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IMPLEMENTATION PLAN REVIEW FOR OHIO AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

EPA-450/3-74-067

IMPLEMENTATION PLAN REVIEW

FOR

OHIO

REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

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IMPLEMENTATION PLAN REVIEW

FOR OHIO

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the state on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the states. The states may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require states to change any existing plan.

Congress has intended that this report provide the state with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage states to either defer compliance with regulations or to revise the SO_2 emission regulations. The states have also been asked to discourage large scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those states with the largest clean fuels saving potential. Several of these states have or are currently in the process of revising SO_2 regulations. These states are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 states and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are: 1) the use of the example region approach in developing state-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many state plans and, in some instances, conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a state to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the state if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the state where sources would not otherwise contribute to NAAQS violations. For example, a control strategy based on a particular region or source can result in a regulation requiring 1% sulfur oil to be burned statewide where the use of 3% sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of states will use the review findings to assist them in deciding whether or not to revise portions of their State Implementation Plans. However, it is most important for those states which desire to submit a revised plan to recognize the review's limitations. The findings

of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA believes that the states possess the best information for developing revised plans. The states have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of quality air. Therefore, those states desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that states select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution situations such as sulfates.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emission and are a major source of TSP emissions.

Part of each state's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation

regulations. In conjunction with the regional analysis, a summary of the state's fuel combustion sources (power plants, industrial sources, and area sources) has also been carried out.

The following are the principle findings for the State of Ohio (Air Quality Control Regions are displayed on Fig. 1-1).

- The U. S. Environmental Protection Agency Region V Office is undertaking a study to propose new regulations for the state. This study will be consistent with the Clean Fuels Policy and will provide a much more detailed and definitive analysis of the state's regulations than is provided in this report.
- Based on the brief analysis of this review, there appears to be virtually no tolerance for increased particulate emissions throughout the state. There are widespread high TSP readings and several proposed Air Quality Maintenance Areas for particulates.
- There are indications that SO_2 regulation revisions which would permit the use of higher sulphur local fuels are possible in some areas without violating the National Ambient Air Quality Standards. Such a revision would result in significant savings of clean fuels. The study being conducted by EPA, Region V will pinpoint the actual extent to which the regulations can be changed in each region of the state.
- Coal blending(i.e. mixing of fuels with high and low sulfur content) to achieve moderate fuel sulfur content (1-2%) may be required to realize the clean fuels savings resulting from regulation revision.
- Area source emissions play a significant role in the air quality situation in portions of Ohio. Additional study is needed to determine a feasible level of control for these sources which is consistant with both air quality and clean fuels conservation.

2.0 OHIO STATE IMPLEMENTATION PLAN REVIEW

2.1 Summary

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

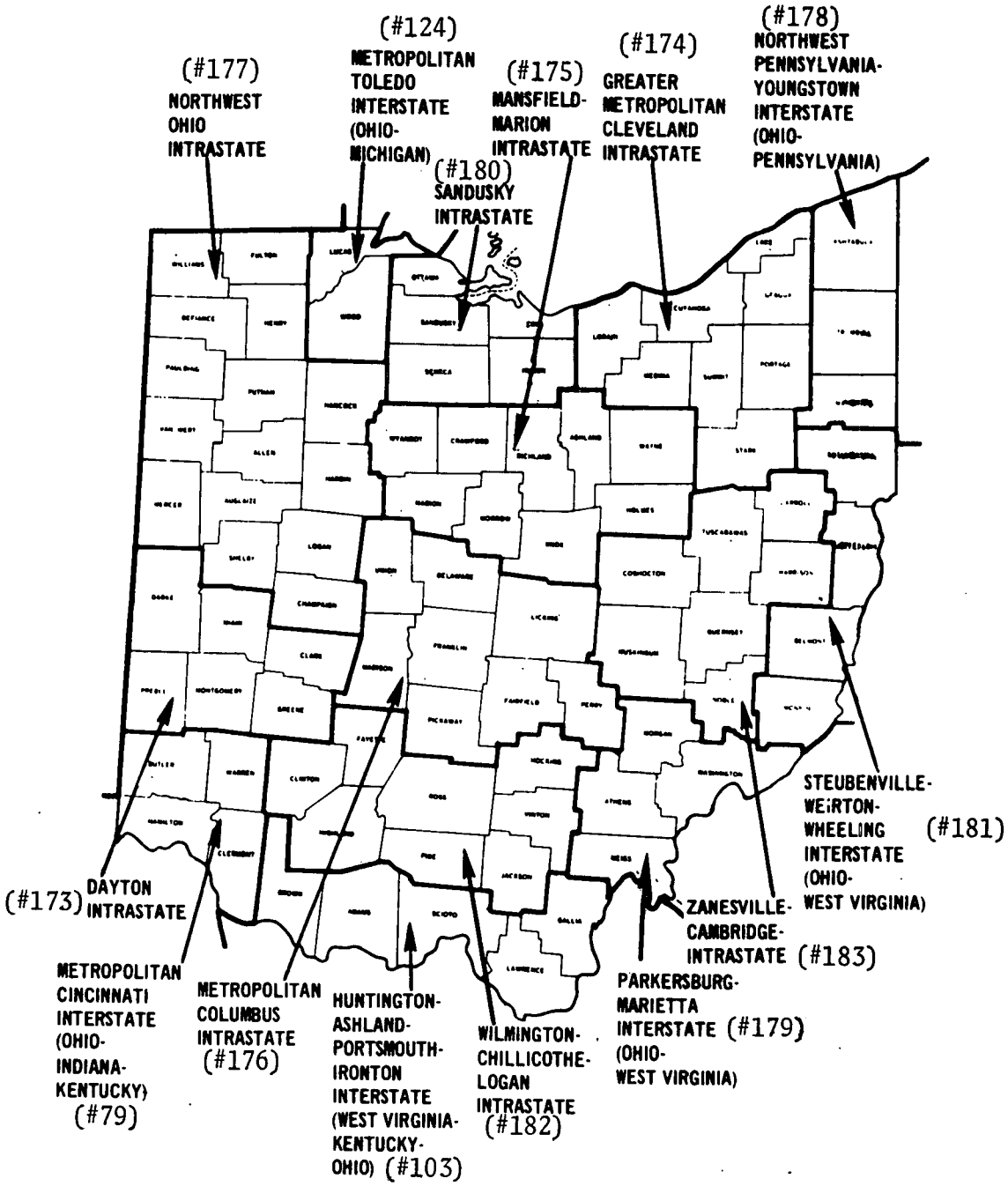

Figure 1-1. Ohio Air Quality Control Regions (AQCR)

- Does the state have air quality standards which are more stringent than NAAQS?

- Does the state have emission limitation regulations for control of (1) power plants, (2) industrial sources, (3) area sources?

- Did the state use an example region approach for demonstrating the attainment of NAAQS or more stringent state standards?

- Has the state not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?

- Are there no proposed Air Quality Maintenance Areas?

- Are there indications of a sufficient number of monitoring sites within a region?

- Is there an expected 1975 attainment date for NAAQS?

- Based on (1973) air quality data, are there indications of a tolerance for increasing emissions?

- Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?

- Do modeling results for specific fuel combustion sources show a potential for regulation revision?

- Is there a significant clean fuels savings potential in the region?

- Must the regulations be revised to accomplish significant fuels switching?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, is organized to provide the background and current situation information for the State Implementation Plan. Section 3, and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. An evaluation of regional air quality indicators is presented in Appendix B; power plants, industrial sources, and area sources are analyzed in Appendices C, D, and E respectively.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. Table 2-1 summarizes the State Implementation Plan Review. The remaining portions of the report support this summary with explanations.

2.2 Air Quality Setting for the State of Ohio

2.2.1 Ohio Air Pollution Control Areas

The State of Ohio is divided into fourteen Air Quality Control Regions (AQCRs), as shown in Fig. 1-1. There are eight intrastate and six interstate regions. Table A-1 gives the pollutant priority classifications for each of the fourteen regions.

The table also shows population and population density to be largest in the five metropolitan areas of Cincinnati (#79), Dayton (#173), Toledo (#124), Cleveland (#174), and Columbus (#176). Based on present conditions and growth projections for the state, some 23 counties have been designated as Air Quality Maintenance Areas (AQMAs) for particulates and 13 for sulfur dioxide. These are indicated in Table A-1 and Fig. A-1.

2.2.2 Ohio Ambient Air Quality Standards

Ohio has adapted Federal Secondary Standards for particulates as shown in Table A-2. The state standards for SO_2 are more stringent than the federal standards, but a two-year extension in meeting these standards has been requested. The analysis herein proceeds under the assumption that federal primary and (where appropriate) secondary standards are to be achieved by 1975.

2.2.3 Ohio Air Quality Status

The Ohio air quality status is summarized in Table A-3 for TSP and Table A-4 for SO_2. The data is from the SAROAD data bank as of June 1974.

TSP is a widespread problem, requiring significant reductions to meet secondary NAAQS in all but one AQCR (Marietta, #179) where TSP is currently being measured. Highest reductions are required in Cincinnati (#79, 81%), Dayton (#173, 64%), Cleveland (#174, 85%), Sandusky (#180, 84%), and Steubenville (#181, 84%). These results are generally consistent with the AQMA designations with the exception of Sandusky, which has only five monitors (indicating the results may be spurious and would require more detailed analysis). Violations

Table 2-1. State Implementation Plan Review Summary for Ohio

"INDICATORS"	State		Cincinnati[a] AQCR #79		Portsmouth-Ironton[a] AQCRS #103		Toledo[a] AQCR #124		Dayton AQCR #173	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	No	Yes								
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources	Yes Yes Yes	Yes Yes Yes								
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Yes	Yes	Example	Region					Example	Region
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	Yes	No[b]								
• Are there no proposed Air Quality Maintenance Areas?			No	Yes	Yes	Yes	No	Yes	No	No
• Are there indications of a sufficient number of monitoring sites within a region?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Is there an expected 1975 attainment date for NAAQS?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Based on (1973) Air Quality Data, are there no reported violations of NAAQS?			No	Yes	No	Yes	No	Yes	No	No
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?			No	Yes	No	Yes	No	Yes	No	No
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?			No	No	Yes	No	Yes	No	Yes	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?			NA	Yes	NA	Yes	NA	Yes	NA	Yes
• Is there a significant Clean Fuels Saving potential in the region?			No		Yes		Yes		Yes	
• Must the regulations be revised to accomplish significant fuel switching?			Yes		Yes		Yes		Yes	
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?			TSP - Poor SO_2 - Poor		TSP - Poor SO_2 - Good		TSP - Poor SO_2 - Good		TSP - Poor SO_2 - Marginal	

[a]Interstate

[b]The State's emission regulations are being rewritten by EPA Region V Office and will reflect the Clean Fuels Policy as well as provide a more detailed analysis than provided in this review.

Table 2-1. State Implementation Plan Review Summary for Ohio (Contd.)

"INDICATORS"	Cleveland AQCR #174		Mansfield-Marion AQCR #175		Columbus AQCR #176		Northwest Ohio AQCR #177		Youngstown[a] AQCR #178	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?										
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources										
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Example	Region								
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?										
• Are there no proposed Air Quality Maintenance Areas?	No	No	No	Yes	No	Yes	Yes.	Yes	No	Yes
• Are there indications of a sufficient number of monitoring sites within a region?	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes
• Is there an expected 1975 attainment date for NAAQS?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
• Based on (1973) Air Quality Data, are there no reported violations of NAAQS?	No	Yes	No	Yes	No	Yes	--	Yes	No	No
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?	No	No	No	Yes	No	Yes	--	Yes	No	No
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?	No	No	No	No	No	No	No	No	Yes	Yes
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	NA	Yes	NA	NA	NA	Yes	NA	Yes	NA	Yes
• Is there a significant Clean Fuels Saving potential in the region?	Yes		No		Yes		Yes		Yes	
• Must the regulations be revised to accomplish significant fuel switching?[b]	Yes		Yes		Yes		Yes		Yes	
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?	TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Poor		TSP - Poor SO_2 - Good		TSP - Marginal SO_2 - Good		TSP - Poor SO_2 - Marginal	

Table 2-1. State Implementation Plan Review Summary for Ohio (Cont'd.)

