EPA 905/2-77-002-A

Emissions Update and Projections For Indiana Air Quality Maintenance Areas

Volume II
Marion County

March 1977

Final Report

U.S. Environmental Protection Agency
Region V
Air and Hazardous Materials Division
Chicago, Illinois 60604

Exhibit B

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA 905/2-77-002A	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Emissions Update and Projections for Indiana Air Quality Maintenance Areas Volume II Marion County		5. REPORT DATE March 1977
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) C. P. Bartosh, B. P. Cerepaka, W. J. Moltz		8. PERFORMING ORGANIZATION REPORT NO. DCN 77-100-044-13-08
9. PERFORMING ORGANIZATION NAME AND ADDRESS Radian Corporation 8500 Shoal Creek Blvd. Austin, Texas 78766		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-02-1383, Task 13
12. SPONSORING AGENCY NAME AND ADDRESS Environmental Protection Agency, Region V Air and Hazardous Materials Division Chicago, Illinois 60604		13. TYPE OF REPORT AND PERIOD COVERED
		14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

This document is one of several volumes.

16. ABSTRACT

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17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
	20. SECURITY CLASS *(This page)*	22. PRICE

EPA Form 2220-1 (9-73)

EPA 905/2-77-002A

EMISSIONS UPDATE AND PROJECTIONS FOR INDIANA AIR QUALITY MAINTENANCE AREAS

VOLUME II

MARION COUNTY

By

Radian Corporation
8500 Shoal Creek Blvd.
Austin, Texas 78766

CONTRACT NO. 68-02-1383 TASK ORDER 13

FINAL REPORT

Prepared for

Environmental Protection Agency
Region V
Air and Hazardous Materials Division
Chicago, Illinois 60604
March 1977

This air pollution report is issued by Region V, Environmental Protection Agency, to assist state and local air pollution control agencies in carrying out their program activities. Copies of this report may be obtained, for a nominal cost, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151.

This report was furnished to the Environmental Protection Agency by Radian Corporation, Austin, Texas, in fulfillment of EPA Contract 68-02-1383 TO 13. This report has been reviewed by Region V, EPA and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Region V Publication No. EPA 905/2-77-002A

ABSTRACT

The implementation of the strategy for reduction of pollutant emissions has resulted in reduced ambient concentrations of TSP and SO_2. Current levels of air quality in Marion County, however, indicate that progress has not been sufficient to attain the NAAQS for TSP. At present, it is not known whether the SIP is in itself insufficient. In order to make this determination, the State of Indiana initiated a review of the current SIP. Radian Corporation was retained to perform an update of the area and point source portions of the review. The update was designed to determine the area and point source emissions at a level of accuracy consistent with the higher level of detail described in the Guidelines for Air Quality Maintenance Planning and Analysis. To determine if problems will be encountered in maintaining air quality standards in the future, the area and point source emissions were projected for the years 1980 and 1985.

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ABBREVIATIONS

AQMA - Air Quality Maintenance Area
CDM - Climatological Dispersion Model
DMD - Department of Metropolitan Development
EF - Emission Factor
EGF - Emission Growth Factor
IAA - Indianapolis Airport Authority
IAPCD - Indiana Air Pollution Control Division
IHCC - Indiana Heartland Coordinating Commission
IRTADS - Indianapolis Regional Transportation And Development Study
NSPS - New Source Performance Standard(s)
SIC - Standard Industrial Classification
SIP - State Implementation Plan
SO_2 - Sulfur Dioxide
TSP - Total Suspended Particulates - for fugitive dust particles emissions are reported for particles < 30 μm

INTRODUCTION

This report documents a study to update and project air pollutant emissions inventories for Indianapolis, Marion County, Indiana. The pollutants studied were total suspended particulates (TSP) and sulfur dioxide (SO_2). The study was divided into an area sources segment and a point sources segment. The area source segment consisted of two parts: the baseyear 1974 inventory and projections for 1975, 1980, and 1985. The area source baseyear inventory is reported in Section 2.0. The projected inventories are described in Section 3.0. The goal of the point sources segment was to project 1975, 1980, and 1985 emissions from a 1974 NEDS-format inventory. Section 1.0 describes the methods and results for the point source projections. Finally both the point and area sources inventories were converted into input format for the Climatological Dispersion Model (CDM). This conversion is described in Section 4.0. The following section summarizes the inventory results for both point and area sources.

SUMMARY

The results of the reported project can be summarized as follows. For point sources the basic goal was to obtain stack-by-stack emission projections for each point source in the existing 1974 NEDS inventory. The methods used and results are included in Chapter 1.0. Summaries were also made of plant-by-plant emissions, county point source emissions, and plant emissions for each SIC. These summaries are included in Appendix E.

For area sources, both a baseyear 1974 inventory and projections were accomplished. The baseyear inventory encompassed some 18 area source categories. Countywide emissions were apportioned into 67 IRTADS grids. County baseyear emissions are reported in Section 2.0. Emission projections were performed using countywide growth factors. The countywide projections were then applied to the baseyear apportioned emissions. The methods used to project each area source category are described in Section 3.0. The gridded emissions are displayed in Appendix E.

Stack-by-stack point source emissions and area source gridded emissions were converted to CDM format. These methods are described in Section 4.0. Computer card decks and related project documentation have limited distribution and were submitted under a separate cover.

RECOMMENDATIONS

The point source projections reported herein were developed from an existing data base. This data base was found to have a variety of errors and omissions. It is recommended that a program of validation be undertaken to support the work documented in this report.

The area source portion of this study involved both establishment of a detailed, gridded inventory plus projections. Although attempts were made to inventory all area source categories rigorously, several items should be noted. First, the fugitive dust categories are difficult to inventory because of the poor precision of emission factors, e.g., reentrainment. This difficulty is even more apparent when attempting to apportion county emissions down into grid squares as small as 1 km. Second, care should be exercised when using the results for modeling purposes. Ideally each area source emissions category in the 1974 inventory is "representative" of 1974. At the county level this is more nearly the case than at the grid level. For example, it was not possible to acquire all year-by-year building construction data. Last, the annual inventory cannot be directly used for other averaging times. For example, several categories are intermittent sources on a daily basis. That is, on one particular day in 1974, the emissions cannot be calculated by dividing the annual tonnage by 365. It is hoped that consideration of these temporal and spatial uncertainies will allow a more beneficial use of the data reported herein.

1.0 POINT SOURCE PROJECTIONS

The purpose of this section is to describe the procedures used and results obtained for the point source emission projections in Marion County, Indiana. The first step in the analysis was to gather data for each point source which could be identified. This activity is described in Section 1.2. The second step in the analysis was to prepare a detailed methodology which could be used to project particulate and sulfur dioxide emissions for each point source. The resulting methodology is discussed in Section 1.3. The third step was to transform the data gathered in Section 1.2 analysis into a form which could be used within the projection methodology. This input data is shown in Section 1.4. The results of these procedures are estimated particulate and sulfur dioxide emissions for each point source in Marion County for the years 1975, 1980 and 1985. These emission estimates are shown in Section 1.1.

1.1 Projected Point Source Emissions

1.1.1 Existing Sources

This section describes the results of the emission projections on a stack-by-stack basis. Data was gathered by the methods described in Section 1.2 for each process which the 1974 NEDS data base reported as a point source. This data (see Section 1.4) was analyzed by the procedures described in Section 1.3. The result of this procedure was a projected particulate and SO_2 emission rate (in tons per year) for each source existing in 1974 for the years 1975, 1980, and 1985. These emission projections reflect a consideration of process growth, emission control equipment, and state and federal regulations.

Compliance with all regulations is assumed. A listing of these projections for Marion County is shown in Table 1-1. These emissions have been rounded off to the nearest ton per year with any emissions less than 0.5 ton per year being reported as zero. The listing includes the following sources:

1) Any source in the 1974 NEDS for which growth data was received, whether or not there were any particulate or SO_2 emissions projected.

2) Any source in the 1974 NEDS for which no plant specific growth data was available but did have particulate and/or SO_2 emissions reported in 1974.

The listing does not include any source for which no plant specific growth data was available and was reported as not having particulate and/or SO_2 emissions in 1974.

1.1.2 New Sources

In addition to the data reported by the facilities with regard to existing source growth, several facilities in Indiana indicated plans for the addition of new processes. The purpose of this data was to estimate particulate and SO_2 emissions generated by new point sources at existing facilities. The results of this analysis in Marion County showed that there were no substantial particulate or SO_2 emissions within this category in 1975, 1980 or 1985.

TABLE I-1. Projected ... at Existing Point Sources in Marion County, Indiana

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	1	1	0	0	0	0	0	0
	1	2	10	0	11	0	12	0
	2	1	0	0	0	0	0	0
	3	1	1	22	1	22	1	23
	3	2	1	14	1	15	1	15
	4	1	0	0	0	0	0	0
	4	2	0	0	0	0	0	0
	4	3	0	0	0	0	0	0
	5	1	53	438	55	459	55	459
	5	2	105	774	128	1045	128	1045
	5	3	13	0	15	0	15	0
	6	2	2	6	2	6	2	6
	7	1	0	0	0	0	0	0
	8	1	85	716	80	866	80	866
	8	2	0	0	0	0	0	0
	8	3	4	0	4	0	4	0
	8	4	4	0	4	0	4	0
	8	5	1	0	1	0	1	0
	8	6	1	0	1	0	1	0
	9	1	0	0	0	0	0	0

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	9	2	0	0	0	0	0	0
	9	3	0	0	0	0	0	0
	9	4	0	0	0	0	0	0
	9	5	0	0	0	0	0	0
	9	6	0	0	0	0	0	0
	9	7	44	273	44	273	44	273
	9	8	27	165	27	165	27	165
	10	1	27	307	27	308	29	339
	10	2	45	272	45	272	50	300
	10	3	17	125	18	127	19	139
	10	4	0	0	0	0	0	0
	10	5	0	0	0	0	0	0
	10	6	0	0	0	0	0	0
	11	1	14	167	15	169	15	169
	11	2	14	167	15	169	15	169
	11	3	14	167	15	169	15	169
	11	4	0	0	0	0	0	0
	11	5	4	1	0	0	0	0
	12	1	19	0	24	0	24	0
	12	2	28	0	36	0	36	0

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	12	3	0	0	0	0	0	0
	14	1	14	29	14	30	15	31
	15	1	6	14	6	14	6	14
	16	1	0	0	0	0	0	0
	17	1	0	4	0	5	0	5
	17	2	4	38	4	42	4	45
	17	3	8	80	9	89	9	95
	17	4	0	0	0	0	0	0
	17	5	3	173	3	193	3	205
	17	6	2	126	2	141	2	150
	17	7	0	0	0	0	0	0
	17	12	0	0	0	0	0	0
	18	1	0	0	0	0	0	0
	19	1	0	0	0	0	0	0
	19	2	0	0	0	0	0	0
	19	3	0	0	0	0	0	0
	19	4	0	0	0	0	0	0
	19	5	0	0	0	0	0	0
	20	1	7	6	7	6	7	6
	20	2	13	0	13	0	13	0

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	21	1	126	378	96	144	87	131
	21	2	178	540	135	205	124	187
	21	3	52	162	52	61	36	56
	22	1	63	518	81	700	81	700
	22	2	0	0	0	0	0	0
	25	1	3	122	3	124	3	127
	25	2	3	122	3	124	3	127
	25	3	0	0	0	0	0	0
	25	4	0	0	0	0	0	0
	27	1	4	0	4	0	4	0
	27	2	2	0	2	0	2	0
	28	1	0	0	0	0	0	0
	28	2	1	3	1	3	1	3
	28	3	0	0	0	0	0	0
	30	1	0	0	0	0	0	0
	30	2	0	0	0	0	0	0
	30	3	0	0	0	0	0	0
	30	4	0	0	0	0	0	0
	31	1	8	62	8	63	8	63
	32	1	159	28	150	30	160	33

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	33	1	0	1	1	4	1	5
	33	2	0	1	1	4	1	5
	33	3	0	1	1	4	1	5
	33	4	0	1	1	4	1	5
	33	5	0	1	1	4	1	5
	33	6	0	1	1	4	1	5
	33	7	0	1	1	4	1	5
	33	8	0	1	1	4	1	5
	33	9	152	866	0	0	0	0
	33	10	0	0	0	0	0	0
	33	11	483	6816	113	1601	95	1335
	33	12	0	1	0	0	0	0
	33	13	464	8049	347	6020	367	6363
	34	1	238	1278	265	1416	265	1416
	34	2	284	1278	316	1416	316	1416
	34	3	48	938	53	1037	53	1040
	34	4	48	938	53	1037	53	1040
	34	5	4	384	5	431	5	431
	34	6	4	384	5	431	5	431
	34	7	0	2	1	4	1	4

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	34	8	0	2	1	4	1	4
	35	1	46	233	0	0	0	0
	35	2	46	333	0	0	0	0
	36	1	2	192	2	225	3	244
	37	1	5	30	5	30	5	30
	39	1	1	0	1	0	1	0
	39	2	27	210	26	206	28	266
	39	3	9	102	11	138	12	152
	39	4	21	303	24	333	26	367
	39	5	0	114	0	274	0	137
	39	6	0	0	0	0	0	0
	40	1	2	2	2	2	2	2
	40	2	2	2	2	2	2	2
	41	1	15	131	15	131	15	131
	41	2	15	131	15	131	15	131
	41	3	15	131	15	131	15	131
	41	4	5	5	6	6	6	6
	42	1	166	1187	66	1147	66	1147
	42	2	101	621	87	669	87	669
	42	3	50	359	54	334	54	334

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	42	4	219	0	234	0	234	0
	42	5	2	0	2	0	2	0
	42	6	0	12	0	13	0	13
	42	7	16	64	6	24	6	24
	44	1	1	0	1	0	1	0
	47	1	0	0	0	0	0	0
	47	2	77	765	77	765	77	765
	47	3	0	0	0	0	0	0
	47	4	0	0	0	0	0	0
	48	1	0	0	0	0	0	0
	48	2	3	21	3	21	3	21
	49	1	0	0	0	0	0	0
	49	2	4	17	4	17	4	17
	49	3	36	278	36	278	36	278
	50	1	0	0	0	0	0	0
	51	1	12	188	11	172	14	215
	51	2	69	493	94	668	104	713
	51	3	0	0	0	0	0	0
	52	1	4	21	4	21	4	21
	52	2	1	1	1	1	1	1

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	52	3	0	0	0	0	0	0
	56	1	40	81	40	81	40	81
	56	2	78	81	78	81	78	81
	56	3	2	42	2	42	2	42
	57	1	0	0	0	0	0	0
	58	1	9	62	9	44	9	44
	58	2	16	107	16	76	16	76
	58	3	17	114	17	80	17	80
	58	4	63	419	61	286	61	286
	58	5	0	0	0	0	0	0
	59	1	2	4	2	3	1	3
	60	1	15	170	14	159	13	148
	60	2	15	170	15	170	15	170
	60	3	15	170	15	170	15	170
	61	1	9	1	0	0	0	0
	61	2	4	16	3	13	3	13
	61	3	4	16	3	13	3	13
	61	4	4	16	3	13	3	13
	61	5	6	0	0	0	0	0
	61	6	8	0	0	0	0	0

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	61	7	0	231	0	0	0	0
	61	8	9	1	0	0	0	0
	61	9	6	0	0	0	0	0
	61	10	8	0	0	0	0	0
	61	11	0	231	0	0	0	0
	61	12	10	2	0	0	0	0
	61	13	7	0	0	0	0	0
	61	14	10	0	12	0	12	0
	61	15	0	271	0	304	0	304
	61	16	9	1	0	0	0	0
	61	17	6	0	0	0	0	0
	61	18	9	0	10	0	10	0
	61	19	0	237	0	261	0	261
	62	1	8	18	8	21	8	24
	62	2	8	18	8	21	8	24
	62	3	8	18	8	21	8	24
	62	4	0	0	0	0	0	0
	62	5	0	0	0	0	0	0
	62	6	0	0	0	0	0	0
	62	7	0	0	0	0	0	0

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	62	8	0	0	0	1	8	17
	62	9	0	0	0	1	8	17
	63	1	1	4	1	4	2	5
	64	1	79	740	90	691	90	691
	64	2	0	0	0	0	0	0
	65	1	9	30	9	30	9	30
	65	2	0	0	0	0	0	0
	66	1	0	0	0	0	0	0
	66	2	0	0	0	0	0	0
	66	3	0	0	0	0	0	0
	68	1	27	0	27	0	27	0
	69	1	0	0	0	0	0	0
	70	1	38	426	19	11	19	11
	70	2	38	426	19	11	19	11
	70	3	38	426	19	11	19	11
	70	4	38	426	19	11	19	11
	70	5	3	11	3	9	2	6
	71	1	0	0	0	0	0	0
	71	2	9	50	18	95	21	109
	71	3	12	115	10	99	10	99

(Continued)

TABLE 1-1 (Continued)

COUNTY NUMBER	PLANT NUMBER	PT. NO.	1975 PARTICULATE EMISSIONS (TPY)	1975 SO2 EMISSIONS (TPY)	1980 PARTICULATE EMISSIONS (TPY)	1980 SO2 EMISSIONS (TPY)	1985 PARTICULATE EMISSIONS (TPY)	1985 SO2 EMISSIONS (TPY)
2640	71	4	3	3	4	4	4	4
	72	1	0	0	0	0	0	0
	73	1	0	0	0	0	0	0
	74	1	0	0	0	0	0	0
	75	1	0	0	0	0	0	0
	76	0	0	0	0	0	0	0
	77	0	0	0	0	0	0	0
	78	0	0	0	0	0	0	0
	79	0	8	352	10	414	10	448

1.1.3 Compliance Analysis

As will be discussed in detail in Section 1.3, each source which emitted particulates or SO_2 was subjected to a comparison with allowable emissions as determined by the Indiana SIP and the federal New Source Performance Standards. The emissions reported in Table 1-1 represent emissions which were calculated assuming complete compliance with all state and federal regulations. There were, however, several sources which when analyzed solely on the basis of projected process parameters would generate emissions greater than those allowed by the regulations. These sources are listed in Table 1-2 along with the projected emissions based on process parameters and the final projected emissions based on regulations.

1.2 Data Acquisition

This aspect of the point source projection procedure involved acquiring both the 1974 baseline emissions and the growth parameters for the 1975, 1980, and 1985 projections. This section, therefore, is divided into a subsection on baseline data and a subsection on projection data. The data acquired by the methods described below were used as input to the projections procedures described in a subsequent section.

1.2.1 Baseline Data

The year which was used as a baseline in these procedures was 1974. The 1974 emission and process parameter data used was that supplied by the Indiana Air Pollution Control Division (IAPCD) in the form of a 1974 National Emissions Data System (NEDS) point source inventory computer tape and a 1974 Emission Inventory Subsystem (EIS) printout.

TABLE 1-2. MARION COUNTY COMPLIANCE ANALYSIS

Plant Number	Point Number	Regulation	Year	Violation: Actual Emissions (TPY)	Violation: Allowed Emissions (TPY)
3	1	4R	75	4	1
		4R	80	4	1
		4R	85	4	1
	2	4R	75	3	1
		4R	80	3	1
		4R	85	3	1
5	1	4R	75	105	53
		4R	80	110	55
		4R	85	110	55
	2	5	75	737	105
		5	80	995	128
		5	85	995	128
	3	5	75	19	13
		5	80	25	15
		5	85	25	15
8	1	13	75	1694	716
		13	80	1044	866
		13	85	1044	866
9	7	13	75	377	273
		13	80	377	273
		13	85	377	273
	8	13	75	227	165
		13	80	227	165
		13	85	227	165
11	1	13	75	214	167
		13	80	218	169
		13	85	218	169
	2	13	75	214	167
		13	80	218	169
		13	85	218	169
	3	13	75	214	167
		13	80	218	169
		13	85	218	169
12	2	5	75	70	28
		5	80	101	36
		5	85	101	36
22	1	4R	75	396	63
		4R	80	167	81
		4R	85	167	81

Continued

TABLE 1-2 (Continued)

Plant Number	Point Number	Regulation	Year	Violation Actual Emissions (TPY)	Violation Allowed Emissions (TPY)
32	1	NSPS	75	226	159
		NSPS	80	249	160
		NSPS	85	273	160
33	9	4R	75	1627	152
		13	75	3074	866
	11	13,NSPS	75	24393	6816
		13,NSPS	80	4070	1601
		13,NSPS	85	3393	1335
	13	13,NSPS	75	59575	8049
		13,NSPS	80	39130	6020
		13,NSPS	85	33679	6363
34	1	13	75	4522	1278
		13	80	4567	1416
		13	85	4412	1416
	2	13	75	3833	1278
		13	80	3872	1416
		13	85	3741	1416
	3	13	75	3317	938
		13	80	3350	1037
		13	85	3235	1040
	4	13	75	3317	938
		13	80	3350	1037
		13	85	3235	1040
	5	13	75	1373	384
		13	80	1387	431
		13	85	1339	431
	6	13	75	1373	384
		13	80	1387	431
		13	85	1339	431
35	2	13	75	498	333
		4R	75	63	46
39	2	13	75	510	210
		13	80	394	206
		13	85	434	266
	3	13	75	164	102
		13	80	175	138
		13	85	192	152
	4	13	75	272	303
41	1	4R	75	75	15
		4R	80	75	15
		4R	85	75	15
	2	4R	75	75	15
		4R	80	75	15
		4R	85	75	15

Continued

TABLE 1-2 (Continued)

Plant Number	Point Number	Regulation	Year	Violation Actual Emissions (TPY)	Violation Allowed Emissions (TPY)
	3	4R	75	75	15
		4R	80	75	15
		4R	85	75	15
42	1	4R	75	593	166
		13	75	1977	1187
	2	4R	75	268	101
	3	4R	75	134	50
		4R	80	144	54
		4R	85	144	54
		13	75	597	359
47	2	4R	75	934	77
		4R	80	234	77
		4R	85	234	77
		13	75	918	765
		13	80	906	765
		13	85	906	765
56	2	4R	75	120	78
		4R	80	120	78
		4R	85	120	78
58	1	4R	75	26	9
		4R	80	20	9
		4R	85	20	9
	2	4R	75	45	16
		4R	80	35	16
		4R	85	35	16
	3	4R	75	43	17
		4R	80	21	17
		4R	85	21	17
	4	4R	75	176	63
		4R	80	131	61
		4R	85	131	61
60	1	4R	75	19	15
		4R	80	18	14
		4R	85	16	13
	2	4R	75	19	15
		4R	80	19	15
		4R	85	19	15
	3	4R	75	19	15
		4R	80	19	15
		4R	85	19	15
62	1	4R	75	9	8
		4R	80	10	8
		4R	85	12	8

Continued

TABLE 1-2 (Continued)

Plant Number	Point Number	Regulation	Violation Year	Violation Actual Emissions (TPY)	Violation Allowed Emissions (TPY)
	2	4R	75	9	8
		4R	80	10	8
		4R	85	12	8
	3	4R	75	9	8
		4R	80	10	8
		4R	85	12	8
	8	4R	85	13	8
	9	4R	85	13	8
64	1	4R	75	863	79
		4R	80	939	90
		4R	85	939	90
68	1	4R	75	88	27
		4R	80	88	27
		4R	85	88	27

When the baseline data was required for a projection, the data shown in Table 1-3 was drawn from the NEDS or EIS data base and was assumed to be correct.

1.2.2 Projections Data

The two types of data which were used for emission projections are 1) growth estimates provided by the emitting facility and 2) growth estimates based on economic growth as projected by the United States Department of Commerce. The first type of data, as provided by the facility, was used whenever possible and the generalized growth factors were used only as a backup when more specific data was not available. The procedures used in obtaining the source specific estimates are discussed in the following section on the Growth Survey and the general factors are discussed in the section on OBERS Estimated Growth.

1.2.2.1 Growth Survey

The growth survey consisted of mailing a two-part questionnaire to each facility listed in the 1974 NEDS point source inventory. These questionnaires were mailed out to these facilities under a cover letter designed by IAPCD and shown in Figure 1-1. Part one of the questionnaire was designed by the IAPCD and Radian and consisted of general questions related to overall plant changes and growth. An example of this part of the questionnaire is shown in Figure 1-2. Part two of the questionnaire was developed by Radian and consisted of a request for growth projections (in the form or projected throughput, fuel use, etc.) for each specific process at the facility. A request was also made for data on any projected new emission sources at these facilities. An example of a completed Part II questionnaire for a facility in Indiana is shown in Figure 1-3.

TABLE 1-3. 1974 DATA AND NEDS LOCATION

Data	Location: Card	Location: Column
County Number	All	3-6
Plant Number	All	10-13
Establishment Name	1	22-61
Point Number	2-6	14-15
SIC	2	18-21
Particulate Control Efficiency	3	53-55
SO_2 Control Efficiency	3	56-58
Operating Time	4	26-30
Particulate Emissions	4	31-37
SO_2 Emissions	4	38-44
Allowable Particulate Emissions	5	18-24
Allowable SO_2 Emissions	5	25-31
SCC	6	18-25
Operating Rate	6	26-32
Maximum Design Rate	6	33-39
Percent Sulfur	6	40-42
Percent Ash	6	43-45

STATE of INDIANA

STATE BOARD OF HEALTH

An Equal Opportunity Employer

INDIANAPOLIS

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46206

Re: Air Pollution Point Source Survey

The Air Pollution Control Division of the Indiana State Board of Health is responsible for preparing a special evaluation of the impact of air pollution in eleven Indiana counties. This objective is part of an overall goal of the Federal EPA to evaluate the attainment of the national ambient air quality standards. A federally-sponsored contractor will assist in the data gathering.

Your company is requested to fill out the enclosed questionnaires as part of an inventory of 1975 emissions and data collection to give an idea of what future emissions may be in 1980 and 1985.

We realize that calculation of growth factors and throughput for 1980 and 1985 will be speculative. We believe, however, that your estimates will be better than the use of nationally-developed growth factors, and that this survey will lead to an accurate estimation of future air emissions.

Please complete and return this form to our office before May 21, 1976. If you have any questions, feel free to contact Sue Schrader, Indiana Air Pollution Control Division, at (317) 633-4814, or at the above address.

Very truly yours,

Harry D. Williams

Harry D. Williams, Director
Air Pollution Control Division

SES/vs

FIGURE 1-1

SURVEY COVER LETTER

QUESTIONNAIRE I

Instructions: Of the following questions, answer those which are pertinent to your operation. Base your answers on your growth projections for the next ten years. If you have more than one plant location, please make out a form for each.

Company Name ____________________ Location ____________________

Person to Contact Concerning Responses ____________________ Phone ____________________

A. General Questions

1. How many employees do you have or estimate you will have for:

   1974 137   1980 135

   1975 135   1985 135

2. What technological advances do you foresee that will affect:

   a. Plant Operating Capacity

      None

   b. Employment

      No change anticipated

3. Given that your company continues to grow, what will your plans be concerning:

   a. Plant Expansion (Do you have available land to expand?)

      No land available - no expansion of steam system currently planned.

   b. Plant Relocation

      1. in county

      2. out of county All electric expansion will be out of the county.

4. If you needed to relocate, and could not expand at your present location, would you prefer land in an industrial park or an individual site? Individual site out of the county.

FIGURE 1-2

EXAMPLE SURVEY FORM - PART I

B. TOTAL FACILITY FUEL USE

1. Amount

	1974	1975	1980	1985
(a) Anthracite Coal	0	0	0	0
Bituminous Coal (Both in Tons/Yr.)	392,245	376,480	418,000	419,000
(b) Distillate Fuel Oil	59	152	300	300
Residual Fuel Oil (Both in Thousand Gal./Yr.)	0	0	0	0
(c) Natural Gas (Million CF/Yr.)	42,390	45,957	Ignition Gas Only	
(d) LP Gas (Thousand Gal./Yr.)	0	0	0	0
(e) Wood (Tons/Yr.)	0	0	0	0
(f) Other (Specify)	0	0	0	0

2. Explain major shifts in fuel use pattern.

3. Sulfur Content (Percent) (as received).

	1974	1975	1980	1985
(a) Anthracite Coal	NA	NA	NA	NA
Bituminous Coal	2.77	3.1	2.82	2.72
(b) Distillate Fuel Oil	.3	.3	.3	.3
Residual Fuel Oil	NA	NA	NA	NA
(c) Other	NA	NA	NA	NA

4. Ash Content (Percent)

	1974	1975	1980	1985
Anthracite Coal				
Bituminous Coal	10.3	11.2		

5. List the vendors of these fuels for 1974.

Fuel	% of Total Purchased	Vendor	Address
Hawthorn Coal	26.9	Peabody Coal	St. Louis, Mo.
Lynnville Coal	9.8	Peabody Coal	St. Louis, Mo.
Enos Blackfoot Coal	63.3	Old Ben Coal Co.	Chicago, Illinois

6. Is the fuel use proportional to plant throughput?

Yes

7. What type of equipment is used for space heating?

Not applicable, steam heating

8. What are your plans for replacement of obsolete fuel burning equipment?

Description of Equipment	Date of Replacement
No replacement planned through 1985	

C. Total Facility Incineration

		Tons/Year Incineration			
1.	Type of Incinerator	1974	1975	1980	1985
	(a) Not applicable	______	______	______	______
	(b) ______	______	______	______	______
	(c) ______	______	______	______	______

2. Is the incineration proportional to plant throughput?

D. Industrial Processes

1. What are the expected process changes between 1974 and 1985 by type, amount, and year?

   Not applicable

2. What are your plans for replacement of obsolete processing equipment which are sources of air pollution?

Description of Equipment	Date of Replacement
______	______
______	______
______	______

3. For 1975, 1980 and 1985, please estimate the % change in total plant production anticipated relative to 1974.

   1975 ______ %   1980 ______ %   1985 ______ %

4. What is the expected use of water to meet State Air Quality Standards (e.g., for air scrubber operation)?

   1975 ______ (gal./yr.)   1980 ______   1985 ______

5. How much particulate matter will you remove and dispose of into sanitary or storm sewers?

   1975 ______ (tons/yr.)   1980 ______   1985 ______

NAME & ADDRESS: CITY: 2040 PAGE 1

PLANT ID: COUNTY: MARION SIC:

1 PN	2 SCC PROCESS	3 SCC CODE	4 THROUGHPUT 1974	5 UNITS/YEAR	6 YEAR	7 GROWTH FACTOR	8 PROJECTED THROUGHPUT	9 PROJECTED CONTROLS TYPE(S)	10 % EFF	11 POLLUTANT
* 01	BOILER 11 coal	1-01-002-02	59000 191,808	TONS BURNED	1975		184,852			
					1980		205,238			
					1985		205,729			
02	BOILER 12 coal	1-01-002-02	59000	TONS BURNED	1975					
					1980					
					1985					
* 03	BOILER 13 coal	1-01-002-02	65000 134,540	TONS BURNED	1975		135,533			
					1980		150,480			
					1985		150,840			
04	BOILER 14 coal	1-01-002-02	65000	TONS BURNED	1975					
					1980					
					1985					

* Boilers share the same stack and have similar characteristics

WHAT IS THE BASIS FOR YOUR GROWTH FACTORS:

FIGURE 1-3

EXAMPLE SURVEY - PART II

The complete questionnaire was then assembled by IAPCD and mailed to each facility in Marion County. The approximate number of facilities surveyed and the number of existing emission points analyzed in Marion County are as follows:

Number of facilities surveyed:	79
Number of points analyzed:[1]	209

Of the approximately 79 questionnaires which were sent to the Marion County facilities, approximately 90 percent were completed and returned. Out of the remaining 10 percent, however, more than one half were sent to facilities which had no previously reported particulate or SO_2 emissions. The effective response, therefore, was about 96 percent.

