SN 14838.000

Proposed Implementation Plan for the Control of Particulates and Sulfur Oxides

for the
State of Indiana Portion
of the
Metropolitan Cincinnati Interstate Air Quality Control Region

September 1970

prepared for
National Air Pollution Control Administration

TRW SYSTEMS GROUP
WASHINGTON OPERATIONS

PROPOSED IMPLEMENTATION PLAN FOR THE CONTROL OF PARTICULATES AND SULFUR OXIDES FOR THE STATE OF INDIANA PORTION OF THE METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

SEPTEMBER 1970

Prepared for

National Air Pollution Control Administration

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1. DESCRIPTION OF THE REGION

1.1 GENERAL CHARACTERISTICS

The Metropolitan Cincinnati Interstate Air Quality Control Region (MCIAQCR) was designated by the Secretary of the Department of Health, Education and Welfare on May 2, 1969. The Region is comprised of approximately 3000 square miles of land area located in the extreme southwestern portion of Ohio and the adjacent state of Indiana and the Commonwealth of Kentucky (Figure 1-1). There is a total of nine counties, including the territorial areas of all municipalities within the counties in the MCIAQCR, namely:

Indiana

- Dearborn County
- Ohio County

Kentucky

- Boone County
- Campbell County
- Kenton County

Ohio

- Butler County
- Clermont County
- Hamilton County
- Warren County

Current estimates place the population of the Region at approximately 1.5 million persons, of which about 500,000 reside within the City of Cincinnati. The population within the Region is centered on Cincinnati with nearly two-thirds of the populace living with 15 miles of the confluence of the Ohio and Licking Rivers. Projections of future growth indicate that the total population of the Region should increase to 1.8 million by 1975 and 2.0 million by 1980.

The MCIAQCR is primarily an industrial area with about one-third of the total employment in manufacturing industries. The principal industries are aerospace, soap products, automotive, primary metals, fabricated metals, petroleum products, rubber, plastics, chemical, and machine tool manufacture. Industry is concentrated along the Mill Creek, Great Miami and Little Miami Rivers in Ohio, and the Licking River in Kentucky.

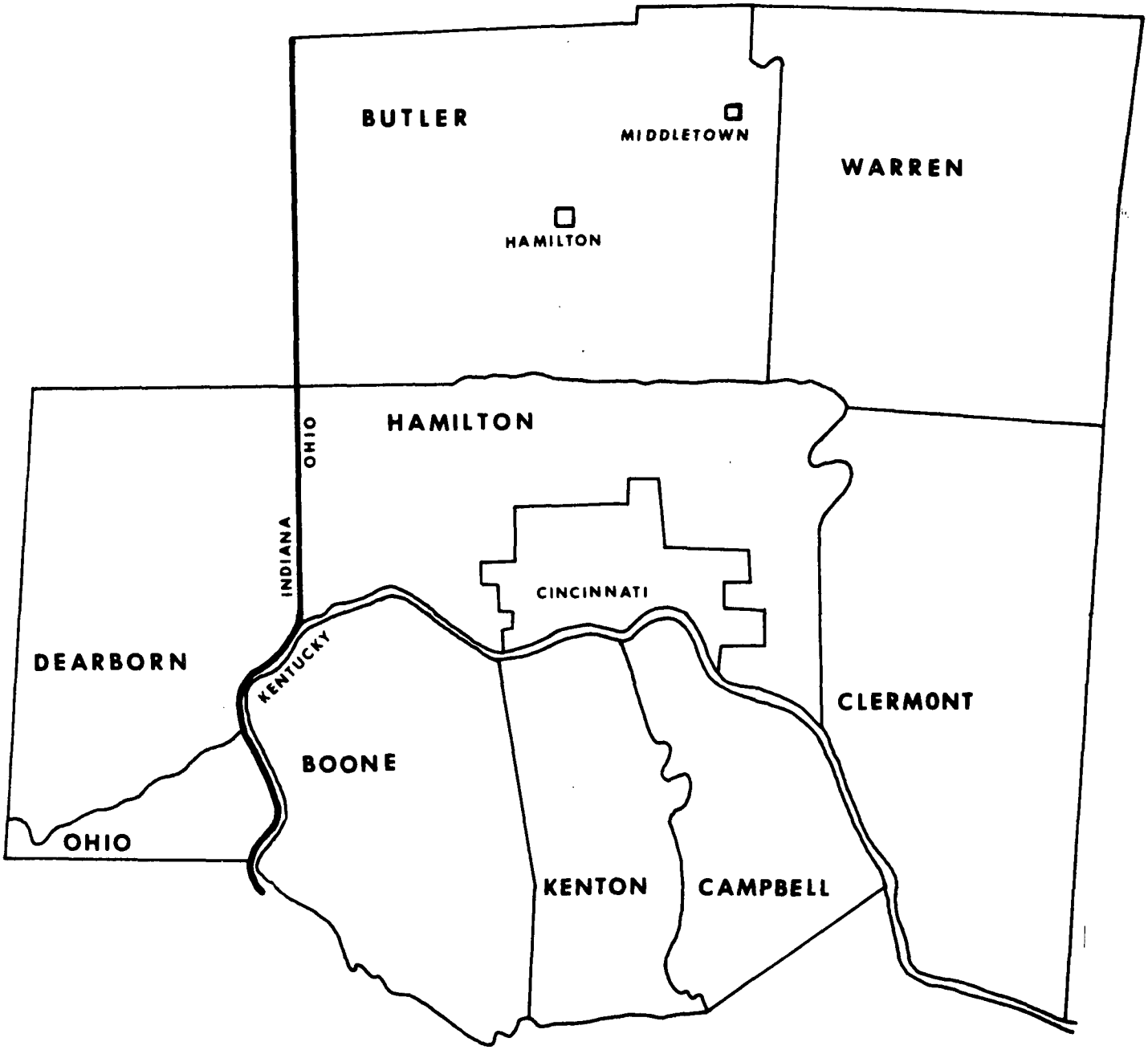

Figure 1-1. METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

The major sources of sulfur oxides are related to fuel combustion with the most significant sources being the several large electric generating plants located in the Region. Fuel combustion also contributes heavily to the total emission of particulates, and again the electric power generating plants represent major point sources. Significant amounts of particulates are also emitted by industrial fuel combustion sources as well as industrial process losses. Solid waste disposal by open burning is permitted within the Region; and as a result, such sources emit large quantities of particulate pollutants.

1.2 TOPOGRAPHICAL FEATURES

The area in and around Cincinnati consists of an upland plain about 900 feet above sea level which is cut by the flood plain of the Ohio River. Hills and valleys are more pronounced in the southern and western portions of the Region. The basin area within the flood plain of the Ohio River is surrounded by steep bluffs rising 200 to 400 feet to the general level of the upland plain. These bluffs are cut frequently by the valleys of small streams which produce a setting of promontories and steep hills. In general, throughout the Region the hills and valleys have only a minimal effect on air movement; however, within the steep walled meandering valleys, the air flow is strongly influenced by the surrounding terrain.

1.3 DEMOGRAPHY

Population statistics for each county and for six principal cities within the MCIAQCR are presented in Table 1-1. The City of Cincinnati with a population exceeding 500,000 accounts for one-third of the total population of the Region. The four Ohio counties include over 80 percent of the population in the MCIAQCR. Population density for the entire Region averages 494 persons per square mile but varies from 52 persons per square mile in Ohio County, Indiana, to 2384 persons per square mile in Hamilton County, Ohio. The counties of Boone in Kentucky and Warren in Ohio showed the greatest growth in the ten-year period 1960 - 1970. (Figure 1-2)

	Increase (%)	Land Area (sq.mi.)	1960	1965	Estimated 1970	1975	Density Persons/Sq.Mi.	Percent of Total Population
Indiana	3.0	739	32,936	34,301	35,320	36,340	48	2.0
Dearborn Cty.	3.0	306	28,771	29,901	30,800	31,700	100	1.8
Ohio County	2.7	87	4,165	4,400	4,520	4.640	52	0.2
Kentucky	7.3	563	230,289	242,584	260,300	278,400	462	15.1
Boone County	22.6	249	22,033	25,112	30,800	36,700	124	1.8
Campbell County	5.2	149	87,119	90,336	95,000	99,800	638	5.5
Kenton County	6.6	165	121,137	127,136	134,500	141,900	815	7.8
Ohio	9.1	1751	1,214,000	1,319,421	1,439,500	1,550,000	822	83.0
Butler County	10.6	471	199,897	221,194	244,700	268,300	520	14.2
Clermont Cty.	14.9	458	80,874	96,697	111,100	125,600	242	6.3
Hamilton Cty.	5.6	414	867,214	934,301	987,200	1,040,200	2384	56.9
Warren Cty.	25.0	408	66,015	77,229	96,500	115,900	284	5.6
MCIAQCR		3032	1,477,225	1,606,306	1,735,120	1,864,740	572	

Source: Ohio, Kentucky, Indiana Regional Planning Authority

Table 1-1. POPULATION GROWTH BY COUNTY AND FOR SELECTED CITIES
1960 - 1980

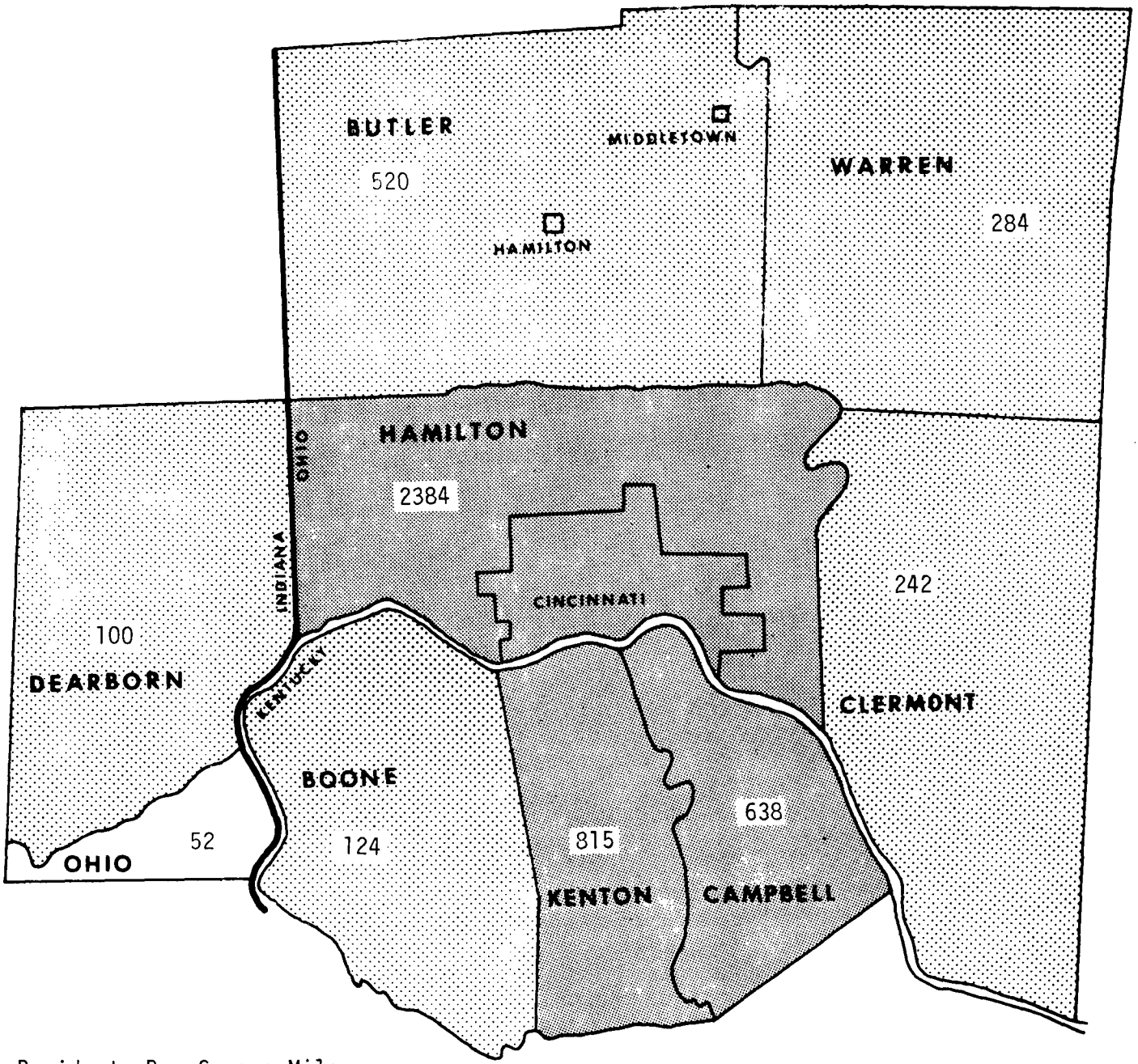

Figure 1-2. POPULATION DENSITY IN MCIAQCR

1.4 METEOROLOGICAL DATA

1.4.1 Climatology

Climate of the MCIAQCR is typically continental with a wide range of temperatures from winter to summer. Summers are warm and rather humid, with temperatures reaching 100°F or more one year out of three. Above 90°F temperature occurs about 28 days each year. Winters are moderately cold with frequent periods of extensive cloudiness. However, during an average winter the temperature reaches zero or below only on two days.

The Region is subjected to frequent changes in the weather due to the passage of numerous cyclonic storms in the winter and spring and thunderstorms during the summer. Minimum precipitation occurs in the fall. Nearly one-third of the yearly precipitation occurs during the summer months when prevailing south-to-southwest winds on the western sides of the Bermuda high carry warm, moist air from the Gulf of Mexico up the Mississippi and Ohio Valleys. South-to-southwest flow predominates throughout the year with average wind speeds at Greater Cincinnati Airport between 10 to 11 m.p.h. from November to April, between 7 to 9 m.p.h. from May to September, and 9 m.p.h. over the year. Wind speeds within the city limits average about 2 to 3 m.p.h. lower than these recorded at the Airport.

Table 1-2 gives estimates of monthly mean afternoon mixing heights in meters above ground, averaged over each month and the year as a whole. These data, interpolated from values computed by Holzworth[1] for the nearest surrounding radiosonde observation stations, Joliet, Illinois, Pittsburgh, Pennsylvania, and Nashville, Tennessee, cover the 10-year period 1946 - 1955. Table 1-3 shows seasonal and annual frequencies of noctural inversions, nighttime cloud cover equal to or less than 3/10, nighttime wind speed equal to or less than 7 m.p.h. The data, adapted from Hosler[2], apply to Greater Cincinnati Airport. In the city, nocturnal inversions occur less frequently than at the airport despite the higher frequency of light winds.

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[1] Holzworth, G.C., "Estimates of Mean Maximum Mixing Depths in the Contiguous United States", Monthly Weather Review, 92, 5, 235-242 (May 1964).

[2] Hosler, C.R., "Low-Level Inversions Frequency in the Contiguous United States", Monthly Weather Review, 89, 319-339 (September 1961).

January	February	March	April	May	June	July	August	September	October	November	December
500	570	1020	1140	1250	1320	1550	1440	1200	950	670	520

Annual
1010

Table 1-2. MONTHLY MEAN AFTERNOON MIXING HEIGHTS (meters) FOR THE METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

	Winter	Spring	Summer	Autumn	Annual
(1) Inversions	25*	28	32	37	30
(2) Cloud Cover Equal to or Less Than 3/10	26	36	55	54	42
(3) Winds Equal To Or Less Than 7 m.p.h.	31	38	69	50	47

* Percent of Total Hours

Table 1-3. SEASONAL AND ANNUAL AVERAGE FREQUENCY OF OCCURRENCE OF CONDITIONS FAVORABLE FOR HIGH POLLUTION VALUES

1.4.2 Data for the Atmospheric Dispersion Model

The dispersion model used for the development of control strategies, discussed in Section 2, requires input of the following meteorological data:

- Wind: direction and speed
- Atmospheric stability
- Average mixing height

Wind and stability are combined in a 480-unit, three-dimensional frequency distribution based on 16 wind directions, six wind speed classes, and five stability categories. The data used for this analysis are listed in the Appendix in two tables:

- Table A-1. DATA COVERING THE YEAR 1965 THROUGH 1969, TO ESTIMATE AVERAGE ANNUAL GROUND LEVEL POLLUTANT CONCENTRATIONS
- Table A-2. DATA COVERING THE THREE MONTHS NOVEMBER 1969 THROUGH JANUARY 1970, FOR VALIDATING THE MODEL

Average annual and winter afternoon mixing heights for the five-year period were determined to be 1315 meters and 680 meters, respectively. These values, derived from radiosonde data for Dayton, Ohio, are higher than interpolated climatological data given in Table 1-2, which cover an earlier and longer period of record.

The model also provides for a computation of effective stack height based on Holland's Plume Rise Equation.[3] Meteorological data required for this computation include barometric pressure, here assumed to be 1000 millibars, and mean ambient temperature, assumed to be 32°F, or 273°K.

1.5 EMISSION INVENTORY

In October 1968, the Division of Air Quality and Emission Data, National Air Pollution Control Administration, completed an inventory of all sources of air pollution in the nine-county MCIAQCR. A partial emission inventory for the City of Cincinnati was completed by the Division of Air Pollution Control and Heating Inspection in December 1968. Following this, in October 1969, the Kentucky Air Pollution Control Commission conducted an inventory of sources of pollution for Boone, Campbell and Kenton Counties. The APC agencies for Ohio and Indiana conducted inventories in December 1969.

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[3] Holland, J.Z., "A Meteorological Survey of the Oak Ridge Area," USAEC Report ORO-99, Oak Ridge National Library, 1953.

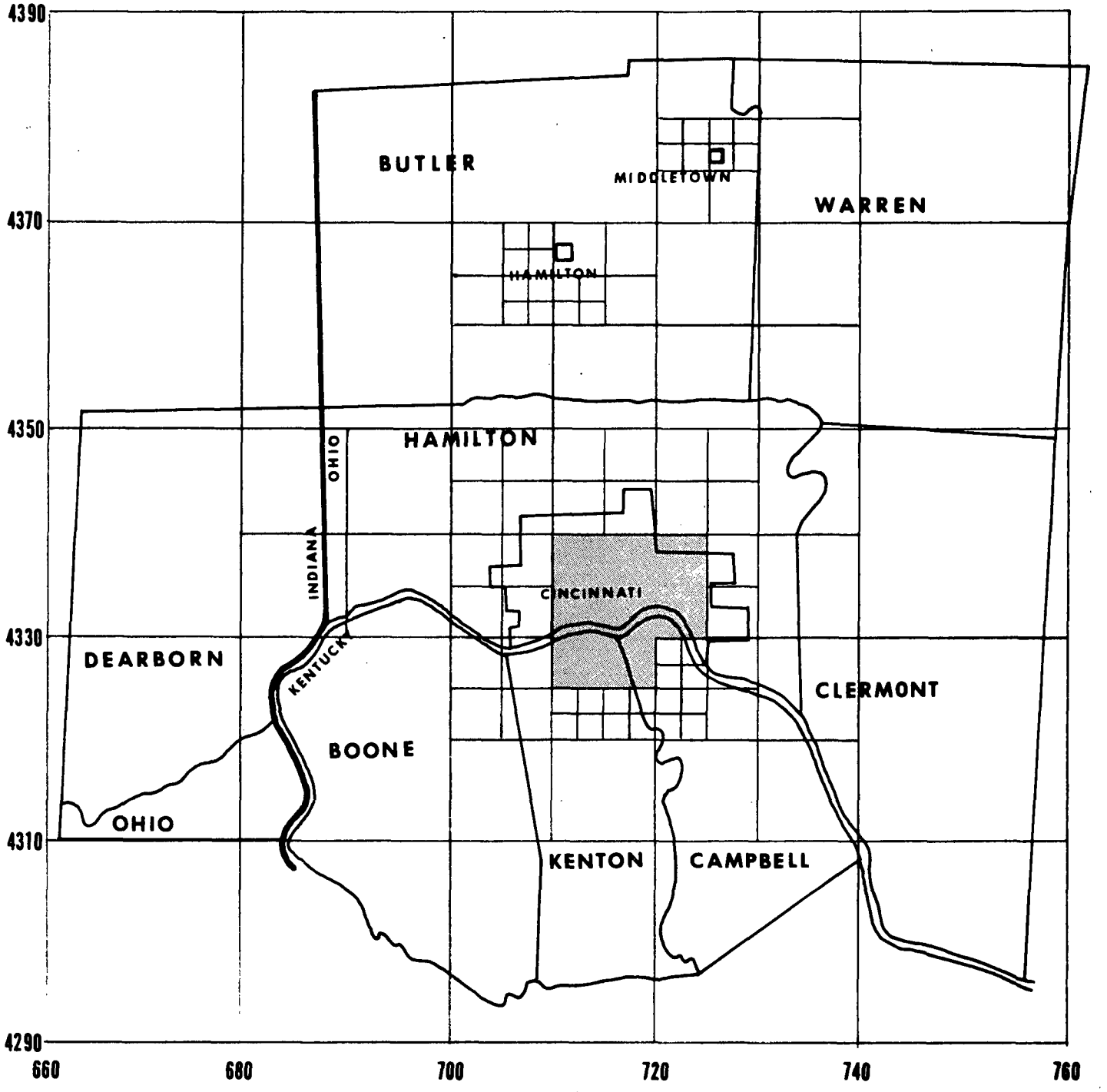
Information derived from all of the above surveys was used to compile the comprehensive emission inventory upon which this Implementation Plan is based. All sources emitting more than 10 tons/year of pollutants were treated as point sources. Those with emissions less than 10 tons/year were included with the area emission sources.

The Universal Transverse Mercator (UTM) grid system was used to locate all sources of pollution in the Region. The basic grid for the Region is 100 x 100 kilometers (Figure 1-3). All points sources are located by their easting and northing coordinates. Area sources of pollution are computed for grids varying in size from 2.5 x 2.5 KM to 20 x 20 KM, the smaller grid size being used in areas with high emission densities. Area source grids are located by the easting and northing coordinates of the lower left corner of the grid.

A summary of all point and area sources of emission is presented in Table 1-4 for sulfur oxides and in Table 1-5 for particulates.* A total of 389,000 tons of sulfur oxides are emitted annually from all sources within the Region. Fuel combustion for stationary sources accounts for nearly 375,000 tons or 96.4 percent of sulfur oxide emissions. More than 82 percent of all sulfur oxides emitted in the Region comes from electric power generating plants. Even though the MCIAQCR is basically a manufacturing center, industrial process losses account for only 2 percent of the total sulfur oxide emissions.

In excess of 172,000 tons of particulate pollutants are emitted into the atmosphere within the MCIAQCR each year. Again, fuel combustion sources represent the dominant contributors of particulates, accounting for 68 percent (117,600 tons/year). Electric power generating plants are the single most important type of source in that they emit 80,8000 tons/year or about 47 percent of all particulates. Industrial process losses emit 25,000 tons and solid waste disposal 20,800 tons of particulates each year. For solid waste disposal, open burning accounts for 18,400 tons of particulates each year. The geographical distribution of point sources emitting more than 10 tons per year is presented in Figure 1-4. It is apparent that the majority of the point sources are located in Ohio with the greatest concentration of point sources in Hamilton County.

*The complete emission inventory has been supplied to NAPCA and only summary tabulations appear in this report.



Shaded area composed of forty 1 km^2 areas

Figure 1-3. EMISSION INVENTORY GRID MAP SHOWING LOCATIONS AND SIZES OF AREAS INTO WHICH AREA EMISSION SOURCES WERE GROUPED

Source Category	POLITICAL JURISDICTIONS				
	Cincinnati	Indiana	Kentucky	Ohio	TOTAL
Fuel Combustion, Stationary	10,845.88	126,081.09	2,496.73	230,716.90	370,140.60
Apartments, Commercial, Government	5,765.54	463.38	1,910.15	4,956.40	13,068.47
Industrial	4,463.39	1,689.20	271.78	28,253.75	34,678.12
Power Plants	0	123,844.50	0	196,041.50	319,886.00
Residential	616.95	111.01	314.80	1,465.25	2,508.01
Fuel Combustion, Mobile	1,299.65	149.94	544.97	2,895.74	4,890.30
Gasoline Powered	984.09	107.90	404.55	2,153.08	3,649.72
Diesel Powered	315.56	42.04	140.42	742.66	1,240.68
Industrial Process Emissions	0	0	0	8,584.80	8,584.80
Solid Waste Disposal	550.81	57.33	97.16	2,552.54	3,257.84
Open Burning	113.23	57.33	97.16	2,453.99	2,721.71
Industrial	110.23	37.33	28.10	335.14	510.80
Commercial, Government	3.00	5.40	54.46	224.50	287.36
Municipal	0	14.60	14.60	1,894.35	1,923.55
Incineration	437.58	0	0	98.55	536.13
Industrial	0	0	0	0	0
Commercial, Government	47.03	0	0	0	47.03
Municipal	309.55	0	0	98.55	489.10
GRAND TOTAL	12,696.34	126,288.36	3,138.86	244,749.98	386,873.54

Table 1-4. EXISTING SULFUR OXIDE EMISSIONS IN THE MCIAQCR BY SOURCE CATEGORY AND LOCATION BASED ON 1969 EMISSION INVENTORY (tons/year)

Source Category	POLITICAL JURISDICTIONS				
	Cincinnati	Indiana	Kentucky	Ohio	TOTAL
Fuel Combustion, Stationary	6,302.41	25,092.55	1,251.27	85,965.89	118,602.12
Apartments, Commercial, Government	2,538.80	190.72	833.93	2,166.12	5,729.57
Industrial	3,431.91	1,222.00	265.13	25,119.54	30,038.58
Power Plants	0	23,633.75	0	58,104.35	81,738.10
Residential	331.70	36.08	152.21	575.88	1,095.87
Fuel Combustion, Mobile	2,179.90	259.47	1,692.04	4,913.08	9,044.49
Gasoline Powered	1,312.11	143.86	539.39	2,870.77	4,866.13
Diesel Powered*	867.79	115.61	1,152.65	2,042.31	4,178.36
Industrial Process Emissions	365.00	91.25	7,489.80	16,968.85	24,914.90
Solid Waste Disposal	3,677.59	1,201.37	1,905.37	14,006.54	20,790.87
Open Burning	1,887.50	1,201.37	1,905.37	10,929.59	18,424.08
industrial	1,837.39	622.27	468.50	5,585.67	8,513.83
commercial, government	50.11	90.00	907.62	4,964.32	6,012.05
municipal	0	489.10	529.25	379.60	3,898.20
Incineration	1,790.09	0	0	3,076.95	2,166.04
industrial	0	0	0	0	0
commercial, government	235.19	0	0	0	235.19
municipal	1,554.90	0	0	3,076.95	1,930.85
GRAND TOTAL	12,524.90	26,634.64	12,338.48	121,854.36	173,352.38

Table 1-5. EXISTING (1969) PARTICULATE EMISSIONS IN THE MCIAQCR BY SOURCE CATEGORY (tons/year)

*Includes particulate emissions from Greater Cincinnati Airport in Kentucky

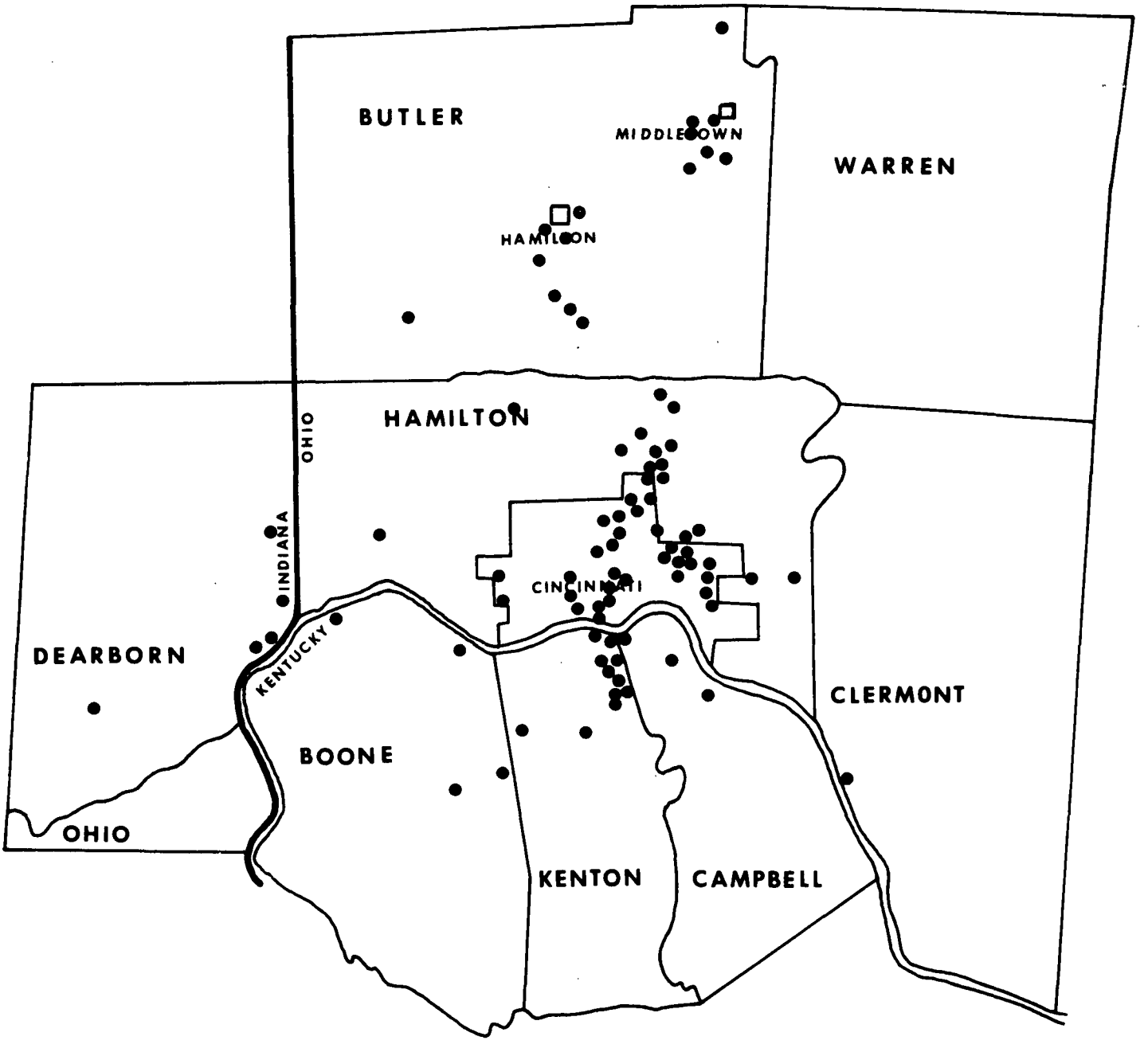


Figure 1-4. POINT SOURCES IN THE MCIAQCR EMITTING MORE THAN 10 TONS PER YEAR OF EITHER POLLUTANT

There are two power generating plants in Dearborn County, Indiana, and one in Clermont County, Ohio. Emission sources located in the Cities of Hamilton and Middletown, Ohio, are shown by separate clusters to the north of the City of Cincinnati.

Contributions from area sources of emissions are presented in terms of emission densities (tons/day/km^2) for sulfur oxides (Figure 1-5) and particulates (Figure 1-6). The two pollutants show the same geographical pattern with areas of highest emission densities centered on the City of Cincinnati and the northern Kentucky cities of Covington and Newport. The Cities of Hamilton and Middletown in Butler County also show up as significant area sources for both SO_2 and particulates. Grid number 223 in Boone County shows relatively high particulate emissions as a result of aircraft activity at the Greater Cincinnati Airport.

1.6 REGIONAL AIR QUALITY

1.6.1 Sampling Stations

Measurements of ambient concentrations of particulates and sulfur oxides have been made at various locations in the MCIAQCR since 1957. For the most part, the sampling sites were located in or near the City of Cincinnati and were operated for periods of one year or less on a project basis. As a result, there is a paucity of data for the Region as a whole.

Table 1-6 lists the most recent sampling sites, identified by site numbers used on NAPCA and state and local programs. Locations are shown in UTM coordinates. At four locations, three in Cincinnati and one in Covington, measurements made under federally sponsored programs span a number of years. Station 106, operating under the Continuous Air Monitoring Program (CAMP) has an uninterrupted record dating back to 1961. Three stations, Numbers 98 and 109 in Cincinnati and 105 in Covington, are part of the National Air Sampling Network (NASN); the record for Station 109 dates back to 1957.

Further data on sampling stations are given in connection with specific projects and results discussed below.

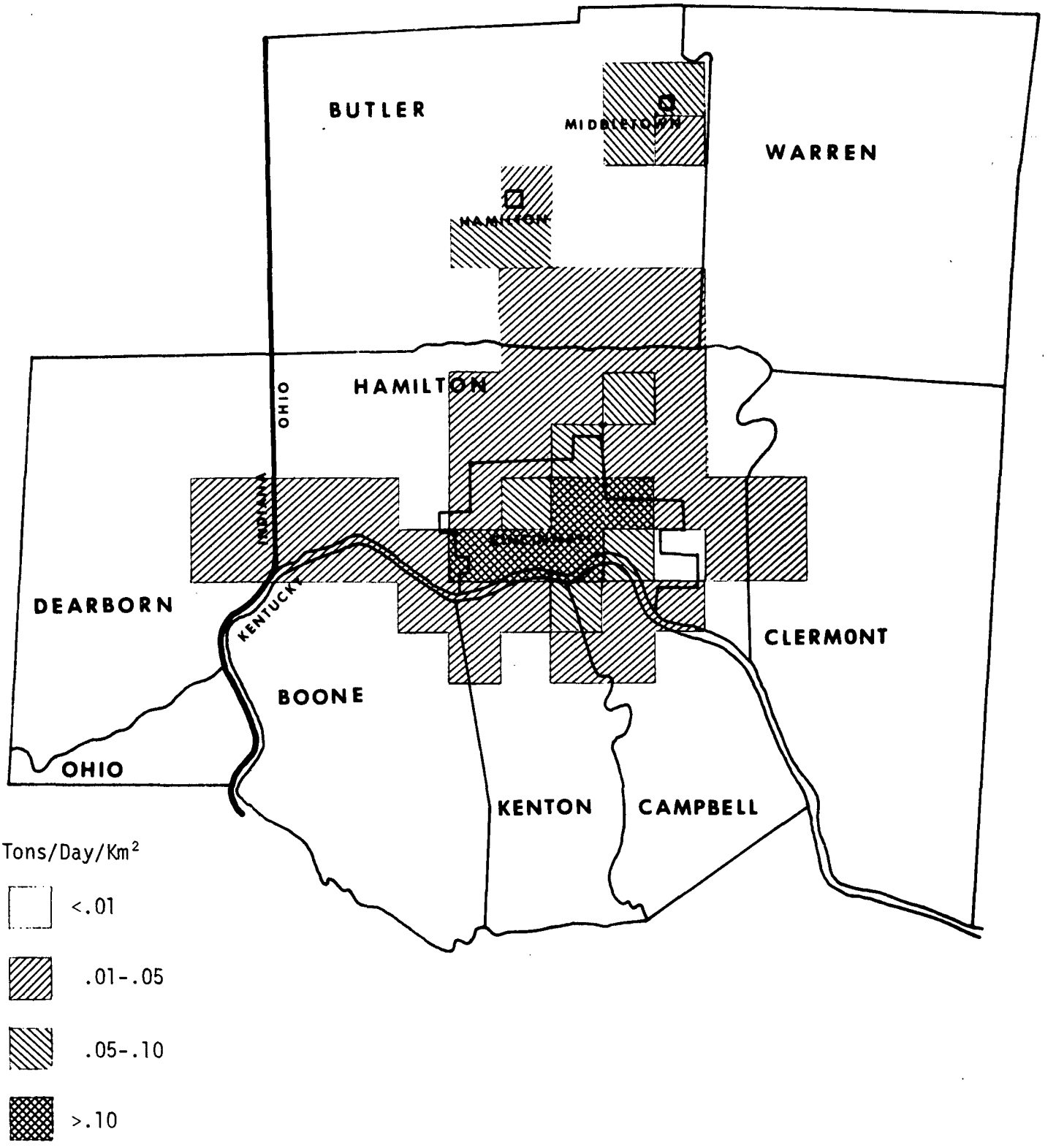


Figure 1-5. SULFUR OXIDES EMISSION DENSITY BY GEOGRAPHICAL AREAS

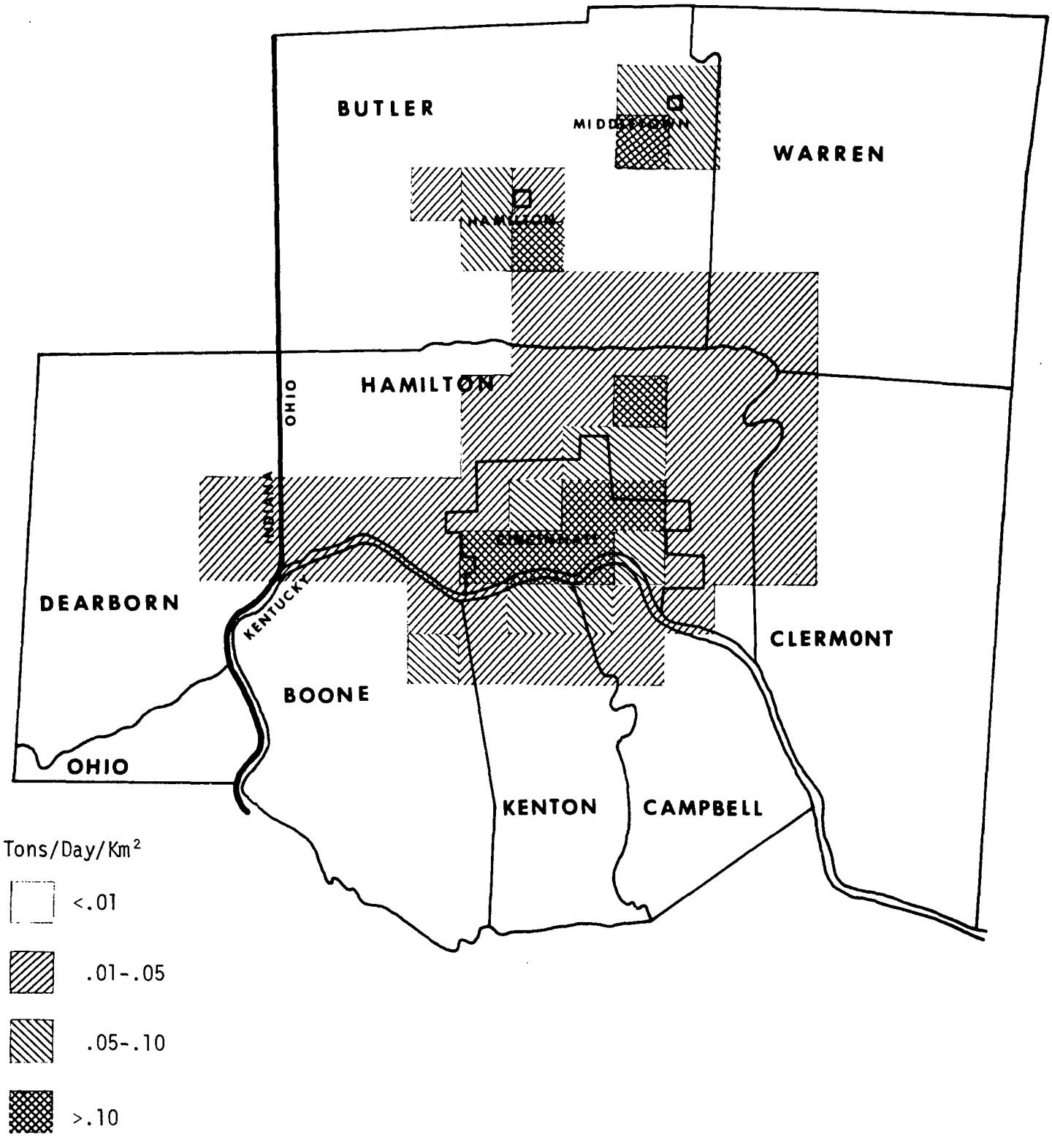


Figure 1-6. PARTICULATE EMISSION DENSITY BY GEOGRAPHICAL AREAS

Table 1-6. MCIAQCR SAMPLING STATIONS

STATION NUMBER		COORDINATE (kilometer)			LOCATION	
NAPCA	State & Local	Easting	Northing	Name	City or County	State
10		721.80	4331.90	Tennyson Pumping Station	Cincinnati	Ohio
39		716.20	4329.50	Newport Mall	Newport	Kentucky
42		707.00	4321.80	Erlanger City Hall	Erlanger	Kentucky
70	2	694.67	4335.75	North Bend Fire Station	North Bend	Ohio
71	3	701.27	4348.52	New Baltimore Fire Station	New Baltimore	Ohio
72	6	707.39	4340.25	Monfort Heights Fire Station	Monfort Heights	Ohio
73	13	709.37	4331.84	Seaton High School	Hamilton County	Ohio
74	16	717.73	4341.15	Seymour Fire Station	Hamilton County	Ohio
75	17	717.55	4339.31	Laidlaw	Cincinnati	Ohio
76	20	723.69	4349.82	Sharonville Elem. School	Sharonville	Ohio
77	21	719.81	4344.81	Lockland Fire Station	Lockland	Ohio
78	23	722.24	4339.72	Nativity Elem. School	Hamilton County	Ohio
79	31	729.39	4327.69	Anderson Township School	Hamilton County	Ohio
80	30	728.13	4334.13	Newton Elem. School	Newton	Ohio
81	36	740.94	4323.40	Amelia Elem. School	Amelia	Ohio
82	37	735.58	4314.80	New Richmond Fire Station	New Richmond	Ohio
83	43	709.75	4363.87	City Building	Hamilton	Ohio
84	44	708.42	5362.39	Monroe Elem. School	Hamilton	Ohio
85	45	711.69	4366.20	Hamilton No. Water Treatment Plant	Butler County	Ohio

Table 1-6. MCIAQCR SAMPLING STATIONS (continued)

STATION NUMBER		COORDINATE (kilometer)			LOCATION	
NAPCA	State & Local	Easting	Northing	Name	City or County	State
86	46	712.20	4364.40	Grant School	Hamilton	Ohio
87	47	712.03	4361.45	Van Buren Elem. School	Hamilton	Ohio
88	52	723.57	4376.70	Middletown High School	Middletown	Ohio
89	53	723.69	4374.77	Garfield Elem. School	Middletown	Ohio
90	54	727.75	4378.12	Manchester Jr. High School	Middletown	Ohio
91	55	728.42	4376.08	Creekview Elem. School	Middletown	Ohio
92	56	725.46	4374.50	Pioneer Standard Electronics	Middletown	Ohio
93	58	733.05	4381.58	Franklin High School	Franklin	Ohio
94	59	740.12	4368.94	Lebanon High School	Lebanon	Ohio
98	2	711.60	4341.60	College Hill	Cincinnati	Ohio
105		715.60	4328.80	Covingtnn NASN	Covington	Kentucky
106		714.40	4331.60	CAMP	Cincinnati	Ohio
107		712.20	4331.60	Waste Water Treatment Plant	Cincinnati	Ohio
109		715.00	4331.20	Library	Cincinnati	Ohio
110		685.00	4331.10	Greendale Utilities	Greendale	Indiana
111		714.30	43333.30	WLW TV Tower	Cincinnati	Ohio
112		687.10	4329.30	Lawrenceburg Police & Fire Station	Lawrenceburg	Indiana
113		615.10	4329.20	IRS Building	Covington	Kentucky
114		742.10	4322.40	Volunteer Fire Department	Amelia	Ohio
202		712.80	4335.40	Highway Maintenance	Cincinnati	Ohio

Table 1-6. MCIAQCR SAMPLING STATIONS (continued)

STATION NUMBER		COORDINATE (kilometer)			LOCATION	
NAPCA	State & Local	Easting	Northing	Name	City or County	State
203		725.30	4337.90	French Bauer (Dairy)	Cincinnati	Ohio
204		727.70	4340.40	Maderia Board of Education	Maderia	Ohio
207		719.10	4336.30	Norwood Fire Station #2	Norwood	Ohio
209		711.60	4336.70	Cincinnati Gas & Electric Substation	Cincinnati	Ohio
244		715.90	4326.70	Rockcastle Motor Sales	Covington	Kentucky
245		723.32	4376.96	City Building Annex	Middletown	Ohio

1.6.2 Regional Distribution of Particulate Pollutants

Figure 1-7 shows isopleths of average annual ground level concentrations of suspended particulates measured over a portion of the Region during 1967 to 1969. The observational records used to develop this figure include those of the CAMP and NASN stations and the combined data of several measurement programs irregularly spaced throughout the period. From Figure 1-7 it is apparent that areas of high pollution are centered on Cincinnati and Newport, Kentucky, the City of Hamilton and the vicinity of the Ohio and Indiana border near the Ohio River. It will also be apparent, from the table of Air Quality Standards in Section 1.6.4 infra, that these standards are being exceeded over a significant part of the MCIAQCR. These indications are further supported by a three-month study from November 1969 through January 1970, results of which are shown in Table 1-7. All measurements reported in micrograms per cubic meter were made by means of high volume samplers ("hi-vols"). At one site, in Newport, Kentucky, soiling index (smoke shade) measurements reported in COHs per 1000 linear feet were made on an AISI tape sampler. These units are not used for Air Quality Standards and no factor to convert them to equivalent micrograms per cubic meter is universallly agreed upon.