"INDICATORS"	Marietta[a] AQCR #179		Sandusky AQCR #180		Steubenville[a] AQCR #181		Wilmington-Chillicothe AQCR #182		Zanesville AQCR #183	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?										
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources										
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?									Example	Region
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?										
• Are there no proposed Air Quality Maintenance Areas?	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• Are there indications of a sufficient number of monitoring sites within a region?	No	No	Yes	No	Yes	Yes	No	No	No	No
• Is there an expected 1975 attainment date for NAAQS?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
• Based on (1973) Air Quality Data, are there no reported violations of NAAQS?	Yes	--	No	--	No	No	--	--	--	--
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?	Yes	--	No	--	No	No	--	--	--	--
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?	No	No	Yes	Yes	No	No	No	No	Yes	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	NA	Yes	NA	NA	NA	Yes	NA	NA	NA	Yes
• Is there a significant Clean Fuels Saving potential in the region?	Yes		No		Yes		No		Yes	
• Must the regulations be revised to accomplish significant fuel switching?[b]	Yes		Yes		Yes		Yes		Yes	
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?	TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Poor		TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Poor		TSP - Poor SO_2 - Good	

of the annual and 24-hr TSP standards were most widespread in Cincinnati (#79), Cleveland (#174), and Steubenville (#181), with about half of the stations recording excesses.

Table A-4 indicates that SO_2 is of much less concern in meeting and maintaining NAAQS than TSP. This is encouraging from a clean fuels perspective. Emission reductions are required to meet the 24-hr NAAQS in Dayton (#173, 54%) and Steubenville (#181, 25%). Cleveland (#174) is very close to violation of the annual NAAQS, with a tolerance for emission increase of only 4%. Youngstown (#178) shows a need for emission reduction based on the highest 24-hr reading (the second highest reading was not available). This is probably erroneous since Youngstown has the lowest annual average reading of all AQCRs and could probably tolerate an emission increase. The remainder of the AQCRs would seem to have a high tolerance for relaxed SO_2 emission regulations. It should be noted that even in regions which show NAAQS violations only one station has recorded an excess of the primary standard; thus significant problems seem to be localized in nature and would warrant a more detailed analysis.

2.2.4 Ohio Emissions Summary

Emission sources and emission rates in Ohio are tabulated in Tables A-5 to A-8.

Power plants are concentrated in the Cincinnati (#79), Dayton (#173), Cleveland (#174), and Steubenville (#181) AQCRs. Out of 31 plants in the state, 19 are located in these four regions. Industrial fuel combustion sources are numerically concentrated in Cincinnati (#79), Cleveland (#174), Mansfield-Marion (#175), Columbus (#176), and Youngstown (#178). This concentration pattern, however, is not as distinct an indication of emission patterns as the power plant locations. For example, Cleveland has 38 facilities that constitute 90% of the TSP and SO_2 emissions, indicating a wide dispersion of sources. Youngstown, which has a comparable total emission rate, has only 10 facilities contributing 90% of the emissions, indicating a much more concentrated location of sources.

Particulate emissions are highest in Cincinnati (#79), Cleveland (#174), Youngstown (#178), and Zanesville (#183). These four regions make up 56% of the total TSP emissions. With the exception of Zanesville (for which there is no air quality data), all of these regions require substantial emission reductions to meet the NAAQS. The lowest emissions are from Mansfield-Marion (#175),

Northwest Ohio (#177), and Wilmington (#182), which combine for only 6% of the total. Mansfield-Marion has the second lowest requirement for emission reduction and the other two have no air quality data. In all three regions, more than half of the TSP emissions are from fuel combustion sources, indicating that any regulation change might have a substantially detrimental effect on air quality.

Of the six interstate regions (#79, 103, 124, 178, 179, and 181), three have more than 60% of the emissions coming from Ohio fuel combustion sources. Changes in Ohio regulations would have major impacts on interstate air quality. In the other three, less than a third of the emissions are from Ohio fuel combustion sources, and regulation changes would produce a much smaller impact.

SO_2 emissions are highest in Cincinnati (#79), Portsmouth-Ironton (#103), Cleveland (#174), Youngstown (#178), Marietta (#179), and Steubenville (#181). Cleveland, Dayton, and Steubenville are experiencing difficulties with the SO_2 standards. The others appear to have a dispersion of emission sources that enables the region to absorb the emissions without violation. The lowest emissions are in Mansfield-Marion (#175), Northwest Ohio (#177), and Wilmington (#182). Mansfield and Northwest Ohio have two of the largest tolerances for emission increase; there is no air quality data for Wilmington.

Of the six interstate regions, only Youngstown (#178) has less than half (42%) of the SO_2 emissions coming from Ohio fuel combustion sources. All the others have at least half, indicating that Ohio regulation changes should be coordinated with those of adjacent states to avoid interstate air quality violations.

The only inconsistency in the data is that Dayton (#173) has only a moderate SO_2 emission rate while showing a violation of the 24 hr standard. The indication is that the problem may be a local one rather than one that is AQCR-wide.

2.3 Background on the Development of the Current State Implementation Plan

2.3.1 General Information

The State of Ohio originally developed its total suspended particulate and sulfur dioxide control strategies for stationary sources based on previous modeling efforts in the Cleveland and Cincinnati AQCRs. Using available ambient air quality and emission data, the Cleveland AQCR was determined to have the

most severe particulate and sulfur oxide air pollution problem. Using the "worst" region approach, Cleveland was selected as the example region to demonstrate attainment of the NAAQS. The achievement of the desired air quality levels was evaluated by proportional reduction calculations. Since the analysis indicated that the Cleveland AQCR would not be able to attain the TSP secondary air quality standards by 1975, the Dayton AQCR was evaluated to demonstrate the attainment of air quality standards.

In addition to the Cleveland and Dayton AQCRs, proportional reduction analysis was made for two Priority II example regions: the Zanesville AQCR, to demonstrate attainment of the particulate standards; and the Cincinnati AQCR, to demonstrate the attainment of the sulfur oxide standards.

All sources of particulate emissions would have to comply with the most stringent regulation for stationary sources by July 1, 1975, with the exception of the Cleveland AQCR. The State is requesting an 18-month extension for sources in the Cleveland AQCR to attain compliance with the secondary particulate standards. All sources of sulfur oxide emissions in all regions would have to meet the most stringent regulations applicable by July 1, 1977. Combustion sources of 250 million Btu/hr, or greater, of heat input would be required to achieve the most stringent applicable emission regulation by July 1, 1975.

It was Ohio's aim to comply with the Federal Standards for particulates and sulfur oxides by 1975 and for oxidants and nitrogen oxides by 1977. The data indicate carbon monoxide standards are already being achieved. The attainment of the air quality standards by these dates was predicated on the following — availability and use of low sulfur fuel and availability and application of flue gas desulfurization (FGD) systems that are usable and economically feasible.

2.3.2 Particulate Control Strategy

The Cleveland and Dayton AQCRs were selected as the Priority I example regions and the Zanesville AQCR as the Priority II region. Since the selection of Cleveland as the "worst" region was based on existing air quality data, regulations that achieve the desired air standards in this region were assumed to achieve these same standards in the other urban regions of Ohio. The secondary particulate standard was not achieved in the Cleveland region using this analysis: therefore, the Dayton and Zanesville regions were analyzed to confirm achievement of the secondary standards, using the existing regulations.

The maximum annual average and 24-hour value were measured at two separate sampling stations in Cleveland. Based on the highest annual particulate average at one station, proportional reduction analysis indicated that a 79% reduction in particulate emissions was required to meet the federal primary air quality standard and an 87% reduction required to meet the secondary standard. A background of 35 $\mu g/m^3$ was used in this analysis.

The proposed emission regulations were applied to all point sources in the Cleveland area, and the reductions in emissions were calculated. The regulations used were based on the results of diffusion modeling conducted for the Cleveland region during 1970. These regulations require strict controls for both combustion and industrial sources, with more stringent controls required for the larger sources.

The applicable regulations were applied to point and area sources to determine the expected levels of emissions after compliance with the regulations. Where the existing emissions were lower than the allowable emissions (calculated as annual average emissions), the existing emissions were used in place of the allowable. The application of these regulations achieved an 85% reduction in emission levels, but due to the projected growth of emissions sources for the Cleveland area, only an 80% reduction in emissions could actually be attained. Thus, it appeared that the 87% reduction in emissions required to achieve the secondary standard would not be met.

2.3.3 Sulfur Oxides Control Strategy

The sulfur oxide control strategy was also developed on the basis of the example region concept. Emission reduction calculations were made for Cleveland, a Priority I region, and for Cincinnati, a Priority II region.

Combustion processes, mainly the combustion of coal, account for 92% of the SO_2 emissions in Cleveland. The highest ambient air values for a station in Cleveland were an annual average of 157 $\mu g/m^3$ for 24-hour average in 1970. Using these data, a 49% reduction in emissions was required to meet the primary standard and a 62% reduction in SO_2 emissions was required to meet the secondary standard. No background SO_2 value was used in the proportional reduction calculations. The Priority I region regulations applied to Cleveland would achieve a reduction of SO_2 emissions of approximately 72%. Allowing for projected growth, the emissions were calculated to be reduced by 65%, thus current Priority I region regulations would enable Cleveland to achieve both the federal primary and secondary standards.

A 7% reduction in SO_2 levels was required for the highest station in the Cincinnati region to meet the secondary standards. Implementation of applicable regulations would result in an estimated 21% reduction of SO_x emissions; thus this region would be able to meet the applicable federal standards.

The air quality control regions in the state were subsequently re-evaluated, using either estimated or available air quality data. This analysis resulted in a reclassification of the AQCRs into 5 categories on a county-by-county basis. This reclassification is based on annual pollutant concentrations and is applicable to combustion sources with a heat input less than 250 million Btu/hr. To determine the classification of each county, the available air quality data were compared with estimated air quality levels. The highest annual average concentrations for the period were used to determine the county's priority classification.

The air quality estimates were developed using the "area" model described in the CFR, Volume 36, Number 228. The data base used consisted of two major components, the NEDS printout of annual SO_2 emissions on a county-by-county basis and the urbanized area of each county, based on the Census Bureau definition. The degree of control required for small combustion sources in the reclassified counties were adjusted to a level consistent with the measured or estimated air quality levels. The concentration levels for each category and the resulting emission limits are as follows:

County Classification Definition Based Upon Annual Concentration

Classification	Emission Limit[a] (lbs $SO_2/10^6$ Btu)	SO_2 Concentration - "X" - in $\mu gm/m^3$
A	11.0	X > 100
B	11.6	100 > X > 60
C	3.2	60 > X > 45
D	4.0	45 > X > 30
E	4.8	30 > X

[a]For sources with less than 250 x 10^6 Btu/hr heat input

2.3.4 Current Situation

The Buckeye Power Decision of the Sixth Circuit invalidated EPA's approval of the Ohio implementation plan and enabled Governor Gillyan to withdraw the

original plan submission. In May, 1974, the Governor resubmitted a new plan to EPA for review and approval. This resubmission had few changes that affect large facilities and the regulations applicable to utility power plants and other large combustion sources went essentially unchanged.

