EPA 904/9-78-008

# Kentucky Air Quality Maintenance Planning and Analysis

## Area Source Emission Inventory Allocation and Projection

U.S. Environmental Protection Agency
Region IV, Atlanta, Georgia
Kentucky Department for Natural Resources
and Environmental Protection

| BIBLIOGRAPHIC DATA SHEET | 1. Report No. EPA 904/9-78-008 | 2. | 3. Recipient's Accession No. |
|---|---|---|---|
| 4. Title and Subtitle<br>Kentucky Air Quality Maintenance Planning and Analysis<br>Area Source Emission Inventory, Allocation and Projection | | | 5. Report Date<br>May 1978<br>6. |
| 7. Author(s) | | | 8. Performing Organization Rept. No. |
| 9. Performing Organization Name and Address<br>Engineering-Science<br>7903 Westpark Drive<br>McLean, Virginia 22101 | | | 10. Project/Task/Work Unit No.<br>Task Order 16<br>11. Contract/Grant No.<br>68-02-1380 |
| 12. Sponsoring Organization Name and Address<br>U. S. Environmental Protection Agency<br>Region IV, Air Programs Branch<br>Atlanta, Georgia 30308 | | | 13. Type of Report & Period Covered<br>Final<br>14. |
| 15. Supplementary Notes | | | |

16. Abstracts

Engineering-Science assisted the Kentucky State Department of Natural Resources and Environmental Protection in developing, allocating and projecting the TSP, $SO_2$ $NO_x$, CO and HC Area Source Emission Inventory for the Louisville AQMA (SMSA) and seven additional Kentucky counties surrounding the metropolitan Louisville area. These outlying counties included Bullitt, Hardin, Henry, Oldham, Shelby, Spencer and Trimble. Because of special considerations, Fort Knox was considered distinct from Hardin County and a separate emission inventory was developed for this military reservation. The baseline year was defined as 1975 with projection years of 1980, 1985 and 1995.

In developing, allocating and projecting the area source emission inventory, ES made use of the instructions and methodologies described in Volume 1 through 13 of the EPA Guideline Series for AQMA analysis as well as other EPA documents and publications. In particular ES incorporated the recently issued computer emission factor program, Mobile 1, for motor vehicles in the calculation of HC, $NO_x$ and CO emissions. Emission factors were determined for each calendar year, pollutant, average speed (road class), ambient temperature, fraction cold-start operation and fraction hot-start operation. Because the magnitude and location of future changes in activity patterns play an important part in the estimation projection and allocation of emissions, the regional growth patterns forecast by the planning agency were also examined. In general, emissions from each of the 26 area source categories were projected to the planning years and the total emissions were then distributed to the appropriate sub-county areas.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. Descriptors | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
|---|---|---|
| Air Pollution<br>Air Quality Maintenance<br>Suspended Particulate<br>Sulfur Dioxide<br>Hydrocarbon<br>Carbon Monoxide<br>Nitrogen Oxides<br>Area Source Categories | State of Kentucky<br>Louisville SMSA<br>Bullitt, Hardin, Henry, Oldham, Spencer and Trimble Counties<br>Emission Inventory, Allocation and Projection | |

| 18. Availability Statement | 19. Security Class (This Report) UNCLASSIFIED | 21. No. of Pages 225 |
|---|---|---|
| Release Unlimited | 20. Security Class (This Page) UNCLASSIFIED | 22. Price |

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21. **Number of Pages.** Insert the total number of pages, including introductory pages, but excluding distribution list, if any

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904/9-78-008



# KENTUCKY AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS PROJECT

BOA Contract 68-02-1380

TASK ORDER NO. 16

FINAL REPORT

Prepared For

U. S. ENVIRONMENTAL PROTECTION AGENCY

Region IV
345 Courtland Street
Atlanta, Georgia 30309

and

Kentucky Air Quality Maintenance Area
Air Quality Task Force

Submitted By

Engineering-Science
7903 Westpark Drive
McLean, Virginia 22101

May 1978

This air pollution report is issued by Region IV, 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.

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Region IV Publication No. 904/9-78-008

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# CHAPTER I

## INTRODUCTION

In 1975 Engineering-Science, under contract to the Environmental Protection Agency Region IV (EPA), conducted an air pollution emission inventory for the Louisville Standard Metropolitan Statistical Area (SMSA) consisting of Jefferson County, Kentucky and Floyd and Clark Counties, Indiana. This project was part of the air quality maintenance planning and analysis program completed by the Kentucky Department for Natural Resources and Environmental Protection. The inventory was made for the 1973 base-line year and considered two pollutants, sulfur dioxide ($SO_2$) and particulate matter (TSP). In general, Engineering-Science was responsible for the analysis of area sources and the Department for point sources. The work was divided into four activity areas:

- Update of the 1973 county-wide base-line year emission inventory.
- Allocation of the base-line year emission inventory to subcounty areas appropriate to dispersion modeling.
- Projection of the county-wide emission inventories to 1975, 1980, and 1985.
- Allocation of the projected emissions to subcounty areas.

The final report of the project is contained in the EPA document, Louisville Air Quality Maintenance Area Planning and Analysis - Volume 1, EPA 904/9-76-015. Summary base-line year and projected emission inventories by source category taken from that report are contained in Tables A-1 and A-2, Appendix A.

The work reported in this volume is an extension of the earlier work. Seven additional Kentucky counties surrounding metropolitan Louisville are included: Bullitt, Hardin, Henry, Oldham, Shelby, Spencer and Trimble. Furthermore, the emissions inventories include, in addition to $SO_2$ and TSP, the other three criteria pollutants, nitrogen oxide ($NO_x$), carbon monoxide (CO) and hydrocarbons (HC). The base-line year is defined as 1975 with projection years of 1980, 1985, and 1995.

In the earlier project it was found that several source categories are not relevant to the study area. These source categories, listed below, are not considered further:

- Frost Control
- Slash Burning
- Agricultural Burning
- Prescribed Burning
- Coal Refuse Burning

As in the earlier study, wherever possible and to the degree possible, the instructions and methodologies contained in EPA documents and publications have been followed. In particular, reference is made to the following:

- Compilation of Air Pollution Emission Factors (AP-42 Supplement 6).
- Guide for Compiling a Comprehensive Emission Inventory, Second Edition (APTD 1135).
- Guidelines for Air Quality Maintenance Planning and Analysis. Volume 7: Projecting County Emissions.
- Guidelines for Air Quality Maintenance Planning and Analysis. Volume 13: Allocating Projected Emissions to Subcounty Areas.
- Methodology for Inventorying Hydrocarbons (EPA-600/4-76-813).
- 40 CFR 51 Subpart D. Maintenance of National Standards.

In addition to this introduction, this report contains a chapter which describes the population, employment and land use data base upon which the emissions are estimated and projected; a chapter which describes the results of the surveys conducted to define the base-line year emissions; and a chapter which describes the subcounty allocation scheme. The main body of the report contains the inventories and allocation procedures and results for the seven additional counties. Following the first three chapters, the next several chapters discuss the data requirements, data sources and availability, emission factors and methodology for determining the 1975 base-line year emissions and emission projections for each of the source categories.

Because of special considerations, Fort Knox is considered distinct from Hardin County and the results for the military reservation are reported in a separate chapter. Finally, the last chapter summarizes the results of the analysis.

The update and expansion of the Jefferson, Floyd, and Clark County Data are considered in the appendices. Appendix A is an expansion of the original 1973 emission inventory to include the three additional criteria pollutants.

An examination of the totals shown in Appendix A led to the conclusion that many of the original source categoreis were not significant. Therefore, it was agreed by the Jefferson County Air Pollution Control District (JCAPCD) that only those source categories contributing significantly to the totals of one or more pollutants and the new hydrocarbon evaporative sources would be reinventoried for 1975 and projected to the planning years. These inventories are contained in Appendix B.

# CHAPTER II

## POPULATION AND EMPLOYMENT

Because population and employment growth, and the location of the industry, housing, and commercial/institutional establishments to support the growth play such an important part in the projection and allocation of air pollution emissions, the general regional growth factors are examined separately in this chapter. In general, it will be required that each of the several area source category emissions be projected to the planning years and the total emissions be distributed to appropriate subcounty areas.

For each source category, the projections and distribution can be done in one of three ways.

- o A two-step approach in which country-wide emissions are projected and then distributed to subcounty areas in accordance with independently determined factors, or,
- o Direct projection of the disaggregated totals, since the baseline year emission inventory has already been distributed to subcounty areas, or,
- o A combination of the first two approaches in which disaggregated baseline year emissions are projected and then adjusted to the correct projected county-wide totals. This approach will be the one more commonly used.

The distribution of county totals to subcounty areas may involve three processes. We have used the word "allocate" to indicate distribution of county totals to subcounty areas, such as census tracts, planning districts, drainage basins, etc., in accordance with some rational surrogate allocation factor, e.g., population. Apportionment is the distribution of county-wide or subcounty emissions to the square grid system discussed in Chapter III. This is done by area integration. Assignment places a discrete area source, e.g., aircraft operations, into a particular known subcounty area or grid square.

## A. POPULATION PROJECTIONS

Provisional 1975 population estimates by counties, with the exception of Hardin County, were provided by the Kentuckiana Regional Planning and Development Agency (KIPDA). Revised 1975 estimates were received later, after baseline year emission calculations and allocations were made. The difference between the two estimates is considered insignificant with regard to air quality. The 1975 projections for Hardin County were provided by the Lincoln Trail Area Development District (LTADD). The 1975 Hardin County population is 78,000. This figure includes the Fort Knox military base. The 1975 on-post population of Fort Knox was 37,640.[1] This figure includes 6,000 residents of Meade County. Therefore, the 1975 Fort Knox population in Hardin County is 31,640. These data are summarized in Table II-1. In addition, for Jefferson, Floyd, and Clark Counties, the 1975 projected populations from the Louisville Air Quality Maintenance Plan (LAQMP) are shown.

The 1975 KIPDA population estimates by census tract were available for Jefferson County based on a county total of 731,843. These estimates were apportioned to grid squares by area integration and then normalized to the 1975 provisional estimate of 733,212.

TABLE II-1

1975 POPULATION ESTIMATES

| COUNTY | PROVISIONAL | REVISED | LAQMP |
|---|---|---|---|
| Bullitt | 33,642 | 32,785 | |
| Hardin | 46,360 | 46,360 | |
| Fort Knox | 31,640 | 31,640 | |
| Henry | 11,532 | 11,666 | |
| Oldham | 18,651 | 18,134 | |
| Shelby | 20,126 | 20,201 | |
| Spencer | 5,372 | 5,330 | |
| Trimble | 5,683 | 5,683 | |
| Jefferson | 733,212 | 732,366 | 739,911 |
| Floyd | 59,457 | 59,300 | 58,484 |
| Clark | 84,595 | 84,331 | 87,726 |
| TOTAL | 1,050,270 | 1,047,796 | 886,121 |

(1) Taken as an average of the 1975 fiscal year population: 34,062, and the population as of June 30, 1976: 41,217.

Such resolution of population distribution was not available for the other counties. For Floyd and Clark Counties, the 1975 census tract population estimates from the LAQMP were apportioned to grid squares by area integration and then normalized to the 1975 provisional estimates. For all other counties the 1970 population of county subdivisions [1] was disaggregated to grid squares by area integration and then normalized to the 1975 provisional estimates.

Projected population by county was available from KIPDA and LTADD. No significant changes in population were anticipated in Fort Knox. Reportedly, major changes in population would occur only in case of war. Hence, Fort Knox population remains the same through the projection years. County population projections are shown in Table II-2.

TABLE II-2

COUNTY POPULATION PROJECTIONS

| COUNTY | 1980 | 1985 | 1995 |
|---|---|---|---|
| Bullitt | 41,811 | 50,004 | 70,582 |
| Hardin | 57,940 | 71,198 | 90,194 |
| Fort Knox | 31,640 | 31,640 | 31,640 |
| Henry | 12,261 | 13,143 | 15,158 |
| Oldham | 23,478 | 26,232 | 32,530 |
| Shelby | 21,738 | 23,480 | 27,222 |
| Spencer | 5,627 | 6,371 | 8,002 |
| Trimble | 6,076 | 6,507 | 7,412 |
| Jefferson | 789,124 | 845,480 | 957,186 |
| Floyd | 65,634 | 71,886 | 85,132 |
| Clark | 96,780 | 106,788 | 127,852 |
| TOTAL | 1,152,109 | 1,252,729 | 1,452,910 |

B. EMPLOYMENT PROJECTIONS

Baseline 1975 and projected commercial/institutional, manufacturing and construction employment data by county, with the exception of Hardin County, were provided by KIPDA. Hardin County employment data were provided by the LTADD. Employment data for Floyd and Clark Counties were not available. Jefferson County growth projections were used to represent the growth in the entire Louisville SMSA.

(1) From 1970 Census of Population, Bureau of Census, July 1971.

The commercial and institutional employment data are summarized in Table II-3. Commercial and institutional data include employees from transportation, wholesale and retail trade, services, and government organizations. Manufacturing and construction employment data are presented in Tables II-4 and II-5, respectively.

TABLE II-3

COMMERCIAL/INSTITUTIONAL EMPLOYEES BY COUNTY

| COUNTY | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| Bullitt | 2,289 | 3,855 | 4,901 | 7,501 |
| Hardin | 3,933 | 4,192 | 4,439 | 4,940 |
| Henry | 1,464 | 1,790 | 2,023 | 2,524 |
| Oldham | 2,015 | 3,160 | 3,777 | 5,190 |
| Shelby | 3,691 | 4,220 | 4,768 | 5,895 |
| Spencer | 428 | 563 | 681 | 937 |
| Trimble | 548 | 625 | 704 | 896 |
| Jefferson | 198,643 | 241,802 | 260,455 | 299,907 |

TABLE II-4

MANUFACTURING EMPLOYEES BY COUNTY

| COUNTY | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| Bullitt | 882 | 1,510 | 2,167 | 4,203 |
| Hardin | 2,965 | 3,162 | 3,348 | 3,726 |
| Henry | 458 | 700 | 825 | 1,101 |
| Oldham | 486 | 783 | 986 | 1,478 |
| Shelby | 1,001 | 1,200 | 1,368 | 1,675 |
| Spencer | 31 | 49 | 57 | 71 |
| Trimble | 23 | 35 | 46 | 77 |
| Jefferson | 104,731 | 114,655 | 125,931 | 141,761 |

TABLE II-5

CONSTRUCTION EMPLOYEES BY COUNTY

| COUNTY | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| Bullitt | 111 | 178 | 227 | 349 |
| Hardin | 410 | 437 | 463 | 515 |
| Henry | 61 | 90 | 110 | 145 |
| Oldham | 233 | 311 | 364 | 485 |
| Shelby | 175 | 180 | 193 | 223 |
| Spencer | 10 | 10 | 10 | 13 |
| Trimble | 26 | 38 | 50 | 78 |
| Jefferson | 14,140 | 17,354 | 18,409 | 20,465 |

# CHAPTER III

## SURVEY RESULTS

Four vendor surveys were planned in order to gather data for the emission inventory. In general, the methods for conducting the surveys are those suggested in the EPA Publication, Methodology for Inventorying Hydrocarbons, EPA-600/4-76-813. The forms used for the surveys are found at the end of this chapter.

### A. FUEL USE SURVEY

The 1973 emission inventory for the Louisville SMSA included a comprehensive survey of all fuel dealers in the area. Results were satisfactory, and it was believed that reasonably accurate estimates were made of fuel use by type and user. In order to avoid imposing further burden upon the fuel jobbers, it was agreed that a sample of fuel distributors would be surveyed to determine fuel use changes during the 1973 to 1975 period. The data collected could then be used to estimate 1975 fuel usage both in the SMSA and the seven other counties.

Eighteen fuel oil distributors and all natural gas distributors were surveyed; all responded. Those distributors who reported sharp changes in sales volume were recontacted to verify the accuracy of the data. The results of the survey are summarized in Table III-1. Because of the confidential nature of the information, only totals are shown.

TABLE III-1

FUEL SURVEY RESULTS

| | DISTILLATE OIL ($10^3$gal) | | | NATURAL GAS ($10^6$ft$^3$) | | |
|---|---|---|---|---|---|---|
| | 1973 | 1975 | % Change | 1973 | 1975 | % Change |
| Residential | 3,435 | 3,502 | +2.0 | 28,576 | 28,285 | -1.0 |
| Commercial/Institutional | 7,059 | 7,038 | -0.3 | 18,885 | 18,335 | -2.9 |

## B. DRY CLEANING SURVEY

A survey of all dry-cleaning plants in the seven-county area and a partial survey of dry-cleaning plants in Jefferson County was conducted. The results of the latter survey are reported in Appendix B. Only a small portion of the dry-cleaning operators in the seven-county area responded to the mail survey. A telephone follow-up showed that most of the dry cleaners who had not responded were only pick-up centers for centralized cleaning. Three establishments had gone out of business.

Table III-2 summarizes the survey results. In the seven-county area, there were nine establishments with cleaning on the premises. Of these, seven provided solvent usage data; the other two were only able to estimate the quantity of clothes cleaned weekly.

TABLE III-2

DRY CLEANING SURVEY RESULTS

| COUNTY | NO. OF ESTABLISHMENTS | | | |
|---|---|---|---|---|
| | TOTAL | CLEANERS | PICK-UP | PROVIDED DATA |
| Bullitt | 3 | 1 | 2 | 1 |
| Hardin | 6 | 6 | 0 | 4 |
| Henry | 0 | 0 | 0 | 0 |
| Oldham | 2 | 0 | 2 | 0 |
| Shelby | 5 | 2 | 3 | 2 |
| Spencer | 0 | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 | 0 |
| TOTAL | 16 | 9 | 7 | 7 |

## C. AUTOMOTIVE PAINT SURVEY

A survey of all auto body shops and automobile dealers in the area, including the Louisville SMSA, was made. Response to the survey was unsatisfactory. A telephone follow-up was made in the seven outlying counties; however, because of the large number of shops and dealers in Louisville, a

telephone follow-up was impractical. Instead, a survey of auto paint suppliers was conducted. Table III-3 summarizes the results of the body shop survey. Of the total of 89 establishments, 47 did no painting. Of those who did painting, 23 provided data.

TABLE III-3

AUTO BODY SHOP SURVEY RESULTS

| COUNTY | NO. OF ESTABLISHMENTS | | | |
|---|---|---|---|---|
| | TOTAL | PAINTING | NO PAINTING | PROVIDED DATA |
| Bullitt | 21 | 2 | 17 | 2 |
| Hardin | 34 | 21 | 10 | 11 |
| Henry | 2 | 1 | 1 | 1 |
| Oldham | 11 | 3 | 8 | 3 |
| Shelby | 14 | 7 | 6 | 5 |
| Spencer | 1 | 0 | 1 | 0 |
| Trimble | 6 | 1 | 4 | 1 |
| TOTAL | 89 | 35 | 47 | 23 |

The automotive paint supplier survey was conducted only in the Louisville SMSA. There are six automobile paint suppliers in the area. After a telephone follow-up, all responded. Data supplied by one of the suppliers, found to be inaccurate, was corrected by considering data supplied by the other five.