1.6.3 Regional Distribution of Sulfur Dioxide

Ambient air monitoring data for sulfur dioxide are scarcer than for particulates, both on a regionwide and a local basis. In recent years, however, several projects were undertaken to obtain measurements of sulfur oxides, using sulfation networks, wet impingers ("bubblers"), and continuous SO_2 analyzers. Figure 1-8 shows isopleths of annual average ground level concentrations of SO_2 derived from several projects in operation during 1968-1969. Table 1-8 gives results for the three-month period corresponding to Table 1-7. Table 1-9 also covers the period November 1969 through January 1970, but the data are measurements of sulfation taken from a close network of stations. The station numbers are different from those previously listed for the Region. Coordinates are given to the nearest kilometer, measured from the origin at (660.0, 4290.0) in the UTM system.

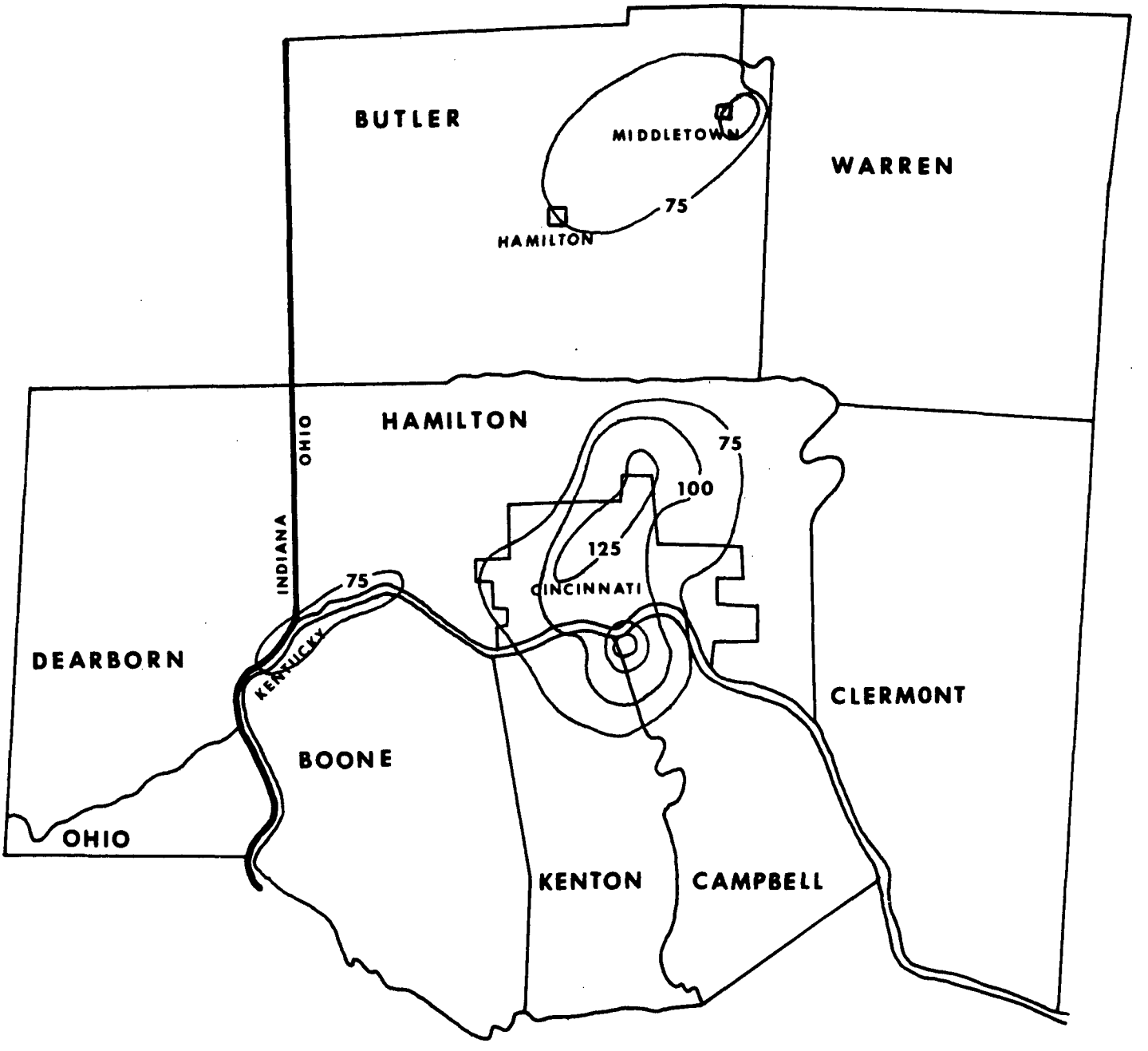


Figure 1-7. AVERAGE ANNUAL PARTICULATE CONCENTRATIONS DURING 1967 - 1969 (micrograms per cubic meter)

Table 1 - 7 QUARTERLY SUMMARY STATISTICS FOR
MCIAQCR STUDY, NOVEMBER 1969 - JANUARY 1970
POLLUTANT: PARTICULATES $\mu g/m^3$

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
10	31	178	24	77	34	70	1.55
39	29	342	59	162	67	148	1.54
42	29	191	19	62	35	55	1.67
70	30	221	24	78	42	69	1.62
71	30	191	25	71	40	63	1.62
72	30	228	28	74	44	65	1.64
73	30	263	33	70	48	61	1.60
74	28	248	30	119	66	102	1.79
75	28	281	25	126	71	108	1.78
76	30	154	27	75	32	69	1.53
77	30	426	35	136	95	111	1.90
78	30	225	11	95	42	85	1.73
79	30	108	16	53	20	50	1.45
80	31	122	25	63	24	59	1.46
81	21	131	12	67	34	58	1.78
82	29	143	28	82	34	74	1.64
83	28	244	27	85	56	73	1.73

Table 1 - 7 Continued

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
84	31	195	15	56	41	47	1.80
85	30	333	28	90	74	73	1.81
86	31	211	27	78	39	71	1.55
87	27	140	28	66	27	61	1.51
88	30	196	49	93	35	88	1.43
89	27	212	37	99	45	89	1.63
90	30	130	26	64	26	59	1.50
91	28	188	15	74	37	66	1.70
92	28	344	50	128	65	115	1.61
93	28	156	20	68	32	62	1.59
94	19	103	21	56	23	52	1.53
98	30	213	29	68	41	60	1.65
105	70	203	52	113	66	98	1.79
106	48	233	49	110	44	102	1.45
107	30	276	26	107	60	93	1.71
109	31	248	35	102	49	93	1.53
110	31	187	26	67	36	59	1.64
111	29	250	40	89	50	80	1.54
112	13	148	41	85	35	79	1.51

Table 1 - 7 Continued

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
113	28	219	31	89	46	79	1.58
202	31	443	39	135	86	117	1.68
203	25	160	31	92	31	87	1.43
204	22	228	48	95	40	89	1.44
207	27	244	42	100	47	91	1.54
209	30	211	30	83	47	73	1.64
244	24	196	50	105	36	99	1.40
			ADDENDUM				
		Pollutant:	Particulates	Units:	Soiling Index, COHs/1000 linear feet		
039	725	260	0.00	0.34	0.39	0.22	2.76

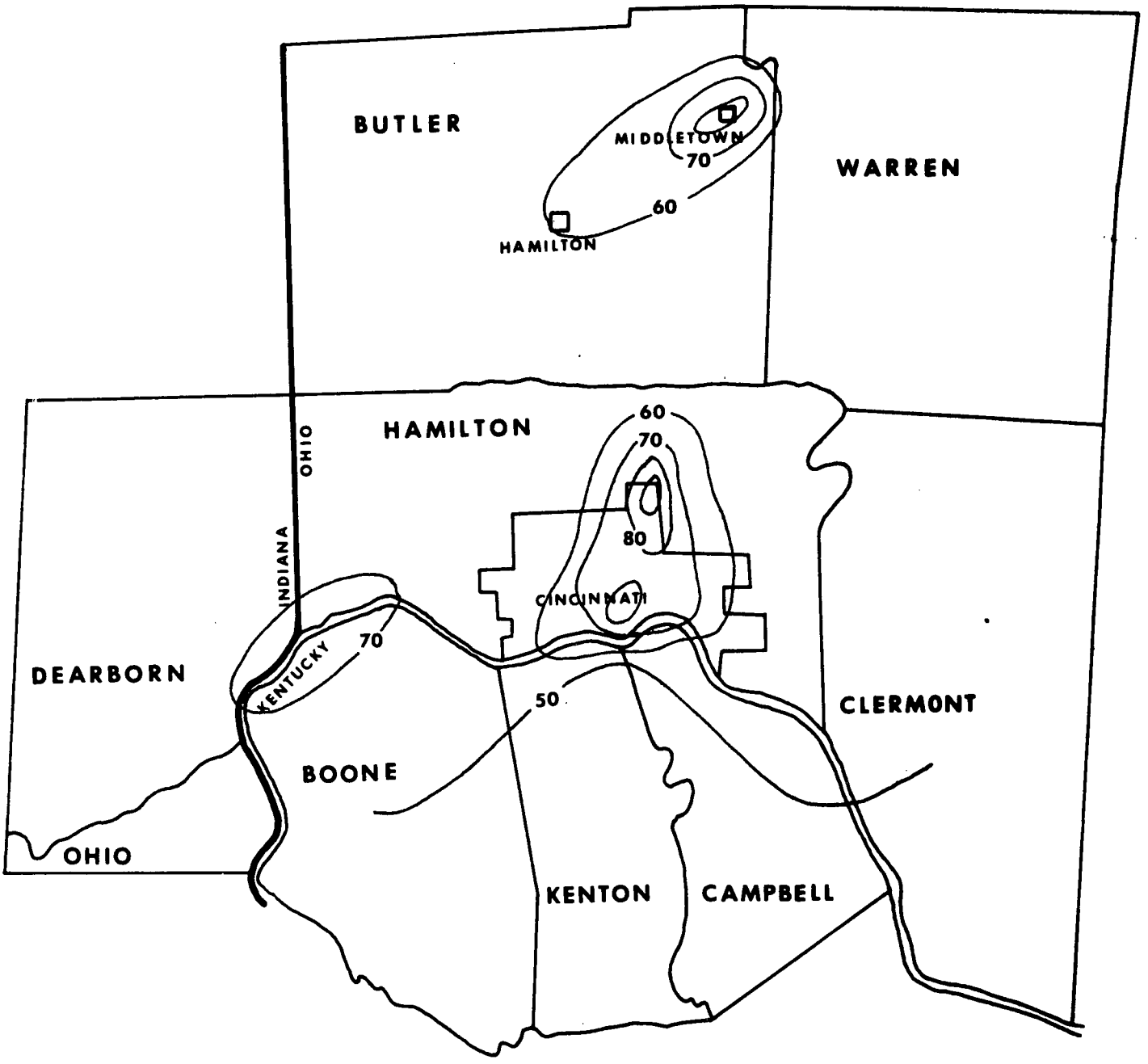


Figure 1-8. ANNUAL AVERAGE SO_2 CONCENTRATIONS DURING 1968-1969 (micrograms per cubic meter)

Table 1 - 8 QUARTERLY SUMMARY STATISTICS FOR
MCIAQCR STUDY. NOVEMBER 1969 - JANUARY 1970
POLLUTANT: SO_2 UNITS: ppm

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
39	(1) 6	.018	.002	.008	.008	.005	2.78
	(2) 513	.290	.000	.020	.027	.014	2.44
70	(1) 30	.130	.005	.028	.027	.020	2.37
75	(1) 22	.045	.010	.027	.011	.024	1.58
	(3) 1659	.150	.000	.023	.019	.018	2.08
77	(3) 1906	.350	.000	.033	.037	.023	2.29
82	(1) 29	.040	.005	.016	.011	.013	1.93
83	(3) 1144	.150	.000	.022	.026	.151	2.59
105	(1) 6	.025	.010	.016	.006	.015	1.44
106	(1) 6	.020	.005	.012	.005	.011	1.60
	(2) 2079	.250	.000	.031	.028	.023	2.18
109	(1) 5	.015	.005	.008	.004	.007	1.67
110	(1) 27	.075	.000	.027	.025	.017	3.14
114	(1) 25	.055	.005	.018	.012	.014	1.95
203	(1) 28	.040	.005	.021	.009	.018	1.73
245	(3) 1171	.140	.000	.029	.024	.022	2.28

(NOTE)
(1) Wet Impinger, West-Gaeke & Pate Technique
(2) Colorimetric, Continuous Analyzer
(3) Coulometric, Continuous Analyzer

Table 1-9 MCIAQCR SULFATION DATA Nov. 1969-Jan. 1970

Station	County	Coordinates	μg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	X_*
1	Dearborn	25, 39	6	11	15	11
2	Dearborn	24, 37	3	6	10	6
3	Dearborn	23, 38	5	12	14	10
4	Dearborn	25, 38	6	10	14	10
5	Dearborn	26, 39	7	6	15	9
6	Hamilton	28, 41	6	12	15	11
7	Hamilton	29, 42	9	10	14	11
8	Hamilton	31, 42	10	13	21	15
9	Hamilton	32, 43	22	15	21	19
10	Hamilton	28, 46	4	8	14	9
11	Dearborn	27, 44	4	6	14	8
11A	Dearborn	26, 42	8	6	17	10
12	Dearborn	24, 40	11	9		
13	Dearborn	24, 41	5	6	11	7
14	Dearborn	24, 42	4	8		
15	Dearborn	24, 39	6	10	18	11
16	Dearborn	22, 42	6	11	14	10
17	Dearborn	22, 41	6	11	15	11
17A	Dearborn	21, 36	2	6	11	6
18	Dearborn	21, 34	5	10	16	10
19	Boone	24, 36	4	6	14	8
20	Boone	28, 39	8	15	19	14
21	Boone	30, 37	3	6	11	7
22	Boone	29, 40	6	9	17	11
23	Boone	28, 36	7	12	18	12
24	Boone	26, 37	7			
25	Boone	22, 34	5	12	13	10
26	Boone	42, 35	6	14	18	13
27	Boone	42, 38	2	6		
28	Boone	39, 40	5	7	19	10
29	Boone	35, 44	6	11	16	11
30	Boone	33, 43	10	11	17	13
31	Boone	31, 41	10	11	19	13
32	Boone	35, 37	6	10	17	11
33	Boone	30, 32	4	6	11	7
34	Clermont	72, 32	4	4	11	6
35	Clermont	73, 31	6	3	10	6
36	Clermont	76, 31	11	2	15	9
37	Clermont	76, 30	3	3	15	7
38	Clermont	74, 31	3	2	14	6
39	Clermont	74, 29	6	5	17	9
40	Clermont	75, 26	7	4	11	7
41	Clermont	75, 25	2	6	10	6
42	Clermont	74, 27	4	2	11	6
43	Clermont	75, 29	10	9	16	12
44	Clermont	75, 30	10	8	17	12
45	Clermont	76, 28	9	12	14	12
46	Clermont	78, 27	6	11	14	10
47	Clermont	81, 29	4	4	13	7
48	Clermont	79, 34	9	6	16	10
49	Clermont	74, 37	6	5	14	8
50	Hamilton	65, 40	3	3	10	5

* arithmetic mean

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	X
51	Hamilton	65, 38	3	3	7	4
52	Hamilton	68, 37	5	5	8	6
53	Hamilton	70, 36	6	3	13	7
54	Campbell	60, 36	4	10	10	8
55	Campbell	65, 33	5	10	10	8
56	Campbell	70, 32	4	8	6	6
57	Campbell	69, 30	4	9	7	7
58	Campbell	70, 31	5	13	14	11
59	Campbell	72, 29	2	7	8	6
59A	Campbell	72, 28	2	5	6	4
60	Campbell	70, 27	6	10	13	10
61	Campbell	72, 26	2	5	8	5
62	Campbell	73, 27	3	8	10	7
63	Campbell	73, 28	4	8	9	7
64	Campbell	72, 29	3	8	10	7
65	Campbell	79, 17	3	6	8	6
66	Campbell	77, 21	3	3	8	5
67	Campbell	75, 21	3	13	13	10
68	Campbell	73, 17	3	8	9	7
69	Campbell	70, 18	8	10	13	10
70	Campbell	66, 25	6	11	14	10
71	Campbell	69, 23	4	7	9	7
72	Campbell	72, 22	6	10	12	9
73	Campbell	75, 23	3	7	9	6
74	Hamilton	63, 43		7	10	
76	Clermont	75, 34	7	3	22	11
77	Clermont	79, 32	6	6	14	9
80	Hamilton	60, 45	5			
81	Boone	38, 30	5	10	15	10
82	Boone	33, 35	7	14	17	13
83	Boone	27, 30	5	8	10	8
84	Boone	28, 26	5	7	12	8
85	Boone	28, 21	6	8	16	10
86	Boone	41, 25	6	10		
87	Kenton	50, 30	7	11	15	11
88	Hamilton	70, 39	6	5	18	10
90	Boone	38, 36	5	9	14	9
91	Boone	33, 41	11	14	24	16
92	Boone	37, 39	7	11	19	12
93	Boone	31, 40	13	12	13	13
93A	Boone	31, 38		10	18	
94	Boone	35, 33	6	13	19	13
94A	Boone	26, 36	5	7	12	8

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	$\bar{X}$
95	Boone	31, 29	6	-	15	
96	Boone	27, 33	5			
97	Boone	24, 35	4			
98	Boone	23, 34	3	7		
99	Boone	27, 32	5			
100	Boone	43, 29	6	10	15	10
101	Hamilton	32, 57	9	11	18	13
102	Hamilton	29, 57	5	7	10	7
103	Hamilton	30, 50	2	7	8	6
104	Hamilton	33, 49	9	13		
105	Hamilton	32, 48	6	6	14	9
106	Hamilton	34, 48	8	7	10	8
107	Hamilton	34, 47	9	9	11	10
108	Hamilton	33, 44	14	6		
109	Hamilton	30, 45	9	9	16	11
110	Dearborn	22, 37	3	8	12	8
111	Dearborn	20, 47	2	7	9	6
112	Dearborn	15, 51	3	7		
114	Dearborn	09, 60	5	5	18	9
115	Dearborn	19, 59	3	4	10	6
116	Hamilton	39, 59	-	9	13	
117	Butler	30, 70	8	7	14	10
118	Butler	31, 80	3	6	11	7
119	Butler	29, 89	5	10	16	10
120	Butler	39, 89	7	10	18	12
121	Butler	39, 79	9	10	19	13
122	Butler	39, 70	8	7	18	11
123	Butler	50, 68	6	9	12	9
124	Butler	59, 69	6	8	14	9
125	Butler	59, 80	9	10	14	11
126	Butler	51, 80	5	8	12	8
127	Butler	50, 90	6	10	22	13
128	Butler	60, 90	4	7	13	8
129	Warren	70, 89	6	4	14	8
130	Warren	79, 90	6	3	13	7
131	Warren	90, 90	6	10	14	10
132	Warren	89, 80	2	5	9	5
133	Warren	80, 81	8	10	15	11
134	Warren	70, 78	6	6	12	8
135	Warren	70, 70	10	10	14	11
136	Warren	79, 70	6	7	11	8
137	Warren	90, 70	5	6	13	8
140	Dearborn	25, 41	11	11	18	13
141	Dearborn	26, 40	8	7	15	10
142	Hamilton	65, 47	5	6	13	8
143	Hamilton	67, 50	6	9	14	10
144	Hamilton	59, 46	8	8	13	10
145	Hamilton	54, 43	10	13	16	13
146	Kenton	47, 31			12	

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	$\bar{X}$
151	Hamilton	58, 55		7	14	
152	Hamilton	34, 45			12	
153	Clermont	75, 24		7	11	
154	Campbell	56, 39				
155	Hamilton	61, 41			14	
159	Kenton	57, 37			12	
160	Hamilton	51, 41	5	10	14	10
161	Hamilton	52, 45	6	9		
162	Kenton	55, 39	19		16	
163	Hamilton	57, 49	19	9	16	15
164	Hamilton	51, 45		6		
201	Dearborn	20, 37	4	4	13	7
202	Dearborn	19, 40	2	5	14	7
203	Dearborn	18, 42	6	8	18	11
204	Dearborn	16, 43	4	10	15	10
205	Dearborn	12, 44	5	10	13	9
206	Dearborn	09, 47	6	14	17	12
207	Dearborn	07, 40	2	8	15	8
208	Dearborn	13, 37	6	14	14	11
209	Dearborn	17, 35	6	8	14	9
210	Dearborn	13, 40		6	9	
211	Dearborn	11, 41	3	6	15	8
212	Ohio	26, 23	4	5	13	7
213	Ohio	23, 30	4	9	13	9
214	Ohio	20, 26	2	3	10	5
215	Ohio	17, 23	6	5	13	8
216	Ohio	18, 18	6	10	14	10
217	Ohio	06, 18	6	7	14	9
218	Dearborn	04, 25	5	9	14	9
219	Dearborn	08, 30	3	8	11	7
220	Ohio	13, 26	6	6	11	8
221	Dearborn	15, 31	5	11	14	10
222	Dearborn	13, 34	2		8	
223	Dearborn	07, 36	5	11	17	11
224	Dearborn	07, 48	6	12	16	11
250	Hamilton	60, 50	4	2	12	6
251	Hamilton	60, 56	2	5	12	6
252	Hamilton	60, 61	2	2	14	6
253	Hamilton	50, 61	2	4	18	8
254	Hamilton	50, 57	2	4		
255	Hamilton	50, 51	3	3	14	7

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	$\bar{X}$
256	Hamilton	50, 45	5	3	14	
257	Hamilton	50, 40		-	12	
258	Hamilton	40, 41		5	12	
259	Hamilton	40, 46		7	14	
260	Hamilton	40, 51		2	11	
270	Hamilton	64, 51		11	17	
271	Hamilton	54, 48		7		
272	Hamilton	55, 45		5	14	
273	Hamilton	57, 44		6	22	
274	Hamilton	62, 47		12	15	
275	Hamilton	45, 46		5	10	
276	Hamilton	60, 53				
277	Hamilton	53, 51				
278	Hamilton	47, 42		10		
279	Hamilton	44, 39				
300	Clermont	73, 35	9	1	14	8
301	Hamilton	63, 35	4	4	12	7
302	Hamilton	71, 33	5	2	11	6
303	Clermont	76, 26	3	2	10	5
304	Clermont	77, 25	6	4	17	9
305	Clermont	80, 26	5	4	14	8
306	Clermont	80, 39	6	2	14	7
307	Clermont	90, 40	5	10	14	10
308	Clermont	89, 29	2	5	12	6
309	Clermont	73, 41	6	6	15	9
310	Clermont	77, 38	3	2	14	6
311	Clermont	80, 36	7	5	15	9
312	Clermont	77, 35	6	2	15	8
313	Clermont	77, 33	8	2	17	9
314	Clermont	77, 31	4	2	10	5
315	Clermont	78, 28	8	2	18	9
316	Clermont	77, 27	5	9	10	8
317	Clermont	78, 26	2	2	9	4
318	Clermont	82, 25	5	2	15	7
319	Clermont	79, 23	10	4	14	9
320	Clermont	75, 33	11	2	18	10

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	$\bar{X}$
321	Hamilton	70, 50	6	4	15	8
322	Clermont	80, 49	3	8	15	9
323	Clermont	90, 49	2	10	14	9
324	Hamilton	67, 45	5	3	9	6
326	Boone	25, 32	15	6	11	11
327	Boone	38, 20	18			
328	Boone	39, 10	16	6	15	12
329	Campbell	60, 39	6	8	13	9
330	Clermont	89, 20	2	4	13	6
331	Campbell	61, 30	9	10	14	11
340	Clermont	99, 09		5	13	
341	Clermont	84, 14		6	9	
342	Clermont	79, 19		4	9	
343	Clermont	90, 59				
344	Clermont	80, 59		5	9	
345	Hamilton	69, 59		6	12	
346	Hamilton	64, 45		10	17	
347	Hamilton	64, 54		9	20	
348	Hamilton	61, 54		9		
349	Hamilton	54, 54		8	15	
350	Hamilton	57, 52		7	15	
351	Hamilton	55, 41		6		
352	Hamilton	53, 40		10	15	
353	Hamilton	54, 42		9	15	
400	Campbell	66, 13		6	10	
401	Kenton	51, 21		4		
402	Kenton	61, 20		7	14	
403	Kenton	53, 10		8	12	
500	Hamilton	44, 55			18	
501	Hamilton	58, 47			13	
502	Hamilton	54, 46			17	
503	Hamilton	56, 43			16	
504	Hamilton	60, 42			10	
505	Hamilton	62, 40			12	

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.
506	Hamilton	66, 42			15
507	Hamilton	55, 48			15
508	Campbell	58, 42			10
509	Hamilton	60, 49			
510	Hamilton	63, 39			9
511	Hamilton	51, 54			14
512	Hamilton	46, 58			16
513	Hamilton	54, 59			14
514	Hamilton	59, 59			15
515	Hamilton	65, 58			18
516	Clermont	75, 47			9
517	Hamilton	69, 47			18
518	Hamilton	43, 49			11
519	Hamilton	43, 43			14
520	Hamilton	46, 52			10
521	Clermont	73, 48			11
522	Hamilton	70, 43			10
523	Hamilton	75, 44			10

Table 1-10. AIR QUALITY STANDARDS FOR MCIAQCR
(concentrations in micrograms per cubic meter)

	SULFUR OXIDES				PARTICULATES		
State	Annual	Monthly	24 Hours	1 Hour	Annual	24 Hours 1 Percent[3]	Maximum
Indiana	43(AM)[1]		286	1201	75(GM)	200	200
Kentucky	57(GM)[2]	143	286	858	65(GM)	180	220
Ohio	43(AM)		286	858	65(GM)	200	260

[1]AM - Arithmetic Mean

[2]GM - Geometric Mean

[3]Concentration not to be exceeded more than 1 percent of the time

1.6.4 Air Quality Standards

The Air Quality Standards adopted by the States are shown in Table 1-10. These are the goals which the implementation planning process must be designed to achieve. Although the standards vary somewhat from state to state within the Region, these discrepancies are not significant enough to prevent effective regionwide planning for air pollution control. Indeed, considering the transport of pollution from one section of the Region to another, there appears to be no reason why control strategy development cannot proceed on a regional basis leading to the eventual adoption of uniform emission control regulations throughout the Region.

1.7 SAMPLING RECORDS IN INDIANA

1.7.1 Station Locations

In the two Indiana counties (Ohio and Dearborn) that are part of the MCIAQCR, no air quality sampling stations have been in operation until November 1969. At that time, two stations designed as Nos. 110 and 112 were established in Dearborn County. Their locations are shown in Figure 1-9.

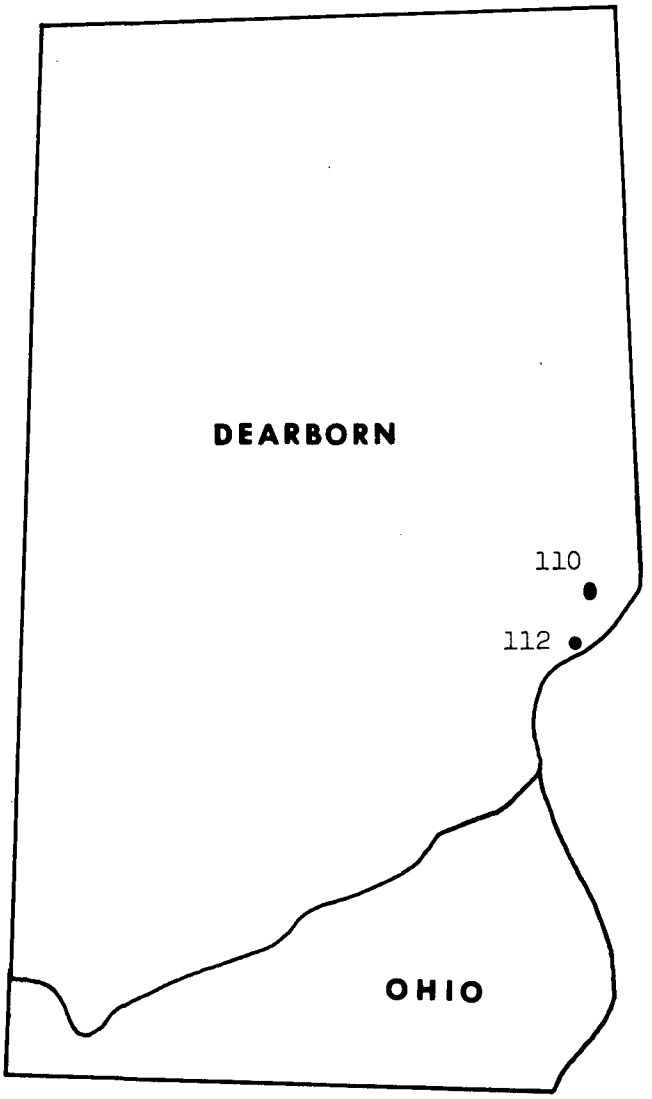


Figure 1-9. LOCATION OF STATIONS IN INDIANA PORTION OF THE MCIAQCR

Both stations are equipped with high volume samplers (hi-vols) for measuring suspended particulates. In addition, Station No. 110 is sampling 24-hour concentrations of SO_2 bi-weekly by means of bubblers, analyzed by the West-Gaeke technique.

1.7.2 Air Quality Data

Since the observational record is fragmentary, no data summaries of significance are as yet available

2.0 CONTROL PLAN

An Emission Control Strategy is made up of a set of compatible emission standards. Each standard applies to emissions from a specific type of operation (e.g., fuel combustion, industrial process, solid waste disposal), and the summation of the several standards included within each strategy defines allowable emission levels from each source in the region. In an air quality control region made up of several political jurisdictions (states, counties, or cities), each set may apply to a specific political jurisdiction within the region. Separate emission control strategies are defined for each pollutant.

2.1 DESCRIPTION OF THE SIMULATION MODEL

The simulation model used for strategy evaluation was the Implementation Planning Program developed by TRW Systems Group under contract with the National Air Pollution Control Administration, U. S. Department of Health, Education and Welfare. This program uses three computer models to perform an analytic evaluation of each proposed control strategy.

2.1.1 Atmospheric Diffusion Model

This model, operating on a data base consisting of a regional source emission inventory and annual average meteorological data, produces expected ground level pollutant concentrations on an annual arithmetic average basis. Expected ground level concentrations are calculated at a large number (200-250) of receptor sites throughout the region. Isopleth maps and other visual displays of projected air quality are produced to aid in regional evaluations. Existing air quality measurements are used to verify the predicted concentration values so that further extrapolations and projections can be made with some assurance (see Section 2.3). The atmospheric diffusion model provides the key link between pollutant emissions and ambient air quality necessary to make informed decisions relating to proposed emission regulations. The diffusion model, by providing a set of factors relating each emission source to receptor points throughout the air quality control region, allows the effect of various degrees of emission reduction to be examined in terms of expected ambient pollutant concentrations.

2.1.2 Control Cost Model

A complete evaluation of an air pollution control strategy should include consideration of the various control techniques and measures which would be required by the emission reduction plan. This can be accomplished by an examination of all the control alternatives available to each source within the region. This examination should include not only the control efficiencies expected from the various control measures but also an estimate of the cost of each measure. Only with such information developed on the basis of available control technology can a judgment be made concerning the feasibility and cost of various emission reduction plans. The Control Cost Model prepares a listing of applicable control techniques for each pollution source identified in the regional emission inventory. This listing defines the types of available devices or control measures and estimates the control efficiency and cost of each. The data generated by this model is utilized in the subsequent control strategy evaluation section of the program.

2.1.3 Control Strategies Model

This model operates upon information produced by the two computer models described above to provide summary compilations relating to the regional effects of various control strategies. Control strategies consist of a set of compatible emission standards covering all political jurisdictions and source types included in the air quality control region. Emission standards, the basic building blocks of control strategy, generally specify maximum emission levels of a particular pollutant for certain source types. A combination of emission standards covering all the sources of a pollutant is thus an emission control strategy. By applying the emission reductions which would be required under each strategy to the atmospheric diffusion model described above, it is possible to estimate the ambient air quality levels which would result. Also, the overall cost to the region of bringing each source into compliance with the various emission standards is estimated. The degree to which current control technology is able to supply the required emission reductions is available for review. The Control Strategies Model is capable of simulating a variety of control alternatives available to regional control officials and provides them information with which to judge the relative merits of each. Regional growth predictions and other factors can also be analyzed with the model.

The overall computer simulation program thus provides the user with the type of data on which an informed judgment concerning air quality control regulations may be based.

2.2 RATIONALE FOR SELECTION OF OPTIMAL STRATEGY

Several criteria are available with which to measure the desirability of any control strategy. The use of the computer simulation modeling technique aids control strategy selection by providing detailed technical estimates of the regional effects of various alternative strategies. The following is a list of the criteria used in selecting the optimum control strategy in this Implementation Plan, together with a brief description of how these criteria are compiled.

2.2.1 Compatibility with Air Quality Standards

Air quality standards for particulate and sulfur dioxide pollutants have been adopted by the three states making up the MCIAQCR. The primary purpose of emission control regulations is to bring ambient pollutant levels into compliance. By simulation modeling of the emission reductions required, a control strategy can be evaluated with atmospheric diffusion calculations. The process leads to rejection of those strategies under which emission levels remain too high to allow achievement of the desired air quality.

2.2.2 Regional Cost

After one or more strategies have been found which will permit attainment of air quality standards, the total cost of implementing these emission standards must be considered. As was mentioned in Section 2.1, the simulation model being used provides an estimate of cost based on available control technologies. If two control strategies promise nearly equal ambient air quality, then the less costly of the two would be the most desirable. In addition to the overall cost of implementing a particular control strategy, some source categories may experience greatly different control requirements under different strategies. The computer simulation output enables examination of this phenomenon with respect to important source categories.

2.2.3 Enforceability

Certain types of emission standards may be easier for a control agency to administer and enforce than others; even though equivalent pollutant reductions are required. Field experience gained in actual control agency operations is invaluable in making an evaluation of this factor. The control agency resource requirements may well be influenced by the type of emission standards ultimately adopted.

2.2.4 Summary

Each of the alternate strategies was evaluated according to the above criteria and the optimum set of emission standards was selected. These emission standards were used in formatting the proposed control regulations (Section 4.2).

2.3 MODEL VERIFICATION

The use of measured ambient pollutant data is an essential step in the simulation process. The model verification or validation compares model estimates of pollutant concentration with actual measured values. Several potential errors in the atmospheric transport and diffusion calculations may be examined and systematically accounted for by this procedure.

a) The pollutant emission inventory can be examined for consistency with air quality measurements. Errors or omissions in the inventory are often detected at this stage and may be corrected before continuing with the strategy simulation exercise.

b) Topographic conditions peculiar to the air quality region may be evaluated. While the diffusion model does not explicitly consider terrain features, their effect on air quality may be accounted for by the verification process.

The basic results generated by the model verification are a statistical regression line relating measured to calculated ground level concentrations and a correlation coefficient. Based on the correlation coefficient and the number of measurement stations, it is possible to make a statistical estimate regarding the validity of the model predictions compared with actual air quality measurement. A high correlation coefficient (close to unity) indicates that the diffusion model results correctly indicate the trend in pollutant concentrations as measured in the region.

The regression line relating predicted to measured pollutant concentrations is used to correct the model estimates. The two parameters of the linear regression each have a particular meaning and interpretation in the diffusion model verification.

y-Intercept - The regression line may be visualized by plotting measured versus calculated concentrations on the x and y axis, respectively, of a scatter plot diagram (See figures 2-2 and 2-5). The y intercept, y_o, is the minimum value that may be predicted using the regression line to relate calculated to measured concentrations. In this sense, y_o may be considered a background concentration.

Slope - The slope of the regression line indicates the amount of increase observed in the measured concentrations (or in the concentration predicted using the regression line) due to a given increase in that calculated by the diffusion model.

The air quality data available for model verification in the MCIAQCR consisted of the results of measurements made throughout the region during the months of November and December 1969, and January 1970. The use of seasonal air quality data as a basis for verifying a model designed basically to predict average annual concentration values is open to question. Indeed the results described in this section show that for the MCIAQCR it was not possible to develop a useful model verification from the winter period for sulfur dioxide.

In addition to the air quality data, several other types of information were used during the model verification exercise. Meteorological data used were the average winter mixing height as measured at the Dayton (Ohio) Airport, and the wind direction and speed data for the three month period collected at the Cincinnati Airport located in Covington, Kentucky. The same sources of meteorlogical data were used in making the annual concentration estimates based on the atmospheric diffusion model. In this case, however, averages taken over five years were used rather than a specific annual period. (See Appendix A for meteorological data.)

No specific effort was made to account for the topographic features of the region in the model verification procedure.

2.3.1 Suspended Particulates

Diffusion model verification for suspended particulates used air quality measurements made by the 24 hour high volume filter technique. The location of these stations is displayed in Figure 2-1. These stations adequately cover the geographical area of the MCIAQCR. A number of model verification runs were made based on the data collected from these stations. During the initial runs, a number of errors in both the original emission inventory and in the air quality data were detected. The errors were corrected and a final verification run was made.

Figure 2-2 displays the results of this computation. This figure shows the measured air quality data plotted against the model calculations for the same location based on the emission inventory and meteorological data. The line shown is the regression line calculated on the basis of the data. The regression is highly significant in a statictical sense (less than a 1% probability that no correlation exists). The background, y_o, value of 36 $\mu g/m^3$ is also regarded as acceptable, i.e., it represents a reasonable approximation of background levels of suspended particulates, or the irreducible level due to uncontrollable sources.