EPA has not approved the proposed revision to the emission regulations and is conducting an extensive evaluation of the situation in preparation for proposing alternative regulations. Special emphasis is being placed on regulations applying to utility power plants. The current situation, therefore, is in a state of flux since the State does not have an approved Implementation Plan while, at the same time, has its own regulations which could, in theory, be enforced independently.

This review, as required by ESECA, is not intended to supplant or supersede the evaluation of the Ohio situation that is currently being conducted by EPA, Region V. Rather in complying with the requirements of ESECA, it will provide a survey of existing information and will indicate some initial areas on which to focus the detailed analysis. The detailed evaluation may confirm or dispute the findings of this cursory review but will represent the kind of in-depth analysis that must follow for a SIP revision to be proposed.

2.3.5 Control Regulations Summary

Based on the above control strategy analyses and current developments, Ohio now has proposed the emission control regulations that are summarized in Table A-9. Existing facilities with heat input less than 250 x 10^6 Btu/hr heat input and new facilities less than 100 x 10^6 Btu/hr are subject to the SO_2 county emission limit regulation shown in Fig. A-2. Existing facilities greater than 250 x 10^6 Btu/hr are required to meet the priority region limits specified in Table A-10 until July 1, 1975, after which they are required to meet the 1.0 lbs $SO_2/10^6$ Btu limit. All new facilities greater than 100 x 10^6 Btu/hr are subject to the county regulation. All fuel combustion facilities are required to meet the priority region emission limits for particulates shown in Fig. A-3.

Note that these regulations have <u>not</u> been approved by EPA. They are used here only as an indication of where the detailed evaluation might focus its attention.

2.4 Special Considerations for the State of Ohio

In 1972, shipments of coal by Ohio mines averaged 3.4% sulfur by weight, while shipments to utilities averaged 3.5% sulfur. The enforcement of the current Ohio SO_2 regulation for power plants would prevent the use of most coals now being burned, unless the power plants installed flue gas desulphurization (FGD) systems. Very few of the local coals can comply with the present SO_2 control requirements, even with the use of conventional coal washing facilities. Wholesale installation of FGD systems are necessary if the power plants are to comply with existing regulations and continue to burn Ohio coals.

In 1971, Ohio was the nation's largest consumer of bituminous coal, having consumed 63 million tons (MT). While Ohio is a net importer of coal, it is also a significant producer (4th in the nation in 1971), having produced 51 MT; most of this was consumed in the East-North Central Region. Consumption in 1971 was broken down as follows:

Utility	38.6 MT
Coal & Gas	10.6 MT
Retail	1.3 MT
Industrial & Other	12.6 MT
Total	63.1 MT

This utility consumption level was also the highest in the nation.

In 1972, coal accounted for 99.4% of the fossil fuel burned in Ohio power plants. Therefore, there is little opportunity to conserve oil or natural gas through conversions from the use of these fuels to coal.

3.0 AIR QUALITY CONTROL REGION ASSESSMENTS

3.1 General Methodology

The previous section having set the background for the State Implementation Plan and evaluated the current air quality situation, this section will review the available information for each AQCR to determine the feasibility of relaxing emission regulations in the interest of conserving clean fuels. Care must be taken in interpreting the results of this analysis and the following caveats must be kept in mind: (1) The analytical procedure is intended to provide a first approximation to the evaluation of potential regulation changes (e.g., rollback and single source modeling techniques were used). The state must conduct a more detailed analysis of the situation to confirm or dispute any of these findings prior to submitting any SIP revisions. In Ohio, EPA has already begun this analysis. (2) In many instances the necessary data were unavailable or limited in scope. Where possible, best engineering estimates were used to fill in the gaps. Where better information is available, the state should use it in developing SIP revisions.

The analysis encompasses five distinct considerations for each AQCR. First, the current air quality situation is assessed to determine if the indicators point to the region's ability to tolerate an emission increase without violation of any NAAQS. Most of the data necessary for this review have already been presented in Section 2 and Tables B-1 and B-2 summarize the information for particulates and SO_2, respectively, in each AQCR. The assessment is made on the basis of 7 criteria: (1) current air quality violations, (2) expected NAAQS attainment dates, (3) Air Quality Maintenance Area designations, (4) total emissions, (5) portion of emissions from the state's fuel combustion sources, (6) regional emission reduction required (based on rollback calculations), and (7) pollutant priority classification. Note that this evaluation is based strictly on air quality considerations. Determinations of whether regulation relaxation would, in fact, result in clean fuels savings will be made on a source-by-source evaluation.

The second consideration for each AQCR is the power plant assessment and this data is summarized in the tables in Appendix C. All existing and proposed plants are reviewed to estimate the emission reductions to be achieved by the imposition of existing regulations. (The proposed Ohio regulations, although not approved by EPA, are used for this analysis since they represent the most recent standards.) The clean fuel requirement is determined at the same time. Where dispersion modeling data are available, the maximum allowable fuel sulfur content which would enable the plant to meet the NAAQS in its immediate vicinity is determined and the resulting emission reduction (or increase) is calculated and compared to that produced by existing regulations and to what the region requires. For the purposes of this report, the SO_2 modeling data used[1] assumes the power plant fuel use pattern in 1975 will be the same as that existing in 1971 with the addition of fuel consumption for new units coming on-line. The choice of 1971 as the baseline year is based on the consideration that fuel switching to achieve SIP emission regulations did not begin nationwide until 1972, therefore 1971 represents consumption patterns which are not dictated by emission regulations but rather by the economics of fuel availability. In terms of the maximum allowable fuel sulfur content determined from the modeling, the 1971 fuel sulfur content is used as an upper bound. For particulate emissions, plants currently below required SIP emission levels are assumed to remain so. No particulate modeling results were available. Fuel use data[2],[3] and emission data[4],[5] are drawn from both published and unpublished sources.

The third consideration for each AQCR is the assessment of large industrial/commercial/institutional point sources and the summary data is presented in Appendix D. The procedure is effectively equivalent to that carried out for power plants in that resulting emission reductions achieved through the application of existing regulations are determined along with clean fuel requirements. Emission and fuel use data were drawn from the National Emission Data System (NEDS) file.[5] No individual source modeling data were available.

The fourth consideration is area source assessments. The fuel use patterns, emission reductions, and clean fuel requirements determined by existing regulations is computed for these sources using NEDS data.[5] The results are summarized in Appendix E.

The fifth consideration is a synthesis of the first four in that the emission reductions that are imposed on all sources in the region are totaled and compared to required reductions. Fuel use requirements are also aggregated for the region. Summary tables are in Appendix F.

At this point, an overall assessment of the potential for regulation revision and resulting clean fuel savings can be made. The findings for each AQCR have been summarized on Table 2-1 and in Section 1. An AQCR is determined to be a good candidate for emission limit regulation revision if the air quality indicators show that the region has a tolerance to absorb increased emissions and if the source-by-source evaluations show that significant clean fuels savings could be effected by such revision. If the air quality situation is such that no emission increase could be tolerated and/or if the source evaluations show little or no clean fuels savings potential, then the region is classified as a poor candidate for regulation revision. If the air quality or the clean fuels savings evaluations are inconclusive or show conflicting information, then the region is assessed as a marginal candidate for regulation revision.

The detailed evaluation being carried out by EPA will confirm or correct these assessments. This initial review provides an initial focus for the detailed study.

3.2 Cincinnati Interstate AQCR (#79)

3.2.1 Particulates

This interstate AQCR accounts for a significant fraction (11% or 269,000 tons/yr) of Ohio TSP emissions, of which 8% or 188,000 tons/yr

are in the Ohio portion of the region; fuel combustion emissions contribute 86% of the Ohio total, with 40% attributable to power plants.[a] Air quality conditions in the region indicate that a large reduction in fuel combustion emissions in Ohio is required to meet NAAQS.[b] All four counties in this AQCR have been proposed as TSP AQMAs.[c] Existing regulations applied to power plants and significant point sources appear to be sufficient to meet much of the required reduction;[d] however, eliminating the required amount of area source fuel combustion emissions will require replacing a significant amount of current coal use by clean fuels (oil and/or natural gas).[e] For this reason, it is suggested that this region be analyzed further to determine: (1) the major factors contributing to the TSP problem in the region, and (2) the potential for tightening regulations for source categories where source control technology is technically and economically feasible. Also, such an analysis should assess the trend toward area source conversions to clean fuels and the various markets for alternative fuels in the region. Pending further investigation, this region must be classified as a poor candidate for TSP regulation revision.

3.2.2 SO_2

This AQCR accounts for a significant fraction of the Ohio SO_2 emissions (11% or 487,000 tons/yr), of which 7% or 305,000 tons/yr are in the Ohio portion of the region; fuel combustion sources contribute 93% of the Ohio total, with 76% attributed to power plants.[f] Air quality conditions in the region indicate that some tolerance for SO_2 emissions increase exists,[b] modeling results show that only small savings in clean fuels could be achieved

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[a]Refer to Tables A-5 and A-6.
[b]Refer to Table A-8.
[c]Refer to Table A-1.
[d]Refer to Tables C-2 and D-2.
[e]Refer to Table E-1.
[f]Refer to Tables A-5 and A-7.
[g]Refer to Table A-4.

if NAAQS are to be met.[a] Therefore, this region is classified as a poor candidate for SO_2 regulation revision.

3.3 Portsmouth-Ironton Interstate AQCR (#103)

3.3.1 Particulates

This interstate AQCR accounts for a moderate fraction (7% or 167,000 tons/yr) of the Ohio TSP emissions, of which 3% or 64,000 tons/yr are due to Ohio sources. Fuel combustion emissions account for only 33% of the Ohio total. Air quality conditions in the region indicate that a significant fractional reduction in TSP emissions will be required to meet NAAQS. While power plants in this region appear to be well controled, the problem is compounded by the addition of a major new power plant (Gavin); this implies, even with existing regulations, that only a small fractional reduction will be achieved in the utility sector. Only one major point source of TSP fuel combustion emissions exists in the region and existing regulations will achieve the required reduction. Area sources in the region contribute a relatively small fraction of the regional total TSP emissions and probably will be eliminated by fuel switching to oil or natural gas. Because the increase in utility emissions due to the Gavin plant will offset most of the gains made by existing regulations, this region is classified as a poor candidate for TSP regulation revision.

3.3.2 SO_2

This AQCR accounts for a significant fraction of the Ohio SO_2 emissions (9% or 401,000 tons/yr), of which 6% or 260,000 tons/yr are in the Ohio portion of the region. Fuel combustion sources contribute 98% of the Ohio total, of which 93% are attributable to power plants. Air quality conditions indicate that the region has a significant tolerance for SO_2 emissions increase. Also, modeling results show that some regulation relaxation is possible and a significant savings of clean fuels can be realized if coal blending is practiced on a large scale.[b] Therefore, this region can be classified as a

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[a] Refer to Table F-1.

[b] Blending of high sulfur (72%) and low sulfur (< 1%) coal might be necessary to achieve significant quantities of moderate sulfur (1-2%) coal.

good candidate for SO_2 regulation revision. The significant amount of coal consumed in this region for power generation (16.5×10^6 tons/yr) suggests that it receive close scrutiny in further analyses.