## D. GASOLINE MARKETING SURVEY

The original survey was directed at gasoline service station operators. Response was unsatisfactory even after an extensive follow-up by telephone. An additional survey was made of the nine gasoline distributors in the area. All responded with accurate data.

# 1973-1975 FUEL USE UPDATE

COMPANY NAME: _____

ADDRESS: _____

PERSON TO CONTACT ABOUT FORM: _____

TELEPHONE: _____

On the form below, please indicate the percent increase on sales from 1973 to 1975. Extreme accuracy in calculating this figure is not necessary. For the intended purposes, a rough estimate will be adequate. The areas covered in the study are Jefferson County, Kentucky and Floyd and Clark Counties, Indiana.

| Type of Fuel Sold | Type of Customer | | |
|---|---|---|---|
| | Residential | Commercial/ Institutional | Industrial |
| Distillate Oil | % | % | % |
| Residual Oil | % | % | % |
| Other (specify) | % | % | % |

COMMENTS: _____

DATE FORM PREPARED: _____

ES

ENGINEERING-SCIENCE

7903 WESTPARK DRIVE · McLEAN, VIRGINIA 22101 · 703/790-9300

CABLE ADDRESS: ENGINSCI
TELEX. 89-9401

# DRY CLEANING SURVEY

GENERAL INFORMATION:

COMPANY NAME: _____

ADDRESS: _____

NEAREST STREET INTERSECTION: _____

PERSON TO CONTACT ABOUT FORM: _____

TELEPHONE: _____

NORMAL OPERATING SCHEDULE:

_____hrs/day _____days/week _____weeks/year

APPROXIMATE PERCENT OF SEASONAL SALES:

Dec. - Feb._____% Mar. - May_____%

Jun. - Aug._____% Sep. - Nov._____%

APPROXIMATE PERCENT OF DAILY SALES FROM: 6:00 AM to 9:00 AM_____%

OPERATIONAL INFORMATION:

TYPE OF DRY CLEANING UNIT:

_____ hot or dry-to-dry

_____ cold or transfer

_____ both of the above

_____ other (please specify)

AMOUNT OF CLOTHES CLEANED PER YEAR: _____tons

or AVERAGE AMOUNT OF CLOTHES CLEANED PER WEEK: _____pounds

TYPE AND AMOUNT OF SOLVENT CLEANER PURCHASED IN 1975:

Perchloroethylene _____gallons/year

Stoddard solvent _____gallons/year

Other (specify) _____gallons/year

Other (specify) _____gallons/year

ON-SITE SOLVENT STORAGE CAPACITY: _____gallons

# DRY CLEANING SURVEY (CONT'D)

SUPPLIER OF SOLVENT - NAME AND ADDRESS

Perchloroethylene: _____

_____

Stoddard: _____

_____

Other (specify): _____

_____

Other (specify): _____

_____

SOLVENT COMPONENTS - please list the names of all solvent(s) used and their components as listed on the solvent's package or bottle.

| Name of Solvent | Ingredients |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

AIR POLLUTION CONTROL EQUIPMENT DATA:

DOES YOUR ESTABLISHMENT HAVE A VAPOR RECOVERY SYSTEM INSTALLED? _____

Water-cooled condenser: _____

Activated-carbon absorber: _____

Other (please specify): _____

COMMENTS: _____

_____

_____

_____

DATE PREPARED: _____

ES

ENGINEERING-SCIENCE CO.

7903 WESTPARK DRIVE · McLEAN, VIRGINIA 22101 · 703/790-9300

CABLE ADDRESS: ENGINSCI
TELEX: 89-9401

# AUTOMOTIVE PAINTING SURVEY

## GENERAL INFORMATION:

COMPANY NAME: _____

ADDRESS: _____

NAME OF NEAREST STREET INTERSECTION: _____

PERSON TO CONTACT ABOUT FORM: _____

TELEPHONE: _____

NORMAL OPERATING SCHEDULE:

_____hrs/day _____days/week _____weeks/year

APPROXIMATE PERCENT OF SEASONAL SALES:

Dec. - Feb._____% Mar. - May_____%

Jun. - Aug._____% Sep. - Nov._____%

APPROXIMATE PERCENT OF DAILY SALES FROM: 6:00 AM to 9:00 AM_____%

## OPERATIONAL INFORMATION:

TYPE AND AMOUNT OF COATING BEING USED:

_____ACRYLIC ENAMEL _____GAL/YR OR _____GAL/WK

_____SYNTHETIC ENAMEL _____GAL/YR OR _____GAL/WK

_____ACRYLIC LACQUER _____GAL/YR OR _____GAL/WK

_____OTHER (please specify):

_____ _____GAL/YR OR _____GAL/Wk

_____ _____GAL/YR OR _____GAL/WK

TYPE AND AMOUNT OF PRIMER BEING USED:

_____ENAMEL PRIMER _____GAL/YR OR _____GAL/WK

_____LACQUER PRIMER _____GAL/YR OR _____GAL/WK

_____OTHER (please specify):

_____ _____GAL/YR OR _____GAL/WK

_____ _____GAL/YR OR _____GAL/WK

TYPE AND AMOUNT OF THINNER OR REDUCER USED:

| | | |
|---|---|---|
| _____ENAMEL REDUCER | _____GAL/YR OR | _____GAL/WK |
| _____LACQUER THINNER | _____GAL/YR OR | _____GAL/WK |
| _____OTHER (please specify): | | |
| _____ | _____GAL/YR OR | _____GAL/WK |
| _____ | _____GAL/YR OR | _____GAL/WK |

NUMBER OF SPRAYING BOOTHS AT THIS FACILITY:_____

IS A PAINT BAKING OVEN USED AT THIS FACILITY:_____Yes _____No

COMMENTS:_____

_____

_____

DATE PREPARED:_____

AUTOMOTIVE PAINT SURVEY
(SUPPLIERS)

NAME OF COMPANY: _____

1) On the form below, please indicate one of the following:

   a) Number of gallons sold in 1975, or

   b) Average number of gallons sold per month in 1975

   (You can choose whichever is easier for you to supply.)

| | Units (fill in one column only) | |
|---|---|---|
| Kind of Coating | (a) Gallons Sold in 1975 | or (b) Average Number of Gallons Sold per Month, 1975 |
| Acrylic Enamel | _____ | _____ |
| Synthetic Enamel | _____ | _____ |
| Lacquer | _____ | _____ |
| Enamel Primer | _____ | _____ |
| Lacquer Primer | _____ | _____ |
| Enamel Reducer | _____ | _____ |
| Lacquer Thinner | _____ | _____ |
| Other (specify) | _____ | _____ |
| _____ | _____ | _____ |

2) Were all the above stated amounts sold to establishments in the automotive paint business? _____ Yes _____ No

3) If the answer to question 2) is "No", please indicate what percent of the sales was to automotive painting establishments.
   _____%

4) Please indicate if you conduct business in one or more of the following counties:

| | | |
|---|---|---|
| Jefferson | ____Yes | ____No |
| Floyd | ____Yes | ____No |
| Clark | ____Yes | ____No |
| Bullitt | ____Yes | ____No |
| Hardin | ____Yes | ____No |
| Henry | ____Yes | ____No |
| Oldham | ____Yes | ____No |

Others(please specify)

_____

_____

_____

_____

Prepared by:_____

Date:_____

Comments:_____

_____

_____

_____

_____

ES

ENGINEERING-SCIENCE

7903 WESTPARK DRIVE · McLEAN, VIRGINIA 22101 · 703/790-9300

CABLE ADDRESS: ENGINSCI
TELEX: 89-9401

# GASOLINE MARKETING SURVEY

## GENERAL INFORMATION:

COMPANY NAME: _____

ADDRESS: _____

NEAREST STREET INTERSECTION: _____

PERSON TO CONTACT ABOUT FORM: _____

TELEPHONE: _____

NORMAL OPERATING SCHEDULE:

_____hrs/day _____days/week _____weeks/year

APPROXIMATE PERCENT OF SEASONAL SALES:

Dec. - Feb._____% Mar. - May_____%

Jun. - Aug._____% Sep. - Nov._____%

APPROXIMATE PERCENT OF DAILY SALES FROM: 6:00 AM to 9:00 AM_____%

## OPERATIONAL INFORMATION:

Approximate number of gallons of gasoline sold per year:_____ gallons

Number of pumps at station: _____

Storage capacity at station: _____ gallons

Number of tanks: _____

Capacity of tanks: No. 1_____gallons No. 4_____gallons

No. 2_____gallons No. 5_____gallons

No. 3_____gallons No. 6_____gallons

Frequency of gasoline deliveries to station: Every_____days

Method of filling storage tanks: (check one)

_____ Splash filling in which the outlet of the delivery hose is above the liquid surface in the tank.

_____ Uncontrolled submerged filling in which the outlet of the delivery hose is extended to the bottom of the tank.

_____ Controlled submerged filling in which a vapor return line to the delivery truck reduces venting of vapors to the atmosphere.

COMMENTS: _____

_____

_____

DATE PREPARED: _____

# CHAPTER IV

## GRID SYSTEM

Dispersion models inputs include, among other things, area grid system locations and dimensions. In some cases, the grid system may be nonsymmetric and nonorthogonal. This was the system used in the earlier project for Jefferson, Floyd and Clark Counties for which the basic grid was based on census tracts. In other cases, a square grid system is required. It was suggested by the Department for Natural Resources and Environmental Protection that such a square grid system was required for this project.

A square grid based on the Universal Transverse Mercator system was designed. Figures IV-1 through IV-10 show the grids for each of the ten counties. The grid numbers, areas, and centroid locations are found in Table IV-1.

Allocation to the grid system was made independently for each source category. A work sheet was designed upon which the emissions for each category were entered in the appropriate grid. The emissions for all categories were then added to determine the total emissions for the grid square. The completed work sheets were submitted to the Department for Natural Resources and Environmental Protection Agency. A copy of the summary work sheet is shown in Figure IV-11.

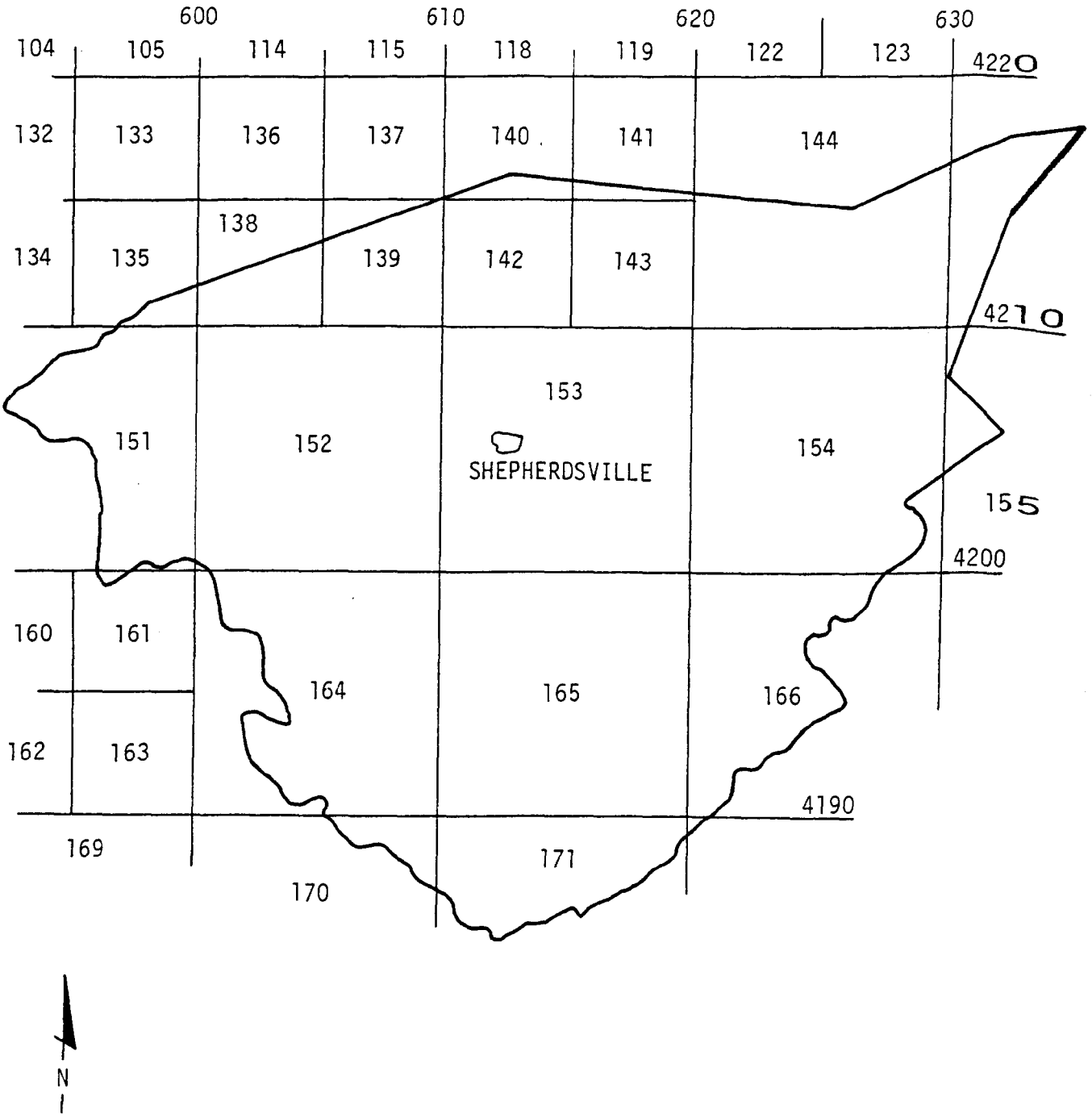


Figure IV-1. Bullitt County grid.

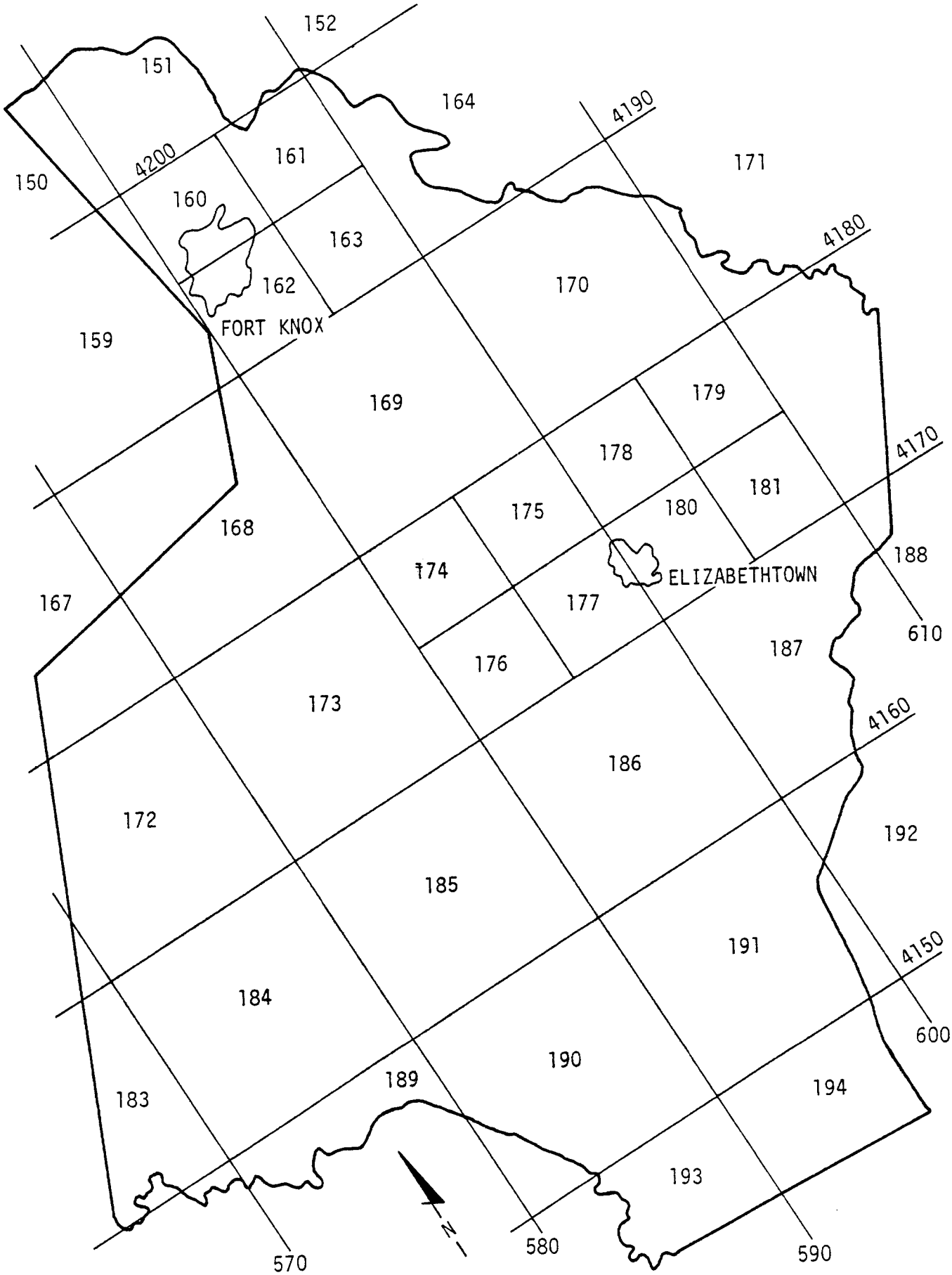


Figure IV-2. Hardin County grid.

