 1.00) were subjected to further analysis. It is recommended, therefore, that the guidelines allow the user to terminate analysis where new growth is so obviously not a meaningful factor in relation to future air quality. The requirement for analysis at five year intervals, regardless of growth, should be an adequate safeguard.

Two additional major areas of concern involve oxidants and carbon monoxide. In the case of oxidants, New York State, and many other states, are likely to be designated as non-attainment areas. It is obvious that the phenomenon of oxidant formation is yet to be described by a single model and successfully counteracted by control strategies. The variations in the approaches of the growth tracking methods that are presented only serve to emphasize the difficulties of the oxidant problem. It is recommended, therefore, that growth tracking for oxidants be delayed.

A special situation developed for carbon monoxide. Since no area of the state had undergone detailed analysis, it was agreed to consider the use of the separate GCA hot spot screening techniques. The complete drafts of these guidelines were not available until late in the project; thus, they were subjected to a review without the benefit of testing. The hot spot screening guidelines are well prepared and quite detailed. Their purpose appears to be directed toward design correction of problem sites. To obtain quantitative estimates of carbon monoxide levels, the first and second steps would have to be performed. This becomes a rather open ended activity as an unlimited amount of time could be spent analyzing sites. The hot spot screening techniques could be an invaluable aid for special studies, but probably should remain only an option for growth tracking purposes.

A final consideration of growth tracking is the manpower required to complete an annual review. Each annual review could, of course, differ considerably according to the extent of analysis required. However, it is estimated that if the analysis as presented in the following pages had been performed as a routine exercise, approximately four man-weeks would have been required. A breakdown of the time required for each guideline category is provided in Table 1.

## CATEGORIZATION OF COUNTIES

The initial step in the demonstration of the GCA growth tracking guidelines is the categorization of the State's counties. For particulate matter, sulfur oxides, and nitrogen oxides, counties are grouped in one of four categories depending upon the existence of permanent monitoring and the extent of previously completed air quality and growth analyses. Similarly, for oxidants, Air Quality Control Regions (AQCR's) are grouped according to the same criteria. Carbon monoxide, however, is treated differently, with the emphasis on detecting localized violations.

Figure 1 shows the Air Quality Maintenance Areas (AQMA's) that have been identified by New York State and the Administrator of the US EPA as having the potential to exceed specified air quality standards within ten years. The Areas, and the pollutants of concern, are as follows:

| | |
|---|---|
| Binghamton | Particulate matter |
| New York City Metropolitan | Particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide and photochemical oxidants |
| Niagara Frontier | Particulate matter and sulfur dioxide |
| Utica-Rome | Particulate matter |
| Elmira-Corning | Particulate matter |
| Rochester | Particulate matter |
| Jamestown | Particulate matter |
| Syracuse | Particulate matter |
| Capital District | Particulate matter and sulfur dioxide |
| Mid-Hudson | Particulate matter |

According to the GCA guidelines, all of the counties in these AQMA's should be placed in Category 4 (except for carbon monoxide which does not apply) for the pollutant that is listed. However, since a Subpart D analysis has not yet been completed for any of these counties, it was decided to consider them as Category 3 counties. It should be noted also that for some of the counties, only a portion of their land area is in a designated AQMA. However, it was felt that since these areas represent a significant concentration of activity, the counties should be placed in the higher category.

Figure 2 depicts the State's eight AQCR's. The final version of the GCA guidelines changed the analysis area for oxidants from the county to the AQCR in consideration of the more widespread nature of this pollutant. Thus, the categorization changed considerably. If just one county within an AQCR has permanent monitoring, then the AQCR must be designated as Category 2. As a result, only the Southern Tier West is designated as Category 1 and the Metropolitan as Category 3; the remaining six AQCR's are in Category 2.

Table 2 indicates those counties in the State that have permanent monitoring for particulate matter, sulfur dioxide, oxidants and nitrogen dioxide. In conjunction with the considerations presented above, the categorization of the counties is given in Table 3 for these four pollutants. Not shown is a categorization for carbon monoxide since all counties are considered to be without detailed analysis.

## PARTICULATE MATTER AND SULFUR OXIDES

All of the guidelines, except for Category 4, were revised in the final report. Categories 1, 2 and 3 were modified to provide alternate instructions dependent upon the availability of new projections. In addition, Categories 1 and 2 now require that ten-year projections be completed in the first year of analysis so that there will be a basis for comparison in future years.

The analysis was updated to the extent possible to reflect those changes. However, one additional county in Category 3 and twenty-one additional counties in Category 1 would now be required to undergo further analysis. Since this would require considerable time and would not significantly influence the testing of the guidelines, it was decided to omit all but one of these counties from further analysis. At the request of the U.S. Environmental Protection Agency, Sullivan County, the only county classified in Category 1 for particulate matter, was also reviewed.

Category 1 - No monitoring and no previous analysis.

This category includes thirty counties for sulfur dioxide and one additional county for both particulate matter and sulfur dioxide.

The guideline instructions now direct the user to Step 2 to prepare a worst case ten-year projection in the first year of analysis. Step 1, in the following years, will depend upon comparisons with the growth factors and forecasts of that initial analysis. Since, as noted above, time did not allow for the analysis of all thirty-one counties, results are given only for the ten counties that were previously singled out by the draft final report version of the guidelines and the specially selected Sullivan County. Table 4 illustrates the procedure that was used to determine the ten counties that appear to require further analysis for sulfur dioxide.

According to the instructions of Step 2, an emission inventory was prepared and projected to 1986 for each of the counties. The inventories were based upon the 1975 fuel use survey and the NYC Department of Transportation projections of vehicle miles traveled.

The next task was the determination of a theoretical maximum emission density, obtained by dividing the county emissions by the "settled" area of each county. A problem developed here in determining the amount of land area that could be considered urbanized or developed enough so that it would be truly representative as a receptor of maximum emissions in a county. Obviously, incorporated areas such as cities and villages could be expected to be densely populated areas. Towns in New York State, however, are minor civil subdivisions often encompassing large land areas throughout which population density can vary greatly.

Eventually, four alternatives, i.e. combinations of part or all of the aggregate emissions and various definitions of settled areas were used to test each county's emissions growth potential. These were as follows:

1. Total emissions in county divided by the land area where population density exceeds 100 persons per square mile.

2. Amount of emissions proportional to the population living in the defined land area divided by the land area of cities and villages.

3. Amount of emissions proportional to the population living in the defined land area divided by the land area of cities, villages, and also those towns where population density exceeds 250 persons per square mile.

4. Total emissions in county divided by the land area of cities and villages.

The emission densities were then entered into the Hanna-Gifford model. A wind speed of 3.3 meters/second was used, representative of actual data for the Syracuse and Albany AQMA's. Also, a constant of 50 was selected for $SO_2$ and 91.7 for TSP from the USEPA Guidelines, Volume 12.

The results for four alternative maximum emissions densities are listed in Table 5. The projected air quality includes the background concentration and an estimate, for two counties, of the effect of existing power plants.

The significance of the guideline requirements are discussed further in the Discussion and Recommendations.

Category 2 - Monitoring, but no previous analysis.

This category includes seven counties for particulate matter and sulfur dioxide, twenty-two counties for particulate matter only, and eight counties for sulfur dioxide only. There is no record of either a condensed or detailed growth analysis, as described by the guidelines, for any of these counties.

Step 1 provides instructions that vary according to the availability of new projections; in either case, a comparison is made with a previous projection. Since that previous projection has never been made, it was necessary to proceed to the next step.