The values which were used as a basis for projections were the projected throughput or growth factor[2] and the projected emission control efficiency from Part II (Figure 1-3) of the questionnaire. If a facility responded to the survey but did not supply this information, the overall projected plant growth from Part I of the questionnaire (Figure 1-2) was used along with the assumption that the emission control efficiency did not change from that reported for 1974. If neither of these methods was possible, due to no response or an incomplete response, generalized growth factors were used as described in the next section along with the assumption that the emission control efficiency did not change from that reported in 1974.

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[1] These points represent all the points at the facilities responding to the survey and the points which emitted particulates and/or SO_2 in 1974 at the nonresponding facilities.

[2] The growth factor is defined as the throughput in the projection year divided by the throughput in the base year (1974).

1.2.2.2 Generalized Factors

If no facility-supplied growth projections were available, a growth factor had to be developed from generalized economic forecasts for the geographic area containing the facility. The factors used for this purpose were developed from economic projections as reported in OBERS Series E. These growth factors were derived by the following method:

1) Interpolate between 1971 and 1980 earnings as reported in OBERS to find earnings for 1974, 1975, 1980, and 1985 by the following equation:

$$\text{Earnings}_x = \text{Earnings}_{1971} \times \left[\frac{\text{Earnings}_{1980}}{\text{Earnings}_{1971}}\right]^{\left(\frac{x-1971}{9}\right)}$$

where x = the projection year (e.g., 1975)

2) Determine an earnings index for each year based on the following equation:

$$\text{Earning Index Year } x = \frac{\text{Earnings}_x}{\text{Earnings}_{1974}}$$

3) Find an OBERS multiple for 1974, 1975, 1980, and 1985 based on 1971 and 1980 multiples reported in OBERS by the following equation:

$$\text{Multiple}_x = \text{Multiple}_{1971} \times \left[\frac{\text{Multiple}_{1980}}{\text{Multiple}_{1971}}\right]^{\left(\frac{x-1971}{9}\right)}$$

4) Determine a multiples index for each year based on the following equation:

$$\text{Multiple Index}_x = \frac{\text{Multiple}_x}{\text{Multiple}_{1974}}$$

5) Determine a growth factor for each year by the following equation:

$$\text{Growth Factor}_x = \text{Earning Index}_x \times \text{Multiple Index}_x$$

These procedures were followed for each year for each Standard Industrial Classification (SIC) for which OBERS data was available. The OBERS which was used in this analysis were statewide OBERS projections developed for Indiana. A summary of the growth factors determined by these procedures is shown in Table 1-4.

TABLE 1-4. GROWTH FACTORS DEVELOPED FROM OBERS SERIES E

	SIC	1974/ 1974	1975/ 1974	1980/ 1974	1985/ 1974
Mining					
Metal	10	1.0000	--	--	--
Coal	11,12	1.0000	1.0147	1.0917	1.1377
Crude Petroleum, and Natural Gas	13	1.0000	0.9998	0.9987	1.0306
Non-Metallic, Except Fuels	14	1.0000	1.0341	1.2227	1.3166
Manufacturing					
Food and Kindred Products	20	1.0000	1.0206	1.1304	1.2408
Textile Mill Products	22	1.0000	--	--	--
Apparel and Other Fabric Products	23	1.0000	1.0347	1.2269	1.3628
Lumber Products and Furniture	24,25	1.0000	1.0367	1.2417	1.4138
Paper and Allied Products	26	1.0000	1.0445	1.2992	1.5018
Printing and Publishing	27	1.0000	1.0411	1.2734	1.5024
Chemicals and Allied Products	28	1.0000	1.0501	1.3404	1.6775
Petroleum Refining	29	1.0000	1.0336	1.2187	1.4085
Primary Metals	33	1.0000	1.0319	1.2070	1.3149
Fabricated Metals	34,19	1.0000	1.0527	1.3610	1.5843
Machinery, Excl. Electrical	35	1.0000	1.0387	1.2557	1.4216
Electrical Machinery	36	1.0000	1.0544	1.3750	1.7092
Motor Vehicles	371	1.0000	1.0392	1.2599	1.4730
Transportation, Equipment, exc. intr. v.	37 except 371	1.0000	1.0322	1.2091	1.3573
Other Manufacturing	21, 30-32, 38,39	1.0000	--	--	--
Transportation, Communication and Public Utilities	40-49	1.0000	--	--	--

NOTE: "--" indicates not available from OBERS

1.3 Projection Methodology

The following discussion describes the methods used to calculate particulate and sulfur dioxide emissions for the projection years 1975, 1980, and 1985. The basis for these emission projections is as follows:

1) 1974 NEDS data as supplied by the IAPCD.

2) EPA emission factors, AP-42[1].

3) Process growth projections from the growth survey.

4) Emission control equipment projections from the growth survey.

5) Fuel characteristic projections (i.e., % ash and % sulfur) from the growth survey.

6) Emission limitations due to the Indiana SIP (Appendix C).

7) Emission limitations due to New Source Performance Standards (40 CFR 60).

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[1]Environmental Protection Agency, Compilation of Air Pollutant Emission Factors. 2nd ed. AP-42 with supplements, Research Triangle Park, N.C., 1973.

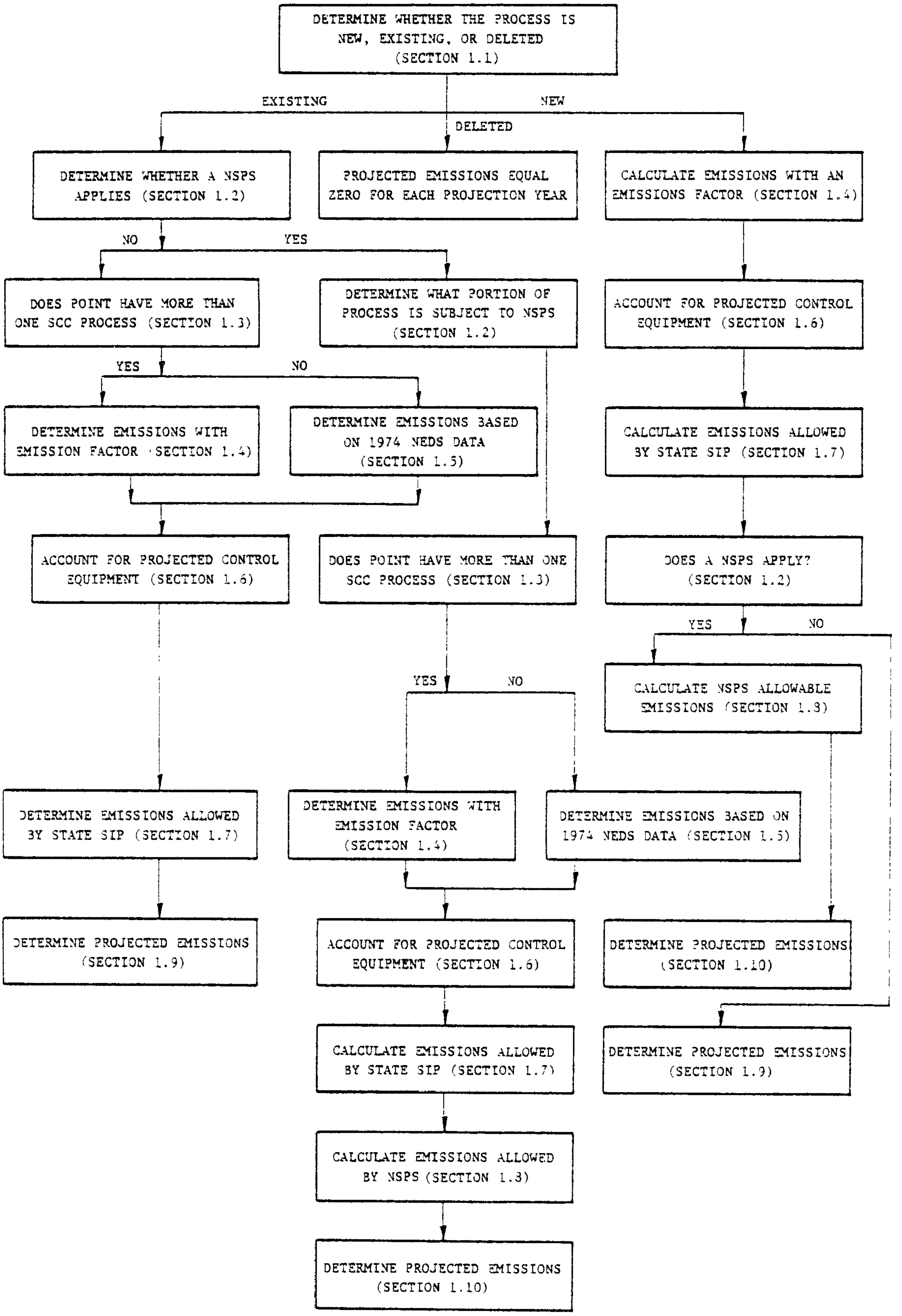

Figure 1-4. Emission Projection Methodology

8) Methods outlined in Guidelines for Air Quality Maintenance Planning and Analysis.[1,2]

9) Emissions' calculation procedures as shown in A Guide to Compiling a Comprehensive Emissions Inventory, APTD 1135.[3]

The projections were made for each SCC process in the 1974 NEDS data base and each new source for which data was reported in the growth survey. An overview of the method used to calculate these emissions is shown in the flow diagram in Figure 1-4. A more detailed discussion of the methods used is contained in the following numbered subsections. Each subsection number can be matched to the numbers contained in the steps shown in Figure 1-4. By using Figure 1-4 and these subsections, a complete methodology can be found for any process. These subsections, therefore, are presented in the order as shown in Figure 1-4 and not necessarily in order of importance, difficulty, or frequency of use.

The procedure outlined in Figure 1-4 and discussed in the subsequent subsections was carried out for every SCC process

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[1] Booz, Allen and Hamilton, Inc., Guidelines for Air Quality Maintenance Planning Analysis, Vol. 7, Projecting County Emissions, 2nd ed. EPA 450/4-74-008, Contract No. 68-02-1005, Task 4. Bethesda, Maryland, Jan. 1975.

[2] Baldwin, T. E. et al., Guidelines for Air Quality Maintenance Planning and Analysis, Volume 13, Allocating Projected Emissions to Subcounty Areas, Final Report, EPA 450/4-74-014. Argonne, Ill., Argonne Nat'l. Lab., Energy & Environmental Systems Div., Nov. 1974.

[3] Environmental Protection Agency (Office of Air and Water Programs), Guide for Compiling a Comprehensive Emission Inventory, revised. APTD-1135. Research Triangle Park, N.C., March 1973.

in every projection year for each pollutant. That is, the procedures were followed once for each projection year (1975, 1980, and 1985) for each pollutant, thereby requiring six iterations through Figure 1-4 for each SCC process. (A total of approximately 1200 iterations were completed for Marion County.) The bulk of the calculations was performed by computer.

1.3.1 Determination of Whether Source is New, Existing, or Deleted

This determination was made on the basis of growth survey data and the 1974 NEDS data base. A new source was defined as any source for which data was supplied in the growth survey response but was not represented in the 1974 NEDS data base. A deleted source is any source which was in the 1974 NEDS but by the growth survey response was shown to no longer be in use after 1974. An existing source is any source in the 1974 NEDS which continued operation in any or all of the subsequent projection years.

1.3.2 Determination of Whether New Source Performance Standards (NSPS) Apply

The first type of case where this analysis was made was on a new source. The SCC number for the process was first compared to a listing of each SCC process for which there is currently or is projected to be an NSPS regulation. If the number was not on the list, NSPS did not apply. If the number was on the list, it was determined whether the process was operational before or after the NSPS became effective. If the process was operating before this date, NSPS are not applicable. If the process began operation after the effective date, it was determined that NSPS did apply. For those sources which were found not to be subject to NSPS, it was assumed that they would have at least a 15 year operational life and would not be subject to the NSPS in any year of the projection period. The listing of SCC processes which was used to determine applicability was derived from the supplement to Volume 13 of the Guidelines (Accounting for New Source Performance Standards in Projecting and Allocating Emissions - Hypothetical Example)[1].

The second type of situation where an NSPS analysis was made was for existing sources. The method used for these processes is that outlined on pages 20 through 23 of Volume 7 of the Guidelines (see Appendix A) and the supplement to Volume 13. The capacity which was used in this analysis was the capacity reported in the 1974 NEDS. Since the capacity was reported in NEDS as an hourly capacity, the annual capacity was determined by multiplying the hourly capacity by the operating time reported in NEDS (see Equation 1-3).

$$\text{Annual Capacity} = \text{Hourly Capacity} \times \frac{\text{weeks operated}}{\text{year}} \times \frac{\text{days operated}}{\text{week}} \times \frac{\text{hours operated}}{\text{day}} \qquad (1\text{-}3)$$

The equipment life was determined to be twice the upper limit equipment life as stipulated in Tax Information on Depreciation,

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[1]Environmental Protection Agency, Office of Air and Waste Management, Accounting for New Source Performance Standards in Projecting and Allocating Emissions, Hypothetical Example. EPA 450/4-74-014 b, A Supplement to Guidelines for Air Quality Maintenance Planning and Analysis--Volume 13: Allocating Projected Emissions to Subcounty Areas (EPA 450/4-74-014).

Publication 534, Department of the Treasury, 1976. The replacement rate on this basis is calculated according to Equation 1-2.

$$\text{Replacement Rate} = \frac{1}{(\text{upper limit life x 2})} \qquad (1\text{-}2)$$

The "expected activity growth" (see Appendix 1) was determined on the basis of growth survey data. On the basis of this data, each process for which an NSPS might be applicable was subjected to the analysis as described in Appendix 1. The calculation of allowable emissions from the data resulting from this analysis will be discussed in Section 1.3.8.

1.3.3 Determination of Whether NEDS Point Has More Than One SCC Process

This step is necessary since the NEDS emissions data cannot be used for projection of emissions at one SCC process if the reported NEDS emissions include more than one SCC process. If the point was comprised of more than one SCC process, projected emissions were calculated on the basis of EPA emission factors (see Section 1.3.4). If, however, the point was made up of only one SCC process, the methods shown in Section 1.3.5 were used. Determination of the number of SCC processes at a NEDS point was made by inspection of the NEDS printout.

1.3.4 Emissions Calculation by Use of Emission Factors

The emission factors which were used in these calculations were EPA factors as reported in EPA publication AP-42.[1]

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[1] Environmental Protection Agency, Compilation of Air Pollutant Emission Factors. 2nd ed. AP-42 with supplements. Research Triangle Park, N.C., 1973.

The emissions which were calculated in this procedure are uncontrolled annual emissions. The equation used in this calculation is shown below as Equation 1-3 for general processes and Equation 1-4 for processes which included % ash or % sulfur in the emission factor.

$$\text{Projected Uncontrolled Emissions (TPY)} = \text{Projected Annual Throughput (SCC units/year)} \times \text{Emission Factor (lb/SCC unit)} \times \frac{\text{ton}}{2000\ \text{lb}} \quad (1\text{-}3)$$

$$\text{Projected Uncontrolled Emissions (TPY)} = \text{Projected Annual Throughput (SCC units/year)} \times \text{Emission Factor (lb/SCC unit)} \quad (1\text{-}4)$$

$$\times\ \%\ \text{ash or sulfur} \times \frac{\text{ton}}{2000\ \text{lb}}$$

1.3.5 Emission Calculation by Use of NEDS Data

The emissions calculated by this method were based on growth survey data and 1974 NEDS data. The basic equations used were the same as those described in Section 1.3.4 (Equations 1-3 and 1-4) except that the emissions factor was found by use of the 1974 NEDS data as shown in Equation 1-5.

$$\text{Emission Factor lb/SCC Unit} = \frac{\text{1974 Emissions } \text{Ton}/\text{Yr}}{\text{1974 Throughput } \frac{\text{SCC Units}}{\text{Yr}}} \times \frac{2000\ \text{lb}}{\text{ton}} \quad (1\text{-}5)$$

Since the desired emissions rate to be calculated in this step was uncontrolled annual emissions, Equation 1-6 also had to be used.

$$\text{Uncontrolled Emissions (TPY)} = \text{Projected Emissions (Equations 1-3 and 1-5)} \times \frac{100}{100 - \text{1974 Control Efficiency (\%)}} \qquad (1\text{-}6)$$

The equation which was ultimately used in this analysis, therefore, is a combination of Equations 1-3, 1-5, and 1-6 and is shown in Equation 1-7.

$$\text{Projected Uncontrolled Emissions (TPY)} = \text{Projected Annual Throughput} \times \frac{\text{1974 Emissions}}{\text{1974 Throughput}} \times \frac{100}{100 - \text{1974 Control Efficiency}} \qquad (1\text{-}7)$$

1.3.6 Accounting for Projected Control Efficiencies

This procedure was used to account for the reduction of predicted uncontrolled emissions due to the control equipment efficiency as projected by the sources and reported in the growth survey. If no control efficiency was projected, the equipment was assumed to be the same as that operating in 1974. The equation used in this calculation is shown in Equation 1-8 below.

$$\text{Projected Controlled Emissions} = \text{Projected Uncontrolled Emissions} \times \frac{100 - \text{Projected Control Eff. (\%)}}{100} \qquad (1\text{-}8)$$

1.3.7 Calculation of Emissions Allowed by State SIP

The quantity of particulate and SO_2 emissions allowed by the Indiana SIP was determined in one of the following two ways:

(1) If the throughput in the projection year was the same as the throughput in 1974, it was assumed that the allowable emissions as reported in NEDS were correct.

(2) If the throughput was not the same as the 1974 throughput as reported in NEDS, the allowable emissions were recalculated using the applicable regulation. The regulations which were used are reproduced in Appendix C.

When it was determined by the methods described in Section 1.3.2 that a portion of the process was subject to a NSPS the State allowables were calculated on the basis of that portion of the throughput which was regulated by State regulations. If the regulations required that a factor be determined which related allowed emissions to process input (e.g., Pt_f: pounds of particulate emissions per million Btu input in APC-4R) on the basis of a total capacity, the total plant capacity was used in all cases.

An example of such a calculation is shown below for a Marion County point source:

<u>Source Description</u>: coal fired boiler (SCC Number 1-02-002-09)

<u>Applicable Regulations</u>:

1) Particulate - APC 4-R, Section 2

$$Pt_f = 0.87 \, Q_m^{-0.16} \quad \text{where}$$

Pt_f = pounds of particulate matter emitted per million Btu heat input.

Q_m = total plant operating capacity rating in million Btu heat input per hour.

For values of Q_m less than 10, Pt_f shall not exceed 0.6 and where Q_m is greater than 10,000, Pt_f shall not exceed 0.2.

2) Sulfur Dioxide - APC 13, Section 2

$$E_m = 17.0\ Q_m^{-0.33} \quad \text{where}$$

E_m = maximum allowable sulfur dioxide emissions in pounds per million Btu fuel heat input.

Q_m = total combustion equipment capacity rating, fuel heat input in millions of Btu per hour.

The value of E_m shall not exceed 6.0 lbs of sulfur dioxide nor shall it be required that E_m be reduced below 1.2 lbs of sulfur dioxide per million Btu of heat input.

<u>Calculation of Allowable Emissions</u>:

1) Particulate -

The total hourly input capacity for the three boilers at this facility is reported in NEDS as 8.43 tons of coal per hour. Q_m, therefore, is found as follows:

Q_m = 8.43 ton/hour x 23 x 10^6 Btu/ton = 193.89 x 10^6 Btu/hour

Pt_f is found from the equation of APC 4R as follows:

$Pt_f = 0.87 \times 193.89^{-0.16} = 0.375$ lb/10^6 Btu

The 1975 coal usage at this boiler was reported by the facility as 2972 tons. The allowable particulate emissions for this point, therefore, is found as follows:

Allowable Particulate Emissions = 0.375 lb/10^6 Btu x 2972 tons/year x 23 x 10^6 Btu/ton x ton/2000 lb

= 12.8 tons per year

2) Sulfur Dioxide

Q_m, as discussed previously, was found to be 193.89 million Btu per hour. E_m, therefore, is found as follows:

$E_m = 17.0 \times 193.89^{-0.33} = 2.989$ lb/10^6 Btu

The 1975 allowable is calculated from fuel use as follows:

Allowable SO_2 Emissions = 2.989 lb/10^6 Btu x 2972 tons/year x 23 x 10^6 Btu/ton x ton/2000 lb

= 102 tons/year

Summary:

The allowable emissions for subsequent years were found by assuming that overall plant input capacity (Q_m) remained constant unless the facility reported projected new equipment within the growth survey. A summary of the data used and allowable emissions calculated for the boiler discussed in this example is shown below for all projection years.

EXAMPLE ALLOWABLE EMISSIONS

Year	Coal Usage (tons)	Pt_f (lb/10 Btu)	E_m (lb/10 Btu)	Allowable Emissions (TPY) Particulate	Sulfur Dioxide
1975	2972	0.375	2.989	13	102
1980	4000	0.375	2.989	17	138
1985	4400	0.375	2.989	19	152

1.3.8 Calculation of Emissions Allowed by NSPS

The annual emissions allowed by the applicable NSPS were calculated on the basis of data presented in the supplement to Volume 13 of the Guidelines (Accounting for New Source Performance Standards in Projecting and Allocating Emissions). This data was in the form of a control efficiency which would be required to comply with the NSPS (an equivalent control efficiency). The allowed emissions, therefore, were calculated by applying this control efficiency to the uncontrolled emissions generated by the process or portion of the process found to be subject to the NSPS by the methods of Section 1.3.2. The equation used in this calculation is shown below as Equation 1-9.

$$\text{NSPS Allowed Emissions} = \text{Projected Uncontrolled Emissions} \times \frac{\text{\% of the process under NSPS}}{100} \times \frac{\text{100-Equivalent Control Efficiency}}{100} \quad (1\text{-}9)$$

It should be noted that if the entire process was found to be subject to an NSPS (i.e., a new process beginning operation after the effective date of the NSPS), the second term on the right side of Equation 1-9 is unity.

1.3.9 Determination of Projected Emissions Where NSPS Do Not Apply

The projected emissions for a process where NSPS do not apply were determined to be the least of the actual controlled emissions based on process parameters (see Equation 1-8) and emissions allowed by the applicable state regulation, if any (see Section 1.3.7). Once the projected emissions had been determined for each SCC process at a point source, they were totaled to find the projected point source emissions. It should be noted that although this procedure assumes compliance with all applicable regulations, it does not consider compliance schedules, conditional variances or other enforcement measures which would permit emissions greater than that specified by the applicable regulation.

1.3.10 Determination of Projected Emissions Where An NSPS Applies

There are two possible cases where this determination must be made: (1) where the entire process is subject to an NSPS and (2) where a portion of the process is subject to an NSPS (see Section 1.3.2) The methods in these two cases are described below.

The Entire Process is Subject to an NSPS: The projected emissions in these cases were assumed to be the least of the actual projected controlled emissions (Equation 1-8), the NSPS allowed emissions (Equation 1-9), and the state allowed emissions (Section 1.3.7). (This assumes compliance with all applicable regulations.)

A Portion of the Process is Subject to an NSPS: In these cases, the SCC process was treated as if it were two processes -- that is, one process subject to state regulations and one process subject to an NSPS. The projected emissions for the state regulated portion of the process were determined to be the least of the projected controlled emissions determined by Equation 1-10 and the state allowed emissions determined in Section 1.3.7.

$$\text{State Regulated Projected Emissions} = \text{Projected Controlled Emissions (from Equation 1-8)} \times \frac{\text{\% of Process under state regulation}}{100} \qquad (1\text{-}10)$$

Once the emissions had been projected by the above methods for each portion of the process, the total projected emissions for the entire process were determined by totaling the projected emissions for each portion.

1.4 Inputs to Projection Methodology

The purpose of this section is to describe the data which was acquired by the methods discussed in Section 1.2 and processed by the procedures of Section 1.3 for Marion County. A listing of the data used in these procedures is shown in Appendix D. A description of the listing format is shown in Table 1-5. The following discussion is to aid in interpretation of this data for 1975, 1980, and 1985. The base year (1974) input data from NEDS is not reproduced herein.

Most of the process data was taken directly from the point source growth survey to be used in conjunction with the 1974 NEDS data base. The only deviation from this procedure was when the percent ash and/or percent sulfur in the fuel to be burned changed from 1974. When one or both of the values changes, the projected process throughput was altered to allow computation of the correct projected particulate emissions in all cases. These alterations are reflected in the entries on the listing in Appendix D. The basis of these alterations is described below:

$$\text{Projected Throughput}_{\text{(Appendix D)}} = \text{Projected Throughput}_{\text{(growth survey)}} \times \frac{\text{Projected \% Ash}}{\text{1974 \% Ash}} \qquad (1\text{-}11)$$

This operation was necessary since the method of calculation of projected emissions where the percent ash was a part of the emission factor (e.g., coal-fired boiler) was based on the following equation:

TABLE 1-5. INPUT DATA DESCRIPTION AND FORMAT

Column Title	Description
C #	Card number: a "1" in this column indicates that the following information is process data; a "2" indicates a comment.
CNTY NUMB	County Number: SAROAD county number.
PLNT NUMB	Plant Number: NEDS plant number.
PT #	Point Number: NEDS point number.
M S	Multiple SCC: an "M" in this column indicates that the point has more than one SCC process.
SCC	Source Classification Code: This is the SCC number for the process being analyzed.
N,D	New, Deleted: an "N" in this column indicates that the source is new (i.e., not the 1974 NEDS); a "D" in this column indicates that the source no longer operates as of 1975 but was included in the 1974 NEDS.
RP, YR	Replacement Year: This column contains the last two digits of the year in which a piece of equipment will be replaced <u>or</u> the year a new source becomes operational.
1975 THRUPUT	1975 Throughput: 1975 throughput as reported on the questionnaire in SCC units (either this value <u>or</u> a growth factor appears for each year of operation for a process with particulate and or SO_2 emissions).
GTH FAC	Growth Factor: $\frac{\text{1975 Throughput}}{\text{1974 Throughput}}$ (either this value <u>or</u> a throughput appears for each projection year for a process with particulate and/or SO_2 emissions).
PRT EFF	Particulate Control Efficiency (%): This number indicates the % particulate control in 1975. A blank indicates no change from 1974. (A decimal should be placed between the last two digits of this value).

Continued

TABLE 1-5 (Continued)

Column Title	Description
SO_2 EFF	SO_2 Control Efficiency (%): This number indicates the % SO_2 control in 1975. A blank indicates no change from 1974. (A decimal should be placed between the last two digits of this value).
1980 THRUPUT	1980 Throughput: 1980 throughput as reported on the questionnaire in SCC units (either this value or a growth factor appears for each year of operation for a process with particulate and for SO_2 emissions).
GTH FAC	Growth Factor: $\frac{\text{1980 Throughput}}{\text{1974 Throughput}}$ (either this value or a throughput appears for each projection year for a process with particulate and/or SO_2 emissions).
PRT EFF	Particulate Control Efficiency (%): This number indicates the % particulate control in 1980. A blank indicates no change from 1974. (A decimal should be placed between the last two digits of this value).
SO_2 EFF	SO_2 Control Efficiency (%). This number indicates the % SO_2 control in 1980. A blank indicates no change from 1974. (A decimal should be placed between the last two digits of this value).
1985 THRUPUT	1985 Throughput: 1985 throughput as reported on the questionnaire in SCC units (either this value or a growth factor appears for each year of operation for a process with particulate and for SO_2 emissions).
GTH FAC	Growth Factor: $\frac{\text{1985 Throughput}}{\text{1974 Throughput}}$ (either this value or a throughput appears for each projection year for a process with particulate and/or SO_2 emissions).

Continued

TABLE 1-5 (Continued)

Column Title	Description
PRT EFF	Particulate Control Efficiency (%): This number indicates the % particulate control in 1985. A blank indicates no change from 1974. (A decimal should be placed between the last two digits of this value).
SO_2 EFF	SO_2 Control Efficiency (%). This number indicates the % SO_2 control in 1985. A blank indicates no change from 1974. (A decimal should be placed between the last two digits of this value).
% SF	Percent Sulfur: This value indicates the % sulfur in the fuel. It only appears for a new source where the emission factor includes the % sulfur. (A decimal should be placed before the last two digits).
% ASH	Percent Ash: This value indicates the % ash in the fuel. It only appears for a new source where the emission factor includes the % ash. (A decimal should be placed before the last digit).
NE	No Emissions: an "N" in this column indicates that the source has no particulate or SO_2 emissions.

$$\text{Projected Emissions} = \text{1974 Throughput} \times \text{Emission Factor} \times \%\ \text{Ash}_{1974} \tag{1-12}$$

$$\times \frac{\%\ \text{Ash}_{\text{Projected}}}{\%\ \text{Ash}_{1974}} \times \frac{\text{Projected Throughput}}{\text{1974 Throughput}}$$

or

$$\text{Projected Emissions} = \text{1974 Emissions} \times \frac{\%\ \text{Ash}_{\text{Projected}}}{\%\ \text{Ash}_{1974}} \tag{1-13}$$

$$\times \frac{\text{Projected Throughput}}{\text{1974 Throughput}}$$

If the percent ash remained constant (i.e., $\%\ \text{Ash}_{\text{Projected}} = \%\ \text{Ash}_{1974}$) then Equation 1-13 reduced to the form shown in Equation 1-14. Since Equation 1-14 was the basis of the automated emissions projection, if the percent ash did not remain constant, the second term in Equation 1-13 ($\%\ \text{Ash}_{\text{Projected}} / \%\ \text{Ash}_{1974}$) was included in the projected throughput of Equation 1-14 by using Equation 1-11. In the cases where the percent ash was projected to change, therefore, the values listed in Appendix D included the second term in Equation 1-13.

$$\text{Projected Emissions} = \text{1974 Emissions} \times \frac{\text{Projected Throughput}}{\text{1974 Throughput}} \tag{1-14}$$

When the throughput was varied as described above, it caused two effects: (1) the projected SO_2 emissions were incorrect and (2) the calculated growth factor was incorrect. In order to correct these values, the following information was entered on the comment cards: (1) a "sulfur factor" which, when multiplied by the calculated SO_2 emissions, yields the correct SO_2 emissions and (2) the correct growth factor. In other cases, only the percent sulfur changed. In these cases the projected throughput and growth factors are correct and only a "sulfur factor" appears in the comment.

A third use of the comment entries is to indicate when actual projected process throughputs were not available and another type of projection was used. In these cases the comment will indicate the basis for the projections (e.g., OBERS projections, total plant growth, etc.) and in which years they were used. The comments also occasionally were used for process description and/or data explanation.

2.0 BASEYEAR AREA SOURCE EMISSIONS

This section describes the methods employed to calculate 1974 area source county and gridded emissions for Marion County, Indiana. Countywide emissions also are included in the text below. Gridded emissions in tabular form have been transmitted to the Indiana APCD. Wherever possible the most detailed inventory methods were used.[1,2] Projected area source emissions are described in Section 3.0.