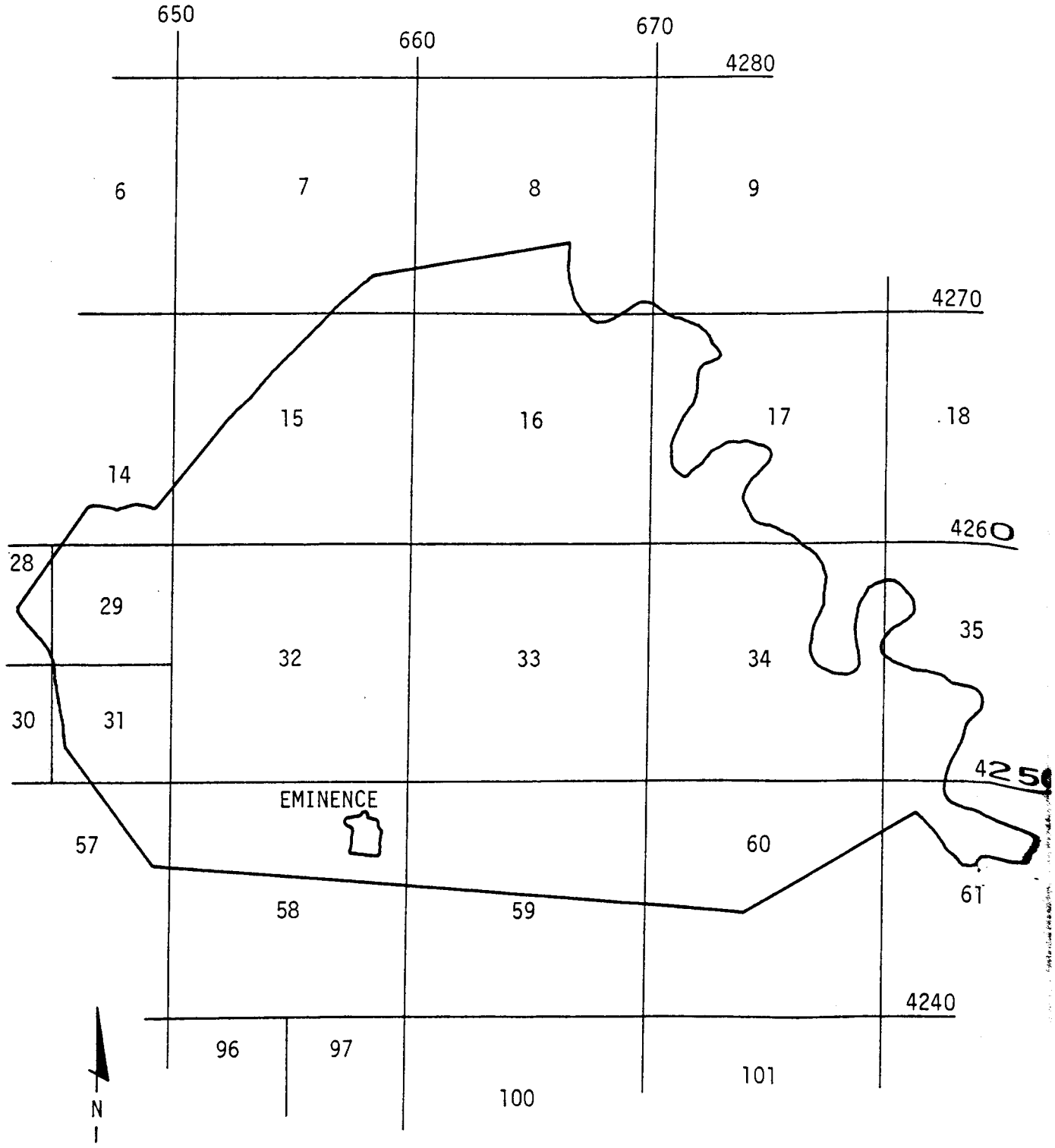


Figure IV-3. Henry County grid.

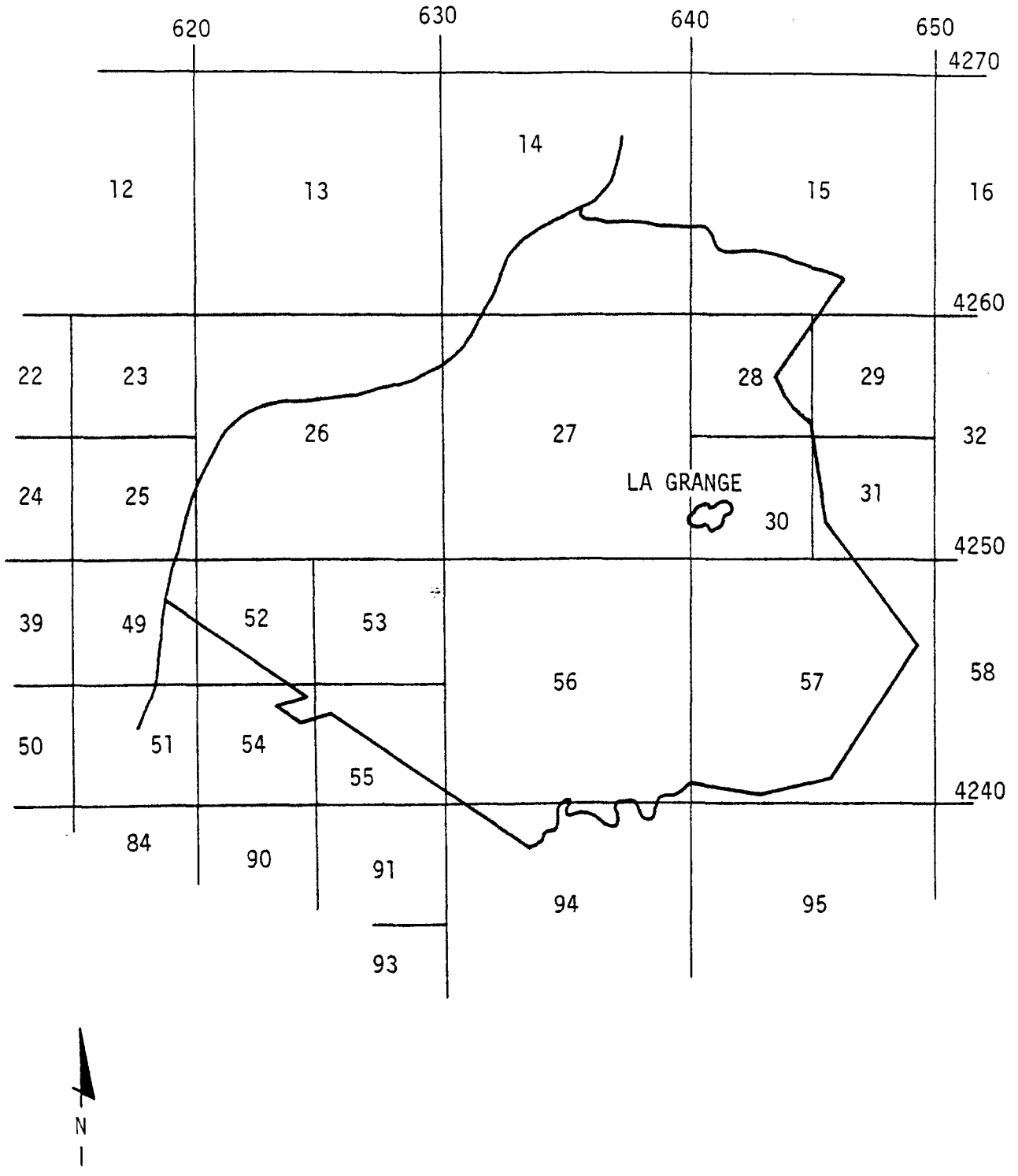


Figure IV-4. Oldham County grid.

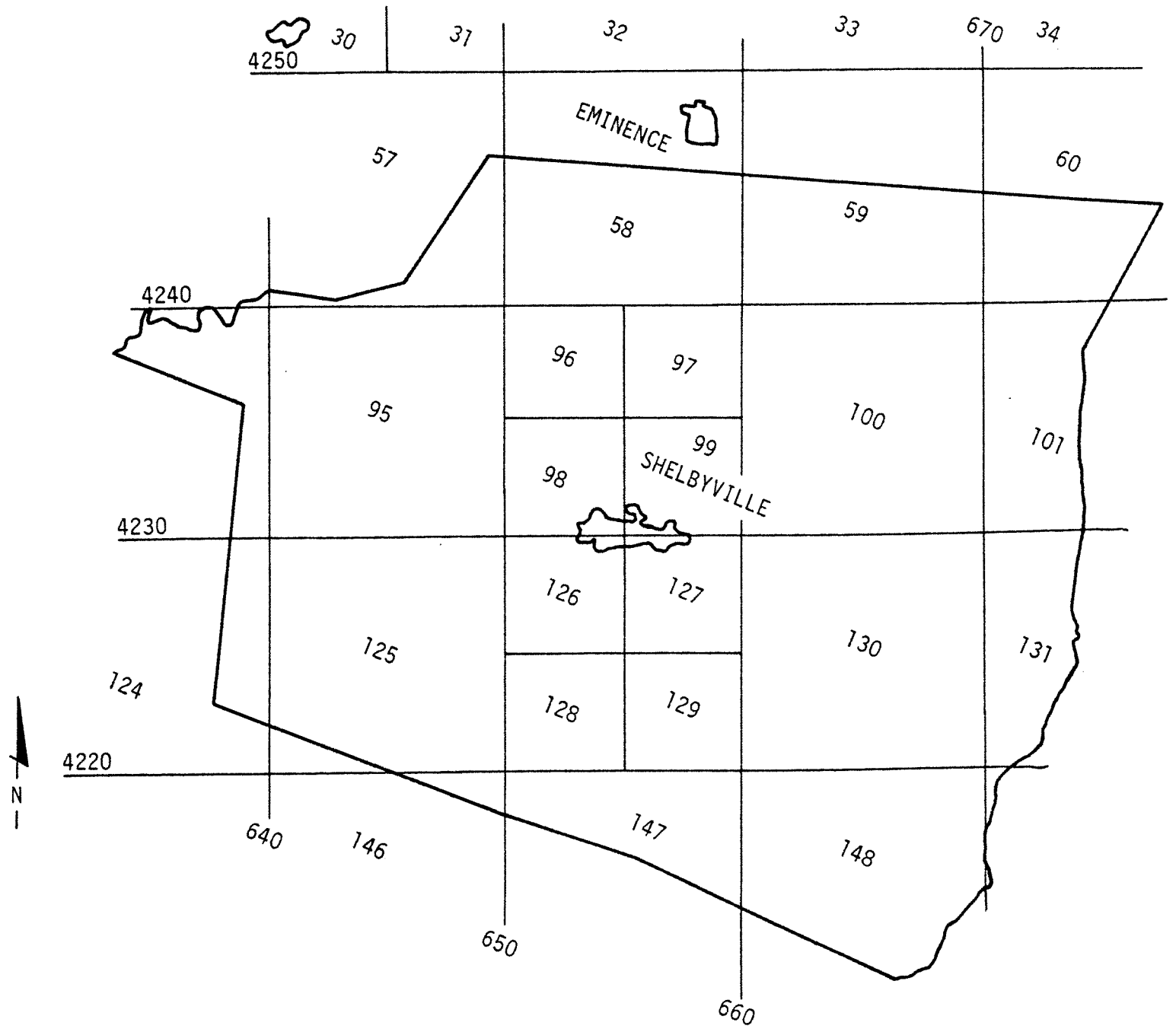


Figure IV-5. Shelby County grid.

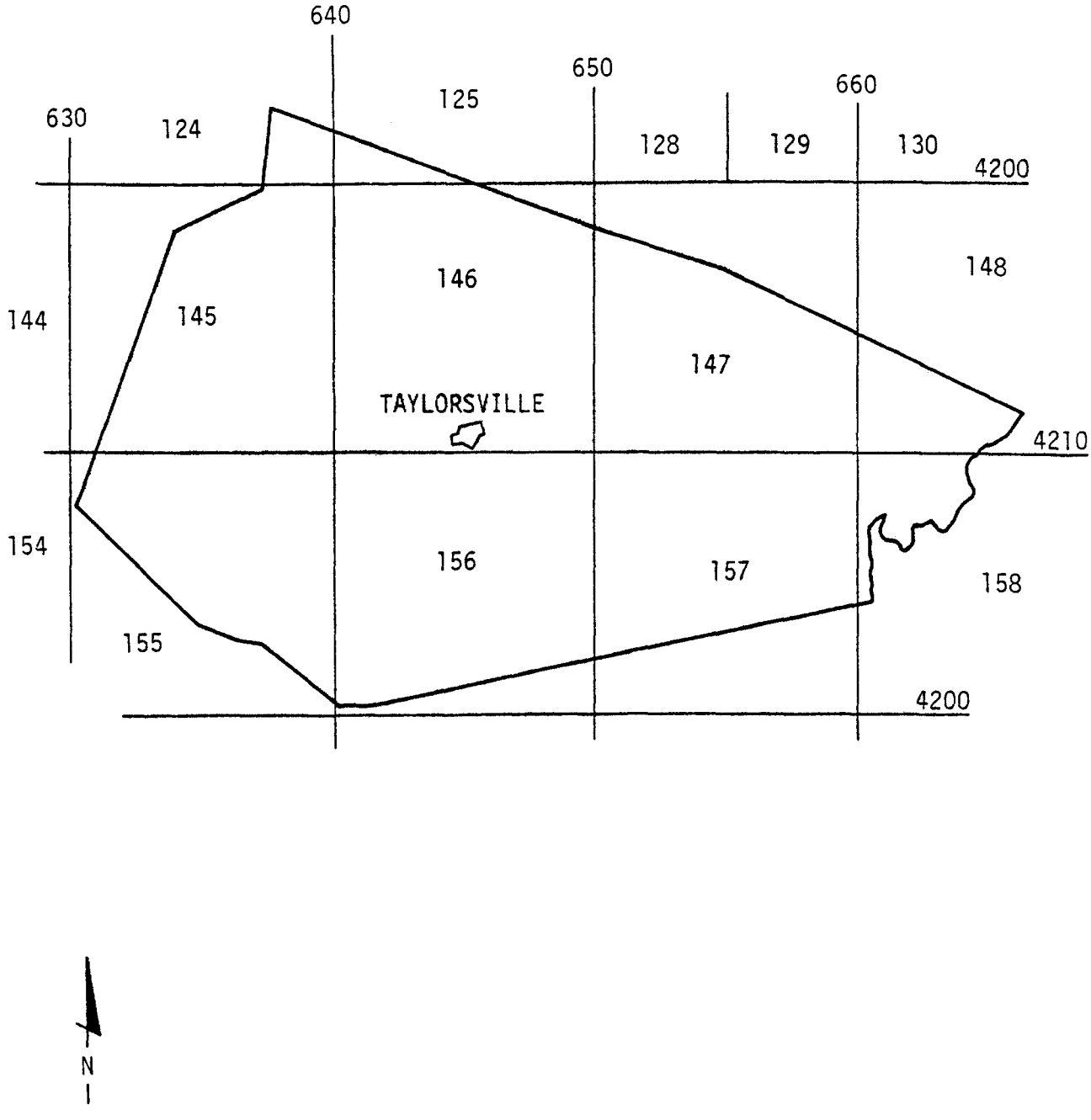


Figure IV-6. Spencer County grid.

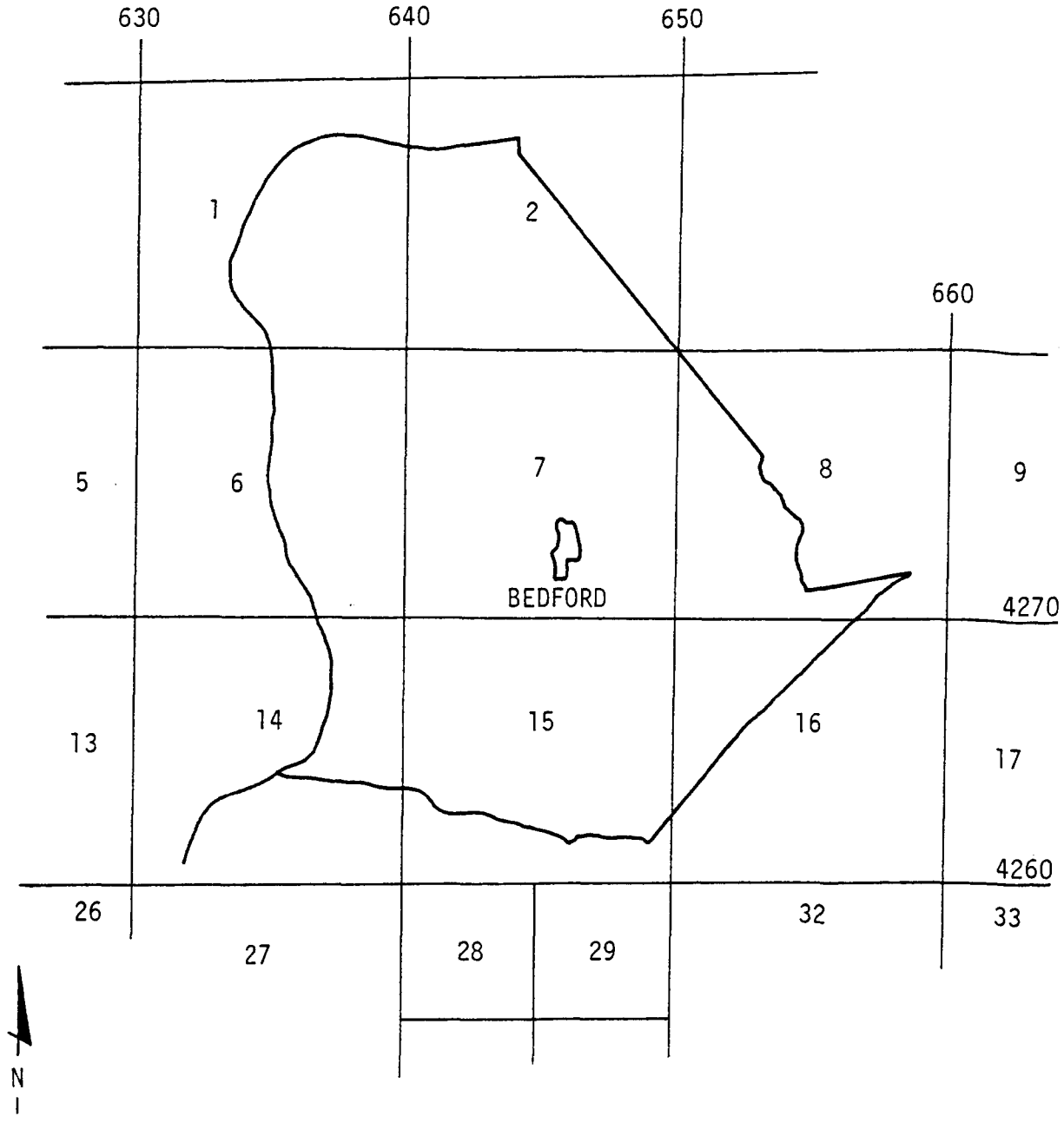


Figure IV-7. Trimble County grid.