Step 2 employs the use of a modified form of the proportional roll-forward model. The highest annual average for TSP (geometric mean) and/or $SO_2$ (arithmetic mean) was determined from the monitoring records for each county for 1976. The ten-year growth factor used was the larger of either the population or employment forecasts. As before, the population forecasts were based upon NYS Economic Development

Board numbers. Employment projections were available in only six counties based upon unofficial NYS Department of Labor figures; all of the rest were extrapolated from estimates of actual 1970-76 employment.

Table 6 shows the growth rates and the actual and projected air quality levels. None of the counties would be within ten percent of the annual ambient standard.

For the short-term standard for TSP, a guideline value of 60 $\mu g/m^3$, annual geometric mean, was used to assess the 24-hour standard per 40 CFR 50.7(a). Only one county, Greene, appeared to have a potential problem. However, a check of the monitor site revealed that it is located in the hamlet of Cementon and is principally affected by a cement plant operation. A second monitoring site in the county recorded a value of 31 $\mu g/m^3$ and is considered to be a more accurate indicator of county-wide conditions. Using that figure, expected growth would not result in violations.

The value of checking for short-term standards in a growth tracking procedure is discussed further in the Discussion and Recommendations.

It should be noted that for two of the counties listed, Clinton and Franklin, lack of valid monitoring data precluded an analysis. However, if data from previous years were considered, expected growth would not generate future violations.

Category 3 - Monitoring with a previous limited analysis.

All of the remaining counties, sixteen for TSP and $SO_2$, and sixteen for TSP only, were classified in this category for the purpose of this demonstration.

The first step in the revised guidelines is now separated into two options, the choice dependent upon the availability of projections. Since "new" projections are available, Step 1(b), the comparison of growth projections, applied.

Table 7 shows the results of that comparison of current and previous ten-year projections for both population and non-agricultural employment (total employment projections being unavailable). For population, the growth factors based upon current NYS Economic Development Board projections are compared with those of the June, 1972 projection prepared by the NYS Office of Planning Services. For non-agricultural employment, the growth factors for major labor areas within AQCR's from the latest, although unofficial, study of the NYS Department of Labor are compared with projections made in July, 1971.

The result of the comparisons is that six of the counties should be subject to further analysis. One of these counties, Chautauqua, was not included in this group in accordance with the instructions of

the draft final report guidelines. Since its inclusion would require additional calculations and would not significantly affect the demonstration, it was omitted.

Step 2 requires projecting emissions ten years and modeling air quality using the procedure of Appendix A of the guidelines. Emissions were estimated based upon the 1975 point source inventory and the 1975 fuel-use survey, and then were updated (to 1976) and projected (to 1986). Transportation source emissions were based upon NYS Department of Transportation estimates of vehicle miles traveled. Also, total employment growth factors were developed through extrapolation of estimates of 1970-1976 employment.

The emissions estimate and projections, and the results of the air quality modeling are listed in Table 8. None of the counties appear to have the potential to exceed standards based on this procedure.

Discussion and Recommendations

The procedures for these categories present some difficulties which should be reviewed in greater detail.

Category 1 is possibly the biggest problem in that the results could be manipulated, and, even if not, could predict erroneously to either extreme. The eleven counties which were subjected to further analysis are a good cross-section for this study. They include primarily suburban, small city/rural, and primarily rural counties. Based on New York's experience with more heavily populated counties with much larger emission loads, and with an awareness of the anticipated growth rates, there is little likelihood that the annual standards would be violated. Yet, analysis can produce widely varying results.

The stumbling block is the development of a theoretical emission density which is dependent upon the estimation of the "settled area." (The development of the maximum emission density in any square mile area in a county would require a relatively great amount of time and effort). These counties vary considerably in population densities and in definable receptor areas, whether they are or are not incorporated. The methods chosen were an attempt to compensate for these differences so that a useful and consistent set of emission densities would be calculated. However, as Table 5 demonstrates, although there is plausibility for each of the methods used, the results are unpredictable.

The effect is that, despite careful consideration by the guideline user, there will always be uncertainty as to the value of projected air quality in this step of the analysis. Thus, unnecessary additional analysis may be required for one county, while a problem area may go undetected in another.

In Category 2, a problem arose in determining the potential for violations of the short-term standards. The Division of Air Resources objects to the use of a proportional roll-forward model for short-term standards. Therefore, in the demonstration, the EPA guideline value of 60 $\mu g/m^3$ annual geometric mean, was used to assess the 24-hour standard for TSP. The possibility was raised that a similar guideline value could be developed for $SO_2$. However, further discussion revealed that large point sources are most likely to influence short-term violations; this potential is controlled by other methods, i.e., diffusion analysis. Long-term violations reflect the impact of all the sources in the area and would properly be monitored through growth tracking. The conclusion, therefore, is that a short-term guideline for $SO_2$ is not necessary.

Category 3 presents a procedure that is, at least in part, unnecessarily complicated and confusing. If new ten year projections are available, and they indicate greater growth, then the guideline user is directed to project emissions and model air quality per Appendix A (Step 2). However, if new projections are unavailable, then sequential comparisons are made between current estimates of growth indicators and previous forecasts, and between current estimates of emissions loading and a linearly interpolated figure from the previous condensed analysis. If the previous values are exceeded, the guideline user is instructed to somehow assess the validity of final year forecasts; if they are no longer valid, he must proceed to Step 2.

The significance is that, in either case if higher growth has occurred or is anticipated, emissions loading must be determined. Once this is known, it is a relatively small task to update and project them using estimates of growth factors and, if new projections are unavailable, extrapolation. The result is that the guideline user will eventually calculate what he needs to know, a new estimate of final year air quality.

On this basis, it is recommended that if either current estimates of growth indicators or new projections appear to be significantly higher, then the guideline user should be directed to Step 2.

OXIDANTS

The final GCA guidelines, as noted previously, changed the area of analysis for oxidants from the county to the AQCR in consideration of the apparent non-localized nature of this pollutant problem. This necessitated a transfer of 35 counties from Category 1 to 2 as they are located within an AQCR with monitoring.

In addition, specific instructions for each category were revised; the analysis was updated to the extent possible to reflect those changes.

Category 1 - No monitoring and no previous analysis.

One AQCR, the Southern Tier West, is classified in this category at this time.

The initial instruction now directs the guideline user to Step 3 if a recently prepared ten-year projection of AQCR vehicle miles traveled (VMT) is readily available. Since VMT projections for counties are available from the NYS Department of Transportation, Step 3 was easily completed. The result, shown in Table 9, is that the projected 1986 VMT/square mile figure for the Southern Tier West is far below the critical level presented in the guidelines table. Thus, it is concluded from this step that the AQCR does not have a potential oxidant problem and further analysis is not necessary.

Category 2 - Monitoring, but no previous analysis.

The Hudson Valley, Northern, Central, Southern Tier East, Genesee Finger Lakes, and Niagara Frontier AQCR's are now listed in this category. Of the total 46 counties, monitoring is conducted in 11 counties and provides the representative data for this analysis.

Step 1 requires an estimate of gasoline sales in the AQCR to determine if positive growth has occurred. Since statewide sales of gasoline have increased each year since 1974, it was assumed that positive growth had probably occurred in each of the AQCR's.

Step 2 involves the possible use of two models provided by the guidelines. The first is a proportional model; it is to be used for projecting future air quality when an AQCR is currently in compliance. In this instance, the alternate model, "projected emission reduction," was used since all of the six AQCR's are currently in violation. The factor P, the proportion of hydrocarbon emissions from light-duty mobile sources, had previously been calculated for the 11 counties with monitoring sites, using VMT estimates, unedited point source inventories, and the 1975 fuel use survey. Time did not permit a complete recalculation, so these results were used to determine a representative P for each AQCR. As is now suggested, in Step 2, a growth factor based upon VMT, rather than on population, was developed for each AQCR. Finally, a value of ER equal to 0.20 was taken from Appendix A of the guidelines.