3.4 Toledo Interstate AQCR (#124)

3.4.1 Particulates

This interstate AQCR accounts for a moderate fraction of Ohio TSP emissions (5% or 122,000 tons/yr), of which 3% or 67,000 tons per year are due to Ohio sources. Fuel combustion emissions contribute 51% of the Ohio total. Air quality conditions in the region indicate that moderate reduction in these emission levels is necessary to meet NAAQS. Both counties in this AQCR have been proposed as TSP AQMAs. The two power plants in the region appear to be well controlled and little or no added reduction will be achieved by existing regulations. Further, these plants are contributing an insignificant portion of the region's total fuel combustion TSP emissions. Large point sources apparently will achieve the required reduction when existing regulations are applied to them, but these plants do not appear to constitute the major problem. Small, distributed industrial/institutional/commercial sources and area sources appear to constitute the bulk of the problem in this region. These sources will probably have to be controlled by fuel switching; no opportunity to relax regulations appears to exist if the required reduction to meet NAAQS is to be achieved. Therefore, this region is a poor candidate to revise TSP regulations.

3.4.2 SO_2

This AQCR accounts for a moderate fraction of Ohio SO_2 emissions (6% or 256,000 tons/yr), of which 4% or 192,000 tons/yr are in the Ohio portion of the region. Fuel combustion sources account for 77% of the Ohio total, with 41% attributable to power plants. Air quality conditions in the region indicate that a large tolerance for SO_2 emissions increase exists. Modeling results indicate that a moderate potential for clean fuel savings are possible with additional savings possible if coal blending is utilized. Therefore, this AQCR is considered a good candidate for SO_2 emission regulation revision.

3.5 Dayton Intrastate AQCR (#173)

3.5.1 Particulates

This region accounts for a moderate fraction of the Ohio TSP emissions (7% or 177,000 tons/yr). Fuel combustion emissions contribute 39% of this total, with 23% attributable to area sources. Air quality conditions in the region indicate a significant reduction in fuel combustion TSP emissions is required to meet NAAQS. Three of the six counties have been proposed TSP AQMAs in this AQCR. Existing regulations applied to power plants and major fuel combustion sources appear to be marginally adequate to meet the required reductions. Area sources are potentially the problem in this region and presumably will be handled by fuel switching. For these reasons, this AQCR is judged a poor candidate for TSP regulation revision.

3.5.2 SO_2

This AQCR accounts for only a small fraction of the SO_2 emissions in Ohio (2% or 106,000 tons/yr). Fuel combustion emissions account for 91% of this total with 61% attributable to power plants. Air quality conditions in the region would appear to require a significant reduction in SO_2 emissions to meet NAAQS. Three of the six counties in this AQCR have been proposed as SO_2 AQMAs. This result appears to be somewhat inconsistent with the relatively small levels of SO_2 emissions in the region. Further, modeling results would indicate that a substantial clean fuel savings could be realized if emission regulations are revised. However to achieve these savings, 1971 fuel use patterns which consumed mostly low sulphur coals would have to be reversed. Therefore, this region is judged to be a marginal candidate for SO_2 regulation revision pending the resolution of the inconsistencies in air quality and emission data and a further investigation of fuel supplies to the region.

3.6 Cleveland Intrastate AQCR (#174)

3.6.1 Particulates

This region accounts for a significant fraction of the Ohio TSP emissions (15% or 360,000 tons/yr). Fuel combustion emissions contribute a major fraction of this total (73%), with 42% attributable to area sources. Air quality conditions in the region indicate that a significant reduction in fuel combustion TSP emissions is required to meet NAAQS. Seven counties in this AQCR have been

proposed as TSP AQMAs. Existing regulations applied to power plants and major fuel combustion sources in the region do not appear to be adequate to produce sufficient reductions to meet NAAQS. Likewise, since a significant amount of high sulphur coal is being consumed by area sources in this region, TSP emissions from these sources must presumably be controlled by a shift to clean fuels (oil or natural gas). All indications are that TSP regulations cannot be relaxed if NAAQS are to be met.

3.6.2 SO_2

This AQCR accounts for a major fraction of SO_2 emissions in Ohio (17% or 732,000 tons/yr). Fuel combustion emissions account for 92% of this total with 41% attributable to power plants, 30% attributable to major point sources, and 21% due to area sources. Air quality conditions in this region indicate that there is little tolerance for SO_2 emission increase. Seven counties in this AQCR have been proposed as SO_2 AQMAs although the region does have a 1975 expected attainment date for SO_2 standards. However, modeling results seem to indicate a substantial potential for clean fuel savings, particularly if coal blending is feasible. These results appear to be somewhat contradictory and require further analysis. Therefore, this region is considered a marginal candidate for SO_2 regulation revision pending further investigation.

3.7 Mansfield-Marion Intrastate AQCR (#175)

3.7.1 Particulates

This region accounts for a very small fraction of the Ohio TSP emissions (2% or 46,000 tons/yr). Fuel combustion emissions contribute approximately half of these emissions with 33% attributable to area sources (no power plants are in this region). Air quality conditions indicate that a moderate reduction in these emissions is required to meet NAAQS. One of the nine counties has been proposed as a TSP AQMA, although only three monitoring stations exist in the region. Existing regulations appear to be more than adequate to achieve required reductions. Area sources will presumably be controlled by shifts to clean fuels. Some relaxation of regulations in this region appears possible but little significant fuel savings would result; therefore, this AQCR is classified as a poor candidate for TSP regulation revision.

3.7.2 SO_2

This AQCR accounts for a very small portion of SO_2 emissions in Ohio (1% or 52,000 tons/yr). Fuel combustion emissions contribute 92% of this total with 48% attributable to major point sources (there are no power plants in this region). Air quality conditions indicate that a large tolerance for SO_2 emission exists in this region. Some potential for clean fuel savings exists if regulations for major point sources and area sources could be relaxed to allow the burning of high sulphur coals. However, no modeling results are available at this time to assess the extent of savings or the limits of new regulations for these sources. Therefore, it is judged as a poor candidate for SO_2 regulation revision due to the relatively small savings that could be realized even if regulations were revised in this AQCR.

3.8 Columbus Intrastate AQCR (#176)

3.8.1 Particulates

This region accounts for a moderate fraction of the Ohio TSP emissions (5% or 110,000 tons/yr). Fuel combustion emissions contribute 75% of this total with 32% attributable to area sources and 29% attributable to power generation. Air quality conditions indicate that a substantial reduction in these emissions is required to achieve NAAQS. One of eight counties have been proposed as TSP AQMAs in this AQCR. Existing regulations applied to power plants and major point sources appear to be more than adequate to meet required emission reductions, while area sources, again, appear to require fuel switching to achieve required levels of control. Although there appears to be some flexibility to relax TSP regulations applied to major point sources, the existence of a TSP maintenance area designation in this AQCR would argue against this action. Therefore, this AQCR is judged as a poor candidate for TSP regulation revision.

3.8.2 SO_2

This AQCR accounts for a small fraction of the SO_2 emissions in Ohio (2% or 96,000 tons/yr). Fuel combustion emissions contribute 95% of this total; they are evenly distributed between power plants, major point sources, and area sources. Air quality conditions indicate that there is a large tolerance for SO_2 emission reduction in this AQCR. Also, modeling results indicate that a

modest potential for clean fuel savings exists in this region; therefore, it is classified as a good candidate for SO_2 regulation revision.

3.9 Northwest Ohio Intrastate AQCR (#177)

3.9.1 Particulates

This AQCR accounts for only a very small fraction of the Ohio TSP emissions (2% or 47,600 tons/yr). Fuel combustion emissions contribute 79% of this total with 49% attributable to area sources. No TSP monitoring stations exist in this region by which to judge air quality. Thus, while no basis now exists for judging the candidacy of this AQCR for TSP regulation revision, some moderate savings in clean fuels would result if it could be determined that area sources in the region could continue to burn high sulphur coal without violating TSP NAAQS. Therefore, this region is judged to be a marginal candidate for TSP regulation revision.

3.9.2 SO_2

This region accounts for a very small fraction of the Ohio SO_2 emissions (1% or 51,000 tons/yr). Fuel combustion emissions contribute 76% of this total with 40% attributable to area sources. Air quality conditions indicate that there is a large tolerance for SO_2 emissions in this region. Modeling results indicate that the small amount of power generation coal use in the region could be high sulphur. If it can be shown that existing area sources can also continue to consume high sulphur coal without threatening standards, a moderate clean fuel savings can be achieved. Therefore, this region is judged to be a good candidate for SO_2 regulation revision.

3.10 Youngstown Interstate AQCR (#178)

3.10.1 Particulates

This interstate AQCR accounts for a significant fraction of the TSP emissions in Ohio (14% or 320,000 tons/yr), of which 8% or 189,000 tons/yr are due to Ohio sources. Fuel combustion emissions account for 57% of the Ohio total, with 32% attributable to major fuel combustion point sources. Air quality conditions in the region indicate that a substantial reduction in TSP emissions will be required to meet NAAQS. Two of three counties in this AQCR have been proposed as TSP AQMAs. Existing regulations applied to power plants and

major point sources in the region appear to be more than adequate to meet the required reductions. Area sources will presumably achieve reductions by fuel switching to clean fuels. While regulations may be somewhat overrestrictive, little clean fuels savings could result by relaxation. Therefore, this region is is classified as a poor candidate for TSP regulation revision.

3.10.2 SO_2

This region accounts for a significant fraction of the SO_2 emissions in Ohio (12% or 533,000 tons/yr); however, only 5% or 238,000 tons/yr are due to Ohio sources. Fuel combustion emissions account for 93% of the Ohio total, with 46% due to power production and 36% attributable to other major point sources. Air quality conditions in the region indicate that no tolerance for SO_2 emissions increase exists. However, this is somewhat misleading as reference to Table A-4 will indicate. Since the second highest 24-hr reading was unavailable to estimate tolerance, the highest reading was used which lead to the conclusion that no emission tolerance was available. However, the highest annual average air quality concentration in the region is the lowest in the state which would lead to the conclusion that a large tolerance for emissions increase probably exists. Further, modeling results indicate that significant clean fuel savings can be achieved by relaxing emissions. Therefore, conditional on more definitive air quality results, this region is judged to be a marginal candidate for SO_2 regulation revision.

3.11 Marietta Interstate AQCR (#179)

3.11.1 Particulates

This interstate AQCR accounts for a moderate fraction of the Ohio TSP emissions (4% or 91,000 tons/yr), of which 8% or 82,000 tons/yr are due to Ohio sources. Fuel combustion emissions account for 94% of the Ohio total, with 76% attributable to power generation. Air quality conditions in the region indicate that a moderate tolerance for TSP emissions increase exists. However, since area sources consume only a small amount of coal in this region, insignificant fuel savings will result from a regulation revision. Therefore, this AQCR is judged a poor candidate for TSP regulation relaxation.

3.11.2 SO_2

This region accounts for a significant fraction of the Ohio SO_2 emissions (14% or 533,000 tons/yr), of which 9% or 416,000 tons are due to Ohio sources. Fuel combustion emissions account for virtually 100% of the Ohio total, of which 60% are attributable to power plants and 39% are due to other major point sources. Unfortunately, no air quality data is available in this region to assess the potential SO_2 emissions tolerance. Modeling results indicate that a moderate amount of fuel savings may be realized. Therefore, this region is classified as a marginal candidate for relaxation pending further analysis.

3.12 Sandusky Intrastate AQCR (#180)

3.12.1 Particulates

This region accounts for a moderate proportion of the Ohio TSP emissions (4% or 90,000 tons/yr). Fuel combustion emissions account for only 12% of the Ohio total. Therefore, there is no benefit to be gained from revising TSP regulations in this region and it is classified as a poor candidate for such action.

3.12.2 SO_2

This region accounts for a moderate proportion of the Ohio SO_2 emissions (5% or 226,000 tons/yr). However, only 9% are attributable to fuel combustion sources in this AQCR. Little clean fuel savings can be derived in this region due to revision of the SO_2 regulations.