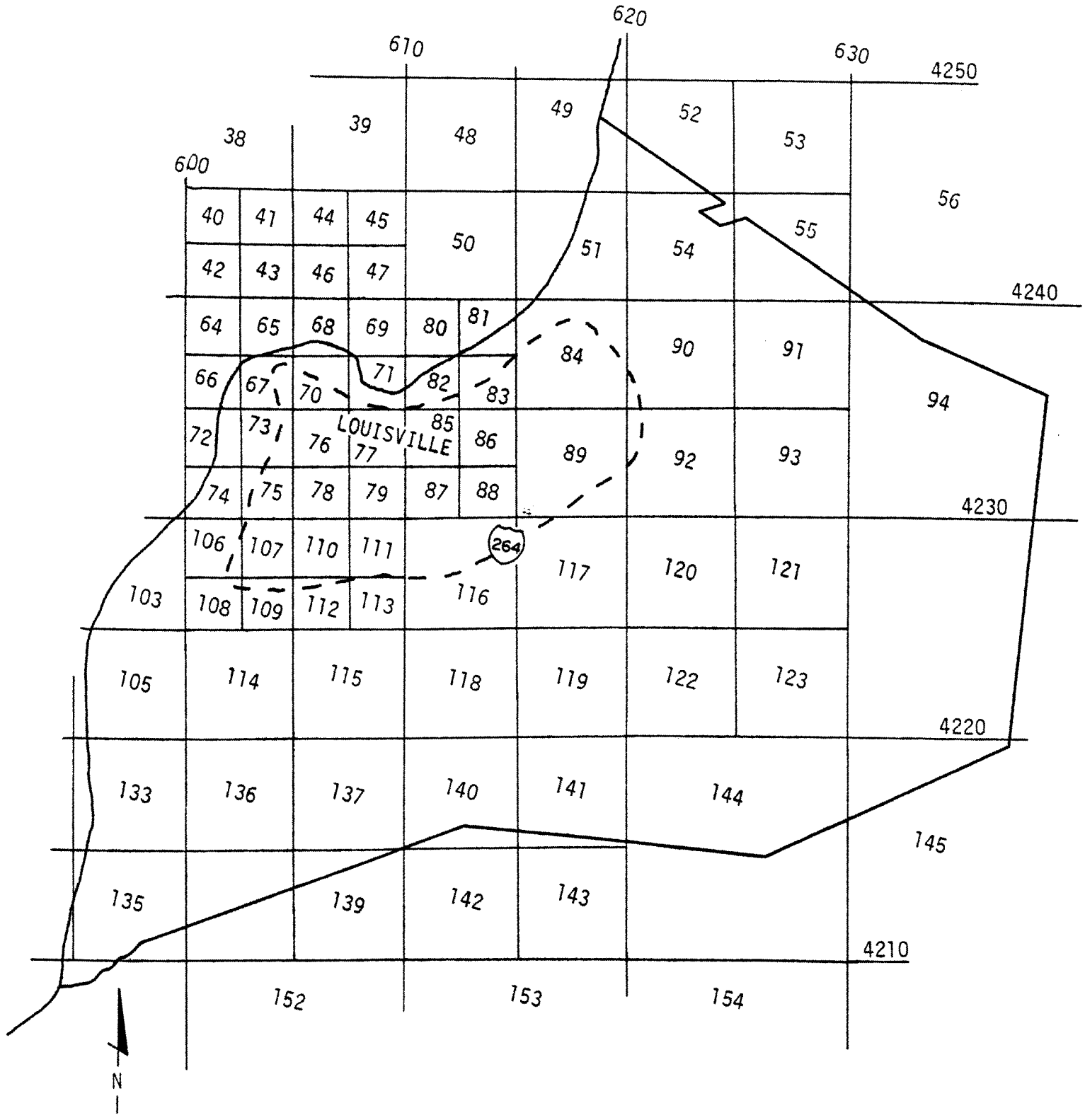


Figure IV-8. Jefferson County grid.

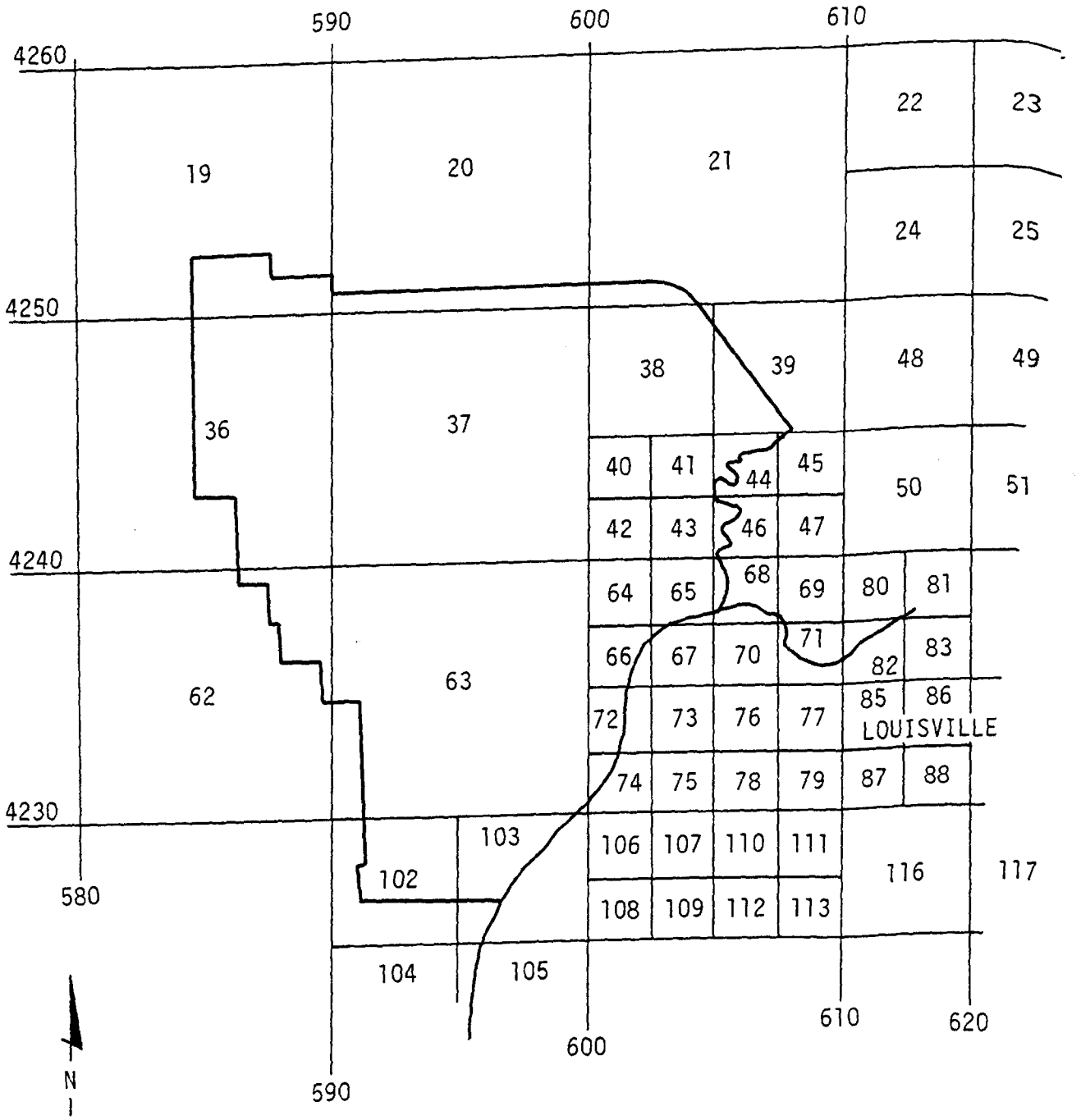


Figure IV-9. Floyd County grid.

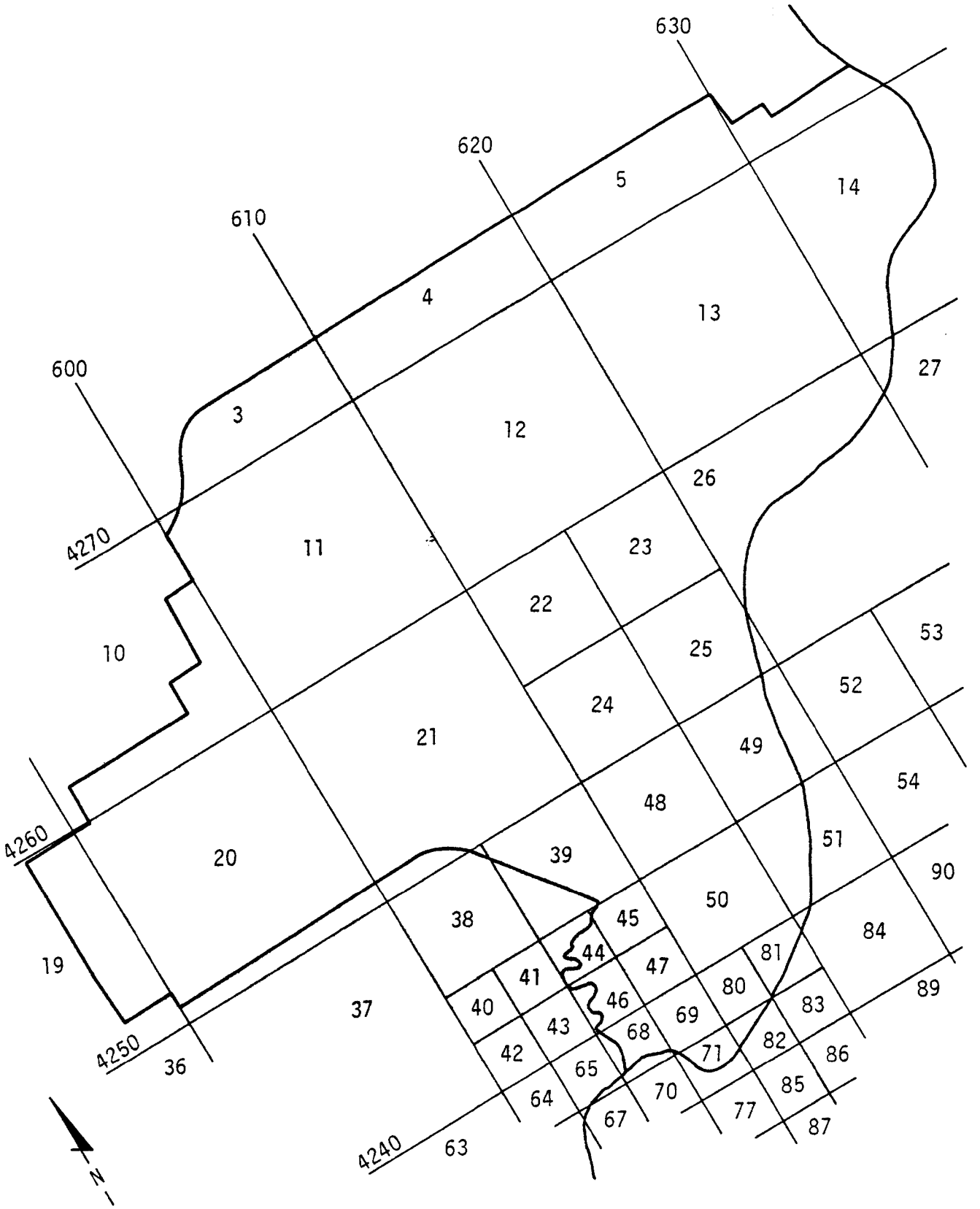


Figure IV-10. Clark County grid.

## SUMMARY WORK SHEET

STUDY AREA

| TRACT NO. | COORDINATES | | AREA ($KM^2$) | SOURCE HEIGHT (M) | TOTAL (tons/day) | | | | | POP. | - - - | - - - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | Y | | | TSP | $SO_2$ | CO | HC | $NO_x$ | | | |
| TOTAL | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
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FIGURE IV

TABLE IV-1

GRID DATA

| GRID NO. | COORDINATES | | AREA ($km^2$) | GRID NO. | COORDINATES | | AREA ($km^2$) |
|---|---|---|---|---|---|---|---|
| | x | y | | | x | y | |
| 1 | 635.0 | 4285.0 | 100 | 31 | 647.5 | 4252.5 | 25 |
| 2 | 645.0 | 4285.0 | 100 | 32 | 655.0 | 4255.0 | 100 |
| 3 | 605.0 | 4275.0 | 100 | 33 | 665.0 | 4255.0 | 100 |
| 4 | 615.0 | 4275.0 | 100 | 34 | 675.0 | 4255.0 | 100 |
| 5 | 625.0 | 4275.0 | 100 | 35 | 685.0 | 4255.0 | 100 |
| 6 | 635.0 | 4275.0 | 100 | 36 | 585.0 | 4245.0 | 100 |
| 7 | 645.0 | 4275.0 | 100 | 37 | 595.0 | 4245.0 | 100 |
| 8 | 655.0 | 4275.0 | 100 | 38 | 602.5 | 4247.5 | 25 |
| 9 | 665.0 | 4275.0 | 100 | 39 | 607.5 | 4247.5 | 25 |
| 10 | 595.0 | 4265.0 | 100 | 40 | 601.25 | 4243.75 | 6.25 |
| 11 | 605.0 | 4265.0 | 100 | 41 | 603.75 | 4243.75 | 6.25 |
| 12 | 615.0 | 4265.0 | 100 | 42 | 601.25 | 4241.25 | 6.25 |
| 13 | 625.0 | 4265.0 | 100 | 43 | 603.75 | 4241.25 | 6.25 |
| 14 | 635.0 | 4265.0 | 100 | 44 | 606.25 | 4243.75 | 6.25 |
| 15 | 645.0 | 4265.0 | 100 | 45 | 608.75 | 4243.75 | 6.25 |
| 16 | 655.0 | 4265.0 | 100 | 46 | 606.25 | 4241.25 | 6.25 |
| 17 | 655.0 | 4265.0 | 100 | 47 | 608.75 | 4241.25 | 6.25 |
| 18 | 675.0 | 4265.0 | 100 | 48 | 612.5 | 4247.5 | 25 |
| 19 | 585.0 | 4255.0 | 100 | 49 | 617.5 | 4247.5 | 25 |
| 20 | 595.0 | 4255.0 | 100 | 50 | 612.5 | 4242.5 | 25 |
| 21 | 605.0 | 4255.0 | 100 | 51 | 617.5 | 4242.5 | 25 |
| 22 | 612.5 | 4257.5 | 25 | 52 | 622.5 | 4247.5 | 25 |
| 23 | 617.5 | 4257.5 | 25 | 53 | 627.5 | 4247.5 | 25 |
| 24 | 612.5 | 4252.5 | 25 | 54 | 622.5 | 4242.5 | 25 |
| 25 | 617.5 | 4252.5 | 25 | 55 | 627.5 | 4242.5 | 25 |
| 26 | 625.0 | 4255.0 | 100 | 56 | 635.0 | 4245.0 | 100 |
| 27 | 635.0 | 4255.0 | 100 | 57 | 645.0 | 4245.0 | 100 |
| 28 | 642.5 | 4257.5 | 25 | 58 | 655.0 | 4245.0 | 100 |
| 29 | 647.5 | 4257.5 | 25 | 59 | 665.0 | 4245.0 | 100 |
| 30 | 642.5 | 4252.5 | 25 | 60 | 675.0 | 4245.0 | 100 |

TABLE IV-1 (Continued)

GRID DATA

| GRID NO. | COORDINATES x | COORDINATES y | AREA ($km^2$) | GRID NO. | COORDINATES x | COORDINATES y | AREA ($km^2$) |
|---|---|---|---|---|---|---|---|
| 61 | 685.0 | 4245.0 | 100 | 91 | 627.5 | 4237.5 | 25 |
| 62 | 585.0 | 4235.0 | 100 | 92 | 622.5 | 4232.5 | 25 |
| 63 | 595.0 | 4235.0 | 100 | 93 | 627.5 | 4232.5 | 25 |
| 64 | 601.25 | 4238.75 | 6.25 | 94 | 635.0 | 4235.0 | 100 |
| 65 | 603.75 | 4238.75 | 6.25 | 95 | 645.0 | 4235.0 | 100 |
| 66 | 601.25 | 4236.25 | 6.25 | 96 | 652.5 | 4237.5 | 25 |
| 67 | 603.75 | 4236.75 | 6.25 | 97 | 657.5 | 4237.5 | 25 |
| 68 | 606.25 | 4238.75 | 6.25 | 98 | 652.5 | 4232.5 | 25 |
| 69 | 608.75 | 4238.75 | 6.25 | 99 | 657.5 | 4232.5 | 25 |
| 70 | 606.25 | 4236.75 | 6.25 | 100 | 665.0 | 4235.0 | 100 |
| 71 | 608.75 | 4236.75 | 6.25 | 101 | 675.0 | 4235.0 | 100 |
| 72 | 601.25 | 4233.75 | 6.25 | 102 | 592.5 | 4227.5 | 25 |
| 73 | 603.75 | 4233.75 | 6.25 | 103 | 597.5 | 4227.5 | 25 |
| 74 | 601.25 | 4231.25 | 6.25 | 104 | 592.5 | 4222.5 | 25 |
| 75 | 603.75 | 4231.25 | 6.25 | 105 | 597.5 | 4222.5 | 25 |
| 76 | 606.25 | 4233.75 | 6.25 | 106 | 601.25 | 4228.75 | 6.25 |
| 77 | 608.75 | 4233.75 | 6.25 | 107 | 603.75 | 4228.75 | 6.25 |
| 78 | 606.25 | 4231.25 | 6.25 | 108 | 601.25 | 4226.25 | 6.25 |
| 79 | 608.75 | 4231.25 | 6.25 | 109 | 603.75 | 4226.25 | 6.25 |
| 80 | 611.25 | 4238.75 | 6.25 | 110 | 606.25 | 4228.75 | 6.25 |
| 81 | 613.75 | 4238.75 | 6.25 | 111 | 608.75 | 4228.75 | 6.25 |
| 82 | 611.25 | 4236.25 | 6.25 | 112 | 606.25 | 4226.25 | 6.25 |
| 83 | 613.75 | 4236.25 | 6.25 | 113 | 608.75 | 4226.25 | 6.25 |
| 84 | 617.5 | 4237.5 | 25 | 114 | 602.5 | 4222.5 | 25 |
| 85 | 611.25 | 4233.75 | 6.25 | 115 | 607.5 | 4222.5 | 25 |
| 86 | 613.75 | 4233.75 | 6.25 | 116 | 612.5 | 4227.5 | 25 |
| 87 | 611.25 | 4231.25 | 6.25 | 117 | 617.5 | 4227.5 | 25 |
| 88 | 613.75 | 4231.25 | 6.25 | 118 | 612.5 | 4222.5 | 25 |
| 89 | 617.5 | 4232.5 | 25 | 119 | 617.5 | 4222.5 | 25 |
| 90 | 622.5 | 4237.5 | 25 | 120 | 622.5 | 4227.5 | 25 |

TABLE IV-1 (Continued)