Table 10 lists the growth and hydrocarbon emissions factors, the 1976 air quality (second highest concentration), the projected emission reduction and the emission reduction required according to Appendix J. Only one of the AQCR's, the Niagara Frontier, appears to have a projected emission reduction less than what is required.

The analysis was concluded at this point, but is dealt with in greater detail in the Discussion and Recommendations.

Category 3 - Monitoring with a previous limited analysis.

The remaining AQCR, the New York City Metropolitan, is classified in this category for the purpose of this demonstration.

The first step in the revised guidelines is now separated into two options; the choice dependent upon the availability of projections. Since "new" projections are available, it was decided to apply Step 1(b).

Table 11 shows the analysis for both population and non-agricultural employment. For population, the growth factor based on the current NYS Economic Development Board projections is compared with that of the June, 1972 projections prepared by the NYS Office of Planning Services. For non-agricultural employment in the major labor areas within the AQCR, the latest, although unofficial, annual average growth rates prepared by the NYS Department of Labor are compared with the previous projections of July, 1971.

In both cases, the new growth rate is seen to be less than that anticipated at the time of maintenance area designation. Thus, a previously prepared analysis of projected air quality would still be considered valid.

Discussion and Recommendations

In reviewing the guidelines for oxidants, several considerations have been kept in mind. The first is that New York considers the entire state to be a non-attainment area for this pollutant. Further, the Division of Air Resources, among others, has expressed its dissatisfaction with current methodology (including Appendix J), and is representing the state in the joint efforts of the Moodus Committee to determine a reasonable control strategy. Finally, the experience of ambient air quality monitoring over several years shows that despite positive or negative growth and the increase in hydrocarbon controls, i.e., through normal replacement of motor vehicles, oxidant peaks have not changed significantly.

The guidelines attempt to assess the future oxidant problem on the established basis of estimated hydrocarbons emissions, projected growth rates, and the anticipated hydrocarbons reduction due to new motor vehicle emissions controls.

Category 1 uses a Hanna-Gifford model assuming no atmospheric transformation of hydrocarbons to determine critical levels of gasoline sales, vehicles miles traveled, and emissions loading. According to this specialized procedure, an AQCR suspected of non-compliance is shown to be of little cause for concern.

Category 2 offers two models. The first is a form of the proportional method which should not be applied to project future oxidant air quality according to the USEPA's own criteria. The second method, used in the demonstration because of existing noncompliance, predicts an emissions reduction for comparison with a yet unseen revision of the aforementioned Appendix J. While the accuracy of the hydrocarbon proportion factor P may be challenged as high (the point source inventories are completely unedited and probably incomplete - however, space heating sources are included despite the seasonal aspects of oxidant violations), the results, using the current Appendix J, show only one AQCR with real difficulty in meeting the standard.

Similarly, the analyses for Categories 3 and 4 would ultimately be dependent upon Appendix J or its replacement methodology.

Obviously, the oxidant problem is one of the most complex of the air pollution problems today. There are many remaining questions concerning photochemical reactions between hydrocarbons and nitrogen oxides, reactivity of types of emitted hydrocarbons, meteorological conditions, natural concentrations of oxidants, and long range transport of oxidants. No simple model will account for all of these factors. Appendix J has not been an acceptable model and it is uncertain how much of an improvement the promised revised version of Appendix J would provide. Thus, the value of implementing the guidelines even as the roughest of approximations is highly questionable. It is recommended, therefore, that their use be postponed.

NITROGEN OXIDES

All of the guidelines, except for Category 4, were revised in the final report. For Category 1, population and population density numbers were provided as a result of GCA's statistical analysis. For Category 2, the model for projecting air quality was modified to include the growth effect of electric utility emissions and vehicle miles traveled. Both Category 2 and 3 were modified to accommodate the availability of new projections.

The analysis was updated completely to include the additions and revisions.

Category 1 - No monitoring and no previous analysis.

There are 43 counties which currently are not monitored for nitrogen oxides and have not undergone any analysis of projected emissions growth.

Step 1 requires that ten-year projections of population be obtained. If either the population exceeds 800,000, or the population density exceeds 1250 persons per square mile (revised from 140 according to M. Burke letter of December 22, 1977), then ambient air quality monitoring should be initiated in that county.

Table 12 shows the results of this analysis. None of the 43 counties will exceed the threshold values for population or population density by 1986. Thus, none would require monitoring.

Category 2 - Monitoring, but with no previous analysis.

Ten counties have permanent monitoring for nitrogen oxides but have never undergone condensed or detailed growth analysis as described by the guidelines.

Step 1 offers the guideline user two options to follow depending upon the availability of new projections. Since the described guideline analysis had never been performed, comparisons could not be made and it was necessary to proceed to Step 2.

Step 2 now offers a model that includes a factor G, the projected emissions growth, based upon the projected increase in electric utility emissions and the projected increase in vehicle miles traveled. Table 13 shows the results of the application of this model. Four of the counties have electric utility facilities located in their jurisdictions, but, according to the 1977 Report of Member Electric Systems of the New York Power Pool and the Empire State Electric Energy Research Corporation, will not have increased capacity (therefore, emissions) in the next ten years. The growth in vehicle miles traveled for all counties is greater than the anticipated growth in population for the same time period.

Using the proportional model with the highest annual nitrogen dioxide average recorded in a county, and assuming a background concentration of 20 $\mu g/m^3$, it was found that all of the counties in this category had projected concentrations well below the $NO_2$ standard.

Category 3 - Monitoring with a previous limited analysis.

The remaining nine counties were classified in this category for the purpose of this demonstration.

Once again, the first step in the revised guidelines is now separated into two options; the choice dependent upon the availability of projections. Since "new" projections are available, Step 1(b), the comparison of growth projections, applied.