2.1 Residential Fuels

2.1.1 County Emissions

This category includes fuel consumption at all residential dwellings. The method selected to gather required data was a fuel dealers' survey. The following fuels were surveyed: anthracite and bituminous coal, distillate and residual oil, natural gas, and liquefied petroleum gas (LPG). A mailing list was developed using telephone books, the Indiana Coal Mine Directory, and advice from the Governor's Energy Office and the DMD. The survey also requested total sales, commercial/institutional sales, and industrial fuel sales. Annual sales for 1974 and 1975 were requested along with estimates of 1980 and 1985 sales. Sulfur content of the fuel oils and coal also was requested. Extensive assistance by the State

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[1] Booz, Allen and Hamilton, Inc., Guidelines for Air Quality Maintenance Planning and Analysis, Vol. 7, Projecting County Emissions, 2nd ed., EPA 450/4-74-008, Contract No. 68-02-1005, Task 4, Bethesda, Maryland, Jan. 1975.

[2] Baldwin, T. E. et al., Guidelines for Air Quality Maintenance Planning and Analysis, Volume 13, Allocating Projected Emissions to Subcounty Areas, Final Report, EPA 450/4-74-014, Argonne, Ill., Argonne Nat'l. Lab., Energy & Environmental Systems Div., Nov. 1974.

APCD and the DMD insured that all local and out-of-town dealers serving Marion County were contacted. Appendix B contains the survey cover letter and example questionnaires. Survey results and computed emissions are shown in Table 2-1.

2.1.2 Subcounty Apportionment

To accurately apportion county residential fuel emissions to IRTADS districts, the type of fuel used in each home must be known. Space heating is the largest residential fuel use. Therefore, 1970 census data, count of occupied units by house heating fuel, were chosen.[1] Although these data are reported at the census tract level, the DMD recommended that below the township level the resolution for Marion County was questionable. Therefore, township emissions were apportioned to districts using percentage of dwelling units (DU). This procedure is described below.

For each fuel, county emissions were apportioned to each township by the following equation:

$$\text{Township Emissions} = \text{County Emissions} \times \frac{\text{Township DU}}{\text{County DU}}$$

Township emissions for each fuel were then summed to obtain total residential emissions for each township. Total township emissions were then apportioned to IRTADS districts by the percentage of housing units computed from Table Y in the

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[1] U.S. Department of Commerce, Bureau of the Census, Detailed Housing Characteristics, Indiana, Washington, D.C., GPO.

TABLE 2-1. RESIDENTIAL FUEL SURVEY RESULTS AND EMISSIONS

Fuel	Number of Dealers	1974 Fuel Sales	Emission Factors		County Emissions	
			TSP	SO_2	TSP	SO_2
Natural Gas	1	26,857x10^6ft^3	10 lbs/10^6ft^3	0.6 lbs/10^6ft^3	134 tons	8.1 tons
LPG	9	2,622x10^3gals	1.9 lbs/ 10^3gals	0.02 lbs/10^3gals	2.4	Neg
Distillate Fuel Oil	31	59,078x10^3gals*	2.5 lbs/ 10^3gals	142(0.3) lbs/10^3gals	73.8	1,258
Anthracite Coal	1	24 tons		(included in bituminous)		
Bituminous	4	8,042 tons	21.5 lbs/ton	38(3.1) lbs/ton	86.5	475
					297 tons	1,741 tons

* includes 100,000 gals of residual

Note: For two distillate fuel oil dealers reporting only total sales, the following average of all other dealers was used: 56% Residential, 34% C/I, and 10% Industrial.

publication UPP 500/Work Paper 2.[1] The 1974 housing units were obtained from Table Y by interpolating between the years 1970 and 2000.

2.2 Commercial/Institutional Fuels

2.2.1 County Emissions

The commercial/institutional (C/I) category includes establishments engaged in retail and wholesale trade, schools, hospitals, government buildings, and large apartment complexes. The Standard Industrial Classification (SIC) groups 50-99 encompass the sources in this category. Three data sources were used: the point source survey, the fuel dealers' survey and permits from the files of the Indianapolis APCD.

The permits were for fuel burning equipment greater than 650,000 Btu/hour input. The city supplied a 43 page table of data for almost 600 area source facilities. Radian separated the sources into C/I and industrial sources. The estimated 1974 fuel consumption for each facility was then totaled for each fuel. The permit data represents one portion of C/I area source emissions.

The fuel survey was performed in conjunction with the residential and industrial fuels survey. For each fuel, the commercial/institutional portion was totaled. Some amount of

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[1] Indianapolis, City of, Indiana, Dept. of Metropolitan Development, Div. of Planning and Zoning, Small Area Socio Economic Forecasts for the Year 2000 by Traffic Analysis Zones. Work Paper 2. May 1975.

the total for each fuel is used by point sources. The point source surveys were then analyzed to determine the amount of each fuel dealer's sales sold to C/I point sources. This amount was then subtracted from the total fuel dealer sales. The difference represents fuel dealers' area source usage. These data are shown in Table 2-2. As evident from the table, the C/I point sources in Marion County reported substantially more bituminous coal use than the fuel dealers' sales estimate. Discussions with the Indianapolis APCD led to the conclusion that the supplied permit data would include all C/I coal boilers. Therefore, the permit data have been used.

The last component of C/I area sources is fuel combustion not in the NEDS point source file at point source facilities. These amounts are not substantial because the NEDS point source file contains almost all significant fuel use at these facilities. In general, space heating fuels at these facilities are considered as "area sources". Table 2-3 summarizes these data along with emissions computed from the fuel survey and the permit data.

2.2.2 Subcounty Apportionment

Two basic methods were used to apportion county commercial/institutional emissions to the IRTADS districts. The permitted area source facilities were individually located in each district by address. The area source emissions at point source facilities also were located by address. The remaining area source emissions were allocated to the districts using the distribution of non-manufacturing employees. The employee

TABLE 2-2

COMMERCIAL/INSTITUTIONAL FUELS

1974 FUEL SURVEY AND PERMITS

Fuel	Number of Dealers	(Total Fuel Dealer Sales) −	(Fuel Dealer Sales to C/I Point Sources) =	(Fuel Survey Area Source Fuels) −	(Permitted Area Sources) =	Area Sources Apportioned By Employment
Natural Gas ($10^6 ft^3$)	1	11,884	310	11,574	2,974	8,600
LPG (10^3gals)	6	3,100	-	3,100	-	3,100
Distillate Fuel Oil (10^3gals)	19	51,795	3,416	48,379	7,506	40,873
Residual Fuel Oil (10^3gals)	1	25	-	25	-	25
Bituminous Coal (tons)	4	22,616	38,775	*	20,183	-
Anthracite Coal (tons)	0	-	-	-	-	-

* Negative number indicates that permits should be used.

TABLE 2-3

COMMERCIAL INSTITUTIONAL AREA SOURCE EMISSIONS

Fuel	Area Sources Apportioned By Employment	Emission Factors		Emissions	
		TSP	SO_2	TSP	SO_2
Natural Gas	$8,600x10^6ft^3$	10 lbs/10^6ft^3	0.6 lbs/10^6ft^3	43 tons	2.6 tons
LPG	$3,100x10^3$gals	1.8 lbs/10^6ft^3	0.02 lbs/10^6ft^3	2.8	Neg
Distillate Fuel Oil	$40,873x10^3$gals	2.0 lbs/10^3gals	142(0.3) lbs/10^3gals	40.9	870.6
Residual Fuel Oil	$25x10^3$gals	16.5 lbs/10^3gals	157(1.3) lbs/10^3gals	0.2	2.6
				86.9	875.8
			Permitted Area Sources	32.8	180.2
			Area Sources at Point Sources	6.5	67.3
			County Area Source Emissions	126 tons	1,123 tons

district percentages were computed from Table I' in UPP/500, Work Paper 2[1]. The emissions allocated by each method are summarized in Table 2-3.

2.3 Industrial Fuels

2.3.1 County Emissions

The industrial fuels category includes emissions from all boiler fuel and space heating fuel consumption at manufacturing facilities too small to be point sources. The facilities included are within SIC groups 19-39. The procedures described in the commercial/institutional fuels section are also applicable to industrial fuels.

First the fuel use from industrial sources in the permit data was tabulated by each fuel. The fuel survey results were then tabulated along with industrial point source use by dealers in the survey. It should be noted that several point source fuel suppliers were not in the original fuel survey mailing list. These suppliers were generally out-of-town. Most of these out-of-town dealers sell directly to large (point source) industries in Indianapolis. They do not sell directly to smaller facilities which are area sources. Emphasis was placed on obtaining fuel sales from all local dealers because they sell the bulk of area source fuels. Table 2-4 summarizes the fuel survey results and the permit data.

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[1] Indianapolis, City of, Indiana, Dept. of Metropolitan Development, Div. of Planning and Zoning, Small Area Socio-Economic Forecasts for the Year 2000 by Traffic Analysis Zones. Work Paper 2. May 1975.

TABLE 2-4

INDUSTRIAL FUELS

1974 FUEL SURVEY AND PERMITS

Fuel	Number of Dealers	(Total Fuel Dealer Sales) -	(Fuel Dealer Sales to Point Sources) =	(Fuel Survey Area Sources) -	(Permitted Area Sources) =	Area Sources Apportioned By Employment
Natural Gas ($10^6 ft^3$)	1	9,398	6,887	2,511	645	1,866
LPG (10^3gals)	5	2,145	71	2,074	-	2,074
Distillate Fuel Oil (10^3gals)	8	23,135	8,399	14,736	6,467	8,269
Residual Fuel Oil (10^3gals)	4	14,619	10,777	3,842	623	3,219
Bituminous Coal (tons)	5	2,014,800	2,298,800	*	117	-
Anthracite Coal (tons)	0	-	-	-	-	-

* Negative number indicates that permit data should be used.

The last component of industrial area sources in Marion County is minor fuel combustion at point source facilities. The point source survey results were used to compute the difference between total facility fuel use and fuels listed in the point source file. This difference represents miscellaneous fuel use by small process sources and space heating. Table 2-5 summarizes these emissions along with emissions computed from the fuel survey and the permit data.

2.3.2 Subcounty Apportionment

Two methods were used to apportion county industrial area source emissions to IRTADS districts. The permitted area source facilities were located by street address into the appropriate district. The area source emissions at point source facilities were also lcoated by address. The remaining area source emissions were allocated to the districts using the distribution of manufacturing employees. Percentages were computed from Table I' in UPP/500, Work Paper 2[1]. Table 2-5 summarizes the emissions allocated by each method.

2.4 Mobile Sources - Highway Vehicles

2.4.1 County Emissions

This category includes emissions from vehicular travel on all roads and streets. The required parameter is annual total vehicle miles traveled (VMT). This includes travel by all

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[1] Indianapolis, City of, Indiana, Dept. of Metropolitan Development, Div. of Planning and Zoning, Small Area Socio-Economic Forecasts for the Year 2000 by Traffic Analysis Zones. Work Paper 2. May 1975.

TABLE 2-5

INDUSTRIAL AREA SOURCE EMISSIONS

Fuel	Area Sources Apportioned By Employment	Emission Factors TSP	Emission Factors SO_2	Emissions TSP	Emissions SO_2
Natural Gas	$1,866 \times 10^6 ft^3$	$10 lbs/10^6 ft^3$	$0.6 lbs/10^6 ft^3$	9.3 tons	0.6 tons
LPG	$2,074 \times 10^3$gals	1.8 lbs/10^3gals	0.02 lbs/10^3gals	1.9	Neg
Distillate Fuel Oil	$8,269 \times 10^3$gals	2 lbs/10^3gals	142(0.3) lbs/10^3gals	8.3	176
Residual Fuel Oil	$3,219 \times 10^3$gals	16.5 lbs/10^3gal	157(1.3) lbs/10^3gals	26.6	341
				46.1	517.6
		Permitted Area Sources		16.6	171.3
		Area Sources at Point Sources		126.3	432.1
		County Area Source Emissions		189 tons	1,121 tons

types of road vehicles, both gasoline- and diesel-fueled. In addition to VMT, the vehicle-type mix is desirable to accurately specify the particulate and SO_2 emission factors. Emissions reported in this section include tail pipe exhaust, tire wear, and brake lining wear. Dust entrained from the highway pavement by vehicles is treated in Section 2.14.

To obtain VMT at the county level, daily traffic counts (ADT) for over 2,000 roadway links were converted to VMT and summed. The counts were taken from maps supplied by the Indianapolis DMD. These counts were used to update to the 1974 baseline a 1964 Street Facilities Inventory provided by the DMD on computer cards. In addition, recent counts for state highways provided by the Indiana Highway Commission were used as a check. After computing the individual VMT's for each link and summing, the county total was 11.8 million daily vehicle miles traveled. Annual VMT was computed by multiplying daily VMT times 303.

Vehicle travel mix data was also supplied by the DMD. The following percentages were used:

light duty gasoline vehicles	88% VMT
heavy duty gasoline trucks	6%
heavy duty diesel trucks	6%
	100% VMT

To compute county emission factors, the above percentages are used with 1974 vehicle-specific emission factors from AP-42 as follows:

$$\text{TSP EF} = .88(.54\ \text{g/mi}) + .06(1.21\ \text{g/mi}) + .06(1.6\ \text{g/mi})$$
$$= .64\ \text{g/mi}\ (1.4\ \text{lbs/mi})$$

$$SO_2\ EF = .88(.13\ g/mi) + .06(.36\ g/mi) + .06(2.8\ g/mi)$$
$$= .30\ g/mi\ (0.66\ lbs/mi)$$

The above emission factors can be applied to the annual county VMT to yield:

	Emission Factors		Emissions	
Annual VMT	TSP	SO_2	TSP	SO_2
3.58×10^9	1.4 lbs/mi	0.66 lbs/mi	2,540 tons	1,190 tons

2.4.2 Subcounty Apportionment

The over 2,200 traffic links used to establish the county total VMT were located in IRTADS districts. Links which were coincident with a district boundary were assigned a 50% to one district and 50% to the other. Links which crossed a district boundary were allocated to each district to the nearest 10%. The ADT, and length of each link along with the allocation percentages were coded, keypunched and input to a computer program which performed the calculations. The output was the VMT for each district.

The subcounty variation in vehicle travel mix was unavailable, so the county distribution was assumed for each district. The VMT percentages for each district were then used to apportion county emissions.

2.5 Mobile Sources - Railroad Engines

2.5.1 County Emissions

The primary fuel used by the railroad engines in Indiana is diesel fuel. Emissions were computed for two engine duties: road hauling and switching. To compute emissions, diesel fuel consumption for each engine duty must be obtained. The National

Railroad - Highway Crossing inventory (NRHCI) was selected as the best data source to determine railroad engine activity in Marion County[1].

Fuel used by engines on road hauling operations was computed based on an average fuel consumption of 7.8 gallons per train-mile[2]. The number of train-miles was estimated by using the following procedure. First, using the NHRHI, numbers of road hauling trains per day were tabulated for sixteen track sections in the county. The number of trains per day was then multiplied times the measured length of track to obtain daily train-miles. Multiplying daily train-miles times 365 yielded 600,900 annual train-miles for the county. Using the aforementioned fuel consumption factor, approximately 4.69 million gallons were used in road-hauling operations in 1974.

Switching operations for the county originate at four yards. The quantity of fuel used by these engines was obtained from the diesel superintendent at the Avon, Indiana rail yard, the dispatching point for all railroad fuels in the area. The total trucked to the four Marion County yards was estimated to be 1.2 million gallons in 1974.

Annual emissions from railroad engine operations in Marion County are then as follows:

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[1]U.S. Department of Transportation, National Railroad-Highway Crossing Inventory, Procedures Manual.

[2]U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States: 1975, 96th ed., Washington, D.C., 1975.

Operation	Fuel	Emission Factors TSP	Emission Factors SO_2	Emissions TSP	Emissions SO_2
Road-hauling	$4,690 \times 10^3$gals	$25 \frac{lbs}{10^3 gals}$	$57 \frac{lbs}{10^3 gals}$	59 tons	134 tons
Switching	$1,200 \times 10^3$gals	"	"	15 tons	34 tons
	$5,890 \times 10^3$gals			74 tons	168 tons

2.5.2 Subcounty Apportionment

Subcounty apportionment was accomplished separately for road-hauling and switching operations. Road-hauling emissions were apportioned by (1) measuring the length of track in each IRTADS district, (2) applying track-specific train movements (trains per day) to each measured segment, and (3) computing fuel use and emissions as described above. Switching operations were apportioned in two steps. First, an estimate of actual fuel consumed at each yard was obtained. Each yard was then located in the proper IRTADS district. Next, the amount used by switch engines outside the yards (1,200,000 - 739,000 = 461,000) was apportioned to districts by using switching movements from the NRHCI. The track sections with switching operations were measured into IRTADS districts to obtain switching train-miles per day in each district. The relative number of train-miles was then used to apportion the 461,000 gallons and emissions to each district. Switching operations are summarized below:

Yard	Annual Fuel Use	Apportioned By
Hill	105,000 gals	Location
Transfer	205,000	Location
Hawthorne	275,000	Location
Indy Union	154,000	Location
Outside Yards	461,000	Switching Train-Miles
Total Switching	1,200,000 gals	

2.6 Mobile Sources - Vessels

In Marion County boating is limited to pleasure crafts on Geist Reservoir. Discussions with local representatives have led to the conclusion that pleasure boating contributes a very insignificant amount of particulate and sulfur dioxide emissions. Generally, it can be assumed that the predominant power source for vessels on Geist Reservoir is the gasoline outboard engine. The conclusion regarding the insignificance of emissions from this category is due to the nature of the fuel and the exhaust characteristics of outboard marine engines. Gasoline fuel has relatively low sulfur content, less than 0.1%. Exhausts from outboards are below the waterline, thus providng an extremely efficient scrubbing mechanism for particulates. In addition, some outboard engines require low or no-lead gasoline, thus reducing particulate emissions significantly.

An estimate of gasoline consumption by outboards in Marion County can be made based on state total sales for marine uses in Highway Statistics, 1974[1]. This document reports 19.173 million gallons sold in Indiana in 1974. Apportioning this to Marion County on the basis of inland water surface area as found in Area Measurement Reports, Areas of Indiana[2] yields the following:

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[1] U.S. Department of Transportation, Federal Highway Transportation, Highway Statistics. Washington, D.C., GPO, 1973.

[2] U.S. Department of Commerce, Bureau of the Census, Area Measurement Report, Indiana, 1960. GE 20, No. 16, Washington, D.C., GPO, February 1967.

	Inland Water	Marine Gasoline
State	102 sq. miles	19.173 million gallons/year
Marion County	1.8 sq. miles	.338 million gallons/year

Particulate emissions from the 338,000 gallons are negligible; sulfur oxides emissions are about 1.1 tons.

2.7 Mobile Sources - Aircraft

2.7.1 County Emissions

The data for aircraft operations were obtained from the Indianapolis Airport Authority (IAA) and the Metropolitan Airport System Plan, Work Paper 1.[1] The total aircraft operations per type of aircraft for Weir Cook Airport and Eagle Creek Airport were provided by the IAA.[2] The Airport System Plan supplied the number of based aircraft for thirteen other air facilities. Using Eagle Creek's operations and number of based aircraft, a value for operations per based aircraft was calculated. The operations were then estimated for the other air facilities using their based aircraft and the value for operations per based aircraft.

The necessary emission factors and number of engines per type of aircraft were obtained from AP-42. The summarized results are presented below:

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[1](Arnold) Thompson Associates, Aviation Consultants, Metropolitan Airport System Plan, Physical and Statistical Inventory. Work Paper 1/Job 570. March 1974.

[2]Orcutt, Daniel C., Private Communication, Indianapolis Airport Authority, Weir Cook Municipal Airport, 6 March 1975.

County Total Operations	Emissions	
	Particulates	Sulfur Dioxide
503,600	58.8 TPY	73.8 TPY

2.7.2 Subcounty Apportionment

Each air facility was located into the proper IRTADS district. Table 2-6 summarizes the data applicable to each airport and computed emissions.

2.8 Mobile Sources - Other Off-Highway Fuels

2.8.1 County Emissions

This category includes diesel and gasoline consumed by internal combustion engines in six subcategories: agricultural equipment, industrial equipment, construction equipment, lawn mowers, snow mobiles, and motorcycles. The methodology used for Marion County was to obtain county estimates made by the National Air Data Branch (NADB). The NADB data has been calculated using the area source fuel apportioning program, ASFAP. The ASFAP estimates county fuel consumption and emissions for the six subcategories defined above. The years of record for these estimates vary from the 1969 Census of Agriculture to 1972. The estimates shown below should also be representative of 1974.

FUEL	MARION COUNTY	EMISSION FACTORS		EMISSIONS	
		TSP	SO_2	TSP	SO_2
Gasoline	8,235,000 gallons	10.7 $\frac{\text{lbs}}{\text{10 gals}}$	5.6 $\frac{\text{lbs}}{\text{10 gals}}$	44 tons	23 tons
Diesel	7,000,000 gallons	33.3 $\frac{\text{lbs}}{\text{10 gals}}$	29.8 $\frac{\text{lbs}}{\text{10 gals}}$	117 tons	104 tons
				161 tons	127 tons

TABLE 2-6
1974 AIRCRAFT OPERATIONS AND EMISSIONS

	Percentage Aircraft Type	Operations/ Year	No. of Engines	LTO's*	Particulate EF (lbs/LTO-eng)	Particulate Emissions (tons)	Sulfur Dioxide EF (lbs/LTO-eng)	Sulfur Dioxide Emissions (tons)
Weir Cook Airport								
Air Carrier	100	102,570						
Jumbo Jet	0		4	0	1.30	0.0	1.82	0.0
Long Range Jet	2		4	1,026	1.21	2.48	1.56	3.20
Medium Range Jet	86		2.26	44,105	0.41	20.43	1.01	50.33
Turbo-Prop	12		2	6,154	1.10	6.77	0.40	2.46
Air Taxi	100	18,100						
Piston Transport	33		1.5	2,987	0.56	1.25	0.28	0.62
Turbo-Prop	67		2	6,063	0.20	1.26	0.18	1.09
Military	100	10,000						
Piston	14		1	700	0.28	0.09	0.14	0.04
Jet	3		2	150	0.31	0.04	0.76	0.11
Helicopter	80		1	4,000	0.25	0.50	0.18	0.36
Turbo-Prop	3		2	150	1.10	0.16	0.41	0.06
General Aviation	100	246,286						
Business Jet	3		2	3,695	0.11	0.40	0.37	1.36
Turbo-Prop	7		2	8,620	0.20	1.72	0.18	1.55
Piston Transport	60		2	36,943	0.56	20.68	0.28	10.34
Piston	30		1	73,885	0.02	0.73	0.01	0.51
TOTAL Weir Cook Airport		377,000				56.6		72.1
Other Fields		126,600				2.2		1.7
County Emissions						58.8 tons		73.8 tons

*LTO - Landing Takeoff cycle = 2 operations

Agricultural uses of diesel and gasoline have been estimated using the number of tractors and an average fuel consumption of 1,000 gals/yr.[1] The *Census of Agriculture* reports 1,037 tractors at farms in Marion County, about 70% gasoline-fueled, those purchased before 1965, and 30% diesel-fueled, those purchased after 1964.[2] Assuming a small decrease in number of tractors between 1969 and 1974, the tractor fuel use for 1974 is estimated to be 300,000 gallons diesel and 700,000 gallons gasoline. Emissions from agricultural uses were apportioned to IRTADS districts based on the distribution of harvested acreage in the county (refer to Section 2.11). Emissions from the remaining other off-highway fuels were apportioned using total employment.[3] The emissions allocated by each method are shown below.

AGRICULTURAL USES	CONSUMPTION	EMISSION FACTORS		EMISSIONS	
		TSP	SO_2	TSP	SO_2
Gasoline	700,000 gals	10.7 $\frac{lbs}{10^3 gals}$	5.6 $\frac{lbs}{10^3 gals}$	3.8 tons	2.0 tons
Diesel	300,000 gals	33.3 $\frac{lbs}{10^3 gals}$	29.8 $\frac{lbs}{10^3 gals}$	5.0 tons	4.5 tons
				8.8 tons	6.5 tons

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[1] Booz, Allen and Hamilton, Inc., *Guidelines for Air Quality Maintenance Planning and Analysis, Vol. 7, Projecting County Emissions*, 2nd ed. EPA 450/4-74-008, Contract No. 68-02-1005, Task 4, Bethesda, Maryland, Jan. 1975.

[2] U.S. Department of Commerce, Bureau of the Census, *1969 Census of Agriculture, Volume 1, Area Reports, Part II, Indiana, Section 2, County Data.* Washington, D.C., GPO, March 1972.

[3] Indianapolis, City of, Indiana, Dept. of Metropolitan Development, Div. of Planning and Zoning, *Small Area Socio-economic Forecasts for the Year 2000 by Traffic Analysis Zones.* Work Paper 2. May 1975.

REMAINING	EMISSIONS	
	TSP	SO_2
Gasoline	44-3.8=40.2 tons	23-2=21 tons
Diesel	117-5.0=112 tons	104-4.5=99.5 tons
TOTAL	152.2 tons	120.5 tons

2.9 Solid Waste Disposal - Open Burning

2.9.1 County Emissions

In 1974, only residential open burning was allowed in Marion County. Therefore commercial/institutional and industrial open burning emissions are zero. Emissions from residential on-site open burning have been provided by the Indianapolis Air Pollution Control Division. The results of this study are summarized here. A copy of the communication supplied to Radian is included in the Appendix B. The Indianapolis APCD study indicates that by mass balance, approximately 18% of trash generated at one and two dwelling unit residences is disposed on-site. The total is 47,800 tons annually. In addition, an estimate of the quantity of leaves burned is included in this study. The results of this study are summarized below.

TYPE	QUANTITY	EMISSION FACTORS		EMISSIONS	
		TSP	SO_2	TSP	SO_2
Trash	47,800 tons	35 $\frac{lbs}{ton}$	.5 $\frac{lbs}{ton}$	836.5 tons	12 tons
Leaves	5,686 tons	46.5 $\frac{lbs}{ton}$		132.5	Neg.
				969 tons	12 tons

2.9.2 Subcounty Apportionment

The county emissions presented above were allocated to townships in the City APCD report. Radian apportioned these into IRTADS districts by the distribution of dwelling units. See Section 2.1.

2.10 Solid Waste Disposal - Incineration

2.10.1 County Emissions

On-site incineration occurs in Marion County at food and department stores, schools, hospitals, and other establishments. In this report all residential on-site disposal is considered open burning rather than incineration. See Section 2.9. It is also assumed that all incinerators in the county are permitted. Therefore, permit file data from the City APCD has been used to quantify emissions from this category. An additional component of area source incineration is incineration at point source facilities. Radian's point source survey requested data on incineration. The amounts incinerated are included here if the incinerator(s) was not in the NEDS point source file. The tables below summarize these quantities.

	Commercial/Institutional	Industrial
At point sources	577 tons	2,818 tons
Schools	22,399 tons	
Other	6,778 tons	1,542 tons
	29,754 tons	4,360 tons

CATEGORY	QUANTITY	EMISSION FACTORS TSP	EMISSION FACTORS SO_2	EMISSIONS TSP	EMISSIONS SO_2
Commercial/ Institutional	29,754	$8\frac{lbs}{ton}$	$2.5\frac{lbs}{ton}$	120 tons	37 tons
Industrial	4,360	$8\frac{lbs}{ton}$	$2.5\frac{lbs}{ton}$	17 tons	5 tons
				137 tons	42 tons

2.10.2 Subcounty Allocation

Each facility operating an incinerator was located by street address in the appropriate IRTADS district.

2.11 Agricultural Tilling

This section considers dust generated by agricultural tilling operations. Emissions were estimated using the following equation from AP-42:

$$EF = 1.12\ s/(\frac{PE}{50})^2, \text{ where}$$

EF = suspended dust emission factor for particles <30 μm (lbs/acre-tilled)

s = silt content of soil

PE = Thornwaites precipitation - evaporation index (PE=106 for Marion County)

The required parameters are (1) acreage tilled and (2) silt content of soil. Information for 1974 on field crops in Marion County is presented on the following page:[1]

[1] Kahlo, Clarke R., Private communication, City of Indianapolis, Department of Metropolitan Development, 30 Sept. 1976.

CROP	ACRES HARVESTED	AVERAGE TILLING OPERATIONS	ACRES TILLED
Corn	29,700	3.5	104,000
Soybeans	25,000	3.5	87,500
Wheat	5,900	2	11,800
Oats	900	2	1,800
Hay	5,600	2	11,200
TOTAL	67,100		216,300

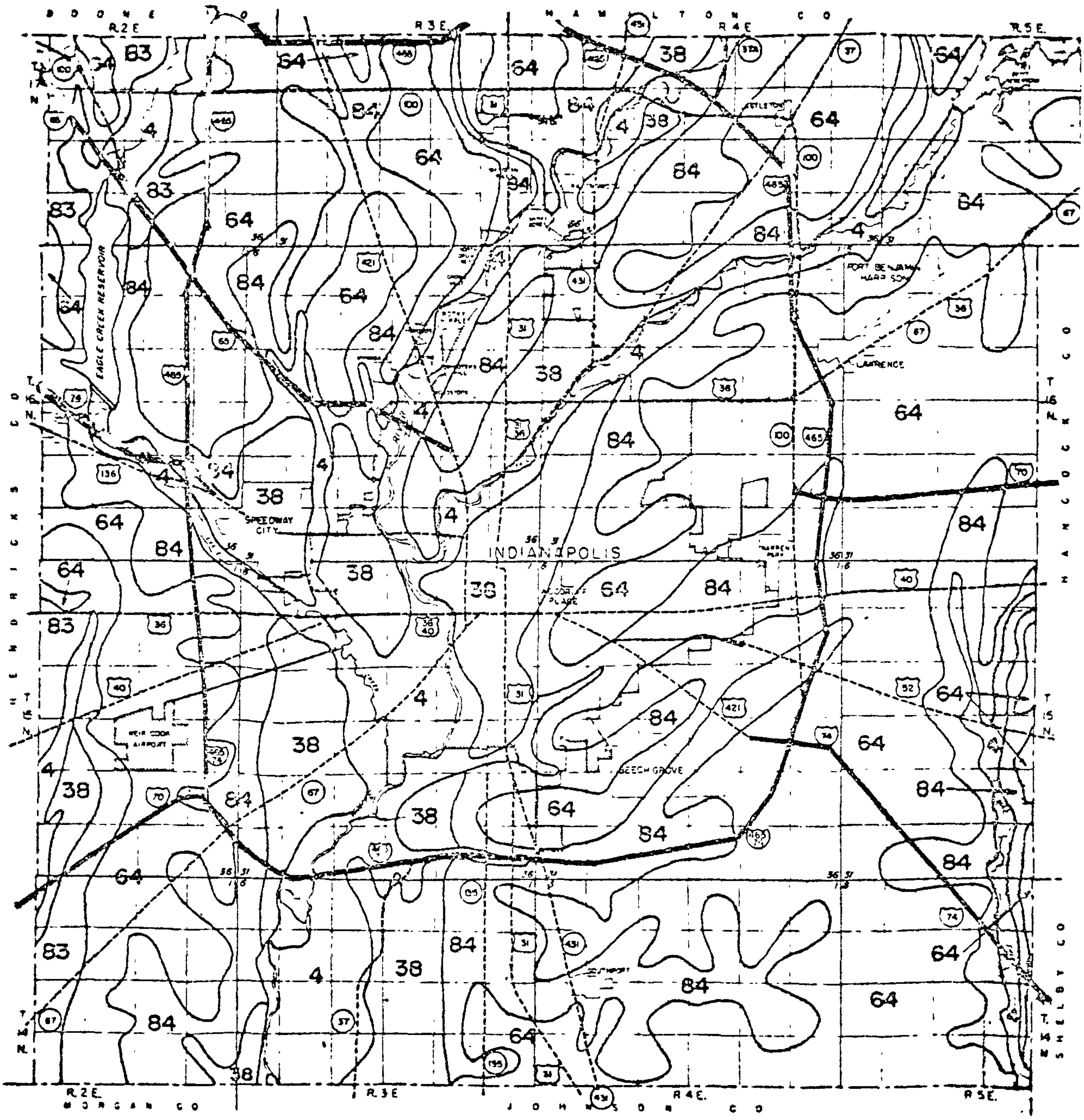
The silt content varies across the county. See Figure 2-1. To compute county emissions the following grid specific calculations were performed. First, the IRTADS district map was superimposed on the soil map (Figure 2-2). Then the average silt content for each district with farm land was estimated. Next, the district emission factor was computed. Emissions for each district were then computed by measuring the fraction of agricultural land in each district. This fraction was applied to the county acres-tilled which was 216,300. Emissions for each district were summed to yield county emissions of 1,410 tons.