GRID DATA

| GRID NO. | COORDINATES x | COORDINATES y | AREA ($km^2$) | GRID NO. | COORDINATES x | COORDINATES y | AREA ($km^2$) |
|---|---|---|---|---|---|---|---|
| 121 | 627.5 | 4227.5 | 25 | 151 | 595.0 | 4205.0 | 100 |
| 122 | 622.5 | 4222.5 | 25 | 152 | 605.0 | 4205.0 | 100 |
| 123 | 627.5 | 4222.5 | 25 | 153 | 615.0 | 4205.0 | 100 |
| 124 | 635.0 | 4225.0 | 100 | 154 | 625.0 | 4205.0 | 100 |
| 125 | 645.0 | 4225.0 | 100 | 155 | 635.0 | 4205.0 | 100 |
| 126 | 652.5 | 4227.5 | 25 | 156 | 645.0 | 4205.0 | 100 |
| 127 | 657.5 | 4227.5 | 25 | 157 | 655.0 | 4205.0 | 100 |
| 128 | 652.5 | 4222.5 | 25 | 158 | 665.0 | 4205.0 | 100 |
| 129 | 657.5 | 4222.5 | 25 | 159 | 585.0 | 4195.0 | 100 |
| 130 | 665.0 | 4225.0 | 100 | 160 | 592.5 | 4197.5 | 25 |
| 131 | 675.0 | 4225.0 | 100 | 161 | 597.5 | 4197.5 | 25 |
| 132 | 592.5 | 4217.5 | 25 | 162 | 592.5 | 4192.5 | 25 |
| 133 | 597.5 | 4217.5 | 25 | 163 | 597.5 | 4192.5 | 25 |
| 134 | 592.5 | 4212.5 | 25 | 164 | 605.0 | 4195.0 | 100 |
| 135 | 597.5 | 4212.5 | 25 | 165 | 615.0 | 4195.0 | 100 |
| 136 | 602.5 | 4217.5 | 25 | 166 | 625.0 | 4195.0 | 100 |
| 137 | 607.5 | 4217.5 | 25 | 167 | 575.0 | 4185.0 | 100 |
| 138 | 602.5 | 4212.5 | 25 | 168 | 585.0 | 4185.0 | 100 |
| 139 | 607.5 | 4212.5 | 25 | 169 | 595.0 | 4185.0 | 100 |
| 140 | 612.5 | 4217.5 | 25 | 170 | 605.0 | 4185.0 | 100 |
| 141 | 617.5 | 4217.5 | 25 | 171 | 615.0 | 4185.0 | 100 |
| 142 | 612.5 | 4212.5 | 25 | 172 | 575.0 | 4175.0 | 100 |
| 143 | 617.5 | 4212.5 | 25 | 173 | 585.0 | 4175.0 | 100 |
| 144 | 625.0 | 4215.0 | 100 | 174 | 592.5 | 4177.5 | 25 |
| 145 | 635.0 | 4215.0 | 100 | 175 | 597.5 | 4177.5 | 25 |
| 146 | 645.0 | 4215.0 | 100 | 176 | 592.5 | 4172.5 | 25 |
| 147 | 655.0 | 4215.0 | 100 | 177 | 597.5 | 4172.5 | 25 |
| 148 | 665.0 | 4215.0 | 100 | 178 | 602.5 | 4177.5 | 25 |
| 149 | 675.0 | 4215.0 | 100 | 179 | 607.5 | 4177.5 | 25 |
| 150 | 585.0 | 4205.0 | 100 | 180 | 602.5 | 4172.5 | 25 |

TABLE IV-1 (Continued)

GRID DATA

| GRID NO. | COORDINATES | | AREA ($km^2$) | GRID NO. | COORDINATES | | AREA ($km^2$) |
|---|---|---|---|---|---|---|---|
| | x | y | | | x | y | |
| 181 | 607.5 | 4172.5 | 25 | 188 | 615.0 | 4165.0 | 100 |
| 182 | 615.0 | 4175.0 | 100 | 189 | 575.0 | 4155.0 | 100 |
| 183 | 565.0 | 4165.0 | 100 | 190 | 585.0 | 4155.0 | 100 |
| 184 | 575.0 | 4165.0 | 100 | 191 | 595.0 | 4155.0 | 100 |
| 185 | 585.0 | 4165.0 | 100 | 192 | 605.0 | 4155.0 | 100 |
| 186 | 595.0 | 4165.0 | 100 | 193 | 585.0 | 4145.0 | 100 |
| 187 | 605.0 | 4165.0 | 100 | 194 | 595.0 | 4145.0 | 100 |

# CHAPTER V

# RESIDENTIAL FUEL USE

This source category includes emissions associated with residential fuel combustion. Emission factors for the various residential fuel types are found in AP-42.

## A. 1975 EMISSION INVENTORY

The total Jefferson County residential heating requirements obtained as a result of the 1975 fuel survey were $3.149 \times 10^{13}$ Btu.[1] Table V-1 shows the residential heat requirements for the seven-county study area based on 1975 population ratios to Jefferson County. The distribution of heating requirements by fuel type is shown in Table V-2. For natural gas, the values are actual reported values obtained from the gas distributors. The distribution of the other types of fuel is based on the 1970 Census of Housing, which contains the distribution of dwelling units by fuel type. Two assumptions are apparent in the methods described:

- Per capita fuel consumption is constant throughout the area.
- There have been no major shifts in the fuel type distribution from 1970 to 1975.

Emission factors and emissions for this source category are summarized in Tables V-3 and V-4.

## B. 1975 EMISSIONS ALLOCATION

Emissions were allocated in accordance with the population distribution, since subcounty area fuel type distributions were not available with sufficient resolution to permit allocation by fuel type.

---

[1] A reduction from $3.17 \times 10^{13}$ Btu from 1973, reflecting the weighted average change in fuel usage determined from the survey.

TABLE V-1

1975 COUNTY RESIDENTIAL FUEL USE

| COUNTY | POPULATION RATIO | FUEL USE (Btu/yr) |
|---|---|---|
| Bullitt | 0.0459 | $1.445 \times 10^{12}$ |
| Hardin | 0.0632 | $1.990 \times 10^{12}$ |
| Henry | 0.0157 | $4.944 \times 10^{11}$ |
| Oldham | 0.0254 | $7.998 \times 10^{11}$ |
| Shelby | 0.0274 | $8.628 \times 10^{11}$ |
| Spencer | 0.0073 | $2.299 \times 10^{11}$ |
| Trimble | 0.0078 | $2.456 \times 10^{11}$ |

TABLE V-2

ESTIMATED TOTAL RESIDENTIAL FUEL USE BY COUNTY AND FUEL TYPE(1)

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Bullitt | 562.1 | 3,102.7 | 2,889.7 | 3,108.6 | 6,837.7 |
| Hardin | 1,098.7 | 2,155.3 | 2,646.0 | 4,995.1 | 5,318.4 |
| Henry | 125.7 | 1,550.8 | 1,043.4 | 2,761.7 | 541.0 |
| Oldham | 353.0 | 1,016.3 | 1,823.8 | 3,734.7 | 723.7 |
| Shelby | 378.2 | 1,477.6 | 1,266.1 | 5,448.4 | 1,181.0 |
| Spencer | 14.4 | 1,137.7 | 478.5 | 1,443.8 | 359.4 |
| Trimble | 16.0 | 84.2 | 1,243.6 | 901.5 | 772.3 |

(1) In preparing Table V-2 from the fuel use ratios shown in Table V-1, the residential Btu fossil requirement has been adjusted to account for the relative split between fossil fuel and electric home heating in each county as compared to Jefferson County

TABLE V-3

EMISSION FACTORS FOR RESIDENTIAL FUEL BURNING

| FUEL TYPE | EMISSION FACTOR UNITS | EMISSION FACTORS | | | | |
|---|---|---|---|---|---|---|
| | | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| Natural Gas | lbs/$10^6$ ft$^3$ | 10.0 | 0.6 | 20 | 8 | 80 |
| LPG(1) | lbs/$10^3$ gal | 1.85 | 0.09 [0.16](4) | 1.95 | 0.75 | 7.5 |
| Oil | lbs/$10^3$ gal | 2.5 | 142.0 [0.27] | 5.0 | 1.0 | 18 |
| Coal(2) | lbs/ton | 20.0 | 38.0 [2.0] | 90.0 | 20.0 | 3 |
| Wood(3) | lbs/ton | 15.0 | 1.5 | 60.0 | 70.0 | 10 |

(1) 50% propane, 50% butane

(2) Hand-fired units.

(3) Highest emission factors used.

(4) [ ] indicate sulfur content from AP-42 or 1973 fuel survey.

TABLE V-4

1975 RESIDENTIAL FUEL USE EMISSIONS SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| Bullitt | 91.7 | 178.8 | 360.9 | 275.3 | 99.0 |
| Hardin | 100.6 | 244.9 | 404.0 | 242.6 | 110.0 |
| Henry | 35.1 | 125.4 | 146.1 | 48.4 | 27.1 |
| Oldham | 47.8 | 177.5 | 198.9 | 65.4 | 43.6 |
| Shelby | 68.2 | 232.3 | 289.0 | 98.5 | 46.1 |
| Spencer | 18.9 | 64.3 | 78.2 | 27.7 | 13.1 |
| Trimble | 16.5 | 58.7 | 67.1 | 36.8 | 17.4 |

## C. PROJECTED EMISSION INVENTORY

The projections in this source category depend upon increasing population, as given in Table II-2, and future fuel type and dwelling distributions. Assumptions used in projecting fuel type distribution are:

- o Decrease in coal consumption by 4.5% per year.
- o Natural and LP gas usage constant.
- o 5% of coal conversions and new dwellings will be heated by distillate oil and 95% by electricity.(1)
- o Wood usage will increase with population growth.

Fuel usage projections based on these assumptions are presented in Tables V-5 through V-7. Emissions are summarized in Chapter XXXII.

TABLE V-5

1980 PROJECTED TOTAL RESIDENTIAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Bullitt | 562.1 | 3,102.7 | 3,158.4 | 2,469.3 | 8,499.3 |
| Hardin | 1,098.7 | 2,155.3 | 2,952.1 | 3,967.9 | 6,648.0 |
| Henry | 125.7 | 1,550.8 | 1,111.8 | 2,193.8 | 575.1 |
| Oldham | 353.0 | 1,016.3 | 1,996.7 | 2,966.7 | 911.1 |
| Shelby | 378.2 | 1,477.6 | 1,363.8 | 4,328.0 | 1,275.5 |
| Spencer | 14.4 | 1,137.7 | 509.5 | 1,146.9 | 379.5 |
| Trimble | 16.0 | 84.2 | 1,312.8 | 716.1 | 825.6 |

(1) As reported by Kentucky Utilities and verified by Kentucky Energy Office.

TABLE V-6

1985 PROJECTED TOTAL RESIDENTIAL
FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Bullitt | 562.1 | 3,102.7 | 3,281.0 | 1,961.6 | 10,160.8 |
| Hardin | 1,098.7 | 2,155.3 | 3,148.1 | 3,151.9 | 8,169.1 |
| Henry | 125.7 | 1,550.8 | 1,129.2 | 1,742.7 | 616.7 |
| Oldham | 353.0 | 1,016.3 | 2,045.0 | 2,356.6 | 1,018.2 |
| Shelby | 378.2 | 1,477.6 | 1,397.9 | 3,438.0 | 1,378.2 |
| Spencer | 14.4 | 1,137.7 | 522.0 | 911.0 | 462.2 |
| Trimble | 16.0 | 84.2 | 1,320.1 | 568.9 | 884.3 |

TABLE V-7

1995 PROJECTED TOTAL RESIDENTIAL
FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Bullitt | 562.1 | 3,102.7 | 3,585.1 | 1,237.7 | 14,345.5 |
| Hardin | 1,098.7 | 2,155.3 | 3,429.1 | 1,988.9 | 10,349.6 |
| Henry | 125.7 | 1,550.8 | 1,165.4 | 1,099.6 | 710.9 |
| Oldham | 353.0 | 1,016.3 | 2,150.4 | 1,487.0 | 1,262.1 |
| Shelby | 378.2 | 1,477.6 | 1,465.2 | 2,169.4 | 1,597.9 |
| Spencer | 14.4 | 1,137.7 | 549.3 | 574.9 | 535.5 |
| Trimble | 16.0 | 84.2 | 1,334.5 | 358.9 | 1,007.1 |

## D. PROJECTED EMISSIONS ALLOCATION

Projected emissions were allocated in accordance with projected population distribution.

# CHAPTER VI

# COMMERCIAL AND INSTITUTIONAL FUEL USE

This source category includes emissions associated with commercial and institutional fuel combustion. Emission factors for the various commercial/institutional fuels are found in AP-42.

## A. 1975 EMISSIONS INVENTORY

The total Jefferson County commercial/institutional heating requirements obtained from the 1975 fuel survey were $2.277 \times 10^{13}$ Btu. Table VI-1 shows the commercial/institutional fuel use ratios for the seven-county study area relative to Jefferson County. The 1975 sales tax ratios were used to reflect the relative commercial activity within the counties. As Louisville is within shopping distance of many of the residents of the counties, a population-based comparison would not be appropriate. The distribution of heating requirements by fuel type is shown in Table VI-2. For natural gas, fuel usage was obtained from the gas distributors. The distribution of the other fuel types within each county was assumed to be the same as the 1975 fuel-type distribution for Jefferson County.

Emission factors and emissions for this source category are summarized in Tables VI-3 and VI-4.

TABLE VI-1

1975 COUNTY COMMERCIAL/INSTITUTIONAL FUEL USE

| COUNTY | SALES TAX RATIOS(1) | FUEL USE (Btu/yr) |
|---|---|---|
| Bullitt | 0.0150 | $3.416 \times 10^{11}$ |
| Hardin | 0.0622 | $1.416 \times 10^{12}$ |
| Henry | 0.0074 | $1.685 \times 10^{11}$ |
| Oldham | 0.0111 | $2.527 \times 10^{11}$ |
| Shelby | 0.0219 | $4.987 \times 10^{11}$ |
| Spencer | 0.0026 | $5.920 \times 10^{10}$ |
| Trimble | 0.0015 | $3.416 \times 10^{10}$ |

(1) Source: Research Staff, Kentucky Department of Revenue

TABLE VI-2

ESTIMATED TOTAL COMMERCIAL/INSTITUTIONAL
FUEL USE BY COUNTY AND TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) |
|---|---|---|---|---|
| Bullitt | 279.8 | 7.8 | 344.8 | 258.4 |
| Hardin | 1,159.9 | 32.5 | 1,429.7 | 1,071.6 |
| Henry | 138.0 | 3.9 | 170.1 | 127.5 |
| Oldham | 207.1 | 5.8 | 255.1 | 191.2 |
| Shelby | 183.1 | 45.0 | 2,024.7 | 1,510.8 |
| Spencer | 48.5 | 1.3 | 59.8 | 44.8 |
| Trimble | 7.0 | 3.9 | 176.1 | 131.3 |

TABLE VI-3

EMISSION FACTORS FOR COMMERCIAL/INSTITUTIONAL FUEL BURNING

| FUEL TYPE | EMISSION FACTOR UNITS | EMISSION FACTORS | | | | |
|---|---|---|---|---|---|---|
| | | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| Natural Gas | lbs/$10^6$ft$^3$ | 10 | 0.6 | 20 | 8 | 120 |
| LPG(1) | lbs/$10^3$ gal | 1.85 | 0.09 [0.16](2) | 1.95 | 0.75 | 11.5 |
| Oil | lbs/$10^3$ gal | 2 | 142 [0.27] | 5 | 1 | 22 |
| Coal | lbs/ton | 2 [8.0] | 38 [2.0] | 10 | 3 | 6 |

(1) 50% propane, 50% butane

(2) [ ] indicate sulfur and ash content from AP-42 or 1973 fuel survey.

TABLE VI-4

1975 COMMERCIAL/INSTITUTIONAL EMISSIONS SUMMARY

| | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| COUNTY | PARTICU-LATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDRO-CARBONS | NITROGEN OXIDES |
| Bullitt | 3.8 | 16.5 | 5.0 | 1.7 | 21.4 |
| Hardin | 15.8 | 68.5 | 20.6 | 7.0 | 88.7 |
| Henry | 1.9 | 8.1 | 2.4 | 0.8 | 10.6 |
| Oldham | 2.8 | 12.2 | 3.7 | 1.2 | 15.8 |
| Shelby | 15.1 | 96.3 | 14.5 | 4.0 | 38.0 |
| Spencer | 0.7 | 2.9 | 0.9 | 0.3 | 3.7 |
| Trimble | 1.3 | 8.4 | 1.2 | 0.3 | 2.8 |

B. 1975 EMISSIONS ALLOCATION

The 1972 Census of Retail Trade gives the volume of retail sales for counties and cities of 2500 population or more. With the exception of Hardin County, emissions were allocated to such cities in accordance with volume of sales. In the case of Hardin County, more precise data were available. Emissions were allocated by land-use maps (April 1975) provided by the LTADD.

C. PROJECTED EMISSION INVENTORY

Emissions from this source category were projected in accordance with projected commercial and institutional employment, as given in Table II-3. Assumptions used in projecting fuel type distribution are:

- o No growth in coal usage;
- o No growth in natural and LP gas usage;
- o 5% of the growth in fuel usage will be by distillate oil and 95% by electricity.(1)

Commercial and institutional fuel usage projections based on these assumptions are presented in Tables VI-5 through VI-7. Projected emissions are summarized in Chapter XXXII.

D. PROJECTED EMISSIONS ALLOCATION

Projected emissions were allocated in accordance with projected population distribution.

(1) As reported by Kentucky Utilities and verified by Kentucky Energy Office.

TABLE VI-5

1980 PROJECTED TOTAL COMMERCIAL AND INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) |
|---|---|---|---|---|
| Bullitt | 279.8 | 7.8 | 430.1 | 258.4 |
| Hardin | 1,159.9 | 32.5 | 1,463.8 | 1,071.6 |
| Henry | 138.0 | 3.9 | 183.8 | 127.5 |
| Oldham | 207.1 | 5.8 | 307.5 | 191.2 |
| Shelby | 183.1 | 45.0 | 2,051.1 | 1,510.8 |
| Spencer | 48.5 | 1.3 | 66.6 | 44.8 |
| Trimble | 7.0 | 3.9 | 177.9 | 131.3 |

TABLE VI-6

1985 PROJECTED TOTAL COMMERCIAL AND INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) |
|---|---|---|---|---|
| Bullitt | 279.8 | 7.8 | 487.1 | 258.4 |
| Hardin | 1,159.9 | 32.5 | 1,496.4 | 1,071.6 |
| Henry | 138.0 | 3.9 | 193.6 | 127.5 |
| Oldham | 207.1 | 5.8 | 335.8 | 191.2 |
| Shelby | 183.1 | 45.0 | 2,078.6 | 1,510.8 |
| Spencer | 48.5 | 1.3 | 72.6 | 44.8 |
| Trimble | 7.0 | 3.9 | 179.7 | 131.3 |

TABLE VI-7

1995 PROJECTED TOTAL COMMERCIAL AND INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG ($10^3$ gal) | DISTILLATE OIL ($10^3$ gal) | COAL (tons) |
|---|---|---|---|---|
| Bullitt | 279.8 | 7.8 | 628.7 | 258.4 |
| Hardin | 1,159.9 | 32.5 | 1,562.0 | 1,071.6 |
| Henry | 138.0 | 3.9 | 214.6 | 127.5 |
| Oldham | 207.1 | 5.8 | 400.5 | 191.2 |
| Shelby | 183.1 | 45.0 | 2,134.9 | 1,510.8 |
| Spencer | 48.5 | 1.3 | 85.5 | 44.8 |
| Trimble | 7.0 | 3.9 | 184.2 | 131.3 |

# CHAPTER VII

# INDUSTRIAL FUEL USE

This source category includes area source emissions resulting from industrial fuel combustion. The total industrial fuel inventory for the seven counties in the study area has been included in either the point source inventory or the small point source category, Chapter XVII.