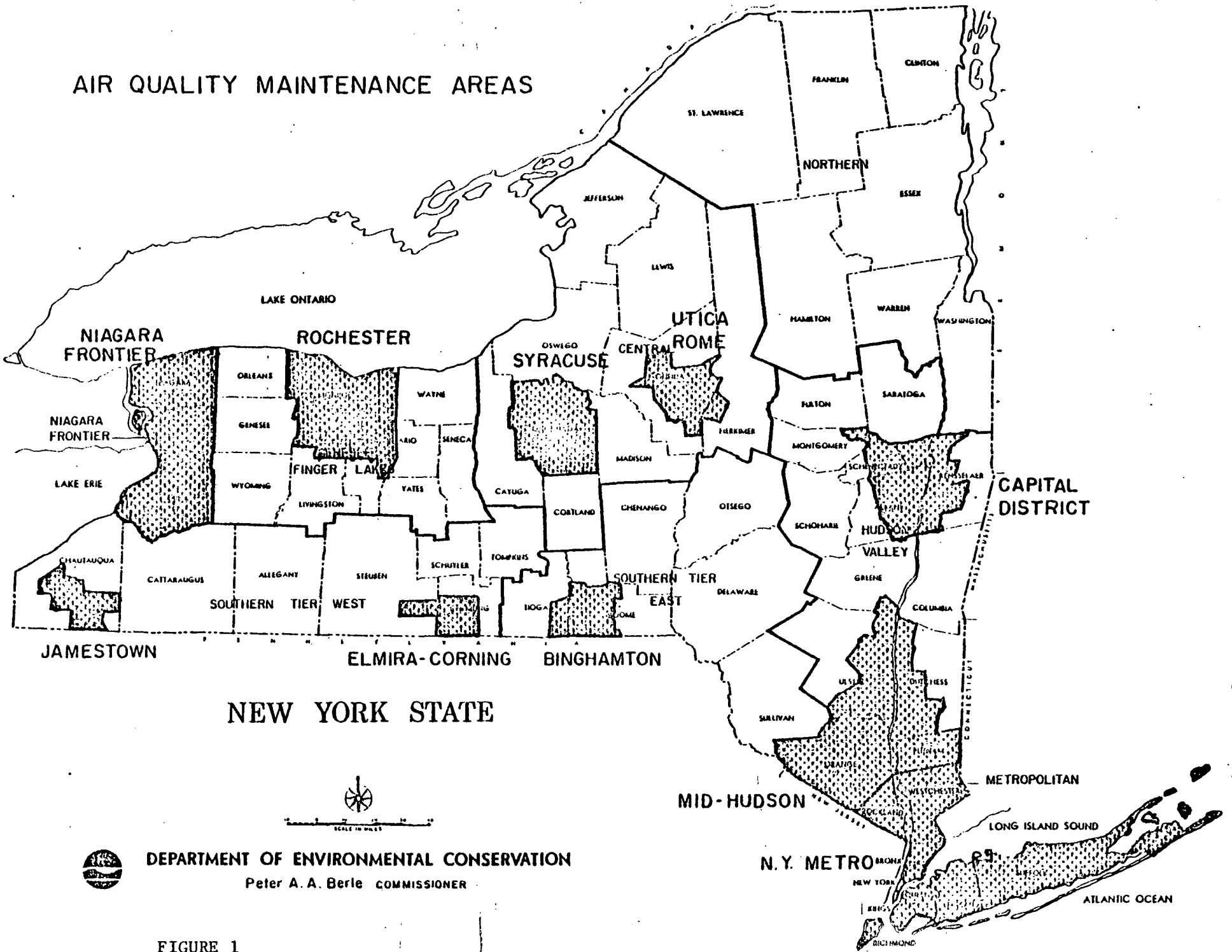
Table 14 shows the results of comparing the most recent growth projections for population and non-agricultural employment with those that were available at the time of the designation analysis. Projections for electric utility emissions were not compared because a previous projection was not available.

The comparison demonstrates that, for all nine counties, the new growth rates are less than what was previously anticipated. Therefore, the projected air quality of a condensed analysis would still be adequate.

Discussion and Recommendations

General comments previously given on the procedure for Categories 3 and 4 would, of course, apply to this section as well. There is only one additional comment and that pertains to Category 2.

The proportional model of Category 2 has been improved by the addition of a growth factor formula that accounts for the major emissions contributions from electric utility facilities and motor vehicles. One flaw should be corrected, however. The $Q_p/Q_c$ factor works only if a county has an existing electric utility facility. However, if a new facility is to be located in a county where there currently is no such facility, the factor is useless as $Q_p/0$ equals infinity.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ROCHESTER
SYRACUSE
UTICA ROME
CENTRAL
NORTHERN
CAPITAL DISTRICT
HUDSON VALLEY
MID-HUDSON
METROPOLITAN
N.Y. METRO
SOUTHERN TIER WEST
SOUTHERN TIER EAST
FINGER LAKES
JAMESTOWN
ELMIRA-CORNING
BINGHAMTON
LAKE ONTARIO
LAKE ERIE
LONG ISLAND SOUND
ATLANTIC OCEAN
NEW YORK STATE
ST. LAWRENCE
FRANKLIN
CLINTON
ESSEX
JEFFERSON
LEWIS
HAMILTON
WARREN
WASHINGTON
OSWEGO
ORLEANS
GENESEE
WAYNE
WYOMING
LIVINGSTON
ONTARIO
SENECA
YATES
CAYUGA
MADISON
HERKIMER
FULTON
SARATOGA
MONTGOMERY
SCHENECTADY
RENSSELAER
CORTLAND
CHENANGO
OTSEGO
SCHOHARIE
GREENE
COLUMBIA
DELAWARE
TOMPKINS
SCHUYLER
CHAUTAUQUA
CATTARAUGUS
ALLEGANY
STEUBEN
SULLIVAN
ORANGE
ROCKLAND
WESTCHESTER
DUTCHESS
ULSTER
CONNECTICUT
MASSACHUSETTS
NEW JERSEY
NEW YORK
BRONX
KINGS
RICHMOND
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Peter A. A. Berle COMMISSIONER

FIGURE 1

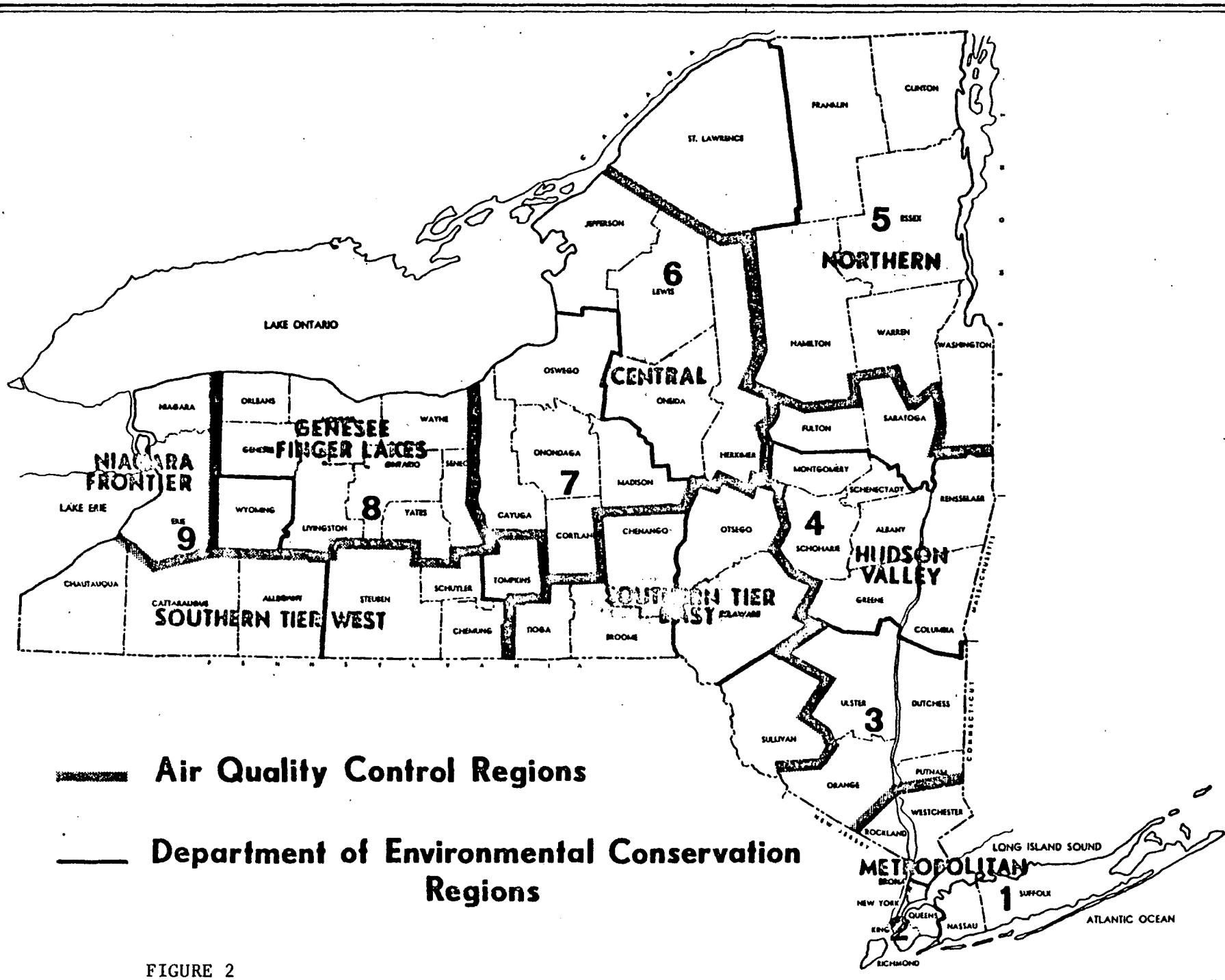
LAKE ONTARIO
LAKE ERIE
ST. LAWRENCE
FRANKLIN
CLINTON
JEFFERSON
LEWIS
ESSEX
NORTHERN
HAMILTON
WARREN
WASHINGTON
OSWEGO
CENTRAL
ONEIDA
FULTON
SARATOGA
NIAGARA
ORLEANS
GENESEE
WAYNE
FINGER LAKES
GENESEE
ONTARIO
SENECA
ONONDAGA
HERKIMER
MONTGOMERY
SCHENECTADY
RENSSELAER
FRONTIER
ERIE
WYOMING
LIVINGSTON
YATES
CAYUGA
MADISON
CORTLAND
CHENANGO
OTSEGO
SCHOHARIE
ALBANY
HUDSON
VALLEY
CHAUTAUQUA
CATTARAUGUS
ALLEGHANY
STEUBEN
SCHUYLER
TOMPKINS
CHEMUNG
TIOGA
BROOME
SOUTHERN TIER WEST
SOUTHERN TIER EAST
GREENE
COLUMBIA
ULSTER
DUTCHESS
SULLIVAN
ORANGE
PUTNAM
WESTCHESTER
ROCKLAND
LONG ISLAND SOUND
METROPOLITAN
NEW YORK
BRONX
KING
QUEENS
NASSAU
SUFFOLK
ATLANTIC OCEAN
RICHMOND
Air Quality Control Regions
Department of Environmental Conservation Regions