3.13 Steubenville Interstate AQCR (#181)

3.13.1 Particulates

This interstate AQCR accounts for a moderate fraction of the Ohio TSP emissions (5% or 124,000 tons/yr), of which 4% or 96,000 tons/yr are due to Ohio sources. Fuel combustion emissions account for 90% of the Ohio total with 60% attributable to power plants. Air quality conditions in this region indicate that a significant reduction in TSP emissions is required to meet NAAQS. Three of four counties in the AQCR have been designated as TSP AQMAs. Existing regulations applied to power plants and major point sources in the region appear to be marginally adequate to meet required reductions. Only insignificant clean fuel savings could result from relaxing regulations on area sources. Therefore, this region is judged a poor candidate for TSP regulation revision.

3.13.2 SO_2

This region produces a major fraction of SO_2 emissions in Ohio (17% or 737,000 tons/yr), of which 13% or 560,000 tons/yr are due to Ohio sources. Virtually all SO_2 emissions in Ohio are due to fuel combustion sources, of which 93% are attributable to power generation. Air quality conditions in the region indicate that a moderate reduction in SO_2 emissions is required to meet NAAQS, and three SO_2 AQMA proposals exist in the region. Modeling results do, however, indicate a modest potential for clean fuel savings if coal blending is practiced. This region is considered a marginal candidate for SO_2 regulation revision pending further study.

3.14 Wilmington-Chillicothe Intrastate AQCR (#182)

3.14.1 Particulates

This AQCR accounts for a small fraction of the Ohio TSP emissions (2% or 58,000 tons/yr). Fuel combustion emissions contribute for 63% of the total, with 47% attributable to major point sources (there are no power plants in this region). No TSP monitoring stations exist in this region by which to judge air quality. Very little clean fuel savings would result from TSP revision in this region; therefore it is judged a poor candidate for such action.

3.14.2 SO_2

This region accounts for a very small fraction of Ohio SO_2 regulations (1% or 47,000 tons/yr). Fuel combustion accounts for only 45% of this total with 34% due to major point sources. No SO_2 monitoring stations exist in this region by which to judge air quality. Very little clean fuel savings could result from SO_2 regulation in this region; therefore, it is judged a poor candidate for such action.

3.15 Zanesville Intrastate AQCR (#183)

3.15.1 Particulates

This region accounts for a significant fraction of the Ohio TSP emissions (16% or 383,000 tons/yr). However, fuel combustion emissions contribute only 16% of the total, with 13% attributable to power generation. No TSP monitoring stations exist in the region by which to judge air quality. Little clean fuel

savings could result in this region by revising TSP regulations; therefore, it is judged a poor candidate for such action.

3.15.2 SO_2

This AQCR accounts for a moderate fraction of Ohio SO_2 emissions (5% or 203,000 tons/yr). Fuel combustion emissions account for virtually all of the total, with 89% attributable to power plants. No SO_2 monitoring stations exist in the region by which to judge air quality. However, modeling results indicate a significant clean fuel savings potential exists in the region; therefore, it is judged a good candidate for SO_2 regulation revision.

APPENDIX A

State Implementation Plan Background

TABLE A-1. Ohio Air Pollution Control Areas

	Air Quality Control Region	Federal Number	Demographic Information: Population 1975 (Millions)	Area (Square Miles)	Population Per Square Mile	Priority Classification: Particulates	SO_x	NO_x	Proposed AQMA Designations[a]:	TSP Counties		SO_x Counties
1.	Cincinnati (Ky.-Ind.)	079		3816	435	I	II	I	(4)	Hamilton, Clermont, Butler, Warren	(0)	
2.	Portsmouth-Ironton (Ky.-W.Va.)	103	.60	8148	74	I	III	III	(0)		(0)	
3.	Toledo (Michigan)	124	.69	1519	457	I	I	I	(2)	Lucas, Wood	(0)	
4.	Dayton	173	1.06	2715	390	I	II	I	(3)	Montgomery, Greene, Clark	(3)	Montgomery, Greene, Clark
5.	Cleveland	174	3.38	3493	969	I	I	I	(7)	Summit, Portage, Cuyahoga, Lake Geauga, Stark, Lorain	(7)	Summit, Portage, Cuyahoga, Lake, Geauga, Stark, Lorain
6.	Mansfield-Marion	175	.49	4054	120	II	II	III	(1)	Richland	(0)	
7.	Columbus	176	1.18	3990	296	I	III	I	(1)	Franklin	(0)	
8.	Northwest Ohio	177	.59	6521	91	II	I	III	(0)		(0)	
9.	Youngstown, (Penn.)	178	1.60	12267	131	I	II	III	(2)	Trumbull, Mahoning	(0)	
10.	Marietta (W. Va.)	179	.29	3578	81	I	II	III	(0)		(0)	
11.	Sandusky	180	.29	1982	144	III	III	III	(0)		(0)	
12.	Steubenville (W.Va.)	181	.47	2516	188	I	I	III	(3)	Jefferson, Belmont ,Columbiana	(3)	Jefferson, Belmont, Columbiana
13.	Wilmington-Chillicothe-Logan	182	.22	3744	60	III	III	III	(0)		(0)	
14.	Zanesville	183	.28	3499	79	II	II	III	(0)		(0)	

[a]As of November 14, 1974

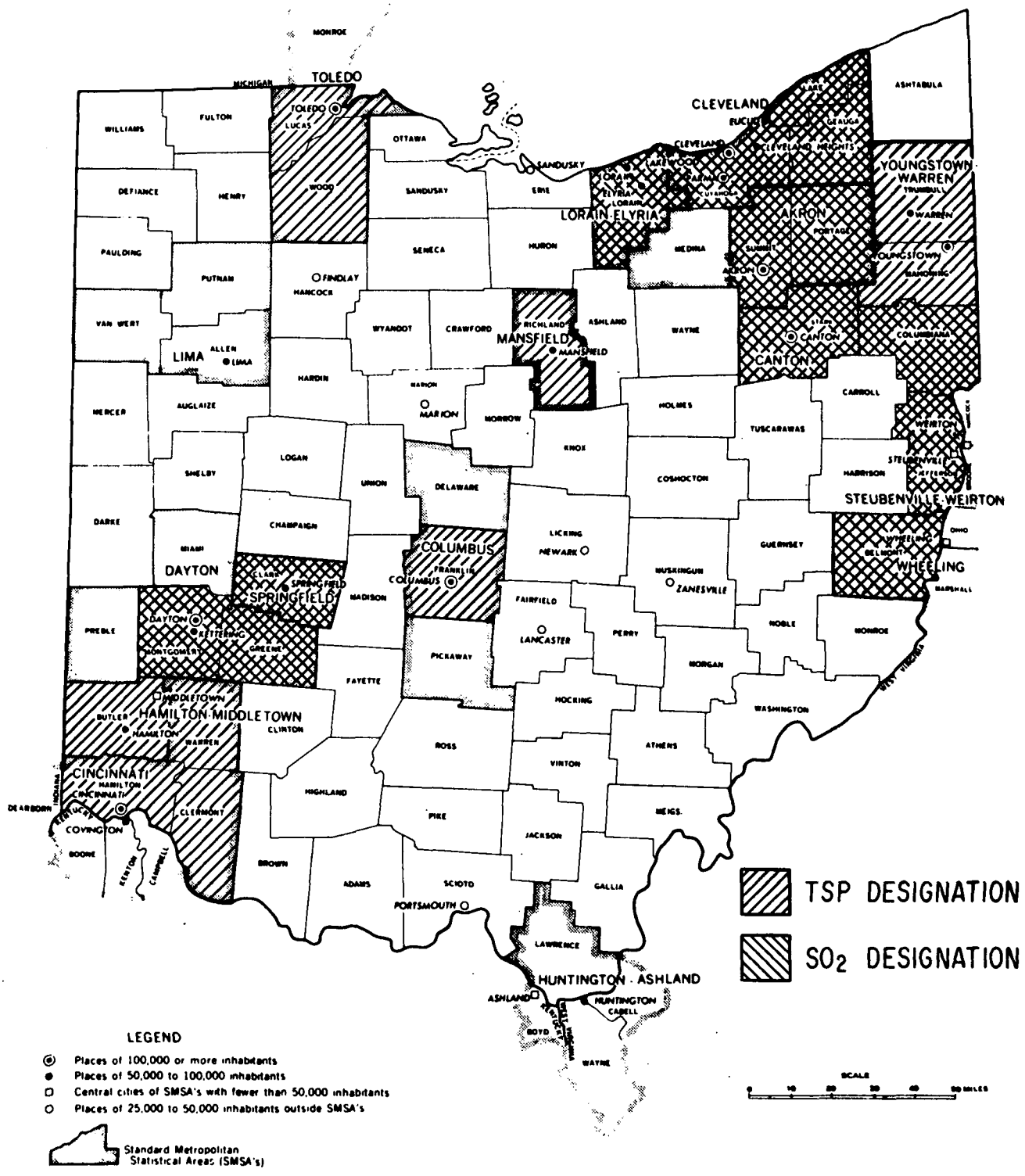

Fig. A-1. Ohio Air Quality Maintenance Area (AQMA) Designations

TABLE A-2. Ohio Ambient Air Quality Standards

All concentrations in $\mu gms/m^3$

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide
		Annual	24-Hour	Annual	24-Hour	3-Hour	Annual
Federal (Nov. 1972)	Primary	75 (G)	260[a]	80 (A)	365[a]	---	100 (A)
	Secondary	60 (G)	150[a]	-----	----	1300[a]	100 (A)
State (May 30, 1974)		60 (G) July 1, 1975	150[a]	60 (A)[b]	260[b,c] July 1, 1977	1300	100 (A)

[a]Not to be exceeded more than once per year.

[b]Based on the original Federal secondary standards which have since been rescinded.

[c]Not to be exceeded more than 1% of the time.

(A) Arithmetic mean
(G) Geometric mean

TABLE A-3. Ohio AQCR Air Quality Status, TSP[a]

	AQCR No.	No. Stations Reporting	TSP Concentration (μgm/m³)			Number of Stations Exceeding Ambient Air Quality Standards						% Reduction Required to Meet Standards[d]	Controlling Standard
			Highest Reading		2nd Highest Reading	Primary		Secondary					
			Annual	24-Hr	24-Hr	Annual	24-Hr[c]	Annual	%	24-Hr[c]	%		
1.	79[b]	55	166	450	351	9	2	32	58	14	25	+ 81	Annual
2.	103[b]	40	96	349	239	5	0	12	30	8	20	+ 59	Annual
3.	124[b]	21	77	427	203	2	0	3	14	5	24	+ 40	Annual
4.	173	28	98	367	352	2	1	8	29	5	18	+ 64	24-Hr
5.	174	83	177	610	531	21	14	46	55	45	54	+ 85	Annual
6.	175	3	51	296	262	0	1	0	0	2	68	+ 49	24-Hr
7.	176	14	53	326	321	0	1	0	0	4	29	+ 60	24-Hr
8.	177	0	---	---	---	-	-	-	-	-	-	-	
9.	178[b]	10	92	695	561	1	2	1	10	5	50	+ 78	24-Hr
10.	179[b]	3	---	124	115	0	0	0	0	0	0	- 44	24-Hr
11.	180	5	---	953	753	0	2	0	0	4	80	+ 84	24-Hr
12.	181[b]	35	187	621	574	15	10	16	46	25	71	+ 84	24-Hr
13.	182	0	---	---	---	-	-	-	-	-	-	-	
14.	183	0	---	---	---	-	-	-	-	-	-	-	

[a] 1973 air quality data in National Air Data Bank as of June 7, 1974.