# CHAPTER VIII

## ON-SITE INCINERATION

This source category includes emissions produced by the burning of refuse in municipal, industrial or commercial incinerators. Emission factors based on the amount of refuse burned and on incinerator operating characteristics are found in AP-42.

### A. 1975 EMISSION INVENTORY

Base-line year emission level computations from on-site incineration were based on the nationwide average factors given in Volume 7 of the Guidelines. These factors are:

- Commercial/institutional on-site incineration:
  50 tons/1000 population-year
- Industrial on-site incineration:
  335 tons/1000 manufacturing employees-year

Commercial/institutional and industrial charges for counties computed from these factors are presented in Table VIII-1.

TABLE VIII-1

ON-SITE INCINERATION DATA

| COUNTY | 1975 POPULATION | MANUFACTURING EMPLOYEES(1) | CHARGE (tons/year) | | |
|---|---|---|---|---|---|
| | | | COMMERCIAL/ INSTITUTIONAL | INDUSTRIAL | TOTAL |
| Bullitt | 33,642 | 882 | 1,526(2) | 295 | 1,821 |
| Hardin | 46,360 | 2,965 | 2,068(2) | 993 | 3,061 |
| Henry | 11,532 | 458 | 577 | 153 | 730 |
| Oldham | 18,651 | 486 | 932 | 163 | 1,095 |
| Shelby | 20,126 | 1,001 | 1,006 | 335 | 1,341 |
| Spencer | 5,372 | 31 | 269 | 10 | 279 |
| Trimble | 5,683 | 23 | 284 | 8 | 292 |

(1) Source: KIPDA and LTADD

(2) Charges have been modified to account for incinerators listed in the point source inventory.

The point source inventory was reviewed to determine if any incinerators were included. The following commercial/institutional incinerators were included in the inventory, and the charges subtracted from the total charge to avoid double counting.

| | | |
|---|---|---|
| Brown IGS Foodliner | Bullitt County | 156 tons/year |
| J. M. Jones IGA | Hardin County | 250 tons/year |

Residential on-site incinerators are usually located in large apartment buildings or complexes. Since the counties studied are rural, with mostly single dwelling units, residential on-site incinerators are negligible.

Emissions from on-site incineration are shown in Table VIII-2.

## B. 1975 EMISSION ALLOCATION

Emissions from commercial/institutional incinerators were allocated in accordance with population distribution. Emissions from industrial incinerators were allocated according to the number of manufacturing employees, as found in the Kentucky Directory of Manufacturers.

## C. PROJECTED EMISSION INVENTORY

Emissions from this source category were projected to increase in accordance with the commercial and institutional, and industrial employment projections. Projected emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with projected population distribution.

## TABLE VIII-2

## 1975 ON-SITE INCINERATION EMISSIONS SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES EF = 7.8 lbs/ton[1] | SULFUR DIOXIDE EF = 2.5 lbs/ton | CARBON MONOXIDE EF = 11 lbs/ton[1] | HYDROCARBONS EF = 4.2 lbs/ton[1] | NITROGEN DIOXIDE EF = 2.9 lbs/ton |
| Bullitt | 7.1 | 2.3 | 10.0 | 3.8 | 2.6 |
| Hardin | 11.9 | 3.8 | 16.8 | 6.4 | 4.4 |
| Henry | 2.8 | 0.9 | 4.0 | 1.5 | 1.1 |
| Oldham | 4.3 | 1.4 | 6.0 | 2.3 | 1.6 |
| Shelby | 5.2 | 1.7 | 7.4 | 2.8 | 1.9 |
| Spencer | 1.1 | 0.3 | 1.5 | 0.6 | 0.4 |
| Trimble | 1.1 | 0.4 | 1.6 | 0.6 | 0.4 |

[1] 90% multiple chamber, 10% single chamber.

# CHAPTER IX

# OPEN BURNING

This source category includes emissions from refuse burning in open containers or in open fields. Emission factors for this source category are found in AP-42.

## A. 1975 EMISSIONS INVENTORY

Baseline year emission level computations from open burning of residential, commercial/institutional, and industrial waste were based on the national average factors given in Volume 7 of the Guidelines. These factors are:

- Residential open burning: 122 tons/1000 population-year
- Commercial/institutional open burning: 12 tons/1000 population-year
- Industrial open burning: 160 tons/1000 manufacturing employees-year

Use of these factors requires a trash pickup efficiency of 86% relative to the 5.5 lbs/person-day refuse generation rate generally applicable in the United States. This efficiency compares favorably with the 80% or greater pickup rates reported by most of the county officials. The amounts of residential, commercial/institutional, and industrial waste burned per county, estimated from the Volume 7 factors, are summarized in Table IX-1.

In addition to residential, commercial/institutional, and industrial waste, debris resulting from land clearing and construction is often burned in the open. In the LAQMP, it was shown from a comprehensive study provided by the JCAPCD that 13.8 tons of such debris were generated and burned for each acre cleared in Jefferson County. In the study area, however, land clearing for construction is required to a much lesser degree because of the availability of cleared land. Consequently, the Jefferson County factor is halved to 6.9 tons of debris generated and burned in the study area. The number of acres of construction involved is determined in Chapter XXIII.

Table IX-1 summarizes the waste disposed of by open burning, and Table IX-2 shows the resulting emissions.

## B. 1975 EMISSIONS ALLOCATION

Open burning emissions were allocated by population distribution.

### TABLE IX-1

### OPEN BURNING DATA

| COUNTY | 1975 POPULATION | MANUFACTURING EMPLOYEES(1) | CHARGE (tons/year) | | | | |
|---|---|---|---|---|---|---|---|
| | | | RESIDENTIAL | COMMERCIAL/ INSTITUTIONAL | INDUSTRIAL | LAND CLEARING | TOTAL |
| Bullitt | 33,642 | 882 | 4,104 | 404 | 141 | 683 | 5,332 |
| Hardin | 46,360 | 2,965 | 5,656 | 556 | 474 | 955 | 7,641 |
| Henry | 11,532 | 458 | 1,407 | 138 | 73 | 142 | 1,760 |
| Oldham | 18,651 | 486 | 2,275 | 224 | 78 | 897 | 3,474 |
| Shelby | 20,126 | 1,001 | 2,455 | 242 | 160 | 416 | 3,273 |
| Spencer | 5,372 | 31 | 655 | 64 | 5 | 90 | 814 |
| Trimble | 5,683 | 23 | 693 | 68 | 4 | 51 | 816 |

(1) Source: KIPDA and LTADD

### TABLE IX-2

### 1975 OPEN BURNING EMISSIONS SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| | EF = 16 lbs/ton | EF = 1 lb/ton | EF = 85 lbs/ton | EF = 30 lbs/ton | EF = 6 lbs/ton |
| Bullitt | 42.7 | 2.7 | 226.6 | 80.0 | 16.0 |
| Hardin | 61.1 | 3.8 | 324.7 | 114.6 | 22.9 |
| Henry | 14.1 | 0.9 | 74.8 | 26.4 | 5.3 |
| Oldham | 27.8 | 1.7 | 147.6 | 52.1 | 10.4 |
| Shelby | 26.2 | 1.6 | 139.1 | 49.1 | 9.8 |
| Spencer | 6.5 | 0.4 | 34.6 | 12.2 | 2.4 |
| Trimble | 6.5 | 0.4 | 34.7 | 12.2 | 2.4 |

C. PROJECTED EMISSION INVENTORY

The four classes of open burning shown in Table IX-1 are projected to increase in accordance with the following factors:

- o Residential - population growth
- o Commercial/Institutional - C/I employment growth
- o Industrial - industrial employment growth
- o Land Clearing - population growth

The amounts of projected open burning charges based on these factors are summarized in Tables IX-3 through IX-5. Emissions are summarized in Chapter XXXII.

TABLE IX-3

1980 OPEN BURNING PROJECTIONS

| COUNTY | CHARGE (tons/year) | | | | |
|---|---|---|---|---|---|
| | RESIDENTIAL | COMMERCIAL/ INSTITUTIONAL | INDUSTRIAL | LAND CLEARING | TOTAL |
| Bullitt | 5,101 | 680 | 141 | 849 | 6,771 |
| Hardin | 7,070 | 593 | 505 | 1,194 | 9,362 |
| Henry | 1.496 | 169 | 112 | 151 | 1,928 |
| Oldham | 2,864 | 351 | 126 | 1,129 | 4,470 |
| Shelby | 2,651 | 277 | 192 | 449 | 3,569 |
| Spencer | 692 | 84 | 8 | 95 | 879 |
| Trimble | 741 | 78 | 6 | 55 | 880 |

TABLE IX-4

1985 OPEN BURNING PROJECTIONS

| COUNTY | CHARGE (tons/year) | | | | |
|---|---|---|---|---|---|
| | RESIDENTIAL | COMMERCIAL/ INSTITUTIONAL | INDUSTRIAL | LAND CLEARING | TOTAL |
| Bullitt | 6,099 | 865 | 346 | 1,015 | 8,325 |
| Hardin | 8,688 | 628 | 535 | 1,467 | 11,318 |
| Henry | 1,604 | 191 | 131 | 162 | 2,088 |
| Oldham | 3,201 | 420 | 158 | 1,262 | 5,041 |
| Shelby | 2,865 | 313 | 219 | 485 | 3,882 |
| Spencer | 777 | 102 | 9 | 107 | 995 |
| Trimble | 793 | 87 | 8 | 58 | 946 |

TABLE IX-5

1995 OPEN BURNING PROJECTIONS

| COUNTY | CHARGE (tons/year) | | | | |
|---|---|---|---|---|---|
| | RESIDENTIAL | COMMERCIAL/ INSTITUTIONAL | INDUSTRIAL | LAND CLEARING | TOTAL |
| Bullitt | 8,610 | 1,324 | 672 | 1,433 | 12,039 |
| Hardin | 11,007 | 698 | 596 | 1,858 | 14,159 |
| Henry | 1,849 | 238 | 175 | 187 | 2,449 |
| Oldham | 3,968 | 577 | 237 | 1,564 | 6,346 |
| Shelby | 3,322 | 386 | 268 | 563 | 4,539 |
| Spencer | 976 | 140 | 11 | 134 | 1,261 |
| Trimble | 904 | 111 | 13 | 67 | 1,095 |

D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with the projected population distribution.

# CHAPTER X

# ROAD VEHICLES

This source category includes exhaust emissions from the following classes of road vehicles:

- o Light-duty gasoline automobiles (LDGA)
- o Light-duty gasoline trucks with GVW 0-6000 lbs. ($LDGT_1$)
- o Light-duty gasoline trucks with GVW 6001-8500 lbs. ($LDGT_2$)
- o Light-duty diesel vehicles (LDDV)
- o Heavy-duty gasoline vehicles (HDGV)
- o Heavy-duty diesel vehicles (HDDV)
- o Motorcycles

EPA recently issued new emission factors for motor vehicles. This document which will be published in a future supplement to AP-42 does not revise all information in Supplement No. 5. In particular, updated factors are not included for LDDV nor is any information included on particulates and $SO_2$. The updated factors for the above vehicle classes contain several (optional) correction factors such as trailer towing, air-conditioning, vehicle loading and humidity correction factors and a single correction factor relating speed, ambient temperature and hot/cold vehicle operation. A computer program developed by EPA was used to calculate the emission factors for each calendar year, pollutant, average speed (road class), ambient temperature, fraction cold operation and fraction hot-start operation.[1]

## A. 1975 EMISSION INVENTORY

Comprehensive and extensive average daily traffic (ADT) maps for each county were made available by the Kentucky Department of Transportation (DOT). For the minor roads, for which ADT were not available, estimates were made from ADT values for surrounding roads. In a few cases where estimates could not be made, a value of 50 ADT was assigned to through roads and streets.[2] ADT for dead-end roads and streets were estimated using the formula:

(1) Mobile 1 program, obtained from OTLUP, January 1978.

(2) An assumed ADT value of 50 was recommended by Kentucky DOT.

$$ADT = \frac{\text{No. of Roadside Buildings} \times 3.3}{2}$$

where 3.3 is the national average number of trips/day-vehicle suggested in AP-42, divided by two to account for the average length of trip on the dead-end street.

VMT were calculated for each grid square as the product of ADT and road segment length. A comparison of the seven-county total VMT and the seven-county total allocated on a population basis from DOT state totals, showed that the calculated total exceeded the allocated total by 18%. This is to be expected because of the greater number of major highways in the study area as compared to the State as a whole.

VMT for each grid square were disaggregated by functional road classification. Statewide percentages of vehicle miles traveled by vehicle type and road classification were provided by DOT. These data are shown in Table X-1.

TABLE X-1

VMT BY ROAD CLASSIFICATION AND VEHICLE TYPE(1) (%)

| VEHICLE TYPE | FREEWAY | ARTERIAL | LOCAL |
|---|---|---|---|
| LDGA | 70.6 | 70.4 | 70.3 |
| LDGT | 16.6 | 16.8 | 16.7 |
| LDDV | 4.1 | 4.1 | 4.3 |
| HDGV | 1.1 | 1.0 | 1.5 |
| HDDV | 7.6 | 7.7 | 7.2 |
| TOTAL | 100.0 | 100.0 | 100.0 |

(1) Does not include motorcycles considered separately or LPG vehicles for which emissions are negligible.

Tables X-2 through X-8 summarize traffic data by county. Total VMT by road classification are aggregates of all grid squares. For each road

classification total, VMT were distributed by vehicle type in accordance with the values given in Table X-1. The VMT for the light-duty gasoline powered trucks (LDGT) was divided into each of the weight categories based upon the average sales weighting distribution of the two categories. The weighting distribution by sales is based on national data.

TABLE X-2

1975 BULLITT COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Start (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 123 | 71 | 54 | 248 |
| $LDGT_1$ VMT ($10^6$) | 21 | 12 | 9 | 42 |
| $LDGT_2$ VMT ($10^6$) | 8 | 5 | 3 | 16 |
| LDDV VMT ($10^6$) | 7 | 4 | 4 | 15 |
| HDGV VMT ($10^6$) | 2 | 1 | 2 | 5 |
| HDDV VMT ($10^6$) | 13 | 8 | 6 | 27 |
| TOTAL VMT ($10^6$) | 174 | 101 | 78 | 353 |

TABLE X-3

1975 HARDIN COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 177 | 163 | 106 | 446 |
| $LDGT_1$ VMT ($10^6$) | 30 | 28 | 19 | 77 |
| $LDGT_2$ VMT ($10^6$) | 12 | 11 | 7 | 30 |
| LDDV VMT ($10^6$) | 10 | 10 | 6 | 26 |
| HDGV VMT ($10^6$) | 3 | 2 | 2 | 7 |
| HDDV VMT ($10^6$) | 19 | 18 | 10 | 47 |
| TOTAL VMT ($10^6$) | 251 | 232 | 150 | 633 |

TABLE X-4

1975 HENRY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 36 | 32 | 16 | 84 |
| $LDGT_1$ VMT ($10^6$) | 6 | 6 | 3 | 15 |
| $LDGT_2$ VMT ($10^6$) | 2 | 2 | 1 | 5 |
| LDDV VMT ($10^6$) | 2 | 2 | 0 | 4 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 4 | 3 | 2 | 9 |
| TOTAL VMT ($10^6$) | 51 | 45 | 22 | 118 |

TABLE X-5

1975 OLDHAM COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 44 | 32 | 18 | 94 |
| $LDGT_1$ VMT ($10^6$) | 7 | 6 | 3 | 16 |
| $LDGT_2$ VMT ($10^6$) | 3 | 2 | 1 | 6 |
| LDDV VMT ($10^6$) | 3 | 2 | 2 | 7 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 5 | 4 | 2 | 11 |
| TOTAL VMT ($10^6$) | 63 | 46 | 26 | 135 |

TABLE X-6

1975 SHELBY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 84 | 65 | 30 | 179 |
| $LDGT_1$ VMT ($10^6$) | 14 | 11 | 4 | 29 |
| $LDGT_2$ VMT ($10^6$) | 6 | 5 | 2 | 13 |
| LDDV VMT ($10^6$) | 5 | 4 | 2 | 11 |
| HDGV VMT ($10^6$) | 1 | 1 | 0 | 2 |
| HDDV VMT ($10^6$) | 9 | 7 | 4 | 20 |
| TOTAL VMT ($10^6$) | 119 | 93 | 42 | 254 |

TABLE X-7

1975 SPENCER COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 0 | 17 | 6 | 23 |
| $LDGT_1$ VMT ($10^6$) | 0 | 3 | 1 | 4 |
| $LDGT_2$ VMT ($10^6$) | 0 | 1 | 1 | 2 |
| LDDV VMT ($10^6$) | 0 | 1 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 0 | 2 | 0 | 2 |
| TOTAL VMT ($10^6$) | 0 | 24 | 8 | 32 |

TABLE X-8

1975 TRIMBLE COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 20 | 2 | 6 | 28 |
| $LDGT_1$ VMT ($10^6$) | 4 | 1 | 1 | 6 |
| $LDGT_2$ VMT ($10^6$) | 1 | 0 | 1 | 2 |
| LDDV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 2 | 0 | 0 | 2 |
| TOTAL VMT ($10^6$) | 28 | 3 | 8 | 39 |

VMT estimates for motorcycles were based on the number of motorcycles registered in each county, which was provided by the state motor vehicle registration office. An average value of 4,000 miles/motorcycle-year, 38% two-stroke and 62% four-stroke, was assumed, as suggested in AP-42. Motorcycle data and VMT are summarized in Table X-9.

TABLE X-9

1975 MOTORCYCLE TRAFFIC DATA

| COUNTY | NUMBER OF MOTORCYCLES | MILES TRAVELLED ($10^3$ MI/YR) |
|---|---|---|
| Bullitt | 796 | 3,184 |
| Hardin | 1,074 | 4,296 |
| Henry | 206 | 824 |
| Oldham | 41 | 1,644 |
| Shelby | 304 | 1,216 |
| Spencer | 71 | 284 |
| Trimble | 84 | 336 |

Emission factors for this source category were calculated using AP-42 Supplement #5 for $SO_2$ and particulates and the computerized EPA Emission Factor Programs for each calendar year, each pollutant (HC, CO and $NO_x$ only) average speed (road class), ambient temperature, fraction cold operation and fraction hot operation.

The vehicle age distribution for Jefferson County was provided by the JCAPCD (Table X-10). The same distribution is appropriate for the seven-county study area. The nationwide average of motorcycles by vehicle age distribution used is given in Table X-10. VMT by vehicle age were not available locally. Consequently, the nationwide average annual miles driven by vehicle age, built into the EPA emission factor program was used.