FIGURE 2

TABLE 1

MANPOWER REQUIREMENTS

| Activity | Man-Days |
|---|---|
| Data collection and review; categorization of counties; review of monitoring sites and air quality data | 6 |
| Growth analysis for TSP and $SO_2$: | |
| Category 1 | 3 |
| Category 2 | 2 |
| Category 3 | 3 |
| Growth analysis for $O_x$: | |
| Category 1 | 0.2 |
| Category 2 | 2 |
| Category 3 | 0.2 |
| Growth analysis for $NO_2$: | |
| Category 1 | 0.2 |
| Category 2 | 1 |
| Category 3 | 0.2 |
| Calculations check; report preparation | 2 |
| T O T A L approximately | 20 |

TABLE 2

COUNTIES WITH PERMANENT MONITORING

| County | TSP | $SO_2$ | $O_x$ | $NO_2$ |
|---|---|---|---|---|
| Albany | X | X | | X |
| Allegany | X | | | |
| Bronx | X | X | X | X |
| Broome | X | X | X | |
| Cattaraugus | X | | | |
| Cayuga | X | X | | |
| Chautauqua | X | X | | |
| Chemung | X | X | | |
| Chenango | X | | | |
| Clinton | X | | | |
| Columbia | X | X | | |
| Cortland | X | | | |
| Delaware | X | | | |
| Dutchess | X | X | | |
| Erie | X | X | X | X |
| Essex | X | X | X | |
| Franklin | X | | | |
| Fulton | X | | | |
| Genesee | X | X | | |
| Greene | X | | | |
| Hamilton | X | | | |
| Herkimer | X | | | |
| Jefferson | X | | | |
| Kings | X | X | X | X |
| Lewis | X | | | |
| Livingston | X | | | |
| Madison | X | | | |
| Monroe | X | X | X | X |
| Montgomery | X | | | |
| Nassau | X | X | X | X |
| New York | X | X | X | X |
| Niagara | X | X | X | X |
| Oneida | X | X | X | X |
| Onondaga | X | X | X | X |
| Ontario | X | | | |
| Orange | X | | | |
| Orleans | X | | | |
| Oswego | X | X | | |
| Otsego | X | | | |
| Putnam | X | | | |
| Queens | X | X | X | X |
| Rensselaer | X | X | X | X |

TABLE 2 (Continued)

COUNTIES WITH PERMANENT MONITORING

| County | TSP | $SO_2$ | $O_x$ | $NO_2$ |
|---|---|---|---|---|
| Richmond | X | X | (1) | (1) |
| Rockland | X | X | | |
| St. Lawrence | X | | | |
| Saratoga | X | | | |
| Schenectady | X | X | X | X |
| Schoharie | X | | | |
| Schuyler | X | | | |
| Seneca | X | | | |
| Steuben | X | | | |
| Suffolk | X | X | X | |
| Sullivan | (1) | | | |
| Tioga | X | | | |
| Tompkins | X | | | |
| Ulster | X | X | X | X |
| Warren | X | X | X | X |
| Washington | X | | | |
| Wayne | X | | | |
| Westchester | X | X | X | X |
| Wyoming | X | X | | |
| Yates | X | | | |

(1) Monitoring to begin during 1977

TABLE 3

CATEGORIZATION OF COUNTIES

FOR

GROWTH TRACKING ANALYSIS

| | POLLUTANT | | | |
|---|---|---|---|---|
| County | TSP | $SO_2$ | $O_x$ | $NO_2$ |
| Albany | 3 | 3 | 2 | 2 |
| Allegany | 2 | 1 | 1 | 1 |
| Bronx | 3 | 3 | 3 | 3 |
| Broome | 3 | 2 | 2 | 1 |
| Cattaraugus | 2 | 1 | 1 | 1 |
| Cayuga | 2 | 2 | 2 | 1 |
| Chautauqua | 3 | 2 | 1 | 1 |
| Chemung | 3 | 2 | 1 | 1 |
| Chenango | 2 | 1 | 2 | 1 |
| Clinton | 2 | 1 | 2 | 1 |
| Columbia | 2 | 2 | 2 | 1 |
| Cortland | 2 | 1 | 2 | 1 |
| Delaware | 2 | 1 | 2 | 1 |
| Dutchess | 3 | 2 | 2 | 1 |
| Erie | 3 | 3 | 2 | 2 |
| Essex | 2 | 2 | 2 | 1 |
| Franklin | 2 | 1 | 2 | 1 |
| Fulton | 2 | 1 | 2 | 1 |
| Genesee | 2 | 2 | 2 | 1 |
| Greene | 2 | 1 | 2 | 1 |
| Hamilton | 2 | 1 | 2 | 1 |
| Herkimer | 3 | 1 | 2 | 1 |
| Jefferson | 2 | 1 | 2 | 1 |
| Kings | 3 | 3 | 3 | 3 |
| Lewis | 2 | 1 | 2 | 1 |
| Livingston | 3 | 1 | 2 | 1 |
| Madison | 2 | 1 | 2 | 1 |
| Monroe | 3 | 2 | 2 | 2 |
| Montgomery | 3 | 3 | 2 | 1 |
| Nassau | 3 | 3 | 3 | 3 |
| New York | 3 | 3 | 3 | 3 |
| Niagara | 3 | 3 | 2 | 2 |
| Oneida | 3 | 2 | 2 | 2 |
| Onondaga | 3 | 2 | 2 | 2 |
| Ontario | 3 | 1 | 2 | 1 |
| Orange | 3 | 1 | 2 | 1 |
| Orleans | 2 | 1 | 2 | 1 |
| Oswego | 2 | 2 | 2 | 1 |
| Otsego | 2 | 1 | 2 | 1 |
| Putnam | 3 | 1 | 2 | 1 |
| Queens | 3 | 3 | 3 | 3 |
| Rensselaer | 3 | 3 | 2 | 2 |
| Richmond | 3 | 3 | 3 | 3 |
| Rockland | 3 | 3 | 3 | 3 |