The results of using the regression line resulting from this verification to project average annual concentrations are shown in Figure 2-3. Available average annual measured concentrations (also shown) correlated well with the model estimates. Figure 2-3 indicates that the use of seasonal data (winter) for air quality measurements, meteorological and emission data appeared fairly effective in the case of particulates.

Measurements of ambient concentrations of suspended particulate pollutants have been made at various locations in the MCIAQCR since 1957. For the most part, the sampling sites were located in or near the City of Cincinnati and were operated for periods of one year or less. As a result, there is a paucity of data for the Region as a whole. There are four locations (three in Cincinnati and one in Covington) where data are available for the year 1969. These four stations include three which are a part of the National Air Sampling Network and the CAMP station. The annual (1969) geometric mean concentrations at these stations are shown on a map of the Region (Figure 2-3). Included on the map are the geometric mean concentrations for the stations in the Northern Kentucky Air Monitoring Network (July 1968 to April 1969) and the Cincinnati

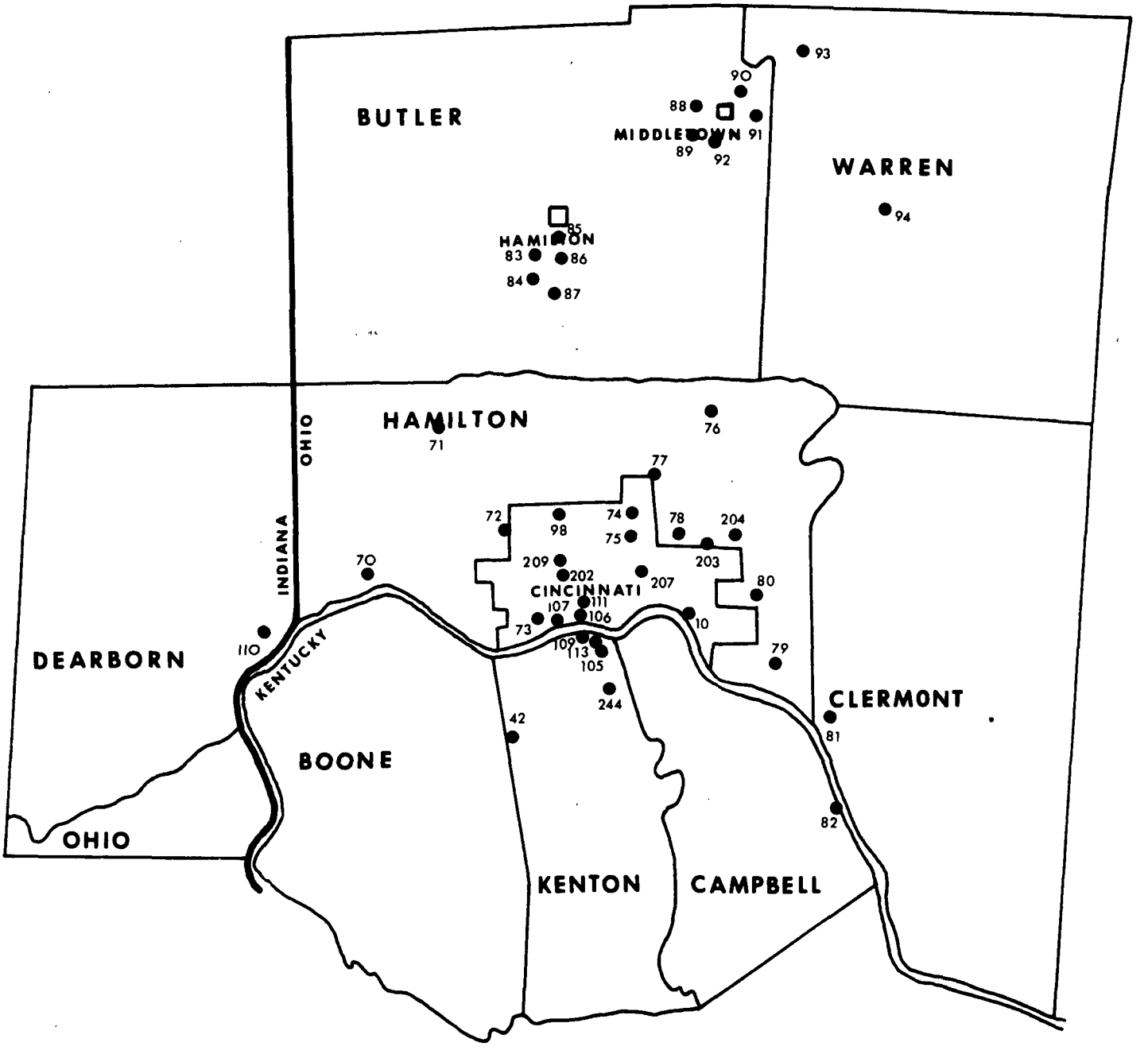


Figure 2-1. Particulate Measuring Stations Used in Model Verification

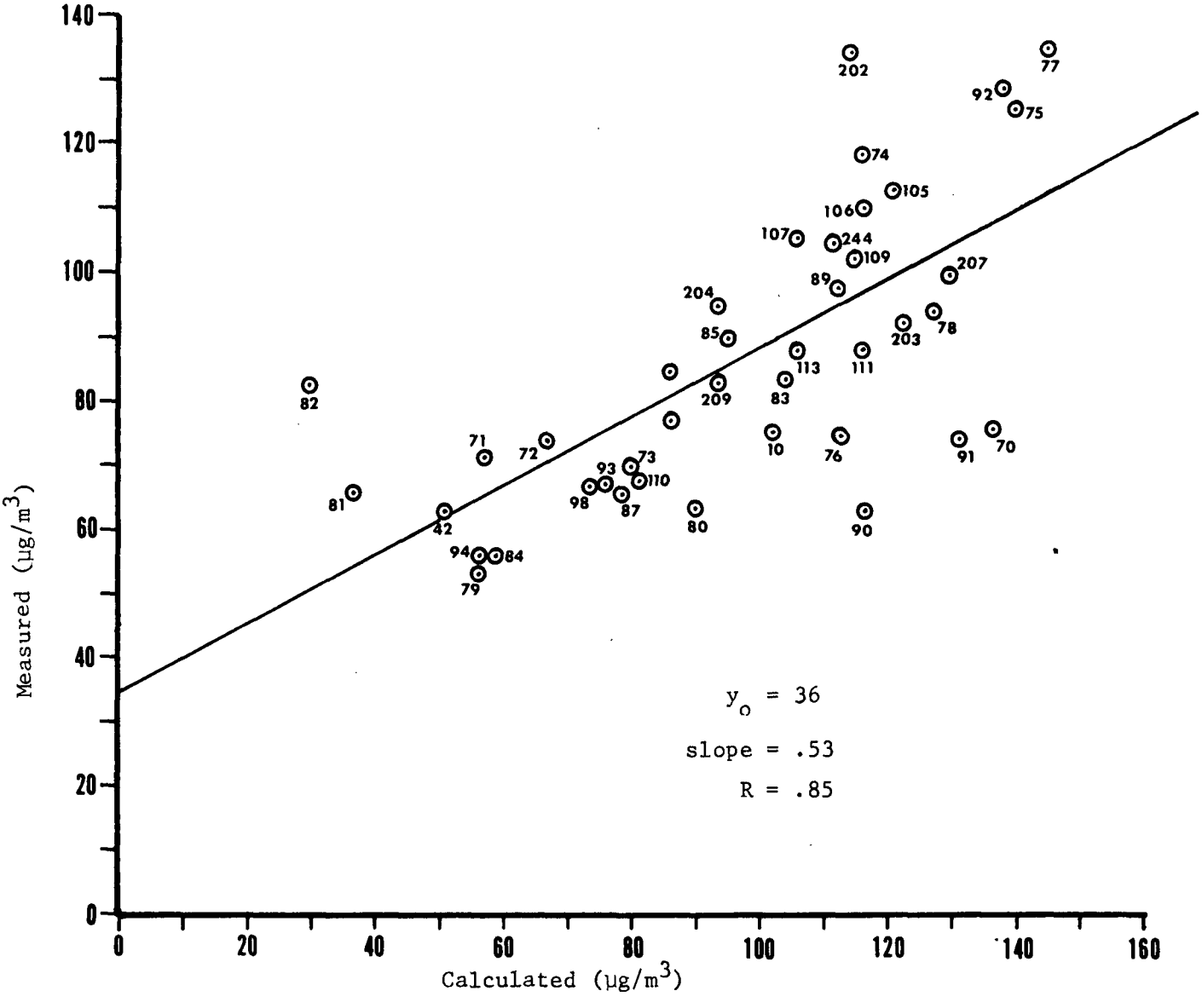


Figure 2-2. Particulate Diffusion Model Verification
(Winter Data - November 1969 - January 1970)

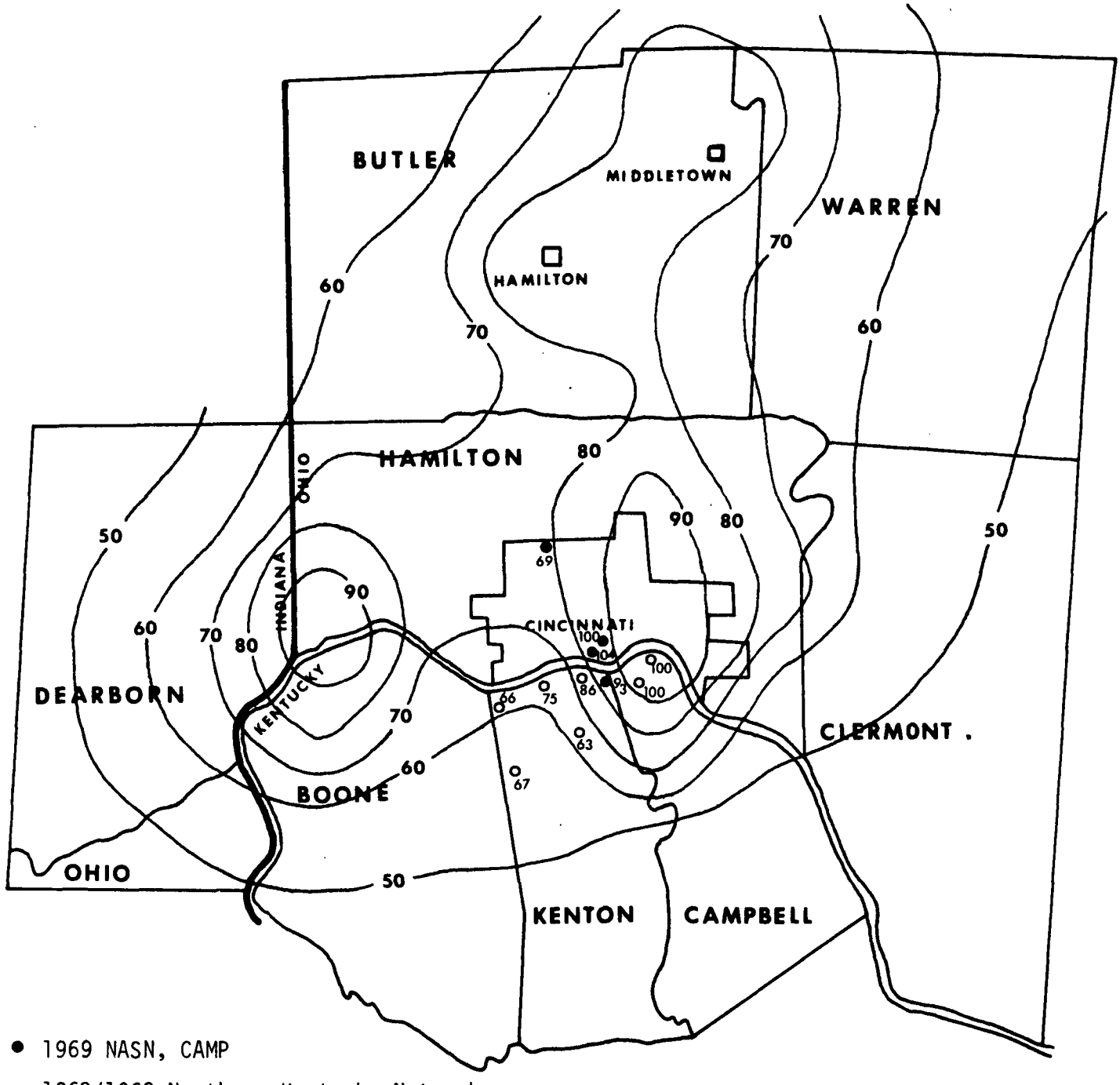


Figure 2-3. ANNUAL GEOMETRIC MEAN CONCENTRATIONS OF SUSPENDED PARTICULATE POLLUTANTS AS MEASURED AT SELECTED SAMPLING STATIONS AND ANNUAL ARITHMETIC MEAN CONCENTRATIONS AS ESTIMATED BY DIFFUSION MODEL

School Study (October 1967 to May 1968).

In order to illustrate the geographical distribution of particulate pollutants for the entire MCIAQCR, the measurement data must be supplemented by estimates of concentration from the diffusion model. The isopleths shown on Figure 2-3 represent annual arithmetic mean concentrations as determined by the model using the 1969 emission inventory and climatological data for the period 1965-1969. (See Section 2.1 for discussion of model.)

There is an inconsistency in Figure 2-3 in that the measurement data are presented as geometric means and the diffusion model estimates are presented as arithmetic means. This inconsistency stems from the fact that the annual air quality standards are expressed in terms of geometric means (65 $\mu g/m^3$ for Kentucky and Ohio, 75 $\mu g/m^3$ for Indiana) and the Martin-Tikvart diffusion model provides only annual arithmetic mean concentrations. For comparative purposes, the arithmetic means can be reduced by 10-15 percent to obtain geometric means.

From Figure 2-3 it is apparent that there are large areas within the MCIAQCR where the air quality standards for particulate pollutants are being exceeded. Areas of high pollution are centered on Cincinnati and Newport, Kentucky, the City of Hamilton and the vicinity of the Ohio and Indiana border near the Ohio River.

This verified diffusion model was used to test various alternative control strategies (Section 2.4).

2.3.2 Sulfur Oxides

Considerably more difficulty was experienced in obtaining a satisfactory model verification for sulfur oxides. Problems relating to data incompatibility with the diffusion model caused the simulation technique to be abandoned for this pollutant.

Initial air quality data were available from fourteen measurement sites for the three month winter period (November 1969 through January 1970). Three measurement techniques were used; West-Gaeke analysis employing liquid impinger samplers, continuous conductimetric measurements, and continuous colorimetric measurements. A satisfactory relationship could not be developed between the different sampling and analytic techniques used and it was necessary to restrict the model validation

exercise to a single measurement type. At one station, number 106, both West-Gaeke and continuous colorimetric measurements were made during the three month study period. The results show that colorimetric measurements gave average readings 50 $\mu g/m^3$ higher than the West-Gaeke technique during the three month period. Since the West-Gaeke method is widely regarded as the standard method only these measurements were used in the model verification procedures.

Other sampling stations were not used because insufficient samples were taken to provide a representative average of the sampling period. The result of these restrictions was to reduce the number of air quality measuring sites available for verification to seven and to reduce the geographical coverage of the region.

Figure 2-4 shows the locations and identification numbers of the sampling stations used in the model validation. The relationship between measured and calculated sulfur dioxide concentrations at these sites is shown in Figure 2-5. The regression line and its coefficients are also displayed in this figure. This represents the best model verification which could be obtained for the winter season based on the air quality data and emission inventory available.

It was recognized that any acceptable verification of the model must be applicable to annual as well as winter conditions before the simulation of control strategies could be accomplished. An attempt was made to use annual average sulfation plate data to verify the diffusion model. This was unsuccessful because the sulfation data did not record a wide enough range of air quality to yield a regression line slope that was significant in either a statistical or practical sense.

Annual average pollutant concentrations were calculated for the MCIAQCR based on the model verification presented in Figure 2-5. These concentrations are presented in Figure 2-6.

The ambient air monitoring data for sulfur dioxide are more scarce, both on a regiowide basis and locally, than was the case for particulates. Presentation of regional air quality must necessarily depend on measurements gathered at relatively few stations. Some localized and short-term measurements specific to this state are presented in Section 1.

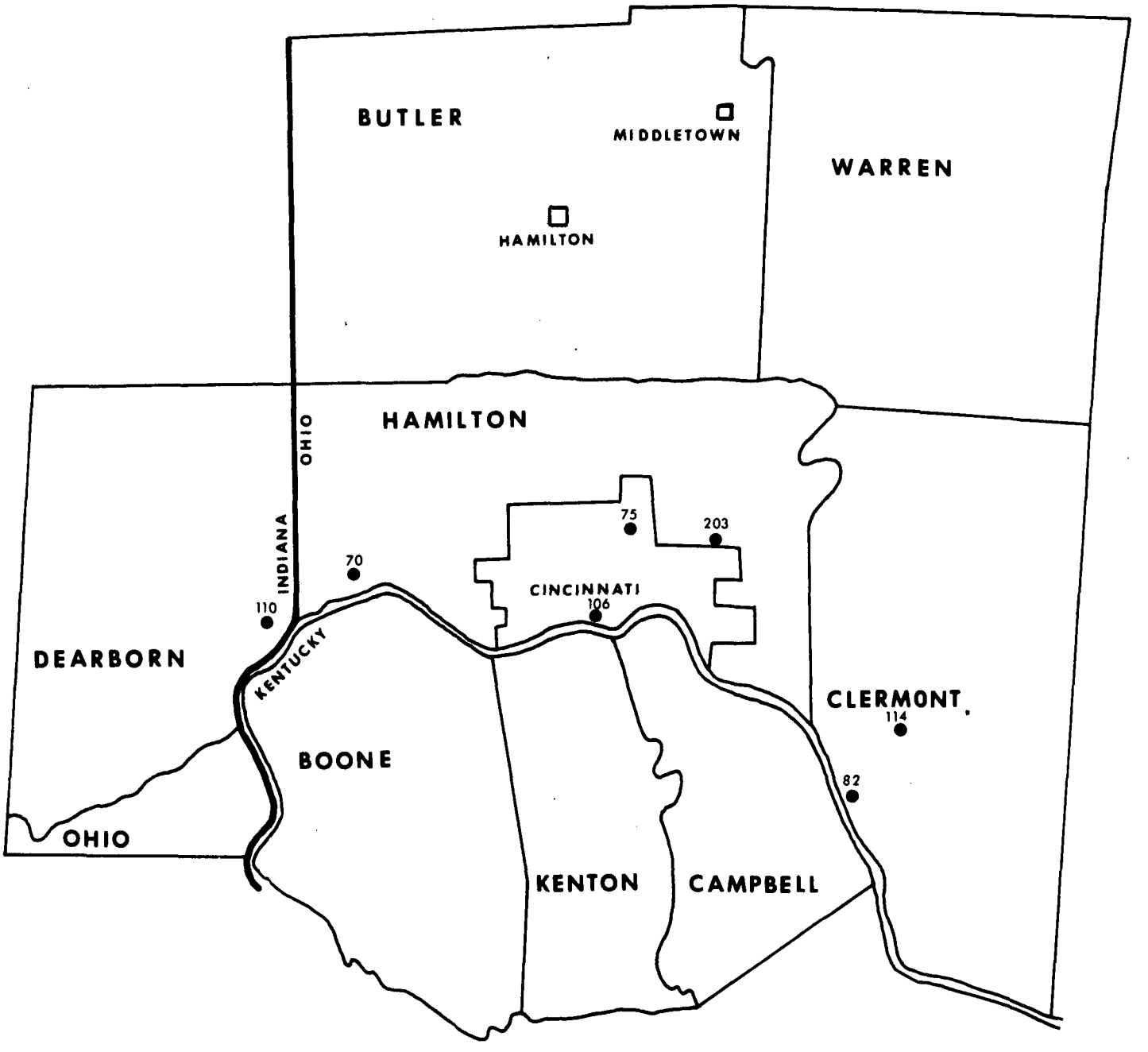


Figure 2-4. SULFUR OXIDE MEASURING STATIONS USED IN MODEL VERIFICATION

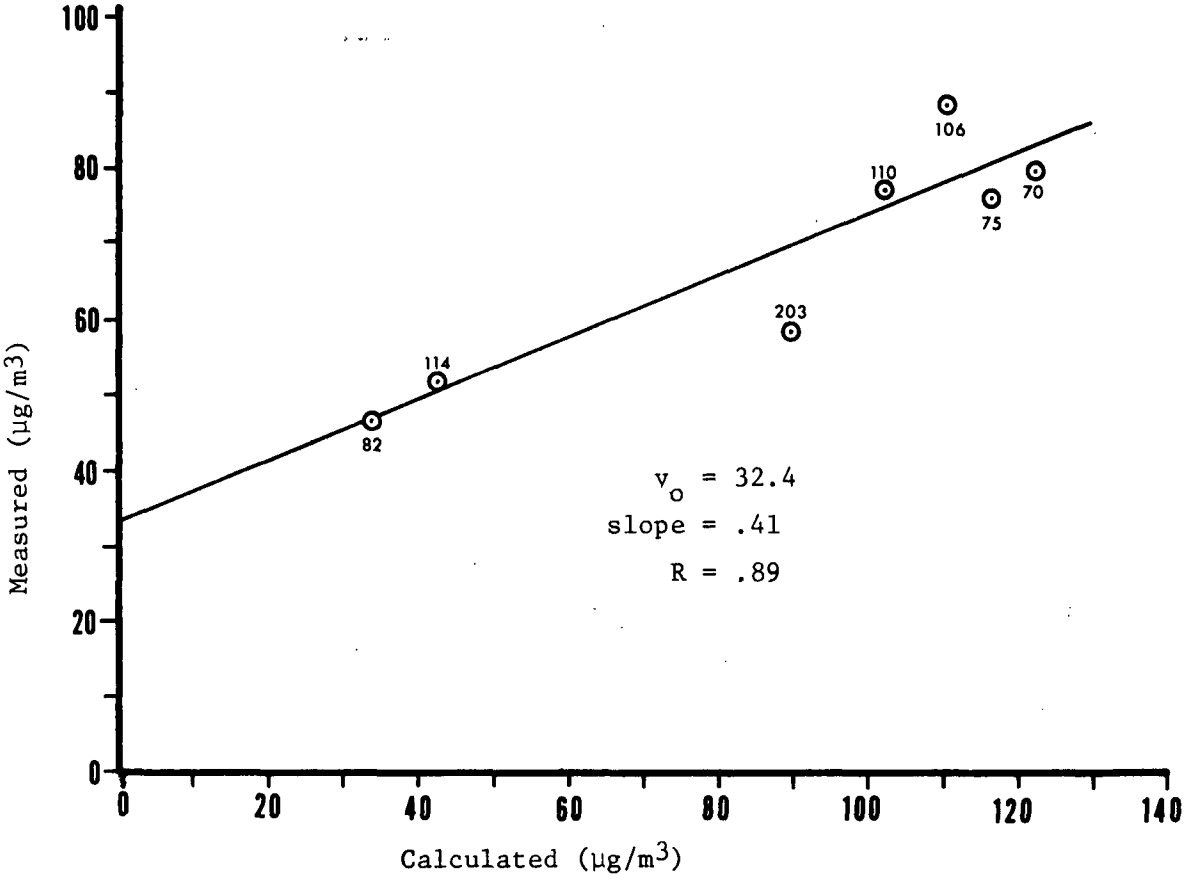


Figure 2-5. WINTER SULFUR OXIDES MODEL VERIFICATION
(November 1969 - January 1970)

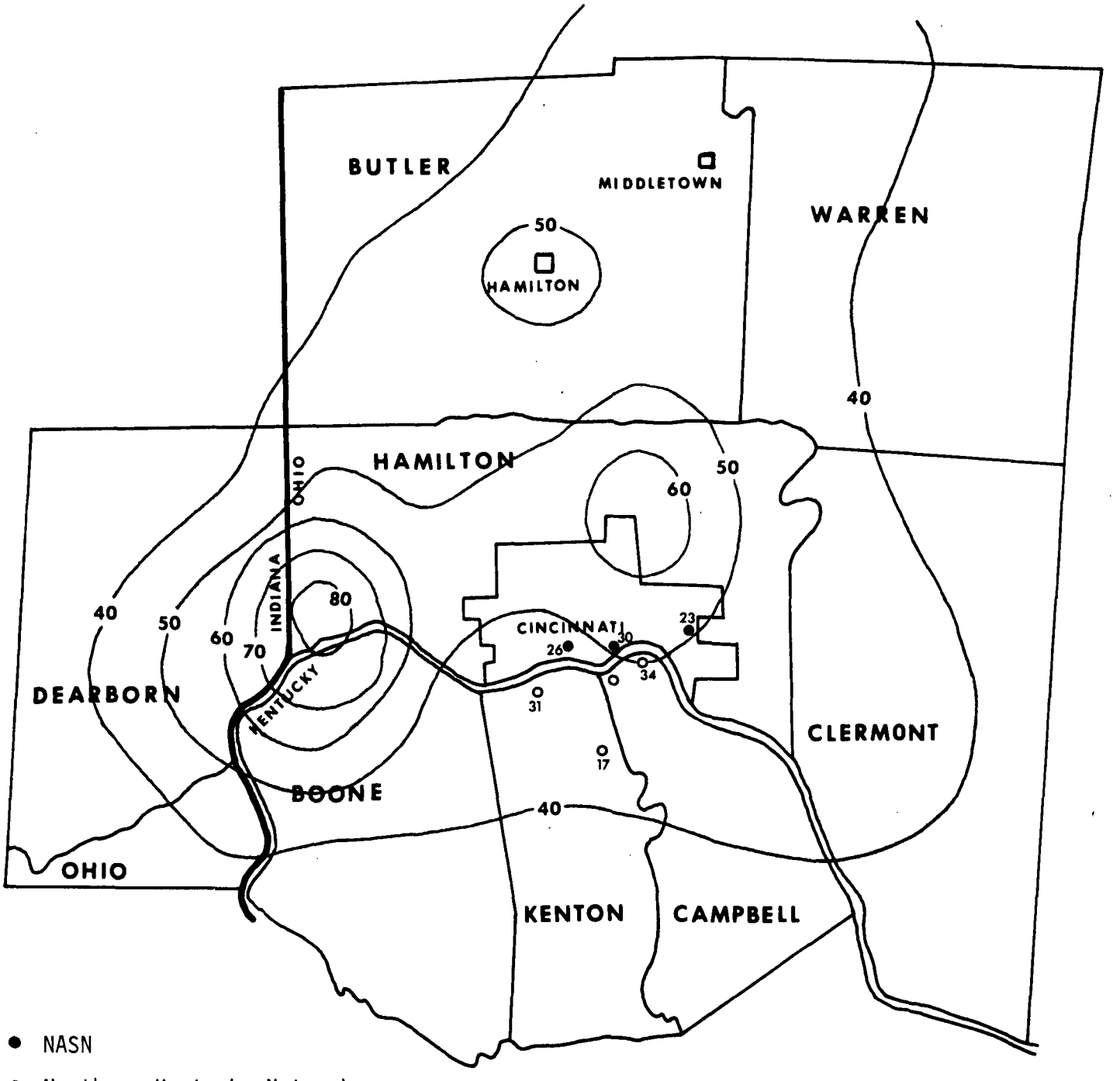


Figure 2-6. ANNUAL MEAN CONCENTRATION OF SULFUR OXIDE AS MEASURED AT SELECTED SAMPLING STATIONS AND ANNUAL ARITHMETIC MEAN CONCENTRATIONS AS ESTIMATED BY DIFFUSION MODEL

Figure 2-6 shows the available annual average sulfur dioxide measurements taken in the MCIAQCR during 1968-1969. The Northern Kentucky Network was operated from August 1968 through April 1969. The National Air Sampling Network (NASN) sites shown represent averages for the calendar year 1969. Also shown in Figure 2-6 are the annual average isopleths predicted by the computerized atmospheric diffusion model. (See Sections 2.2 and 2.3). It should be noted that the concentration values show as model predictions (isopleths) and those from NASN stations are presented as annual arithmetic means. Kentucky's sampling results are displayed on an annual geometric mean since the adopted Air Quality Standard in that state is in terms of a geometric mean. Comparison can be made between the two sets of values by increasing the Kentucky values by about 20%.

It is obvious from an examination of Figure 2-6 that the model predictions and measured air quality data are not in agreement. The model appears to be over-predicting by a factor of approximately two in the area of the sampling stations. This indicates that the verification developed for the diffusion model during the winter season is not applicable when projected to annual average conditions. Unfortunately, the annual data presented in this section was found to be inadequate for model verification because of lack of range in sampled values and the lack of proper geographical coverage. The results presented in Figure 2-6 are discussed further in Sections 2.3.2 and 2.4.3.

It was apparent from the comparison of verified model estimates and annual average measurements (by the West-Gaeke technique) that the winter verification which had been done did not accurately reflect the annual average sulfur dioxide concentrations in the MCIAQCR. Since it was impossible to verify the model on an annual basis it was decided to abandon the computer simulation technique for the evaluation of sulfur oxide control strategies.

2.4 CONTROL STRATEGY SELECTION

2.4.1 Particulate Control Strategies

A total of 18 particulate control strategies was tested in the simulation exercise. Each of these strategies specifies an allowable emission level for each type of source within the region (e.g., fuel combustion, industrial process and solid waste disposal).

1. Existing Control Regulations Through the Region
   This strategy displayed the air quality resulting from complete compliance with existing control regulations in the MCIAQCR. Figure 2-7 shows existing fuel combustion standards. Table 2-1 indicates existing standards for industrial processes and describes existing solid waste disposal standards.

2. Most Stringent Existing Regulations Applied Through Region
   Emission standards for fuel combustion, industrial processes, and solid waste disposal were taken from the existing regulations of Kentucky, Indiana, and Cincinnati, respectively.

3. Most Stringent Existing Fuel Combustion, Second-Most Stringent Industrial Process Regulation
   Emission standards for fuel combustion, industrial processes, and solid waste disposal were taken from the regulations of Kentucky, Indiana, and Cincinnati.

4. Most Stringent Industrial Process Regulation, Second-Most Stringent on Fuel Combustion
   Industrial process and solid waste disposal standard as for Strategy 2, with Cincinnati's fuel combustion control standard.

5. Cincinnati Particulate Regulations Applied Throughout the Region

6. Maximum Technology Control
   This strategy allows fuel combustion sources to switch to natural gas and eliminates all incineration. Industrial process sources are controlled with the most effective control device, usually in fabric filter or efficient electrostatic precipitation.

7. Maximum Technology Control without Fuel Switching
   This strategy allows fuel combustion control with the best

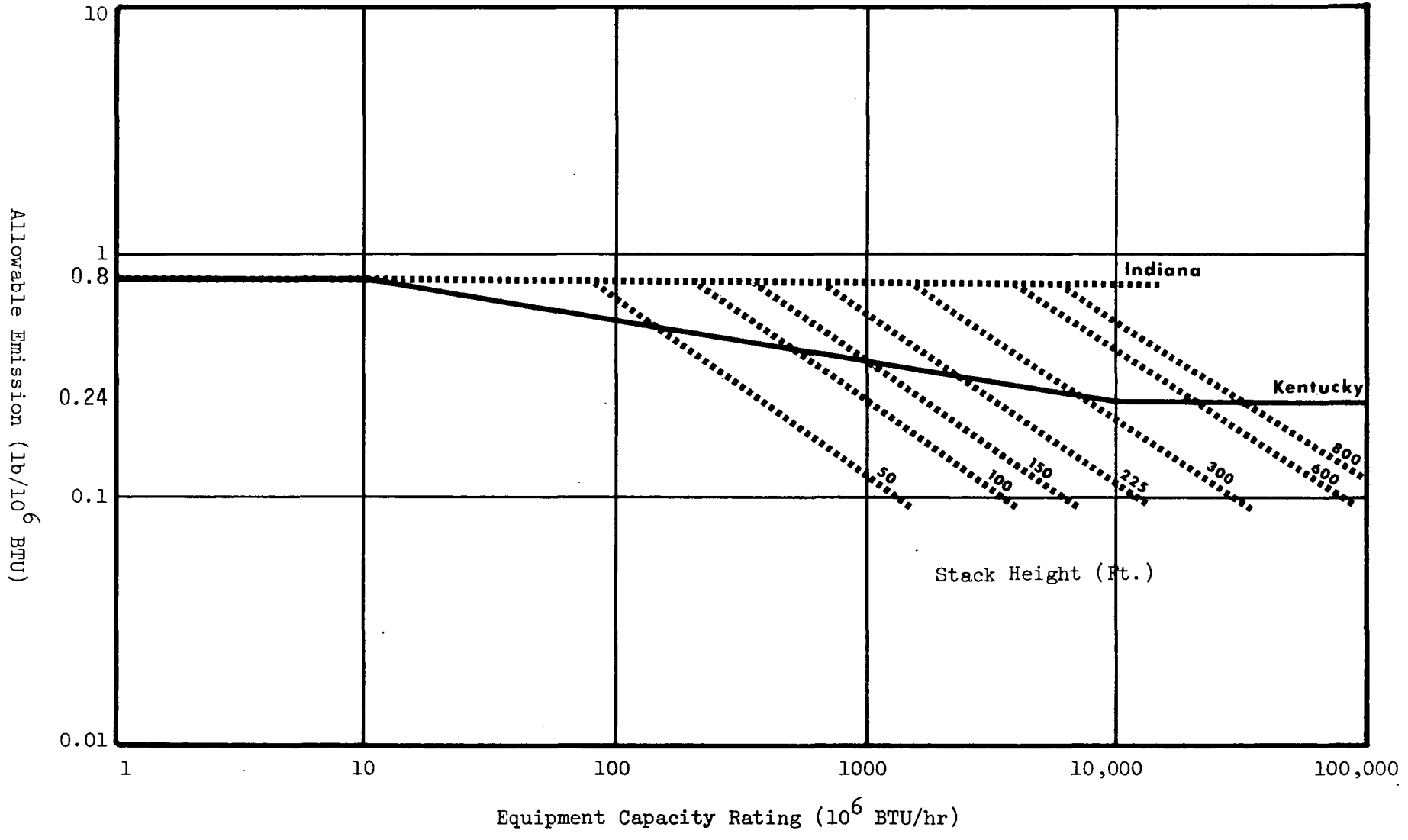


Figure 2-7. Existing Emission Standards in the MCIAQCR Based on Input Heat Capacity

Table 2 - 1(A) Existing Particulate Emission Standard for Industrial Process Sources (City of Cincinnati Regulation)

Effective Height of Process Vent, ft[a]	Allowable Emissions lb/hr[a]
Up to 50	4
75	10
100	17
125	27
150	40
175	53
200	68
225	88
250	110
275	130
300	160

(a) Allowable Emissions for intermediate heights shall be determined by linear interpolation.

(B) Standard for particulate emissions from incinerators: 0.4 pounds of particulate matter per 1000 pounds of discharged gases adjusted to 12 percent CO_2. (City of Cincinnati)

available control device applied. Other sources are controlled as in strategy number 6 above.

8. Maximum Technology Control with Fuel Switching, Solid Waste Disposal Control To Level of Existing Cincinnati Standard

9. Most Stringent Existing Regulations, Maximum Technology Without Fuel Switching
   Industrial processes and solid waste disposal are controlled to same level as in Strategy 1.

10. Most Stringent Set of Control Standards, Not Maximum Technology
    Stringent heat input curve for fuel combustion sources (Figure 2-8A) process weight curve for industrial processes (Figure 2-9A) and 0.05 grains/scf allowable emissions for incinerators.

11. Same As Strategy 10 with Relaxation of Solid Waste Disposal Standard
    Incinerator emission must be controlled to 0.2 grains/scf.

12. Same as Strategy 10 with Process Weight Standard for Industrial Process Emissions as Shown in Figure 2-9B

13. Same as Strategy 11 with Process Weight Standard (Figure 2-9B

14. Same as Strategy 10 with Heat Input Standard for Fuel Combustion Sources as Shown in Figure 2-8B

15. Same as Strategy 11 with Standard for Fuel Combustion (Figure 2-8B)

16. Same as Strategy 12 with Standard for Fuel Combustion (Figure 2-8B)

17. Same as Strategy 13 with Standard for Fuel Combustion (Figure 2-8B)

18. Potential Emission Standard
    This standard relates the allowable emissions for each source to its uncontrolled or potential emissions. Standard is applied to all source categories and is displayed in Figure 2-10.

This set of strategies represents a blend of control standards existing in the Region, theoretical maximum control levels, and control standards developed and used in other parts of the country. Simulation of

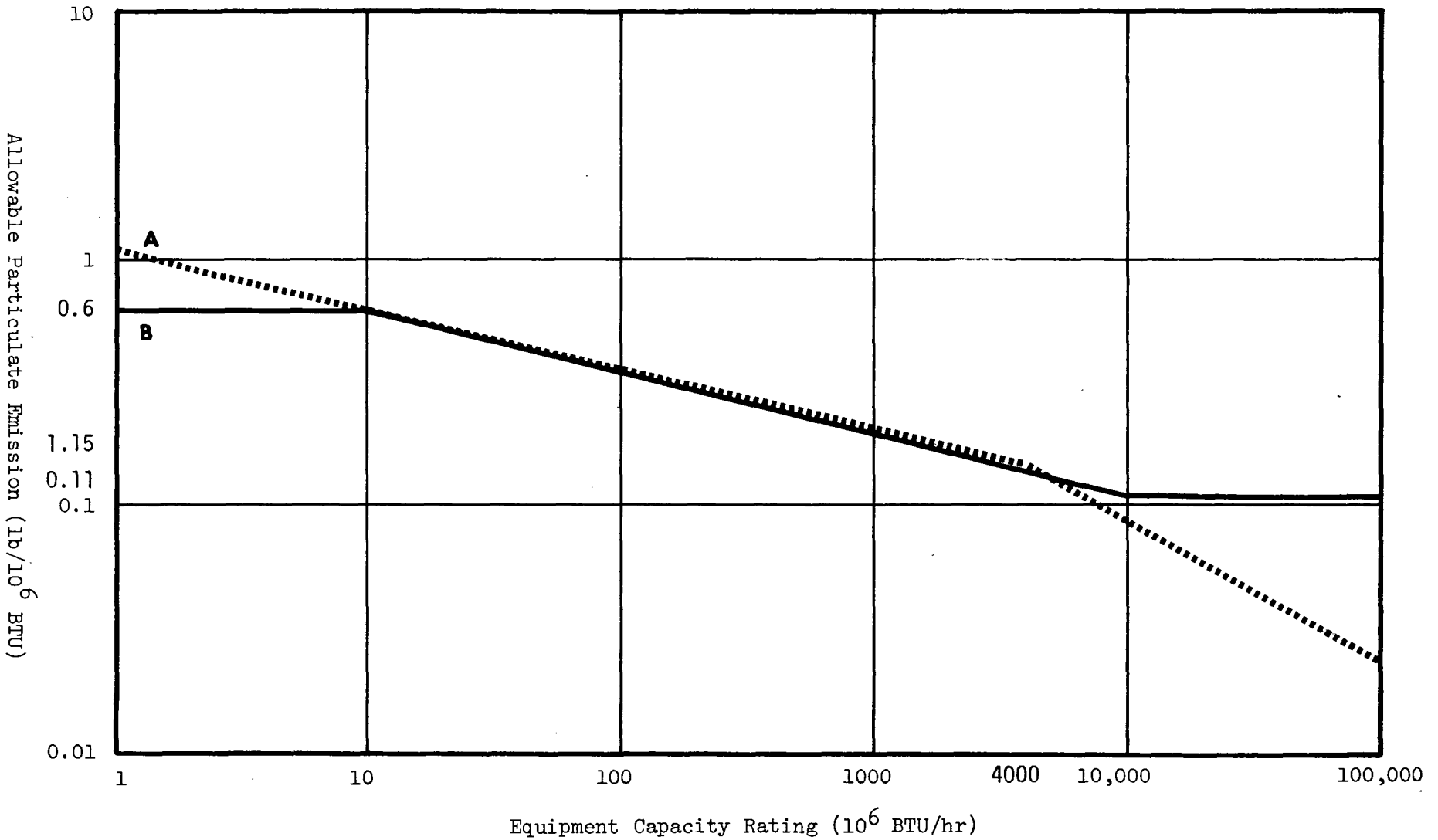


Figure 2-8. Additional Heat Input Type Standards Tested in Proposed MCIAQCR Particulate Control Strategies.