TABLE X-10

LOCALIZED 1975 VEHICLE REGISTRATION (FRACTION)

| VEHICLE AGE | LDGA | $LDT_1$ | $LDT_2$ | HDG | HDD | MC(1) |
|---|---|---|---|---|---|---|
| 1 | 0.076 | 0.128 | 0.130 | 0.176 | 0.176 | 0.105 |
| 2 | 0.095 | 0.117 | 0.116 | 0.084 | 0.086 | 0.225 |
| 3 | 0.111 | 0.109 | 0.109 | 0.118 | 0.115 | 0.206 |
| 4 | 0.101 | 0.095 | 0.095 | 0.084 | 0.084 | 0.149 |
| 5 | 0.085 | 0.064 | 0.063 | 0.067 | 0.067 | 0.097 |
| 6 | 0.082 | 0.061 | 0.060 | 0.084 | 0.079 | 0.062 |
| 7 | 0.082 | 0.066 | 0.067 | 0.067 | 0.069 | 0.046 |
| 8 | 0.078 | 0.054 | 0.056 | 0.067 | 0.067 | 0.033 |
| 9 | 0.065 | 0.050 | 0.049 | 0.050 | 0.052 | 0.029 |
| 10 | 0.062 | 0.043 | 0.042 | 0.034 | 0.033 | 0.023 |
| 11 | 0.055 | 0.041 | 0.039 | 0.034 | 0.035 | 0.008 |
| 12 | 0.037 | 0.031 | 0.032 | 0.025 | 0.022 | 0.005 |
| 13 | 0.026 | 0.022 | 0.025 | 0.017 | 0.022 | 0.013 |
| 14 | 0.016 | 0.018 | 0.018 | 0.017 | 0.017 | 0 |
| 15 | 0.007 | 0.013 | 0.014 | 0.009 | 0.007 | 0 |
| 16 | 0.006 | 0.021 | 0.021 | 0.017 | 0.018 | 0 |
| 17 | 0.005 | 0.020 | 0.018 | 0.017 | 0.016 | 0 |
| 18 | 0.005 | 0.017 | 0.018 | 0.017 | 0.014 | 0 |
| 19 | 0.005 | 0.016 | 0.014 | 0.008 | 0.011 | 0 |
| 20 | 0.004 | 0.014 | 0.014 | 0.008 | 0.010 | 0 |
| TOTAL | 1.003 | 1.000 | 1.000 | 1.000 | 1.000 | 1.001 |

(1) Nationwide average data used.

Other inputs and assumptions that went into the emission factor calculations include:[1]

- o Ambient temperature - 56°F.
- o Altitude - low.
- o Assume the speed and the operating mix (i.e., % cold starts/% stabilized/% hot starts in Table X-2 through X-8.)
- o Assume a value of 1.00 for both the vehicle loading (Lip) and the trailer towing (Uipn) correction factors due to the unavailability of better data or information.
- o For $NO_x$ emission calculations, the humidity recorded for Louisville Airport was used.
- o The national average of vehicles equipped with air conditioning systems by model year, given in Supplement #8 was used.
- o The fraction of vehicles which are equipped with air conditioning that have the air conditioning system in operation was obtained from the 1951-1960 Louisville temperature and wind speed relative humidity occurrence data.
- o Number of tires - 18 for HDDV, 10 for HDGV and four for all other vehicles.
- o No attempt was made to correct for idle emissions since there are no available data on the duration and frequency of stops at major intersections, shopping centers, sport complexes, etc.

The computed emission factors (HC, CO, $NO_x$) and emissions from motor vehicles are summarized in Tables X-11 and X-12.

## B. 1975 EMISSIONS ALLOCATION

Emissions were allocated to each grid square in accordance with the VMT distribution.

(1) All inputs and assumptions used to calculate emissions were reviewed and approved by the Kentucky Department for Natural Resources and Environmental Protection.

TABLE X-11

1975 MOTOR VEHICLE EMISSION FACTORS

(GRAMS/MILE)

| VEHICLE MODE | FREEWAY | | | ARTERIAL | | | LOCAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | HC | CO | $NO_x$ | HC | CO | $NO_x$ | HC | CO | $NO_x$ |
| LDV | 7.45 | 30.33 | 5.01 | 9.20 | 50.95 | 4.98 | 11.48 | 80.81 | 4.59 |
| $LDT_1$ | 7.32 | 28.30 | 4.83 | 8.97 | 47.40 | 4.77 | 11.14 | 75.32 | 4.39 |
| $LDT_2$ | 9.14 | 31.14 | 7.42 | 11.18 | 52.19 | 7.31 | 13.86 | 83.17 | 6.73 |
| HDG | 13.39 | 150.23 | 14.23 | 16.94 | 146.51 | 12.42 | 16.94 | 201.45 | 11.47 |
| HDD | 2.16 | 16.04 | 25.42 | 2.81 | 18.34 | 18.55 | 2.81 | 25.56 | 19.41 |
| MC | 9.09 | 18.72 | 0.16 | 11.32 | 27.72 | 0.16 | 14.35 | 41.14 | 0.15 |
| All Modes | 7.18 | 30.22 | 6.78 | 8.87 | 48.83 | 6.18 | 11.02 | 77.62 | 5.86 |

TABLE X-12(1)

1975 HIGHWAY VEHICLES EMISSIONS SUMMARY

| COUNTY | EMISSIONS (TONS/YEAR) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | HYDROCARBONS | CARBON MONOXIDE | NITROGEN OXIDES |
| Bullitt | 254.8 | 141.2 | 3,221.9 | 17,368.2 | 2,437.2 |
| Hardin | 452.1 | 248.0 | 5,898.1 | 32,541.2 | 4,298.0 |
| Henry | 84.2 | 46.5 | 1,079.0 | 5,826.4 | 810.7 |
| Oldham | 98.3 | 56.4 | 1,205.7 | 6,406.1 | 932.3 |
| Shelby | 182.8 | 102.8 | 2,261.1 | 11,926.9 | 1,745.7 |
| Spencer | 21.8 | 11.3 | 327.5 | 1,925.6 | 202.0 |
| Trimble | 25.8 | 12.4 | 349.2 | 1,746.0 | 256.2 |

(1) Includes the motorcycles emissions.

## C. PROJECTED EMISSION INVENTORY

The projection of emissions from highway vehicles depends upon:

- o Changes in traffic volume;
- o Changes in vehicle type mix; and
- o Changes in emission factors (emissions/vehicle-mile).

Traffic volume is assumed to grow at 2% linear growth/year.[1] The projected VMT growth is summarized in Tables X-13 - X-33. Information is not available on historical changes in the vehicle type mix. Hence, for projection purposes, the vehicle type mix is assumed to remain constant for each of the functional road classifications.

The HC, CO, and $NO_x$ emission factors for the projection years were calculated using the EPA Emission Factor Programs. However, this program is valid only up to the year 1990. Changes in the HC, CO, and $NO_x$ emission factors from 1990 to 1995 are, therefore, assumed to remain relatively constant and the 1990 emission factors were used to estimate the 1995 HC, CO and $NO_x$ emissions. Actually the emission factors for the year 1995 should be less than the 1990 factors, hence this assumption results in a conservative, i.e., higher than expected, estimate of the 1995 HC, CO and $NO_x$ emissions. The projected emission factors for HC, CO and $NO_x$ are summarized in Tables X-34 - X-36. For light-duty diesel-powered vehicles, however, the HC, CO, and $NO_x$ exhaust emission factors obtained from AP-42, Supplement #5 do not change with time.

$SO_2$ exhaust emission factors for all vehicle classes and particulate emission factors for LDDV and the heavy-duty vehicles (HDGV and HDDV) also do not change with time. However for the light-duty gasoline powered vehicles (LDGA and LDGT), particulate emission factors decrease with time because of the expected increased use of catalytic converters which require the use of unleaded gasoline and the resulting reduced emissions of lead oxides. For this vehicle class the particulate emission factor can be expressed as:

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(1) The 2% linear growth/year for the traffic volume in the study areas was recommended by Kentucky DOT.

TABLE X-13

1980 BULLITT COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 135 | 78 | 59 | 272 |
| $LDT_1$ VMT ($10^6$) | 23 | 14 | 9 | 46 |
| $LDT_2$ VMT ($10^6$) | 9 | 5 | 4 | 18 |
| LDDV VMT ($10^6$) | 8 | 4 | 4 | 16 |
| HDGV VMT ($10^6$) | 2 | 1 | 2 | 5 |
| HDDV VMT ($10^6$) | 14 | 9 | 7 | 30 |
| TOTAL VMT ($10^6$) | 191 | 111 | 85 | 387 |

TABLE X-14

1980 HARDIN COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGB) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 195 | 179 | 117 | 491 |
| $LDT_1$ VMT ($10^6$) | 33 | 31 | 21 | 85 |
| $LDT_2$ VMT ($10^6$) | 13 | 12 | 8 | 33 |
| LDDV VMT ($10^6$) | 11 | 11 | 7 | 29 |
| HDGV VMT ($10^6$) | 3 | 2 | 2 | 7 |
| HDDV VMT ($10^6$) | 21 | 20 | 11 | 52 |
| TOTAL VMT ($10^6$) | 276 | 255 | 166 | 697 |

TABLE X-15

1980 HENRY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 40 | 35 | 18 | 93 |
| $LDT_1$ VMT ($10^6$) | 6 | 6 | 3 | 15 |
| $LDT_2$ VMT ($10^6$) | 3 | 3 | 1 | 7 |
| LDDV VMT ($10^6$) | 2 | 1 | 0 | 4 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 4 | 3 | 2 | 9 |
| TOTAL VMT ($10^6$) | 56 | 49 | 24 | 129 |

TABLE X-16

1980 OLDHAM COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 48 | 35 | 20 | 103 |
| $LDT_1$ VMT ($10^6$) | 8 | 6 | 3 | 17 |
| $LDT_2$ VMT ($10^6$) | 3 | 3 | 1 | 7 |
| LDDV VMT ($10^6$) | 3 | 2 | 2 | 7 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 6 | 4 | 2 | 12 |
| TOTAL VMT ($10^6$) | 69 | 50 | 28 | 147 |

TABLE X-17

1980 SHELBY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 92 | 72 | 33 | 197 |
| $LDT_1$ VMT ($10^6$) | 16 | 13 | 5 | 34 |
| $LDT_2$ VMT ($10^6$) | 6 | 5 | 2 | 13 |
| LDDV VMT ($10^6$) | 6 | 4 | 2 | 12 |
| HDGV VMT ($10^6$) | 1 | 1 | 0 | 2 |
| HDDV VMT ($10^6$) | 10 | 8 | 4 | 22 |
| TOTAL VMT ($10^6$) | 131 | 103 | 46 | 280 |

TABLE X-18

1980 SPENCER COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 0 | 19 | 7 | 26 |
| $LDT_1$ VMT ($10^6$) | 0 | 3 | 1 | 4 |
| $LDT_2$ VMT ($10^6$) | 0 | 1 | 1 | 2 |
| LDDV VMT ($10^6$) | 0 | 1 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 0 | 2 | 0 | 2 |
| TOTAL VMT ($10^6$) | 0 | 26 | 9 | 35 |

TABLE X-19

1980 TRIMBLE COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 22 | 2 | 7 | 31 |
| $LDT_1$ VMT ($10^6$) | 4 | 1 | 1 | 6 |
| $LDT_2$ VMT ($10^6$) | 2 | 0 | 1 | 3 |
| LDDV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 2 | 0 | 0 | 2 |
| TOTAL VMT ($10^6$) | 31 | 3 | 9 | 43 |

TABLE X-20

1985 BULLITT COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 148 | 85 | 65 | 298 |
| $LDGT_1$ VMT ($10^6$) | 25 | 14 | 10 | 49 |
| $LDGT_2$ VMT ($10^6$) | 10 | 6 | 4 | 20 |
| LDDV VMT ($10^6$) | 8 | 5 | 5 | 18 |
| HDGV VMT ($10^6$) | 2 | 1 | 2 | 5 |
| HDDV VMT ($10^6$) | 16 | 10 | 7 | 33 |
| TOTAL VMT ($10^6$) | 209 | 121 | 93 | 423 |

TABLE X-21

1985 HARDIN COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 212 | 196 | 127 | 535 |
| $LDGT_1$ VMT ($10^6$) | 36 | 34 | 22 | 92 |
| $LDGT_2$ VMT ($10^6$) | 14 | 13 | 9 | 36 |
| LDDV VMT ($10^6$) | 12 | 12 | 7 | 31 |
| HDGV VMT ($10^6$) | 4 | 2 | 2 | 8 |
| HDDV VMT ($10^6$) | 23 | 22 | 12 | 57 |
| TOTAL VMT ($10^6$) | 301 | 279 | 179 | 759 |

TABLE X-22

1985 HENRY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 43 | 38 | 19 | 100 |
| $LDGT_1$ VMT ($10^6$) | 7 | 7 | 4 | 18 |
| $LDGT_2$ VMT ($10^6$) | 3 | 3 | 1 | 7 |
| LDDV VMT ($10^6$) | 2 | 2 | 0 | 4 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 5 | 4 | 2 | 11 |
| TOTAL VMT ($10^6$) | 61 | 54 | 26 | 141 |

TABLE X-23

1985 OLDHAM COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 53 | 38 | 22 | 113 |
| $LDGT_1$ VMT ($10^6$) | 9 | 7 | 4 | 20 |
| $LDGT_2$ VMT ($10^6$) | 3 | 3 | 1 | 7 |
| LDDV VMT ($10^6$) | 4 | 2 | 2 | 8 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 6 | 5 | 2 | 13 |
| TOTAL VMT ($10^6$) | 76 | 55 | 31 | 162 |

TABLE X-24

1985 SHELBY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 101 | 78 | 36 | 215 |
| $LDGT_1$ VMT ($10^6$) | 17 | 14 | 5 | 36 |
| $LDGT_2$ VMT ($10^6$) | 7 | 5 | 2 | 14 |
| LDDV VMT ($10^6$) | 6 | 5 | 2 | 13 |
| HDGV VMT ($10^6$) | 1 | 1 | 0 | 2 |
| HDDV VMT ($10^6$) | 11 | 8 | 5 | 24 |
| TOTAL VMT ($10^6$) | 143 | 111 | 50 | 304 |

TABLE X-25

1985 SPENCER COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 0 | 20 | 7 | 27 |
| $LDGT_1$ VMT ($10^6$) | 0 | 4 | 1 | 5 |
| $LDGT_2$ VMT ($10^6$) | 0 | 1 | 1 | 2 |
| LDDV VMT ($10^6$) | 0 | 1 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 0 | 2 | 0 | 2 |
| TOTAL VMT ($10^6$) | 0 | 28 | 9 | 37 |

TABLE X-26

1985 TRIMBLE COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 24 | 2 | 7 | 33 |
| $LDGT_1$ VMT ($10^6$) | 4 | 1 | 1 | 6 |
| $LDGT_2$ VMT ($10^6$) | 2 | 0 | 1 | 3 |
| LDDV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 2 | 0 | 0 | 2 |
| TOTAL VMT ($10^6$) | 33 | 3 | 9 | 45 |

TABLE X-27

1995 BULLITT COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 172 | 99 | 76 | 347 |
| $LDGT_1$ VMT ($10^6$) | 29 | 17 | 12 | 58 |
| $LDGT_2$ VMT ($10^6$) | 12 | 7 | 5 | 24 |
| LDDV VMT ($10^6$) | 10 | 6 | 6 | 22 |
| HDGV VMT ($10^6$) | 3 | 1 | 3 | 7 |
| HDDV VMT ($10^6$) | 18 | 11 | 8 | 37 |
| TOTAL VMT ($10^6$) | 244 | 141 | 110 | 495 |

TABLE X-28

1995 HARDIN COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 248 | 228 | 148 | 624 |
| $LDGT_1$ VMT ($10^6$) | 42 | 39 | 26 | 107 |
| $LDGT_2$ VMT ($10^6$) | 17 | 16 | 10 | 43 |
| LDDV VMT ($10^6$) | 14 | 14 | 8 | 36 |
| HDGV VMT ($10^6$) | 4 | 3 | 3 | 10 |
| HDDV VMT ($10^6$) | 27 | 25 | 14 | 66 |
| TOTAL VMT ($10^6$) | 352 | 325 | 209 | 886 |

TABLE X-29

1995 HENRY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 50 | 45 | 22 | 117 |
| $LDGT_1$ VMT ($10^6$) | 8 | 8 | 4 | 20 |
| $LDGT_2$ VMT ($10^6$) | 3 | 3 | 2 | 8 |
| LDDV VMT ($10^6$) | 3 | 3 | 0 | 6 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 6 | 4 | 3 | 13 |
| TOTAL VMT ($10^6$) | 71 | 63 | 31 | 165 |

TABLE X-30

1995 OLDHAM COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 62 | 45 | 25 | 132 |
| $LDGT_1$ VMT ($10^6$) | 10 | 8 | 4 | 22 |
| $LDGT_2$ VMT ($10^6$) | 4 | 3 | 2 | 9 |
| LDDV VMT ($10^6$) | 4 | 3 | 3 | 10 |
| HDGV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDDV VMT ($10^6$) | 7 | 6 | 3 | 16 |
| TOTAL VMT ($10^6$) | 88 | 65 | 37 | 190 |

TABLE X-31

1995 SHELBY COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 118 | 91 | 42 | 251 |
| $LDGT_1$ VMT ($10^6$) | 20 | 16 | 6 | 42 |
| $LDGT_2$ VMT ($10^6$) | 8 | 6 | 2 | 16 |
| LDDV VMT ($10^6$) | 7 | 6 | 3 | 16 |
| HDGV VMT ($10^6$) | 1 | 1 | 0 | 2 |
| HDDV VMT ($10^6$) | 13 | 10 | 6 | 29 |
| TOTAL VMT ($10^6$) | 167 | 130 | 59 | 356 |

TABLE X-32

1995 SPENCER COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 0 | 24 | 8 | 32 |
| $LDGT_1$ VMT ($10^6$) | 0 | 4 | 2 | 6 |
| $LDGT_2$ VMT ($10^6$) | 0 | 2 | 1 | 3 |
| LDDV VMT ($10^6$) | 0 | 1 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 0 | 3 | 0 | 3 |
| TOTAL VMT ($10^6$) | 0 | 34 | 11 | 45 |

TABLE X-33

1995 TRIMBLE COUNTY TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 28 | 3 | 8 | 39 |
| $LDGT_1$ VMT ($10^6$) | 5 | 1 | 2 | 8 |
| $LDGT_2$ VMT ($10^6$) | 2 | 0 | 1 | 3 |
| LDDV VMT ($10^6$) | 1 | 0 | 0 | 1 |
| HDGV VMT ($10^6$) | 0 | 0 | 0 | 0 |
| HDDV VMT ($10^6$) | 3 | 0 | 0 | 3 |
| TOTAL VMT ($10^6$) | 39 | 4 | 11 | 54 |