2.12 Heavy Construction Activities

This category includes dust created by mechanical activity at building and major highway construction sites in Marion County. The data requirements are the acreage, duration, and location of the projects, the soil silt content, and Thornwaite's precipitation-evaporation index (PE).

A uniform ucontrolled emission factor was used for all construction activities in the county. A PE=106 and a silt content = 52.5% was used to adjust the construction emission factor as recommended in AP-42. The resulting emission factor for Marion County is

$$EF = .04\ (52.5)/(106/50)^2$$
$$= 0.46 \text{ tons/acre-month.}$$



SOIL	AVERAGE SILT %
4	50
38	52.5
64	57.5
83	62.5
84	50

SOURCE: Sinclair, H. Raymond, Jr., Private Communication, U.S. Soil Conservation Service, Indianapolis, IN, 5 March 1976.

FIGURE 2-1

GENERAL SOIL MAP AND SILT CONTENTS

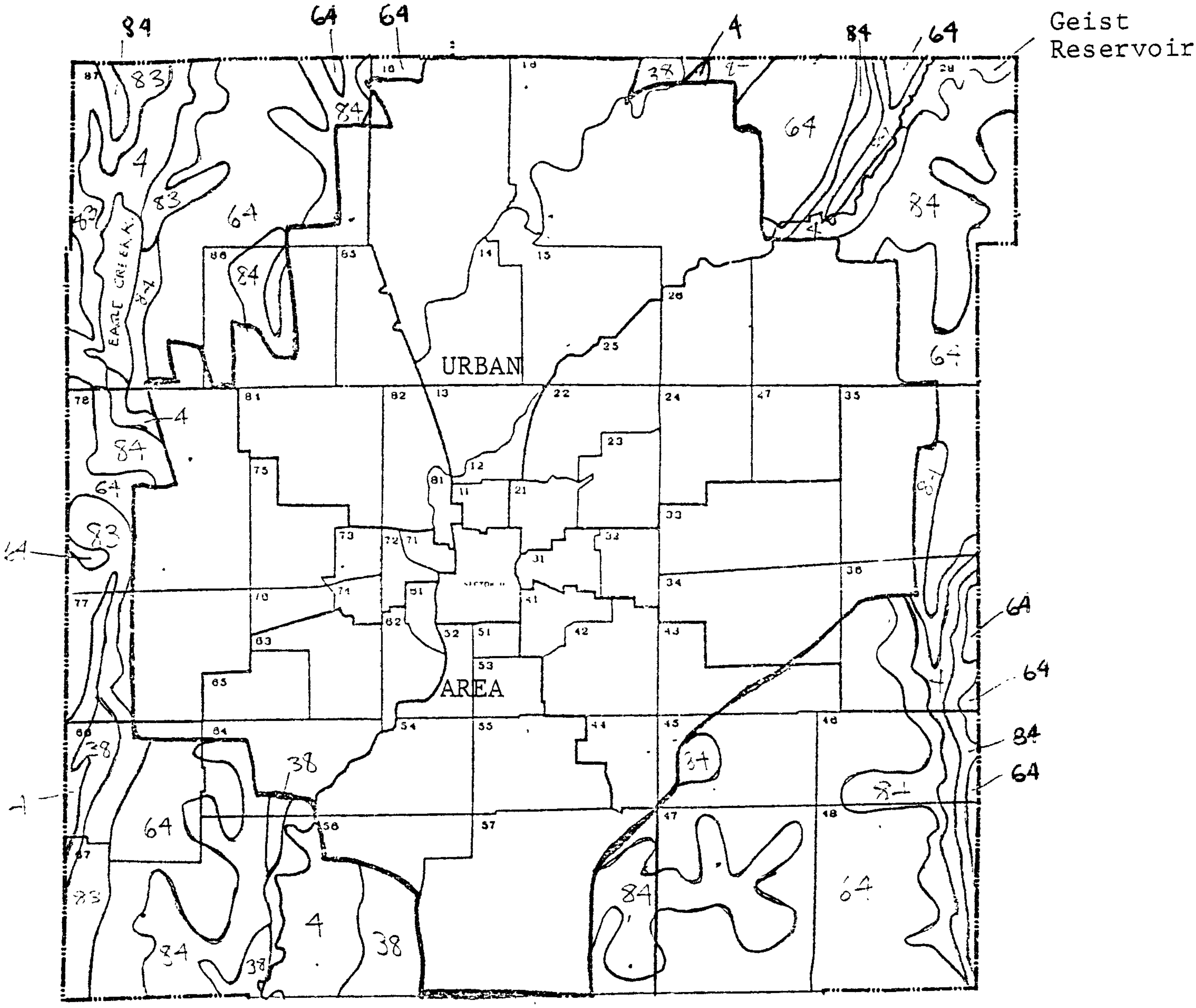


FIGURE 2-2

SOILS OF AGRICULTURAL AREA ON
IRTADS DISTRICT MAP

For building construction, very detailed information was supplied by the DMD. A county map was provided which showed all building construction sites and acreages. The sites were identified as single family, multi-family, industrial and commercial. For the residential sites, DMD could not specify the actual period of construction at each site. It decided to use the acreages to represent a two-year average (1974 and 1975) at each site. Therefore, it was assumed that the 6-month development period occurred 3 months in 1974 and 3 months in 1975. Except for industrial sites, a cut-off project size of 10 acres was selected. The duration of dust-creating activities at commercial and industrial sites was assumed to be 11 months.[1]

Highway construction information was supplied by the Indiana State Highway Commission. Six major sites totaling 13.3 miles were identified. An estimate of 300 feet was used to compute acreage. Dust-creating activities were assumed to take place at these sites during a 6-month period in 1974. The watering program used for dust prevention was assumed to have been 50% effective. The following summarizes heavy construction for the county.

TYPE	ACRES	MONTHS	ACRE-MONTHS	EMISSION FACTOR	EMISSIONS
Highway	484	6	2,900	.23 lbs/acre-month	668 tons
Industrial	46.5	11	512	.46	232
Commercial	202	11	2,222	.46	1,022
Residential	418	3	1,254	.46	576
					2,500 tons

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[1]Cowherd, Chatten C., Jr., Christine M. Guenther, and Dennis D. Wallace, Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites. EPA-450/3-74-085, PB 238-919. Kansas City, Mo., Midwest Research Inst., Nov. 1974.

Each project was located into the appropriate IRTADS district by address.

2.13 Fugitive Dust Vehicles

Fugitive dust occurring from travel over both paved and unpaved roadways is included in this section. Discussions with city agency personnel concluded that no significant travel on unpaved roads occurs in Marion County, except for trucks traveling over the landfill sites in the county. Vehicular travel over paved roads also creates some amount of dust by the action of tires on loose roadway particles. This source is referred to as dust re-entrainment. Although AP-42 at this time has no published emission factor for re-entrainment, a background study for emission factor development has been conducted in Kansas City and reported.[1] In the referenced study emission factors are reported based on vehicle miles traveled and land use. The factors range from 1.2 g/mi to 11 g/mi. The applicability of these factors to Indianapolis roads is not known. Rather than biasing the inventory through use of land-use dependent factors, a constant factor (1.2 g/mi) has been chosen to estimate emissions for Marion County. This factor is reported to be applicable to roads in commercial areas. Since the factor is also climate dependent, a correction factor has been applied as shown below.

$$EF = 1.2 \text{ g/mi } (225/265) = 1 \text{ g/mi}$$

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[1]Midwest Research Institute, Quantification of Dust Entrainment from Paved Roadways, Draft Final Report. EPA Contract No. 68-02-1403, Task 7. Kansas City, Mo., March 1976.

where 265 is the number of "dry days" per year in Kansas City and 225 in Indianapolis.[1] The 1 g/mi factor was applied to the VMT for each IRTADS district (see Section 2.4) County emissions equal 3,944 tons.

Another type of vehicular fugitive dust source was identified in the county, garbage trucks traveling over landfill sites. Dust is generated by the travel made on trips to a dumping location at the sites. Using data on six sites provided by DMD (see Appendix B), the following emission calculations have been made:

EF = (.6)(.81)s (V/30) (d/365) where

EF = uncontrolled emission factor (lbs/NMT)

S = silt content (assume 52%)

V = vehicle speed (assume 20 mph)

d = annual number of "dry days" (assume 225).

Also assume 50% control for water and/or oil application. Annual truck travel was computed assuming 260 days per year (5 days per week). The following summarizes emissions for the six sites.

IRTADS GRID	LANDFILL SITE	ANNUAL TRAVEL	EMISSION FACTOR	EMISSIONS
43	2700 S. Emerson	883 VMT	5.7 lbs/VMT	2.5 tons
62	2561 Kentucky	1,970	5.7	5.6
62	2102 S. Harding	39	10.4	.2
54	3400 S. Harding	7,800	5.7	22.3
52	4600 Bluff Road	286	5.7	0.8
36	2401 Senour Rd.	8,840	5.7	25.2
				56.6 tons

[1] National Climatic Center, Local Climatological Data. Asheville, N.C. (1973-1975).

These emissions were included in the entrainment gridded emissions.

2.14 Wind-Blown Dust

2.14.1 County Emissions

This section includes dust suspended due to wind erosion of farm land. Wind erosion can be quantified using a wind erosion equation such as shown below.[1,2]

$$E = IKCL'V'$$

where: E = an emission factor for total wind erosion (ton/acre/yr). It should be noted that this represents total wind erosion and not just suspended particulates. An adjustment of E to account for this will be discussed subsequently.

I = soil erodibility index (tons/acre/yr). This factor is a measure of maximum soil erodibility under worst conditions. The subsequent terms serve to reduce this index.

K = roughness factor (dimensionless). This factor takes into account surface roughness

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[1] Cowherd, Chatten, Jr., et al., Development of Emission Factors for Fugitive Dust Sources, Final Report. EPA-450/3-74-037, Contract No. 68-02-0619. Kansas City, Mo., Midwest Research Inst., June 1974.

[2] Woodruff, N. P. and F. H. Siddoway, "A Wind Erosion Equation", Soil Science Society of America, Proc. 29(5), 602-08 (1965).

which tends to dissipate wind energy and trap particles.

C = climatic factor. This parameter relates soil erodibility to meteorological conditions.

L' = unsheltered field width factor (dimensionless). This parameter is a function of actual field width (L) and soil erodibility (I).

V' = vegetative cover factor (dimensionless). This parameter is a function of actual quantities of crop residue left on a field while it is bare (V) in lb/acre, roughness factor (K), field width factor (L') and climatic factor (C).

Substitution of typical parameters into the above equation yield emission factors in the range 23-29 lbs/acre. This assumes that 2.5 percent of eroded soil stays suspended. Annual emissions are computed by assuming that agricultural land is subject to wind erosion for 3 months of the year. A county-wide erosion factor of 25 lbs/acre has been used:

ACREAGE	EMISSION FACTOR	EMISSIONS
67,100	25 lbs/acre (3/12)	210 tons

2.14.2 Subcounty Apportionment

County emissions were apportioned to IRTADS districts using the factors developed for agricultural tilling. See Section 2.11.

2.15 Process Losses

Estimates of actual process particulate emissions for fourteen industries in Marion County were provided by the City APCD from their permit files. Emissions from these non-point sources totaled about 153 tons. The sources were located in IRTADS districts by street address. The individual source emissions are listed in Table 2-7.

2.16 Structural Fires

This category includes emissions from building fires. The DMD has provided a county-wide estimate of 3,474 for 1974. An average emission factor per fire has been computed as follows. Assuming 4.25 tons combusted per fire and open burning emission factors weighted as 90% wood and 10% automobile components, the emission factors are:

$$TSP = \left[(0.9 \times 17) + (0.1 \times 100)\right] \times 4.25 = 108 \text{ lbs/fire}$$

$$SO_2 = \left[(0.9 \times 0.00) + (0.1 \times 0.5)\right] \times 4.25 = 0.2 \text{ lbs/fire}$$

The emissions are then as shown below:

Number of Fires	Emission Factors		Emissions	
	TSP	SO_2	TSP	SO_2
3,474	108 lbs/fire	0.2 lbs/fire	187 tons	.35 tons

2.17 Negligible and Uninventoried Categories

The following categories are negligible combustion sources of particulate and sulfur dioxide emissions in Marion County in 1974: forest fires, slash burning, and agricultural

TABLE 2-7. UPDATE OF PERMITTED NON-POINT SOURCES

Source Names	Tons/Year
Asphalt Mix Products	5.0
Asphalt Surfacing Company	3.0
Astro Paving, Inc.	22.0
Dundee Cement Company	0.562
Ertel Manufacturing Company	10.4
Glass Container Corporation	77.6
Harding Paving	13.0
Indiana Auto Shreders	7.1
Rite Mix Corporation	0.379
Suits Foundry, Inc.	2.8
Superior Coffee and Tea	0.937
Asphalt Surfacing Company	6.48
Acme-Evans Company	0.3
Spickelmier Industries	3.6
	153.2

burning.[1] Potential sources of fugitive dust such as unpaved parking lots, unpaved alleys, street sweepers, etc., were not inventoried in this project.

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[1]Wagner, Philip A., III, Private Communication, Indiana Department of Natural Resources, 15 June 1976.

3.0 PROJECTED AREA SOURCE EMISSIONS

This section describes the methodologies used to project 1974 base year countywide area source emissions to 1975, 1980, and 1985. The 1974 and 1975 inventories are identical except for two categories: agricultural tilling and wind-blown dust. Therefore, the following chapters will describe projections for a 10-year period with 1980 being an interim year. The methods described below rely on population growth, employment, etc. For each area source category, pollutant and year, emission growth factors (EGF) were computed, which when multiplied times the base year emissions yield future year emissions. The county EGF was also applied to the gridded baseyear emissions described in Section 2.

3.1 Residential Fuels

The important parameters required to project residential fuels are housing losses, housing gains, and the types of heating fuels. The DMD has provided IHCC estimates of population growth for Marion County and the nine townships. DMD has recommended that 75% of new housing will be all electric, and 25% will be heated with oil.

The remaining unknown is the number of housing losses, especially among those "older" homes heating with coal and oil. The population change for Center Township is slightly downward (6% decrease from 1975 to 1985). It can be assumed that the decrease will represent coal and oil heated housing losses. This 6% decrease will be applied to Center Township base year emissions. The other townships combined will have a net 8.6% population increase between 1975 and 1985. The emission growth factor will be 8.6% x .25 = 2.2%. The resulting emission projections are shown below.

	1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
	TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
Center Township	148.9 tons	842.4 tons	-.94	140	792	-.94	140	792
Other Townships	148.1	899.6	1.013	150	911	1.022	151	919
County Total	297 tons	1,742 tons		290	1,703		291	1,711

Growth factors were computed based on the IHCC population forecasts shown below.

	1975	1980	1985
Center Township	239,537	225,200	225,012
Other Townships	551,509	579,154	599,174
Marion County	791,046	804,354	824,186

3.2 Commercial/Institutional Fuels

The emissions from this category have been projected using employment forecasts from IHCC provided by the DMD. Non-manufacturing employment has been projected to increase approximately 20%. The resulting emission projections are shown below.

	1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
	TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
Marion County	126 tons	1,123 tons	1.084	137	1,217	1.197	151	1,344

	1975	1980	1985
Non-Manufacturing Employment	277,977	301,264	332,727

3.3 Industrial Fuels

Industrial fuel emissions have been projected using manufacturing employment forecasts from IHCC. The results are shown below.

	1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
	TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
Marion County	189 tons	1,121 tons	1.006	190	1,128	1.008	191	1,130

	1975	1980	1985
Manufacturing Employment	113,363	114,097	114,296

3.4 Mobile Sources - Highway Vehicles

Projections of county emissions for this category have been using VMT projections previously supplied to USEPA by the DMD. Emissions growth factors account for VMT increase and projected emission factors as follows:

Emission Factors (AP-42), Appendix D.7)[1]

1980		1985	
TSP	SO_2	TSP	SO_2
.47	.20	.41	.19

Travel

1975 daily VMT = 9,005,800
1985 daily VMT = 11,752,200

1980 VMT/1975 VMT = 1.152   1985 VMT/1975 VMT = 1.305

1980 TSP EGF = (.47)/(.59) x 1.152 = .918
SO_2 EGF = (.20)/(.23) x 1.152 = 1.002

[1] Environmental Protection Agency, Compilation of Air Pollutant Emission Factors. 2nd ed., AP-42 with supplements. Research Triangle Park, N.C., 1973.

$$1985\ TSP\ EGF = (.41)/(.59) \times 1.305 = .907$$
$$SO_2\ EGF = (.19)/(.23) \times 1.305 = 1.078$$

These growth factors applied to 1974 emissions yield the projected emissions shown below. It also has been assumed that 1974 VMT and emissions equals 1975 VMT and emissions.

1975 Emissions		1980 Emissions		1985 Emissions	
TSP	SO_2	TSP	SO_2	TSP	SO_2
2,530 tons	1,190 tons	2,322	1,192	2,294	1,283

3.5 Mobile Sources - Railroad Engines

Railroad engine emissions have been projected to increase corresponding to total employment in Marion County. The resulting projections are shown below.

1974 Emissions		1980 Emissions			1985 Emissions		
TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
74 tons	168 tons	1.061	78	178	1.142	85	192

Total Employment	1975	1980	1985
	391,340	415,361	447,023

3.6 Mobile Sources - Vessels

No significant change in emissions is expected from boating in Marion County. About 1 ton of sulfur dioxide is projected for 1980 and 1985.

3.7 Mobile Sources - Aircraft

Aircraft emission projections have been made for Weir Cook Airport based on estimates of future air traffic by the IAA.[1] Emissions from the other air fields in the county were also projected using the projected emissions for Weir Cook as growth factors.

WEIR COOK	1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
CATEGORIES	TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
Commercial	32.2 tons	57.7 tons	1.22	39.2	70.2	1.39	44.8	80.1
Civilian	23.6	13.8	1.14	27.0	15.8	1.20	28.4	16.6
Military	.8	.6	1.0	.8	.6	1.13	.9	.7
	56.6 tons	72.1 tons		67.0			74.0	97.4

WEIR COOK OPERATIONS	1975	1980	1985
Commercial	122,500	149,000	170,000
Civilian	246,560	281,600	297,000
Military	10,000	10,000	11,250

3.8 Mobile Sources - Other Off-Highway Sources

Emissions from the sources in this category have been projected to increase proportionally to population growth in Marion County (see Section 3.1).

1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
161 tons	127 tons	1.02	164	129	1.04	168	132

---

[1]Orcutt, Daniel C., Private Communication, Indianapolis Airport Authority, Weir Cook Municipal Airport, 6 March 1975.

3.9 Solid Waste Disposal - Open Burning

Residential open burning has been projected assuming business as usual and a constant per capita burning rate. Therefore, population growth will be the emission growth factor as shown below.

1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
969 tons	12 tons	1.02	988	12	1.04	1,008	13

3.10 Solid Waste Disposal - Incineration

Incineration is divided into commercial/institutional and industrial subcategories. Projections have been made using non-manufacturing and manufacturing employment as the growth factors (see Sections 3.2 and 3.3).

	1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
	TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
C/I	120 tons	37 tons	1.08	130	40	1.20	144	44
Ind.	17	5	1.006	17	5	1.008	17	5

3.11 Agricultural Tilling

Fugitive dust emissions from tilling operations have been projected based on extrapolation of total harvested acreage in Marion County. From 1955 to 1975, harvested acreage of corn, soy beans, wheat, oats, and hay decreased from 83,100 to 61,600. This trend is reflected in the emission projections below.

	1974	1975	1980	1985
Acres Harvested:	67,100	61,600	57,800*	53,900*
TSP Emissions:	1,410 tons	1,290	1,210	1,130

*Regression equation using 1955, 1960, 1965, 1974, and 1975 acreage: projected acres = 121,000 - (790) (Year - 1900)

3.12 Heavy Construction Activities

Emission projections for this category have been made for the four subcategories: highway, residential, commercial, and industrial. No substantial change has been predicted in commercial and industrial construction.[1] Therefore, projected emissions will be the same as for 1974. Residential construction in the county should decrease due to land availability. The DMD has predicted that annual residential land consumption between 1975 and 1980 should be about 30 percent less than the 1970 to 1975 period.[2] This 30 percent decrease should be applicable to the residential construction acreage also. A 30 percent decrease between 1980 and 1985 also seems appropriate.

Highway construction estimates have been made for 1980 and 1985 by the Indiana Highway Commission.[3] These estimates are shown on the following page with projected emissions.

[1] Schmidt, Eric J., Private Communication, State Board of Health, Indianapolis, Indiana, 25 October 1976.

[2] Indianapolis, City of, Indiana, Dept. of Metropolitan Development, Div. of Planning and Zoning, Population, Housing and Residential Land Consumption/1980. Work Paper 4. July 1976.

[3] Bolyard, F. Sterling, Private Communication, State of Indiana, Urban Planning Dept., 6 Feb. 1976.

Project Type	1975 Emissions TSP	1980 Emissions EGF	1980 Emissions TSP	1985 Emissions EGF	1985 Emissions TSP
Highway	668 tons	.15	100 tons	.20	135 tons
Residential	576	.70	403	.70	403
Commercial	1,022	1.0	1,022	1.0	1,022
Industrial	232	1.0	232	1.0	232
	2,500		1,860		1,890

1980 Highway Construction: 2 miles

1985 Highway Construction: 2.7 miles

3.13 Fugitive Dust-Vehicles

Fugitive dust from vehicles traveling over paved roads has been projected using the increase in county VMT. The resulting emissions are shown below. Emissions from trucks traveling to the landfill sites over unpaved roads were estimated to be the same as 1974.

	1975 Emissions	1980 Emissions EGF	1980 Emissions TSP	1985 Emissions EGF	1985 Emissions TSP
Re-entrainment	3,950 tons	1.15	4,450 tons	1.30	5,140 tons
Unpaved Roads	56	1.0	56	1.0	56

3.14 Wind-Blown Dust

Wind erosion emissions have been projected using the estimated harvested acreage as described in Section 3.11. The resulting dust emissions are shown below.

	1974	1975	1980	1985
Acres	67,100 tons	61,600 tons	57,800 tons	53,900 tons
Emissions	206	189	177	165

3.15 Process Losses

Emissions from processes have been estimated to change proportioned to manufacturing employment. The small increase in manufacturing employment yields a negligible emissions growth for this category.

3.16 Structural Fires

The number of building fires has been projected based on county population. These results are shown below.

1975 EMISSIONS		1980 EMISSIONS			1985 EMISSIONS		
TSP	SO_2	EGF	TSP	SO_2	EGF	TSP	SO_2
187 tons	.4 tons	1.017	190	.4	1.042	195	.4

4.0 CDM CONVERSION

This section describes the methods used to translate the emissions into input format for the Climatological Dispersion Model (CDM). The methods are described below for point source projections and area sources. The computer card format for the CDM is shown in Table 4-1.

4.1 Point Sources

The conversion of stack-by-stack emission projection was performed using a deck of stack parameters and UTM coordinates supplied by the IAPCD. The conversion was not direct since the NEDS-based stack-by-stack projections did not correspond to each CDM "stack". Those cases which a correspondence could not be made were reported as such in the documentation accompanying the card decks. Card decks were generated for 1975, 1980, and 1985 emissions.

4.2 Area Sources

Conversion of gridded emissions from the IRTADS district system into CDM format involved the following steps. First, a CDM grid system was selected. This grid system is portrayed in Figure 4-1. It consists of 124 square grids: sixteen 1-square km grids, sixty 4-square km grids, and forty-eight 16-square km grids.

Next, the areas of the IRTADS districts were apportioned into the CDM grids. This was performed for each IRTADS district such that the entire area of Marion County was apportioned into the square CDM grids. The measured apportioning factors are shown in Table 4-2. The horizontal axis of this

TABLE 4-1. CDM INPUT FORMAT

Card No.	Column	Format	Contents
100[a]	1 to 6	F6.0	X(X map coordinate of the southwest corner of the area emission grid, or if appropriate, the X map coordinate of a point source)
	7 to 13	F7.0	Y (Y map coordinate of the southwest corner of the area emission grid, or if appropriate, the Y map coordinate of a point source)
	14 to 20	F7.0	TX (Width of an area grid square in meters. It is important that no entry be made in the case of a point source.)
	21 to 36	2F8.0	S1-S2 (Source emission rate in grams per second for the two pollutants)
	37 to 43	F7.0	SH (Stack height in meters)
	44 to 49[b]	F5.0	D (Diameter of stack in meters)
	50 to 56[b]	F7.0	VS (Exit speed of pollutants from stack in meters per second)
	57 to 63[b]	F7.0	T (Gas temperature of stack gases in degrees centigrade)
	64 to 68[b]	F5.0	SA (If this field is blank, Briggs' formula is used to compute stack height. Otherwise, the product of plume rise and wind speed is entered in square meters per second.)

[a] There will be as many cards of this type as there are area and point sources. The next card type will arbitrarily be numbered 1000.

[b] Needed for point sources only. Leave blank on area source cards.

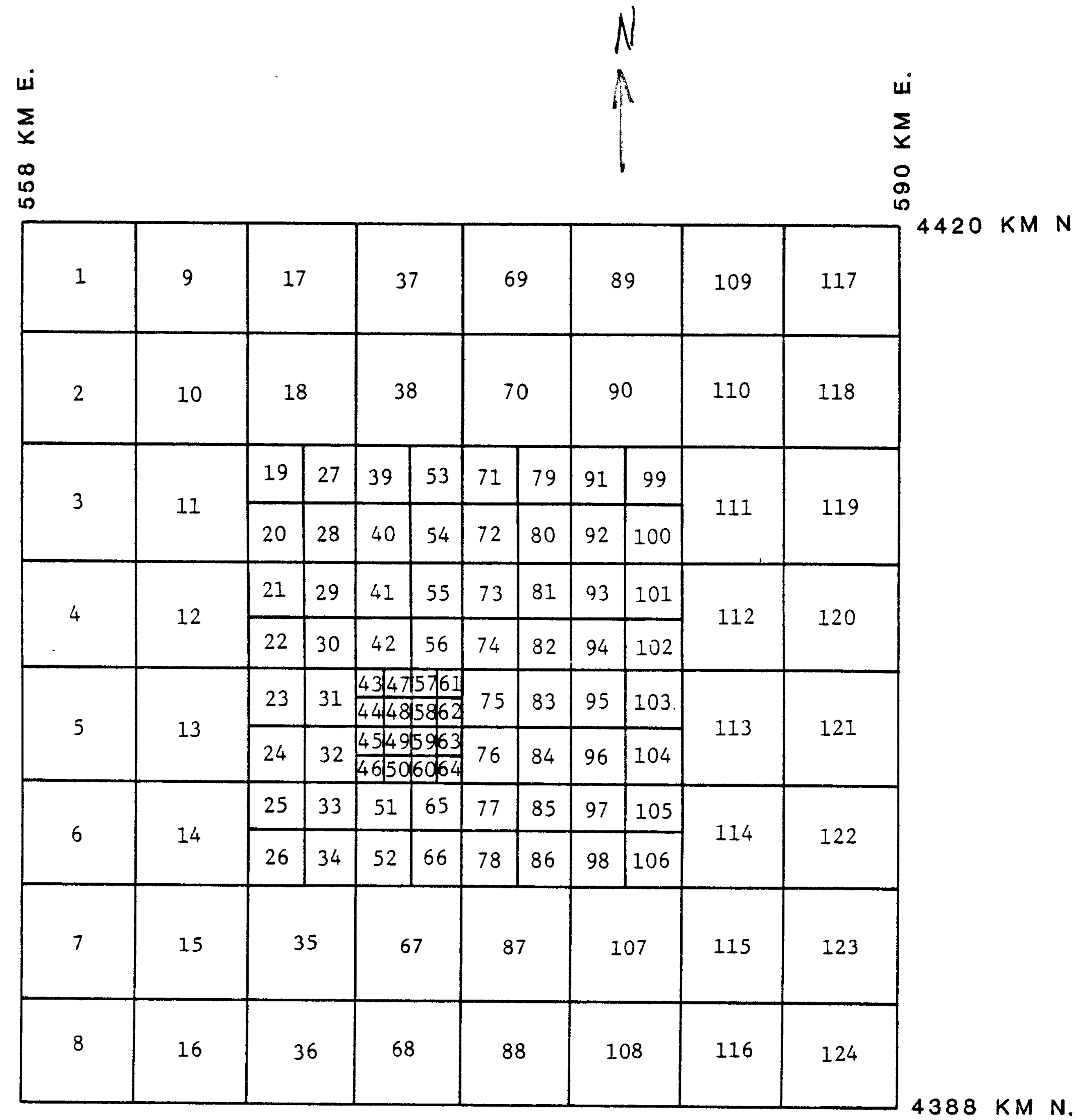

FIGURE 4-1. MARION COUNTY CDM GRID

TABLE 4-2. IRTADS TO CDM GRID APPORTIONING FACTORS

	0	0000000011111111222222223333334444444455555556666	66677777777888888
CDM GRID	1	2345678912345678123456781234561234567812345671234	56712345678124567
1	0	0000000000000000000000000000000000000000000000000	00000000000000002
2	0	0000000000000000000000000000000000000000000000000	00000000000000002
3	0	0000000000000000000000000000000000000000000000000	00000000000000002
4	0	0000000000000000000000000000000000000000000000000	00000000006000000
5	0	0000000000000000000000000000000000000000000000000	00000000022000000
6	0	0000000000000000000000000000000000000000000000000	01000000050000000
7	0	0000000000000000000000000000000000000000000000000	08000000000000000
8	0	0000000000000000000000000000000000000000000000000	00500000000000000
9	0	0000000000000000000000000000000000000000000000000	00000000000000002
10	0	0000000000000000000000000000000000000000000000000	00000000000000021
11	0	0000000000000000000000000000000000000000000000000	00000000000000060
12	0	0000000000000000000000000000000000000000000000000	00000002001004000
13	0	0000000000000000000000000000000000000000000000000	00000006711000000
14	0	00000000000000000000000000000000000000000000000221	00000000020000000
15	0	0000000000000000000000000000000000000000000000005	01100000000000000
16	0	0000000000000000000000000000000000000000000000000	00400000000000000
17	0	0000000000000200000000000000000000000000000000000	00000000000000000
18	0	0000000000000200000000000000000000000000000000000	00000000000000201
19	0	0000000000000000000000000000000000000000000000000	00000000000000210
20	0	0000000000000000000000000000000000000000000000000	00000000000000210
21	0	0000000000000000000000000000000000000000000000000	00000000000002000
22	0	0000000000000000000000000000000000000000000000000	00000000000002000
23	0	0000000000000000000000000000000000000000000000000	00000602000000000
24	0	0000000000000000000000000000000000000000000000010	00000150300000000
25	0	0000000000000000000000000000000000000000000000040	00000000000000000
26	0	0000000000000000000000000000000000000000000000021	00000000000000000
27	0	0000000000000000000000000000000000000000000000000	00000000000000200
28	0	0000000000000000000000000000000000000000000000000	00000000000010200
29	0	0000000000000000000000000000000000000000000000000	00000000000031000
30	0	0000000000000000000000000000000000000000000000000	00000000000031000
31	0	0000000000000000000000000000000000000000000000000	00004630000010000
32	0	0000000000000000000000000000000000000000000003200	00004050000000000
33	0	0000000000000000000000000000000000000000000000410	00000000000000000
34	0	0000000000000000000000000000000000000000010000200	00000000000000000
35	0	0000000000000000000000000000000000000000040300002	00000000000000000
36	0	0000000000000000000000000000000000000000000600000	00000000000000000
37	0	0000000000000302000000000000000000000000000000000	00000000000000000
38	0	0000000000011301000000000000000000000000000000000	00000000000000000
39	0	0000000000020000000000000000000000000000000000000	00000000000000000
40	0	0000000000130000000000000000000000000000000000000	00000000000000000
41	0	0000000000500000000000000000000000000000000000000	00000000000010000