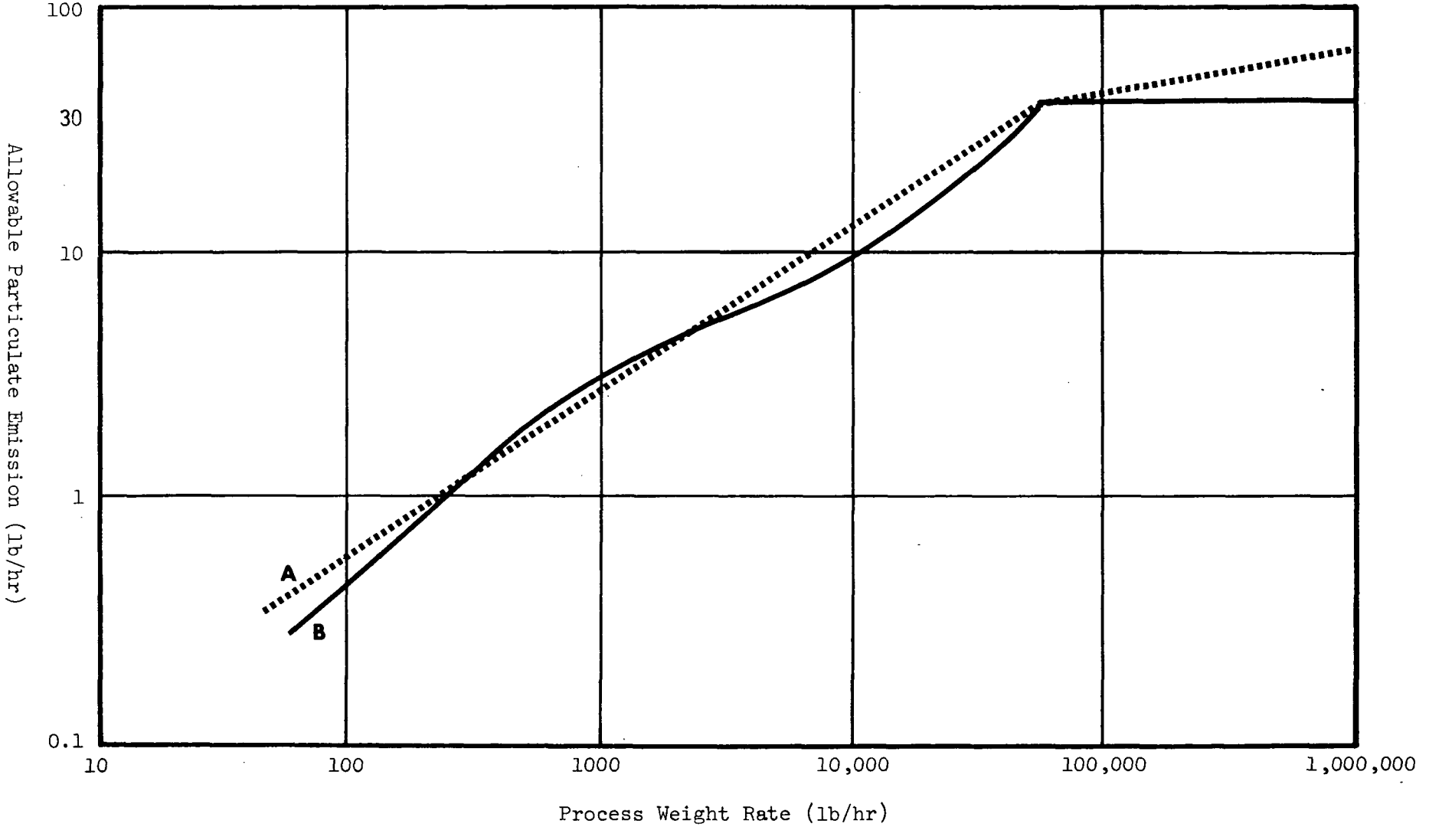
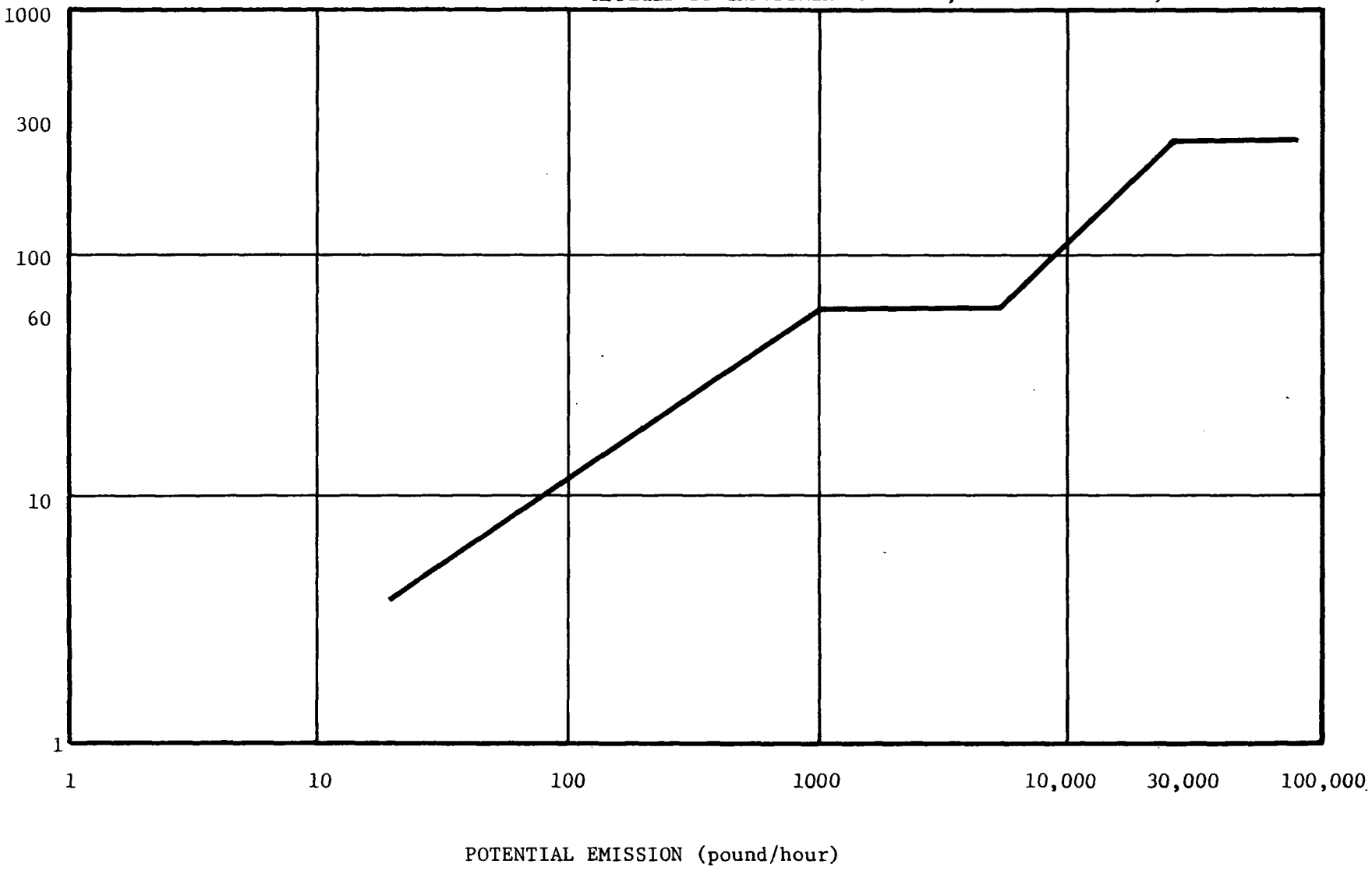


Figure 2-9. Two Sets of Emission Standard Curves for Industrial Process Type Emissions Used in the Particulate Control Strategies Evaluated for the MCIAQCR.

Figure 2-10. ALLOWABLE PARTICULATE EMISSIONS BASED ON THE POTENTIAL OR UNCONTROLLED SOURCE EMISSIONS APPLIED TO INDUSTRIAL PROCESS, FUEL COMBUSTION, & SOLID WASTE DISPOSAL



these standards with the resulting ground level concentration values and required emission reductions allows an informal choice regarding that set of control standards most suited to the needs of the MCIAQCR.

2.4.2 Particulate Simulation Results

After the 18 particulate control strategies described in the previous section were selected, a control strategy simulation was carried out. This simulation predicted ground level particulate concentrations on the basis of the verified atmospheric diffusion model discussed in Section 2.3.

Table 2-2 provides a brief summary of the results of this exercise. The task at this stage was to select a small group of potentially feasible control alternatives for further detailed analysis. The two receptor sites noted in this tabulation were selected as being roughly descriptive of the overall regional air quality.

Three relatively distinct groups of control strategies can be defined in Table 2-2. The first group consists of Strategies 1 through 5 and essentially represents various combinations of emission standards already being applied in political jurisdictions within the MCIAQCR. In general, these strategies had a fairly low regional cost and could be administered rather easily. None of them, however, appeared to give promise of achieving regional air quality standards of 65 $\mu g/m^3$ (75 $\mu g/m^3$ in Indiana). It was decided that Control Strategy 1, existing regulations, should be included in the more detailed strategy analysis.

Strategies 6 through 9 represented variations in maximum control technology. In general, these strategies could be characterized by having rather high regional control costs but producing acceptable air quality values. Strategy 7 was included in the more detailed analysis since the strategy should apply the most effective control techniques throughout the region. The administrative acceptability of this type of regulation was not great, but a view of the best control technology was desired in the detailed analysis.

The third group of control strategies, Numbers 10 through 18, represented various combinations of proposed or existing emission control standards from throughout the country. All seemed to produce acceptably low ground level concentrations. Strategies 14 through 17 also were rela-

Strategy Number	Regional Control Cost* ($ in millions)	Selected Receptor Concentration ($\mu g/m^3$) 264	269
Existing		134.8	141.8
1	1.7	80.0	83.7
2	3.0	79.5	82.9
3	2.7	79.0	82.6
4	2.2	79.8	83.3
5	1.9	79.3	83.0
6	20.0	63.5	66.5
7	6.4	67.7	70.9
8	5.9	71.0	75.7
9	5.6	71.5	76.6
10	7.0	65.1	68.5
11	6.9	65.3	68.9
12	7.2	64.9	68.3
13	7.0	65.1	68.8
14	3.7	68.8	71.5
15	3.5	64.5	67.8
16	3.9	64.2	67.2
17	3.7	64.3	67.6
18	not tested		

*Control Cost of Point Sources Only

Table 2-2. INITIAL SCREENING OF PARTICULATE CONTROL STRATEGIES

tively low in cost and were considered feasible in terms of practical administrative considerations. Strategies 15 and 18 were selected to complete the group of four strategies for more detailed analysis. (Strategy 18 was not tested in the initial screening but was considered to be similar in stringency to those in the 14 to 17 group.)

After the initial strategy simulation runs, a number of minor errors in the emission inventory data base was discovered and corrected. Certain suspected program malfunctions were also investigated. The more detailed control strategy summaries cannot be compared with the output presented in Table 2-2. The general results, however, were similar in both cases.

Table 2-3 presents more complete information on those strategies selected during the initial screening procedure. The maximum receptor concentration occurring after application of each strategy is presented. Also, the emission reduction percentages are shown for both point and area sources and the new emission rates for these categories.

Strategy 1, existing regulations, appears totally unlikely to achieve satisfactory regional air quality and was dismissed from further consideration.

The maximum concentrations reported for the other control strategies must be interpreted with a certain degree of care. Only for strategy 15 was a reduction in area source emissions projected. This was done as a test to determine the effect this factor had on receptor concentrations. It was felt on the basis of reduction in open burning throughout the region and trend in fuel usage toward natural gas and away from coal for small fuel users that this degree of reduction would be reasonable for any of the three strategies. On this basis the maximum concentration would be least (probably between 60 and 65) for Strategy 7. Strategy 18 would be essentially equal to Strategy 15. Since all three control strategies appear to be able to achieve the regional air quality standards within the limits of simulation modeling accuracy, the final selection of a control strategy to be proposed for the MCIAQCR was left to practical administrative and technical considerations.

Strategy 7 was considered to be quite difficult to administer and since its regional cost nearly doubled that of the other two strategies, it was eliminated.

Strategy Number	POINT SOURCES Percent Reduction	POINT SOURCES New Emissions Rate (ton/day)	AREA SOURCES Percent Reduction	AREA SOURCES New Emission Rate (tons/day)	$ x 10^6	$/ton removed	Maximum Receptor ($\mu g/m^3$)
Existing		386.7		212.6			150.5
1	72.3	102.5	--	212.6	1.6	15.	137.9
7	97.1	11.7	--	212.6	6.1	44.	76.1
15	89.2	41.8	33.	142.4	3.3	26.	69.2
18	87.1	49.0	--	212.6	3.4	28.	81.9

Table 2-3. DETAILED RERUN OF SELECTED GROUP OF STRATEGIES FOR MCIAQCR

Strategy 15 was chosen over Strategy 18 since it contains more familiar types of emissions standards. For this reason it was considered to be politically more acceptable and administratively easier to handle.

A detailed breakdown of the emission reductions required under Strategy 15 is presented in Table 2-4. Examination of this table, coupled with a review of particular source-control device combinations, lead to the conclusion that although significant emission reductions are required, they are not beyond the state-of-the-art in control technology.

An isopleth plot of ground level particulate concentrations after application of this strategy, as shown in Figure 2-11. Comparison with the plot of existing concentrations (Figure 2-6) graphically shows the improvement in regional air quality expected following application of Control Strategy 15.

To insure that the selected set of control standards would indeed be able to achieve and maintain acceptable air quality levels over the next several years, an exercise was carried out to project emission rates to the year 1980. These projections were based on economic projections for the MCIAQCR supplied by the United States Department of Commerce. Factors with which to scale existing emission levels were developed for each industrial classification. The revised emission rates expected for the year 1980 are displayed in Table 2-5. Factors were developed to project emission levels based on the 1969 emission inventory to a 1980 basis. These projections were by industrial and commercial categories. The same percentage control of emissions that is currently required was assumed to continue thooughout the projection period. As can be seen, the overall regional emission rate actually declines slightly during this ten-year period. The decline is basically due to large increases projected for relatively nonpolluting industrial classifications and to a change in regional fuel usage toward increased use of natural gas and oil. Based on this anaylyis the emission standards comprising Particulate Control Strategy 15 appears to be suitable to the needs of the MCIAQCR. Figure 2-12 displays the projected ground level concentrations for 1980.

Political Jurisdiction	Area	Apartment Commercial Government	SOURCE CLASSIFICATION Industrial Fuel Combustion	Process	Power Plants	Solid Waste	Total
Cincinnati							
Existing	8030	708	2464	365	0	1555	13,122
Controlled	5402	354	650	365	0	376	7,147
% Reduction	32.7	50.0	73.6	0	0	75.8	45.5
Indiana							
Existing	1679	0	894	91	23,634	489	26,787
Controlled	1131	0	117	91	1,482	0	2,821
% Reduction	32.6	0	86.9	0	93.7	100	89.5
Kentucky							
Existing	4526	44	18	7490	0	529	12,607
Controlled	3029	29	18	544	0	0	3,621
% Reduction	33.1	33.3	0	92.7	0	100	71.3
Ohio							
Existing	19012	0	22177	16,969	58,104	5592	121,855
Controlled	12738	0	3099	2,427	5,577	124	3,966
% Reduction	33.0	0	86.0	85.7	90.4	97.8	80.3
Region							
Existing	33248	752	25554	24,915	81,738	8165	174,371
Controlled	22301	383	3884	3,427	7,059	500	37,555
% Reduction	32.9	49.0	84.8	86.3	91.4	93.9	78.5

TABLE 2-4 . PARTICULATE EMISSIONS FOLLOWING APPLICATION OF PROPOSED EMISSION STANDARDS BASED ON 1969 EMISSION INVENTORY. (TONS OF PARTICULATE/YEAR)

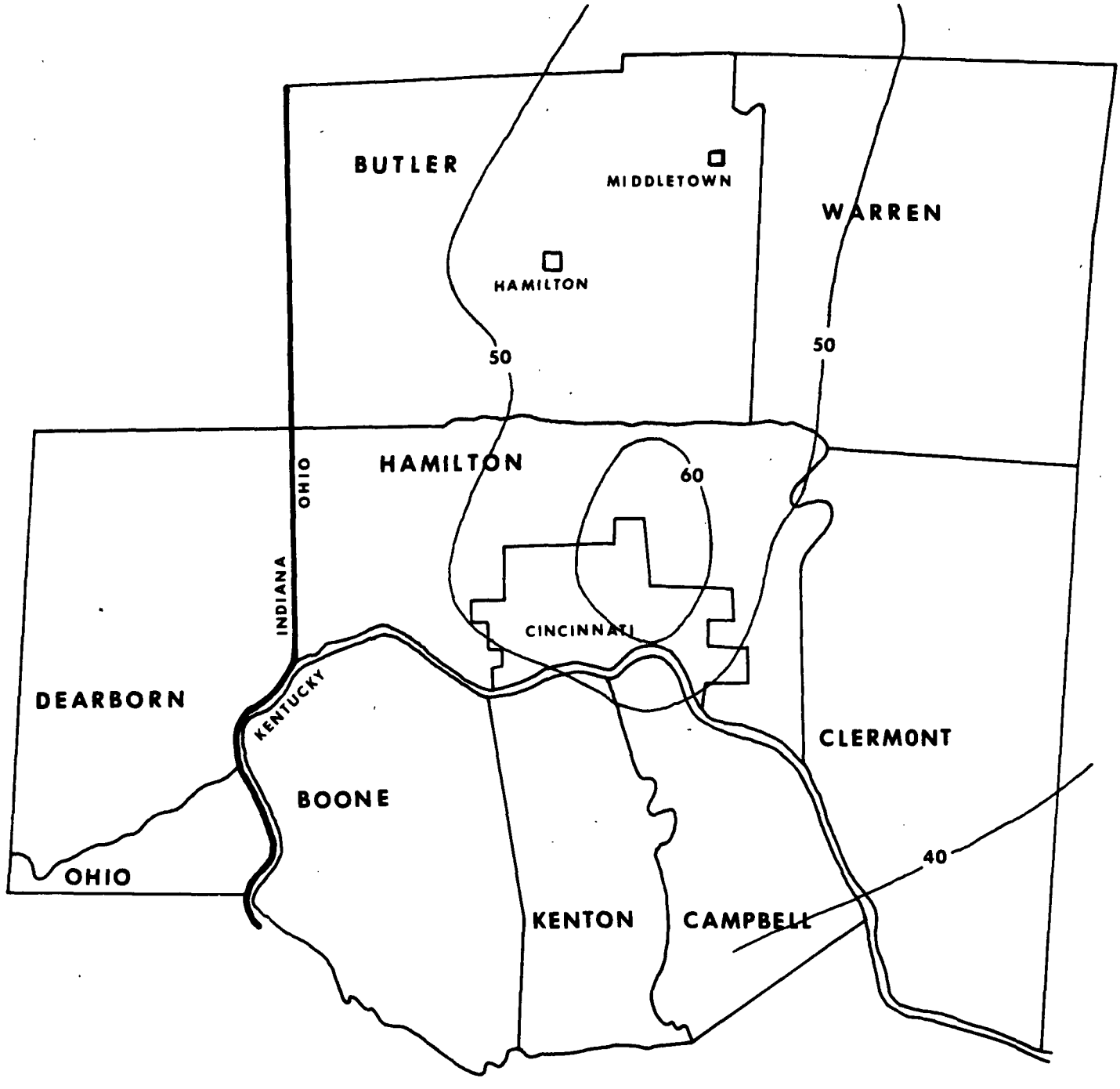


Figure 2-11. Predicted Ground Level Concentrations Following Application of Proposed Control Strategy (1969 Emission Inventory)

Note: Annual Average Concentrations in $\mu g/m^3$

Political Jurisdiction		SOURCE CLASSIFICATION						
		Area	Apartment Commercial Government	Industrial Fuel Combustion	Industrial Process	Power Plant	Solid Waste	Total
Cincinnati								
	Existing	8030	741	3467	434	0	5209	17,881
	Controlled	5402	369	912	434	0	1259	8,377
	% Reduction	32.7	50.0	73.6	0	0	75.8	53.2
Indiana								
	Existing	1679	0	1172	139	23,634	1639	28,262
	Controlled	1131	0	153	139	1,482	0	2,905
	% Reduction	32.6	0	86.9	0	93.7	100.0	89.7
Kentucky								
	Existing	4526	55	22	9191	0	1774	15,567
	Controlled	3029	36	22	668	0	0	3,756
	% Reduction	33.1	33.3	0	92.7	0	100.0	75.9
Ohio								
	Existing	19012	0	31467	20279	9,213	18732	98,703
	Controlled	12738	0	4398	2902	887	416	21,342
	% Reduction	33.0	0	86.0	85.7	90.4	97.8	78.4
Region								
	Existing	33248	796	36128	30043	32,846	27353	160,414
	Controlled	22301	405	5485	414	2,369	1675	37,380
	% Reduction	32.9	49.1	84.8	86.2	92.8	93.9	77.3

TABLE 2-5. PARTICULATE EMISSIONS FOLLOWING APPLICATION OF PROPOSED EMISSION STANDARDS BASED ON PROJECTED 1980 EMISSION LEVELS. (TONS OF PARTICULATES/YEAR)

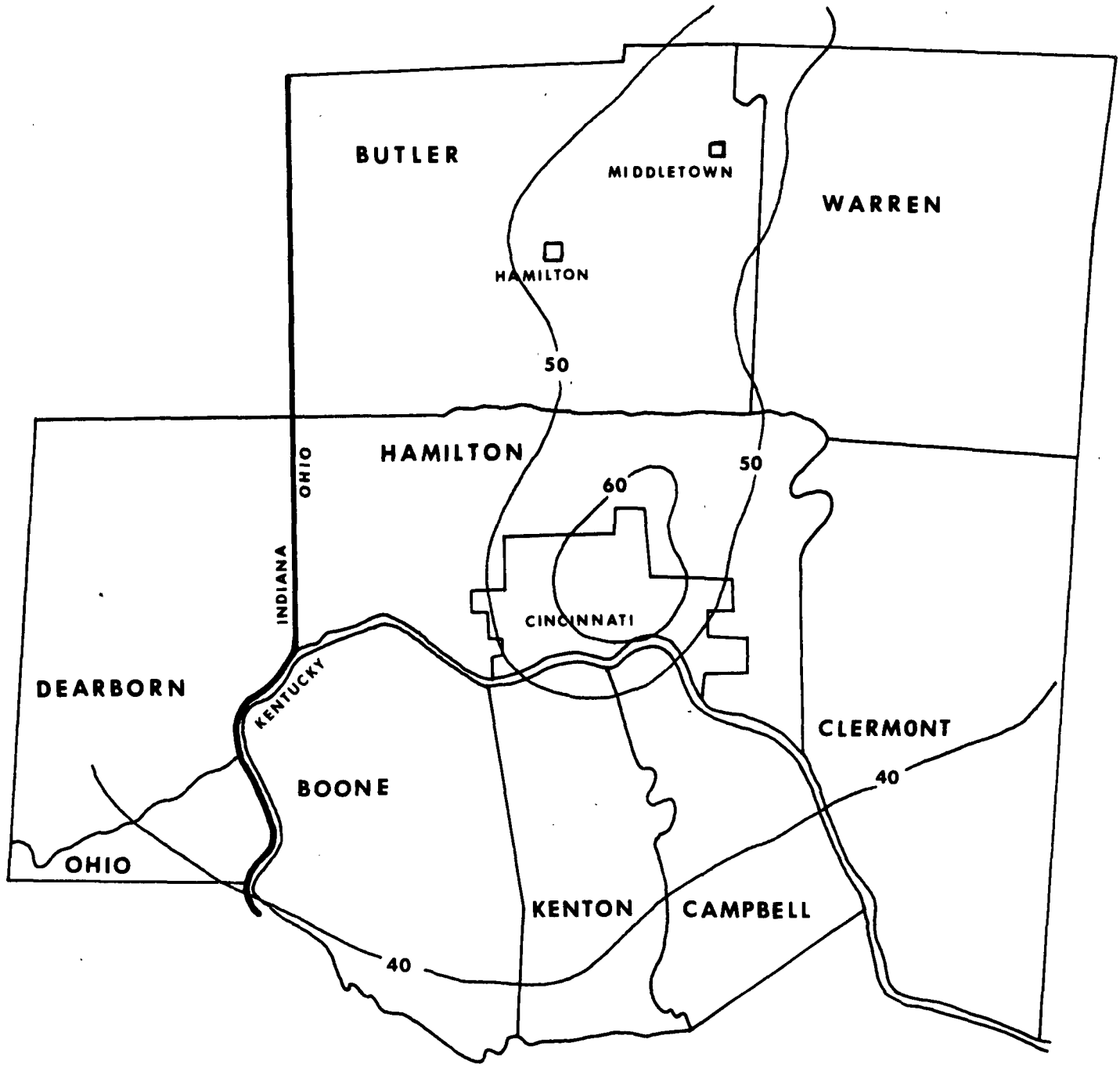


Figure 2-12. Projected Ground Level Particulate Concentration Following Application of Proposed Control Strategy (Projected 1980 Emission Levels)

Note: Annual Average Concentration in $\mu g/m^3$

2.4.3 Sulfur Oxides Control Strategy

It was not possible on the basis of available air quality and emission data to develop a suitable annual verification of the diffusion model for sulfur oxides. (See Section 2.3.2.) Control strategy development for this pollutant had to be undertaken by the use of rollback considerations. (The computer simulation exercise, however, was still performed on a limited group of control strategies. The amount of pollutant reduction required under various emission reduction plans is necessary input to this strategy section procedure. Four sulfur oxide control strategies were simulated on a regional basis. Each of these strategies applied specific restrictions to the fuels used within the MCIAQCR. The four strategies, in order of increasing stringency, are defined as follows:

1. Limitation of all fuel to 1.25% sulfur content or less
2. Limitation of all fuel to 0.8% sulfur content or less
3. Limitation of all fuel to 0.3% sulfur content or less
4. Switch of all combustion sources to the use of natural gas

On an annual basis, the limited air quality data for SO_2 available in the MCIAQCR indicate that ambient SO_2 levels are not exceeding the Air Quality Standard (Ohio and Indiana) of 43 $\mu g/m^3$. On a short-term basis, however, the existing levels exceed the standards. This is discussed in more detail in Section 1.7.

During the three-month effort to collect data for this study (November 1969 through January 1970) periods were observed during which the average for 24 hours and for one hour were higher than allowed by the standard. At sampling station number 77(located in Ohio),the maximum hourly average was 1000 $\mu g/m^3$. This is compared with an Air Quality Standard (Ohio and Kentucky) for the maximum one-hour average in any year of 858 $\mu g/m^3$. Since the sampling only covered a period of three months, a minimum reduction of 14% in ambient air quality is required to comply with air quality standards.

During this same period, sampling station number 70 (located in Ohio) recorded a maximum 24-hour average of 371 $\mu g/m^3$. The maximum 24-hour average allowed by the Air Quality Standards (in all jurisdictions*)

*Ohio's standard specified that this value shall not be exceeded more than 1% of the time.

is 286 $\mu g/m^3$. An overall reduction in sulfur dioxide pollution levels of 23% will be required to bring this value into compliance with the standards. The observations cited in this and the preceding paragraph indicate that air pollution levels need to be reduced approximately 20 to 25%.

An examination of continuous air monitoring data collected over a period of six months is shown in Table 2-6. These data also reveal the existence of undesirably high, short-term, sulfur dioxide concentrations. In particular, the hourly maximum for April 1970 was 1550 $\mu g/m^3$. This value exceeds the adopted air quality standard of 858 for this averaging time by about 45%. These excessive short-term concentrations illustrate the need for a regional reduction of sulfur oxides emissions.

A reduction of each sulfur oxide source in the region by the specified percentage is not an administratively attractive nor technically sound control alternative. Since the majority of this type of pollutant emission is generated by fuel combustion, various control alternatives limiting allowable fuel sulfur content were examined. Reduction of the allowable sulfur content in fuels to 0.3% or 0.8% produced greater emission reductions than would seem to be required by the observational data cited above. The application of the existing City of Cincinnati fuel sulfur content regulation throughout the region was determined to produce sufficient emission reductions. This regulation has been proven to be technically and administratively feasible in one of the political jurisdictions comprising the MCIAQCR and is recommended in this implementation plan as the basis for a regionwide sulfur oxides control strategy. A slight change to the existing Cincinnati regulations is proposed for non-power plant fuel combustion sources. According to the detailed emission inventory information compiled for this study, nearly all smaller fuel users within the region are already using fuel with less than 1.0% sulfur content. Accordingly, to prevent increases in emission from these source categories, the proposed limitation on sulfur content in fuels not used for electrical power generation is set at 1.0%.

Table 2-7 displays the emission reductions required by the adoption of this strategy on a regionwide basis. By far, the greatest reduction in sulfur oxide emissions occurs in the electric power generation source category. This reflects the fact that these sources are the only significant users of high sulfur fuels in the region. This pattern of emission reduction

Table 2-6. AMBIENT SULFUR DIOXIDE CONCENTRATIONS AS MEASURED AT THE CAMP STATION, CINCINNATI

Period	Arithmetic Mean Concentration*	24-Hour Maximum*	One-Hour Maximum*
January 1970	136	286	675
February 1970	94	186	758
March 1970	68	305	780
April 1970	55	251	1550
May 1970	31	106	638
June 1970	24	106	492

*All concentrations are in units of $\mu g/m^3$.

Political Jurisdiction	SOURCE CLASSIFICATION						
	Area	Apartment Commercial Government	Fuel Combustion	Process	Power Plants	Solid Wastes	TOTAL
Cincinnati							
Projected	7,227	1,576	3,398	0	0	390	12,592
Controlled	7,227	1,576	3,398	0	0	390	12,592
% Reduction	0	0	0	0	0	0	0
Indiana							
Projected	1,204	0	1,328	0	123,844	14	126,392
Controlled	1,204	0	1,328	0	50,895	14	53,443
% Reduction	0	0	0	0	58.9	0	57.7
Kentucky							
Projected	3,029	102	0	0	0	14	3,146
Controlled	3,029	102	0	0	0	14	3,146
% Reduction	0	0	0	0	0	0	0
Ohio							
Projected	12,632	0	25,017	8,584	196,052	2,047	244,334
Controlled	12,632	0	20,856	2,609	93,206	2,047	131,352
% Reduction	0	0	16.6	69.6	52.5	0	46.2
REGION							
Projected	24,093	1,679	29,743	8,584	319,896	2,467	386,465
Controlled	24,093	1,679	25,582	2,609	144,102	2,467	200,534
% Reduction	0	0	14.0	69.6	55.0	0	48.1

Table 2-7. EFFECT OF PROPOSED SULFUR OXIDES CONTROL STRATEGY ON MCIAQCR EMISSION LEVELS (tons of pollutant/year)(based on 1969 Emission Inventory)

appears to be consistent with the goal of reducing maximum short-term ambient concentrations. Large emission sources are very important under the unfavorable meteorological conditions which cause the highest hourly and daily concentrations.

Table 2-8 displays the result of the projection of regional growth and the associated sulfur oxide emissions to the year 1980. Despite projected regional population and commercial growth, the expected levels of sulfur oxide emissions remain fairly constant. For this reason, it appears that the proposed control strategy, as described above, will be adequate to achieve and maintain air quality standards during this period.

2.5 PROPOSED CONTROL STRATEGY

The following emission control strategies were selected for adoption throughout the MCIAQCR on the basis of procedures and considerations presented in the preceding section (2.4). These strategies represent emission limitation standards which, when adopted and enforced, should lead to acceptable levels of both suspended particulate and sulfur dioxide as defined by the regional Air Quality Standards. Legally enforceable control regulations based on these emissions standards are presented in Section 4.2.

The proposed particulate control strategy consists of emission standards covering three general categories of emissions sources:

- Industrial Process Emissions

  Sources within this category are allowed emissions based on process weight as defined by curve A, Figure 4-11 covering this source category. (This standard is fully defined in Section 4.2, Proposed Control Regulations.)

- Fuel Combustion Emissions

  Allowable emissions are defined according to the curve B, Figure 4-10 for heat input versus mass particulate emission rate. (This standard is also presented in Section 4.2)

- Solid Waste Disposal

  Incinerators are allowed emissions of 4 pounds/ton of refuse charged and open burning is prohibited under the standard relating to this source category.

The proposed regional sulfur oxides control strategy consists of those emissions standards on which the regulations already in effect in the City of Cincinnati are based. Two emission categories are considered by these standards:

Political Jurisdiction	Area	SOURCE CLASSIFICATION: Apartment Commercial Government	Fuel Combustion	Process	Power Plants	Solid Wastes	TOTAL
Cincinnati							
Projected	7,227	1,569	4,883	0	0	1,306	14,986
Controlled	3,431	1,569	4,883	0	0	1,306	11,190
% Reduction	52.5	0	0	0	0	0	25.3
Indiana							
Projected	1,204	0	1,741	0	123,844	47	126,837
Controlled	547	0	1,741	0	50,900	47	53,652
% Reduction	52.5	0	0	0	58.9	0	57.7
Kentucky							
Projected	3,029	138	0	0	0	47	3,215
Controlled	1,423	138	0	0	0	47	1,609
% Reduction	52.5	0	0	0	0	0	49.9
Ohio							
Projected	12,632	0	35,058	13,041	76,536	6,858	144,127
Controlled	6,000	0	29,238	3,963	36,355	6,858	77,540
% Reduction	52.5	0	16.6	69.6	52.5	0	46/2
REGION							
Projected	24,093	1,708	41,683	13,041	200,381	8,259	289,167
Controlled	11,402	1,708	35,847	3,963	90,171	8,259	150,077
% Reduction	52.5	0	14.0	69.6	55.0	0	48.1

Table 2-8. EMISSIONS FOLLOWING APPLICATION OF PROPOSED SULFUR OXIDES CONTROL STRATEGY BASED ON 1980 EMISSION PROJECTIONS (tons of pollutant/year)

- Industrial Process Emissions

  Sulfur oxide emissions from industrial process are limited to 2000 parts per million by volume of the exhaust gas stream. Acid plants shall control to 36 pounds/ton acid for sulfuric acid plants.

- Fuel Combustion Emissions

  The maximum sulfur content of fuel used shall be 1.25% with 1.00% being the allowable limit for smaller combustion sources.

2.6 TIMETABLE FOR IMPLEMENTING PROPOSED REGULATIONS

Implementation of control regulations logically divides into two separate tasks. First, the new regulation must be officially adopted by the responsible state agency. Second, field enforcement and control of pollution sources affected by the regulation must be carried out. The length of time required to carry out these actions are discussed in the following two sections.

2.6.1 Adoption of Proposed Control Regulations

Indiana's Air Pollution Control Board has been granted by the State Legislature all the powers necessary to hold public hearings, and adopt control regulations. Since no additional powers are needed, the process will begin immediately. The following steps will be carried out in this effort.

1. Prepare proposed control regulations in appropriate legal form

   Section 4.2 of this document indicates the general form the control regulations should take. Administrative considerations may require redrafting. Time required will be one month.

2. Hold public hearings

   This is a necessary step in assuring public acceptance and cooperation with the expanded air pollution control activities proposed in this document. This will be completed by November 2, 1970.

3. Final adoption

   It will be necessary to incorporate changes or additions deemed acceptable following the public hearings; and possibly a final hearing would be necessary at this stage. This step will be completed by January 4, 1971.

2.6.2 Enforcement of Control Regulations

The primary portion of the Indiana enforcement program will be the permit and source surveillance system described in Section 6.2. It is anticipated that legislation proposed in Section 3 to all the Indiana APC Board to set up and operate a permit system will be passed by the Legislature by January 1971. It is anticipated that source registration and surveillance procedures and the permit system will be fully operational within 18 months following the adoption of the necessary legislation and regulations (i.e., by July 1972). State actions to begin to achieve compliance with the proposed control regulations will begin well before this time.

Particulate emission sources should be brought substantially into compliance with the new regulation by July 1972. There are no new control technologies necessary to bring particulate emission sources into compliance with the proposed standards. The approximate 18-month period allowed for compliance after the adoption of the control regulations allows pollution sources an opportunity to design, fabricate or purchase, and install necessary control devices.

The regulations relating to sulfur oxides emissions control may require a longer period in which to achieve compliance. Choice of the most satisfactory control method is usually made by the source after all of the various technical, economic, political and social factors are given serious consideration. The options for fuel substitution are numerous. Natural gas, low sulfur fuel oil, low sulfur coal, and coal-derived gas or oil are available or can be made available at a price. Although considerable pilot plant work has been conducted and many processes are commerically available, the application of full-scale flue gas desulfurization processes to coal-fired power plants is limited. As soon as possible, but not later than six months after the adoption of the proposed control regulations, the applicable sources will be required to submit a control plan of how they will come into compliance. The control plans should cover no more than a two-year period. Therefore, by July 1973 the sources will be in compliance. During this period, the data from the air quality monitoring network will be closely observed to determine the exact trends in the sulfur dioxide concentrations in the Region. If this data indicates that additional control is needed, the Implementation Plan will be modified accordingly.

3. LEGAL AUTHORITY

3.1 SCOPE OF DISCUSSION

This section will address itself to legal deficiencies and remedies of the various aspects of air pollution control as they relate to the State of Indiana. Generally, the discussion will be confined to the adequacy of legal authority of the regional entity to fully implement a control program, including the organization of regional enforcement activities, promulgation and enforcement of regulations, and implementation of emergency action. However, the legal aspects of the proposed emission and control regulations are not discussed in this section.

In general, the format of this section is designed to identify the legal problems which exist in Indiana and the legislative and regulatory action necessary to remedy the deficiencies found in the respective programs.

3.2 GENERAL DISCUSSION OF THE POWERS OF ADMINISTRATIVE AGENCIES

It is the general rule that the powers of administrative agencies are limited by the intent of the legislature as expressed in the statutes. That is to say that administrative agencies have no inherent powers.

However, legislative intent may give rise to <u>implied</u> powers and the courts, in interpreting the powers of such agencies, are not limited by the mere words of the statute. This is especially true where the administration of health and safety is concerned. It is a general principle of law that every grant of power carries with it the reasonable use of necessary means for its effective execution. Thus an administrative agency has every power which is indispensable to the powers specifically granted.

Notwithstanding liberal construction as regards health legislation, it is best to expressly endow the agency with the powers necessary to carry out the intent of the legislature. For while the courts may uphold an agency's exercise of implied power, such litigation is time consuming and ought not to be encouraged by lack of legislative specificity. On the other hand, the intent of the legislature may be defeated by subsequent litigation if that body fails to express its intent in the statute.

3.3 CRITERIA FOR EFFECTIVE AIR POLLUTION REGULATION

Compliance with the requirements discussed in the previous section requires that legislative criteria be set. That is, a check list of all the necessary elements of effective air pollution control legislation must be presented to determine that adequate authority is given the agency.

Thus, statutes relative to air pollution regulation must be analyzed to determine that the legislature has expressed its intent and has defined "air pollution" so as to permit the administrative agency to act to prevent conditions which threaten to endanger the public health prior to the occurrence of actual injury. Additionally, the state agency must have sufficient authority to adopt emission regulations and other control regulations, implement emergency action, gather and evaluate air quality and emissions data, require reporting of information, require permits to construct, require permits to operate, grant and repeal variances, inspect facilities, test facilities, issue orders, hold hearings, subpoena witnesses and evidentiary materials, impose penalties, obtain injunctions, and grant enforcement powers to local agencies.

3.4 LEGISLATIVE INTENT

Legislative intent has been expressed in the Indiana Air Pollution Control Laws.[1] In general, the language provides for protection of public health and, consistent with economics and industrial development, the protection of public enjoyment of the states' air resources.

Indiana Statute §35-4601 states:

> "It is the intent and purpose of this act to maintain the purity of the air resource of the State, which shall be consistent with protection of the public health ...."

While qualifying language has been adopted as regards the intensity of control, it is clear that the protection of public health is unqualifiedly declared to be the public policy.

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1. Indiana Stat. §36-4601.

3.5 LEGISLATIVE DEFINITION OF "AIR POLLUTION"

Adequate air pollution control can only be realized if the administrative agency has the power to act to protect welfare and property as well as health and, in addition, to prevent conditions which reasonably threaten the public health and welfare. Therefore, it is necessary that the legislative definition of "air pollution" be sufficiently broad to encompass the above factors. Indiana state law defines air pollution[2] broadly enough to include those conditions which are injurious to property, or which unreasonably interfere with the comfortable enjoyment of life and property. However, the definition does not include those conditions which threaten to be injurious.

It could be argued that a threat of injury interferes with comfortable enjoyment.[3] While it has not been seen that the original definitions substantially impaired the agencies' ability to cope with situations which posed a mere threat to the public health or welfare, legislative clarification is preferred. The following statutory change will be adopted:[4]

> Indiana Stat. §35-4602 (c);
> "Air Pollution" is presence in the outdoor atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as is or threatens to be injurious to human, plant, or animal life or to property, or which unreasonably interferes with the comfortable enjoyment of life and property.

The amendment to the Indiana Act can be adopted early in 1973.

3.6 POWERS OF THE INDIANA APC AUTHORITY

Indiana's Air Pollution Control Act[5] as amended through 1969, establishes a State Air Pollution Control Board which is generally empowered to adopt and enforce regulations, with the assistance of the State Board of Health. Primary responsibility for air pollution control is at the State level. The original 1961 act impaired the State's authority to act[6] however, and the restricting language was subsequently deleted by the Legislature in 1969. The same Legislature amended another section[7] of the 1961 Act so as to again restrict state enforcement action. That 1969 revision, in effect, grants jurisdiction to the State Board only after an air quality jurisdiction fails

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2. Indiana Stat. §35-4602 (c).
3. "Comfortable enjoyment" is a term which signifies mental quiet as well as physical comfort.
4. Underlining indicates new material; * indicates deletion.
5. Indiana Stat. §35-4601, et seq.
6. Opinions of the Attorney General of Indiana, 1966, No. 32, p. 221.
7. Indiana Stat. §35-4608 (e).

to enforce the local ordinance.[8] Even after such failure is proven, consultation with the local authority is a condition precedent to lawful enforcement action by the State Board. The requirements of proof as to failure of enforcement, and the consultation requirement tend to hinder state enforcement efforts.