[b] Interstate.

[c] Violations based on 2nd highest reading at any station.

[d] Formula:

$$\text{Max}\left[\left(\frac{\text{2nd Highest 24-Hr - 24-Hr Secondary Standard}}{\text{2nd Highest 24-Hr - Background}}\right) \times 100, \left(\frac{\text{Annual - Annual Secondary Standard}}{\text{Annual - Background}}\right) \times 100\right]$$

Ohio particulate background: 35 μgm/m³ except Cleveland (40 μgm/m³)

TABLE A-4. Ohio AQCR Air Quality Status, SO_2[a]

	AQCR No.	No. Stations Reporting 24-Hr	No. Stations Reporting Continuous	SO_2 Concentration (μgm/m³) Highest Reading Annual	SO_2 Concentration (μgm/m³) Highest Reading 24-Hr	SO_2 Concentration (μgm/m³) 2nd Highest Reading 24-Hr	Number of Stations Exceeding Ambient Air Quality Standards Primary Annual	Primary 24-Hr[c]	Secondary 3-Hr[c]	% Reduction Required to Meet Standards[d]	Controlling Standard
1.	79[b]	32	3	55	203	141	0	0	0	- 45	Annual
2.	103[b]	17	1	28	429	178	0	0	0	- 105	24-Hr
3.	124[b]	3	6	41	224	82	0	0	0	- 95	Annual
4.	173	16	6	117	991	789	1	1	0	+ 54	24-Hr
5.	174	48	4	77	414	215	0	0	0	- 4	Annual
6.	175	1	0	24	103	93	0	0	-	- 233	Annual
7.	176	1	1	---	99	43	0	0	0	- 749	24-Hr
8.	177	1	0	---	131	120	0	0	-	- 204	24-Hr
9.	178[b]	4	1	18	378	378[e]	0	1	0	+ 3	24-Hr
10.	179[b]	0	0	---	---	---	-	-	-	---	---
11.	180	0	0	---	---	---	-	-	-	---	---
12.	181[b]	14	0	106	432	403	1	1	-	+ 25	Annual
13.	182	0	0	---	---	---	-	-	-	---	---
14.	183	0	0	---	---	---	-	-	-	---	---

[a] 1973 air quality data in National Air Data Bank as of June 7, 1974.

[b] Interstate.

[c] Violations based on 2nd highest reading at any station.

[d] Formula:

$$\text{Max}\left[\left(\frac{\text{2nd Highest 24-Hr - 24-Hr Standard}}{\text{2nd Highest 24-Hr}}\right) \times 100,\ \left(\frac{\text{Annual - Annual Standard}}{\text{Annual}}\right) \times 100\right]$$

[e] Highest reading used because 2nd highest reading was unavailable.

TABLE A-5. Ohio Fuel Combustion Source Summary

AQCR No.	Power Plants[a]	Other Fuel Combustion Point Sources[b]	Area Sources[c]	Total Emissions[d] (10^3 tons/year) TSP	Total Emissions[d] (10^3 tons/year) SO_2	% Emissions from Ohio Fuel Combustion Sources TSP	% Emissions from Ohio Fuel Combustion Sources SO_2
79[e]	4	15	4	269	487	60	58
103[e]	2[f]	1	5	167	401	19	64
124[e]	2	5	2	122	256	28	57
173	4	6	6	177	106	39	91
174	6	38	8	360	732	73	92
175	0	11	9	46	52	57	98
176	1	13	8	110	96	75	95
177	1	9	15	47	57	79	76
178[e]	2	10	3	320	533	33	42
179[e]	2	1	4	91	481	85	86
180	0	4	5	90	226	13	9
181[e]	5	4	4	124	737	70	75
182	0	2	8	58	47	63	95
183	2	0	7	383	203	16	99
Total	31	119	88	2,364	4,414	--	--

[a]Ohio plants

[b]Ohio plants contributing 90% of the particulate and SO_2 emissions

[c]Ohio counties

[d]AQCR total

[e]Interstate

[f]Additional plant scheduled for 1974-75

TABLE A-6. Ohio Emissions Summary[a], TSP

AQCR	Total (10^3 tons/yr)	%	Electricity Generation (10^3 tons/yr)	%	Industrial/Commercial/ Institutional Point Source (10^3 tons/yr)	%	Area Source (10^3 tons/yr)	%
79 Ohio	188	8	76	40	37	20	49	26
Other	81	3	56	69	3	4	2	2
Total	269	11	132	49	40	15	51	19
103 Ohio	64	3	12	19	4	6	5	8
Other	103	4	86	83	4	4	3	3
Total	167	7	98	59	8	5	8	5
124 Ohio	67	3	4	6	14	21	16	24
Other	55	2	18	33	13	24	1	2
Total	122	5	22	18	27	22	17	14
173	177	7	18	10	11	6	41	23
174	360	15	31	9	78	22	151	42
175	46	2	1	2	10	22	15	33
176	110	5	32	29	15	14	35	32
177	47	2	7	15	7	15	23	49
178 Ohio	189	8	11	6	60	32	36	19
Other	131	6	14	11	21	16	51	40
Total	320	14	25	8	81	25	87	27
179 Ohio	82	3	62	76	10	12	5	6
Other	9	1	9	100	0	0	0	0
Total	91	4	71	78	10	11	6	7
180	90	4	0	0	1	1	11	12
181 Ohio	96	4	58	60	18	19	11	11
Other	28	1	25	89	0	0	0	0
Total	124	5	83	67	18	15	11	9
182	58	2	0	0	27	47	9	16
183	383	16	49	13	3	1	9	2
Total	2364	100	569	24	336	14	474	20

[a]Emissions in data bank as of June 27, 1974.

TABLE A-7. Ohio Emissions Summary[a], SO_2

AQCR	Total (10^3 tons/yr)	%	Electricity Generation (10^3 tons/yr)	%	Industrial/Commercial/ Institutional Point Source (10^3 tons/yr)	%	Area Source (10^3 tons/yr)	%
79 Ohio	305	7	232	76	28	9	23	8
Other	182	4	173	95	5	3	4	2
Total	487	11	405	83	33	7	27	6
103 Ohio	260	6	241	93	9	3	5	2
Other	141	3	124	88	6	4	5	4
Total	401	9	365	91	15	4	10	3
124 Ohio	192	4	79	41	55	29	13	7
Other	64	2	54	84	7	11	2	3
Total	256	6	133	52	62	24	15	6
173	106	2	61	58	15	14	20	19
174	732	17	298	41	217	30	155	21
175	52	1	7	13	25	48	19	37
176	96	2	33	34	31	32	28	29
177	57	1	6	11	14	25	23	40
178 Ohio	238	5	110	46	86	36	26	11
Other	295	7	173	59	69	23	49	17
Total	533	12	283	53	155	29	75	14
179 Ohio	416	9	248	60	161	39	5	1
Other	65	5	64	98	0	0	1	2
Total	481	14	313	65	161	33	6	1
180	226	5	3	1	5	2	13	6
181 Ohio	560	13	520	93	17	3	19	3
Other	177	4	174	98	0	0	2	1
Total	737	17	694	94	17	2	21	3
182	47	1	0	0	34	72	11	23
183	203	5	180	89	8	4	13	6
Total	4414	100	2781	63	792	18	436	10

[a]Emissions in data bank as of June 27, 1974

TABLE A-8. Ohio AQCR Required Emission Reduction[a]

AQCR	Required Particulate Emission Reduction		Required SO_2 Emission Reduction	
	%	10^3 tons/year	%	10^3 tons/year
79[b]	+81	+218	- 45	-219
103[b]	+59	+ 99	-105	-421
124[b]	+40	+ 49	- 95	-243
173	+64	+113	+ 54	+ 57
174	+85	+306	- 4	- 29
175	+49	+ 23	-233	-121
176	+60	+ 66	-749	-719
177	-	-	-204	-116
178[b]	+78	+250	+ 3	+ 16
179[b]	-44	- 40	---	---
180	+84	+ 76	---	---
181[b]	+84	+104	+ 25	+185
182	-	-	---	---
183	-	-	---	---

[a]Based on a proportional change of emissions to air quality. This type of "rollback" calculation is not recognized as an accurate measure of emission tolerances; it is used only as an indicator here.

[b]Interstate

TABLE A-9. Ohio Fuel Combustion Emission Regulations

	Existing Facilities		New Facilities	
	$\leq 250 \times 10^6$ Btu/hr	$> 250 \times 10^6$ Btu/hr	$\geq 100 \times 10^6$ Btu/hr	$< 100 \times 10^6$ Btu/hr
SO_2	County Emission Limit: Fig. A-2	Priority Region Emission Limit: Table A-10	1.0 lbs/10^6 Btu	County Emission Limit: Fig. A-2
	All Facilities			
Particulates	Priority Region Emission Limit: Fig. A-3			

LEGEND:

(1.0) = 1.0 pounds of sulfur dioxide per million BTU of heat input

(1.6) = 1.6 pounds of sulfur dioxide per million BTU of heat input

(3.2) = 3.2 pounds of sulfur dioxide per million BTU of heat input

(4.0) = 4.0 pounds of sulfur dioxide per million BTU of heat input

(4.8) = 4.8 pounds of sulfur dioxide per million BTU of heat input

Figure A-2. Sulfur Dioxide Emission Limitations Specified in OEPA Regulations HP-11-13(B)(1) - Table A-9.

TABLE A-10. Ohio SO_2 Priority Region Emission Limit for Existing Sources with > 250 x 10^6 Btu/Hr Heat Input

AQCR	Emission Limit (lbs $SO_2/10^6$ Btu heat input)
103	3.2 (from July 17, 1972 - July 1, 1975) 1.0 (after July 1, 1975
176	
180	
182	
79	1.6 (from July 17, 1972 - July 1, 1975) 1.0 (after July 1, 1975)
173	
175	
178	
179	
124	1.0
174	
177	
181	
183	