(continued)

TABLE 4-2 (continued)

	0	0000000011111111222222223333334444444455555556666	66677777777888888
CDM GRID	1	2345678912345678123456781234561234567812345671234	56712345678124567
42	0	0000000031000000000000000000000000000000000000000	00000000000071000
43	0	0000000000000000000000000000000000000000000000000	00010000000300000
44	0	0000000000000000000000000000000000000000000000000	00050000000000000
45	0	0100000000000000000000000000000000000000000003000	00000000000000000
46	0	0000000020000000000000000000000000000000000003000	00000000000000000
47	0	0007000010000000000000000000000000000000000000000	00000000000000000
48	01	0311000000000000000000000000000000000000000000000	00000000000000000
49	0	0500000100000000000000000000000000000000000000000	00000000000000000
50	0	0000000600000000000000000000000000000001000000000	00000000000000000
51	0	0000000000000000000000000000000000000005000001200	00000000000000000
52	0	0000000000000000000000000000000000000004020000000	00000000000000000
53	0	0000000000020000000000000000000000000000000000000	00000000000000000
54	0	0000000001200000000000000000000000000000000000000	00000000000000000
55	0	0000000000530000000000000000000000000000000000000	00000000000000000
56	0	0000000005400000020000000000000000000000000000000	00000000000000000
57	0	0024000010000000000000000000000000000000000000000	00000000000000000
58	10	0090200000000000000000000000000000000000000000000	00000000000000000
59	0	0100052000000000000000000000000000000000000000000	00000000000000000
60	0	0000006100000000000000000000000000000030000000000	00000000000000000
61	0	0002000000000000100000000000000000000000000000000	00000000000000000
62	0	0002000000000000000010000000000000000000000000000	00000000000000000
63	0	0000400000000000000000000000001000000000000000000	00000000000000000
64	0	0000012000000000000000000000001000000020000000000	00000000000000000
65	0	0000000000000000000000000000000000000050600000000	00000000000000000
66	0	0000000000000000000000000000000000000003020000000	00000000000000000
67	0	0000000000000000000000000000000000000000033110000	00000000000000000
68	0	0000000000000000000000000000000000000000000030000	00000000000000000
69	0	0000000000000160000000000000000000000000000000000	00000000000000000
70	0	0000000000003020000000000000000000000000000000000	00000000000000000
71	0	0000000000003000000000000000000000000000000000000	00000000000000000
72	0	0000000000001000010030000000000000000000000000000	00000000000000000
73	0	0000000000000000004000000000000000000000000000000	00000000000000000
74	0	0000000000000000511000000000000000000000000000000	00000000000000000
75	0	0000000000000000200000000800000000000000000000000	00000000000000000
76	0	0000000000000000000000001000060000000000000000000	00000000000000000
77	0	0000000000000000000000000000001200000001000000000	00000000000000000
78	0	0000000000000000000000000000000100000000002000000	00000000000000000
79	0	0000000000002000000200000000000000000000000000000	00000000000000000
80	0	0000000000000000010050000000000000000000000000000	00000000000000000
81	0	0000000000000000003200000000000000000000000000000	00000000000000000
82	0	0000000000000000006000000000000000000000000000000	00000000000000000

(continued)

TABLE 4-2 (continued)

	0	0000000011111111222222223333334444444455555556666	66677777777888888
COM GRID	1	2345678912345678123456781234561234567812345671234	56712345678124567
83	0	0000000000000000000000000600000000000000000000000	00000000000000000
84	0	0000000000000000000000000300001100000000000000000	00000000000000000
85	0	0000000000000000000000000000000004000000000000000	00000000000000000
86	0	0000000000000000000000000000000103000000000000000	00000000000000000
87	0	0000000000000000000000000000000004000000000030200	00000000000000000
88	0	0000000000000000000000000000000000000000000000400	00000000000000000
89	0	0000000000000021000000000000000000000000000000000	00000000000000000
90	0	0000000000000020000002000000000000000000000000000	00000000000000000
91	0	0000000000000000000002000000000000000000000000000	00000000000000000
92	0	0000000000000000000102000000000000000000000000000	00000000000000000
93	0	0000000000000000000300000000000000000000000000000	00000000000000000
94	0	0000000000000000001200000000000000000000000000000	00000000000000000
95	0	0000000000000000000000000120000000000000000000000	00000000000000000
96	0	0000000000000000000000000001000010000000000000000	00000000000000000
97	0	0000000000000000000000000000000120000000000000000	00000000000000000
98	0	0000000000000000000000000000000011100000000000000	00000000000000000
99	0	0000000000000000000002000000000000000000000000000	00000000000000000
100	0	0000000000000000000102000000000000000000000000000	00000000000000000
101	0	0000000000000000000200100000000000000000000000000	00000000000000000
102	0	0000000000000000000100000020000000000000000000000	00000000000000000
103	0	0000000000000000000000000020000000000000000000000	00000000000000000
104	0	0000000000000000000000000002000000000000000000000	00000000000000000
105	0	0000000000000000000000000001000020000000000000000	00000000000000000
106	0	0000000000000000000000000000000010200000000000000	00000000000000000
107	0	0000000000000000000000000000000002302000000000000	00000000000000000
108	0	0000000000000000000000000000000000000500000000000	00000000000000000
109	0	0000000000000020000000000000000000000000000000000	00000000000000000
110	0	0000000000000010000000020000000000000000000000000	00000000000000000
111	0	0000000000000000000000220000000000000000000000000	00000000000000000
112	0	0000000000000000000000700020200000000000000000000	00000000000000000
113	0	0000000000000000000000000025110000000000000000000	00000000000000000
114	0	0000000000000000000000000001010030220000000000000	00000000000000000
115	0	0000000000000000000000000000000000221100000000000	00000000000000000
116	0	0000000000000000000000000000000000002200000000000	00000000000000000
117	0	0000000000000000000000020000000000000000000000000	00000000000000000
118	0	0000000000000000000000020000000000000000000000000	00000000000000000
119	0	0000000000000000000000020000100000000000000000000	00000000000000000
120	0	0000000000000000000000000000400000000000000000000	00000000000000000
121	0	0000000000000000000000000000240000000000000000000	00000000000000000
122	0	0000000000000000000000000000040000030000000000000	00000000000000000
123	0	0000000000000000000000000000000000030200000000000	00000000000000000
124	0	0000000000000000000000000000000000000500000000000	00000000000000000

table is the IRTADS district number. There are 67 columns corresponding to each of the 67 IRTADS districts. The vertical axis is the CDM grid number corresponding to Table 4-1. There are 124 rows, one for each CDM grid. The entrees in the matrix are the apportioning factors in tenths.

An example of the use of Table 4-2 is shown below.

CDM grid 43 = (1/10) IRTADS District 71 +
(3/10) IRTADS District 81

where the 1/10 and 3/10 are the apportioning factors from Table 4-2. To obtain the CDM emission rates the district totals for each pollutant as listed in Appendix E were multiplied by appropriate apportioning factors. To continue the above example consider the 1974 TSP emissions. Table E-5 lists the district total emissions as

1974 TSP District 71 emissions = 41.7 tons
1974 TSP District 81 emissions = 34.3 tons

These annual emissions were converted to grams per second by dividing by 34.72. Use of the above apportioning factors yields the CDM emissions.

CDM grid 43, 1975 TSP emissions =
[(1/10)(41.7) + (3/10)(34.3)]/34.72 = 0.4165 gm/sec

A similar procedure was followed for SO_2 and the projection year's emissions. Note that IRTADS Districts 01, 02, and 65 are entirely with CDM grids 58, 48, and 14, respectively. Apportioning factors for these grids are 1 or 10/10.

At the request of the Indiana APCD, the plume height for all area source grids was set at 12.0 meters. An ambient temperature of 25 C was selected. UTM coordinates were measured for each grid and entered in the appropriate fields. See Figure 4-1.

APPENDICES

APPENDIX A

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS, VOL. 7, PROJECTING COUNTY EMISSIONS

EXCERPT FROM VOLUME 7: PROJECTING COUNTY EMISSIONS, GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS, PAGES 20-23

(3) The Effect of New Source Performance Standards on Forecasted Emissions

The value for the future equivalent control efficiency to be "plugged into" the emissions equation is usually a function of the laws and regulations already agreed upon by the State agencies and EPA. There are, however, some industrial processes that are now, or are likely to be, subject to Federal New Source Performance Standards (NSPS). Some NSPS became effective in 1971 while others will be implemented in 1975. Still others will probably be in effect by 1980 or by 1985. Preliminary estimates of the emission reductions resulting from these promulgated and proposed NSPS have been tabulated by EPA for use in Air Quality Maintenance emission projections and can be obtained from the AQMA representative in each EPA Regional Office. This reference specifies either the required control efficiency (percent removal of uncontrolled emissions) or the maximum amount of pollutant allowed per unit of activity for each process likely to be affected by NSPS between 1974 and 1985.

Federal NSPS apply to the following industrial activities:

(a) New equipment installed in an existing facility
(b) Replacement of obsolete equipment within an existing facility
(c) All equipment in a new facility

Federal NSPS do not apply to utilization of idle capacity, however.

Thus, three different situations can exist for an industrial process subject to NSPS:

(a) The entire facility is subject to NSPS
(b) Part of the production is subject to NSPS and no other laws affect the remaining production
(c) One part of the production is subject to NSPS and the remainder is subject to a local agency regulation

Exhibit 1 depicts plan information for a source that is currently subject to a local regulation or compliance schedule and also will be subject to an NSPS in 1980. The objective of this example is to show, in general, how to estimate 1985 emissions when one portion of the 1985 source production will be subject to an NSPS and the remainder will still be subject to the local regulation. This method is also valid when the NSPS is the sole control regulation affecting the industrial process. Before constructing a graph similar to Exhibit 1, the following data must be collected for the point source under investigation:

(a) Production rate for the base year (obtained via interviews)
(b) Design capacity (obtained via interviews)

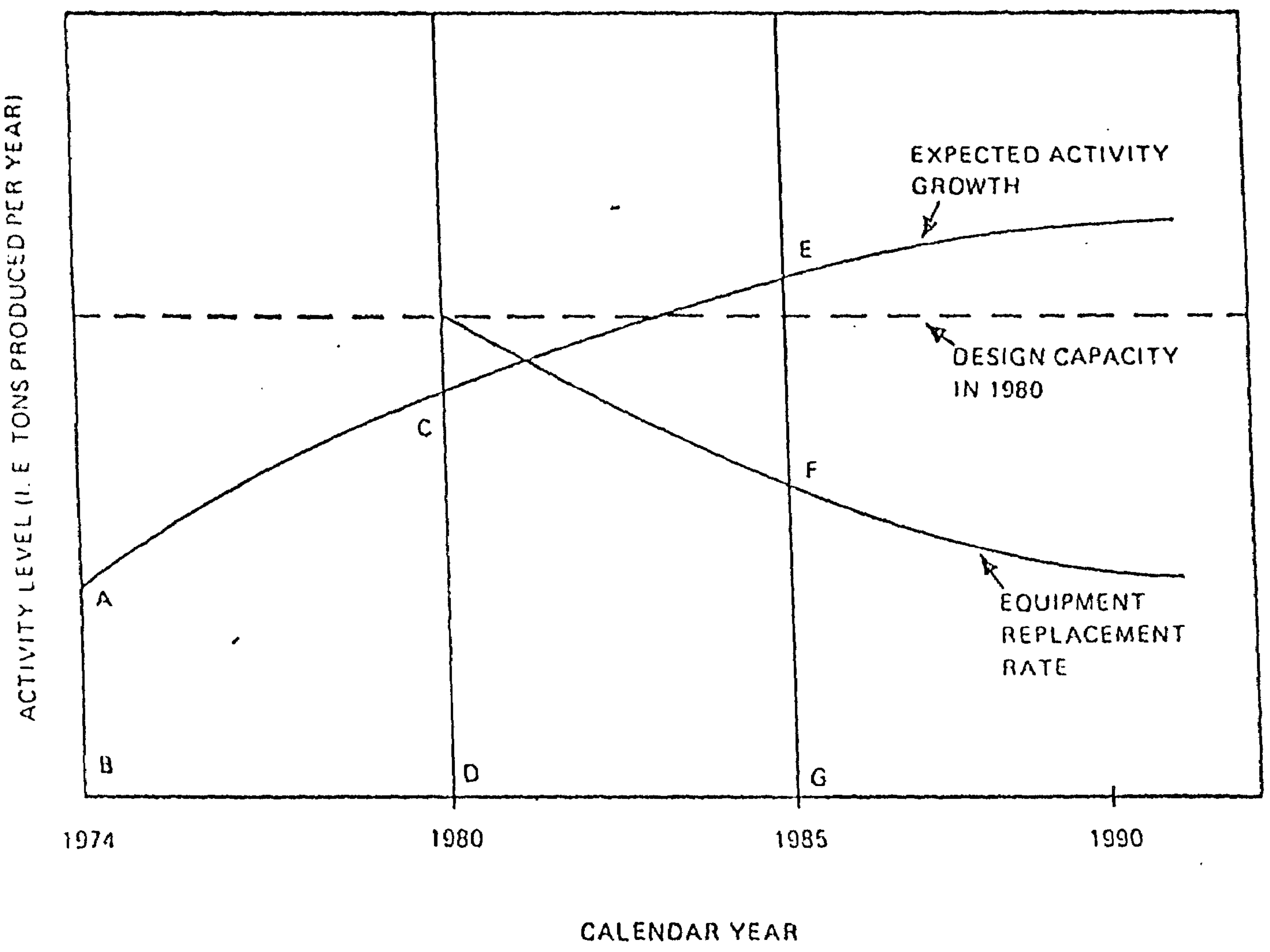

EXHIBIT 1

SAMPLE PLANT PROJECTIONS

APPENDIX B

SUPPLEMENTAL AREA SOURCE DATA

B-1 Area Source Fuel Dealers Survey Cover Letter and Fuel Oil Questionnaires

B-2 Residential Open Burning Communication From Indianapolis APCD

B-3 Fugitive Dust From Garbage Trucks Data Provided by Indianapolis DMD

APPENDIX B-1

Area Source Fuel Dealers Survey Cover Letter and Fuel Oil Questionnaire

STATE of INDIANA

STATE BOARD OF HEALTH

An Equal Opportunity Employer

INDIANAPOLIS

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46206

June 14, 1976

Re: Fuel Survey

The Air Pollution Control Division of the Indiana State Board of Health is responsible for preparing a special evaluation of the impact of air pollution in eleven Indiana counties. This objective is part of an overall goal of the Federal EPA to evaluate the attainment of the national ambient air quality standards. A federally-sponsored contractor will assist in the data gathering.

Your company is requested to fill out the enclosed questionnaire as part of an inventory of 1974 and 1975 fuel sales and an estimate of what future fuel sales may be in 1980 and 1985.

We realize that the allocation of fuel into residential, commercial/institutional and industrial categories and projecting fuel sales for 1980 and 1985 will be speculative. We hope, however, that the estimates you indicate on this survey will provide a more accurate estimation of fuel consumption patterns, in each county, than estimates determined by nationally-developed data, and that this survey will lead to an accurate estimation of future air emissions.

Please complete and return this form to our office before June 23, 1976. If you have any questions, feel free to contact Sue Schrader, Indiana Air Pollution Control Division, at (317) 633-6855, or at the above State Board of Health address.

Very truly yours,

Harry D Williams

Harry D. Williams, Director
Air Pollution Control Division

SES/dd

INSTRUCTIONS

We are interested in estimating fuel oil use in the following Indiana counties: Allen, Dearborn, Jefferson, Lake, La Porte, Marion, Porter, St. Joseph, Vigo, and Wayne. Please fill in the amount sold in 1974 + 1975 for direct consumption in the above counties serviced by your company. Please use one sheet per county. Attempt to divide the amounts into residential, commercial + institutional, and industrial (see definintions below). If possible, estimate 1980 + 1985 sales and record in the same manner.

Residential:	All residential dwellings from single-family residences to apartment complexes.
Commercial/ Institutional:	Retail and wholesale stores, schools, hospitals, government and public buildings.
Industrial:	All manufacturing industries regardless of size.

Company Name: ____________________

Address: ____________________

____

Phone No.: ____________________

Name of Person Completing this Form: ____________________

Date: ____________________

Amount Sold Directly to Consumers in ____________ County.

Fuel Type		Residential	Commercial/ Institutional	Industrial	Total
Distillate Fuel Oil	1974	______gals ___% S	______gals ___% S	______gals ___% S	______gals ___% S
	1975	______ ___	______ ___	______ ___	______ ___
If possible, please estimate	1980	______ ___	______ ___	______ ___	______ ___
	1985	______ ___	______ ___	______ ___	______ ___

Fuel Type		Residential	Commercial/ Institutional	Industrial	Total
Residual Fuel Oil	1974	______gals ___% S	______gals ___% S	______gals ___% S	______gals ___% S
	1975	______ ___	______ ___	______ ___	______ ___
If possible, please estimate	1980	______ ___	______ ___	______ ___	______ ___
	1985	______ ___	______ ___	______ ___	______ ___

For Wholesalers: Amount sold to retailers who serve this county (1974):

Distillate __________gals. Residual __________gals.

APPENDIX B-2

Residential Open Burning Communiction From Indianapolis APCD

DEPARTMENT OF PUBLIC WORKS

INTER-DEPARTMENT COMMUNICATION

April 26, 1976

To: M.T. DeBusschere

From: W.M. Smouse

Subject: Banning of Open Burning

The present Indianapolis regulation permits open burning of household refuse in some single and multiple family dwellings. In reality, not all residential units open-burn their household refuse, but some commercial firms do conduct open burning. (Primary violators have been small firms, many times located in a building previously used as a residence; some schools and churches, etc.)

The present Indianapolis regulation permits open burning of leaves for both residential and commercial properties. Again, not all leaves are burned in our residential areas and the primary contact we have had with commercial leaf burning has been with large wooded areas such as cemeteries.

At this time both Beech Grove and Speedway prohibit open burning of any kind, both leaves and trash. It is our understanding that Federal installations also prohibit open burning of any kind.

The following analysis is based on household trash burning and household leaf burning in Marion County. No data is available to account for the volume of trash or leaves that are burned in the commercial community; consequently the following data is conservitive in estimating the emission tonnage per year, but because the commercial firm is not served by tax supported refuse collection the costs indicated are valid for our Sanitary District.

Extensive use has made of AP-42 for emission factors for trash burning, an EPA contractor's results for emission factors for leaf burning, Department of Metropolitan Development data on residential units in Marion County, an analysis by Black and Veatch indicating the volume of refuse, and leaves burned in Marion County, and recent conversations with the Indianapolis Sanitary District relating to current trash volumes, costs, and future capabilities of collection operation.

OPEN BURNING OF TRASH

Table A indicates the number of single and double occupied residential units in Marion County in 1974, as obtained from DMD. Present volume of trash collected (38# per residence per week) is less than Black and Veatch indicated would be generated (46.4# per residence per week). Table A indicates the tons of refuse burned in 1974. The expected particulate, CO, and HC emissions were calculated from AP-42, Household domestic incinerator factors of 35,300, and 100 pounds per ton of refuse. The resulting emissions are indicated in Table A.

Table A indicates, in summary, that 47,800 tons of refuse were open-burned in 1974, causing 836.5 tons of particulate emissions, 7,168.8 tons of CO emissions, and 2,392.4 tons of HC emissions. The Indianapolis Sanitary District, collecting from only half the residences in the county, would require $71,700.00 per year to pay the landfill cost; but current reorganization of collection routes within the District permits the collection of the additional refuse to be accomodated without additional personnel or equipment.

LEAF BURNING

Table B indicates the expected tonnage of leaves in Marion County in 1974, as obtained from DMD and the Black and Veatch analysis. Emission factors from an EPA contractor have been used to calculate the particulate, CO and HC yearly tonnage. While all figures in Table B are yearly figures, the leaf season is only about eight weeks long, so the collection of leaves and/or the emissions will take place during that period of the year only.

Table B indicates in summary that 5,686 tons of leaves were burned in Marion County in 1974; causing 132.5 tons of particulate emissions, 310.5 tons of CO emissions, and 64.8 tons of HC emissions. (The presumption made in distribution of leaf volume throughout the county is that volumes are dependent upon land area, not population.) The Indianapolis Sanitary District estimates that their total cost of collection and disposal of the leaves within their district would be $63,607.00 per year, wherein they are anticipating a special collection service to assist with their problems during that particular period of the year.

INDIANAPOLIS SANITARY DISTRICT

The costs previously indicated from the Indianapolis Sanitary District, and their willingness to accept these additional challenges is appreciated by the Air Pollution Control Division. Mr. Curtis Daugherty, Manager of the Solid Waste Division, indicated that for their convenience the suggested starting date for banning open burning and increasing the work load of the Solid Waste Division would be January 1, 1977. We indicated to Curtis that his suggested starting date would be a matter of record, and that while the Air Pollution Control Board might wish to discuss with him a modification of that date, our initial presentation would be made with his date as the target.

CONCLUSION

A ban on open burning of trash and leaves would result in a reduction in particulate emissions of 969 tons per year, a reduction in CO emissions of 7,479 tons per year, and a reduction in HC emissions of 2,457 tons per year. The additional cost to the Indianapolis Sanitary District would be $135,307.00 per year to handle the trash and leaves that are now being burned.

TABLE A

Townships & Total	Pike	Washington	Lawrence	Wayne	Center	Warren	Decatur	Perry	Franklin	Total
No. of single and double occupied residences.	4,294	35,974	11,803	32,072	80,274	25,753	4,230	16,483	3,470	214,353
Tons of household refuse burned per year	957	8,022	2,632	7,152	17,901	5,743	943	3,676	774	47,800
Particulate emissions, tons per year	16.7	140.4	46.1	125.2	313.3	100.5	16.5	64.3	13.5	836.5
CO emissions, tons per year										7,168.8
HC emissions, tons per year										2,392.4

TABLE B

Tons of leaves burned per year	631.8	631.8	631.8	631.8	631.8	631.8	631.8	631.8	631.8	5,686
Particulate emissions, tons per year	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	132.5
CO emissions, tons per year										310.5
HC emissions, tons per year										64.8

APPENDIX B-3

Fugitive Dust From Garbage Trucks
Data Provided by Indianapolis DMD

Fugitive Dust Emissions Data for Landfill Sites in Marion County, Indiana in 1974

	Unpaved Roads	Trucks Entering Daily	Dust Control Measures
2700 South Emerson Avenue	200 feet	80 to 100	Oil
2561 Kentucky Avenue	1000 feet	400	Water Spray
2102 South Harding	100 feet	7 to 8	?
3400 South Harding	1/2 mile	60	Road oil as need
4600 Bluff Road	500' gravel	12	Oil
2401 Senour Road	1500'	120 est.	Water Spray

*Data collected by survey of landfill facilities

Prepared by:

Clarke Kahlo 9-20-76

CRK:st

APPENDIX C

REGULATIONS (INCORPORATED HEREIN BY REFERENCE)

REGULATIONS (INCORPORATED HEREIN BY REFERENCE)

REGULATION APC-2, Promulgated December 6, 1968
Amended REGULATION APC-3, Promulgated October 7, 1974
REGULATION APC 4-R, Promulgated June 8, 1972
REGULATION APC-5, Promulgated December 6, 1968
REGULATION APC-6, Promulgated December 6, 1968
REGULATION APC-7, Adopted May 28, 1975
REGULATION APC-13, Promulgated November 22, 1974
NEW RULE NUMBERED APC-14, Promulgated January 21, 1972
REGULATION APC-18, Promulgated January 22, 1974
REGULATION APC-20, Promulgated January 22, 1974
REGULATION APC-22, Promulgated August 15, 1974

APPENDIX D

INPUT LISTING OF GROWTH SURVEY AND OTHER DATA FOR POINT SOURCE PROJECTIONS

(Limited Distribution - submitted under separate cover and in computer format)

APPENDIX E

EMISSIONS SUMMARIES

EMISSIONS SUMMARIES

Point Source Emission Summaries

In order to facilitate a comparison of the projected point source emissions to baseyear emissions, emission summaries have been prepared for Marion County. These summaries are shown in Table E-1, Table E-2 and Table E-3. The summaries were prepared from the stack-by-stack projections described in Section 1. Table E-1 shows plant total emissions for 1974 (from an existing NEDS data base), 1975, 1980, and 1985. In addition, this table shows emission growth factors for each projection year at each plant (i.e., projection year emissions/ baseyear emissions). The plant numbering system is corresponding to the 1974 NEDS inventory used as the basis for projections. The SIC is the Standard Industrial Classification for each plant as extracted from NEDS. Table E-2 shows county total particulate and SO_2 emissions along with county total emission growth factors. Table E-3 shows county total emissions for 1974, 1975, 1980 and 1985 grouped by Standard Industrial Classification.

It should be noted when using these summaries as a means to compare projected emissions to 1974 emissions that the projected emissions, as discussed in Section 1.0, assume compliance with all applicable regulations. The baseyear emissions, however, reflect actual estimated emissions as reported in NEDS.