TABLE 3 (Continued)

CATEGORIZATION OF COUNTIES

FOR

GROWTH TRACKING ANALYSIS

| | POLLUTANT | | | |
|---|---|---|---|---|
| County | TSP | $SO_2$ | $O_x$ | $NO_2$ |
| St. Lawrence | 2 | 1 | 2 | 1 |
| Saratoga | 3 | 3 | 2 | 1 |
| Schenectady | 3 | 3 | 2 | 2 |
| Schoharie | 2 | 1 | 2 | 1 |
| Schuyler | 2 | 1 | 1 | 1 |
| Seneca | 2 | 1 | 2 | 1 |
| Steuben | 3 | 1 | 1 | 1 |
| Suffolk | 3 | 3 | 3 | 3 |
| Sullivan | 1 | 1 | 2 | 1 |
| Tioga | 3 | 1 | 2 | 1 |
| Tompkins | 2 | 1 | 1 | 1 |
| Ulster | 3 | 2 | 2 | 2 |
| Warren | 2 | 2 | 2 | 2 |
| Washington | 2 | 1 | 2 | 1 |
| Wayne | 3 | 1 | 2 | 1 |
| Westchester | 3 | 3 | 3 | 3 |
| Wyoming | 2 | 2 | 2 | 1 |
| Yates | 2 | 1 | 2 | 1 |

1 - County (for Oxidants, county within AQCR) without monitoring
2 - County (for Oxidants, county within AQCR) with monitoring
3 - County (for Oxidants, county within AQCR) with condensed analysis

TABLE 4

GROWTH RATE ANALYSIS

FOR CATEGORY 1 COUNTIES - TSP AND $SO_2$

(Per Draft Final Report, Step 1)

| | 1976 Population Current Estimate (000s) | 1976 Population Previous Forecast (000s) | Actual Growth +/- |
|---|---|---|---|
| Particulates and $SO_2$ | | | |
| Sullivan | 61.9 | 63.2 | - |
| $SO_2$ Only | | | |
| Allegany | 50.3 | 51.6 | - |
| Cattaraugus | 85.4 | 85.8 | - |
| Chenango | 46.8 | 47.4 | - |
| Clinton | 85.1 | 85.0 | + |
| Cortland | 48.5 | 47.2 | + |
| Delaware | 47.5 | 48.4 | - |
| Franklin | 44.9 | 45.2 | - |
| Fulton | 55.1 | 56.6 | - |
| Greene | 39.3 | 40.2 | - |
| Hamilton | 5.0 | 5.2 | - |
| Herkimer | 69.0 | 68.0 | + |
| Jefferson | 90.8 | 92.8 | - |
| Lewis | 25.3 | 25.2 | + |
| Livingston | 57.8 | 57.6 | + |
| Madison | 65.9 | 66.6 | - |
| Ontario | 86.5 | 86.2 | + |
| Orange | 246.9 | 250.0 | - |
| Orleans | 38.3 | 39.2 | - |
| Otsego | 58.4 | 58.4 | - |
| Putnam | 71.6 | 70.2 | + |
| St. Lawrence | 116.8 | 118.2 | - |
| Schoharie | 29.3 | 31.0 | - |
| Schuyler | 17.8 | 18.2 | - |
| Seneca | 33.6 | 33.8 | - |
| Steuben | 101.4 | 101.2 | + |
| Tioga | 48.7 | 48.4 | + |
| Tompkins | 85.9 | 85.0 | + |
| Washington | 54.7 | 55.6 | - |
| Wayne | 82.9 | 83.6 | - |
| Yates | 21.2 | 21.2 | - |

TABLE 5

PROJECTED AIR QUALITY FOR CATEGORY 1 COUNTIES -

TSP AND $SO_2$
(Step 2)

| | 1986 Air Quality[a], $\mu g/m^3$ | | | |
|---|---|---|---|---|
| | Per Method 1 | Per Method 2 | Per Method 3 | Per Method 4 |
| TSP | | | | |
| Sullivan | 123.4 | 92.3 | 92.3 | 123.4 |
| $SO_2$ | | | | |
| Clinton | 27.8 | 48.0 | 19.7 | 109.2 |
| Cortland | 9.7 | 15.0 | 15.0 | 20.2 |
| Herkimer | 13.0 | 16.8 | 16.8 | 23.0 |
| Lewis | 64.8 | 29.6 | 29.6 | 64.8 |
| Livingston | 12.1 | 15.0 | 15.0 | 23.2 |
| Ontario | 12.7 | 13.3 | 13.3 | 18.6 |
| Putnam | 8.8 | 13.8 | 9.1 | 85.0 |
| Steuben | 30.6 | 34.5 | 34.5 | 40.5 |
| Tioga | 9.1 | 11.8 | 11.8 | 20.5 |
| Tompkins | 37.9 | 40.8 | 36.9 | 51.7 |

[a] - Using TSP background concentration of 30 $\mu g/m^3$ and $SO_2$ background concentration of 8 $\mu g/m^3$

Method 1: Total emissions in county divided by the land area where population density exceeds 100 per square mile

Method 2: Amount of emissions proportional to the population living in land area divided by the land area of cities and villages

Method 3: Amount of emissions proportional to the population living in land area divided by the land area of cities and villages, and also those towns where population density exceeds 250 per square mile

Method 4: Total emissions in county divided by the land area of cities and villages

TABLE 6

PROJECTED AIR QUALITY FOR CATEGORY 2 COUNTIES - TSP AND $SO_2$
(Step 2)

| Pollutant / County | 1986/1976 Population Growth Rate | 1986/1976 Employment Growth Rate | ANNUAL TSP, $\mu g/m^3$ Actual 1976 | ANNUAL TSP, $\mu g/m^3$ Projected[a] 1986 | ANNUAL $SO_2$, $\mu g/m^3$ Actual 1976 | ANNUAL $SO_2$, $\mu g/m^3$ Projected[b] 1986 |
|---|---|---|---|---|---|---|
| **TSP and $SO_2$** | | | | | | |
| Cayuga | 1.05 | 1.08 | 39 | 39.7 | 18.7 | 19.6 |
| Columbia | 1.15 | 1.13 | 39 | 40.4 | 18.7 | 20.3 |
| Essex | 1.08 | 0.94 | 25 | 27.0 | 15.0 | 15.6 |
| Genesee | 1.08 | 1.10 | 33 | 33.3 | 3.7 | 4.1 |
| Oswego | 1.17 | 1.15[c] | 33 | 33.5 | 37.4 | 42.4 |
| Warren | 1.14 | 1.15 | 45 | 47.3 | 26.2 | 28.9 |
| Wyoming | 1.07 | 1.39 | 36 | 38.3 | 41.2 | 54.1 |
| **TSP only** | | | | | | |
| Allegany | 1.14 | 1.14 | 30 | 34.2 | | |
| Cattaraugus | 1.09 | 1.15 | 39 | 40.4 | | |
| Chenango | 1.05 | 1.17 | 32 | 32.3 | | |
| Clinton | 1.23 | 1.30 | d | NA | | |
| Cortland | 1.11 | 1.23 | 46 | 49.7 | | |
| Delaware | 1.09 | 1.17 | 40 | 41.7 | | |
| Franklin | 1.02 | 1.11 | d | NA | | |
| Fulton | 1.07 | 1.14 | 31 | 31.1 | | |
| Greene | 1.25 | 1.36 | 53 | 61.3 | | |
| Hamilton | 1.06 | 1.48 | 13 | 19.2 | | |
| Jefferson | 1.04 | 1.06 | 29 | 30.7 | | |
| Lewis | 1.09 | 1.18 | 30 | 35.4 | | |
| Madison | 1.12 | 1.15[c] | 40 | 41.5 | | |
| Orleans | 1.07 | 1.13[c] | 33 | 33.4 | | |
| Otsego | 1.08 | 1.18 | 42 | 44.2 | | |
| St. Lawrence | 1.07 | 1.06 | 29 | 31.0 | | |
| Schoharie | 1.26 | 1.17 | 28 | 35.3 | | |
| Schuyler | 1.11 | 1.18 | 38 | 39.4 | | |
| Seneca | 0.99 | 1.00 | 38 | 38.0 | | |
| Tompkins | 1.15 | 1.09 | 47 | 49.7 | | |
| Washington | 1.08 | 1.15 | 40 | 41.5 | | |
| Yates | 1.11 | 1.25 | 28 | 35.8 | | |
| **$SO_2$ only** | | | | | | |
| Broome | 1.02 | 1.09[c] | | | 29.9 | 31.9 |
| Chautauqua | 1.04 | 1.09 | | | 59.9 | 64.6 |
| Chemung | 1.02 | 0.97 | | | 15.7 | 15.9 |
| Dutchess | 1.14 | 1.16 | | | 37.4 | 42.1 |
| Monroe | 1.06 | 1.13[c] | | | 59.9 | 66.6 |
| Oneida | 0.98 | 1.06 | | | 23.6 | 26.7 |
| Onondaga | 1.05 | 1.15[c] | | | 39.3 | 44.0 |
| Ulster | 1.16 | 1.10 | | | 44.5 | 50.3 |