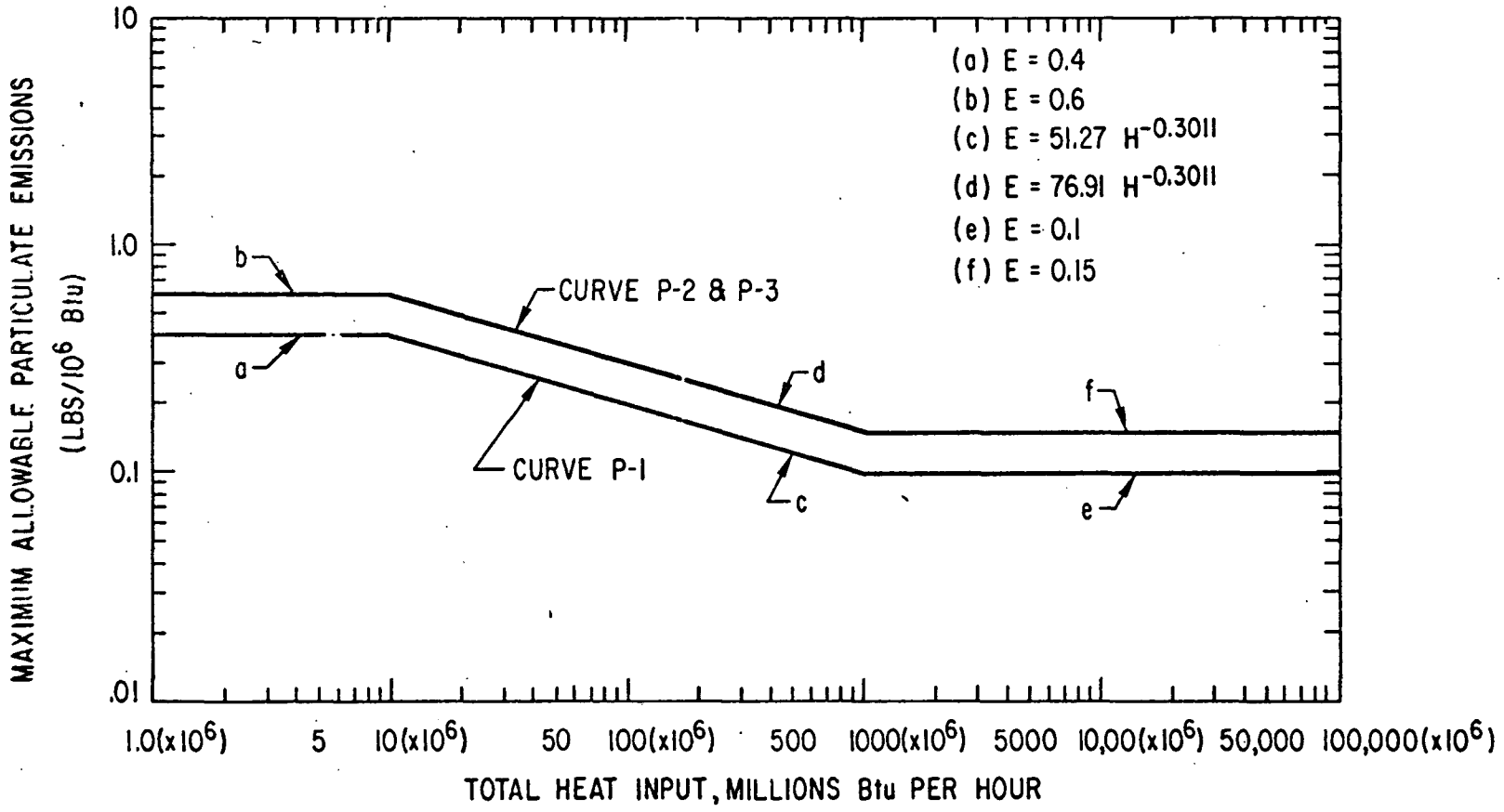

Figure A-3. Ohio Priority Region Emission Limit for Fuel Combustion Sources.

APPENDIX B

Regional Air Quality Assessment

TABLE B-1. Ohio AQCR Particulate Summary

Air Quality Control Region	Federal Number	Stations with Particulate Air Quality Violations	Expected Attainment Date	Number of Counties with AQMA Designations	Total Particulate Emissions (10^3 tons/yr)	% Emissions from Ohio Fuel Combustion	Emission Reduction Required for NAAQS (10^3 tons/yr)	Particulate Priority
Cincinnati[a]	79	3	7/75	4	269	60	+218	1
Portsmouth-Ironton[a]	103	3	7/75	0	167	19	+ 99	1
Toledo[a]	124	2	7/75	2	122	28	+ 49	1
Dayton	173	1	7/75	3	177	39	+113	1
Cleveland	174	6	1/77	7	360	73	+306	1
Mansfield-Marion	175	2	7/75	1	46	57	+ 23	2
Columbus	176	1	7/75	1	110	75	+ 66	1
Northwest Ohio	177	-	-	0	47	79	---	2
Youngstown[a]	178	3	1/77	2	320	33	+250	1
Marietta[a]	179	0	-	0	91	85	- 40	1
Sandusky	180	2	7/75	0	90	13	+ 76	3
Steubenville[a]	181	4	1/77	3	124	70	+104	1
Wilmington-Chillicothe	182	-	-	0	58	63	---	3
Zanesville	183	-	-	0	383	16	---	2

[a]Interstate

TABLE B-2. Ohio AQCR SO_2 Summary

Air Quality Control Region	Federal Number	Stations with SO_2 Air Quality Violations	Expected Attainment Date	Number of Counties with AQMA Designations	Total SO_2 Emissions (10^3 tons/yr)	% Emissions from Ohio Fuel Combustion	Emission Reduction Required for NAAQS (10^3 tons/yr	Particulate Priority
Cincinnati[a]	79	0	-	0	487	59	-219	2
Portsmouth-Ironton[a]	103	0	7/75	0	401	64	-421	2
Toledo[a]	124	0	-	0	256	57	-243	1
Dayton	173	1	7/75	3	106	91	+ 57	2
Cleveland	174	0	-	7	732	92	- 29	1
Mansfield-Marion	175	0	-	0	52	98	-121	2
Columbus	176	0	-	0	96	95	-719	3
Northwest Ohio	177	0	-	0	57	76	-116	1
Youngstown[a]	178	1	7/75	0	533	42	+ 16	2
Marietta[a]	179	-	-	0	481	86	---	2
Sandusky	180	-	-	0	226	9	---	3
Steubenville[a]	181	1	7/75	3	737	75	+185	1
Wilmington-Chillicothe	182	-	-	0	47	95	---	3
Zanesville	183	-	-	0	203	99	---	1A

[a]Interstate

APPENDIX C

Power Plant Assessment

TABLE C-1. Ohio Power Plant Assessment

AQCR	Plant	1975 Capacity (Mw)	Estimated 1975 Fuel Use		% Sulphur SIP Regulations[b]	% Sulphur Allowed by Model[c]
			Fuel	Quantity[a]		
79[d]	Municipal Light	133.5	Coal Oil Gas	193.2 46.5 1404.7	.56	.75
	Beckjord	1221.3	Coal Oil	2794.1 59.4	.55	.6
	Miami Fort	893.2	Coal	2360.1	.52	1.4
	West End	219.3	Gas	5470.1		
103[d]	Gavin	2600.0	Coal	773.8	.30	1.0
	Kyger Creek	1086.0	Coal	3051.0	.61	2.0
	Stuart	2440.6	Coal Oil	5672.3 41.8	.59	1.3
124	Acme[d]	321.0	Coal Oil Gas	394.0 164.0 863.0	.6	2.6
	Bay Shore	638.0	Coal Oil	1617.8 20.6	.6	1.5
173	Mad River	75.0	Coal	130.1	.9	1.6
	Piqua	73.0	Coal Oil	125.6 .4	.8	.9
	Hutchins	414	Coal Gas	677.8 133.5	.4	.9
	Tait	448.6	Coal	728.6	.4	1.46

TABLE C-1. Ohio Power Plant Assessment (Contd.)

AQCR	Plant	1975 Capacity (Mw)	Estimated 1975 Fuel Use		% Sulphur SIP Regulations[b]	% Sulphur Allowed by Model[c]
			Fuel	Quantity[a]		
174	Avon Lake	1275	Coal Oil	2475.3 118.7	.56	2.7
	Edgewater	192.9	Coal	337.8	.70	2.8
	East Lake	1257.0	Coal Oil	2339.2 17.4	.43	2.1
	Lake Shore	514.0	Coal Oil	1224.7 13.2	.62	1.3
	Cleveland Municipal	208.6	Coal Oil	190.2 188.5	.57	
	Gorge	87.5	Coal	245.5	.58	2.6
175	None					
176	Pickaway	230.8	Coal	271.0	.67	2.5
177	Woodcock	37.5	Coal Oil	52.1 11.5	.72	3.0
178[d]	Niles	250.0	Coal	1651	.66	2.8
	Ashtabula	456.0	Coal Oil	805.5 133.2	.41	3.0
179[d]	Poston	232.0	Coal	635.0	.37	1.3
	Muskingum River	1529.6	Coal Oil	4061.9 35.4	.54	1.4
180	None					
181[d]	Burger	544.0	Coal	1243.3	.5	.6
	Cardinal	1230.5	Coal Oil	2857.0 53.7	.5	1.5
	Toronto	175.8	Coal	433.3	.45	2.4
	Sammis	2303.5	Coal	5241.3	.6	1.1
	Tidd	226.3	Coal Oil	495.8 18.3	.54	.1

TABLE C-1. Ohio Power Plant Assessment (Contd.)

AQCR	Plant	1975 Capacity (Mw)	Estimated 1975 Fuel Use		% Sulphur SIP Regulations[b]	% Sulphur Allowed by Model[c]
			Fuel	Quantity[a]		
182	None					
183	Conesville	1275.5	Coal	2171.0	.47	2.3
	Philo	500.0	Coal Oil	678.9 8.4	.55	1.1

[a]Coal quantity is 10^3 tons/yr, oil quantity is 10^3 gal/yr, gas quantity is 10^6 ft^3/yr. Estimates are based on 1971 fuel use patterns plus planned additions. If 1971 fuel use data were unavailable, 1972 data were used.

[b]In dual coal-oil fired plants, only coal is assumed to change. Oil of the same % S as was fired in 1972 was assumed for 1975. The maximum allowable % S is assumed to be the 1971 % S unless the regulations require a lower % S.

[c]Maximum allowable % S is assumed to be 1971 % S unless modeling results show a lower % S allowable.

[d]Interstate

Table C-2. Ohio Power Plant Evaluation Summary

	SO_2								TSP
	1975 Coal Required by SIP Regulations[a] (10^3tons/yr)			1975 Emissions Reduction[b]	1975 Coal Required by Modified Regulations[c] (10^3tons/yr)			Modified 1975 Emission Reduction[d]	1975 Emission Reduction by SIP Regulations[c]
AQCR	<1%S	1-2%S	>2%S	(10^3tons/yr)	<1%S	1-2%S	>2%S	(10^3tons/yr)	(10^3tons/yr)
79	5,347.4			176	2,987.3	2,360.1		124	68
103	16,461.3			152		16,461.3		-209	2
124	2,011.8			64		1,617.8	394.0	16	0
173	1,662.1			39	803.4	858.7		4	11
174	6,812.7			411		3,563.9	3,058.6	145[f]	12
175				0		0	0	0	0
176	271.0			18			271.0	9	24
177	52.1			2			52.1	0	0.5
178	1,456.7			95			1,456.7	7	13
179	4,696.9			385		4,696.9		301	88
180				0				0	0
181	10,270.7			486	1,739.1	8,098.3	433.3	356	75
182				0				0	0
183	2,849.9			169		678.9	2,171.0	71	61

[a]Fuel requirements based on 1971 fuel use patterns at 1975 consumption rates. If 1971 fuel data were unavailable, 1972 data were used. Coal quantity is 10^3 tons/yr, oil quantity is 10^3 gal/yr, gas quantity is 10^6 ft^3/yr. Maximum allowable % S is 1971 % S unless regulations require a lower % S.

[b]Emission reduction from current emission rates. Oil of the same % S as was fired in 1972 was assumed for 1975. If actual fuels % S were unknown, state-wide averages were used.

[c]Maximum allowable % S is 1971 % S unless modeling indicates a lower % S. Oil and gas consumption are assumed to remain constant.

[d]Emission reduction from current emission rate.

[e]Emission reduction from current emission rates. Plants already at or below SIP requirements are assumed to remain so. New plants are assumed to meet SIP regulations.

[f]Modeling results not available for all plants.