The Act provides the Board adequate authority to adopt emission regulations and other control regulations. While, on its face, the Legislature's statement of intent[9] seems to limit the Board's authority in this regard, the general rule is that enabling health legislation will be liberally construed in order to effectuate the purpose of the enactment.[10] No apparent authority exists to enable the Board to require the reporting of information, adopt a permit system, or conduct source testing. However, a liberal construction of the Act[11] indicates that the Board could engage in such regulatory action provided the action was reasonable and consistent with the general intent of the Act. An analysis of the legal authority of the Indiana APC Board as of July, 1970, is summarized in Table 3-1.

The enabling legislation requires that the State APC Board must adopt regulations before effective control authority is vested in the fields of emergency action, information reporting, permit systems, and variances. As of July, 1970, the legislative power grant had been exercised only as regards construction permits. To this extent, the State Board has inadequate authority to act in the other areas mentioned above. That is to say, it has legislative authority to regulate but lacks administrative authority.

Action is proposed to remove the restraints imposed upon the State Board where local ordinances are adopted. While local enforcement activity is to be

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8. The language of §35-4608 (e) reads as follows:
   (e) When an air quality jurisdiction, or administrator thereof fails to enforce the local ordinance which affords protection to the public equal to that provided by state law, the Control Board, after consultation with that jurisdiction or administrator may take such appropriate action as may be necessary to enforce applicable provisions of state law. (As amended by Chapter 357, Acts of 1969).
9. Indiana Stat. §35-4601.
10. Blue v Beach, 155 Ind. 121, 56 N.E. 89, (1900).
11. The Board is empowered to adopt and promulgate reasonable rules and regulations consistent with the general intent of the Act and necessary to carry out the purposes of the Act. Indiana Stat. §§35-4604 (A) (3).
12. Indiana APC Board Regulation APC-1.

TABLE 3-1

ANALYSIS OF INDIANA APC LAWS AND REGULATIONS AS OF JULY, 1970

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
1. Definition of air pollution in State Law must be sufficiently broad to enable the agency to protect welfare and injury to property as well as health	APC Board	Ind. Stat. §35-4602(c)
2. Under the definition of air pollution, the agency must be able to control and prevent conditions which threaten or endanger the public health or welfare before the occurrence of actual injury	APC Board	Ind. Stat. §35-4602(c), Further clarification of the statute is desirable
3. Power to hold public hearings relating to any aspect of the administration of air pollution laws and regulations	APC Board	Ind. Stat. §35-4604

TABLE 3-1. Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
4. Power to adopt, amend and repeal rules and regulations	APC Board	Ind. Stat. §35-4604(A) (3)
5. Power to enforce the law by appropriate administrative and judicial proceedings, including injunctive relief	APC Board	Ind. Stat. §35-4604(A) (4)
6. Power to compel the attendance of witnesses at hearings and other administrative proceedings (subpoena power)	APC Board	Ind. Stat. §63-3021

TABLE 3-1. Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
7. Power to gain access to records relating to emissions of air contaminants	APC Board	Ind. Stat. §35-4604 (A) (3),
8. Power to compel the production of books and records for use in administrative proceedings (subpoena power)	APC Board	Ind. Stat. §§35-4604(A) (4) and 63-3021
9. Power to secure necessary technical information by contract or otherwise		Chap. 397. Acts, 1969, Item 2 under "Other Operating Accounts for Services by Contract". (This is under the biennial appropriation Act)

TABLE 3-1. Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
10. Power to prepare comprehensive plans for the control of air pollution	State Board of Health	Ind. Stat. §35-4604(B) (2)
11. Power to collect and disseminate information concerning air pollution (including conduct of studies, investigations and research)	State Board of Health	Ind. Stat. §35-4604(B) (3)
12. Power to establish ambient air quality standards and emission standards for all or parts of the State	APC Board	Ind. Stat. §35-4604(A) (3) and §35-4604a Air Pollution Control Regulations APC-9 (Air Quality Standards)

TABLE 3-1. Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
13. Power to classify air contaminant sources and require reports from such classes	APC Board	Ind. Stat. §35-4604(A) (3), General conferral of authority
14. Power to establish a permit system for the construction and operation of new sources and control apparatus as well as for the alteration of existing sources and control apparatus	APC Board	Ind. Stat. §35-4604 (A) (3) General conferral of authority Air Pollution Control Regulation APC-1 (New Installations only)
15. Power to inspect, subject to legal limitations regarding search warrants, the locations of contaminant sources	State Board of Health	Ind. Stat. §35-4604 (B) (9)

TABLE 3-1. Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
16. Power to conduct tests of emissions of air contaminants from any source	State Board of Health	Ind. Stat. §35-4604(B) (9) Implied from language of statute.
17. Power to utilize variances subject to careful procedural and substantive controls	APC Board	Ind. Stat. §35-4604(A) (3) General Conferral of authority
18. Power to provide for the confidentiality of information acquired from private sources, without unduly restricting ability to enforce the applicable law	APC Board	Air Pollution Control Regulation APC-1

TABLE 3-1. Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
19. Power to exercise emergency authority to limit or eliminate emissions from stationary sources with minimum delay	APC Board	Ind. Stat. §35-4605
20. Power to impose penalties for air pollution violations	APC Board	Ind. Stat. §35-4607(b)
21. Power to receive and administer grants or gifts made for the purpose of carrying out the statute and regulations	State Board of Health	Ind. Stat. §35-4604(B) (8)

TABLE 3-1.Continued

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
22. Power to advise, consult, cooperate and enter into agreements with the governments and agencies of the adjacent States, and any interstate or regional agency representing any such State or political subdivision	APC Board State Board of Health	Ind. Stat. §§53-1101 et seq.
23. Power to take any action necessary to carry out statute and regulations	-	None
24. Power to delegate performance of duties to a subordinate agency	-	Ind. Stat. §35-4608 APC Act does not limit authority of local political subdivision

encouraged, such authority should be concurrent with, and not in lieu of, state authority. The recommended legislative action, therefore, will consist of the deletion of subsection (e) of Indiana Statute §35-4608. Such action will not impair effective local control of air pollution.

Further action is deemed desirable in regard to the delegated powers of the Indiana Air Pollution Control Board and the State Board of Health. Specific authority is granted for adequate regulation in the area of information reporting, permit system, and source testing. It is proposed that the above-mentioned powers be given the State Board of Health by amendment to Indiana Stat. §35-4604 (B) as follows:[13]

> (B) Powers and Duties of the State Board of Health - The duty and power to assist and cooperate with other groups interested in and affected by air pollution is hereby vested in the State Board of Health and such Board is hereby empowered to:
> (1) Advise, consult and cooperate with other agencies in the State, towns, cities and counties, industries, other states and the federal government, and with affected groups in the prevention and control of new and existing air contamination sources within the State.
> (2) Encourage and conduct studies, investigations, and research relating to air pollution and its causes, effects, prevention, control and abatement.
> (3) Collect and disseminate information relating to air pollution, its prevention and control.
> (4) Encourage voluntary cooperation by persons, towns, cities, and counties or other affected groups in restoring and preserving a reasonable degree of purity of air within this State.
> (5) Encourage authorized air pollution agencies of towns, cities and counties to handle air pollution problems within their respective jurisdictions to the greatest extent possible.
> (6) Provide technical assistance to towns, cities, or counties requesting same for the furtherance of air pollution control.
> (7) Represent the State of Indiana in any and all matters pertaining to plans, procedures, or negotiations for interstate compacts in relation to the control of air pollution.
> (8) Accept and administer grants or other funds or gifts for the purpose of carrying out any of the functions of this Act.
> (9) Enter at all reasonable times in or upon any private or public property except private residences for the purpose of inspecting and investigating conditions * and conducting tests on any air contaminant source to determine compliance with this Act.
> (10) Require the person responsible for any air contaminant source to file reports with the State Board of Health containing information as to location, size, and height of air contaminant outlet, and rate,

13. Underlining indicates new material; * indicates deletion.

duration, temperature, and composition of the air contaminant.
(11) Prohibit the installation, alteration, or use of any air contaminant source, or the appurtenant equipment thereto, unless an appropriate permit therefore has been obtained from the State Board of Health.
(12) Adopt rules and regulations with respect to the issuance of permits.
(13) Investigate complaints received by it or referred to it by the Control Board, make such reports to the Control Board of its investigations as it deems advisable and participate, on behalf of this State, in proceedings or public hearings before the Control Board.
(14) The State Board of Health is authorized to budget and receive duly appropriated monies for expenditures to carry out the provisions and purposes of this Act.

In addition, specific authority will be given to the State APC Board to grant and repeal variances from the Board's emission standards. The amendatory language appears in subsection (5) of Indiana Statute §35-4604 (A) and should read substantially as follows:

> §35-4604 (A) - Powers and Duties of the Air Pollution Control Board. The duty and power to administer and carry out the adjudicatory provisions of this Act hereinafter set forth in this Section is hereby vested in the Air Pollution Control Board and Such Board is hereby empowered to:
>
> (a) Any person who owns or is in control of any plant, building, structure, process or equipment may apply to the (agency) for a variance from rules or regulations. The (agency) may grant such variance if it finds that:
>
> 1. The emissions occuring or proposed to occur do not endanger or tend to endanger human health or safety; and
> 2. Compliance with the rules or regulations from which variance is sought would produce serious hardship without equal or greater benefits to the public.
>
> (b) No variance shall be granted pursuant to this Section except after public hearing on due notice and until the (agency) has considered the relative interests of the applicant, other owners of property likely to be affected by the discharges, and the general public.
>
> (c) Any variance or renewal thereof shall be granted within the requirements of subsection (a) and for time periods and under conditions consistent with the reasons therefor, and with the following limitations:
>
> 1. If the variance is granted on the ground that there is no practicable means known or available for the adequate prevention, abatement or control of the air pollution involved, it shall be only until the necessary means for prevention, abatement or control become known and available, and subject to the taking of any substitute or alternate measures that the (agency) may prescribe.

2. If the variance is granted on the ground that compliance with the particular requirement or requirements from which variance is sought will necessitate the taking of measures which, because of their extent or cost, must be spread over a considerable period of time, it shall be for a period not to exceed such reasonable time as, in the view of the (agency) is requisite for the taking of the necessary measures. A variance granted on the ground specified herein shall contain a timetable for the taking of action in an expeditious manner and shall be conditioned on adherence to such timetable.

3. If the variance is granted on the ground that it is justified to relieve or prevent hardship of any kind other than provided for in terms 1 and 2 of this subsection, it shall be for not more than (one) year.

(d) Any variance granted pursuant to this Section may be renewed on terms and conditions and for periods which would be appropriate on initial granting of a variance. If complaint is made to the (agency) on account of the variance, no renewal thereof shall be granted, unless, following public hearing on the complaint, the (agency) finds that renewal is justified. No renewal shall be granted except on application therefor. Any such application shall be made at least (sixty) days prior to the expiration of the variance. Immediately upon receipt of an application for renewal the (agency) shall give public notice of such application in accordance with rules and regulations of the (agency).

(e) A variance or renewal shall not be a right of the applicant or holder thereof but shall be in the discretion of the (agency). However, any person adversely affected by a variance or renewal granted by the (agency) may obtain judicial review thereof by a proceeding in the (appropriate court). Notwithstanding any provision of Section 12 of this ordinance, judicial review of the denial of a variance may be had only on the ground that the denial is arbitrary or capricious.

(f) Nothing in this Section and no variance or renewal granted pursuant hereto shall be construed to prevent or limit the application of the emergency provisions and procedures of Section II of this ordinance to any person or his property.

(g) Any hearing held under the provisions of this Section shall conform with the relevant requirements set out in Section 12 of this ordinance.

The above amendments will be presented for adoption during the 1971 session of the Legislature.

In addition to the above legislative action, it is necessary for the State APC Board to adopt and promulgate regulations for the implementation of emergency action, information reporting, operation permits and variances. This will be done by late 1970.

3.7 IMPLEMENTATION OF EMERGENCY ACTION

As has been indicated in section 3.6, Indiana has sufficient legislation for the implementation of emergency action. In this section, we shall consider this phase of the air pollution control program in greater detail.

Enabling legislation for the implementation of emergency action was passed by the Indiana Legislature in 1969.[14] The statute provides authority for the technical secretary of the State Board of Health, to determine that air pollution in an area constitutes an unreasonable and emergency risk to the health and safety of those in the area. Thereupon the determination shall be communicated to the Governor who may, by proclamation, declare an emergency and order immediate abatement of contaminant emissions. In addition, the Governor may request the State Attorney General to initiate injunctive proceedings or to take such other action as may be necessary.

The procurement of temporary injunctions, an ex parte proceeding, in cases where health hazards are imminent, can be realized within a short time so as to effectively cope with the emergency situation. The necessary evidentiary material is discussed in Section 7.0 The next section, 3.8, indicates that Indiana may enter into regionwide agreements for episode control.

3.8 ORGANIZATION OF REGIONAL ENFORCEMENT ACTIVITIES

The Indiana APC Board may engage in effective intrastate enforcement activities through the authority of the state's Air Pollution Control Act[15] and the state's Constitution. Local political subdivisions only have such powers as granted by statute and state agencies such as the APC Board retain superior jurisdiction notwithstanding local programs.[16] Therefore the Board may establish a regional organization to enforce state standards in Ohio and Dearborn Counties.

Indiana's APC Board may participate in an interstate planning endeavor with the air pollution authorities of Kentucky and Ohio through the authority of that state's Interlocal Cooperation Act.[17]

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14. Indiana Stat. §35-4605.
15. See section 5.6.1, supra.
16. See section 5.6.1, supra.
17. Indiana Stat. §53-1101 et. seq.

No legislative action is required for the proposed organization of regional operations within the Indiana portion of the MCIAQCR.

3.9 INTERSTATE PLANNING AND SERVICES AUTHORITY

Interstate cooperation in the form of planning and computerized support services is a necessary element of the proposed regional structure. Services may be generally provided by contract with the City of Cincinnati and by contract with an interstate planning authority. Existing Ohio Law[18] permits any board of county commissioners and the legislative authority of any municipality to cooperate with other such entities in Ohio and in sister states to create by agreement an interstate regional planning commission. The various political subdivisions in Indiana are empowered to enter such agreement pursuant to the authority given them by the state's Interlocal Cooperation Act.[19]

In light of an analysis of existing state laws applicable to MCIAQCR, it appears that the Regional Commission will have adequate authority to conduct a program of information exchange and air pollution control planning and coordination. Ohio law, ORC §713.33 (A), states that the "commission may make studies, maps, plans, and other reports relative to the region and shall recommend procedures and policies to the appropriate authorities, based on physical ... conditions and trends, to promote ... the general health, welfare, convenience, and prosperity of the people of the region." (Emphasis supplied.)

3.10 SUMMARY OF LEGISLATIVE AND ADMINISTRATIVE ACTIONS TAKEN TO EFFECT THE IMPLEMENTATION PLAN

The preceding discussion pointed out the legal and administrative deficiencies which exist in the Indiana Programs, and the proposed remedial action. This is summarized in the following table.

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18. Ohio Rev. Code §§713.30 et seq.
19. Indiana Stat. §§53-1101 et seq.

TABLE 3-2

SUMMARY OF LEGISLATIVE AND ADMINISTRATIVE ACTIONS TAKEN TO AFFECT THE IMPLEMENTATION PLAN FOR THE STATE OF INDIANA

Responsible Body	Potential Effective Date	Purpose	Discussed on P. No.
Legislature	Feb. 1973	Amend Ind. Stat. §35-4602 (c) to define air pollution sufficiently broad to abate prior to actual occurrence of injury	3-3
Legislature	Jan. 1971	Amend Ind. Stat. §35-4604 (B) to give the State Board of Health power to require the reporting of information, adopt a permit system for new and existing installations, and conduct source testing.	3-13
Legislature	Jan. 1971	Amend Ind. Stat. §35-4604 (A) to give the State APC Board power to grant variances	3-14
APC Board	Sept. 1970	Emergency Action procedures	3-15
APC Board	Oct. 1970	Information reporting	3-15
APC Board	Oct. 1970	Use permits	3-15
APC Board	Dec. 1970	Variances	3-15
Interstate Agreement	Aug. 1973	Interstate control of episodes	3-16
Legislature	Jan. 1971	Amend Ind. Stat. §35-4608 (e) to provide effective state jurisdiction where local APC program exists.	3-13

4. CONTROL REGULATIONS

4.1 EXISTING REGULATIONS

The current control regulations for the State of Indiana are as follows.

AIR POLLUTION CONTROL BOARD
OF THE
STATE OF INDIANA

PROPOSED AIR POLLUTION CONTROL REGULATIONS

New installations or new potential sources of air pollution will be subject on the effective date of these regulations to the limits contained therein. All persons must comply within one year with Regulation APC 2. Existing installations which are sources of air pollution must within one year submit a program and timetables to comply with Regulations APC 3, APC 4, APC 5, APC 6 and APC 7.

DEFINITIONS

The following terms as used in these Rules and Regulations shall, unless the context otherwise requires, have the following meanings:

AIR CONTAMINANT - Particulate matter, dust, fumes, gas, mist, smoke or vapor, or any combination thereof, but excluding uncombined water.

AIR CONTAMINANT SOURCE - Any and all sources of emission of air contaminants, whether privately- or publicly-owned or operated. Without limiting the generality of the foregoing, this term includes all types of business, commercial and industrial plants, works, shops and stores, and hydrocarbon combustion plants, power generating plants, and steam heating plants and stations, building and other structures of all types, including single and multiple family residences, apartments, houses, office buildings, hotels, restaurants, schools, hospitals, churches, and other institutional buildings, aircraft, automobiles, trucks, tractors, buses and other motor vehicles, garages and vending and service locations and stations, railroad locomotives, ships, boats and other water-borne craft, portable fuel-burning equipment, incinerators of all types, indoor and outdoor, refuse dumps and piles, and all stack and other chimney outlets from any of the foregoing.

AIR POLLUTION - Presence in the outdoor atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant or animal life or to property, or which unreasonably interefere with the enjoyment of life and property.

ASME - The American Society of Mechanical Engineers.

ASTM - The American Society for Testing and Materials.

AUXILIARY FUEL FIRING EQUIPMENT - Equipment to supply additional heat, by the combustion of an auxiliary fuel, for the purpose of attaining temperatures sufficiently high (a) to dry and ignite the waste material, (b) to maintain ignition thereof, and (c) to promote complete combustion of combustible solids, vapors, and gases.

BACKYARD INCINERATION - The burning of material originating on the premises of single and multiple family residences.

BLAST FURNACE - The furnace and equipment used in the smelting process in which primarily oxygen is removed from the ore and molten metal produced with gas as a by-product. The furnace and equipment consists of, but is not limited to, the furnace proper, charging equipment, stoves, bleeders, gas dust catcher, gas cleaning devices and other auxiliaries pertinent to the process.

BOARD - The Air Pollution Control Board of the State of Indiana.

BASIC OXYGEN FURNACE (BOF) - A furnace in which the melting and refining of iron are accomplished by the high velocity addition of large quantities of high purity oxygen to the atmosphere above the surface of the metal bath. The metal is held in a tiltable vessel with a basic refactory lining. Such a furnace includes furnace proper, oxygen lance, scrap and flux charging units, iron transfer units, gas collecting and cleaning equipment and stacks and any other auxiliaries pertinent to the process.

BRITISH THERMAL UNIT - The quantity of heat required to raise one pound of water from 59 degrees F to 60 degrees F. (Abbreviated B.T.U., BTU or Btu.)

BY-PRODUCT COKE PLANT - A plant used in connection with the distillation process to produce coke in which the volatile matter is expelled, collected, and recovered. Such plant consists of, but is not limited to, coal and coke handling equipment, by-product chemical plant and other equipment associated with and attendant to the coking chambers or ovens making up a single battery operated and controlled as a single unit.

CARBONACEOUS FUEL - Any form of combustible matter -- solid, liquid, vapor or gas, consisting primarily of carbon containing compounds in either fixed or volatile form which are burned primarily for their heat content.

CATALYTIC CRACKING UNIT - A unit composed of a reactor, regenerator and fractionating tower which is used to convert certain petroleum fractions into more valuable products by passing the material at elevated temperature through a bed of catalyst in the reactor. Coke deposits produced on the catalyst during cracking are removed by burning off in the regenerator.

COMBUSTION FOR INDIRECT HEATING - The combustion of fuel to produce usable heat that is to be transferred through a heat-conducting materials barrier or by a heat storage medium to a material to be heated so that the material being heated is not contacted by, and adds no substance to the products of combustion.

ELECTRIC FURNACE - A furnace in which the melting and refining of metals are accomplished by means of electric energy.

ENGINEER - Any person meeting the requirements as set forth in Chapter 148, Acts of 1935, Indiana General Assembly, as amended, and who is registered under the Act as a Professional Engineer. He shall be the person

who designed or is responsible for the design of the equipment or air pollution control devices and preparation of the plan documents.

EQUIPMENT - Fuel burning, combustion or process devices or apparatus including incinerators, fuel-burning equipment, refuse-burning equipment used for the burning of fuel or other combustible material from which the products of combustion are emitted. Also this shall include apparatus which generates heat and may emit products of combustion; and manufacturing chemical, metallurgical or mechanical processes which may emit smoke, particulate matter or other air contaminants. Processes are defined as equipment according to this regulation.

EXCESS AIR - That air supplied in addition to the theoretical quantity necessary for complete combustion of all fuel and/or combustible waste material present.

EXISTING EQUIPMENT - Equipment under construction, installed or operated on the effective date of these regulations. Any existing equipment which subsequent to the effective date of these regulations is altered, repaired or rebuilt at a cost of 30% or more of its replacement value shall be deemed new equipment. The cost of air pollution control equipment and of its installation is not to be included as a cost of altering, repairing or rebuilding existing equipment.

FOUNDRY CUPOLA - A stack-type furnace used for melting of metals consisting of, but not limited to, furnace proper, tuyeres, fans or blowers, tapping spout, charging equipment, gas cleaning devices and other auxiliaries.

FOUNDRY OPEN HEARTH - An open hearth furnace as defined herein but used in the foundry industry.

GARBAGE - Animal and vegetable matter such as that originating in houses, kitchens, restaurants and hotels, produce markets, food service and processing establishments, and greenhouses.

GAS CLEANING DEVICE - Facility designed to remove air contaminants from equipment exhaust gases.

HEATING AND REHEATING FURNACE - A furnace in which metal is heated to permit shaping or forming, or to achieve specific physical properties.

HEATING VALUE - The heat released by combustion of one pound of waste or fuel measured in BTU's on an as received basis.

INCINERATOR - Combustion apparatus designed for high temperature operation in which solid, semi-solid, liquid, or gaseous combustible wastes are ignited and burned efficiently and from which the solid residues contain little or no combustible material.

OPEN BURNING - Any burning of combustible materials wherein the products of combustion are emitted directly into the open air without passing through a stack or chimney.

OPEN HEARTH FURNACE - A furnace in which the melting and refining of metal is accomplished by the application of heat to a saucer-type or shallow hearth in an enclosed chamber. Such furnace consists of, but is not limited to, the furnace proper, checkers, flues, and stack and may include a waste heat boiler, an oxygen lance, and other auxiliaries pertinent to the process.

PARTICULATE MATTER - Any material, except water, that exists in a finely divided form as a liquid or solid.

PERSON - Any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, political subdivision, or any other legal entity, or their legal representative, agent, or assigns.

PLAN DOCUMENTS - Reports, proposals, preliminary plans, survey and basis of design data, general and detail construction plans, profiles, specifications and all other information pertaining to the equipment.

POLITICAL SUBDIVISION - Any municipality, city, incorporated town, village, county, township, district or authority, or any portion or combination of two or more thereof.

PROCESS - Any action, operation, or treatment and the equipment used in connection therewith, and all methods or forms of manufacturing or processing that may emit air contaminants.

PROCESS WEIGHT - The total weight of all materials introduced into any source operation. Solid fuels charged will be considered as part of the process weight but liquid and gaseous fuels and combustion air will not.

PROCESS WEIGHT RATE - (a) For continuous or long-run steady-state source operations, the total process weight for the entire period of continuous operation or for a typical portion thereof, divided by the number of hours of such period or portion thereof.

(b) For a cyclical or batch source operation, the total process weight for a period that covers a complete operation or an integral number of cycles, divided by the hours of actual process operation during such a period.

When the nature of any process or operation or the design of any equipment is such as to permit more than one interpretation of this definition, the interpretation that results in the minimum value for allowable emission shall apply.

REFUSE—Includes garbage, rubbish and trade wastes.

RINGELMANN CHART—The chart published and described in the U. S. Bureau of Mines Information Circular 8333, and on which are illustrated graduated shades of gray to black for use in estimating the light-obscuring power of smoke.

RUBBISH—Solids not considered to be highly flammable or explosive such as, but not limited to, rags, old clothing, leather, rubber, carpets, wood, excelsior, plastics, paper, ashes, tree branches, yard trimmings, furniture, tin cans, glass, crockery, masonry, and other similar materials.

SALVAGE OPERATIONS—Any business, trade or industry engaged in whole or part in salvaging or reclaiming any product or material, such as, but not limited to, metals, chemicals, shipping containers, or drums.

SINTERING PLANT—The plant used in connection with the process of fusing fine particles of metallic ores causing agglomeration of such particles. Such plant consists of, but is not limited to, sintering machines, handling facilities, wind boxes, stack and other auxiliaries pertinent to the process.

SMOKE—Small gas-borne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon, ash and other combustible material, that form a visible plume in the air.

SMOKE MONITOR—A device using a light source and a light detector which can automatically measure and record the light-obscuring power of smoke at a specific location in the flue or stack of a source. Measuring and recording to be at intervals of not less than 15 seconds.

SOURCE OPERATION—The last operation preceding the emission of an air contaminant, which operation: (a) results in the separation of the air contaminant from the process materials or in the conversion of the process materials into air contaminants, and (b) is not an air pollution abatement operation.

STACK OR CHIMNEY—A flue, conduit or opening permitting particulate or gaseous emission into the open air, or constructed or arranged for such purpose.

STANDARD CONDITIONS—A gas temperature of 70 degrees Fahrenheit and a gas pressure of 14.7 pounds per square inch absolute (psia).

STANDARD CUBIC FOOT (SCF)—The standard cubic foot is a measure of the volume of one cubic foot of gas at standard conditions.

STANDARD METROPOLITAN STATISTICAL AREA (SMSA)—The county which has at least one city with a population of at least 50,000 and the contiguous counties which contain the suburban areas for these cities.

TECHNICAL SECRETARY—The Technical Secretary of the Air Pollution Control Board of the State of Indiana.

THEORETICAL AIR—The exact amount of air required to supply the required oxygen for complete combustion of a given quantity of a specific fuel or waste.

TRADE WASTE—All solid or liquid material or rubbish resulting from construction, building operations, or the prosecution of any business, trade or industry such as, but not limited to, plastic products, chemicals, cinders and other forms of solid or liquid waste materials.

REGULATION APC 1

Reports, Plans and Specifications

Any person planning to construct a new installation which will or might reasonably be expected to become a source of air pollution or make modifications to an existing installation which will or might reasonably be expected to increase the amount or change the effect or the character of air contaminants discharged, so that such installation may be expected to become a source of air pollution, or planning to install an air-cleaning device shall submit a report, plans and specifications for approval prior to initiation of construction.

The following listed installations are exempted from the submission of reports, plans and specifications:

a. Comfort heating equipment, boilers, water heaters, air heaters, and steam generators with a rated capacity of less than one million BTU per hour.

b. Fuel-burning equipment and incinerators used singly or jointly by occupants of dwellings containing four or less apartment units.

c. Comfort ventilating systems.

d. Unit space heaters.

e. Vacuum-cleaning systems used exclusively for commercial or residential housekeeping.

f. Laboratory hoods which exhaust to outer air.

g. Exhaust systems for controlling steam and heat.

h. Fuel-burning equipment using as fuel only natural gas, or L.P. gas, or a mixed gas distributed by a utility in accordance with the rules of the Public Service Commission of the State of Indiana.

Reports, plans and specifications filed for approval shall include the following:

a. Expected composition of effluent stream both before and after any cleaning device, including emission rate, concentration, volume and temperature.

b. Expected physical characteristics of particulates.

c. Size, type and performance characteristics of air-cleaning devices.

d. The location and elevation of the emission point and other factors relating to dispersion and diffusion of the air contaminant in the outer air, and the relation of the emission to nearby structures, window openings, and other information necessary to appraise the possible effects of the effluent.

e. When necessary to ascertain compliance, the location of planned sampling points and the tests to be made of the completed installation by the owner.

f. Any other reasonable and pertinent information that may be required by the Board.

Any information relating to secret processes, methods of manufacture, or production submitted in connection with reports, plans and specifications or testing shall be protected communications and shall not be released or made public without the express permission of the person supplying the information.

The Board, at its discretion, may accept in lieu of detailed plans and specifications a certificate that the proposed air pollution control device will operate in accordance with the emission limitations of the Rules and Regulations.

REGULATION APC 2

Open Burning

No person shall conduct a salvage operation by open burning except on written approval of the Board. The Board must seek advice and guidance of local authorities before issuing such approval.

No person shall burn any refuse in any open fire except as follows:

a. Camp fires and fires used solely for recreation purposes where such fires are properly controlled by a responsible person.

b. Backyard incineration.

c. Burning of rubbish on a farm, derived from an agricultural operation, when the prevailing winds, at the time of burning, are away from populated areas and no nuisance is created.

d. Open burning, in remote areas, of highly explosive or other dangerous materials for which there is no other known method of disposal or for special purposes when approved by the Board.

The exceptions apply in all areas where they are not prohibited by local ordinances or by other officials having jurisdiction such as local fire officials.

REGULATION APC 3

Smoke and Other Visible Emissions

The Ringelmann Chart shall be used for grading the light-obscuring power of smoke. No person shall operate any combustion installation so as to produce, cause, suffer or allow smoke to be emitted, the appearance, density or shade of which is darker than No. 2 of the Ringelmann Chart. When cleaning a fire or blowing tubes, smoke which is not darker than a No. 3 Ringelmann Chart may be emitted for a period or periods not exceeding five minutes in any 60-minute period, such emissions shall not be permitted on more than six occasions during any 24-hour period. When building a new fire, smoke not darker than a No. 3 Ringelmann Chart may be emitted not to exceed ten minutes on one occasion per day. The Board, at its discretion, may accept an extension of the time period and number of such time periods per day.

When a breakdown of equipment or a change of fuel results in smoke darker than a No. 2 of the Ringelmann Chart, the Board shall be notified immediately.

The opacity of any color equivalent to the Ringelmann Chart may be used as prima-facie evidence in determining process emissions but may be refuted by approved stack emission tests or other evidence acceptable to the Board.

REGULATION APC 4

Combustion for Indirect Heating

Emission of particulate matter from the combustion of fuel for indirect heating shall be limited by the ASME Standard No. APS-1, dated June 15, 1966, "Recommended Guide for the Control of Dust Emission-Combustion for Indirect Heat Exchangers." For purposes of this Regulation, the maximum allowable emission shall be calculated using equation (15) in this Standard with a maximum downwind ground level dust concentration of 50 micrograms per cubic meter for a 30- to 60-minute time period. Figure 2 of the Standard may be used to estimate allowable emissions. However, irrespective of stack height, the maximum allowable emission for any stack shall be 0.6 pounds for new equipment and 0.8 pounds for existing equipment of particulates per million BTU input.

REGULATION APC 5

Process Operations

No person shall operate any process so as to produce, cause, suffer or allow particulate matter to be emitted in excess of the amount shown in the following table. Exceptions are combustion for indirect heating, incinerators, open burning, existing cement kilns, existing catalytic cracking units, and existing foundries.

Allowable Rate of Emission Based on Process Weight Rate[1]

Process Weight Rate Lbs/Hr	Tons/Hr	Rate of Emission Lbs/Hr	Process Weight Rate Lbs/Hr	Tons/Hr	Rate of Emission Lbs/Hr
100	0.05	0.551	16,000	8.00	16.5
200	0.10	0.877	18,000	9.00	17.9
400	0.20	1.40	20,000	10.00	19.2
600	0.30	1.83	30,000	15.00	25.2
800	0.40	2.22	40,000	20.00	30.5
1,000	0.50	2.58	50,000	25.00	35.4
1,500	0.75	3.38	60,000	30.00	40.0
2,000	1.00	4.10	70,000	35.00	41.3
2,500	1.25	4.76	80,000	40.00	42.5
3,000	1.50	5.38	90,000	45.00	43.6
3,500	1.75	5.96	100,000	50.00	44.6
4,000	2.00	6.52	120,000	60.00	46.3
5,000	2.50	7.58	140,000	70.00	47.8
6,000	3.00	8.56	160,000	80.00	49.0
7,000	3.50	9.49	200,000	100.00	51.2
8,000	4.00	10.40	1,000,000	500.00	69.0
9,000	4.50	11.20	2,000,000	1,000.00	77.6
10,000	5.00	12.00	6,000,000	3,000.00	92.7
12,000	6.00	13.60			

When the process weight exceeds 200 tons/hour, the maximum allowable emission may exceed that shown in the table, provided the concentration of particulate matter in the discharge gases to the atmosphere is less than 0.10 pounds per 1,000 pounds of gases at standard conditions.

Existing cement manufacturing operations equipped with electrostatic precipitators, bag filters, or equivalent gas-cleaning devices shall be allowed to discharge concentrations of particulate matter in accordance with $E=8.6\ P^{0.67}$ below 30 tons per hour of process weight and $E=15.0\ P^{0.5}$ over 30 tons per hour of process weight.

Existing petroleum catalytic cracking units equipped with cyclone separators, electrostatic precipitators, or other gas-cleaning systems shall recover 99.97% or more of the circulating catalyst or total gas-borne particulate.

[1] Interpolation of the data in this table for process weight rates up to 60,000 lbs/hr shall be accomplished by use of the equation $E=4.10\ P^{0.67}$, and interpolation and extrapolation of the data for process weight rates in excess of 60,000 lbs/hr shall be accomplished by use of the equation $E=55.0\ P^{0.11-40}$, where E=rate of emission in lbs/hr and P=process weight in tons/hr.

REGULATION APC 6

Existing Foundries

No person shall operate any existing foundry so as to produce, cause, suffer, or allow particulate matter to be emitted in excess of the amount shown in the following table. All new foundries shall not exceed the requirements of Regulation APC 5.

Allowable Emissions from Foundry Cupolas
(Existing Emission Sources)

Process Weight Rate Lbs/Hr	Allowable Emission of Particulate Matter Lbs/Hr
1,000	3.05
2,000	4.70
3,000	6.35
4,000	8.00
5,000	9.65
6,000	11.30
7,000	12.90
8,000	14.00
9,000	15.50
10,000	16.65
12,000	18.70
16,000	21.60
18,000	22.80
20,000	24.00
30,000	30.00
40,000	36.00
50,000	42.00
60,000	48.00
70,000	49.00
80,000	50.50
90,000	51.60
100,000	52.60

REGULATION APC 7

Incinerators

No person shall cause or permit the emission of particulate matter from the stack or chimney of any incinerator in excess of the following:

a. Incinerators with a maximum refuse-burning capacity of 1,000 or more pounds per hour, 0.4 pounds of particulate matter per 1,000 pounds of dry exhaust gas at standard conditions corrected to 50% excess air.
b. All other incinerators, 0.7 pounds of particulate matter per 1,000 pounds of dry gas at standard conditions corrected to 50% excess air.
c. No incinerator shall emit or produce smoke in excess of the requirements in Regulation APC 3.

All new incinerators shall be multiple chamber or equivalent incinerators.

REGULATION APC 13

Maximum Allowable Concentrations for Sulfur Dioxide Emissions for the State of Indiana and Federally-Designated Metropolitan Interstate and Intrastate Air Quality Control Regions

In accordance with the provisions of the Federal Clean Air Act of 1967, Public Law 90-148, select high-population density areas of the State of Indiana have been designated as Interstate and Intrastate Air Quality Control Regions. In such areas, ambient air quality standards and emission standards to achieve these air quality standards are essential. It is also essential that ambient air quality in all other less densely populated parts of the State be established for the purpose of protecting public health and welfare.

Combustion of Fuels for Indirect Heating

Emission of sulfur dioxide from the combustion of fuel for indirect heating shall be limited to sixty (60) percent of the maximum allowable particulate matter as covered in Regulation APC 4. For purposes of this Regulation, reference can be made to ASME Standard No. APS-1, dated June 15, 1966, "Recommended Guide for the Control of Dust Emission-Combustion for Indirect Heat Exchangers." Figure 2 of this ASME Standard, using the 60 percent factor, may be used to estimate maximum allowable emissions. However, irrespective of stack height the maximum allowable sulfur dioxide emission per million Btu input shall be 0.36 pounds for new equipment and 0.48 pounds for existing equipment. In addition, where fuel combustion operations utilize a number of stacks of the same height, the maximum allowable emission (estimated as being from one stack) shall be divided numerically by $n^{0.25}$, where "n" is the number of stacks. For a total plant load utilizing stacks of unequal height, weighted factors may be used to obtain an equivalent stack height.

Process Operations

Emission of sulfur dioxide from any sources, except those covered by the preceding paragraph, shall be limited to 0.05 percent by volume of the exhaust gases. Dilution of the exhaust gases to circumvent the intent of this Regulation shall be considered grounds for immediate action on the part of the Board to start injunction proceedings.

TABLE 2

ALLOWABLE RATE OF EMISSION BASED ON PROCESS WEIGHT RATE[a,b]

Process Weight Rate		Rate of Emission	Process Weight Rate		Rate of Emission
Lb/Hr	Tons/Hr	Lb/Hr	Lb/Hr	Tons/Hr	Lb/Hr
100	0.05	0.551	16,000	8.00	16.5
200	0.10	0.877	18,000	9.00	17.9
400	0.20	1.40	20,000	10.	19.2
600	0.30	1.83	30,000	15.	25.2
800	0.40	2.22	40,000	20.	30.5
1,000	0.50	2.58	50,000	25.	35.4
1,500	0.75	3.38	60,000	30.	40.0
2,000	1.00	4.10	70,000	35.	41.3
2,500	1.25	4.76	80,000	40.	42.5
3,000	1.50	5.38	90,000	45.	43.6
3,500	1.75	5.96	100,000	50.	44.6
4,000	2.00	6.52	120,000	60.	46.3
5,000	2.50	7.58	140,000	70.	47.8
6,000	3.00	8.56	160,000	80.	49.0
7,000	3.50	9.49	200,000	100.	51.2
8,000	4.00	10.4	1,000,000	500.	69.0
9,000	4.50	11.2	2,000,000	1,000.	77.6
10,000	5.00	12.0	6,000,000	3,000	92.7
12,000	6.00	13.6			

[a] Sections of major importance with reference to this table are sections 2024, 2027, 3213, 3214, and 6112.2.

[b] Interpolation of the data in this table for process weight rates up to 60,000 lb/hr shall be accomplished by use of the equation $E = 4.10^{P^{0.67}}$, and interpolation and extrapolation of the data for process weight rates in excess of 60,000 lb/hr shall be accomplished by use of the equation:

$$E = 55.0^{P^{0.11}} - 40$$, where E = rate of emission in lb/hr and

P = process weight rate in tons/hr.

Section 6112.4 Any volume of gases passing through and leaving an air pollution abatement operation may be substituted for the source gas volume of the source operation served by such air pollution abatement operation, for the purposes of section 6112.3, provided such air pollution abatement operation emits no more than 40% of the weight of particulate matter entering thereto; and provided further that such substituted volume shall be corrected to standard conditions and to a moisture content no greater than that of any gas stream entering such air pollution abatement operation.

4.2 PROPOSED REGULATIONS

It is proposed that selected portions of the existing State regulations be modified and that additional regulations be added where necessary.

4.2.1 General Provisions

Regulation APC 1 does not adequately provide for a comprehensive permit system. The regulation will be modified to include provision for both a construction permit and operating certificate for new and existing sources rather than mere approval of plans and specifications. See Section 4.2.4 for the proposed modifications.

Existing regulations do not provide for registration of emission information, source testing, approval of control plan and compliance schedules and control of nuisance. The additions to existing regulations are proposed in Section 4.2.4.

4.2.2 Particulate Matter

- Open Burning

  Existing Regulation APC 2 currently exempts backyard burning AND rubbish burning on a farm. These exemptions will be deleted from this regulation for application in the Cincinnati Interstate AQCR.

- Visible Emissions

  Regulation APC 3 currently regulates black smoke emissions according to the Ringelmann No. 2 scale and other color air contaminants by equivalent opacity. However, opacity regulations can be refuted by the violator using stack emission tests or other evidence. It is proposed that Regulation APC 3 be strengthened by reducing allowable smoke emissions to Ringelmann No. 1 in accordance with current technology and deleting exceptions to opacity regulations to enhance field enforcement aspects of the regulation.

- Fuel Burning Equipment

  Existing Regulation APC 4 is not consistent with modern control technology. Regulation APC 4 will be substituted by the proposed Regulation APC 4. (See Section 4.2.4.)

- Process Equipment

  Existing Regulation APC 5 is consistent with the control strategy except for the exemptions. Exceptions for cement kilns, catalytic cracking units and foundries will be deleted from Regulation APC 5.