a - Using TSP background concentration of 30 $\mu g/m^3$
b - Using $SO_2$ background concentration of 8 $\mu g/m^3$
c - Based on unofficial projections for major labor areas for 1974-1985 for nonagricultural employment, NYS Department of Labor. All others extrapolated from estimates of total employment for 1970-1976.
d - Available data not valid

TABLE 7

GROWTH RATE ANALYSES

FOR CATEGORY 3 COUNTIES - TSP AND $SO_2$
(Step 1b)

| Pollutant / County | POPULATION 1986/1976 Growth Rate (6/77) | POPULATION 1985/1975 Growth Rate (6/72) | POPULATION New Growth Rate +/- | NON-AG EMPLOYMENT 1986/1976[a] Growth Rate (3/77) | NON-AG EMPLOYMENT 1985/1975 Growth Rate (7/71) | NON-AG EMPLOYMENT New Growth Rate +/- |
|---|---|---|---|---|---|---|
| TSP and $SO_2$ | | | | | | |
| Albany | 1.03 | 1.05 | - | 1.11 | 1.19 | - |
| Bronx | 0.93 | 0.98 | - | 0.93 | 1.08 | - |
| Erie | 1.00 | 1.06 | - | 1.05 | 1.14 | - |
| Kings | 0.94 | 0.97 | - | 0.93 | 1.08 | - |
| Montgomery | 1.05 | 1.00 | + | NA | NA | - |
| Nassau | 0.99 | 1.08 | - | 1.25 | 1.38 | - |
| New York | 0.92 | 0.96 | - | 0.93 | 1.08 | - |
| Niagara | 1.01 | 1.04 | - | 1.05 | 1.14 | - |
| Queens | 1.00 | 1.03 | - | 0.93 | 1.08 | - |
| Rensselaer | 1.06 | 1.13 | - | 1.11 | 1.19 | - |
| Richmond | 1.22 | 1.24 | - | 0.93 | 1.08 | - |
| Rockland | 1.20 | 1.29 | - | 1.18 | 1.33 | - |
| Saratoga | 1.25 | 1.19 | + | 1.11 | 1.19 | - |
| Schenectady | 1.03 | 1.06 | - | 1.11 | 1.19 | - |
| Suffolk | 1.20 | 1.38 | - | 1.25 | 1.38 | - |
| Westchester | 0.99 | 1.11 | - | 1.18 | 1.33 | - |
| TSP only | | | | | | |
| Broome | 1.02 | 1.05 | - | 1.09 | 1.14 | - |
| Chautauqua | 1.04 | 1.02 | + | NA | NA | |
| Chemung | 1.02 | 1.05 | - | NA | NA | |
| Dutchess | 1.14 | 1.40 | - | NA | NA | |
| Herkimer | 1.03 | 1.00 | + | 1.06 | 1.16 | - |
| Livingston | 1.12 | 1.21 | - | 1.13 | 1.26 | - |
| Monroe | 1.06 | 1.16 | - | 1.13 | 1.26 | - |
| Oneida | 0.98 | 1.05 | - | 1.06 | 1.16 | - |
| Onondaga | 1.05 | 1.11 | - | 1.15 | 1.22 | - |
| Ontario | 1.17 | 1.16 | + | NA | NA | |
| Orange | 1.25 | 1.46 | - | NA | NA | |
| Putnam | 1.38 | 1.49 | - | NA | NA | |
| Steuben | 1.06 | 1.04 | + | NA | NA | |
| Tioga | 1.10 | 1.24 | - | 1.09 | 1.14 | - |
| Ulster | 1.16 | 1.25 | - | NA | NA | |
| Wayne | 1.10 | 1.20 | - | 1.13 | 1.26 | - |

a - Based on unofficial projections for major labor areas for 1974-1985, NYS Department of Labor.

TABLE 8

PROJECTED AIR QUALITY

FOR CATEGORY 3 COUNTIES - TSP AND $SO_2$
(Step 2)

| Pollutant / County | Estimated 1976 Emissions tons/yr. | Projected 1986 Emissions tons/yr. | ANNUAL TSP, $\mu g/m^3$ Actual 1976 | ANNUAL TSP, $\mu g/m^3$ Projected[a] 1986 | ANNUAL $SO_2$, $\mu g/m^3$ Actual 1976 | ANNUAL $SO_2$, $\mu g/m^3$ Projected[b] 1986 |
|---|---|---|---|---|---|---|
| **TSP** | | | | | | |
| Herkimer | 602 | 674 | 36 | 36.7 | | |
| Montgomery | 772 | 846 | 30 | 32.9 | | |
| Ontario | 1423 | 1678 | 45 | 47.7 | | |
| Saratoga | 2186 | 2508 | 45 | 47.2 | | |
| Steuben | 1149 | 1227 | 50 | 51.4 | | |
| **$SO_2$** | | | | | | |
| Montgomery | 2027 | 2082 | | | 31[c] | 31.6 |
| Saratoga | 7304 | 7414 | | | 31[c] | 31.3 |

a - Using TSP background concentration of 30 $\mu g/m^3$

b - Using $SO_2$ background concentration of 8 $\mu g/m^3$

c - Portion of county designated as part of an AQMA, but no monitors are located in county; values listed are estimates based upon data from nearest monitors.