Area Sources Emission Summaries

Gridded area source emissions were computed in this study for eighteen categories. The categories inventoried are

TABLE E-1. POINT SOURCE PLANT EMISSION SUMMARIES

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	1	TSP	0.005	0.010	2.000	0.011	2.200	0.012	2.400
	2042	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	2	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3255	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	3	TSP	0.008	0.002	0.250	0.002	0.250	0.002	0.250
	3999	SO2	0.043	0.036	0.837	0.037	0.860	0.038	0.884
2640	4	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3411	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	5	TSP	1.327	0.171	0.129	0.198	0.149	0.198	0.149
	3362	SO2	1.886	1.212	0.643	1.504	0.797	1.504	0.797
2640	6	TSP	0.005	0.002	0.400	0.002	0.400	0.002	0.400
	8221	SO2	0.016	0.006	0.375	0.006	0.375	0.006	0.375
2640	7	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3714	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	8	TSP	0.186	0.095	0.511	0.090	0.484	0.090	0.484
	2092	SO2	0.969	0.716	0.739	0.866	0.894	0.866	0.894
2640	9	TSP	0.055	0.071	1.291	0.071	1.291	0.071	1.291
	8062	SO2	0.479	0.438	0.914	0.438	0.914	0.438	0.914

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	10	TSP	0.179	0.089	0.497	0.090	0.503	0.098	0.547
	3714	SO2	0.739	0.704	0.953	0.707	0.957	0.778	1.053
2640	11	TSP	0.524	0.046	0.087	0.045	0.085	0.045	0.085
	3714	SO2	1.113	0.502	0.451	0.507	0.456	0.507	0.456
2640	12	TSP	0.289	0.047	0.163	0.060	0.208	0.060	0.208
	3321	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	14	TSP	0.000	0.014	0.000	0.014	0.000	0.015	0.000
	8062	SO2	0.004	0.029	7.250	0.030	7.500	0.031	7.750
2640	15	TSP	0.021	0.006	0.286	0.006	0.286	0.006	0.286
	2499	SO2	0.014	0.014	1.000	0.014	1.000	0.014	1.000
2640	16	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3321	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	17	TSP	0.017	0.017	1.000	0.018	1.059	0.018	1.059
	3714	SO2	0.132	0.421	3.189	0.470	3.561	0.500	3.788
2640	18	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3569	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	19	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2834	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	20	TSP	0.009	0.020	2.222	0.020	2.222	0.020	2.222
	2043	SO2	0.007	0.006	0.857	0.006	0.857	0.006	0.857
2640	21	TSP	0.136	0.356	2.618	0.283	2.081	0.247	1.816
	3714	SO2	1.145	1.080	0.943	0.410	0.358	0.374	0.327
2640	22	TSP	0.360	0.063	0.175	0.081	0.225	0.081	0.225
	9100	SO2	1.265	0.518	0.409	0.700	0.553	0.700	0.553
2640	23	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3714	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	25	TSP	0.099	0.006	0.061	0.006	0.061	0.006	0.061
	3569	SO2	0.239	0.244	1.021	0.248	1.038	0.254	1.063
2640	26	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2499	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	27	TSP	0.006	0.006	1.000	0.006	1.000	0.006	1.000
	2951	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	28	TSP	0.000	0.001	0.000	0.001	0.000	0.001	0.000
	8221	SO2	0.002	0.003	1.500	0.003	1.500	0.003	1.500
2640	30	TSP	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	8061	SO2	0.017	0.000	0.000	0.000	0.000	0.000	0.000

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	31	TSP	0.010	0.008	0.800	0.008	0.800	0.008	0.800
	2499	SO2	0.057	0.062	1.088	0.063	1.105	0.063	1.105
2640	32	TSP	0.222	0.159	0.716	0.160	0.721	0.160	0.721
	4953	SO2	0.027	0.028	1.037	0.030	1.111	0.033	1.222
2640	33	TSP	3.452	1.099	0.318	0.468	0.136	0.470	0.136
	4911	SO2	80.735	15.740	0.195	7.653	0.094	7.738	0.095
2640	34	TSP	0.405	0.626	1.546	0.699	1.726	0.699	1.726
	4911	SO2	12.718	5.204	0.409	5.776	0.454	5.782	0.455
2640	35	TSP	0.166	0.092	0.554	0.000	0.000	0.000	0.000
	4911	SO2	0.991	0.566	0.571	0.000	0.000	0.000	0.000
2640	36	TSP	0.002	0.002	1.000	0.002	1.000	0.003	1.500
	3369	SO2	0.186	0.192	1.032	0.225	1.210	0.244	1.312
2640	37	TSP	0.003	0.005	1.667	0.005	1.667	0.005	1.667
	2651	SO2	0.020	0.030	1.500	0.030	1.500	0.030	1.500
2640	39	TSP	0.120	0.058	0.483	0.062	0.517	0.067	0.558
	3714	SO2	1.988	0.729	0.367	0.951	0.478	0.922	0.464
2640	40	TSP	0.004	0.004	1.000	0.004	1.000	0.004	1.000
	2821	SO2	0.004	0.004	1.000	0.004	1.000	0.004	1.000

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	41	TSP	0.005	0.050	10.000	0.051	10.200	0.051	10.200
	8062	SO2	0.005	0.398	79.600	0.399	79.800	0.399	79.800
2640	42	TSP	2.067	0.554	0.268	0.449	0.217	0.449	0.217
	2046	SO2	4.474	2.243	0.501	2.187	0.489	2.187	0.489
2640	44	TSP	0.001	0.001	1.000	0.001	1.000	0.001	1.000
	2851	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	45	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2819	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	46	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3999	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	47	TSP	0.000	0.077	0.000	0.077	0.000	0.077	0.000
	3999	SO2	0.000	0.765	0.000	0.765	0.000	0.765	0.000
2640	48	TSP	0.003	0.003	1.000	0.003	1.000	0.003	1.000
	2999	SO2	0.021	0.021	1.000	0.021	1.000	0.021	1.000
2640	49	TSP	0.044	0.040	0.909	0.040	0.909	0.040	0.909
	2999	SO2	0.201	0.295	1.468	0.295	1.468	0.295	1.468
2640	50	TSP	0.005	0.000	0.000	0.000	0.000	0.000	0.000
	3999	SO2	0.013	0.000	0.000	0.000	0.000	0.000	0.000

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	51	TSP	0.106	0.081	0.764	0.105	0.991	0.114	1.075
	2911	SO2	0.853	0.681	0.798	0.840	0.985	0.928	1.088
2640	52	TSP	0.005	0.005	1.000	0.005	1.000	0.005	1.000
	3714	SO2	0.022	0.022	1.000	0.022	1.000	0.022	1.000
2640	55	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3999	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	56	TSP	0.195	0.120	0.615	0.120	0.615	0.120	0.615
	2099	SO2	0.306	0.204	0.667	0.204	0.667	0.204	0.667
2640	57	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8999	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	58	TSP	0.272	0.105	0.386	0.103	0.379	0.103	0.379
	3661	SO2	0.592	0.702	1.186	0.466	0.821	0.486	0.821
2640	59	TSP	0.003	0.002	0.667	0.002	0.667	0.001	0.333
	3714	SO2	0.006	0.004	0.667	0.003	0.500	0.003	0.500
2640	60	TSP	0.399	0.045	0.113	0.044	0.110	0.043	0.108
	3999	SO2	0.528	0.510	0.966	0.499	0.945	0.488	0.924
2640	61	TSP	0.119	0.109	0.916	0.031	0.261	0.031	0.261
	3312	SO2	1.119	1.023	0.914	0.604	0.540	0.604	0.540

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	62	TSP	0.362	0.024	0.066	0.024	0.066	0.040	0.110
	3322	SO2	0.132	0.054	0.409	0.065	0.492	0.106	0.803
2640	63	TSP	0.001	0.001	1.000	0.001	1.000	0.002	2.000
	8221	SO2	0.002	0.004	2.000	0.004	2.000	0.005	2.500
2640	64	TSP	1.100	0.079	0.071	0.090	0.081	0.090	0.081
	3069	SO2	0.923	0.740	0.802	0.691	0.749	0.691	0.749
2640	65	TSP	0.011	0.009	0.818	0.009	0.818	0.009	0.818
	3069	SO2	0.037	0.030	0.811	0.030	0.811	0.030	0.811
2640	66	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	68	TSP	0.072	0.027	0.375	0.027	0.375	0.027	0.375
	0	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	69	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3714	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	70	TSP	0.471	0.155	0.329	0.079	0.168	0.078	0.166
	3714	SO2	2.248	1.715	0.763	0.053	0.024	0.050	0.022
2640	71	TSP	0.014	0.024	1.714	0.032	2.286	0.035	2.500
	3714	SO2	0.066	0.168	2.545	0.198	3.000	0.212	3.212

(continued)

TABLE E-1 (continued)

PLANT TOTALS(TONSX10**-3)

COUNTY	PLANT & SIC	POL	1974	1975	75/74	1980	80/74	1985	85/74
2640	72	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2834	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	73	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2834	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	74	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2834	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	75	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5172	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	76	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5172	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	77	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5172	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	78	TSP	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5172	SO2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2640	79	TSP	0.007	0.008	1.143	0.010	1.429	0.010	1.429
	3369	SO2	1.677	0.352	0.210	0.414	0.247	0.448	0.267

TABLE E-2. COUNTY TOTAL POINT SOURCE EMISSIONS

COUNTY TOTALS(TONSX10**-3)

COUNTY		
2640	1974 TSP	12.874
	1975 TSP	4.594
	75/74	0.357
	1980 TSP	3.715
	80/74	0.289
	1985 TSP	3.723
	85/74	0.289
	1974 SO2	118.021
	1975 SO2	38.415
	75/74	0.325
	1980 SO2	28.458
	80/74	0.241
	1985 SO2	28.779
	85/74	0.244

TABLE E-3. POINT SOURCE EMISSIONS GROUPED BY SIC

SIC TOTALS(TONSX10**-3)

COUNTY	SIC	1974 TSP	1975 TSP	1980 TSP	1985 TSP	1974 SO2	1975 SO2	1980 SO2	1985 SO2
2640	2042	0.005	0.010	0.011	0.012	0.000	0.000	0.000	0.000
	3255	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3999	0.412	0.124	0.123	0.122	0.584	1.311	1.301	1.291
	3411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3362	1.327	0.171	0.198	0.198	1.886	1.212	1.504	1.504
	8221	0.006	0.004	0.004	0.005	0.020	0.013	0.013	0.014
	3714	1.469	0.752	0.616	0.594	7.459	5.345	3.321	3.368
	2092	0.186	0.095	0.090	0.090	0.969	0.716	0.866	0.866
	8062	0.060	0.135	0.136	0.137	0.488	0.865	0.867	0.868
	3321	0.289	0.047	0.060	0.060	0.000	0.000	0.000	0.000
	2499	0.031	0.014	0.014	0.014	0.071	0.076	0.077	0.077
	3569	0.099	0.006	0.006	0.006	0.239	0.244	0.248	0.254
	2834	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2043	0.009	0.020	0.020	0.020	0.007	0.006	0.006	0.006
	9100	0.360	0.063	0.081	0.081	1.265	0.518	0.700	0.700
	2951	0.006	0.006	0.006	0.006	0.000	0.000	0.000	0.000
	8061	0.002	0.000	0.000	0.000	0.017	0.000	0.000	0.000
	4953	0.222	0.159	0.160	0.160	0.027	0.028	0.030	0.033
	4911	4.023	1.817	1.167	1.169	94.444	21.510	13.429	13.520
	3369	0.009	0.010	0.012	0.013	1.863	0.544	0.639	0.692
	2651	0.003	0.005	0.005	0.005	0.020	0.030	0.030	0.030
	2821	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
	2046	2.067	0.554	0.449	0.449	4.474	2.243	2.187	2.187
	2851	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
	2819	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2999	0.047	0.043	0.043	0.043	0.222	0.316	0.316	0.316
	2911	0.106	0.081	0.105	0.114	0.853	0.681	0.840	0.928
	2099	0.195	0.120	0.120	0.120	0.306	0.204	0.204	0.204
	8999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3661	0.272	0.105	0.103	0.103	0.592	0.702	0.486	0.486
	3312	0.119	0.109	0.031	0.031	1.119	1.023	0.604	0.604
	3322	0.362	0.024	0.024	0.040	0.132	0.054	0.065	0.106
	3069	1.111	0.088	0.099	0.099	0.960	0.770	0.721	0.721
	0	0.072	0.027	0.027	0.027	0.000	0.000	0.000	0.000
	5172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

listed in Table E-4. The grid chosen to apportion county emissions was the Indianapolis Regional Transportation And Development Study district grid system. This grid system is shown in Figure E-1. Tables E-5 and E-6 are summaries of the gridded TSP and SO_2 1974 area source emissions for each category. The horizontal axis of each table is the category number as defined in Table E-4. The vertical axis is the IRTADS district number. There are 67 districts in Marion County. Districts numbered 19, 49, 58, 59, and 68 on Figure E-1 are outside Marion County and are not included in this study. The entrees in the matrix have the units, tons. A total is also listed for each district and each category on the right-hand side and bottom, respectively. Tables E-7, E-8, E-9, E-10, E-11, and E-12 are the gridded inventories for the projection years. The county total emissions in some cases differ slightly from those reported in the text. This is due to rounding errors when adding the gridded emissions.

TABLE E-4. KEY FOR AREA SOURCE SUMMARY TABLES

Area Source Category	TSP No.	TSP No.	Text Sections
Residential Funds	1	1	2.1, 3.1
Commercial/Institutional Fuels	2	2	2.2, 3.2
Industrial Fuels	3	3	2.3, 3.3
Highway Vehicles	4	4	2.4, 3.4
Railroad Engines	5	5	2.5, 3.5
Vessels	*	6	2.6, 3.6
Aircraft	7	7	2.7, 3.7
Farm Tractors	8	8	2.8, 3.8
Other Off-Highway	9	9	2.8, 3.8
Commercial/Institutional Incineration	10	10	2.10, 3.10
Industrial Incineration	11	11	2.10, 3.10
Residential Open Burning	12	12	2.9, 3.9
Tilling	13	*	2.11, 3.11
Heavy Construction	14	*	2.12, 3.12
Wind Erosion	15	*	2.14, 3.14
Reentrainment	16	*	2.13, 3.13
Process Losses	17	*	2.15, 3.15
Structural Fires	18	*	2.16, 3.16
Unpaved Roads	6	*	2.13, 2.13

*No emissions

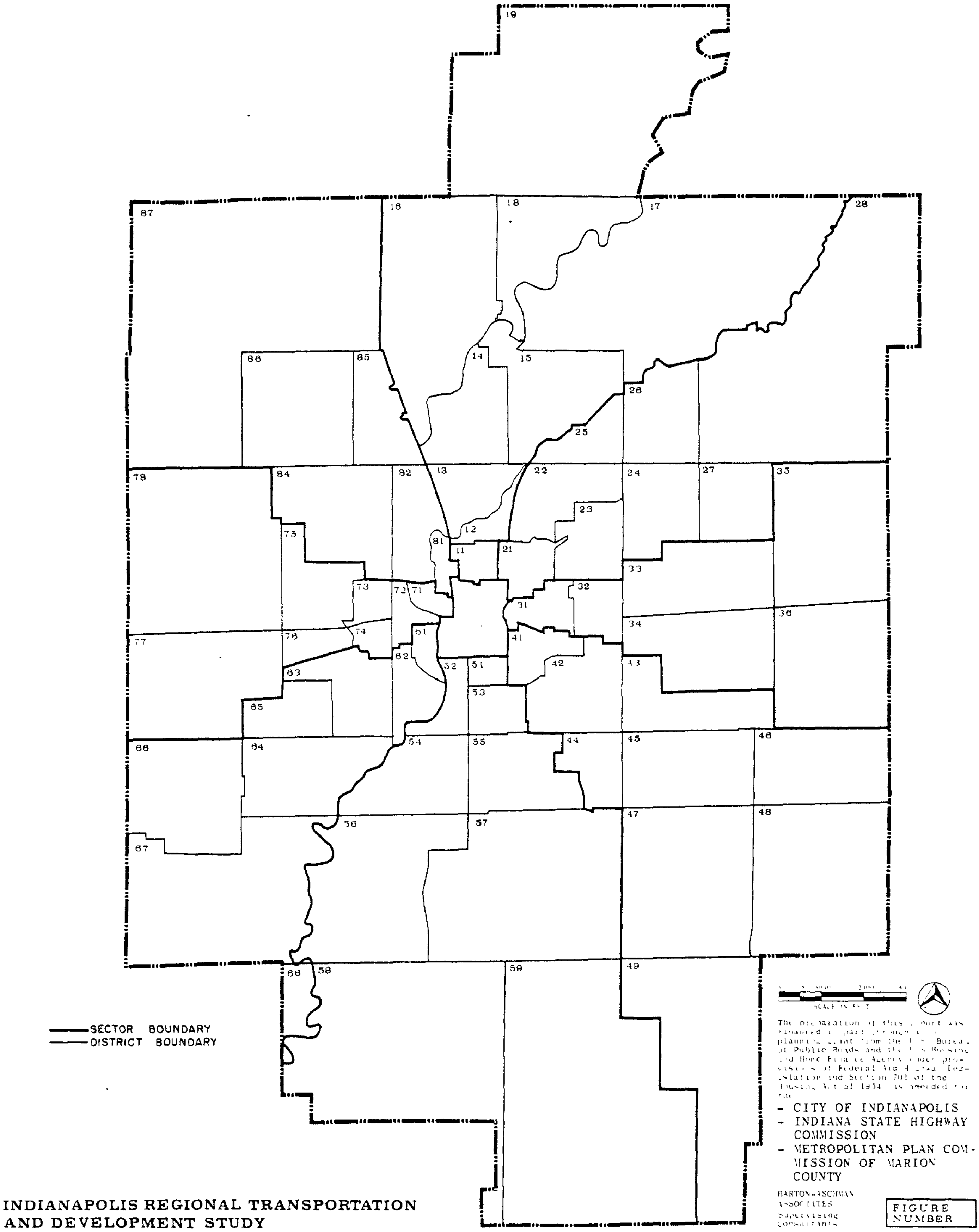

Figure E-1. Indianapolis, Marion County IRTADS districts.

TABLE E-5. 1974 TSP AREA SOURCE EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
1	0.3	3.6	2.2	5.	1.9	0.0	0.0	0.0	6.3	0.0	0.0	0.7	0.	0.	0.0	8.	0.0	0.0	28.0
2	0.2	2.9	1.5	4.	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.3	0.	0.	0.0	7.	0.0	0.0	21.0
3	0.9	3.3	2.9	31.	0.0	0.0	0.0	0.0	5.6	0.1	0.0	2.0	0.	0.	0.0	49.	0.0	0.2	95.0
4	1.6	3.1	1.4	12.	0.0	0.0	0.0	0.0	4.5	0.5	0.0	3.6	0.	0.	0.0	19.	0.0	0.3	46.0
5	1.8	1.7	1.0	17.	0.0	0.0	0.0	0.0	3.0	0.1	0.0	3.9	0.	0.	0.0	29.	0.0	0.4	57.9
6	4.2	1.9	0.0	13.	0.0	0.0	0.0	0.0	2.0	2.0	0.0	9.2	0.	65.	0.0	21.	0.0	0.9	119.8
7	1.3	2.3	0.6	12.	0.0	0.0	0.0	0.0	1.1	2.3	0.0	3.0	0.	50.	0.0	18.	0.0	0.7	91.3
8	0.8	1.4	9.2	5.	0.0	0.0	0.0	0.0	2.4	0.0	8.4	1.3	0.	40.	0.0	7.	0.0	0.3	75.6
9	1.0	2.1	0.5	6.	0.0	0.0	0.0	0.0	1.3	0.0	0.0	2.3	0.	60.	0.0	10.	0.0	0.5	83.7
11	10.4	7.4	2.4	41.	0.0	0.0	0.0	0.0	7.4	3.7	0.1	23.0	0.	30.	0.0	64.	0.0	3.0	192.4
12	8.0	1.0	0.5	16.	0.3	0.0	0.0	0.0	1.4	0.8	0.0	17.7	0.	0.	0.0	25.	0.0	3.3	74.0
13	13.9	2.8	1.1	67.	0.0	0.0	0.0	0.0	3.6	4.6	0.0	30.5	0.	0.	0.0	104.	0.0	5.9	233.4
14	8.9	2.1	0.7	54.	0.1	0.0	0.0	0.0	2.4	3.4	0.0	35.8	0.	0.	0.0	84.	0.0	7.5	198.9
15	9.0	5.4	2.0	62.	0.6	0.0	0.0	0.0	5.6	4.7	0.0	36.3	0.	6.	0.0	128.	4.0	6.3	289.9
16	7.9	3.0	0.4	66.	0.0	0.0	0.0	0.0	1.3	0.4	0.0	32.0	8.	103.	1.0	103.	0.0	6.3	332.3
17	7.9	1.3	1.1	130.	0.8	0.0	0.0	0.6	2.2	0.9	0.0	31.1	104.	593.	14.2	203.	0.6	6.6	1097.5
18	1.9	0.6	1.5	50.	0.2	0.0	0.0	0.1	1.5	0.6	3.7	7.8	11.	120.	1.6	78.	9.5	1.1	289.3
21	10.0	2.4	2.9	22.	1.8	0.0	0.0	0.0	3.0	6.1	0.1	22.0	0.	125.	0.0	34.	10.4	4.4	244.1
22	11.9	1.0	44.1	40.	0.2	0.0	0.0	0.0	2.2	4.1	0.0	26.2	0.	1.	0.0	62.	0.0	6.5	199.8
23	11.8	1.7	1.4	28.	1.9	0.0	0.0	0.0	2.3	4.1	0.8	25.9	0.	95.	0.0	44.	5.0	5.4	227.3
24	6.7	3.0	1.5	42.	1.6	0.0	0.0	0.0	4.9	1.7	0.0	20.0	0.	1.	0.0	66.	0.0	3.8	150.6
25	3.4	1.6	0.8	21.	0.1	0.0	0.0	0.0	2.6	1.6	0.0	13.5	0.	0.	0.0	33.	0.0	2.2	79.8
26	6.7	0.7	0.4	41.	0.6	0.0	0.0	0.0	1.2	1.8	0.0	17.8	0.	0.	0.0	64.	0.0	4.9	137.1
27	3.5	2.9	3.2	62.	0.0	0.0	0.0	0.0	5.0	3.6	0.0	15.0	0.	58.	0.0	97.	0.0	3.3	253.5
28	9.0	4.0	1.3	79.	6.3	0.0	0.0	0.8	3.9	2.9	0.1	33.8	113.	77.	19.8	124.	0.0	7.9	482.8
31	9.5	2.0	5.0	32.	0.1	0.0	0.0	0.0	2.6	2.5	0.0	21.0	0.	0.	0.0	50.	0.0	4.5	129.2
32	11.4	9.0	32.9	33.	0.4	0.0	0.0	0.0	3.8	4.0	0.0	23.0	0.	2.	0.0	51.	0.0	4.4	173.9
33	9.2	3.3	1.4	90.	0.4	0.0	0.0	0.0	4.7	4.8	0.0	39.6	0.	15.	0.0	140.	0.0	4.2	312.6
34	3.7	3.9	0.0	52.	1.6	0.0	0.0	0.0	5.0	2.3	0.0	15.9	2.	102.	0.2	82.	0.0	2.7	281.3
35	4.2	1.8	0.3	53.	0.9	0.0	0.0	0.2	1.0	8.1	0.0	18.1	36.	48.	4.9	83.	0.0	3.0	262.5
36	0.6	0.5	0.1	4.	1.5	25.2	0.0	0.4	0.3	3.6	0.1	2.4	68.	0.	9.7	12.	0.0	0.5	133.1
41	9.1	1.0	0.9	22.	0.0	0.0	0.0	0.0	1.6	2.4	0.1	20.0	0.	26.	0.0	34.	8.0	4.3	129.4
42	10.1	1.8	0.4	24.	4.8	0.0	0.0	0.0	1.4	5.1	0.0	22.3	0.	1.	0.0	37.	77.6	5.3	190.8
43	1.0	0.0	0.0	33.	0.0	2.5	0.0	0.1	0.0	0.1	0.0	4.3	23.	0.	3.1	52.	0.0	0.6	119.7
44	2.5	0.3	0.2	23.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	10.7	0.	20.	0.0	35.	0.0	2.3	94.5
45	1.4	0.3	0.5	45.	0.3	0.0	0.0	0.3	0.6	0.0	0.0	10.5	51.	53.	7.0	70.	0.0	0.9	240.8
46	0.6	0.0	0.3	14.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	4.7	56.	0.	7.8	22.	0.0	0.4	106.1
47	0.8	0.0	0.0	17.	0.1	0.0	0.0	0.7	0.0	0.0	0.0	5.7	116.	0.	16.1	27.	0.0	0.5	183.9
48	1.0	0.0	0.0	18.	0.5	0.0	0.0	0.7	0.0	0.0	0.0	7.3	122.	23.	16.7	28.	2.8	0.7	220.7
51	4.0	0.7	0.5	16.	0.0	0.0	0.0	0.0	1.1	1.6	0.0	10.2	0.	50.	0.0	25.	0.0	2.2	111.9
52	1.2	0.6	0.4	13.	0.1	0.8	0.0	0.0	1.0	0.8	0.1	2.6	0.	0.	0.0	20.	0.0	0.6	41.6

(continued)

TABLE E-5 (continued)

TRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	TRTADS TOTAL
53	6.1	1.4	1.9	26.	0.6	0.0	0.0	0.0	1.9	4.7	0.6	13.4	0.	10.	0.0	43.	0.0	2.8	114.4
54	0.5	2.0	0.1	72.	0.4	22.3	0.0	0.0	0.4	0.0	0.0	2.3	0.	1.	0.0	87.	0.0	0.5	188.5
55	4.9	1.2	0.7	93.	0.9	0.0	0.0	0.0	1.8	1.2	0.2	21.0	0.	103.	0.0	145.	0.0	4.7	377.6
56	0.9	0.3	0.2	33.	0.3	0.0	0.0	0.4	0.6	0.2	0.0	3.8	69.	29.	10.3	51.	0.0	0.9	199.9
57	9.6	1.1	0.5	116.	2.2	0.0	0.0	0.3	1.7	0.7	0.0	41.3	42.	131.	6.2	181.	0.0	9.0	542.6
61	1.8	2.4	14.4	13.	0.0	0.0	0.0	0.0	4.1	0.8	0.0	3.9	0.	25.	0.0	20.	0.0	0.8	86.2
62	1.9	0.7	0.9	16.	0.1	5.8	0.0	0.0	1.1	2.8	0.0	4.3	0.	18.	0.0	24.	13.0	0.9	89.5
63	1.8	3.4	13.2	31.	1.5	0.0	0.0	0.0	5.9	0.2	2.1	6.9	0.	5.	0.0	46.	22.0	2.1	143.1
64	1.9	0.1	0.1	47.	0.4	0.0	0.0	0.1	0.2	0.4	0.1	17.3	16.	8.	2.3	73.	0.0	2.0	168.9
65	1.8	0.8	0.5	42.	0.0	0.0	0.0	0.0	1.3	0.4	0.3	8.4	69.	76.	0.0	65.	0.0	2.0	267.5
66	0.5	0.0	0.0	35.	0.2	0.0	0.0	0.4	0.0	0.1	0.0	4.3	138.	0.	9.5	54.	0.0	0.4	242.4
67	1.0	0.1	0.0	16.	0.3	0.0	0.0	0.8	0.0	0.0	0.0	9.5	0.	0.	19.2	26.	0.0	1.1	74.0
71	1.8	4.0	1.4	9.	0.0	0.0	0.0	0.0	4.6	2.5	0.0	3.9	0.	0.	0.0	14.	0.0	0.5	41.7
72	2.6	1.1	3.0	14.	4.2	0.0	0.0	0.0	1.7	2.3	0.1	6.2	0.	0.	0.0	23.	0.3	1.3	60.0
73	2.5	0.6	0.2	8.	0.3	0.0	0.0	0.0	0.8	1.5	0.0	9.4	0.	1.	0.0	13.	0.0	2.5	39.8
74	1.2	0.8	0.9	15.	4.6	0.0	0.0	0.0	1.5	0.0	0.0	4.6	0.	0.	0.0	23.	0.0	1.0	52.8
75	4.5	2.3	5.3	34.	2.7	0.0	0.0	0.0	3.7	1.4	0.4	18.0	0.	0.	0.0	53.	0.0	3.6	129.2
76	1.6	0.3	0.2	13.	4.0	0.0	0.0	0.0	0.6	0.0	0.0	6.7	0.	0.	0.0	20.	0.0	1.5	48.1
77	3.2	1.5	1.2	46.	11.6	0.0	56.6	0.2	2.4	0.9	0.0	12.2	32.	34.	4.1	71.	0.0	2.7	279.6
78	11.5	3.5	1.6	146.	11.9	0.0	0.0	0.4	2.6	5.6	0.0	43.2	65.	61.	8.7	228.	0.0	8.3	597.3
81	2.8	0.6	0.2	8.	0.3	0.0	0.0	0.0	0.6	0.2	0.0	6.2	0.	1.	0.0	13.	0.0	1.4	34.3
82	9.2	2.7	1.3	27.	0.0	0.0	0.0	0.0	2.8	3.1	0.0	20.3	0.	0.	0.0	42.	0.0	4.6	113.0
84	6.1	2.5	1.3	64.	0.0	0.0	0.0	0.0	2.6	5.9	0.0	30.6	0.	93.	0.0	100.	0.0	7.1	315.1
85	2.0	0.3	0.1	20.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	8.1	0.	0.	0.0	31.	0.0	1.7	63.7
86	2.1	0.9	0.7	29.	0.0	0.0	0.2	0.2	1.6	0.4	0.1	18.1	39.	48.	5.6	46.	0.0	2.0	193.9
87	1.6	1.9	2.5	129.	0.0	0.0	1.3	1.7	1.7	0.3	0.0	13.3	231.	94.	38.5	201.	0.0	1.5	718.4
TOTAL	296.6	124.8	169.3	2543.	73.8	56.6	58.1	8.7	152.1	121.1	17.4	970.2	1411.	2502.	206.5	3944.	153.2	185.9	13015. TONS

TABLE E-6. 1974 SO_2 AREA SOURCE EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
1	2.	41.	21.	3.	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	72.0
2	1.	29.	17.	2.	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	53.0
3	5.	33.	27.	15.	4.4	0.0	0.0	0.0	4.5	0.0	0.0	0.0	88.9
4	9.	26.	15.	6.	0.0	0.0	0.0	0.0	3.5	0.2	0.0	0.1	59.8
5	10.	17.	10.	9.	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.1	48.5
6	24.	26.	7.	6.	0.0	0.0	0.0	0.0	1.6	0.6	0.0	0.1	65.3
7	8.	11.	6.	6.	0.0	0.0	0.0	0.0	0.9	0.7	0.0	0.0	32.6
8	3.	14.	11.	2.	0.0	0.0	0.0	0.0	1.9	0.0	2.6	0.0	34.5
9	6.	12.	5.	3.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	27.0
11	59.	47.	29.	19.	0.0	0.0	0.0	0.0	5.8	1.1	0.0	0.3	161.2
12	45.	9.	5.	8.	0.6	0.0	0.0	0.0	1.1	0.3	0.0	0.2	69.2
13	78.	52.	12.	31.	0.1	0.0	0.0	0.0	2.8	1.5	0.0	0.4	177.8
14	59.	14.	8.	25.	0.2	0.0	0.0	0.0	1.9	1.1	0.0	0.5	109.7
15	60.	39.	23.	38.	1.5	0.0	0.0	0.0	4.5	1.5	0.0	0.5	168.0
16	52.	8.	4.	31.	0.0	0.0	0.0	0.0	1.0	0.1	0.0	0.4	96.5
17	48.	13.	9.	61.	1.7	0.0	0.0	0.5	1.8	0.3	0.0	0.4	135.7
18	13.	8.	26.	24.	0.5	0.0	0.0	0.1	1.1	0.2	1.2	0.1	74.2
21	56.	22.	16.	10.	4.1	0.0	0.0	0.0	2.4	1.9	0.0	0.3	112.7
22	67.	14.	14.	19.	0.5	0.0	0.0	0.0	1.7	1.3	0.0	0.4	117.9
23	67.	15.	16.	13.	4.3	0.0	0.0	0.0	1.7	1.3	0.2	0.4	118.9
24	30.	31.	21.	20.	3.5	0.0	0.0	0.0	3.9	0.5	0.0	0.2	110.1
25	22.	16.	9.	10.	0.1	0.0	0.0	0.0	2.1	0.5	0.0	0.2	59.9
26	24.	7.	4.	19.	1.3	0.0	0.0	0.0	0.9	0.6	0.0	0.2	57.0
27	22.	29.	33.	29.	0.0	0.0	0.0	0.0	3.9	1.1	0.0	0.2	118.2
28	45.	42.	13.	37.	14.4	0.5	0.0	0.1	3.1	0.7	0.0	0.4	156.2
31	54.	22.	24.	15.	0.2	0.0	0.0	0.0	2.1	0.8	0.0	0.3	118.4
32	59.	22.	281.	15.	1.0	0.0	0.0	0.0	3.0	1.3	0.0	0.3	382.6
33	58.	33.	16.	42.	1.0	0.0	0.0	0.0	3.7	1.5	0.0	0.5	155.7
34	23.	29.	27.	25.	3.8	0.0	0.0	0.0	4.0	0.7	0.0	0.2	112.7
35	27.	9.	3.	25.	1.9	0.0	0.0	0.2	0.6	2.5	0.0	0.2	69.6
36	4.	2.	1.	4.	3.4	0.0	0.0	0.4	0.3	1.2	0.0	0.0	16.3
41	51.	9.	10.	10.	0.0	0.0	0.0	0.0	1.3	0.8	0.0	0.3	82.4
42	57.	28.	5.	11.	10.8	0.0	0.0	0.0	1.1	1.6	0.0	0.3	114.8
43	6.	0.	0.	16.	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	22.2
44	14.	3.	2.	11.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0
45	9.	3.	2.	21.	0.6	0.0	0.0	0.3	0.0	0.0	0.0	0.1	36.0
46	4.	0.	0.	7.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	11.3
47	5.	0.	0.	8.	0.2	0.0	0.0	0.6	0.0	0.0	0.0	0.0	13.8
48	6.	0.	0.	8.	1.0	0.0	0.0	0.6	0.0	0.0	0.0	0.1	15.7
51	26.	7.	7.	8.	0.0	0.0	0.0	0.0	0.9	0.5	0.0	0.1	49.5
52	7.	6.	15.	6.	0.3	0.0	0.0	0.0	0.8	0.2	0.0	0.0	35.3

(continued)

TABLE E-6 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
53	35.	17.	12.	13.	1.4	0.0	0.0	0.0	1.5	1.5	0.2	0.2	81.8
54	3.	45.	2.	34.	0.9	0.0	0.0	0.0	0.3	0.0	0.0	0.0	85.2
55	28.	13.	7.	44.	2.2	0.0	0.0	0.0	1.4	0.4	0.0	0.1	96.1
56	5.	3.	2.	15.	0.7	0.0	0.0	0.4	0.5	0.1	0.0	0.0	26.7
57	55.	10.	6.	54.	5.0	0.0	0.0	0.2	1.4	0.2	0.0	0.1	131.9
61	10.	23.	100.	6.	0.0	0.0	0.0	0.0	3.2	0.3	0.0	0.1	142.6
62	11.	6.	17.	7.	0.3	0.0	0.0	0.0	0.8	0.9	0.0	0.1	43.1
63	11.	34.	75.	14.	3.4	0.0	0.0	0.0	4.6	0.0	0.7	0.1	142.8
64	13.	1.	1.	22.	0.8	0.0	0.0	0.1	0.2	0.1	0.0	0.1	38.3
65	14.	8.	7.	20.	0.0	0.0	0.0	0.0	1.1	0.1	0.1	0.1	50.4
66	3.	0.	0.	16.	0.5	0.0	0.0	0.4	0.0	0.0	0.0	0.0	19.9
67	7.	2.	0.	8.	0.8	0.0	0.0	0.7	0.0	0.0	0.0	0.1	18.6
71	10.	29.	16.	4.	0.0	0.0	0.0	0.0	3.6	0.8	0.0	0.1	63.5
72	16.	11.	7.	7.	9.5	0.0	0.0	0.0	1.3	0.7	0.0	0.1	52.6
73	15.	8.	3.	4.	0.6	0.0	0.0	0.0	0.6	0.5	0.0	0.1	31.8
74	7.	9.	8.	7.	10.9	0.0	0.0	0.0	1.2	0.0	0.0	0.1	43.2
75	29.	25.	41.	16.	6.2	0.0	0.0	0.0	2.9	0.3	0.1	0.2	120.7
76	11.	3.	2.	6.	9.1	0.0	0.0	0.0	0.5	0.0	0.0	0.1	31.7
77	20.	15.	8.	21.	26.4	0.0	72.1	0.2	1.9	0.3	0.0	0.2	165.1
78	70.	31.	9.	68.	27.1	0.0	0.0	0.3	2.1	1.7	0.0	0.6	209.8
81	16.	6.	2.	4.	0.8	0.0	0.0	0.0	0.4	0.1	0.0	0.1	29.4
82	52.	26.	13.	13.	0.0	0.0	0.0	0.0	2.2	1.0	0.0	0.3	107.5
84	49.	22.	11.	30.	0.0	0.0	0.0	0.0	2.0	1.8	0.0	0.4	116.2
85	13.	3.	2.	9.	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	27.5
86	8.	9.	6.	14.	0.0	0.0	0.2	0.2	1.2	0.1	0.0	0.1	40.8
87	6.	10.	8.	60.	0.0	0.5	0.2	1.4	1.3	0.1	0.0	0.1	87.6
TOTAL	1742.	1117.	1121.	1194.	168.0	1.0	72.5	7.1	119.1	37.6	5.1	11.5	5596.