- Incinerators

  Existing Regulation APC 7 for incinerators is not completely consistent with the control strategy. This regulation will be rewritten to require all incinerators to meet an emission standard of 0.2 pounds of particulate matter per 100 pounds of refuse charged on a mass emission rate basis. The regulation will also incorporate changes in design and operational requirements. See Section 4.2.4 for the proposed Regulation APC 7.

- Fugitive Dust

  There currently are no regulations for control of fugitive dust. Refer to Section 4.2.4 for Regulation APC 9

4.2.3 Sulfur Oxides

- Fuel Equipment

  No regulations are in effect for control of sulfur oxides from the use of fuels. The proposed regulation APC 10 is intended to implement the control strategy selected. (See Section 4.2.4.)

- Process Equipment

  No regulations are in effect for control of sulfur oxides from industrial process operations. Since no sources exist in the Indiana portion of the Region, none are proposed at this time.

4.2.4 Modified Regulations

(REVISED) REGULATION APC 1

General Provisions

A. PERMITS AND OPERATING CERTIFICATES

(1) Any person planning to construct a new installation which will or might reasonably be expected to become a source of air pollution or make modifications to an existing installation which will or might reasonably be expected to increase the amount or change the effect or the character of air contaminants discharged, so that such installation may be expected to become a source of air pollution, or planning to install an air-cleaning device shall submit a report, plans and specifications for approval prior to initiation of construction. No person shall commence construction until receipt of a valid construction permit from the Director.

(2) No person shall cause or permit the use or operation of a new installation or air-cleaning device for which a construction permit is required without first obtaining an operating certificate from the Director.

(3) No person shall cause or permit the use or operation of an existing installation or air-cleaning device without obtaining an operating certificate from the Director within six months of the adopted date of these regulations or an approved control plan in accordance with Section B of this regulation.

(4) The following listed installations are exempted from the submission of reports, plans and specifications:

a. Comfort heating equipment, boilers, water heaters, air heaters, and steam generators with a rated capacity of less than one million BTU per hour.

b. Fuel-burning equipment and incinerators used singly or jointly by occupants of dwellings containing four or less apartment units.

c. Comfort ventilating systems.

d. Unit space heaters.

e. Vacuum-cleaning systems used exclusively for commercial or residential housekeeping.

f. Laboratory hoods which exhaust to outer air.

g. Exhaust systems for controlling steam and heat.

h. Fuel-burning equipment using as fuel only natural gas, or L.P. gas, or a mixed gas distributed by a utility in accordance with the rules of the Public Service Commission of the State of Indiana.

(5) Reports, plans and specifications filed for approval shall include the following:

a. Expected composition of effluent stream both before and after any cleaning device, including emission rate, concentration, volume and temperature.

b. Expected physical characteristics of particulates.

c. Size, type and performance characteristics of air-cleaning devices.

d. The location and elevation of the emission point and other factors relating to dispersion and diffusion of the air

contaminant in the outer air, and the relation of the emission to nearby structures, window openings, and other information necessary to appraise the possible effects of the effluent.

e. When necessary to ascertain compliance, the location of planned sampling points and the tests to be made of the completed installation by the owner.

f. Any other reasonable and pertinent information that may be required by the Director.

(6) Any information relating to secret processes, methods of manufacture, or production submitted in connection with reports, plans and specifications or testing shall be protected communcations and shall not be released or made public without the express permission of the person supplying the information.

(7) The Director, at his discretion, may accept in lieu of detailed plans and specifications a certificate that the proposed air pollution control device will operate in accordance with the emission limitations of the Rules and Regulations.

B. CONTROL PLAN AND TIME SCHEDULE

Except as otherwise specified, compliance with the provisions of these regulations shall be according to the following time schedule:

(1) New Installations

All new installations shall comply as of going into operation.

(2) Existing Installations

All existing installations not in compliance as of the effective date of these regulations shall be in compliance within six months of the effective date of these regulations unless the owner or

person responsible for the operation of the installation shall have submitted to the Department in a form and manner satisfactory to it, a control plan and schedule for achieving compliance, such plan and schedule to contain a date on or before which full compliance will be attained, and such other information as the Department may require. If approved by the Department, such date will be the date on which the person shall comply. The Department may require persons submitting such a plan to submit subsequent periodic reports on progress in achieving compliance. In no event shall the control plan and schedule exceed two and one-half years from the adopted date of these regulations.

F. SUBMISSION OF EMISSION INFORMATION

The Director may require the submission of air pollutant information, from any or all potential sources for purposes of maintaining an air pollutant emission inventory. Such information shall be provided on forms furnished by the Department.

G. MEASUREMENT OF EMISSIONS OF AIR CONTAMINANTS

(1) The Director may require any person responsible for emission of air contaminants to make or have made tests to determine the emission of air contaminants from any source in order to obtain an operating certificate or whenever the Department has reason to believe that an emission in excess of that allowed by these regulations is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. The Department shall

be given a copy of the test results in writing and signed by the person responsible for the tests.

(2) The Director may conduct tests of emissions of air contaminants from any source. Upon request of the Department the person responsible for the source to be tested shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices as may be necessary for proper determination of the emission of air contaminants.

H. AIR POLLUTION NUISANCES PROHIBITED

(1) No person shall cause or permit the discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any person or to the public or which endanger the comfort, repose, health, or safety of any such person or the public or which cause injury or damage to business or property.

(2) Nothing in any part of these regulations concerning emission of air contaminants or any other regulation relating to air pollution shall in any manner be construed as authorizing or legalizing the creation or maintenance of a nuisance.

(REVISED) REGULATION APC 4

RESTRICTION ON EMISSION OF PARTICULATE MATTER FROM FUEL BURNING EQUIPMENT

A. GENERAL PROVISIONS

(1) This regulation applies to installations in which fuel is burned for the primary purpose of producing heat or power by indirect heat transfer. Fuels include those such as coal, coke, lignite, coke breeze, fuel oil, and wood but do not include refuse. When any products or by-products of a manufacturing process are burned for the same purpose or in conjunction with any fuel, the same maximum emission limitations shall apply.

(2) The heat content of coal shall be determined according to ASTM method D-271-64 Laboratory Sampling and Analysis of Coal or Coke or ASTM method D-21-5-62T Gross Calorific value of Solid Fuel by the Adiabatic Bomb Calorimeter, which publications are made a part of this section by reference.

(3) For purposes of this regulation the heat input shall be the aggregate heat content of all fuels whose products of combustion pass through a stack or stacks. The heat input value used shall be the equipment manufacturer's or designer's guaranteed maximum input, whichever is greater. The total heat input of all fuel burning units on a plant or premises shall be used for determing the maximum allowable amount of particulate matter which may be emitted.

(4) The amount of particulate matter emitted shall be measured according to the American Society of Mechanical Engineer's Power Test Codes - PTC-27 dated 1957 and entitled Determining Dust

Concentrations in a Gas Steam, which publication is made a part of this section by reference.

B. EMISSION LIMITATIONS

(1) No person shall cause or permit the emission of particulate matter, caused by combustion of fuel in fuel-burning equipment, from any stack or chimney in excess of the quantity set forth in the following Figure 1

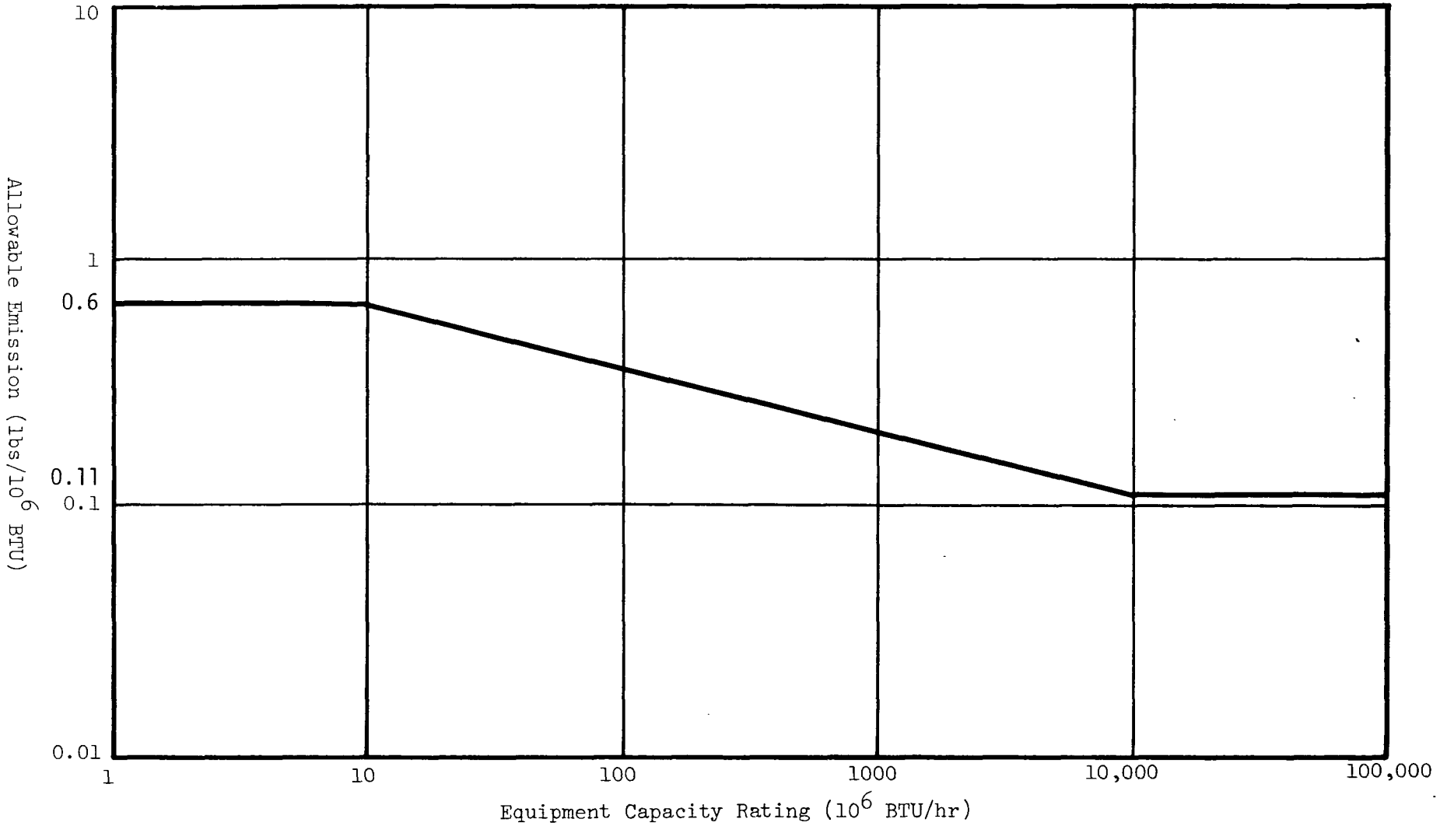

Figure 1. Allowable Particulate Emissions from Fuel Combustion for Indirect Heating.

(REVISED) REGULATION APC 7

RESTRICTION ON EMISSIONS FROM INCINERATORS

A. GENERAL PROVISIONS

(1) This regulation shall apply to any incinerator used to dispose of refuse or other wastes by burning and the processing of salvable material by burning. Notwithstanding definitions in other regulations, as used in this regulation the word refuse includes garbage, rubbish, trade wastes, leaves, salvable material, agricultural wastes, and other wastes. The word incinerator, as used in this regulation, includes incinerators and other devices, structures, or contrivances used to burn refuse (as defined herein) or to process refuse by burning.

(2) The burning capacity of an incinerator shall be the manufacturer's or designer's guaranteed maximum rate or such other rate as may be determined by the Director in accordance with good engineering practices. In case of conflict, the determination made by the Director shall govern.

(3) The amount of particulate matter emitted from any incinerator shall be determined according to the National Air Pollution Control Administration publication, "Specifications for Incinerator Testing at Federal Facilities" which publication is made part of this regulation be reference.

(4) For the purposes of this regulation the total of the capacities of all furnaces within one system shall be considered as the incinerator capacity.

B. EMISSION LIMITATIONS

(1) No person shall cause, suffer, or allow to be emitted into the open air from any incinerator, air contaminants the appearance, density, or shade of which exceed No. 1 of the Ringelmann Chart, or an equivalent opacity.

(2) No person shall cause, suffer, or allow to be emitted into the atmosphere from any incinerator or to pass a convenient measuring point near the stack outlet, fly ash in the gases to exceed 0.20 pounds per 100 pounds per hour of rated capacity.

C. DESIGN-OPERATION REQUIREMENTS

(1) No residential or commercial single-chamber incinerator shall be used for the burning of refuse for a period in excess of eighteen (18) months after the adopted date of this regulation.

(2) All new incinerators and all existing incinerators after January 1, 1972 shall be multiple-chamber incinerators, provided that the Director may approve any other type of incinerator if he finds that the emissions do not exceed those allowed in this regulation.

(3) No person shall operate or cause or permit the operation of any incinerator at any time other than between the hours of 10:00 A.M. and 4:00 P.M. This restriction shall not apply to incinerators having a refuse-burning capacity of five (5) tons per hour or more.

(4) Incinerators, including all associated equipment and grounds, shall be designed, operated and maintained so as to prevent the emission of odors.

(PROPOSED) REGULATION APC 9

RESTRICTION OF EMISSION OF FUGITIVE DUST AND GASES

A. No person shall cause or permit the handling or transporting or storage of any material in a manner which allows or may allow unnecessary amounts of particulate matter to become air-borne.

B. No person shall cause or permit a building or its appurtenances or a road, or a driveway, or an open area to be constructed, used, repaired or demolished without applying all such reasonable measures as may be required to prevent particulate matter from becoming air-borne. The Director may require such reasonable measures as may be necessary to prevent particulate matter from becoming air-borne including but not limited to paving or frequent cleaning of roads, driveways and parking lots; application of dust-free surfaces; application of water; and the planting and maintenance of vegetative ground cover.

C. When dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from a building or equipment in such manner and amount as to cause a nuisance or to violate any regulation, the Director may order that the building or equipment in which processing, handling and storage are done be tightly closed and ventilated in such a way that all air and gases and air- or gas-borne material leaving the building or equipment are treated by removal or destruction of air contaminants before discharge to the open air.

(PROPOSED) REGULATION APC 10

RESTRICTION OF EMISSIONS OF SULFUR DIOXIDE FROM USE OF FUEL

A. GENERAL PROVISIONS

(1) This regulation shall apply to any installation in which fuel is burned and in which the sulfur dioxide emission is due largely to the content of the fuel burned, and in which the fuel is burned primarily to produce heat or power by indirect heat transfer.

(2) For purposes of the regulation, a fuel-burning installation is any single fuel-burning furnace or boiler or other unit, device, or contrivance in which fuel is burned or any grouping of two or more such furnaces or boilers or other units, devices, or contrivances on the same premises or otherwise located in close proximity to each other and under control of the same person. The capacity of such installations shall be the manufacturer's or designer's guaranteed maximum heat input rate.

(3) The method for determining the percent of sulfur in coal shall be that described in ASTM D-271-64, Standard Methods of Laboratory Sampling and Analysis of Coal and Coke or equivalent method approved by the Director. The method for determining the heat content of coal shall be described in ASTM D-271-74, Standard Methods of Laboratory Sampling and Analysis of Coal and Coke or D-2015-62T, Tentative Method of Test for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter. All coal analyses and heat

contents are to be made on a dry basis. Moisture content of coal is to be determined in all cases and results reduced to facilitate calculations of actual pollutants. The method for determining the sulfur content of fuel oil shall be that described in ASTM D-129-64 Standard Method of Test for Sulfur in Petroleum Products by the Bomb Method. The method for determining the heat content of fuel oil shall be that described in ASTM D-240-64 Standard Method of Test for Heat of Combustion of Liquids by Bomb Calorimeter or other method giving comparable results. The testing methods specified in the subsection A (3) are hereby made a part of this regulation, by reference.

(4) The Director is authorized to take samples of any fuel by any appropriate means for the sampling of the quantity which he finds, at any reasonable time or place, for purposes of determining compliance with this regulation. Where applicable, the following methods will be used.

For coal: ASTM: D-492-48 (1958), Standard Method of Sampling Coals Calssified According to Ash Content

ASTM: D-2013-64T, Tentative Method of Preparing Coal Samples for Analysis

ASTM: D-2234-65T, Tentative Method for Mechanical Sampling of Coal

For oil: ASTM: D-270-64, Standard Method of Sampling Petroleum and Petroleum Products

B. PROHIBITIONS

(1) No person shall burn, sell or make available for sale for burning in fuel burning equipment, any fuel containing in excess of 1% sulfur by weight after July 1, 1971 except for fuel combustion units having heat capacities in excess of 200 million BTU/hour; for these units, fuel in excess of 1.25% sulfur by weight are prohibited.

(2) Any person offering to sell or deliver fuel or any person responsible for fuel burning equipment, shall, upon request, submit to the Department such analyses of the fuel as may be required to determine compliance with these regulations.

(3) It shall be unlawful for any person to import, sell, offer for sale, expose for sale, exchange, deliver or transport for use and consumption in the State of Indiana or to use or consume in the State of Indiana any fuel which does not meet the requirements of this regulation.

(4) Fuels in excess of the limits set out in B(1) above may be burned, sold or made available for sale for burning in fuel burning equipment on which control equipment to desulfurize stack gases has been installed or other methods or devices are used that will produce results equivalent to those that would have resulted from the burning of fuel containing one percent or less sulfur by weight without these added control features and for which approval for use has been obtained from the Director.

5. EMERGENCY EPISODE AUTHORITY AND PROCEDURES

The purpose of an Emergency Episode Plan is to prevent the ambient concentrations of pollutants from ever reaching levels where it appears that the health, safety, and welfare of the community may be in danger. The objective of this Emergency Episode Plan is to temporarily control sources within the Indiana portion of the MCIAQCR during episode periods when dilution is not adequate to prevent high ground level concentrations of pollutants. Planning for emergency episodes assures that the reduction of emission from sources is conducted in a well-structured manner with minimum inconvenience to the emitters as well as the citizens of Indiana.

The Emergency Episode Plan is presented in the following sections. The Plan is designed for the emergency control of particulates and sulfur oxides. Emergency episode plans for other pollutants such as carbon monoxide, oxidants, and nitrogen oxides will be submitted to the Secretary of the Department of Health, Education and Welfare.

The proposed Emergency Episode Plan is viewed as a mechanism that will eventually be sensitive to all air contaminants which may be hazardous to human health during episodes. This is to say, the Plan that is outlined for development is designed with an awareness of the future requirements of the State. The intensity of study which supports the development of the proposed Plan is justified on the grounds that the emergency control of pollutants, in addition to particulates and sulfur oxides, will be eventually coordinated by one common Plan.

5.1 COMPREHENSIVE EMERGENCY EPISODE PLAN

The comprehensive Emergency Episode Plan is an outline of the steps that will be taken by Indiana to establish a viable episode organization. The Plan is based on the MCIAQCR episode organization as presented in Appendix C of this report. Since episodes are regional problems, cooperation among the jurisdictions in the MCIAQCR will be mandatory. The utilization of the MCIAQCR EOCC* will assist the cooperative effort.

The comprehensive Plan is viewed as an outgrowth of the interim Plan which is presented in Section 5.2 The interim Plan calls for a number of specific actions which are recommended for episode avoidance.

*Emergency Operations Control Center

The comprehensive Plan, once developed, will replace parts of the interim Plan with an approach which is based on scientific and engineering fact. The comprehensive plan will provide for intensive evaluation of the emission sources as well as air quality and meteorological parameters to determine a Plan that is sensitive to the needs of the Indiana portion of the MCIAQCR.

5.1.1 Episode Criteria

The following episode criteria will trigger preplanned emergency actions in the Indiana portion of the MCIAQCR:

1. Status: "Forecast" - An internal watch will be activated on the basis of a Weather Bureau HAPPA* or equivalent indication that a high air pollution potential will exist for the next 36 hours.

2. Status: "Alert" - At the initiation of, and periodically during a "Forecast" period, air quality information for the preceding 24-hour period will be reviewed. If for any consecutive 24-hour period the average sulfur dioxide level is equal to or exceeds 0.10 ppm and the soiling index for the same period is equal to or exceeds 2.0 COHs, an "Alert" status is established.

3. Status: "Warning" - If for any consecutive 24-hour period during an "Alert", the average sulfur dioxide level is equal to or exceeds 0.25 ppm and the soiling index for the same period is equal to or exceeds 4.0 COHS, a "Warning" status is established.

4. Status: "Emergency" - If during the "Warning" period, it appears imminent that for a 24-hour period, the average sulfur dioxide level will equal or exceed 0.40 ppm and the soiling index for the same period will equal or exceed 6.0 COHs, an "Emergency" status is established.

5. Status: "Termination" - Once declared, any status reached by application of these criteria will remain in force until the criteria for that status are no longer met. At such time, the next lower status will be resumed. This procedure will continue until the episode is terminated.

Emergency actions will be taken by each state when any monitoring site within the MCIAQCR records ambient air quality in excess of that designated in the criteria. Adverse air quality need not be regionwide to trigger emergency control actions. Also, the Alert, Warning, and Emergency stages can and should be activated on the basis of deteriorating air quality alone; a High Air Pollution Potential Advisory need not be in effect.

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*High Air Pollution Potential Advisory

The entire Emergency Episode Plan operates around the relationship between the measured air quality during the episode and the predetermined levels established by the episode criteria. The relationship between criteria and the remainder of the Plan is illustrated in Figure 5-1.

5.1.2 Episode Communications

Indiana, as a member of the Air Pollution Control Officers Committee* will actively participate in MCIAQCR episode activities. Through the EOCC, the field inspection team and the State air pollution officials will be in direct contact with the organizations listed in Table 5-1.

Table 5-1. ORGANIZATIONS CONTACTED DURING EPISODES

- Legal Authority
- Emission Sources
- Air Quality Data Sources
- Meteorological Data Sources
- NAPCA
- Neighboring Jurisdictions
- Other State and Local Governmental Departments
- News Media
- Hospitals
- Telephone Company

5.1.2.1 Communications Center

The objective of the MCIAQCR EOCC is to serve as the facility for reception and processing of data relating to air pollution episodes and for determination of avoidance actions. It will accept information, process raw information into intelligence data, and determine corrective actions. The implementation of specific source control actions will be left to the individual states.

During air pollution episodes, the MCIAQCR EOCC will be manned by the staff of the City of Cincinnati and personnel from the state agencies in Ohio, Kentucky, and Indiana. Other specialists such as physicians may also be called upon to volunteer their services during the serious stages of episodes. In general, they will recommend appropriate actions as well as assist in the interpretation of air quality data, meteorological factors, public health effects, and engineering considerations.

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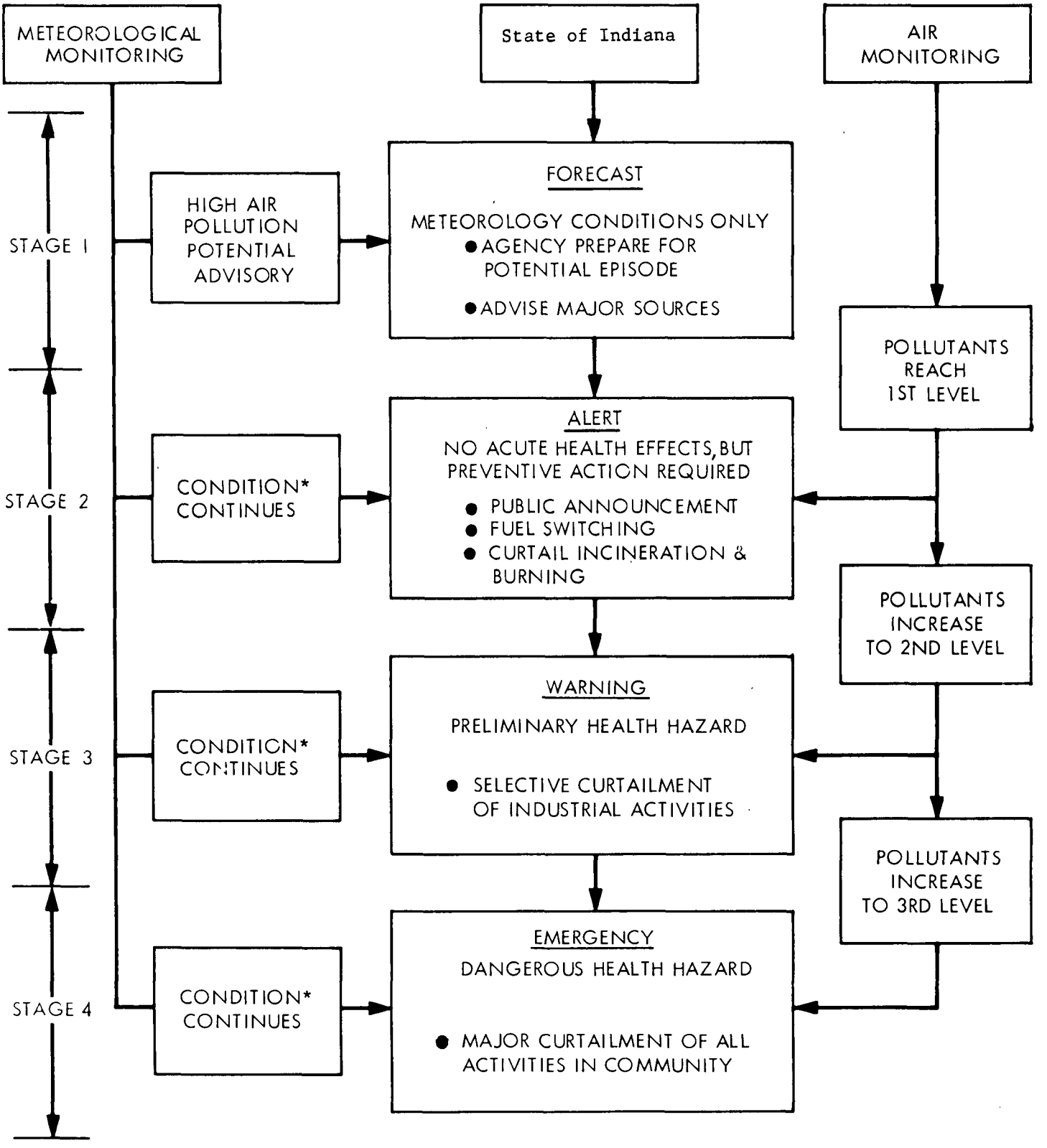
*Abbreviated APCO



*While poor meteorological conditions will continue to be present, a formal HAPPA statement by ESSA is not a requirement.

Figure 5-1. INDIANA EPISODE SEQUENCE

The staff requirements for episode actions under the comprehensive Episode Plan will be similar to the staff identified for the interim Plan in Table 5-5. All of the staff, except for the technicians, field inspectors, and enforcement personnel (who have field responsibilities) will report to the EOCC when so directed. Staffing schedules will be determined by the APCO Committee so that the Center will be manned on a 24-hour basis during the more severe stages of an episode. During each episode, a team will be selected to prepare a post-episode report. This team will coordinate with NAPCA in preparing such a document.

Nearly all communications will be conducted over standard telephone lines. Dedicated telephone lines may be installed to assure communications with such organizations as: major sources of pollution, ESSA, and NAPCA. Such channels may be required because of the heavy load that will be placed on the regular telephone system during episodes.

A fleet of two-way radio equipped automobiles will be needed for air quality inspection, source inspection, and enforcement to maintain continuous contact with the field and to assure adequate surveillance of the emergency conditions.

Equipment needed in the EOCC in addition to standard items such as conference tables, typewriters, and calculators include wall charts and maps for display of:

- Air Quality Data
- Meteorological Information
- Source Control Data
- Traffic Flow Patterns

Essential equipment for the EOCC will be purchased and installed according to the time schedule presented in Section 5.1.6.

5.1.2.2 Communications Manual

A Communications Manual will be developed to simplify the procedure of communicating with the organizations listed in Table 5-1. The Manual will specify the operations to be followed by each member of the EOCC operating staff at each episode stage. The Manual will also identify the steps to be taken by the field personnel.

A series of prepared press releases will be included in the Manual for immediate release during the early stages of an episode. Procedures for publicizing these messages and other specially prepared announcements will be clearly presented.

The Communications Manual will be completed by July 1971.

5.1.3 Episode Surveillance

5.1.3.1 Air Quality Monitoring

During episodes, short-period averages of air quality measurements will be available from four fixed stations described in Section 6.1. Three of these sites are in Ohio and one in Kentucky. Initially, only the existing CAMP station located near downtown Cincinnati will be in operation; but all four should be operative by September 1, 1971, the season of greatest episode probability.

Continuous sulfur dioxide analyzers at each site will permit averages to be obtained for sampling periods as short as 15 minutes and running sums, averages, or combined indices over longer periods as required, updated hourly.

Tape Samplers will be used to provide soiling measurements at all sites. They will be equipped with recorders for real-time measurements and easier retrospective analysis. Normal sequential sampling interval is two hours; however, the sampling time will be reset for hourly or half-hourly intervals when ambient concentrations are high.

Concentrations of suspended particulates will be measured by hi-vol samplers, one at each station. During non-episode periods, hi-vols will be set to take a midnight-to-midnight reading on a schedule of operation yet to be determined. One schedule under consideration calls for hi-vol operation every third day. However, during episodes, hi-vols will be operated at maximum frequency consistent with the work load.

5.1.3.2 Meteorological Monitoring

During episodes periods, both predictive and observational weather information may be required. The revised Federal Mesometeorological Plan developed by the U.S. Environmental Science Services Administration (ESSA) provides for the establishment of an ESSA Meteorological Support Unit (EMSU) for the MCIAQCR. This unit consist of an urban (air pollu-

tion) meteorologist, a technical assistant, and two technicians. The technicians normally take two low level soundings a day, one near daybreak and one early in the afternoon near the time of maximum imixing height. During episodes one or two additional soundings may be taken.

Low level soundings provide vertical profile data on temperature and wind and derivative data such as mixing height, transport wind, and ventilation index. They differ from ordinary rawinsonde observations in that they utilize a slow-rising balloon to allow high resolution and terminate at 10,000 feet. An observational site for taking low level soundings has not yet been determined. Sites that are representative of urban conditions are preferred to the airport sites used for ordinary rawinsodes.

The target date for EMSU implementation is during fiscal year 1972. However, shortage of funds and qualified manpower has resulted in long delays in establishing EMSU units at many designated regions. As an interim arrangement, therefore, meteorological support will be provided by the existing Weather Bureau facility at Greater Cincinnati Airport, located in Boone County, Kentucky. This office is directed to establish close working relations with air pollution control agencies and related interests in the metropolitan Cincinnati area. Since the present office is responsible for the full spectrum of weather services to the community as well as support to aviation, it lacks the resources for a complete service to air quality control activity such as the EMSU specialists can provide. However, as a minimum the Weather Bureau office will furnish observational data and up-to-the-minute local advisories adapted from the High Air Pollution Potential Advisory (HAPPA), which is issued by the National Meteorological Center (NMC) at Suitland, Maryland.

The HAPPA message is disseminated over Teletype Service C daily at 12:20 E.S.T. The criteria for issuing an advisory are so restrictive, particularly with regard to a minimum size for the affected area, that local communities may not be alerted by this means against limited incidents of high pollutant concentrations. Hence, service that is tailored to the needs of the region will go beyond mere adaptation of

HAPPA messages. As a first step, arrangements will be made to have a daily air pollution potential sheet prepared by the Weather Bureau at Greater Cincinnati Airport and the data routinely telephoned to the Cincinnati Division of Air Pollution Control or to a specified coordinating office such as the Cincinnati Regional Office of the State of Ohio control agency. Data will be adapted from the 7:00 a.m. rawinsonde run taken at Wright-Patterson Air Force Base, Dayton, which is the closest reporting station for upper air temperature and wind data. When air pollution measurements reach or are expected to reach specified levels, the receiving office will relay the meteorological data and other pertinent information to the State agencies of Indiana, Ohio, and Kentucky. A sample informational sheet is shown in Figure 5-2.

When the EMSU unit becomes operative, it will take over the responsibility for preparing, disseminating, and applying the daily air pollution potential sheet. Furthermore, the HAPPA program is expected to be decentralized, so that advisories will be better geared to local situations. Under this new arrangement, advisories for the MCIAQCR will originate from the Cleveland, Ohio Forecast Office.

In addition to the low level soundings that the EMSU unit will provide, pilot balloon ascents are made at the Greater Cincinnati Airport and at Standiford Field, Louisville, Kentucky, at 0100 and 1300 E.S.T. Observational data from Louisville are often indicative of conditions in the Cincinnati area a few hours in advance. During episodes, surface data from the following locations may also be useful:

- Lunken Airport
- Abbe Observatory (now operated by University of Cincinnati)
- MCIAQCR Surveillance Network: Four Primary Stations (See Section 6.1.1.)

One or more developmental types of instrumentation such as the radiothermosonde (scanning radiometer) and acoustical soundings may become operational in the near future.

It is still uncertain how these observational data will be utilized during an air pollution episode. They may be important input in short-period prediction models that are expected to be available. Certain

Figure 5-2. DAILY ADVISORY FROM WEATHER BUREAU AT GREATER CINCINNATI AIRPORT

Date _____

AIR POLLUTION POTENTIAL SHEET

I. Temperatures (°F)	URBAN	RURAL
a. Maximum yesterday	_____	_____
b. Minimum this morning	_____	_____
c. Maximum this afternoon	_____	_____

II. Mixing Height (meters)		
a. Maximum yesterday	_____	_____
b. Minimum this morning	_____	_____
c. Maximum this afternoon	_____	_____
d. Minimum tomorrow morning	_____	_____
e. Maximum tomorrow afternoon	_____	_____

III. Inversion Data (a.m.) (1. Surface, 2. Aloft)

	URBAN					
	Base	Top	Tx needed to break		Base	Top	Tx needed to break
1.	_____	_____	_____	1.	_____	_____	_____
2.	_____	_____	_____	2.	_____	_____	_____

IV. Winds

	URBAN	RURAL
a. Surface at 1000 LST	_____ Kt.	_____ Kt.
b. Surface forecast	_____ Kts.	
c. Morning AVW (Actual)	_____ m/sec.	_____ m/sec.
d. Afternoon AVW (Forecast)	_____ m/sec.	_____ m/sec.
e. Yesterday's observed AVW (Noon)	_____ m/sec.	_____ m/sec.
(6-7 p.m.)	_____ m/sec.	_____ m/sec.

V. Cloudiness

	AMOUNT (0-10)
a. Today until 7p.m.	_____
b. Tonight (7p.m. until 7a.m.)	_____

VI. Ventilation

	URBAN	RURAL
a. This afternoon(AVW x MXHT) m^2/sec	_____	_____

VII. Index

a. This morning (actual)	_____
b. This afternoon (forecast)	_____
c. Tomorrow morning (forecast)	_____
d. Tomorrow afternoon (forecast)	_____

NOTE: AVW = average ventilation wind through the mixing layer
T_x = Maximum Temperature
MXHT = Mixing Height

developmental models of this type are predicated upon winds that vary in space and time. Interim application of these data remains qualitative and subjective and should be handled by an experienced meteorologist.

5.1.3.3 Data Handling

Data acquired during episodes will be handled as described in Section 6.1.4. However, the greater frequency and shorter sampling intervals prescribed for episodes will require a much heavier workload than normal. The extra level of effort involved both in observational procedures and in data reporting, reduction, and analysis will be consistent with manpower and program funding limitations. In light of criteria that have been established for determining whether manual and semi-automatic networks should be converted to telemetered real-time data reduction systems, the planned network does not yet warrant real-time operation. However, the need and justification for this type of operation will be periodically reviewed.

5.1.3.4 Source Inspection

Under episode conditions, it is the principal field duty of the enforcement personnel to ascertain that the Emission Reduction Plan described in Section 5.1.5 is being executed. The available tools and procedures to exercise this function are the same as those used in normal operations (see Sections 6.2.1 and 6.2.2) except that emphasis will be placed upon quick action and rapid response measures. Equipment needed for communications is specified in Section 5.1.2

Verification of compliance is sometimes difficult. For example, Ringelmann and opacity tests are of little use when a sulfur dioxide episode occurs. Since an effective control technology for particulates is available today and reduction of visible emissions will inevitably result after outlay of funds, effort and public resolve, the major problem will become the enforcement of sulfur dioxide emission reduction. Violations might sometimes be traced through monitoring station measurement, but conclusive evidence must be obtained at the points of emission. It may be necessary to enter the premises of a suspected violator armed

with necessary legal instruments and test equipment. Remedies may then come too late to affect the source of the episode. More direct, faster, legally admissible techniques for determining the amount and type of gaseous emission by scanning the plume from a distance will aid in achieving compliance with the Emission Reduction Plan.

5.1.4 Episode Legal Authority

Enabling legislation necessary for the implementation of emergency action exists in Indiana. The discussion of episode legal authority is presented in Section 3 of this report.

5.1.5 Emission Reduction Plan

The objective of an Emergency Episode Plan is the temporary reduction of emissions during episodes. The Emission Reduction Plan (ERP) is that part of the total episode plan which directs the orderly and equitable control of source emissions. The ERP builds upon and utilizes the other parts of the episode plan that have been previously presented in Section 5.1, that is: episode criteria, surveillance networks, communications center, and legal authority.

An ERP objectively and quantitatively evaluates all sources within a region and selects the sources for control. The criteria for selection include technical feasibility and economic reasonableness of emergency control and minimal disruption of community activities.

The ERP for the Indiana portion of the MCIAQCR will be developed promptly after the submission of this Implementation Plan. Through engineering and economic analyses of the sources in the two-county area a series of optimum emergency control strategies will be developed.

Cooperation among the numerous jurisdictions in the MCIAQCR is imperative in developing the Emission Reduction Plan. This is so because (1) the Plan, once adopted, must be executed on a regionwide basis and (2) economices of scale will result by having one central unit, the APCO Committee, responsible for all episode avoidance activities of the Region. Thus, in developing the Emission Reduction Plan for the MCIAQCR, some specific responsibilities will be performed by the Committee

and others by the individual States. The separation of tasks and the procedure for developing the ERP is illustrated by the flowchart in Figure 5-3. The elements of the Emission Reduction Plan are summarized in Table 5-2.

To curtail emissions during episodes, a set of emergency strategies for achieving rapid step-wise reductions will be developed. Progressively more stringent control strategies will be specified for each episode level as greater emission reduction is required. Substantial background information will be necessary to determine the essential strategies.

As indicated in Figure 5-3, Emergency Control Questionnaires will be used in conjunction with Emission Reduction Guides to obtain the required technical and cost information from selected sources. The plans submitted by the surveyed sources will be reviewed and approved by the air pollution control agency of each state. Plans that are not acceptable will be returned to the source. If the source does not resubmit a plan, the air pollution control agency will make the necessary revisions. Such adjusted plans will be enforced during episodes.

Once alternative strategies have been evaluated, the optimum strategy will be announced to sources and the public with additional information on recommended procedures for acting and communicating during episodes.

5.1.6 Time Schedule for Emergency Episode Plan Development

The development of the Emergency Episode Plan will require significant time and effort to complete. A time schedule for the completion of essential requirements of the Plan is presented in Table 5.4 The schedule is based on estimates which assume State personnel will begin actively developing the Plan soon after the adoption of the Implementation Plan.