APPENDIX D

Industrial, Commercial, Institutional Source Assessment

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
79[e]	Champion Papers	Coal	59,300	0.70
	Air Force Plant	Coal Oil	80,000 200	0.80
	Sorg Paper	Coal	86,900	0.74
	Armco	Coal	100,000	0.63
	Philip Carey	Coal	70,000	1.13
	Diamond	Coal	82,700	1.05
	Factory PB	Coal	34,700	1.13
	Ford (Sharon)	Coal	37,000	0.93
	Proctor & Gamble	Coal	149,000	.71
	Butler Crystal	Coal	30,000	1.13
	General Electric	Coal	70,000	1.14
	Nat. Distillery	Coal	13,700	1.15
	Container Corp.	Coal	28,000	1.13
	Fox Paper	Coal	27,400	1.13
103[e]	Allied Chemical	Coal	150,000	.55
124[e]	Standard Oil	P Gas N Gas	19,875 975	3.82
	Gulf Oil	Oil	50,850	1.04
	Bowling Green	Coal	21,600	2.50
	Libbey-Owens	Coal	61,000	0.71
	Toledo State Hospital	Coal	16,000	0.59

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
173	National Cash Register	Coal	85,500	1.00
	Kimberly-Clark	Coal Gas	100,000	0.88
	Frigidaire GMC	Coal	115,700	0.77
	General Motors	Coal Gas	41,500	1.06
	Central States Univ.	Coal	11,500	2.41
	St. Regis Paper	Coal	17,700	1.19
174	PPG Industries	Coal	1,068,000	1.33
	Firestone Tire & Rubber	Coal	254,900	0.61
	Goodyear Tire & Rubber	Coal Gas	358,200	0.65
	Chrysler Corp.	Coal	31,700	0.63
	Republic Steel (Cuyahaga Co.)	Coal Oil P Gas N Gas	158,550 11,200 132,771 560	2.63
	Republic Steel (Stark Co.)	Coal P Gas	60,140 490	3.88
	Transue & Wms.	Coal Oil	40,000 3,350	4.36
	B. F. Goodrich	Coal	125,200	0.67
	Timken Bearings	Coal	64,000	3.17
	IRC Fibers Division	Coal	220,600	0.66
	B. F. Goodrich - Chm.	Coal	24,900	0.58
	Alcoa	Coal	50,000	0.68
	Diamond Crystal Salt	Coal N Gas	60,000	0.87

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
174 (Contd.)	Uniroyal Chemical	Coal Oil	41,400 1,630	2.47
	Fisher Body	Coal	22,000	0.68
	Hawthorn	Coal	17,000	0.68
	Ford Motor Co.	Coal	31,000	3.13
	G.E. Cleve Wire Plant	Coal Gas	25,000 330	1.03
	Standard Oil Ohio	Coal Oil	17,000 360	0.71
	Canton D. Fgs. M.	Coal	33,660	2.80
	White Motors	Coal	25,000	0.68
	Standard Oil Ohio	Coal Gas	10,000	2.52
	Chase Brass & Copper	Coal Gas	30,000	1.13
	Portjec Inc.	Lignite	11,400	2.92
	U.S. Steel	Coal	10,000	3.54
	Post Office	Coal	9,730	3.41
	Sugardale Foods	Coal	9,000	3.19
	Ford Motor Co.	Coal	35,100	1.05
	Outwait	Coal	21,000	0.66
	Teledyne Rubber	Coal	6,120	3.25
	NASA-Lewis Research Cntr.	Coal Oil N Gas	4,770 1,147	2.31
	Fisher Body	Coal	25,600	1.05
	Perfection Stove	Coal N Gas	4,700	2.21

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
174 (Contd.)	Union Metal Mfg.	Coal	13,000	2.89
	U.S. Steel	P Gas N Gas	32,100	-
	White Engines	Coal	7,350	3.02
	Tecumseh Corrug.	Coal	12,000	0.65
	V. A. Hospital	Coal	14,610	0.71
175	Package Copp. Am. Inds. St.	Coal	162,000	.61
	Timken Co.	Coal	11,500	3.27
	Mansfield Tire & Rubber	Coal	31,950	1.02
	Empire-Detroit Steel	Coal N Gas	26,400	4.73
	Morton Salt	Coal	70,400	1.01
	Marion Power Shovel	Coal	7,730	2.62
	Koppers Co.	Coal	4,000	1.01
	J. M. Smucker	Coal	6,440	.92
	Apple Cr. St. Inst.	Coal	22,000	1.14
	Fisher Body Div.	Coal	24,280	1.02
	Central Soya	Coal	10,500	2.63
176	August Wagner Brewery	Coal	13,200	.63
	Defense Const.	Coal	20,000	2.18
	Marble Cliffs Quaries	Coal	16,700	3.18
	Col. Coated Fabrics	Coal	26,800	1.84
	Loroco Ids.	Coal	12,000	2.84
	Jeffrey Mining Mach.	Coal	13,400	1.93
	Capital City Products	Coal	24,900	1.92

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
176 (Contd.)	Owens-Corning	Coal N Gas	64,000 1,820	1.33
	Crown-Zellerach	Coal	42,200	2.34
	Cont. Corp. of Am.	Coal Oil	55,400 2,800	1.31
	N. Am. Rockwell	Coal N Gas	19,900 720	4.98
	Westinghouse Elec.	Coal	39,900	2.02
177	Standard Oil	Gas Oil	179,100 2,790	1.09
	Campbell Soup	Coal Oil	40,000 500	1.77
	Cooper Tire & Rubber	Coal	20,000	2.18
	St. Mary's Municipal	Coal	20,000	2.54
	Clark Equipment Co.	Coal	18,800	0.66
	Good Year Tire & Rubber	Coal N Gas	46,900 349	3.30
	St. Regis Paper	Coal	11,000	3.40
	St. Regis Paper	Coal	13,800	3.29
	Northern Ohio Sugar	Coal	28,000	2.37
178[e]	Youngstown Sheet-Tube	Coal Coke P Gas R Oil N Gas	141,600 72,000 10,910 2,520 274	1.14
	Republic Steel	Coal P Gas N Gas R Oil	103,000 54,532 342 447	1.61

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
178 (Contd.)	Union Carbide	Coal	812,000	0.55
	U.S. Steel Corp.	Coal	28,000	0.60
	Republic Steel	Coal P Gas R Oil	34,200 69,211 423	3.33
	U.S. Steel	Coal P Gas R Oil N Gas	18,200 60,200 5,620 905	5.25
	Wheeling-Pittsburgh Steel	Coal N Gas	15,030 322	1.28
	General Motors	Coal	9,180	0.69
	Cabot Titania	Coal N Gas	22,000 503	1.29
	Reactive Metals	Coal	38,400	0.68
179[e]	Ohio Power Co.	Coal	1,480,000	.50
180	New Deptr.-Hyatt	Coal	20,900	1.06
	U.S. Gypsum Co.	Coal	22,500	2.80
	Union Carbide	Coal	11,000	2.21
	Ford Motor Co.	Coal	22,400	1.05
181[e]	Wheeling-Pittsburgh Steel	Coal	56,500	0.69
	Federal Paper Board	Coal	50,000	0.61
	Kaul Clay	Coal	47,400	0.71
	Wheeling-Pittsburgh Steel	Coal P Gas R Oil	45,250 101,610 1,770	6.44
182	Mead Papers	Coal	381,300	0.54
	U.S. AEC	Coal	45,900	2.87

TABLE D-1. Ohio Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
183		N O N E		

[a]Ohio plants contributing 90% of the AQCR's SO_2 and particulate emissions.

[b]Does not include plant or process gas.

[c]Coal in 10^3 tons/yr, oil in 10^3 gals/yr.

[d]For plants using both coal and oil, the % S in the oil was assumed to remain at present levels. Within a given plant, there may be particular units fired primarily on oil which would not be in compliance firing such oil. Since unit-by-unit fuel mix data was unavailable, compliance was required on a plant-wide basis.

[e]Interstate

TABLE D-2. Ohio Industrial/Commercial/Institutional Source Evaluation Summary

AQCR	Fuel	Fuel Required by Existing Regulations[a]			SO_2 Emission Reduction[b]
		< 1 %	1-2%	> 2 %	(10^3 tons/yr)
79[d]	Coal	512	356		4
	Oil	200[c]			
103[d]	Coal	150			7
124[d]	Coal	77		22	3
	Oil		850		4
173	Coal	216	145	12	2
174	Coal	1255	1184	515	88
	Oil	17687			
175	Coal	168	152	57	14
176	Coal	250	184	163	13
	Oil	2800			
177	Coal	19	40	140	
	Oil	500	2790		0
178[d]	Coal	808	282		58
	Oil	9010			
179[d]	Coal	1480			136
180	Coal		43	34	2
181[d]	Coal	154		45	3
	Oil		1770		
182	Coal	381		46	26
183	None				0

[a]Does not include plant or process gas. Coal in 10^3 tons/yr; oil in 10^3 gals/yr. Since unit-by-unit fuel mix data was unavailable, compliance was determined on a plant-wide basis.

[b]Emission reduction from current rates. Does not include any reductions from required desulfurization of process gases.

[c]Current SIP regulations require a minimum of 1% S oil.

[d]Interstate

APPENDIX E

Area Source Assessment

TABLE E-1. Area Source Fuel Use

AQCR	Coal (10^3 tons/yr) Low Sulfur (< 1%)	Moderate Sulfur (1-2%)	High Sulfur (> 2%)	Distillate Oil (10^3 gals/yr)	Natural Gas ($10^6 ft^3$/yr)
79	861	195		180,440	81,050
103	5	51	68	33,040	8,440
124	1	399		67,060	37,090
173	2	821		92,490	67,190
174	59		3,830	602,220	208,680
175	102	52	276	68,430	47,020
176	30	458	193	123,400	72,160
177	251	97	499	131,740	43,860
178	5	239	310	80,280	39,800
179	3		78	15,810	7,502
180	2		224	30,460	16,800
181	9		248	41,610	15,940
182	4		162	37,290	10,180
183	7		238	35,800	14,560

APPENDIX F

Fuels Assessment

TABLE F-1. Ohio Clean Fuels Analysis Summary

		Existing Regulations Clean Fuel Requirements[a]		Modified Regulations Clean Fuel Requirements[b]	
AQCR	Fuel	< 1% S	1-2% S	< 1% S	1-2% S
79[e]	Coal	5859.4	356.0	2987.3	12716.1
103[c]	Coal	16611.3		150.0	16461.3
124[c]	Coal	2088.8		77.0	1617.8
173	Coal	1683.9	145.0	1019.4	1003.7
174	Coal	8067.7	1184.0	1255.0	4747.9
175	Coal	168.0	152.0	168.0	152.0
176	Coal	521.0	184.0	250.0	184.0
177	Coal	61.1	40.0	19.0	40.0
178[c]	Coal	2344.7	282.0	888.0	282.0
179[c]	Coal	6176.9		1480.0	4696.9
180	Coal		43.0		43.0
181[c]	Coal	10424.70		1893.1	8098.3
182	Coal	381.0		381.0	
183	Coal	2849.9			678.9

[a]From power plant and industrial/commercial/institutional point sources only. Includes only that required and not entire fuel consumption. Coal in 10^3 tons/yr.

[b]Based on modeling results. No modeling results available for industrial/commercial/institutional sources; fuel consumption was assumed to remain at SIP requirements. Includes only that required and not entire consumption.

[c]Interstate

TABLE F-2. Projected 1975 Ohio Coal Use[a]

AQCR	Power Plants	Industrial/Commercial/Institutional	Area	Total	% of Total	Rank
79	5347	868	1056	7271	10	4
103	16461	150	124	16735	24	1
124	2012	99	400	2511	4	9
173	1662	373	823	2858	4	8
174	6813	2954	3889	13656	19	2
175	0	377	430	807	1	12
176	271	974	681	1926	3	10
177	52	199	902	1153	2	11
178	1457	1170	554	3181	5	6
179	4697	1480	81	6258	9	5
180	0	77	226	303	0	14
181	10271	199	257	10727	15	3
182	0	626	166	792	1	13
183	2850	0	245	3095	4	7
State Total	51893	8971	9779	70643	100	
% of Total	73	13	14	100		

[a]Sources: (1) Steam Electric Plant Factors 1972, (2) NEDS Emission File, Coal use in 10^3 tons/yr.

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