TABLE E-7. 1975 TSP AREA SOURCE EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
1	0.3	3.6	2.2	5.	1.9	0.0	0.0	0.0	6.3	0.0	0.0	0.7	0.	0.	0.0	8.	0.0	0.0	28.0
2	0.2	2.9	1.5	4.	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.3	0.	0.	0.0	7.	0.0	0.0	21.0
3	0.9	3.3	2.9	31.	0.0	0.0	0.0	0.0	5.6	0.1	0.0	2.0	0.	0.	0.0	49.	0.0	0.2	95.0
4	1.6	3.1	1.4	12.	0.0	0.0	0.0	0.0	4.5	0.5	0.0	3.6	0.	0.	0.0	19.	0.0	0.3	46.0
5	1.8	1.7	1.0	17.	0.0	0.0	0.0	0.0	3.0	0.1	0.0	3.9	0.	0.	0.0	29.	0.0	0.4	57.9
6	4.2	1.9	0.6	13.	0.0	0.0	0.0	0.0	2.0	2.0	0.0	9.2	0.	65.	0.0	21.	0.0	0.9	119.8
7	1.3	2.3	0.6	12.	0.0	0.0	0.0	0.0	1.1	2.3	0.0	3.0	0.	50.	0.0	18.	0.0	0.7	91.3
8	0.6	1.4	9.2	5.	0.0	0.0	0.0	0.0	2.4	0.0	8.4	1.3	0.	40.	0.0	7.	0.0	0.3	75.6
9	1.0	2.1	0.5	6.	0.0	0.0	0.0	0.0	1.3	0.0	0.0	2.3	0.	60.	0.0	10.	0.0	0.5	83.7
11	10.4	7.4	2.4	41.	0.0	0.0	0.0	0.0	7.4	3.7	0.1	23.0	0.	30.	0.0	64.	0.0	3.0	192.4
12	8.0	1.0	0.5	16.	0.3	0.0	0.0	0.0	1.4	0.8	0.0	17.7	0.	0.	0.0	25.	0.0	3.3	74.0
13	13.9	2.8	1.1	67.	0.0	0.0	0.0	0.0	3.6	4.6	0.0	30.5	0.	0.	0.0	104.	0.0	5.9	233.4
14	8.9	2.1	0.7	54.	0.1	0.0	0.0	0.0	2.4	3.4	0.0	35.8	0.	0.	0.0	84.	0.0	7.5	198.9
15	9.0	5.4	2.0	82.	0.6	0.0	0.0	0.0	5.6	4.7	0.0	36.3	0.	6.	0.0	128.	4.0	6.3	289.9
16	7.9	3.0	0.1	66.	0.0	0.0	0.0	0.0	1.3	0.4	0.0	32.0	7.	103.	0.9	103.	0.0	6.3	331.6
17	7.9	1.3	1.1	130.	0.8	0.0	0.0	0.6	2.2	0.9	0.0	31.1	95.	593.	13.0	203.	0.6	6.8	1087.8
18	1.9	0.8	1.5	50.	0.2	0.0	0.0	0.1	1.5	0.6	3.7	7.8	10.	120.	1.5	78.	9.6	1.1	288.3
21	10.0	2.4	2.9	22.	1.8	0.0	0.0	0.0	3.0	6.1	0.1	22.0	0.	125.	0.0	34.	10.4	4.4	244.1
22	11.9	1.6	44.1	40.	0.2	0.0	0.0	0.0	2.2	4.1	0.0	26.2	0.	1.	0.0	62.	0.0	6.5	199.8
23	11.8	1.7	1.4	26.	1.9	0.0	0.0	0.0	2.3	4.1	0.8	25.9	0.	95.	0.0	44.	5.0	5.4	227.3
24	4.7	3.0	1.9	42.	1.0	0.0	0.0	0.0	4.9	1.7	0.0	20.0	0.	1.	0.0	66.	0.0	3.8	150.6
25	3.4	1.6	0.8	21.	0.1	0.0	0.0	0.0	2.6	1.6	0.0	13.5	0.	0.	0.0	33.	0.0	2.2	79.8
26	4.7	0.7	0.4	41.	0.6	0.0	0.0	0.0	1.2	1.8	0.0	17.8	0.	0.	0.0	64.	0.0	4.9	137.1
27	3.5	2.9	3.2	62.	0.0	0.0	0.0	0.0	5.0	3.6	0.0	15.0	0.	58.	0.0	97.	0.0	3.3	253.5
28	9.0	4.0	1.3	79.	6.3	0.0	0.0	0.8	3.9	2.9	0.1	33.8	104.	77.	18.2	124.	0.0	7.9	471.9
31	9.5	2.0	5.0	32.	0.1	0.0	0.0	0.0	2.6	2.5	0.0	21.0	0.	0.	0.0	50.	0.0	4.5	129.2
32	10.4	9.0	32.9	33.	0.4	0.0	0.0	0.0	3.8	4.0	0.0	23.0	0.	2.	0.0	51.	0.0	4.4	173.9
33	9.2	3.3	1.4	90.	0.4	0.0	0.0	0.0	4.7	4.8	0.0	39.6	0.	15.	0.0	140.	0.0	4.2	312.6
34	3.7	3.9	6.0	52.	1.6	0.0	0.0	0.0	5.0	2.3	0.0	15.9	2.	102.	0.2	82.	0.0	2.7	281.1
35	4.2	1.8	0.3	53.	0.9	0.0	0.0	0.2	1.0	8.1	0.0	18.1	33.	48.	4.5	83.	0.0	3.0	259.1
36	0.6	0.5	0.1	8.	1.5	25.2	0.0	0.4	0.3	3.8	0.1	2.4	62.	0.	8.9	12.	0.0	0.5	126.7
41	9.1	1.0	0.9	22.	0.0	0.0	0.0	0.0	1.6	2.4	0.1	20.0	0.	26.	0.0	34.	8.0	4.3	129.4
42	10.1	1.8	0.4	24.	4.8	0.0	0.0	0.0	1.4	5.1	0.0	22.3	0.	1.	0.0	37.	77.6	5.3	190.8
43	1.0	0.0	0.0	33.	0.0	2.5	0.0	0.1	0.0	0.1	0.0	4.3	21.	0.	2.8	52.	0.0	0.6	117.6
44	2.5	0.3	0.2	23.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	10.7	0.	20.	0.0	35.	0.0	2.3	94.5
45	1.4	0.3	0.5	45.	0.3	0.0	0.0	0.3	0.6	0.0	0.0	10.5	47.	53.	6.4	70.	0.0	0.9	236.0
46	0.6	0.0	0.3	14.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	4.7	51.	0.	7.2	22.	0.0	0.4	100.9
47	0.8	0.0	0.0	17.	0.1	0.0	0.0	0.7	0.0	0.0	0.0	5.7	106.	0.	14.8	27.	0.0	0.5	173.1
48	1.0	0.0	0.0	18.	0.5	0.0	0.0	0.7	0.0	0.0	0.0	7.3	112.	23.	15.3	28.	2.8	0.7	209.3
51	4.6	0.7	0.5	16.	0.0	0.0	0.0	0.0	1.1	1.6	0.0	10.2	0.	50.	0.0	25.	0.0	2.2	111.9
52	1.2	0.6	0.8	13.	0.1	0.8	0.0	0.0	1.0	0.8	0.1	2.6	0.	0.	0.0	20.	0.0	0.6	41.6

(continued)

TABLE E-7 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
53	6.1	1.4	1.9	28.	0.6	0.0	0.0	0.0	1.9	4.7	0.6	13.4	0.	10.	0.0	43.	0.0	2.8	114.4
54	0.5	2.0	0.1	72.	0.4	22.3	0.0	0.0	0.4	0.0	0.0	2.3	0.	1.	0.0	87.	0.0	0.5	188.5
55	4.9	1.2	0.7	93.	0.9	0.0	0.0	0.0	1.8	1.2	0.2	21.0	0.	103.	0.0	145.	0.0	4.7	377.6
56	0.9	0.3	0.2	33.	0.3	0.0	0.0	0.4	0.6	0.2	0.0	3.8	63.	29.	9.5	51.	0.0	0.9	193.4
57	9.6	1.1	0.5	116.	2.2	0.0	0.0	0.3	1.7	0.7	0.0	41.3	39.	131.	5.7	181.	0.0	9.0	538.6
61	1.8	2.4	14.4	13.	0.0	0.0	0.0	0.0	4.1	0.8	0.0	3.9	0.	25.	0.0	20.	0.0	0.8	86.2
62	1.9	0.7	0.9	16.	0.1	5.8	0.0	0.0	1.1	2.8	0.0	4.3	0.	18.	0.0	24.	13.0	0.9	89.5
63	1.4	3.4	13.2	31.	1.5	0.0	0.0	0.0	5.9	0.2	2.1	6.9	0.	5.	0.0	48.	22.0	2.1	143.1
64	1.9	0.1	0.1	47.	0.4	0.0	0.0	0.1	0.2	0.4	0.1	17.3	15.	8.	2.1	73.	0.0	2.0	167.4
65	1.8	0.8	0.5	42.	0.0	0.0	0.0	0.0	1.3	0.4	0.3	8.4	63.	76.	0.0	65.	0.0	2.0	261.8
66	0.5	0.0	0.0	35.	0.2	0.0	0.0	0.4	0.0	0.1	0.0	4.3	127.	0.	8.7	54.	0.0	0.4	230.3
67	1.0	0.1	0.0	16.	0.3	0.0	0.0	0.8	0.0	0.0	0.0	9.5	0.	0.	17.6	26.	0.0	1.1	72.4
71	1.8	4.0	1.4	9.	0.0	0.0	0.0	0.0	4.6	2.5	0.0	3.9	0.	0.	0.0	14.	0.0	0.5	41.7
72	2.8	1.1	3.0	14.	4.2	0.0	0.0	0.0	1.7	2.3	0.1	6.2	0.	0.	0.0	23.	0.3	1.3	60.0
73	2.5	0.6	0.2	8.	0.3	0.0	0.0	0.0	0.8	1.5	0.0	9.4	0.	1.	0.0	13.	0.0	2.5	39.8
74	1.2	0.6	0.9	15.	4.8	0.0	0.0	0.0	1.5	0.0	0.0	4.6	0.	0.	0.0	23.	0.0	1.0	52.8
75	4.8	2.3	5.3	34.	2.7	0.0	0.0	0.0	3.7	1.4	0.4	18.0	0.	0.	0.0	53.	0.0	3.6	129.2
76	1.8	0.3	0.2	13.	4.0	0.0	0.0	0.0	0.6	0.0	0.0	6.7	0.	0.	0.0	20.	0.0	1.5	48.1
77	3.2	1.5	1.2	46.	11.6	0.0	56.6	0.2	2.4	0.9	0.0	12.2	29.	34.	3.8	71.	0.0	2.7	276.6
78	11.5	3.5	1.6	146.	11.9	0.0	0.0	0.4	2.6	5.6	0.0	43.2	60.	61.	8.0	228.	0.0	8.3	591.3
81	2.8	0.6	0.2	8.	0.3	0.0	0.0	0.0	0.6	0.2	0.0	6.2	0.	1.	0.0	13.	0.0	1.4	34.3
82	9.2	2.7	1.3	27.	0.0	0.0	0.0	0.0	2.8	3.1	0.0	20.3	0.	0.	0.0	42.	0.0	4.6	113.0
84	8.1	2.5	1.3	64.	0.0	0.0	0.0	0.0	2.6	5.9	0.0	30.6	0.	93.	0.0	100.	0.0	7.1	315.1
85	2.0	0.3	0.1	20.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	8.1	0.	0.	0.0	31.	0.0	1.7	63.7
86	2.1	0.9	0.7	29.	0.0	0.0	0.2	0.2	1.6	0.4	0.1	18.1	36.	48.	5.1	46.	0.0	2.0	190.2
87	1.6	1.0	2.5	129.	0.0	0.0	1.3	1.7	1.7	0.3	0.0	13.3	212.	94.	35.3	201.	0.0	1.5	696.3
TOTAL	296.8	124.8	189.3	2543.	73.8	56.6	58.1	8.7	152.1	121.1	17.4	970.2	1295.	2502.	189.6	3944.	153.2	185.9	12882. TONS

GROWTH FACTORS BY CATEGORY:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.918	1.000	0.918	1.000	1.000	1.000

TABLE E-8. 1975 SO_2 AREA SOURCE EMISSIONS

IRIADS	1	2	3	4	5	6	7	8	9	10	11	12	IRIADS TOTAL
1	2.	41.	21.	3.	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	72.0
2	1.	29.	17.	2.	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	53.0
3	5.	33.	27.	15.	4.4	0.0	0.0	0.0	4.5	0.0	0.0	0.0	88.9
4	9.	26.	15.	6.	0.0	0.0	0.0	0.0	3.5	0.2	0.0	0.1	59.8
5	10.	17.	10.	9.	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.1	48.5
6	24.	26.	7.	6.	0.0	0.0	0.0	0.0	1.6	0.6	0.0	0.1	65.3
7	8.	11.	6.	6.	0.0	0.0	0.0	0.0	0.9	0.7	0.0	0.0	32.6
8	3.	14.	11.	2.	0.0	0.0	0.0	0.0	1.9	0.0	2.6	0.0	34.5
9	6.	12.	5.	3.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	27.0
11	59.	47.	29.	19.	0.0	0.0	0.0	0.0	5.8	1.1	0.0	0.3	161.2
12	45.	9.	5.	6.	0.6	0.0	0.0	0.0	1.1	0.3	0.0	0.2	69.2
13	78.	52.	12.	31.	0.1	0.0	0.0	0.0	2.8	1.5	0.0	0.4	177.8
14	59.	14.	8.	25.	0.2	0.0	0.0	0.0	1.9	1.1	0.0	0.5	109.7
15	60.	39.	23.	38.	1.5	0.0	0.0	0.0	4.5	1.5	0.0	0.5	168.0
16	52.	8.	4.	31.	0.0	0.0	0.0	0.0	1.0	0.1	0.0	0.4	96.5
17	48.	13.	9.	61.	1.7	0.0	0.0	0.5	1.8	0.3	0.0	0.4	135.7
18	13.	8.	26.	24.	0.5	0.0	0.0	0.1	1.1	0.2	1.2	0.1	74.2
21	56.	22.	16.	10.	4.1	0.0	0.0	0.0	2.4	1.9	0.0	0.3	112.7
22	67.	14.	14.	19.	0.5	0.0	0.0	0.0	1.7	1.3	0.0	0.4	117.9
23	67.	15.	16.	13.	4.3	0.0	0.0	0.0	1.7	1.3	0.2	0.4	118.9
24	30.	31.	21.	20.	3.5	0.0	0.0	0.0	3.9	0.5	0.0	0.2	110.1
25	22.	16.	9.	10.	0.1	0.0	0.0	0.0	2.1	0.5	0.0	0.2	59.9
26	24.	7.	4.	19.	1.3	0.0	0.0	0.0	0.9	0.6	0.0	0.2	57.0
27	22.	29.	33.	29.	0.0	0.0	0.0	0.0	3.9	1.1	0.0	0.2	118.2
28	45.	42.	13.	37.	14.4	0.5	0.0	0.1	3.1	0.7	0.0	0.4	156.2
31	54.	22.	24.	15.	0.2	0.0	0.0	0.0	2.1	0.8	0.0	0.3	118.4
32	59.	22.	281.	15.	1.0	0.0	0.0	0.0	3.0	1.3	0.0	0.3	382.6
33	58.	33.	16.	42.	1.0	0.0	0.0	0.0	3.7	1.5	0.0	0.5	155.7
34	23.	29.	27.	25.	3.8	0.0	0.0	0.0	4.0	0.7	0.0	0.2	112.7
35	27.	9.	3.	25.	1.9	0.0	0.0	0.2	0.8	2.5	0.0	0.2	69.6
36	4.	2.	1.	4.	3.4	0.0	0.0	0.4	0.3	1.2	0.0	0.0	16.3
41	51.	9.	10.	10.	0.0	0.0	0.0	0.0	1.3	0.8	0.0	0.3	82.4
42	57.	28.	5.	11.	10.8	0.0	0.0	0.0	1.1	1.6	0.0	0.3	114.8
43	6.	0.	0.	16.	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	22.2
44	14.	3.	2.	11.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0
45	9.	3.	2.	21.	0.6	0.0	0.0	0.3	0.0	0.0	0.0	0.1	36.0
46	4.	0.	0.	7.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	11.3
47	5.	0.	0.	8.	0.2	0.0	0.0	0.6	0.0	0.0	0.0	0.0	13.8
48	6.	0.	0.	8.	1.0	0.0	0.0	0.6	0.0	0.0	0.0	0.1	15.7
51	20.	7.	7.	8.	0.0	0.0	0.0	0.0	0.9	0.5	0.0	0.1	49.5
52	7.	6.	15.	6.	0.3	0.0	0.0	0.0	0.8	0.2	0.0	0.0	35.3

(continued)

TABLE E-8 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
53	35.	17.	12.	13.	1.4	0.0	0.0	0.0	1.5	1.5	0.2	0.2	81.8
54	3.	45.	2.	34.	0.9	0.0	0.0	0.0	0.3	0.0	0.0	0.0	85.2
55	28.	13.	7.	44.	2.2	0.0	0.0	0.0	1.4	0.4	0.0	0.1	96.1
56	5.	3.	2.	15.	0.7	0.0	0.0	0.4	0.5	0.1	0.0	0.0	26.7
57	55.	10.	6.	54.	5.0	0.0	0.0	0.2	1.4	0.2	0.0	0.1	131.9
61	10.	23.	100.	6.	0.0	0.0	0.0	0.0	3.2	0.3	0.0	0.1	142.6
62	11.	6.	17.	7.	0.3	0.0	0.0	0.0	0.8	0.9	0.0	0.1	43.1
63	11.	34.	75.	14.	3.4	0.0	0.0	0.0	4.6	0.0	0.7	0.1	142.8
64	13.	1.	1.	22.	0.8	0.0	0.0	0.1	0.2	0.1	0.0	0.1	38.3
65	14.	8.	7.	20.	0.0	0.0	0.0	0.0	1.1	0.1	0.1	0.1	50.4
66	3.	0.	0.	16.	0.5	0.0	0.0	0.4	0.0	0.0	0.0	0.0	19.9
67	7.	2.	0.	8.	0.8	0.0	0.0	0.7	0.0	0.0	0.0	0.1	18.6
71	10.	29.	16.	4.	0.0	0.0	0.0	0.0	3.6	0.8	0.0	0.1	63.5
72	16.	11.	7.	7.	9.5	0.0	0.0	0.0	1.3	0.7	0.0	0.1	52.6
73	15.	8.	3.	4.	0.6	0.0	0.0	0.0	0.6	0.5	0.0	0.1	31.8
74	7.	9.	8.	7.	10.9	0.0	0.0	0.0	1.2	0.0	0.0	0.1	43.2
75	29.	25.	41.	16.	6.2	0.0	0.0	0.0	2.9	0.3	0.1	0.2	120.7
76	11.	3.	2.	6.	9.1	0.0	0.0	0.0	0.5	0.0	0.0	0.1	31.7
77	20.	15.	8.	21.	26.4	0.0	72.1	0.2	1.9	0.3	0.0	0.2	165.1
78	70.	31.	9.	68.	27.1	0.0	0.0	0.3	2.1	1.7	0.0	0.6	209.8
81	16.	6.	2.	4.	0.8	0.0	0.0	0.0	0.4	0.1	0.0	0.1	29.4
82	52.	26.	13.	13.	0.0	0.0	0.0	0.0	2.2	1.0	0.0	0.3	107.5
84	49.	22.	11.	30.	0.0	0.0	0.0	0.0	2.0	1.8	0.0	0.4	116.2
85	13.	3.	2.	9.	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	27.5
86	8.	9.	8.	14.	0.0	0.0	0.2	0.2	1.2	0.1	0.0	0.1	40.8
87	6.	10.	8.	60.	0.0	0.5	0.2	1.4	1.3	0.1	0.0	0.1	87.6
TOTAL	1742.	1117.	1121.	1194.	168.0	1.0	72.5	7.1	119.1	37.6	5.1	11.5	5596. TONS

GROWTH FACTORS BY CATEGORY:

1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000

TABLE E-9. 1980 TSP EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
1	0.3	3.9	2.2	5.	2.0	0.0	0.0	0.0	6.4	0.0	0.0	0.7	0.	0.	0.0	9.	0.0	0.0	29.4
2	0.2	3.1	1.5	4.	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.3	0.	0.	0.0	8.	0.0	0.0	22.1
3	0.9	3.6	2.9	28.	0.0	0.0	0.0	0.0	5.7	0.1	0.0	2.0	0.	0.	0.0	56.	0.0	0.2	100.2
4	1.6	3.4	1.4	11.	0.0	0.0	0.0	0.0	4.6	0.5	0.0	3.7	0.	0.	0.0	22.	0.0	0.3	48.3
5	1.8	1.8	1.0	16.	0.0	0.0	0.0	0.0	3.1	0.1	0.0	4.0	0.	0.	0.0	33.	0.0	0.4	61.1
6	4.1	2.1	0.6	12.	0.0	0.0	0.0	0.0	2.0	2.2	0.0	9.4	0.	48.	0.0	24.	0.0	0.9	105.7
7	1.3	2.5	0.6	11.	0.0	0.0	0.0	0.0	1.1	2.5	0.0	3.1	0.	37.	0.0	21.	0.0	0.7	80.7
8	0.6	1.5	9.3	5.	0.0	0.0	0.0	0.0	2.4	0.0	8.5	1.3	0.	30.	0.0	8.	0.0	0.3	66.3
9	1.0	2.3	0.5	6.	0.0	0.0	0.0	0.0	1.3	0.0	0.0	2.3	0.	45.	0.0	12.	0.0	0.5	69.6
11	10.2	8.0	2.4	38.	0.0	0.0	0.0	0.0	7.5	4.0	0.1	23.5	0.	22.	0.0	74.	0.0	3.1	192.3
12	7.6	1.1	0.5	15.	0.3	0.0	0.0	0.0	1.4	0.9	0.0	18.1	0.	0.	0.0	29.	0.0	3.4	76.9
13	13.6	3.0	1.1	62.	0.0	0.0	0.0	0.0	3.7	5.0	0.0	31.1	0.	0.	0.0	120.	0.0	6.0	244.6
14	8.7	2.3	0.7	50.	0.1	0.0	0.0	0.0	2.4	3.7	0.0	36.5	0.	0.	0.0	97.	0.0	7.7	208.2
15	8.8	5.9	2.0	75.	0.6	0.0	0.0	0.0	5.7	5.1	0.0	37.0	0.	4.	0.0	147.	4.0	6.4	302.5
16	7.7	3.3	0.4	61.	0.0	0.0	0.0	0.0	1.3	0.4	0.0	32.6	7.	77.	0.7	118.	0.0	6.4	315.5
17	7.7	1.4	1.1	119.	0.8	0.0	0.0	0.6	2.2	1.0	0.0	31.7	90.	441.	10.6	233.	0.6	6.9	948.3
18	1.9	0.9	1.5	46.	0.2	0.0	0.0	0.1	1.5	0.6	3.7	8.0	9.	89.	1.2	90.	9.5	1.1	264.6
21	9.4	2.6	2.9	20.	1.9	0.0	0.0	0.0	3.1	6.6	0.1	22.4	0.	93.	0.0	39.	10.4	4.5	216.6
22	11.6	1.7	44.4	37.	0.2	0.0	0.0	0.0	2.2	4.4	0.0	26.7	0.	1.	0.0	71.	0.0	6.6	206.7
23	11.5	1.8	1.4	26.	2.0	0.0	0.0	0.0	2.3	4.4	0.8	26.4	0.	71.	0.0	51.	5.0	5.5	208.3
24	4.6	3.3	1.9	39.	1.7	0.0	0.0	0.0	5.0	1.8	0.0	20.4	0.	1.	0.0	76.	0.0	3.9	157.8
25	3.3	1.7	0.8	19.	0.1	0.0	0.0	0.0	2.7	1.7	0.0	13.8	0.	0.	0.0	38.	0.0	2.2	83.6
26	4.6	0.8	0.4	38.	0.6	0.0	0.0	0.0	1.2	1.9	0.0	18.2	0.	0.	0.0	74.	0.0	5.0	143.9
27	3.4	3.1	3.2	57.	0.0	0.0	0.0	0.0	5.1	3.9	0.0	15.3	0.	43.	0.0	112.	0.0	3.4	249.1
28	6.8	4.3	1.3	73.	6.7	0.0	0.0	0.8	4.0	3.1	0.1	34.5	97.	57.	14.7	143.	0.0	8.1	456.1
31	9.3	2.2	5.0	29.	0.1	0.0	0.0	0.0	2.7	2.7	0.0	21.4	0.	0.	0.0	58.	0.0	4.6	134.8
32	10.2	9.8	33.1	30.	0.4	0.0	0.0	0.0	3.9	4.3	0.0	23.5	0.	1.	0.0	59.	0.0	4.5	180.0
33	9.0	3.6	1.4	83.	0.4	0.0	0.0	0.0	4.8	5.2	0.0	40.4	0.	11.	0.0	161.	0.0	4.3	323.8
34	3.6	4.2	8.0	48.	1.7	0.0	0.0	0.0	5.1	2.5	0.0	16.2	2.	76.	0.1	94.	0.0	2.8	263.9
35	4.1	2.0	0.3	49.	1.0	0.0	0.0	0.2	1.0	8.7	0.0	18.5	31.	36.	3.6	95.	0.0	3.1	253.3
36	0.6	0.5	0.1	7.	1.6	25.2	0.0	0.4	0.3	4.1	0.1	2.4	59.	0.	7.2	14.	0.0	0.5	122.8
41	8.9	1.1	0.9	20.	0.0	0.0	0.0	0.0	1.6	2.6	0.1	20.4	0.	19.	0.0	39.	8.0	4.4	126.6
42	9.9	2.0	0.4	22.	5.1	0.0	0.0	0.0	1.4	5.5	0.0	22.7	0.	1.	0.0	43.	77.6	5.4	195.3
43	1.0	0.0	0.0	30.	0.0	2.5	0.0	0.1	0.0	0.1	0.0	4.4	20.	0.	2.3	60.	0.0	0.6	120.9
44	2.4	0.3	0.2	21.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	10.9	0.	15.	0.0	40.	0.0	2.3	93.0
45	1.4	0.3	0.5	41.	0.3	0.0	0.0	0.3	0.6	0.0	0.0	10.7	44.	39.	5.2	81.	0.0	0.9	225.4
46	0.6	0.0	0.3	13.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	4.8	48.	0.	5.8	25.	0.0	0.4	98.6
47	0.8	0.0	0.0	16.	0.1	0.0	0.0	0.7	0.0	0.0	0.0	5.8	100.	0.	12.0	31.	0.0	0.5	166.4
48	1.0	0.0	0.0	17.	0.5	0.0	0.0	0.7	0.0	0.0	0.0	7.4	105.	17.	12.4	32.	2.8	0.7	196.5
51	4.5	0.8	0.5	15.	0.0	0.0	0.0	0.0	1.1	1.7	0.0	10.4	0.	37.	0.0	29.	0.0	2.2	101.9
52	1.2	0.7	0.8	12.	0.1	0.8	0.0	0.0	1.0	0.9	0.1	2.7	0.	0.	0.0	23.	0.0	0.6	43.7

(continued)