5.2 INTERIM EMERGENCY EPISODE PLAN

Since the comprehensive Emergency Episode Plan will not be immediately available, an interim Plan will be adopted to protect the citizens of the Region. Specific actions for control control, agency personnel, and relevant organizations have been developed for the MCIAQCR and the states

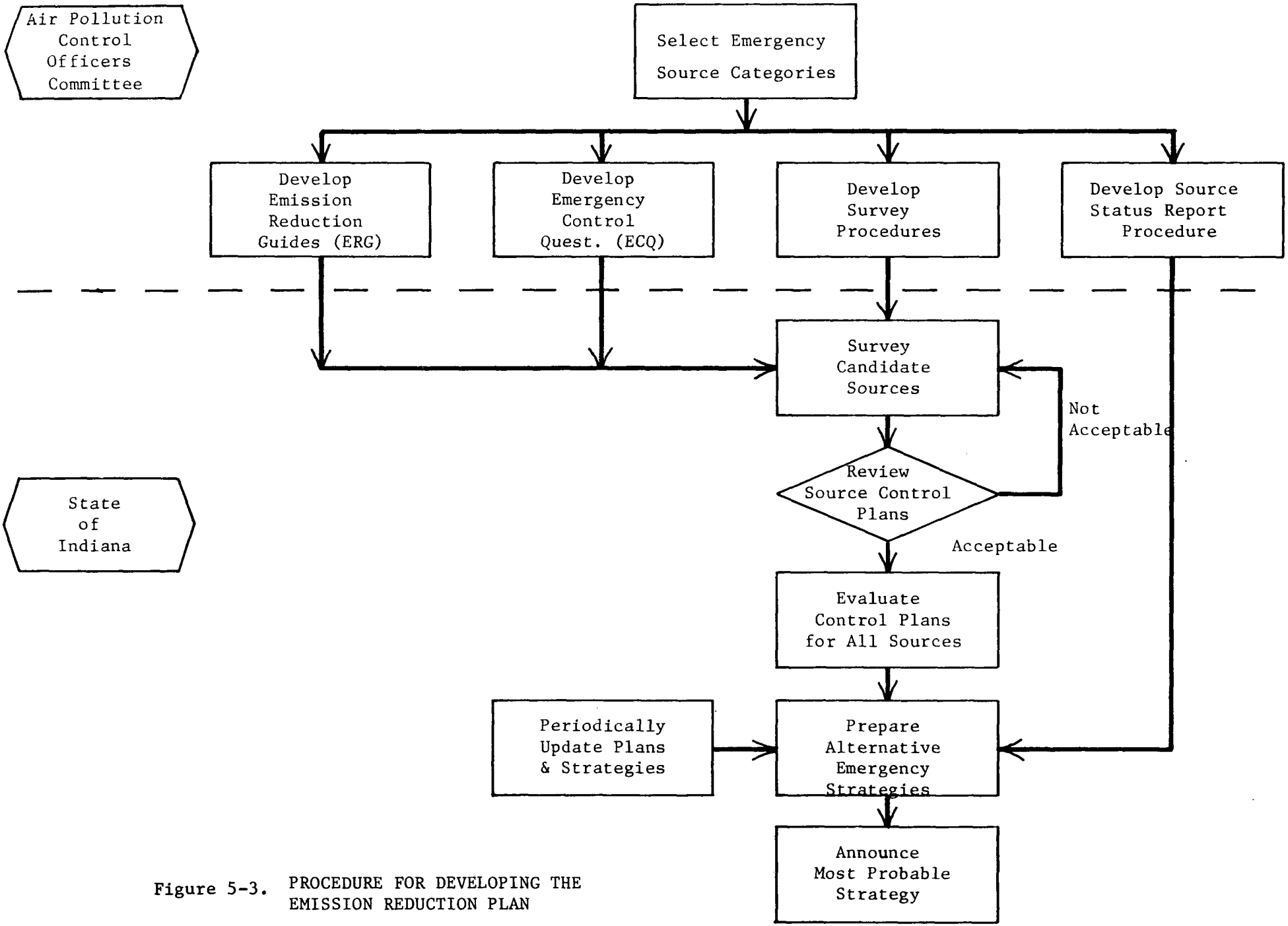


Figure 5-3. PROCEDURE FOR DEVELOPING THE EMISSION REDUCTION PLAN

Emergency* Source Category	Emission Reduction Guides	Emergency Control Questionnaires	Source Surveys	Source Status Report	Emergency Instruction Notification
I	Detailed process and fuel combustion analysis per source category; extensive review of conventional and emergency control techniques	Complete examination of emissions control alternatives and direct and indirect effects on emitters, region, and nation	Questionnaire followed by visitation and consultation	Detailed report of immediate ability to control plus impact of actions on other sources and region	Detailed instructions to source emissions control and communicate responsibility during episode
II & III	Review of fuel combustion and incineration operating techniques and emergency control alternatives	Quantification of emission curtailment alternatives and effectiveness	Questionnaire reviewed by telephone if necessary	Observation of fuels used	Instructions on required actions during episode
IV	None	None	None	Observation of traffic density	Instructions on required actions during episode

*See Table 5-3 (which directly follows) for the proposed Emergency Source Categories for the MCIAQCR

Table 5-2. EMISSION REDUCTION PLAN ELEMENTS

Table 5-3. PROPOSED EMERGENCY SOURCE CATEGORIES FOR THE MCIAQCR*

ESC-I: INDUSTRIAL AND STEAM ELECTRIC POWER

- Food and Kindred Products
- Furniture and Fixtures
- Paper and Allied Products
- Printing, Publishing and Allied Industries
- Chemicals and Allied Products
- Petroleum Refining and Related Products
- Stone, Clay, Glass and Concrete Products
- Primary Metals Industries
- Fabricated Metal Products, except Ordnance, Machinery and Transportation Equipment
- Machinery, except Electrical
- Electric, Gas, and Sanitary Services (except incinerators)

ESC-II: COMMERCIAL FACILITIES

- Commercial
- Office Buildings
- High-Rises
- Hospitals
- Private and Professional Schools
- Construction

ESC-III: GOVERNMENTAL FACILITIES

- Governmental Offices
- Municipal Incinerators
- Schools
- Military Bases

ESC-IV: TRANSPORTATION AND RESIDENTIAL

- Automobiles
- Airlines
- Mass Transit
- Private Dwellings

*See Table 5-2

TABLE 5-4. METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION, INTERIM EMERGENCY EPISODE PLAN

Section I EPISODE CRITERIA		(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
High Air Pollution Potential Advisory (hours)		36	None needed	None needed	None needed
Air Quality Measurements (24-hour Averages)	Particulates (COH/1000 LF)	No specified level	2.0	4.0	6.0
	Sulfur Dioxide (ppm)	No specified level	0.10	0.25	0.40

Section II INTRASTATE EPISODE AUTHORITY	(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Authorized State AP Official	Alert staff	Activate "alert" staff and announce "alert"	Activate "warning" staff	Activate "emergency" staff
State Governor(or AP Commissioner)	No action	No action	Announce "warning"	Announce "emergency"
State Attorney General Office	No action	No action	Assist enforcement procedures	Assist enforcement procedures

Section III EPISODE SURVEILLANCE	(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Air Quality Monitoring	Increase measurement frequency	Maintain hourly measurements	Maintain hourly measurements	Maintain hourly measurements
Meteorological Monitoring	Increase frequency of measurements	Maintain frequency of measurements	Maintain frequency of measurements	Maintain frequency of measurements
Data Handling	Evaluate incoming data and prepare wall charts	Evaluate incoming data and prepare wall charts	Evaluate incoming data and prepare wall charts	Evaluate incoming data and prepare wall charts
Source Surveillance	No action	Inspect major sources	Follow plan for source inspection	Follow plan for source inspection

Table 5-4. (continued)

SECTION IV STATE EMISSION REDUCTION PLANS	(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Control Strategist	Review emission reduction plans	Request "alert" control	Request "warning" control	Request "emergency" control
Power Generating	Inform of conditions	Substantial reduction - fuel switch or load shift	Maximum reduction - fuel switch or load shift	Maximum reduction - fuel switch or load shift
Other Fuel Burning Sources Industrial	No action	Fuel switch - limit cleaning and start-up;partial shutdown	Fuel switch - limit cleaning and start-up; partial shutdown	Maximum possible reduction
Commercial	No action	Substantial reduction	Maximum reduction	Maximum possible reduction
Processing	No action	Fuel switch; limit cleaning and start-up	Fuel switch; limit cleaning and start-up	Maximum possible reduction
Residential	No action	No action	Limit electrical consumption and reduce room temperature to 65°F	Limit electrical consumption and reduce room temperature to 65°F
Fuel Suppliers	No action	Provide assistance to customers	Provide assistance to customers	Provide assistance to customers
Incineration Municipal	Alert	Maximum reduction	Prohibit operations	Prohibit operations
Commercial	No action	Maximum reduction	Prohibit operations	Prohibit operations
Residential	No action	Prohibit operations	Prohibit operations	Prohibit operations
Open Burning	Alert	Prohibit operations	Prohibit operations	Prohibit operations
Manufacturing Continuous	No action	Minimum reduction	Maximum reduction	Maximum reduction or curtail operations
Batch Process	Alert	Minimum reduction	Partial shutdown	Curtail operations
Commercial Entertainment	No action	No action	Prepare to shut down	Shut down
Office Work	No action	No action	Prepare to shut down	Shut down
Business	No action	No action	Prepare to shut down	Shut down
Government Schools	No action	No action	Prepare to shut down	Shut down
General Office	No action	No action	Prepare to shut down non-essential activities	Shut down non-essential activities
Construction	No action	Shut down dust production activities	Prepare to shut down all activities	Shut down all activities
Motor Vehicles	No action	No action	Request non-essential travel be stopped	Prevent all but emergency travel to downtown
Public Transportation	No action	No action	No action	Provide emergency transportation

Table 5-4. (continued)

SECTION V EPISODE COMMUNICATIONS (from emergency operation control center to:)		(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Federal Facilities	C	Not notified	Contact through NAPCA representative	Contact through NAPCA representative	Contact through NAPCA representative
Emission Sources	S	Inform selected sources	Contact through news media and telephone	Contact through news media and telephone	Contact through news media and telephone
News Media (public)	C	Not notified	Send press release "A"	Send press release "W"	Send press release "E"
Hospitals	C	Not notified	Recommend precautionary measures	Recommend precautionary measures	Recommend precautionary measures
Police Department	S	Not notified	Alerted	Request enforcement assistance	Request enforcement assistance
Telephone Company	C	Not notified	Alerted	Request emergency procedures	Request emergency procedures
NAPCA	C	Report conditions	Report conditions	Report conditions	Request assistance
ESSA (U.S. Weather Bureau)	C	Request meteorological info.	Request meteorological info.	Request meteorological info.	Request meteorological info.
State Governor (or AP Commissioner)	S	Not notified	Report conditions	Request "Warning" Announcement	Request "emergency" announcement
State Department of Traffic & Highways	S	Not notified	Alerted	Request traffic reroute	Request traffic reroute

NOTE:

C = announcement resulting from APCO Committee dicision

S = announcement resulting from state official

Table 5-4. (continued)

SECTION VI EMERGENCY EPISODE STAFF		(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
EOCC Director	E	Alerted	Direct staff, communicate with state official, review public announcement	Direct staff, communicate with state official, review public announcement	Direct staff, communicate with state official, review public announcement
Chief Chemist	E	Alerted	Coordinate air quality monitoring and analysis	Coordinate air quality monitoring and analysis	Coordinate air quality monitoring and analysis
Chief Engineer (Strategist)	E	Alerted	Determine optimum source control strategy	Determine optimum source control strategy	Determine optimum source control strategy
Chief Compliance Officer	S	Alerted	Coordinate Field inspections	Coordinate field inspections	Coordinate field inspections
Program Management, Chief	E	No action	Coordinate data handling effort	Coordinate data handling effort	Coordinate data handling effort
Control Engineers	S	No action	Assist sources and evaluate control status	Assist sources and evaluate control status	Assist sources and evaluate control status
Meteorologist	E	Issue local air pollution advisories	Communicate with sources of met. data, evaluate data.	Communicate with sources of met. data, evaluate data	Communicate with sources of met. data, evaluate data
Chemists	S	No action	Analyze samples	Analyze samples	Analyze samples
Technicians	S	Collect air quality samples	Collect and evaluate air quality samples	Collect and evaluate air quality samples	Collect and evaluate air quality samples
Inspectors	S	No action	Source inspections	Source inspections	Source inspections
Clerical	E	Record data and operate telephones	Record data and operate telephones	Record data and operate telephones	Record data and operate telephones
Records Analysts	E	Review emergency control data	Supply strategist with data and maintain wall charts	Supply strategist with data and maintain wall charts	Supply strategist with data and maintain wall charts
Physicians (volunteers)	E	No action	No action	Consult with Director	Consult with Director
Communication Specialists	E	No action	Prepare special press releases	Prepare special press releases	Prepare special press releases
State Police Department	S	No action	Review enforcement procedures	Assist with enforcement	Assist with enforcement

NOTE:

S = denotes state activity

E = denotes EOCC activity

in the MCIAQCR. The actions are presented in Figure 5-4. The following aspects of the Emergency Episode Plan are presented for the Forecast, Alert, Warning, and Emergency stages:

I. Episode Criteria
II. Intrastate Episode Authority
III. Episode Surveillance
IV. State Emission Reduction Plans
V. Episode Communications
VI. Emergency Episode Staff

The interim Emergency Episode Plan heavily depends upon voluntary compliance of major sources within the MCIAQCR. Nearly all sources are candidates for emergency control during episodes. A list of the major point sources is presented in Table 5-5. Only three of the sources in Indiana have particulate or sulfur oxide emission rates equal to or greater than one ton per day. The pollutant emission rates were determined by the NAPCA emission inventory for the MCIAQCR.

The interim Plan includes the required actions to be taken by each source category at specific stages of an air pollution episode. The Plan is based on general knowledge of the source types and the ability of such sources to control emissions during episodes.

At the present time, the engineering and economic information about each source within the MCIAQCR is not available to determine scientifically the optimum strategy or series of preferred strategies. Short-term episode-meteorological diffusion models for regions are not available at this time to test the adequacy of the proposed interim Plan. Without analytical tools to evaluate the effectiveness of the Plan, a philosophy which stresses the protection of the health of the citizens has been taken. Thus, a relatively stringent Plan is recommended. When meteorological tools are developed and are practical for a region the size of the MCIAQCR, such will be incorporated into the comprehensive Emergency Episode Plan.

A selected emergency emission reduction strategy may be used when an episode is discovered in one localized area. The most efficient and economical strategy in such a case will be the emergency control of sources within the immediate geographical area or control of nearby sources that are directly affecting the episode.

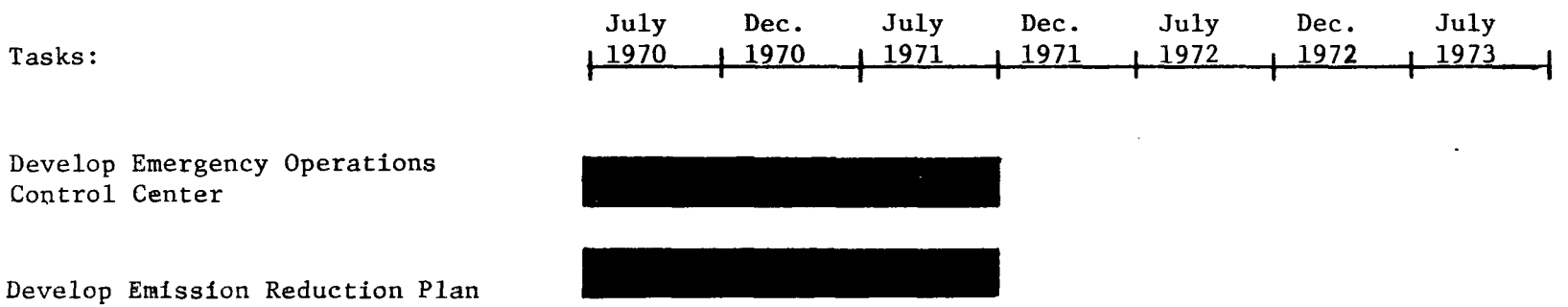


Figure 5-4. INDIANA EMERGENCY EPISODE PLAN TIME SCHEDULE

Table 5-5. MAJOR POINT SOURCES IN THE MCIAQCR

Source	Sulfur Oxides (tons/year)	Particulates (tons/year)
INDIANA		
Dearborn Dump No. 4	0.03	1.13
Jos. E. Seagram & Sons, Inc.	3.64	2.45
Indiana & Michigan Elec. Company (Tanners Creek Station).	339.30	64.75

Whenever possible, sources in similar source categories will be treated equally. The factors of: (1) effectiveness of temporary control, (2) the required response time for emergency control, and (3) economic impact on the source will all be considered in determining the interim ERP, when such factors are known.

Although the interim ERP will be based on voluntary compliance of major point sources, temporary injunctive relief can be requested through local courts when sources will not voluntarily comply with control orders.

Until the recommended air quality monitoring network is operational, the existing network will satisfy the need for episode air quality determination.

Meteorological information will be obtained from the U.S. Weather Bureau. Additional meteorological information, if needed, will be obtained through private sources.

6. AIR QUALITY MONITORING

6.1 OBJECTIVES

Ambient air sampling is required to assess current air quality, determine the degree of improvement necessary and measure the results of control and abatement actions. A second major requirement is for the provision of intelligence prior to, during, and following actual or potential air pollution episodes in order to determine emission curtailment tactics for episodal avoidance.

Requirements are divided into two categories, based on desired averaging times:

- Contaminant concentration on a schedule; intermittent hourly/daily basis
- Continuous real-time monitoring providing 15-minute average concentrations and running averages of one hour, eight hours, and 24 hours

Based on these criteria, two types of air quality monitoring sites are required. These are designated as primary and secondary monitoring stations.

The following are the pollutants of immediate concern, the techniques for monitoring, the type of equipment needed, averaging time, and data summary report period for primary and secondary monitoring sites.

Primary Monitoring Station

Pollutant	Monitoring Technique	Sensor	Averaging Time	Report Period
Sulfur Dioxide	Colorimetric or Coulometric	Continuous	Hourly	Monthly
Particulates	Filtration (Suspended)	Intermittent	24-Hour	Quarterly
	Filtration (Soiling)	Continuous	2-Hour*	Monthly
Wind Speed**	Anemometer	Continuous	Hourly	Monthly
Wind Direction**	Wind-Vane	Continuous	Hourly	Monthly

*One-Hour averaging during episodes
**Taken at several selected sites (to be determined)

Secondary Monitoring Station

Pollutant	Monitoring Technique	Sensor	Averaging Time	Report Period
Sulfur Dioxide	Colorimetric	Intermittent (daily, 24 samples)	Hourly	Monthly
Particulates	Filtration (Suspended)	Intermittent	24-Hour	Quarterly

6.1.1 Location of Sampling Stations

Air quality monitoring sites represent pollutant density in their immediate area (normally within a radius of 1/2 - 3/4 mile around the site), are directly influenced by the proximity of emission sources (emission density), and monitor the impact of pollutants on people working of living in their immediate area (dosage). Therefore, each projected station has been evaluated according to these three considerations as follows:

- Pollution Density*

  Based on real and simulated pollutant averages, annual levels of suspended particulates and sulfur oxides were plotted according to multiple concentration ranges. These were classified as values greater than, equal to, and less than approved Air Quality Standards.

- Population Density*

  Based on 1968 data, population density was plotted by three categories: high, median, and low.

- Emission Density*

  Based on emissions inventory data (1969) compiled for this report for suspended particulates and sulfur oxides, annual emission densities were plotted. These are representative of high, median, and low levels of source concentrations.

Table 6-1 presents the projected regional air quality monitoring network. Each site is described by category and evaluated according to the above noted criteria. Its location in the AQCR is fixed and its actual or scheduled start-up is listed. The numbers and general locations of sampling sites were selected to represent the best judgment regarding the allocation of resources necessary to meet the previously stated surveillance objectives.

*Maps showing the pollutant concentrations, population density, and emission density are presented in Section 1 and were used in determining sampler placement.

TABLE 6-1. PROJECTED REGIONAL AIR QUALITY MONITORING NETWORK

Station Type	Pollution Density			Population Density			Emission Density			Location	Start-Up Date
	H	M	L	H	M	L	H	M	L		
o Primary	X			X			X			Central and Ann Streets, Cincinnati, Ohio	Jan., 1962
o Primary	X			X			X			Drake Hospital Galbraith Road Cincinnati, Ohio	Jan., 1971
o Primary		X		X				X		Main and Dayton Streets, Hamilton, Ohio	April, 1971
o Primary	X			X			X			600 5th Street Newport, Kentucky	Jan., 1971
o Secondary	X			X			X			1055 Laidlaw Avenue Cincinnati, Ohio	Jan., 1968
o Secondary	X			X			X			General Protestant Orphanage, Madison Road, Cincinnati,Ohio	April, 1971
o Secondary		X		X				X		Parkland & Twain Saylor Park Cincinnati, Ohio	July, 1971
o Secondary			X		X				X	800 Bauer Ave.-B.H.S. Batavia, Ohio	July, 1971
o Secondary	X			X				X		Galbraith & Blue Ash Deer Park, Ohio	July, 1971
o Secondary	X				X		X			E. 4th St. - F.H.S. Franklin, Ohio	Jan., 1971
o Secondary		X		X					X	Sharon & Winton Roads Greenhills, Ohio	July, 1971
o Secondary		X			X			X		230 S. Elm Street Harrison, Ohio	Jan., 1971
o Secondary			X		X				X	25 Oakwood Avenue Lebanon, Ohio	Jan., 1971

TABLE 6-1 Continued:

Station Type	Pollution Density			Population Density			Emission Density			Location	Start-Up Date
	H	M	L	H	M	L	H	M	L		
o Secondary		X				X		X		State & Hill Streets Miamitown, Ohio	Jan., 1971
o Secondary	X			X			X			1240 Central Avenue Middletown, Ohio	April, 1971
o Secondary		X			X		X			N.R. Fire Dept., Market Street New Richmond, Ohio	July, 1971
o Secondary	X					X			X	U.S. 50 & St. Rt. 128 North Bend, Ohio	July, 1971
o Secondary			X		X				X	Talawanda High School Chestnut Street Oxford, Ohio	Jan., 1971
o Secondary	X				X		X			Short & E. Williams Lawrenceburg, Indiana	Jan., 1970
o Secondary			X			X	X			State Route 56 Rising Sun, Indiana	Jan., 1971
o Secondary	X			X			X			7th and Scott Street Covington, Kentucky	Jan., 1968
o Secondary		X		X				X		505 Commonwealth Ave. Erlanger, Kentucky	Jan., 1967
o Secondary		X			X				X	Veterans Hospital Ft. Thomas, Kentucky	Jan., 1971
o Secondary		X			X		X			Rt. 20 Petersburg, Kentucky	July, 1971
o Secondary			X		X				X	U.S. 25 & Stevenson Road Walton, Kentucky	Jan., 1971

Figure 6-1 graphically displays the network configuration. Superimposed on the display of sampling location is an isopleth projection of predicted annual arithmetic average particulate concentrations. (See Section 2.2.) This display indicates that areas of maximum pollutant concentrations will be adequately sampled by the proposed network.

6.1.2 Frequency of Collection

Data will be collected on a continuous basis from all automatic SO_2 analyzers utilized. Sequential samplers will measure SO_2 for 24 consecutive one-hour periods every third calendar day.

Twenty-four hour concentrations of suspended particulates will be collected on all hi-vol samplers utilized every third calendar day.

Soiling particulates will be collected continuously at two-hour intervals at all primary monitoring stations.

6.1.3 Methods of Sampling

Prescribed methods of measuring and monitoring atmospheric sulfur oxides are referenced from Public Health Service Publication No. 999-AP-6 (1964). The methods for atmospheric sampling and analyses of suspended particulate matter are referenced from the APCA Recommended Standard Method, APM-2.5 (1967). The methods for atmospheric sampling and analysis of soiling particulate matter are referenced from the APCA Recommended Standard Method, APM-2.1.

6.1.4 Data Handling and Analysis

6.1.4.1 Suspended Particulates

Following the 24-hour sample collection period, filters from the high volume samplers are sent to the Analytical Laboratory operated in Indianapolis by the Division of Air Pollution Control. A laboratory technician determines the concentration of particulates and records the value and the appropriate identification information on data record forms. Routine monthly and annual reports as well as specialized data analyses

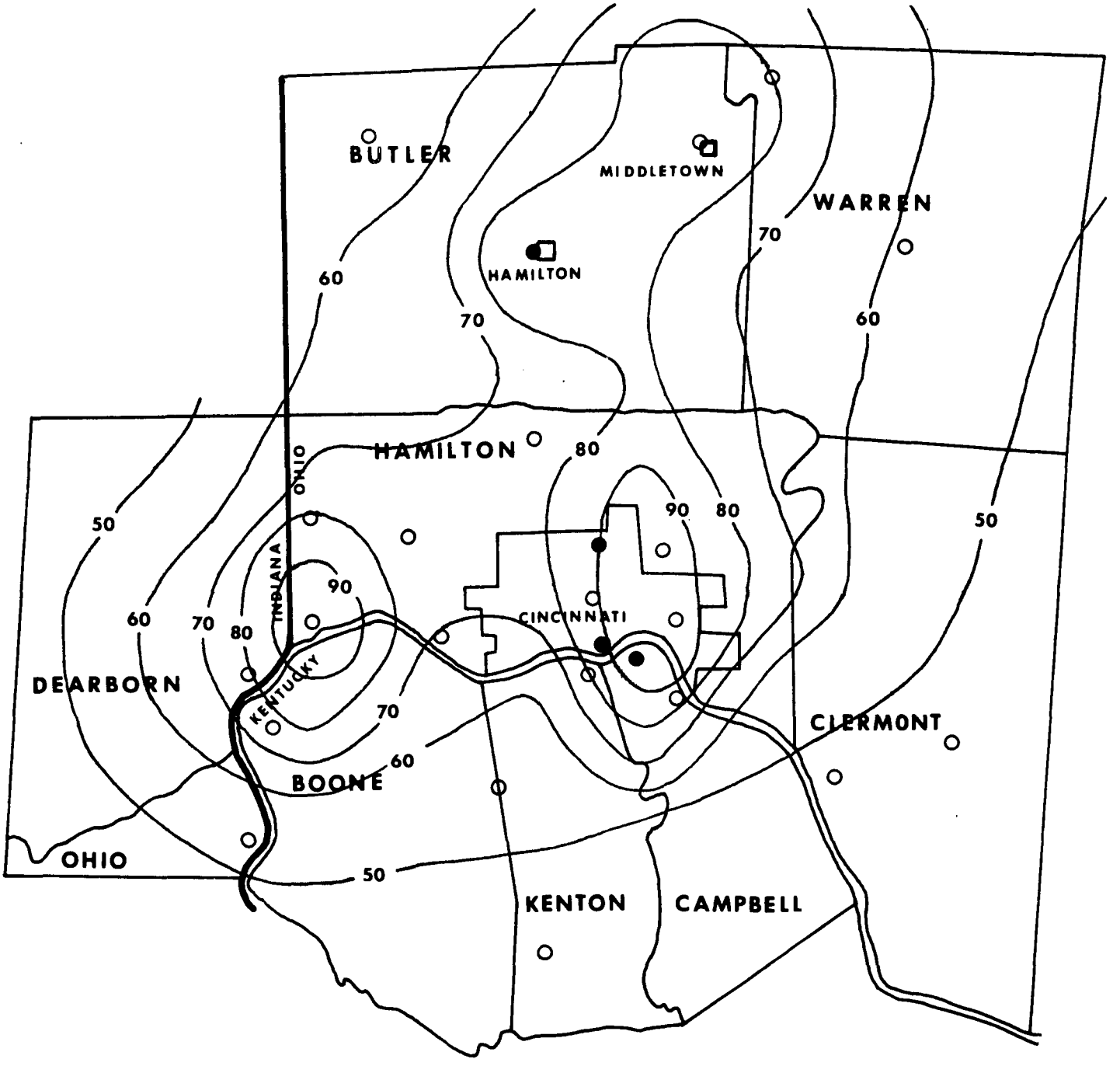


Figure 6-1. Location of Proposed Air Quality Monitoring Stations in the MCIAQCR. Superimposed are Ground Level Particulate Isopleth Concentrations (See Section 4.2). (Concentrations shown represent annual arithmetic mean values in $\mu g/m^3$.)

are prepared manually. Consideration is now being given to the development of a computerized data handling system. Such a system would, of course, be designed to handle data from all State air monitoring activities.

6.1.4.2 Sulfur Dioxide

The sequential samplers used to determine sulfur dioxide concentrations yield 24 one-hour average samples. These samples are forwarded to the laboratory in Indianapolis for analysis. Presently, all data handling including the preparation of monthly and annual reports and special data analyses is done manually.

When and if a computerized data handling system is developed for the air monitoring activities conducted statewide by the Commission, data from the sequential samplers will also be handled by automated techniques.

6.1.4.3 Episode Sampling

During conditions of high or potentially high air pollution, the primary sampling stations, none of which are located in Indiana, will be of foremost importance. The Episode Control Officer may, however, direct collection of special samples at the two secondary stations located within this State. These samples would be analyzed at a central laboratory within the MCIAQCR rather than at Indianapolis, since rapid utilization of the air quality data is of the utmost importance in emergency situations.

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6.2 CONTROL OF EMISSION SOURCES

This function of the total air pollution control effort encompasses both Engineering and Enforcement services personnel. It includes two separate systems, each system being made up of two programs as follows:

- Source Surveillance
  - (a). Source Identification and Registration
  - (b). Permit to Construct
  - (c). Permit to Operate
- Source Inspection - Field Operations
  - (a). Fuel Burning Sources, Industrial Sources
  - (b). Complaint Investigations and Field Patrol

6.2.1 Source Surveillance

All new or existing control apparatus and/or appropriate equipment used within the Region will be required to obtain a Permit to Construct and/or a Permit to Operate. This mechanism will guarantee source identification and registration. The following apparatus and equipment will be required to obtain Permits:

- All control apparatus
- Equipment used in a manufacturing process involving surface coating, including but not limited to spray and dip painting, roller coating, electrostatic depositing or spray cleaning which emits air contaminants into the open air and in which the quantity of material used in any source operation is in excess of 10 pounds in any one hour.
- Equipment used in a manufacturing process involving metal cleaning or surface preparation, including but not limited to degreasing, etching, pickling, or plating which emits air contaminants into the open air from a tank or vessel, the capacity of which is in excess of 100 gallons.
- Equipment, used in a manufacturing process, with some exceptions to be defined, which emits air contaminants into the open air either directly or indirectly and in which the combined weight of all materials, excluding air and water, introduced into any one source operation is in excess of 50 pounds in any one hour.
- Liquid storage tanks, reservoirs, and containers, used for the storage of acids, solvents, diluents or thinners, inks, colorants, lacquers, enamels, varnishes, liquid resins and having a capacity in excess of 10,000 gallons.
- Pneumatic material handling or conveying systems.

- Commercial fuel burning equipment in which the rate of solid fuel burned is in excess of 1,000,000 BTU's in any one hour.
- Any equipment used for the burning or incineration of non-commercial fuel or process by-products in the form of liquid, solid, or gas.
- Any incinerator, except incinerators constructed, installed, or used in one or two family dwellings or in multi-occupied dwellings containing six or less family units, one of which is owner occupied.

Prior to issuance of a Permit to Operate, an engineer will observe the equipment in operation at design capacity. At that time, the equipment will be checked with the plans and specifications previously submitted. During the inspection, observations will be made to determine that:

- the equipment is physically located as shown on the equipment location drawing,
- the equipment is constructed as indicated in the application,
- the equipment is capable of operating in compliance with the applicable rules and regulations of the State Air Pollution Control Agency,
- source testing is or is not necessary.

Based on the engineers' inspection and evaluation of the equipment and process as well as relevant source test results, a recommendation will be made by the engineer regarding the issuance or denial of permit to operate. After review and approval of the recommendation, action will be taken by the State Agency to approve or deny the Permit to Operate.

Source testing capability to support the Permit to Operate program currently exists in the Cincinnati Agency, for the Ohio Program. It will be developed or expanded in the Kentucky and Indiana state agencies. This capability will consist of trained personnel (normally a two-man team) and equipment for determining particulates, sulfur oxides, and other gaseous emissions.

A person desiring to construct or alter and operate any equipment capable of emitting air contaminants will be required to apply for a Permit to Construct from the appropriate air pollution control agency. The agency will furnish application forms, written instructions, and information required for proper filing. The application will be logged, dated, and assigned an identification number. All information pertinent

to the application, including data and drawings, will be submitted to an air pollution control engineer for review and evaluation. Based on the engineer's review, the application will be approved and the applicant may proceed with construction, or the applicant will be requested to confer with the engineer to discuss questionable aspects of the application. In the event that disagreements cannot be resolved by submission of additional information, minor changes in the proposals, or an acceptable explanation by the applicant, the application will be denied.

This mechanism will be installed and operated by the Necessary emissions inventory data will be abstracted at the local level by the State Agencies for entry into the Regional Data Bank. The State will reserve the right to negate Permits to Operate issued to sources which are found in violation of State regulations.

6.2.2 Source Inspections - Field Operations

Equipment installed, placed in operation, and issued a Permit to Operate will then come under the jurisdiction of Enforcement Services personnel. This group is responsible for policing sources of air pollution within its area of jurisdiction to insure compliance with applicable rules and regulations of the agency.

Each Enforcement Unit will encompass the following functional activities:

Industrial Inspections

- Continuously inspect assigned manufacturing plants
- Prepare source inventories
- Check compliance with permit system and conditions of variances in assigned industries
- Investigate breakdowns
- Investigate complaints made against assigned industries

Field Patrols

- Patrol assigned zones including highways and waterways for all visible violations from stationary and mobile sources
- Enter and cite all plants where visible violations are observed
- Keep under surveillance plants on referral from other sections
- Answer public complaints

Communications

- Maintain and operate radio transmitter and receiver 24 hours a day for:
  a. Complaints, instructions, and data to mobile units
  b. Declaration of alerts to specified industries and all mobile units
  c. Receipt and recording of data from air monitoring stations

6.2.3 Schedule

The Source Surveillance System will be completely implemented and operational by January 1973.

The Field Operations and Inspection Systems will be operational by January 1972.

6.3 REGIONAL DATA BANK

A regional data bank will be established and maintained by the City of Cincinnati agency. In order to maximize the utility of collected data in planning and decision making, a total data management system will be developed. Following is a brief summary of the elements of such a system and an estimate of the monthly computer time.

- Air Quality and Meteorological data (Operational by July 1971).

It will be necessary to develop a series of ten computer programs to handle the routine processing of air quality and meteorological data. The air quality monitoring system will yield in excess of 50,000 measurements each month. It will be necessary to convert these data to engineering units, validate the data, update master files, and prepare routine data tabulations and statistical summaries. The monthly computer usage will be ten hours.

These programs will provide a continuing evaluation of the progress toward the attainment of air quality standards. In addition, the programs will provide frequency distributions of pollutant concentrations, relationships among air quality and meteorological parameters, geographical distribution of pollutants, and the like. The monthly computer usage will here be six hours. Approximately two hours per month of an x - y plotter will be utilized.

- Emission Inventory (Operational by January 1971)

The data bank will maintain a current inventory of all sources of air pollution. Such data is necessary to show progress being made in the reduction of total emissions to the atmosphere. A series of 4-6 computer programs will be developed to handle this data; the actual update of the inventory will result from the data collected through the operation of the Permit System. File update will require four hours of computer time per month.

- Permit System (Operational by January 1971)

To maintain control of sources of air pollutants, a permit system will be established. Administration of this system will require a series of 3-4 computer programs. Monthly computer time required will be four hours per month.

- Diffusion Modeling (Operational by January 1972)

In order to assess the adequacy of emission regulations, it is necessary to supplement measurements of air quality with estimates of air quality derived from a mathematical model of atmospheric diffusion. Computer programs are available from NAPCA. Minor modifications will be made to adapt these programs to the RCA Computer. Diffusion modeling will be performed on an annual basis and will require 20 hours per year.

6.4 AIR QUALITY DATA TRANSMISSION

Routinely, data from the continuous analyzers will be manually reduced, punched on input cards, and stored in the computer. No extensive telemetry system will be initially employed.

However, a telephone interrogation system for the automatic monitors at all primary sampling stations will be installed as the stations are activated. This system will consist of a telephone, data processing set, and a teletype printer located at the control center (Cincinnati Air Pollution Control Agency). A data transmission set and a computer-serializer unit will be located at each remote site. A command from the control center, generated by dialing the unlisted phone of the field station,

will signal the data transmission set which then activates the computer-serializer unit. This unit takes a millivolt signal from the appropriate automated monitor and converts it to a signal compatible with the Bell System transmissions equipment. At this point, the transmission set sends a signal over the Bell System's lines to the central control station. The signal is then processed and displayed by means of a teletype printer. After processing sequentially through the available field monitors, the computer-serializer generates a disconnect pulse for the completion of the sequence.

The major objectives of this system are:

- Routine interrogation of field stations to establish the priority of maintenance requirements. A more efficient utilization of the instrument technician will be achieved, thus resulting in the overall reduction of manpower needs.

- Frequent interrogation during emergency episode periods to provide the EAC with a link to "real-time" data.

7. RESOURCES

7.1 GENERAL

The enactment of enabling legislation and the adoption of emission control regulations will not of themselves accomplish the air quality goals set forth in this Implementation Plan. Realization of these goals depends to a great extent upon the ability of the control agencies to enforce abatement programs. Such enforcement, in turn, is contingent upon the availability of adequate resources, the most crucial resource being manpower.

In the determination of manpower requirements, the NAPCA model was used. Briefly, this model uses four area characteristics (land area, population, number of manufacturing establishments, and capital expenditures) to establish man-years of effort required to support some fourteen functions carried out by a control agency.

The organizational structure of the various control agencies within the MCIAQCR is an important factor in determining the required resources. An analysis of the various organizational alternatives considered in the preparation of this Implementation Plan is presented in Appendix C.

The following two sections present the control agency requirements for the Indiana portion of the MCIAQCR as determined by the manpower model. All funds will be provided by the state with matching federal funds and all personnel will be hired by the Indiana State Agency. All state operations will be directed from the central offices in Indianapolis.

7.2 CALCULATED MAN-YEARS

Area characteristics for each county are presented in Table 7-1. The manpower model was used to estimate man-years of effort required in the entire Indiana portion of MCIAQCR. A summary of the output from the manpower model is presented in Table 7-2. A total of 3.1 man-years of effort is required to sustain an adequate control program for the four county area.

A summary of man-years which existed at the end of FY 1970 (June 30, 1970) is presented in Table 7-3. It is apparent that the manpower presently committed to the four county control agencies are far from adequate. Assuming that the necessary funding discussed in the following section is available, the recruitment of the necessary personnel presents a serious problem.

TABLE 7-1 . INPUT CHARACTERISTICS OF INDIANA NEEDED FOR MANPOWER ESTIMATES

County (ies)	Area (Sq. Miles)	Population (1970 est.)	Manufacturing Establishments	Capital Expenditures ($)
Indiana				
Dearborn	306	30.8×10^3	33	2.2×10^6
Ohio	87	4.5×10^3	6	8×10^4
Total	393	35.3×10^3	39	2.2×10^6
Region Total	2707	1.735×10^6	2172	94.6×10^6

TABLE 7-2 . SUMMARY OF MAN-YEAR ESTIMATES FOR INDIANA PORTION OF MCIAQCR

FUNCTION	PREDICTOR	MANPOWER FACTOR	CALCULATED MAN-YEARS
1. Monitoring			
Primary	0	0.5	0.0
Secondary	3	0.2	0.6
Total			0.6
2. Inspections	.04	2.8	0.1
3. Complaints	.3	1.0	0.3
4. Permits	.02	9.7	0.2
5. Policy	1.2	0.22	0.3
6. Training	1.2	0.12	0.2
7. Special Studies	1.2	0.06	0.1
8. Emission Estimates	1.2	0.05	0.1
9. Engineering Reports	1.2	0.06	0.1
10. Administration	1.2	0.59	0.7
11. Data Processing	1.2	0.09	0.1
12. Source Testing	0.3	0.10	0.1
13. Instrumentation	0.7	0.25	0.2
14. Laboratory	0.8	0.35	0.3
Total			3.1

TABLE 7-3 . ESTIMATED PRESENT MANPOWER UTILIZATION BY CONTROL AGENCY FOR INDIANA AND FOR THE TOTAL MCIAQCR

CONTROL PROGRAM	STATE AGENCY INDIANA	REGIONAL TOTALS
Management		
Policy	0.1	2.6
	0.1	1.6
Training	0.1	2.6
Administrative	0.3	6.8
Sub-Total	0.5	11.0
Enforcement		
Inspections	0.1	2.4
Complaints	0.1	5.3
Source Registration	0.1	1.1
Sub-Total	0.3	8.8
Engineering		
Permits	0.1	0.2
Emission Est.	0	3.3
Source Test.	0	1.1
Reports; Reg.	0	0.0
Sub-Total	0.1	4.6
Technical Services		
Monitoring	0	1.0
Special Studies	0	0.0
Data Processing	0	0
Instrumentation	0	0.0
Laboratory	0	1.0
Sub-Total	0	2.0
TOTALS	0.9	21.4

Approximately two additional full time men are required to adequately staff the Indiana portion of the MCIAQCR. These personnel will be hired over the period FY 1971 through FY 1973.

7.3 FUNDING

The funding required to support the Indiana Control Agency operating in the MCIAQCR is projected upon the basis of the staffing presented in Table 7-2. Salaries for the various categories of personnel are based upon information contained in the NAPCA Program and Financial Needs Report for the MCIAQCR (Table 7-4). Salalies are burdened by an overhead factor equivalent to one third of the base salary. Overhead includes such things as; fringe benefits, facilities and support, and additional operating expenses (travel, utilities, consumables, etc.).

A summary of costs for three years beginning with FY 1971 is presented in Table 7-5. The goal is to reach the required level of peration by FY 1973 when it is estimated that in excess of $69,000 will be necessary. This represents about a three-fold increase over the existing level of funding.

The sources of revenue which will produce the projected level of funding are uncertain as of the writing of this report. It is assumed that basic program support will remain at the state level. Furthermore, it is assumed that present Federal grants will be extended and two for one matching funds will be provided for new monies put forth by local or state jurisdictions.

A summary of the capital expenditures necessary to support air monitoring activities over the period FY 1971 to FY 1973 is presented in Table 7-6. The total is distributed over each of the three fiscal years in Table 7-5.