TABLE 9

PROJECTED VMT DENSITY

FOR CATEGORY 1 AQCR - $O_x$
(Step 3)

| AQCR | 1986 Projected VMT ($10^6$) | Area in Square miles | 1986 Projected VMT/Sq. mile ($10^6$) |
|---|---|---|---|
| Southern Tier West | 4426 | 6083 | 0.7 |

TABLE 10

PROJECTED AND REQUIRED EMISSION REDUCTIONS

FOR CATEGORY 2 AQCRs - $O_x$
(Step 2)

| AQCR | 1976 Air Quality[a] $\mu g/m^3$ | VMT Growth Factor 1986/1976 | Proportion of HC Emissions from LDV | Projected Emission Reduction | Emission Reduction Required (Appendix J) |
|---|---|---|---|---|---|
| Hudson Valley | 369 | 1.29 | 0.90 | 0.64 | 0.63 |
| Northern | 226 | 1.20 | 0.98 | 0.74 | 0.27 |
| Central | 263 | 1.25 | 0.87 | 0.62 | 0.39 |
| Southern Tier East | 210[b] | 1.18 | 0.81 | 0.59 | 0.22 |
| Genesee Finger Lakes | 259 | 1.30 | 0.70 | 0.43 | 0.38 |
| Niagara Frontier | 345 | 1.21 | 0.70 | 0.47 | 0.58 |

a - Second highest maximum one hour concentration
b - Ten months of monitoring data

TABLE 11

GROWTH RATE ANALYSES

FOR CATEGORY 3 AQCR - $O_x$
(Step 1b)

| POPULATION | | | |
|---|---|---|---|
| AQCR | 1986/1976 Growth Rate (6/77) | 1985/1975 Growth Rate (6/72) | New Growth Rate +/- |
| Metropolitan | 1.00 | 1.06 | - |

| NON-AG EMPLOYMENT | | | |
|---|---|---|---|
| AQCR | 1974-85 Annual[a] Average Growth Rate, % (3/77) | 1968-80 Annual Average Growth Rate, % (7/71) | New Growth Rate +/- |
| Metropolitan: | | | |
| New York City | -0.73 | 0.77 | - |
| Nassau-Suffolk | 2.54 | 3.83 | - |
| Westchester-Rockland | 1.82 | 3.28 | - |

[a] - Based on unofficial projections for major labor areas for 1974-1985, NYS Department of Labor.

TABLE 12

ANALYSIS OF PROJECTED POPULATION

FOR CATEGORY 1 COUNTIES - $NO_2$
(Step 1)

| County | Projected 1986 Population 6/77 (000s) | Comparison to 800,000 +/- | Projected 1986 Population Density (Persons/sq.mi.) | Comparison to 1250 Persons/sq.mi. +/- |
|---|---|---|---|---|
| Allegany | 57.1 | - | 108.6 | - |
| Broome | 222.7 | - | 311.9 | - |
| Cattaraugus | 92.9 | - | 70.5 | - |
| Cayuga | 82.0 | - | 117.5 | - |
| Chautauqua | 152.9 | - | 141.4 | - |
| Chemung | 102.0 | - | 245.8 | - |
| Chenango | 49.2 | - | 54.5 | - |
| Clinton | 104.9 | - | 99.1 | - |
| Columbia | 64.3 | - | 99.7 | - |
| Cortland | 53.6 | - | 106.8 | - |
| Delaware | 51.9 | - | 36.0 | - |
| Dutchess | 271.0 | - | 333.3 | - |
| Essex | 38.4 | - | 21.1 | - |
| Franklin | 46.0 | - | 27.5 | - |
| Fulton | 58.9 | - | 118.3 | - |
| Genesee | 65.8 | - | 131.3 | - |
| Greene | 49.1 | - | 75.2 | - |
| Hamilton | 5.3 | - | 3.1 | - |
| Herkimer | 71.4 | - | 49.8 | - |
| Jefferson | 94.3 | - | 72.9 | - |
| Lewis | 27.7 | - | 21.5 | - |
| Livingston | 64.9 | - | 101.7 | - |
| Madison | 73.8 | - | 111.6 | - |
| Montgomery | 58.6 | - | 143.6 | - |
| Ontario | 101.4 | - | 155.8 | - |
| Orange | 308.2 | - | 370.0 | - |
| Orleans | 40.8 | - | 103.0 | - |
| Oswego | 130.8 | - | 135.7 | - |
| Otsego | 63.3 | - | 62.5 | - |
| Putnam | 98.6 | - | 426.8 | - |
| St. Lawrence | 124.9 | - | 45.1 | - |
| Saratoga | 183.2 | - | 224.0 | - |
| Schoharie | 36.9 | - | 59.1 | - |
| Schuyler | 19.7 | - | 59.7 | - |
| Seneca | 33.0 | - | 100.0 | - |
| Steuben | 107.3 | - | 76.1 | - |
| Sullivan | 75.1 | - | 76.6 | - |
| Tioga | 53.6 | - | 102.3 | - |
| Tompkins | 99.0 | - | 205.4 | - |
| Washington | 61.2 | - | 73.2 | - |
| Wayne | 91.1 | - | 150.3 | - |
| Wyoming | 41.1 | - | 68.7 | - |
| Yates | 23.6 | - | 68.8 | - |

TABLE 13

PROJECTED AIR QUALITY FOR CATEGORY 2 COUNTIES - $NO_2$
(Step 2)

| County | $\frac{P_p}{P_c}$ [a] | $\frac{Q_p}{Q_c}$ | f | G | Annual $NO_2$, $\mu g/m^3$ | |
|---|---|---|---|---|---|---|
| | | | | | Actual 1976 | Projected[b] 1986 |
| Albany | 1.22 | 1 | 0.59 | 1.09 | 47.0 | 49.4 |
| Erie | 1.22 | 1 | 0.77 | 1.05 | 54.5 | 56.2 |
| Monroe | 1.42 | 1 | 0.27 | 1.31 | 39.5 | 45.5 |
| Niagara | 1.15 | 0 | 0 | 1.15 | 33.8 | 35.9 |
| Oneida | 1.35 | 0 | 0 | 1.35 | 33.8 | 38.6 |
| Onondaga | 1.26 | 0 | 0 | 1.26 | 54.5 | 63.5 |
| Rensselaer | 1.39 | 0 | 0 | 1.39 | 30.0 | 33.9 |
| Schenectady | 1.34 | 1 | 0.27 | 1.25 | 30.0 | 32.5 |
| Ulster | 1.31 | 0 | 0 | 1.31 | 30.0 | 33.1 |
| Warren | 1.21 | 0 | 0 | 1.21 | 33.8 | 36.7 |

a - $P_p/P_c$ based on vehicle miles travelled

b - Using $NO_2$ background concentration of 20 $\mu g/m^3$

TABLE 14

GROWTH RATE ANALYSES FOR CATEGORY 3 COUNTIES - $NO_2$
(Step 1b)

POPULATION

| County | 1986/1976 Growth Rate (6/77) | 1985/1975 Growth Rate (6/72) | New Growth Rate +/- |
|---|---|---|---|
| Bronx | 0.93 | 0.98 | - |
| Kings | 0.94 | 0.97 | - |
| Nassau | 0.99 | 1.08 | - |
| New York | 0.92 | 0.96 | - |
| Queens | 1.00 | 1.03 | - |
| Richmond | 1.22 | 1.24 | - |
| Rockland | 1.20 | 1.29 | - |
| Suffolk | 1.20 | 1.38 | - |
| Westchester | 0.99 | 1.11 | - |

NON-AG EMPLOYMENT

| County | 1974-85[a] Annual Average Growth Rate, % (3/77) | 1968-80 Annual Average Growth Rate, % (7/71) | New Growth Rate +/- |
|---|---|---|---|
| Bronx | -0.73 | 0.77 | - |
| Kings | -0.73 | 0.77 | - |
| Nassau | 2.54 | 3.83 | - |
| New York | -0.73 | 0.77 | - |
| Queens | -0.73 | 0.77 | - |
| Richmond | -0.73 | 0.77 | - |
| Rockland | 1.82 | 3.28 | - |
| Suffolk | 2.54 | 3.83 | - |
| Westchester | 1.82 | 3.28 | - |

[a] - Based on unofficial projections for major labor areas for 1974-85, NYS Department of Labor