TABLE E-9 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
53	6.0	1.5	1.9	26.	0.6	0.0	0.0	0.0	1.9	5.1	0.6	13.7	0.	7.	0.0	49.	0.0	2.9	116.8
54	0.5	2.2	0.1	66.	0.4	22.3	0.0	0.0	0.4	0.0	0.0	2.3	0.	1.	0.0	100.	0.0	0.5	195.6
55	4.8	1.3	0.7	85.	1.0	0.0	0.0	0.0	1.8	1.3	0.2	21.4	0.	77.	0.0	167.	0.0	4.8	366.0
56	0.9	0.3	0.2	30.	0.3	0.0	0.0	0.4	0.6	0.2	0.0	3.9	59.	22.	7.7	59.	0.0	0.9	185.3
57	9.4	1.2	0.5	106.	2.3	0.0	0.0	0.3	1.7	0.8	0.0	42.1	36.	97.	4.6	208.	0.0	9.2	520.4
61	1.9	2.6	14.5	12.	0.0	0.0	0.0	0.0	4.2	0.9	0.0	4.0	0.	19.	0.0	23.	0.0	0.8	82.2
62	1.9	0.8	0.9	15.	0.1	5.8	0.0	0.0	1.1	3.0	0.0	4.4	0.	13.	0.0	28.	13.0	0.9	87.6
63	1.8	3.7	13.3	28.	1.6	0.0	0.0	0.0	6.0	0.2	2.1	7.0	0.	4.	0.0	55.	22.0	2.1	147.2
64	1.9	0.1	0.1	43.	0.4	0.0	0.0	0.1	0.2	0.4	0.1	17.6	14.	6.	1.7	84.	0.0	2.0	171.5
65	1.8	0.9	0.5	39.	0.0	0.0	0.0	0.0	1.3	0.4	0.3	8.6	59.	57.	0.0	75.	0.0	2.0	245.1
66	0.5	0.0	0.0	32.	0.2	0.0	0.0	0.4	0.0	0.1	0.0	4.4	119.	0.	7.1	62.	0.0	0.4	226.1
67	1.0	0.1	0.0	15.	0.3	0.0	0.0	0.8	0.0	0.0	0.0	9.7	0.	0.	14.3	30.	0.0	1.1	71.9
71	1.8	4.3	1.4	8.	0.0	0.0	0.0	0.0	4.7	2.7	0.0	4.0	0.	0.	0.0	16.	0.0	0.5	43.7
72	2.7	1.2	3.0	13.	4.5	0.0	0.0	0.0	1.7	2.5	0.1	6.3	0.	0.	0.0	26.	0.3	1.3	63.0
73	2.4	0.7	0.2	7.	0.3	0.0	0.0	0.0	0.8	1.6	0.0	9.6	0.	1.	0.0	15.	0.0	2.6	41.2
74	1.2	0.9	0.9	14.	5.1	0.0	0.0	0.0	1.5	0.0	0.0	4.7	0.	0.	0.0	26.	0.0	1.0	55.5
75	4.7	2.5	5.3	31.	2.9	0.0	0.0	0.0	3.8	1.5	0.4	18.4	0.	0.	0.0	61.	0.0	3.7	135.3
76	1.6	0.3	0.2	12.	4.2	0.0	0.0	0.0	0.6	0.0	0.0	6.8	0.	0.	0.0	23.	0.0	1.5	50.4
77	3.1	1.6	1.2	42.	12.3	0.0	67.0	0.2	2.4	1.0	0.0	12.4	28.	25.	3.1	82.	0.0	2.8	283.9
78	11.2	3.8	1.6	134.	12.6	0.0	0.0	0.4	2.7	6.0	0.0	44.1	56.	45.	6.5	262.	0.0	8.5	594.9
81	2.7	0.7	0.2	7.	0.3	0.0	0.0	0.0	0.6	0.2	0.0	6.3	0.	1.	0.0	15.	0.0	1.4	35.5
82	9.0	2.9	1.3	25.	0.0	0.0	0.0	0.0	2.9	3.3	0.0	20.7	0.	0.	0.0	48.	0.0	4.7	117.9
84	7.9	2.7	1.3	59.	0.0	0.0	0.0	0.0	2.7	6.4	0.0	31.2	0.	69.	0.0	115.	0.0	7.2	302.3
85	2.0	0.3	0.1	18.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	8.3	0.	0.	0.0	36.	0.0	1.7	66.9
86	2.0	1.0	0.7	27.	0.0	0.0	0.2	0.2	1.6	0.4	0.1	18.5	34.	36.	4.2	53.	0.0	2.0	179.8
87	1.6	1.1	2.5	118.	0.0	0.0	1.5	1.7	1.7	0.3	0.0	13.6	199.	70.	28.6	231.	0.0	1.5	672.6
TOTAL	289.7	135.3	190.4	2334.	78.3	56.6	68.8	8.9	155.1	130.8	17.5	989.6	1215.	1861.	153.6	4536.	153.2	189.6	12564. TONS

GROWTH FACTORS BY CATEGORY:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.976	1.064	1.006	0.918	1.061	1.000	1.184	1.020	1.020	1.080	1.006	1.020	0.861	0.744	0.744	1.150	1.000	1.020

TABLE E-10. 1980 SO_2 EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
1	2.	44.	21.	3.	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.0	75.6
2	1.	31.	17.	2.	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	55.6
3	5.	36.	27.	15.	4.7	0.0	0.0	0.0	4.6	0.0	0.0	0.0	92.1
4	9.	28.	15.	6.	0.0	0.0	0.0	0.0	3.6	0.2	0.0	0.1	62.0
5	10.	18.	10.	9.	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.1	49.8
6	23.	28.	7.	6.	0.0	0.0	0.0	0.0	1.6	0.6	0.0	0.1	67.1
7	8.	12.	6.	6.	0.0	0.0	0.0	0.0	0.9	0.8	0.0	0.0	33.5
8	3.	15.	11.	2.	0.0	0.0	0.0	0.0	1.9	0.0	2.6	0.0	35.7
9	6.	13.	5.	3.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	27.9
11	58.	51.	29.	19.	0.0	0.0	0.0	0.0	5.9	1.2	0.0	0.3	164.3
12	44.	10.	5.	8.	0.6	0.0	0.0	0.0	1.1	0.3	0.0	0.2	69.1
13	76.	56.	12.	31.	0.1	0.0	0.0	0.0	2.9	1.6	0.0	0.4	180.8
14	58.	15.	8.	25.	0.2	0.0	0.0	0.0	1.9	1.2	0.0	0.5	109.8
15	59.	42.	23.	38.	1.6	0.0	0.0	0.0	4.6	1.6	0.0	0.5	170.5
16	51.	9.	4.	31.	0.0	0.0	0.0	0.0	1.0	0.1	0.0	0.4	96.2
17	47.	14.	9.	61.	1.8	0.0	0.0	0.5	1.8	0.3	0.0	0.4	136.1
18	13.	9.	26.	24.	0.5	0.0	0.0	0.1	1.1	0.2	1.2	0.1	74.9
21	55.	24.	16.	10.	4.4	0.0	0.0	0.0	2.4	2.1	0.0	0.3	113.9
22	66.	15.	14.	19.	0.5	0.0	0.0	0.0	1.7	1.4	0.0	0.4	117.9
23	66.	16.	16.	13.	4.6	0.0	0.0	0.0	1.7	1.4	0.2	0.4	119.2
24	29.	34.	21.	20.	3.7	0.0	0.0	0.0	4.0	0.5	0.0	0.2	112.5
25	22.	17.	9.	10.	0.1	0.0	0.0	0.0	2.1	0.5	0.0	0.2	60.9
26	23.	8.	4.	19.	1.4	0.0	0.0	0.0	0.9	0.6	0.0	0.2	57.3
27	22.	31.	33.	29.	0.0	0.0	0.0	0.0	4.0	1.2	0.0	0.2	120.6
28	44.	46.	13.	37.	15.3	0.5	0.0	0.1	3.2	0.8	0.0	0.4	159.9
31	53.	24.	24.	15.	0.2	0.0	0.0	0.0	2.1	0.9	0.0	0.3	119.4
32	58.	24.	283.	15.	1.1	0.0	0.0	0.0	3.1	1.4	0.0	0.3	385.1
33	57.	36.	16.	42.	1.1	0.0	0.0	0.0	3.8	1.6	0.0	0.5	157.6
34	22.	31.	27.	25.	4.0	0.0	0.0	0.0	4.1	0.8	0.0	0.2	115.2
35	26.	10.	3.	25.	2.0	0.0	0.0	0.2	0.8	2.7	0.0	0.2	70.2
36	4.	2.	1.	4.	3.6	0.0	0.0	0.4	0.3	1.3	0.0	0.0	16.7
41	50.	10.	10.	10.	0.0	0.0	0.0	0.0	1.3	0.9	0.0	0.3	82.2
42	56.	30.	5.	11.	11.5	0.0	0.0	0.0	1.1	1.7	0.0	0.3	116.8
43	6.	0.	0.	16.	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	22.1
44	14.	3.	2.	11.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0
45	9.	3.	2.	21.	0.6	0.0	0.0	0.3	0.0	0.0	0.0	0.1	36.2
46	4.	0.	0.	7.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	11.2
47	5.	0.	0.	8.	0.2	0.0	0.0	0.6	0.0	0.0	0.0	0.0	13.7
48	6.	0.	0.	6.	1.1	0.0	0.0	0.6	0.0	0.0	0.0	0.1	15.7
51	25.	8.	7.	8.	0.0	0.0	0.0	0.0	0.9	0.5	0.0	0.1	49.6
52	7.	7.	15.	6.	0.3	0.0	0.0	0.0	0.8	0.2	0.0	0.0	35.8

(continued)

TABLE E-10 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
53	34.	18.	12.	13.	1.5	0.0	0.0	0.0	1.5	1.6	0.2	0.2	82.8
54	3.	49.	2.	34.	1.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	89.1
55	27.	14.	7.	44.	2.3	0.0	0.0	0.0	1.4	0.4	0.0	0.1	96.9
56	5.	3.	2.	15.	0.7	0.0	0.0	0.4	0.5	0.1	0.0	0.0	27.0
57	54.	11.	6.	54.	5.3	0.0	0.0	0.2	1.4	0.2	0.0	0.1	132.0
61	10.	25.	101.	6.	0.0	0.0	0.0	0.0	3.3	0.3	0.0	0.1	145.0
62	11.	7.	17.	7.	0.3	0.0	0.0	0.0	0.6	1.0	0.0	0.1	43.6
63	11.	37.	75.	14.	3.6	0.0	0.0	0.0	4.7	0.0	0.7	0.1	146.2
64	13.	1.	1.	22.	0.8	0.0	0.0	0.1	0.2	0.1	0.0	0.1	38.2
65	14.	9.	7.	20.	0.0	0.0	0.0	0.0	1.1	0.1	0.1	0.1	50.9
66	3.	0.	0.	16.	0.5	0.0	0.0	0.4	0.0	0.0	0.0	0.0	19.9
67	7.	2.	0.	8.	0.8	0.0	0.0	0.7	0.0	0.0	0.0	0.1	18.7
71	10.	31.	16.	4.	0.0	0.0	0.0	0.0	3.7	0.9	0.0	0.1	66.0
72	16.	12.	7.	7.	10.1	0.0	0.0	0.0	1.3	0.8	0.0	0.1	53.9
73	15.	9.	3.	4.	0.6	0.0	0.0	0.0	0.6	0.5	0.0	0.1	32.3
74	7.	10.	8.	7.	11.6	0.0	0.0	0.0	1.2	0.0	0.0	0.1	44.6
75	28.	27.	41.	16.	6.6	0.0	0.0	0.0	3.0	0.3	0.1	0.2	122.9
76	11.	3.	2.	6.	9.7	0.0	0.0	0.0	0.5	0.0	0.0	0.1	32.3
77	20.	16.	8.	21.	28.0	0.0	86.6	0.2	1.9	0.3	0.0	0.2	182.2
78	68.	34.	9.	68.	28.8	0.0	0.0	0.3	2.1	1.8	0.0	0.6	212.9
81	16.	7.	2.	4.	0.8	0.0	0.0	0.0	0.4	0.1	0.0	0.1	29.6
82	51.	28.	13.	13.	0.0	0.0	0.0	0.0	2.2	1.1	0.0	0.3	108.8
84	48.	24.	11.	30.	0.0	0.0	0.0	0.0	2.0	1.9	0.0	0.4	117.3
85	13.	3.	2.	9.	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	27.5
86	8.	10.	8.	14.	0.0	0.0	0.2	0.2	1.2	0.1	0.0	0.1	41.5
87	6.	11.	6.	60.	0.0	0.5	0.2	1.4	1.3	0.1	0.0	0.1	88.6
TOTAL	1704.	1211.	1128.	1196.	178.2	1.0	87.1	7.2	121.5	40.6	5.1	11.7	5691. TONS

GROWTH FACTORS BY CATEGORY:
0.978 1.084 1.006 1.002 1.061 1.000 1.201 1.020 1.020 1.080 1.006 1.020 0.000 0.000 0.000 0.000 0.00(

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TABLE E-11. 1985 TSP AREA SOURCE EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
1	0.3	4.3	2.2	5.	2.2	0.0	0.0	0.0	6.3	0.0	0.0	0.7	0.	0.	0.0	10.	0.0	0.0	31.0
2	0.2	3.5	1.5	4.	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.3	0.	0.	0.0	9.	0.0	0.0	23.3
3	0.9	4.0	2.9	28.	0.0	0.0	0.0	0.0	5.6	0.1	0.0	2.1	0.	0.	0.0	64.	0.0	0.2	107.6
4	1.6	3.7	1.4	11.	0.0	0.0	0.0	0.0	4.5	0.6	0.0	3.7	0.	0.	0.0	25.	0.0	0.3	51.4
5	1.8	2.0	1.0	15.	0.0	0.0	0.0	0.0	3.0	0.1	0.0	4.1	0.	0.	0.0	38.	0.0	0.4	65.5
6	4.1	2.3	0.6	12.	0.0	0.0	0.0	0.0	2.0	2.4	0.0	9.6	0.	49.	0.0	27.	0.0	0.9	110.1
7	1.3	2.8	0.6	11.	0.0	0.0	0.0	0.0	1.1	2.8	0.0	3.1	0.	38.	0.0	23.	0.0	0.7	84.4
8	0.6	1.7	9.3	5.	0.0	0.0	0.0	0.0	2.4	0.0	8.5	1.4	0.	30.	0.0	9.	0.0	0.3	68.0
9	1.0	2.5	0.5	5.	0.0	0.0	0.0	0.0	1.3	0.0	0.0	2.4	0.	45.	0.0	13.	0.0	0.5	72.0
11	10.2	8.9	2.4	37.	0.0	0.0	0.0	0.0	7.4	4.4	0.1	23.9	0.	23.	0.0	83.	0.0	3.1	203.5
12	7.8	1.2	0.5	15.	0.3	0.0	0.0	0.0	1.4	1.0	0.0	18.4	0.	0.	0.0	32.	0.0	3.4	81.1
13	13.6	3.4	1.1	61.	0.0	0.0	0.0	0.0	3.6	5.5	0.0	31.7	0.	0.	0.0	135.	0.0	6.1	261.0
14	8.7	2.5	0.7	49.	0.1	0.0	0.0	0.0	2.4	4.1	0.0	37.2	0.	0.	0.0	109.	0.0	7.8	221.8
15	4.8	6.5	2.0	74.	0.7	0.0	0.0	0.0	5.6	5.6	0.0	37.8	0.	5.	0.0	166.	4.0	6.6	322.9
16	7.1	3.6	0.4	60.	0.0	0.0	0.0	0.0	1.3	0.5	0.0	33.3	6.	78.	0.8	134.	0.0	6.6	332.2
17	7.7	1.6	1.1	118.	0.9	0.0	0.0	0.6	2.2	1.1	0.0	32.3	84.	448.	10.7	264.	0.6	7.1	979.6
18	1.9	1.0	1.5	45.	0.2	0.0	0.0	0.1	1.5	0.7	3.7	8.1	9.	91.	1.2	101.	9.5	1.1	276.9
21	9.8	2.9	2.9	20.	2.1	0.0	0.0	0.0	3.0	7.3	0.1	22.9	0.	94.	0.0	44.	10.4	4.6	224.6
22	11.7	1.9	44.5	36.	0.2	0.0	0.0	0.0	2.2	4.9	0.0	27.2	0.	1.	0.0	81.	0.0	6.8	217.0
23	11.6	2.0	1.4	25.	2.2	0.0	0.0	0.0	2.3	4.9	0.8	26.9	0.	72.	0.0	57.	5.0	5.6	217.2
24	4.6	3.6	1.9	38.	1.8	0.0	0.0	0.0	4.9	2.0	0.0	20.8	0.	1.	0.0	86.	0.0	4.0	168.3
25	3.3	1.9	0.8	19.	0.1	0.0	0.0	0.0	2.6	1.9	0.0	14.0	0.	0.	0.0	43.	0.0	2.3	89.0
26	4.6	0.8	0.4	37.	0.7	0.0	0.0	0.0	1.2	2.2	0.0	18.5	0.	0.	0.0	83.	0.0	5.1	153.9
27	3.4	3.5	3.2	56.	0.0	0.0	0.0	0.0	5.0	4.3	0.0	15.6	0.	44.	0.0	126.	0.0	3.4	264.7
28	6.6	4.8	1.3	72.	7.2	0.0	0.0	0.8	3.9	3.5	0.1	35.2	91.	58.	15.0	161.	0.0	8.2	470.6
31	9.3	2.4	5.0	29.	0.1	0.0	0.0	0.0	2.6	3.0	0.0	21.8	0.	0.	0.0	65.	0.0	4.7	143.0
32	10.2	10.8	33.2	30.	0.5	0.0	0.0	0.0	3.8	4.8	0.0	23.9	0.	2.	0.0	66.	0.0	4.6	189.4
33	9.0	4.0	1.4	82.	0.5	0.0	0.0	0.0	4.7	5.8	0.0	41.2	0.	11.	0.0	182.	0.0	4.4	345.8
34	3.6	4.7	8.1	47.	1.6	0.0	0.0	0.0	5.0	2.8	0.0	16.5	2.	77.	0.2	107.	0.0	2.8	277.9
35	4.1	2.2	0.3	46.	1.0	0.0	0.0	0.2	1.0	9.7	0.0	18.8	29.	36.	3.7	108.	0.0	3.1	265.3
36	0.6	0.6	0.1	7.	1.7	25.2	0.0	0.4	0.3	4.6	0.1	2.5	55.	0.	7.3	16.	0.0	0.5	121.4
41	8.9	1.2	0.9	20.	0.0	0.0	0.0	0.0	1.6	2.9	0.1	20.8	0.	20.	0.0	44.	8.0	4.5	132.7
42	9.9	2.2	0.4	22.	5.5	0.0	0.0	0.0	1.4	6.1	0.0	23.2	0.	1.	0.0	48.	77.6	5.5	202.4
43	1.0	0.0	0.0	30.	0.0	2.5	0.0	0.1	0.0	0.1	0.0	4.5	18.	0.	2.3	68.	0.0	0.6	127.1
44	2.4	0.4	0.2	21.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	11.1	0.	15.	0.0	45.	0.0	2.4	98.5
45	1.4	0.4	0.5	41.	0.3	0.0	0.0	0.3	0.6	0.0	0.0	10.9	41.	40.	5.3	91.	0.0	0.9	233.5
46	0.6	0.0	0.3	13.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	4.9	45.	0.	5.9	29.	0.0	0.4	98.7
47	0.4	0.0	0.0	15.	0.1	0.0	0.0	0.7	0.0	0.0	0.0	5.9	93.	0.	12.2	35.	0.0	0.5	163.9
48	1.0	0.0	0.0	16.	0.6	0.0	0.0	0.7	0.0	0.0	0.0	7.6	98.	17.	12.6	36.	2.8	0.7	194.1
51	4.5	0.8	0.5	15.	0.0	0.0	0.0	0.0	1.1	1.9	0.0	10.6	0.	38.	0.0	32.	0.0	2.3	106.6
52	1.2	0.7	0.8	12.	0.1	0.8	0.0	0.0	1.0	1.0	0.1	2.7	0.	0.	0.0	26.	0.0	0.6	46.8

(continued)

TABLE E-11 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IRTADS TOTAL
53	6.0	1.7	1.9	25.	0.7	0.0	0.0	0.0	1.9	5.6	0.6	13.9	0.	8.	0.0	56.	0.0	2.9	124.1
54	0.5	2.4	0.1	65.	0.5	22.3	0.0	0.0	0.4	0.0	0.0	2.4	0.	1.	0.0	113.	0.0	0.5	208.2
55	4.8	1.4	0.7	84.	1.0	0.0	0.0	0.0	1.8	1.4	0.2	21.8	0.	78.	0.0	189.	0.0	4.9	388.9
56	0.9	0.4	0.2	30.	0.3	0.0	0.0	0.4	0.6	0.2	0.0	4.0	55.	22.	7.8	66.	0.0	0.9	189.3
57	9.4	1.3	0.5	105.	2.5	0.0	0.0	0.3	1.7	0.8	0.0	43.0	34.	99.	4.7	235.	0.0	9.4	546.9
61	1.6	2.9	14.5	12.	0.0	0.0	0.0	0.0	4.1	1.0	0.0	4.1	0.	19.	0.0	26.	0.0	0.8	85.8
62	1.9	0.8	0.9	15.	0.1	5.8	0.0	0.0	1.1	3.4	0.0	4.5	0.	14.	0.0	31.	13.0	0.9	91.7
63	1.8	4.1	13.3	26.	1.7	0.0	0.0	0.0	5.9	0.2	2.1	7.2	0.	4.	0.0	62.	22.0	2.2	154.8
64	1.9	0.1	0.1	43.	0.5	0.0	0.0	0.1	0.2	0.5	0.1	18.0	13.	6.	1.7	95.	0.0	2.1	181.7
65	1.8	1.0	0.5	38.	0.0	0.0	0.0	0.0	1.3	0.5	0.3	8.7	55.	57.	0.0	85.	0.0	2.1	251.6
66	0.5	0.0	0.0	32.	0.2	0.0	0.0	0.4	0.0	0.1	0.0	4.5	111.	0.	7.2	70.	0.0	0.4	226.1
67	1.0	0.1	0.0	15.	0.3	0.0	0.0	0.8	0.0	0.0	0.0	9.9	0.	0.	14.5	34.	0.0	1.1	76.1
71	1.8	4.8	1.4	8.	0.0	0.0	0.0	0.0	4.6	3.0	0.0	4.1	0.	0.	0.0	18.	0.0	0.5	46.5
72	2.7	1.3	3.0	13.	4.8	0.0	0.0	0.0	1.7	2.8	0.1	6.4	0.	0.	0.0	30.	0.3	1.4	67.1
73	2.4	0.7	0.2	7.	0.3	0.0	0.0	0.0	0.8	1.8	0.0	9.8	0.	1.	0.0	17.	0.0	2.6	43.6
74	1.2	1.0	0.9	14.	5.5	0.0	0.0	0.0	1.5	0.0	0.0	4.8	0.	0.	0.0	30.	0.0	1.0	59.4
75	4.7	2.8	5.3	31.	3.1	0.0	0.0	0.0	3.7	1.7	0.4	18.7	0.	0.	0.0	69.	0.0	3.7	143.9
76	1.8	0.4	0.2	12.	4.6	0.0	0.0	0.0	0.6	0.0	0.0	7.0	0.	0.	0.0	26.	0.0	1.6	53.8
77	3.1	1.8	1.2	42.	13.2	0.0	74.0	0.2	2.4	1.1	0.0	12.7	26.	26.	3.1	92.	0.0	2.8	301.1
78	11.3	4.2	1.6	132.	13.6	0.0	0.0	0.4	2.6	6.7	0.0	44.9	52.	46.	6.6	296.	0.0	8.6	627.7
81	2.7	0.7	0.2	7.	0.3	0.0	0.0	0.0	0.6	0.2	0.0	6.4	0.	1.	0.0	17.	0.0	1.5	37.7
82	9.0	3.2	1.3	24.	0.0	0.0	0.0	0.0	2.8	3.7	0.0	21.1	0.	0.	0.0	55.	0.0	4.8	125.1
84	7.9	3.0	1.3	58.	0.0	0.0	0.0	0.0	2.6	7.1	0.0	31.8	0.	70.	0.0	130.	0.0	7.4	319.5
85	2.6	0.4	0.1	18.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	8.4	0.	0.	0.0	40.	0.0	1.8	71.6
86	2.1	1.1	0.7	26.	0.0	0.0	0.3	0.2	1.6	0.5	0.1	18.8	31.	36.	4.2	60.	0.0	2.1	185.3
87	1.6	1.2	2.5	117.	0.0	0.0	1.7	1.8	1.7	0.4	0.0	13.8	185.	71.	29.1	261.	0.0	1.6	690.2
TOTAL	296.9	149.4	190.8	2307.	84.3	56.6	75.9	9.0	152.7	145.3	17.5	1009.0	1133.	1892.	156.1	5127.	153.2	193.3	13142. TONS
GROWTH FACTORS BY CATEGORY:	0.980	1.197	1.008	0.907	1.142	1.000	1.307	1.040	1.004	1.200	1.008	1.040	0.803	0.756	0.756	1.300	1.000	1.040	

TABLE E-12. 1985 SO_2 AREA SOURCE EMISSIONS

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
1	2.	49.	21.	3.	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0	80.6
2	1.	35.	17.	2.	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0	59.1
3	5.	40.	27.	16.	5.0	0.0	0.0	0.0	4.7	0.0	0.0	0.0	97.5
4	9.	31.	15.	6.	0.0	0.0	0.0	0.0	3.6	0.2	0.0	0.1	65.5
5	10.	20.	10.	10.	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.1	52.6
6	24.	31.	7.	6.	0.0	0.0	0.0	0.0	1.7	0.7	0.0	0.1	70.7
7	6.	13.	6.	6.	0.0	0.0	0.0	0.0	0.9	0.8	0.0	0.0	35.3
8	3.	17.	11.	2.	0.0	0.0	0.0	0.0	2.0	0.0	2.6	0.0	37.5
9	6.	14.	5.	3.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	29.6
11	56.	56.	29.	20.	0.0	0.0	0.0	0.0	6.0	1.3	0.0	0.3	171.6
12	44.	11.	5.	9.	0.7	0.0	0.0	0.0	1.1	0.4	0.0	0.2	71.0
13	77.	62.	12.	33.	0.1	0.0	0.0	0.0	2.9	1.8	0.0	0.4	189.6
14	58.	17.	8.	27.	0.2	0.0	0.0	0.0	2.0	1.3	0.0	0.5	113.8
15	59.	47.	23.	41.	1.7	0.0	0.0	0.0	4.7	1.8	0.0	0.5	178.5
16	51.	10.	4.	33.	0.0	0.0	0.0	0.0	1.0	0.1	0.0	0.4	99.7
17	47.	16.	9.	66.	1.9	0.0	0.0	0.5	1.9	0.4	0.0	0.4	142.6
18	13.	10.	26.	26.	0.6	0.0	0.0	0.1	1.1	0.2	1.2	0.1	77.8
21	55.	26.	16.	11.	4.7	0.0	0.0	0.0	2.5	2.3	0.0	0.3	118.0
22	66.	17.	14.	20.	0.6	0.0	0.0	0.0	1.8	1.6	0.0	0.4	121.5
23	66.	18.	16.	14.	4.9	0.0	0.0	0.0	1.8	1.6	0.2	0.4	122.7
24	29.	37.	21.	22.	4.0	0.0	0.0	0.0	4.1	0.6	0.0	0.2	118.2
25	22.	19.	9.	11.	0.1	0.0	0.0	0.0	2.2	0.6	0.0	0.2	63.7
26	24.	8.	4.	20.	1.5	0.0	0.0	0.0	0.9	0.7	0.0	0.2	59.8
27	22.	35.	33.	31.	0.0	0.0	0.0	0.0	4.1	1.3	0.0	0.2	126.4
28	44.	50.	13.	40.	16.4	0.5	0.0	0.1	3.2	0.8	0.0	0.4	169.0
31	53.	26.	24.	16.	0.2	0.0	0.0	0.0	2.2	1.0	0.0	0.3	123.4
32	58.	20.	283.	16.	1.1	0.0	0.0	0.0	3.1	1.6	0.0	0.3	389.8
33	57.	40.	16.	45.	1.1	0.0	0.0	0.0	3.8	1.8	0.0	0.5	165.2
34	23.	35.	27.	27.	4.3	0.0	0.0	0.0	4.2	0.8	0.0	0.2	121.0
35	27.	11.	3.	27.	2.2	0.0	0.0	0.2	0.8	3.0	0.0	0.2	73.7
36	4.	2.	1.	4.	3.9	0.0	0.0	0.4	0.3	1.4	0.0	0.0	17.7
41	50.	11.	10.	11.	0.0	0.0	0.0	0.0	1.4	1.0	0.0	0.3	84.3
42	56.	34.	5.	12.	12.3	0.0	0.0	0.0	1.1	1.9	0.0	0.3	122.1
43	6.	0.	0.	17.	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	23.3
44	14.	4.	2.	12.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.2
45	9.	4.	2.	23.	0.7	0.0	0.0	0.3	0.0	0.0	0.0	0.1	38.2
46	4.	0.	0.	8.	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	11.8
47	5.	0.	0.	9.	0.2	0.0	0.0	0.6	0.0	0.0	0.0	0.0	14.4
48	6.	0.	0.	9.	1.1	0.0	0.0	0.6	0.0	0.0	0.0	0.1	16.4
51	20.	8.	7.	9.	0.0	0.0	0.0	0.0	0.9	0.6	0.0	0.1	51.2
52	7.	7.	15.	6.	0.3	0.0	0.0	0.0	0.8	0.2	0.0	0.0	37.1

(continued)

TABLE E-12 (continued)

IRTADS	1	2	3	4	5	6	7	8	9	10	11	12	IRTADS TOTAL
53	34.	20.	12.	14.	1.6	0.0	0.0	0.0	1.6	1.8	0.2	0.2	86.2
54	3.	54.	2.	37.	1.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	96.8
55	27.	16.	7.	47.	2.5	0.0	0.0	0.0	1.5	0.5	0.0	0.1	102.1
56	5.	4.	2.	16.	0.8	0.0	0.0	0.4	0.5	0.1	0.0	0.0	28.5
57	54.	12.	6.	58.	5.7	0.0	0.0	0.2	1.5	0.2	0.0	0.1	138.0
61	10.	28.	101.	6.	0.0	0.0	0.0	0.0	3.3	0.4	0.0	0.1	148.4
62	11.	7.	17.	8.	0.3	0.0	0.0	0.0	0.8	1.1	0.0	0.1	45.0
63	11.	41.	76.	15.	3.9	0.0	0.0	0.0	4.8	0.0	0.7	0.1	151.7
64	13.	1.	1.	24.	0.9	0.0	0.0	0.1	0.2	0.1	0.0	0.1	40.1
65	14.	10.	7.	22.	0.0	0.0	0.0	0.0	1.1	0.1	0.1	0.1	53.4
66	3.	0.	0.	17.	0.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0	21.2
67	7.	2.	0.	9.	0.9	0.0	0.0	0.7	0.0	0.0	0.0	0.1	19.6
71	10.	35.	16.	4.	0.0	0.0	0.0	0.0	3.7	1.0	0.0	0.1	69.8
72	16.	13.	7.	8.	10.8	0.0	0.0	0.0	1.4	0.8	0.0	0.1	56.6
73	15.	10.	3.	4.	0.7	0.0	0.0	0.0	0.6	0.6	0.0	0.1	33.7
74	7.	11.	8.	8.	12.4	0.0	0.0	0.0	1.2	0.0	0.0	0.1	47.1
75	28.	30.	41.	17.	7.1	0.0	0.0	0.0	3.0	0.4	0.1	0.2	127.7
76	11.	4.	2.	6.	10.4	0.0	0.0	0.0	0.5	0.0	0.0	0.1	33.9
77	20.	18.	8.	23.	30.1	0.0	97.4	0.2	2.0	0.4	0.0	0.2	198.6
78	69.	37.	9.	73.	30.9	0.0	0.0	0.3	2.2	2.0	0.0	0.6	224.3
81	16.	7.	2.	4.	0.9	0.0	0.0	0.0	0.4	0.1	0.0	0.1	30.8
82	51.	31.	13.	14.	0.0	0.0	0.0	0.0	2.3	1.2	0.0	0.3	113.1
84	48.	26.	11.	32.	0.0	0.0	0.0	0.0	2.1	2.2	0.0	0.4	122.5
85	13.	4.	2.	10.	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	28.6
86	8.	11.	8.	15.	0.0	0.0	0.3	0.2	1.2	0.1	0.0	0.1	43.7
87	6.	12.	8.	65.	0.0	0.5	0.3	1.5	1.4	0.1	0.0	0.1	94.4
TOTAL	1711.	1337.	1130.	1287.	191.9	1.0	97.9	7.4	123.9	45.1	5.1	12.0	5949. TONS

GROWTH FACTORS BY CATEGORY:
0.982 1.197 1.008 1.078 1.142 1.000 1.351 1.040 1.040 1.200 1.008 1.040