TABLE 7-4 . AVERAGE SALARY ESTIMATES FOR AGENCY OPERATIONS

Management Activities	Annual
Professional (25%)	$ 16,000
Non-Professional (75%)	8,000
Enforcement Activities	
Inspectors	10,000
Engineering Activities	
Engineers	14,000
Technical Services	
Chemists (40%)	10,000
Technicians (60%)	5,000
Fringe Benefits, Facilities and Support, plus Additional Operating Expenses	33 1/3 % of Base Salary

Table 7-5. ESTIMATED EXPENDITURES FOR INDIANA PORTION OF MCIAQCR

	Fy 71	72	73
Management Operations			
Salaries	16,000	20,000	24,000
Operating Expense	5,300	6,600	7,900
Facilities and support	500	500	500
	21,800	27,100	32,400
Enforcement Operations			
Salaries	5,000	5,000	5,000
Operating Expense	1,700	1,700	1,700
Facilities and support	500	500	500
	7,200	7,200	7,200
Engineering Operations			
Salaries	7,000	7,000	7,000
Operating Expense	2,300	2,300	2,300
Facilities and support	5,000	1,000	1,000
	14,300	10,300	10,300
Technical Service Operations			
Salaries	10,000	10,000	12,500
Operating Expense	3,300	3,300	4,100
Facilities and support	7,000	4,000	3,300
	20,300	17,300	19,900
Expenditures for Agency	63,600	61,900	69,800
Expenditures for Region	1,083,400	1,230,350	1,472,450

TABLE 7-6 . ESTIMATED CAPITAL EXPENDITURES FOR THE INDIANA PROGRAM WITHIN THE MCIAQCR

ITEM	INDIANA	REGIONAL TOTALS
Air Monitoring Network		
Continuous Station		$72,000
Shelter		48,000
Cont. SO_2 (Recorder)		16,000
Tape Sampler		4,000
Hi-Vol Sampler		1,200
SO_2 Bubblers		2,800
Intermittent Station	$2,200 (2)	$23,400 (21)
Hi-Vol Sampler	600	6,300
SO_2 Bubblers	1,500	15,700
Misc. Static	100	1,000
Laboratory Equipment	$10,000	$50,000
Computer Facilities (Time Sharing)	1,000	5,000
TOTALS	$15,400	$244,000

APPENDIX A

TABLE A-1

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 1

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0001	0.0001	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0002	0.0001	0.0	0.0	0.0	0.0
E	0.0001	0.0002	0.0	0.0	0.0	0.0
ESE	0.0001	0.0003	0.0	0.0	0.0	0.0
SE	0.0001	0.0003	0.0	0.0	0.0	0.0
SSE	0.0000	0.0001	0.0	0.0	0.0	0.0
S	0.0001	0.0003	0.0	0.0	0.0	0.0
SSW	0.0001	0.0002	0.0	0.0	0.0	0.0
SW	0.0001	0.0001	0.0	0.0	0.0	0.0
WSW	0.0001	0.0002	0.0	0.0	0.0	0.0
W	0.0002	0.0002	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0001	0.0001	0.0	0.0	0.0	0.0
NNW	0.0001	0.0002	0.0	0.0	0.0	0.0

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 2

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0009	0.0016	0.0006	0.0	0.0	0.0
NNE	0.0007	0.0010	0.0008	0.0	0.0	0.0
NE	0.0012	0.0020	0.0008	0.0	0.0	0.0
ENE	0.0007	0.0012	0.0014	0.0	0.0	0.0
E	0.0007	0.0025	0.0015	0.0	0.0	0.0
ESE	0.0002	0.0012	0.0010	0.0	0.0	0.0
SE	0.0004	0.0013	0.0006	0.0	0.0	0.0
SSE	0.0010	0.0013	0.0006	0.0	0.0	0.0
S	0.0020	0.0021	0.0010	0.0	0.0	0.0
SSW	0.0013	0.0020	0.0012	0.0	0.0	0.0
SW	0.0010	0.0021	0.0010	0.0	0.0	0.0
WSW	0.0008	0.0028	0.0018	0.0	0.0	0.0
W	0.0009	0.0020	0.0014	0.0	0.0	0.0
WNW	0.006	0.0010	0.0011	0.0	0.0	0.0
NW	0.0005	0.0010	0.0007	0.0	0.0	0.0
NNW	0.0003	0.0012	0.0009	0.0	0.0	0.0

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 3

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0005	0.0012	0.0041	0.0007	0.0001	0.0
NNE	0.0003	0.0014	0.0019	0.0003	0.0	0.0
NE	0.0005	0.0012	0.0031	0.0003	0.0	0.0
ENE	0.0006	0.0009	0.0032	0.0005	0.0	0.0
E	0.0005	0.0017	0.0030	0.0010	0.0	0.0
ESE	0.0002	0.0010	0.0025	0.0003	0.0	0.0
SE	0.0003	0.0016	0.0016	0.0001	0.0	0.0
SSE	0.0003	0.0010	0.0017	0.0001	0.0	0.0
S	0.0010	0.0025	0.0039	0.0006	0.0	0.0
SSW	0.0013	0.0036	0.0052	0.0010	0.0	0.0
SW	0.0009	0.0028	0.0072	0.0016	0.0002	0.0
WSW	0.0007	0.0022	0.0073	0.0012	0.0001	0.0
W	0.0005	0.0022	0.0076	0.0013	0.0001	0.0001
WNW	0.0002	0.0006	0.0039	0.0008	0.0	0.0001
NW	0.0002	0.0010	0.0023	0.0001	0.0	0.0
NNW	0.0002	0.0008	0.0016	0.0002	0.0	0.0

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 4

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0004	0.0051	0.0138	0.0134	0.0009	0.0002
NNE	0.0003	0.0035	0.0089	0.0070	0.0005	0.0001
NE	0.0004	0.0054	0.0101	0.0065	0.0002	0.0001
ENE	0.0006	0.0050	0.0114	0.0058	0.0003	0.0
E	0.0005	0.0062	0.0127	0.0056	0.0002	0.0
ESE	0.0004	0.0051	0.0082	0.0039	0.0003	0.0001
SE	0.0004	0.0044	0.0099	0.0028	0.0001	0.0001
SSE	0.0011	0.0043	0.0091	0.0036	0.0001	0.0
S	0.0016	0.0103	0.0210	0.0119	0.0008	0.0001
SSW	0.0012	0.0077	0.0211	0.0186	0.0028	0.0003
SW	0.0008	0.0074	0.0196	0.0244	0.0039	0.0010
WSW	0.0010	0.0071	0.0156	0.0184	0.0029	0.0008
W	0.0009	0.0076	0.0177	0.0262	0.0052	0.0012
WNW	0.0010	0.0041	0.0130	0.0193	0.0036	0.0001
NW	0.0008	0.0047	0.0089	0.0138	0.0010	0.0001
NNW	0.0002	0.0033	0.0061	0.0070	0.0005	0.0001

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL ASEASON

Stability Class 5

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0023	0.0067	0.0046	0.0	0.0	0.0
NNE	0.0033	0.0079	0.0030	0.0	0.0	0.0
NE	0.0034	0.0088	0.0030	0.0	0.0	0.0
ENE	0.0039	0.0107	0.0045	0.0	0.0	0.0
E	0.0058	0.0114	0.0043	0.0	0.0	0.0
ESE	0.0055	0.0098	0.0016	0.0	0.0	0.0
SE	0.0047	0.0088	0.0011	0.0	0.0	0.0
SSE	0.0045	0.0092	0.0017	0.0	0.0	0.0
S	0.0148	0.0215	0.0039	0.0	0.0	0.0
SSW	0.0131	0.0261	0.0039	0.0	0.0	0.0
SW	0.0102	0.0166	0.0060	0.0	0.0	0.0
WSW	0.0035	0.0078	0.0041	0.0	0.0	0.0
W	0.0029	0.0089	0.0063	0.0	0.0	0.0
WNW	0.0021	0.0047	0.0035	0.0	0.0	0.0
NW	0.0017	0.0055	0.0029	0.0	0.0	0.0
NNW	0.0009	0.0025	0.0014	0.0	0.0	0.0

TABLE A-2

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 1

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0	0.0	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0
ENE	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0	0.0	0.0	0.0	0.0	0.0
SSW	0.0	0.0	0.0	0.0	0.0	0.0
SW	0.0	0.0	0.0	0.0	0.0	0.0
WSW	0.0	0.0	0.0	0.0	0.0	0.0
W	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 2

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0	0.0	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0
ENE	0.0005	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0009	0.0	0.0	0.0	0.0	0.0
SSW	0.0005	0.0	0.0	0.0	0.0	0.0
SW	0.0005	0.0	0.0	0.0	0.0	0.0
WSW	0.0005	0.0	0.0	0.0	0.0	0.0
W	0.0005	0.0	0.0	0.0	0.0	0.0
WNW	0.0005	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 3

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0000	0.0005	0.0005	0.0	0.0	0.0
NNE	0.0005	0.0	0.0005	0.0	0.0	0.0
NE	0.0001	0.0009	0.0005	0.0	0.0	0.0
ENE	0.0005	0.0005	0.0009	0.0	0.0	0.0
E	0.0000	0.0005	0.0005	0.0	0.0	0.0
ESE	0.0000	0.0005	0.0	0.0	0.0	0.0
SE	0.0000	0.0005	0.0014	0.0	0.0	0.0
SSE	0.0001	0.0009	0.0	0.0	0.0	0.0
S	0.0005	0.0005	0.0014	0.0	0.0	0.0
SSW	0.0011	0.0009	0.0009	0.0	0.0	0.0
SW	0.0002	0.0018	0.0027	0.0	0.0	0.0
WSW	0.0011	0.0014	0.0009	0.0	0.0	0.0
W	0.0000	0.0009	0.0027	0.0	0.0	0.0
WNW	0.0001	0.0009	0.0018	0.0	0.0	0.0
NW	0.0001	0.0014	0.0009	0.0	0.0	0.0
NNW	0.0007	0.0023	0.0023	0.0	0.0	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 4

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0015	0.0100	0.0255	0.0228	0.0009	0.0
NNE	0.0005	0.0050	0.0123	0.0041	0.0	0.0
NE	0.0001	0.0082	0.0087	0.0027	0.0	0.0
ENE	0.0000	0.0032	0.0068	0.0014	0.0	0.0
E	0.0000	0.0032	0.0105	0.0014	0.0	0.0
ESE	0.0010	0.0046	0.0137	0.0064	0.0	0.0
SE	0.0005	0.0059	0.0087	0.0041	0.0	0.0
SSE	0.0010	0.0041	0.0091	0.0055	0.0	0.0
S	0.0015	0.0128	0.0246	0.0132	0.0	0.0
SSW	0.0024	0.0091	0.0150	0.0150	0.0014	0.0005
SW	0.0034	0.0118	0.0219	0.0291	0.0082	0.0014
WSW	0.0011	0.0146	0.0173	0.0314	0.0059	0.0005
W	0.0016	0.0146	0.0392	0.0442	0.0105	0.0009
WNW	0.0006	0.0087	0.0319	0.0364	0.0055	0.0
NW	0.0010	0.0105	0.0250	0.0246	0.0032	0.0
NNW	0.0001	0.0100	0.0114	0.0137	0.0009	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 5

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0014	0.0023	0.0036	0.0	0.0	0.0
NNE	0.0016	0.0036	0.0023	0.0	0.0	0.0
NE	0.0009	0.0023	0.0018	0.0	0.0	0.0
ENE	0.0025	0.0027	0.0046	0.0	0.0	0.0
E	0.0020	0.0064	0.0018	0.0	0.0	0.0
ESE	0.0034	0.0118	0.0009	0.0	0.0	0.0
SE	0.0022	0.0077	0.0014	0.0	0.0	0.0
SSE	0.0018	0.0050	0.0014	0.0	0.0	0.0
S	0.0069	0.0109	0.0032	0.0	0.0	0.0
SSW	0.0051	0.0128	0.0032	0.0	0.0	0.0
SW	0.0104	0.0196	0.0109	0.0	0.0	0.0
WSW	0.0075	0.0077	0.0041	0.0	0.0	0.0
W	0.0022	0.0073	0.0087	0.0	0.0	0.0
WNW	0.0020	0.0027	0.0073	0.0	0.0	0.0
NW	0.0013	0.0082	0.0055	0.0	0.0	0.0
NNW	0.0007	0.0046	0.0014	0.0	0.0	0.0

Indiana Air Pollution Control Law

Chapter 171, Acts of 1961, as amended
Indiana General Assembly

Air Pollution Control Board of the State of Indiana
1330 West Michigan Street
Indianapolis 46206

INDIANA AIR POLLUTION CONTROL LAW

Chapter 171, Acts of 1961 as amended by Chapter 357, Acts of 1969

Be it enacted by the General Assembly of the State of Indiana:

SECTION 1. It is the intent and purpose of this act to maintain the purity of the air resource of the State, which shall be consistent with protection of the public health and welfare and the public enjoyment thereof, physical property and other resources, flora and fauna, maximum employment and full industrial development of the State. The Control Board shall safeguard the air resource through the prevention, abatement and control of air pollution by all practical and economically feasible methods.

It is declared that local and air quality basin control programs are to be supported to the extent practicable as essential instruments for the securing and maintenance of appropriate levels of air quality.

It is further declared that this can be done most effectively by focusing on goals to be achieved by a maximum of cooperation among all parties concerned and that codes, rules and regulations established under the provisions of this act should be clearly premised upon scientific knowledge of causes as well as of effects.

The State Board of Health shall provide assistance on air pollution matters to towns, cities and counties. (As amended by Chapter 357, Acts of 1969.)

SEC. 2. The following terms as used in this Act shall, unless the context otherwise requires, have the following meanings:

(a) "Control Board" is the Air Pollution Control Board of the State of Indiana.

(b) "Person" is any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, municipality, or any other legal entity, or their legal representative, agent or assigns.

(c) "Air Pollution" is presence in the outdoor atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant or animal life or to property, or which unreasonably interfere with the comfortable enjoyment of life and property.

(d) "Air Contaminant" is dust, fumes, gas, mist, smoke, or vapor, or any combination thereof.

(e) "Air Contaminant Source" is any and all sources of emission of air contaminants, whether privately or publicly owned or operated. Without limiting the generality of the foregoing, this term includes all types of business, commercial and industrial plants, works, shops and stores, and heating and power plants and stations, buildings and other structures of

all types, including single and multiple family residences, apartments, houses, office buildings, public buildings, hotels, restaurants, schools, hospitals, churches and other institutional buildings, automobiles, trucks, tractors, buses and other motor vehicles, garages and vending and service locations and stations, railroad locomotives, ships, boats and other waterborne craft, portable fuel-burning equipment, incinerators of all types, indoor and outdoor, refuse dumps and piles, and all stack and other chimney outlets from any of the foregoing.

SEC. 3. There is hereby created an administrative board to be known as the Air Pollution Control Board of the State of Indiana.

The powers and duties of the Air Pollution Control Board shall be vested in a seven (7) member board. The Secretary of the Indiana State Board of Health shall serve as an ex-officio member of said Board. The remaining six (6) members shall be appointed by the Governor, one (1) of whom shall be a physician who holds an unlimited license to practice medicine in the State of Indiana, one (1) shall be a qualified graduate engineer registered in Indiana, one (1) representing agriculture, one (1) representing industry, one (1) representing municipal government and one (1) representing the general public. The appointed members' terms of office shall be four years except that the terms of those first appointed shall expire as follows:

one at the end of one year after date of appointment,
one at the end of two years after date of appointment,
two at the end of three years after date of appointment,
and

two at the end of four years after the date of appointment as designated by the Governor at the time of appointment. The terms of all members shall continue until their respective successors have been duly appointed and qualified. If a vacancy occurs in the appointed membership, the Governor shall appoint a member for the remaining portion of the unexpired term created by the vacancy. The Governor may remove any appointed member for cause. The ex-officio member of the Control Board shall serve without additional compensation. Other members of the Control Board shall be paid mileage and a per diem of fifteen dollars ($15.00) for each and every day, or part of a day, in actual attendance at any meeting or hearing of the Control Board, which per diem and mileage shall be valid claims against the Division of Health and Preventive Medicine of the State Department of Health (also known as the State Board of Health).

The Control Board shall hold at least two (2) regular meetings each calendar year at a place and time to be fixed by the Board. The Control Board shall select at its first meeting following the passage of this Act, one of its members to serve as chairman and another of its members to serve as vice-chairman. At the first regular meeting in each calendar year thereafter, the chairman and vice-chairman for the ensuing year shall be elected. The Secretary of the State Board of Health shall appoint

from the staff of the State Board of Health a qualified sanitary engineer registered in Indiana as technical secretary of the Control Board. He shall receive no additional compensation for such services and during the interim between meetings of the Control Board he shall handle such correspondence, make or arrange for such investigations and surveys and obtain, assemble or prepare such reports and data as the Control Board may direct and authorize. Special meetings may be called by the chairman or by two (2) members of the Control Board by delivery of written notice at the office of each member of the Control Board. Four (4) members of the Control Board shall constitute a quorum.

SEC. 4. (A) Powers and Duties of the Air Pollution Control Board.

The duty and power to administer and carry out the adjudicatory provisions of this Act hereinafter set forth in this Section is hereby vested in the Air Pollution Control Board and such Board is hereby empowered to:

(1) Make investigations, consider complaints and hold hearings.

(2) Enter such order or determination as may be necessary to effectuate the purposes of this Act. If the Control Board shall find that the condition of air pollution exists, as that term is defined herein, such order may require the taking of such action as is indicated by the circumstances to cause the abatement of such condition.

In making its orders and determinations hereunder, the Control Board shall take into consideration all the facts and circumstances bearing upon the reasonableness of the emissions involved including, but not limited to:

(a) The character and degree of injury to, or interference with, comfort, safety, health, or the reasonable use and enjoyment of property;

(b) The social and economic value of the activity causing the emissions; and

(c) The practicability, both scientific and economic, of reducing or eliminating the emissions resulting from such activity.

The order or determination of the Control Board may include such advisory recommendation as the Control Board may deem appropriate for the control of emissions from any air contaminant source and the reduction of the emission of air contaminants.

(3) Adopt and promulgate reasonable rules and regulations consistent with the general intent and purposes of this Act declared in Section 1 hereof and necessary to carry out the provisions and purposes of this Act. All rules and regulations shall be adopted and promulgated in accordance with the provisions of the statutes of this State concerning the establishment and promulgation of rules and regulations.

(4) Bring appropriate action to enforce its final orders or determinations under the Indiana Administrative Adjudication and Court Review Act. Such action shall be brought in the name of The Air Pollution Control Board of the State of Indiana.

(B) Powers and Duties of the State Board of Health.

The duty and power to assist and cooperate with other groups interested in and affected by air pollution is hereby vested in the State Board of Health and such Board is hereby empowered to:

(1) Advise, consult and cooperate with other agencies of the State, towns, cities, and counties, industries, other states and the federal government, and with affected groups in the prevention and control of new and existing air contamination sources within the State.

(2) Encourage and conduct studies, investigations and research relating to air pollution and its causes, effects, prevention, control and abatement.

(3) Collect and disseminate information relating to air pollution, its prevention and control.

(4) Encourage voluntary cooperation by persons, towns, cities and counties or other affected groups in restoring and preserving a reasonable degree of purity of air within this State.

(5) Encourage authorized air pollution agencies of towns, cities and counties to handle air pollution problems within their respective jurisdictions to the greatest extent possible.

(6) Provide technical assistance to towns, cities or counties requesting same for the furtherance of air pollution control.

(7) Represent the State of Indiana in any and all matters pertaining to plans, procedures, or negotiations for interstate compacts in relation to the control of air pollution.

(8) Accept and administer grants or other funds or gifts for the purpose of carrying out any of the functions of this Act.

(9) Enter at all reasonable times in or upon any private or public property except private residences for the purpose of inspecting and investigating conditions relating to the pollution of the air of this State.

(10) Investigate complaints received by it or referred to it by the Control Board, make such reports to the Control Board of its investigations as it deems advisable and participate, on behalf of this State, in proceedings or public hearings before the Control Board.

(11) The State Board of Health is authorized to budget and receive duly appropriated monies for expenditures to carry out the provisions and purposes of this Act.

SEC. 4a. The Control Board shall adopt and promulgate rules and regulations which shall create air quality basins based upon scientific study of geographical, topographical, meteorological data, and shall adopt and promulgate standards for ambient air quality for each basin to effectuate the purposes of this Act. (As amended by Chapter 357, Acts of 1969.)

SEC. 4b. (a) As the state of knowledge and technology relating to the control of emissions from motor vehicles may permit or make appro-

priate, and in furtherance of the purposes of this Act, the Control Board may provide by rules and regulations for the control of emissions from motor vehicles provided that the Control Board shall, prior to the establishment of such rules and regulations pertaining to the control of emissions from motor vehicles, forward to each member of the Indiana General Assembly a copy of such proposed rules and regulations. Such rules and regulations may prescribe requirements for the installation and use of equipment designed to reduce or eliminate emissions and for the proper maintenance of such equipment and of vehicles. Any rules or regulations pursuant to this section shall be consistent with provisions of federal law, relating to control of emissions from the vehicles concerned. The Control Board shall not require, as a condition precedent to the initial sale of a vehicle or vehicular equipment, the inspection, certification or other approval of any feature or equipment, designed for the control of emissions from motor vehicles, if such feature or equipment has been certified, approved or otherwise authorized pursuant to federal law.

(b) Except as permitted or authorized by law, no person shall fail to maintain in good working order or remove, dismantle or otherwise cause to be inoperative any air pollution control system or mechanism which is used solely to control air pollution of a motor vehicle and required by rules or regulations of the Control Board to be maintained in or on the vehicle. Any such failure to maintain in good working order or removal, dismantling or causing of inoperability shall subject the owner or operator to suspension or cancellation of the registration for the vehicle by the Commissioner of the Bureau of Motor Vehicles. The vehicle shall not thereafter be eligible for registration until the emission control equipment of the motor vehicle has been restored, replaced or repaired and is in good working order.

(c) The remedies and penalties provided in this section shall apply to violations hereof, and no provision of Section 7 (b) of this Act shall apply thereto.

(d) As used in this section "motor vehicles" shall mean "vehicle subject to inspection" as defined by Section 2, Subsection (e), Acts of 1967, Chapter 317. (As amended by Chapter 357, Acts of 1969.)

SEC. 5. The discharge into the outdoor atmosphere of air contaminants so as to cause air pollution and create a public nuisance is contrary to the public policy of the State of Indiana and the provisions of this Act.

Air pollution may at certain times and places so seriously affect the public health and so threaten the population as to warrant emergency powers to prevent or minimize disasters of unforeseen proportions. If the technical secretary of the Control Board, in consultation with the Secretary of the State Board of Health of Indiana, determines that air pollution in any area constitutes an unreasonable and emergency risk to the health and safety of those in the area, such determination shall be immediately communicated to the Governor. The Governor may, by proclamation, declare that an emergency exists and order all persons causing or

contributing to the air pollution to reduce or discontinue immediately the emission of air contaminants. Not more than 24 hours thereafter the Attorney General of the State of Indiana, at the request of the Governor, shall initiate injunctive proceedings in the appropriate court against the person or persons causing or contributing to the air pollution to stop the emission of contaminants causing such pollution or to take such other action as may be necessary. If such action is not commenced within such 24-hour period, the Governor's proclamation shall become void. (As amended by Chapter 357, Acts of 1969.)

SEC. 6. The Air Pollution Control Board may hold a hearing with respect to any suspected violation of the provisions of this Act.

(1) upon its own motion,

(2) upon complaint filed with the Board by any person, and

(3) upon complaint filed with the Board by the appropriate officer of any town, city or county or of the State Board of Health.

Notice of hearing, the conduct of such hearing and appeal from any order or decision of the Control Board shall be in accordance with the provisions of the Indiana Administrative Adjudication and Court Review Act, as amended.

SEC. 7. (a) It shall be unlawful to refuse to comply with any rule, regulation or order of the Control Board, or to in any manner hinder, obstruct, delay, resist, prevent or in any way interfere or attempt to interfere with the Control Board of the State Board of Health, and its personnel in the performance of any duty hereunder, or refuse to permit such personnel to perform their duty by refusing them, after proper identification or presentation of written order of the Control Board, entrance at reasonable hours to any premises.

(b) Any person who violates any provision of this Act or any such regulation or order of the Control Board shall be deemed guilty of a misdemeanor and may be punished by a fine of not to exceed five hundred dollars ($500) per act of violation. Each day that the court may find the defendant in violation of the Act shall be a separate offense. (As amended by Chapter 357, Acts of 1969.)

SEC. 8. (a) Nothing within this Act shall prevent towns, cities or counties from enforcing local air pollution ordinances consistent with the provisions of this Act, or from enacting or enforcing more restrictive ordinances to further the expressed purposes of this Act.

(b) For the maintenance of the quality of the air resource, the board of commissioners of any county may enact and enforce ordinances controlling air pollution. Such ordinances shall not include municipalities with an air pollution ordinance pursuant to the provisions of this Act.

(c) Any town, city or county within an air quality basin may administer its air pollution control program in cooperation with one (1) or more town, city or county of this State, in accordance with the provisions of the Interlocal Cooperation Act.

(d) Each air pollution control agency shall submit such annual reports as may be requested by the Control Board.

(e) When an air quality jurisdiction, or administrator thereof, fails to enforce the local ordinance which affords protection to the public equal to that provided by state law, the Control Board, after consultation with that jurisdiction or administrator, may take such appropriate action as may be necessary to enforce applicable provisions of state law. (As amended by Chapter 357, Acts of 1969).

SEC. 9. If any section, subsection, sentence, clause, phrase, or word of this Act is for any reason held to be unconstitutional, such determination shall not affect the validity of any of the remaining portions of this Act.

SEC. 10. This Act shall be in full force and effect on or after January 1, 1963.

NOTE: Since Chapter 357, Acts of 1969, contains an emergency clause, it shall be in full force and effect on or after March 15, 1969.

APPENDIX C

REGIONAL ORGANIZATIONAL STRUCTURE

PURPOSE OF REGIONAL EXAMINATION

An effective air pollution control program must be based on a complete technical evaluation of the conditions in the control area. This evaluation is necessary but not in itself sufficient. The question of political control and administration of the control agency among and within the various jurisdictions is also vital to the development of a functioning program.

Two closely related problems had to be resolved for this Implementation Plan with regard to the acceptability on a political level of its recommendations for an air pollution control regional organization:

1. The MCIAQCR overlaps three states; Ohio, Kentucky, and Indiana, with a total of nine counties in the three states. Instead of one authority which could impose an implementation plan on subordinate political subdivisions, this study dealt with three independent sovereign states. Agreement to cooperate had to be obtained, with no single authority that could force consent.
2. Each part of the MCIAQCR is located in two distinct areas, its state and the region. NAPCA understandably is looking primarily toward a regional plan, because MCIAQCR is one airshed. Each state, however, looks upon its portion of the region as simply a part of the state. Each state board has state-wide responsibility for air quality. The two, three, or four counties of the state which happen to be located in the region are no different, in the eyes of each state board, than any other counties in the state.

These basic problems had been anticipated in the development of the Plan. A methodology was developed by which various organizational alternatives could be tested (Section 3.3). This procedure was carried out to insure that completed Implementation Plans would be both technically and politically feasible.

ORGANIZATIONAL ALTERNATIVES

Four organizational alternatives were considered in performing the political acceptability analysis:

1. Interstate Compact. All control agency functions would be delegated by the states with Federal approval to a central interstate agency.
2. Interstate Agreement. All of the program except legal enforcement, which would be retained by the states, would be handled by an interstate agency. This organization avoids the need for Congressional approval of a compact.
3. Intrastate Enforcement with a Central Cooperating Mechanism. Basic control authority and operations are retained at the state level.
4. County Enforcement with a Central Cooperating Mechanism.

Each of the above, except the compact, provided a number of suboptions which had to be considered. A description of these four basic plans, including legal considerations and the organization's function in the control of emergency episodes was prepared.

These four alternatives were selected to represent possible methods of controlling and administering an air pollution control program in the MCIAQCR. The following analytic effort was undertaken to determine which of these alternatives would be most appropriate in terms of citizen and political acceptance within the Region.

ANALYSIS

In order to determine which of the above alternatives would best meet the needs of the MCIAQCR, it was necessary to present them to a cross-section of area citizens and leaders. A seminar technique was utilized for this purpose since a full explanation of the various organizations could be presented. The seminar also provided a forum for discussion and comments regarding the various alternatives. A seminar was scheduled for each of the three states and a group consisting of members of the state legislature, the state air pollution control board, city officials, and concerned citizens was invited to attend. The seminar plan provided for a morning session in which the alternatives, including their legal implications and plans for emergency episode control were explained. Following lunch, the study team answered questions from the participants and generally noted the reactions to the proposals, and thus got a feedback as to what was considered to be the most acceptable organizational alternative.

The Ohio Seminar was held on April 3, 1970 at the Holiday Inn, Downtown, Cincinnati and although attendance was somewhat below expectations, the meeting was considered to be a success. The participants did react and did provide the staff with clear ideas concerning their views on what was acceptable. To verify whether or not this reaction represented also the feeling of concerned legislative leaders, one staff member met separately with selected legislators.

The substance of the Ohio reaction was that Ohio's agreement to an interstate compact was contingent upon agreement by the other states. The general consensus was that a plan for intrastate enforcement by the state board would be preferred.

The next seminar, scheduled for April 17, 1970 in Indiana, had a substantially larger guest list than that for Ohio. However, in spite of this larger list of invitees, practically no reservations were received even in response to telephone followup. The meeting was therefore canceled. The reasons appeared to be most important: (1) a conflict of dates with another meeting, and (2) indifference to the interstate aspects of air pollution control. Only two small Indiana counties are included in the MCIAQCR, with a total population of 30,000. Other Indiana and Kentucky counties contiguous to these counties are essentially rural, with no serious pollution problems. Furthermore, the state board had been reasonably active for some time, and apparently was thought to be equal to the task.

The Kentucky meeting, April 24, 1970 at the Holiday Inn in Covington, produced a turnout of 50, plus staff. This turnout resulted from several causes: (1) a high level of interest in pollution control, (2) an expanded list of invitees; and (3) inclusion of Indiana residents who had been interested in a meeting, but had not been able to attend when originally scheduled.

The same format was followed as at the Ohio meeting, but with a larger audience, greater participation resulted. The message was unmistakable. Kentucky was proud of its control program, and wanted no part of a compact or any other device that might dilute the authority and responsibility of the State Board. The audience was virtually unanimous in insisting on a state program (alternative 3), with a willingness to cooperate with other states provided this cooperation did not dilute state responsibility. The Indiana citizens shared the Kentucky viewpoint.

The basic objective of this phase of the analysis was thus satisfied with the identification of intrastate control programs with some interstate cooperation as the desired organizational form.

Nevertheless, the two meetings had come to grips only with the basic plan. Assuming control by the state boards in their receptive areas, two questions remained:

1. To what extent, and in what areas, would there be cooperation among the states?
2. Through what mechanism would this cooperation be exercised?

To resolve these problems, a third meeting was called, this time limited to representatives of the three state boards, the City of Cincinnati, one concerned legislator, and representatives of the Ohio-Kentucky-Indiana Regional Planning Authority, the recognized planning agency for the nine counties of the MCIAQCR.

The various representatives quickly agreed that cooperation was necessary. They pointed out that for many months, they had cooperated through an ad hoc device known as the Air Pollution Control Officers Committee.

They also agreed that, to the extent interstate planning would be needed after implementation, this would require an interstate mechanism.

As a group, the meeting failed to define any role for the OKI Regional Planning Authority. This perhaps came about because of the existence of one well-established agency, the City of Cincinnati, in the heart of the region. The City, as will be described more fully in sections 5 and 8 of this report, is recommended as the agent of the State of Ohio under contract for air quality control in the four Ohio counties. It has expertise. It also has a powerful data processing unit, with ample capacity to serve as the regional data bank. The consensus was that the City of Cincinnati agency is a more logical data bank, so that this data can be most useful particularly in emergency episode control.

ORGANIZATIONAL RECOMMENDATIONS

The seminars indicated which of the various organizational alternatives would be politically viable in the MCIAQCR. Based on the procedure described

above, the following general recommendations are presented. (Sections 3, 6, 7, describe in some detail how these recommendations are to be implemented.)

1. Responsibility for air quality control in the MCIAQCR should be lodged in the respective state boards.
2. The Ohio and Kentucky boards should establish district offices within the region, with appropriate staff. Indiana should continue to operate from its present headquarters in Indianapolis.
3. Ohio can best develop a capability by contracting with the City of Cincinnati and other municipal air pollution control agencies to service the four Ohio counties.
4. Coordination of efforts among the three states should be achieved as follows:
    a. The City of Cincinnati, as part of its contract with the Ohio Board, should assume responsibility for maintaining a regional data bank.
    b. The existing Air Pollution Control Officers Committee should continue its existence as a cooperation mechanism.
    c. This Committee should establish its meeting place in the offices of the OKI Planning Authority. The staff of the Planning Authority should be used for staff to the Committee when necessary. Whenever interstate planning or any other unforeseen studies are necessary, the staff of the Planning Authority should be used.
    d. While responsibility for air pollution control rests with the three respective boards, the OKI Regional Planning Authority board is the only existing mechanism for bringing together the elected officers of the counties comprising MCIAQCR. As such, this board could be used as necessary by the state boards as a means of determining local attitudes.
5. Financing of air quality control is a matter for each state board.

EPISODE ORGANIZATION

The Air Pollution Control Officers Committee will have overall responsibility for promoting interstate planning for air pollution episodes. Because the Committee will have numerous, diverse responsibilities, a separate, subordinate organization is expressly recommended for episode planning purposes. This organization will be called the Region Episode Board. The Board will be comprised of one member from each state in the MCIAQCR. It is possible that members of the Committee may serve as members of the Episode Board. Alternatively, a member from the state agency expressly responsible for state episode planning may be a superior candidate for the Board position.

The Board will have planning and operating responsibilities. During the first few years, the Board will be responsible for developing episode avoidance procedures for the Region. Such procedures are briefly outlined in Section 5 of this report. The board will also assume limited responsibilities for actions during episodes. The actions will be in the form of recommendations to each state at the more severe stage of an episode (i.e., actions which have interstate consequences such as restrictions on automobile travel or shutdown of commercial business activity).

The Board will routinely (e.g., bi-monthly) neet to perform the necessary planning functions. During episodes, the Board will conduct emergency meetings when the Alert stage is reached.

The Board will meet in the office of the OKI Planning Authority for routine meetings. Meetings during episodes will be held at the office of the City of Cincinnati air pollution agency or , when developed, the Ohio District Office for the MCIAQCR.

Staff members from the three states will be used to coordinate and conduct background studies for the purpose of developing an Emergency Episode Plan. When possible, members of the OKI staff will also participate.

See Section 5.1.1 for further discussion on the MCIAQCR Episode Organization.

One regional Emergency Operations Control Center (EOCC) will serve the MCIAQCR. The required facilities will be located in the City offices in downtown Cincinnati, Ohio.

The routine operation of the EOCC will be conducted by the City of Cincinnati staff. During non-episode periods, such operations are minimal. The routine watch of air quality and meteorological conditions will be a part-time responsibility of one of the professional staff. Under normal conditions there will be no extensive distribution of air quality or meteorlogical data to any of the state organizations.

The presently active Air Pollution Control Officers Committee will have overall responsibility for promoting interstate planning for air pollution episodes. The Committee will have planning responsibilities during non-episode periods and will participate in decision-making operations during episodes. During an 18 month period after the submission of the Implementation Plan, the Committee will be responsible for developing episode alert procedures for the Region. Such procedures are briefly outlined in Section 5 of this report. The Committee will routinely meet to perform the necessary planning functions. Such meetings will be held at the EOCC.

The manner in which the members of the Committee organize during episodes is dependent upon the size of the geographical area affected by the episode. There are essentially two distinct cases; localized episodes and regionwide episodes. Under both situations, all surveillance information will be received and evaluated by the MCIAQCR EOCC. In the case of a localized episode (i.e., an episode which affects a part of one state), the control officers will communicate via telephone; but episode actions will be taken only by the control official in the state affected. When a regionwide episode occurs, the members of the Committee will meet at the MCIAQCR EOCC to plan unified actions.

The episode organization for the MCIAQCR will operate effectively because of uniformity of episode criteria and control actions by the states. The combined air quality monitoring networks of the three states involved will effectively serve the EOCC.

Staffing and funding the EOCC by the three states is a consideration that will be resolved by the Air Pollution Control Officers Committee. Naturally, each state will contribute agency personnel to help run the EOCC during episodes. The size of the staff and procedures followed will be determined by the Committee and published in the Standing Operating Procedures for the EOCC.

EXISTING INTERSTATE COOPERATION

Representatives of the governmental jurisdictions encompassed by the MCIAQCR are acutely aware of the necessity for a coordinated program to control air pollution in the Region. Following the designation of the Metropolitan Cincinnati Interstate Air Quality Control Region, an Air Pollution Control Officers Committee was formed for the Region. Following are excerpts from the document which established the Metropolitan Cincinnati Interstate Air Quality Control Region Air Pollution Control Officers Committee.

> . . . This document, concurred in by representatives of the air pollution control agencies of the States of Ohio and Indiana, the Commonwealth of Kentucky, and the City of Cincinnati, Ohio, is designated to set forth basic policies of interjurisdictional cooperation in the area designated by the Secretary of Health, Education and Welfare as the Metropolitan Cincinnati Air Quality Control Region (hereinafter referred to as the "Region"). The purpose of this document is to establish a flexible mechanism whereby the control officers within the Region can readily exchange information and data of common interest, and coordinate, insofar as possible, each other's control programs so as to achieve optimum utilization of data and avoid unnecessary expense and duplication of effort. This document is intended to set forth an informal arrangement by and between the control officers of the aforesaid agencies, and the policies expressed herein should not be construed to be official policy of any of the control agencies represented.
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> Policies and Procedures
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> I. Name: The organization shall be known as the Metropolitan Cincinnati Interstate Air Quality Control Region - Air Pollution Control Officers Committee (hereinafter referred to as the "Committee").
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> II. Membership: Representatives of the following governmental air pollution control agencies shall be members of the Committee:
>
> The State of Ohio
>
> The State of Indiana
>
> The Commonwealth of Kentucky

The City of Cincinnati, Ohio

III. Designated Representatives: For purposes of giving notice, meetings, exchanging data and other pertinent information, etc., the following are designated as the Representatives for each respective control agency:

The State of Ohio -

The State of Indiana -

The Commonwealth of Kentucky -

The City of Cincinnati, Ohio -

IV. Federal Representation: Due to the impact of the Air Quality Act on the control efforts of the various agencies having jurisdiction within the Region, and the desire of the representative control officers to be informed of federal activities and available technical assistance which may inure to each other's benefit, it is felt that federal representation on the Committee would be appropriate and advantageous. Therefore, it is mutually agreed that an official of the National Air Pollution Control Administration shall be invited to attend and participate in all activities of the Committee, such official's name upon designation to be appended to this document.

V. Organization, Meetings, Minutes:

A. Organization - The organizational conduct of the Committee meetings shall be as informal as possible. The Committee shall have no permanent chairman or secretary, but shall, at the discretion of the members, delegate such responsibilities and duties in an equitable manner.

B. Meetings - It is felt that the purposes of the Committee

can, for the most part, be achieved by routine correspondence and telephone communications. Therefore, the Committee shall have no regularly scheduled meetings, but shall meet at a mutually agreeable time and place on the call of one of the members when matters of importance arise.

C. Minutes - Minutes of Committee meetings shall be recorded and distributed to the members by the person designated as the secretary for the meeting.

VI. Program Coordination: The representative control officers will attempt, insofar as possible, to establish program efforts within the Region consistent with the following practices and procedures:

A. Reference System - Data points shall be keyed to the Universal Transverse Mercator System referenced to principal coordinates of 39° 12' 30" latitude, and 84° 27' 30" longitude, which locate a central point in the Region in the vicinity of U. S. Interstate I-75 and Amity Road, Cincinnati, Ohio. Graphic presentations of data using a grid system shall be consistent with Universal Transverse Mercator System, with grid size, depending on need, ranging from one to twenty-five square kilometers.

B. Air Quality Monitoring - Preferred general practices for air quality monitoring shall be determined by the Designated Representatives for:

1. Equipment
2. Sampling Schedules
3. Laboratory Procedures
4. Data Reporting Factors

C. Emission Information - Point source emission data shall, insofar, as practicable, be obtained and reported in a consistent manner.

VII. Exchange of Information: It is the intention of the Committee members that information and data of common interest should be freely exchanged between the representative control agencies. Such exchange shall be directed to the Designated Representative for each respective control agency. Without limiting the scope of exchange, the following matters will form the basis of interjurisdictional exchange of information and data:

A. Legislative and Administrative: The representative control agencies shall exchange copies of enabling legislation, adopted regulations or ordinances, annual reports, and any other pertinent information relative to control activities within the Region.

B. Proposed Standards - The representative control agencies shall forward prior to publication copies of proposed ambient air quality and emission standards applicable to any portion of the Region for the Committee member's review and comment. Notice of any public hearings held relative to the adoption of said standards shall be given the Committee through each control agency's Designated Representative.

C. Air Quality Monitoring Data - The representative control agencies shall exchange summary tabulations of air quality monitoring results for each agency's jurisdiction on a periodic basis as such summaries become available.

D. Source Emission Data - Insofar as consistent with the confidentiality requirements of each control agency's enabling legislation, specific point source emission information shall be available for any Committee member's review in the offices of the agency possessing such information. Mass emission data not making specific reference to any particular plant or industry will be freely exchanged between the Committee members through the Designated Representatives.

VIII. Expression of Intent: The undersigned hereby witness that they concur with the aforesaid purposes and objectives, and that they recognize the desirability and indeed the necessity of coordination of technical matters in interstate areas of joint interest and concern. It is understood that no legal liabilities or other binding committments are hereby made, but that a positive intent for cooperation in all the above matters is expressed .

/s/ Samuel I. Lord, Jr. 11/10/69
Kentucky Air Pollution Control Comm.

/s/ A. C. Offutt, M.D. 11/25/69
Indiana Air Pollution Control Board

/s/ E. W. Arnold, M. D. 12/69

Ohio Air Pollution Control Board

/s/ R. L. Krabach 12/69

City of Cincinnati Air Pollution Control Board