TABLE X-34

1980 MOTOR VEHICLE EMISSION FACTORS

(GRAMS/MILE)

| VEHICLE MODE | FREEWAY | | | ARTERIAL | | | LOCAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | HC | CO | $NO_x$ | HC | CO | $NO_x$ | HC | CO | $NO_x$ |
| LDV | 4.40 | 21.33 | 4.21 | 5.75 | 37.94 | 4.02 | 7.47 | 62.93 | 3.69 |
| $LDT_1$ | 4.38 | 22.88 | 3.93 | 5.91 | 40.85 | 3.72 | 7.88 | 68.15 | 3.40 |
| $LDT_2$ | 5.68 | 26.18 | 5.99 | 7.65 | 46.74 | 5.69 | 10.17 | 78.24 | 5.21 |
| HDG | 10.60 | 145.12 | 13.45 | 13.50 | 156.26 | 11.62 | 18.86 | 203.10 | 10.66 |
| HDD | 2.23 | 12.12 | 29.89 | 2.82 | 15.69 | 18.31 | 3.73 | 22.54 | 18.71 |
| MC | 4.02 | 12.71 | 0.30 | 5.95 | 20.64 | 0.29 | 8.48 | 32.42 | 0.27 |
| All Modes | 4.35 | 22.32 | 6.36 | 5.72 | 38.12 | 5.24 | 7.56 | 63.20 | 4.94 |

TABLE X-35

1985 MOTOR VEHICLE EMISSION FACTORS

(GRAMS/MILE)

| VEHICLE MODES | FREEWAY | | | ARTERIAL | | | LOCAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | HC | CO | $NO_x$ | HC | CO | $NO_x$ | HC | CO | $NO_x$ |
| LDV | 4.40 | 11.01 | 3.22 | 5.75 | 20.27 | 3.01 | 7.47 | 34.52 | 2.77 |
| $LDT_1$ | 4.38 | 16.43 | 3.27 | 5.91 | 30.71 | 3.05 | 7.88 | 52.51 | 2.80 |
| $LDT_2$ | 5.68 | 17.36 | 3.91 | 7.65 | 32.23 | 3.68 | 10.17 | 55.02 | 3.38 |
| HDG | 10.60 | 100.43 | 11.24 | 13.50 | 107.54 | 9.52 | 18.86 | 131.48 | 8.62 |
| HDD | 2.23 | 10.70 | 26.30 | 2.82 | 14.46 | 14.79 | 3.73 | 21.32 | 15.09 |
| MC | 1.01 | 4.65 | 0.54 | 1.73 | 8.06 | 0.53 | 2.63 | 13.09 | 0.50 |
| All Modes | 4.33 | 12.90 | 5.15 | 5.68 | 22.54 | 4.03 | 7.51 | 38.06 | 3.80 |

TABLE X-36

1990 AND 1995 MOTOR VEHICLE EMISSION FACTORS

(GRAMS/MILE)(1)

| VEHICLE MODE | FREEWAY | | | ARTERIAL | | | LOCAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | HC | CO | $NO_x$ | HC | CO | $NO_x$ | HC | CO | $NO_x$ |
| LDV | 0.95 | 6.66 | 2.79 | 1.72 | 13.17 | 2.59 | 2.61 | 23.09 | 2.38 |
| $LDT_1$ | 1.26 | 10.49 | 2.60 | 2.25 | 20.33 | 2.41 | 3.41 | 35.34 | 2.22 |
| $LDT_2$ | 1.35 | 10.66 | 2.73 | 2.37 | 20.54 | 2.54 | 3.56 | 35.65 | 2.34 |
| HDG | 4.73 | 65.47 | 8.85 | 6.44 | 70.38 | 7.44 | 9.35 | 83.46 | 6.70 |
| HDD | 1.26 | 10.27 | 14.86 | 1.76 | 14.08 | 8.15 | 2.49 | 20.93 | 8.31 |
| MC | 0.23 | 1.88 | 0.24 | 0.45 | 3.41 | 0.23 | 0.72 | 5.68 | 0.22 |
| All Modes | 1.07 | 8.22 | 3.76 | 1.86 | 15.03 | 3.04 | 2.83 | 25.83 | 2.85 |

(1) 1990 emission factors calculated using the Mobile 1 program, obtained from OTLUP, January 1978, were used for 1995 based on a telephone conversation with Len Fleckenstein and Lew Guthman of OTLUP.

$$EF = [EF_{cc} \times F] + [EF_{ncc} \times (1 - F)] + EF_{tw}$$

where:

$EF_{cc}$ - The exhaust emission factor for the 1975 model year and later years (0.05 g/mile),

$EF_{ncc}$ = The exhaust emission factor for 1974 model and earlier cars (0.34 g/mile), and

$EF_{tw}$ = Tire wear emission factor (0.20 g/mile).

F is calculated using Table I-22 in Appendix D of AP-42 (Supplement No. 5) for LDGA and Table D.2-11 for LDGT. The projected TSP emission factors for this vehicle class are summarized in Table X-37.

TABLE X-37

PROJECTED TSP EMISSION FACTORS

| VEHICLE CLASS | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| LDGA | 0.51 | 0.33 | 0.27 | 0.27 |
| $LDGT_1$ | 0.51 | 0.35 | 0.28 | 0.28 |
| $LDGT_2$ | 0.51 | 0.35 | 0.28 | 0.28 |

With these projected HC, CO, $NO_x$, particulate emission factors and the unchanging emission factors previously discussed, and the projected VMT, the projected highway vehicle emissions were calculated and summarized in Table X-38 - X-40.

TABLE X-38

1980 HIGHWAY VEHICLES EMISSIONS SUMMARY

| COUNTY | EMISSIONS (TONS/YEAR) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | HYDROCARBONS | CARBON MONOXIDE | NITROGEN OXIDES |
| Bullitt | 214.3 | 155.6 | 2,256.8 | 14,818.2 | 2,394.4 |
| Hardin | 379.7 | 273.8 | 4,163.1 | 27,958.1 | 4,189.8 |
| Henry | 68.3 | 48.2 | 759.0 | 4,961.0 | 774.3 |
| Oldham | 82.1 | 61.2 | 839.3 | 5,408.8 | 919.8 |
| Shelby | 153.8 | 113.2 | 1,586.3 | 10,168.3 | 1,723.1 |
| Spencer | 17.3 | 11.7 | 234.3 | 1,668.7 | 182.6 |
| Trimble | 20.4 | 13.0 | 242.8 | 1,486.1 | 250.8 |

TABLE X-39

1985 HIGHWAY VEHICLES EMISSIONS SUMMARY

| COUNTY | EMISSIONS (TONS/YEAR) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | HYDROCARBONS | CARBON MONOXIDE | NITROGEN OXIDES |
| Bullitt | 209.5 | 170.7 | 1,210.0 | 9,513.8 | 2,083.5 |
| Hardin | 369.3 | 299.2 | 2,260.1 | 18,079.5 | 3,614.0 |
| Henry | 68.1 | 56.0 | 408.5 | 3,204.6 | 688.7 |
| Oldham | 80.7 | 66.9 | 454.1 | 3,520.2 | 793.1 |
| Shelby | 149.0 | 123.0 | 842.6 | 6,470.7 | 1,484.9 |
| Spencer | 15.7 | 12.1 | 126.3 | 1,037.5 | 146.2 |
| Trimble | 18.1 | 13.3 | 119.2 | 892.9 | 206.0 |

TABLE X-40

1995 HIGHWAY VEHICLES EMISSIONS SUMMARY

| COUNTY | EMISSIONS (TONS/YEAR) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | $SO_2$ | HC | CO | $NO_x$ |
| Bullitt | 243.8 | 195.9 | 903.2 | 7,486.7 | 1.800.0 |
| Hardin | 430.5 | 347.8 | 1,692.2 | 14,101.2 | 3,150.6 |
| Henry | 80.4 | 66.3 | 299.6 | 2,471.8 | 597.7 |
| Oldham | 96.2 | 80.8 | 332.9 | 2,725.1 | 692.6 |
| Shelby | 176.2 | 147.1 | 616.3 | 5,005.3 | 1,295.1 |
| Spencer | 20.1 | 16.2 | 101.4 | 852.5 | 137.8 |
| Trimble | 22.9 | 17.6 | 86.7 | 710.0 | 196.7 |

D. PROJECTED EMISSION ALLOCATION:

Projected emissions were allocated to each grid square in accordance with the projected VMT distribution.

# CHAPTER XI

# AIRCRAFT

This source category includes exhaust emissions from aircraft engines. Emission factors, based on the landing-takeoff cycle (LTO), are found in AP-42.

## A. 1975 EMISSION INVENTORY

There are two tower-controlled airports in the study area, both in Hardin County: Elizabethtown Airport and Godman Field at Fort Knox. In addition, there are 15 noncontrolled auxiliary air strips at Fort Knox used for military helicopter training exercises. Aircraft emissions related to Fort Knox are accounted for in Chapter XXXI.

Aircraft operating data for Elizabethtown Airport were obtained from the office of the airport manager. Only general aviation and military operations take place at this airport.

Operating data and emissions are summarized in Table XI-1.

## B. 1975 EMISSIONS ALLOCATION

Emissions from this source category were assigned to subcounty areas in accordance with the location of the airports.

## C. PROJECTED EMISSION INVENTORY

Projected emissions from this source category are dependent upon three factors:

- o Increased operational activity.
- o Change in aircraft equipment mix.
- o More stringent control of aircraft emissions.

Of these, only increased activity is expected to affect emissions at Elizabethtown Airport. Military operations are expected to remain constant, but general aviation

operations are projected to increase at the rate of 10.75% per year as estimated in FAA publication, Terminal Area Forecasts 1976-1986, for general aviation in Kentucky. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with the location of the airports.

TABLE XI-1

AIR CRAFT OPERATIONS AND EMISSION SUMMARY

| | Operations Per Year | Engines | LTO's | Particulate | | Sulfur Dioxide | | Carbon Monoxide | | Hydrocarbons | | Nitrogen Oxides | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | EF (lbs/ LTO-eng) | Emissions (lbs/yr) | EF (lbs/ LTO-eng) | Emissions (lbs/yr) | EF (lbs/ LTO-eng) | Emissions (lbs/yr) | EF (lbs/ LTO-eng) | Emissions (lbs/yr) | EF (lbs/ LTO-eng) | Emissions (lbs/yr) |
| Elizabethtown Airport | | | | | | | | | | | | | |
| Military-Helicopter | 3,000 | 1 | 1,500 | 0.25 | 375 | 0.18 | 270 | 5.7 | 8,550 | 0.52 | 780 | 0.57 | 855 |
| General Aviation-Piston | 57,000 | 1 | 28,500 | 0.02 | 570 | 0.014 | 399 | 12.2 | 347,700 | 0.4 | 11,400 | 0.047 | 1,340 |
| TOTAL HARDIN COUNTY (tons/year) | | | | | 0.5 | | 0.3 | | 178.1 | | 6.1 | | 1.1 |

# CHAPTER XII

# RAILROAD LOCOMOTIVES

This source category includes exhaust emissions from diesel locomotive engines, both line-haul engines and switch engines, as well as emissions from auxiliary equipment and probably some space heating. Emission factors, based on the quantity of fuel consumed, are found in AP-42.

## A. 1975 EMISSION INVENTORY

The three Class I railroads which operate in the study area were requested to provide 1975 fuel usage data by county. The Louisville and Nashville provided the following estimates:

| | |
|---|---|
| Bullitt | 876,000 gallons |
| Hardin | 804,000 gallons |
| Henry | 516,000 gallons |
| Jefferson | 2,717,000 gallons |
| Oldham | 360,000 gallons |
| Shelby | 660,000 gallons |
| Spencer | 0 |
| Trimble | 0 |

The sulfur in fuel content was reported to average 0.4%.

Neither the Southern Railway nor the Illinois Central Gulf could provide fuel usage by county, although total fuel dispensed for Southern's account at the Kentucky and Indiana terminal facility was 5,890,614 gallons for 1975. Sulfur in fuel content was 0.14%.

In the 1973 emission inventory it was shown that fuel usage could be estimated by the factor 8.0 gallons/train-mile for road-haul operations and 1.0 gallons/train-mile for switchyard operations. For the 1975 projection year, using a 1973 to 1975 growth factor of 1.07[1], it was estimated that 2,297,000 gallons of fuel would be used by the Louisville and Nashville in Jefferson County. The discrepancy between the estimated value and the reported value may be, in part at least, a result of an inaccurate projection from 1973 to 1975. Nevertheless, it is believed that the 1973

(1) From the LAQMP

estimating technique is appropriate with the factors adjusted to reflect the increased fuel usage reported by the Louisville and Nashville. The adjusted factors are 10 gallons/train-mile for road-haul operations and 1.25 gallons/train-mile for switchyard operations in those counties in which substantial marshalling yards are located.

Railroad operating data for the Southern, Illinois Central Gulf, and AMTRAK, obtained from the railroads and the Official Railway Guide are summarized in Table XII-1. Fuel usage, by county, for all railroads is summarized in Table XII-2. For the Louisville and Nashville the fuel consumed values are those reported by the railroad. For the other railroads the fuel consumed is calculated by the fuel use factor for road-haul operations. There are no large switchyards in the seven-county study area. Emission summaries are shown in Table XII-3.

## B. 1975 EMISSIONS ALLOCATION

Emissions from this source category were allocated to subcounty areas in accordance with train miles travelled.

## C. PROJECTED EMISSION INVENTORY

Figure XII-1 shows the growth in freight train miles for the Southern District of the Association of American Railroads from 1961 to 1975. An average growth rate of $1.9 \times 10^6$ freight train miles/year was sustained from 1961 to 1974, but the recession resulted in a drop in freight train miles for 1975.

Freight train miles are projected to recover from the recession and resume the historical growth rate. The 1980 and 1985 projections, as shown in Figure XII-1, are $94 \times 10^6$ and $103.5 \times 10^6$ freight train miles, respectively. At the same linear rate, the 1995 projection is $122.5 \times 10^6$ freight train miles. As compared to 1975, increases of 30%, 43%, and 69% are expected for the three planning years. Emissions, projected to increase at the same rate, are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with the projected train miles.

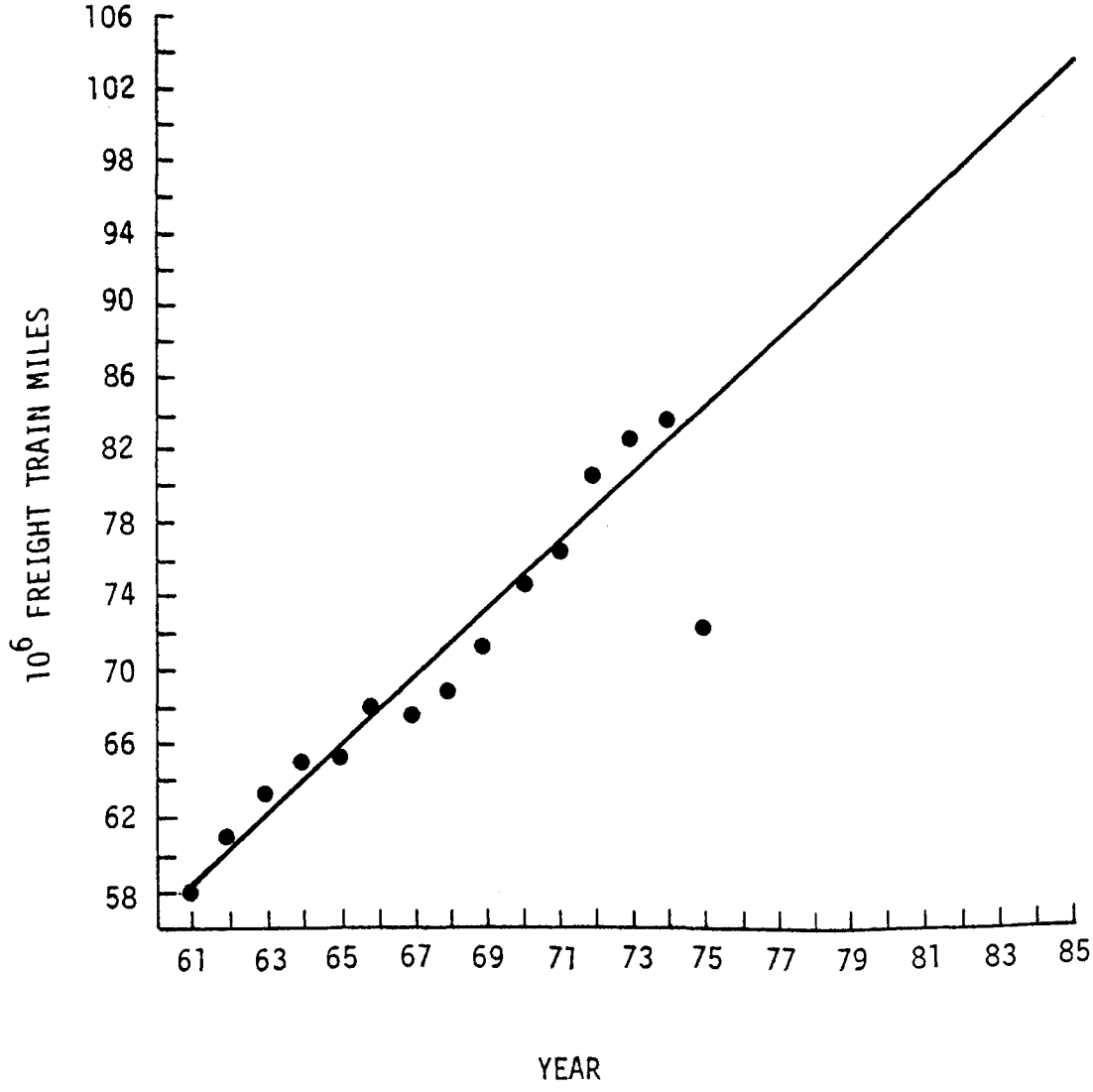


Figure XII-1. Growth in freight train miles.

TABLE XII-1

RAILROAD OPERATING DATA

| COUNTY | TRAIN-MILES PER DAY | | |
|---|---|---|---|
| | SOUTHERN | ICG | AMTRAK |
| Bullitt | 0 | 16.0 | 42.0 |
| Hardin | 0 | 156.2 | 59.2 |
| Henry | 0 | 0 | 0 |
| Oldham | 0 | 0 | 0 |
| Shelby | 141.6 | 0 | 0 |
| Spencer | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 |

TABLE XII-2

1975 FUEL USAGE BY RAILROAD COMPANIES

($10^3$ gal)

| COUNTY | L&N | SOUTHERN | ICG | AMTRAK | TOTAL |
|---|---|---|---|---|---|
| Bullitt | 876 | 0 | 58 | 153 | 1,087 |
| Hardin | 804 | 0 | 570 | 216 | 1,590 |
| Henry | 516 | 0 | 0 | 0 | 516 |
| Oldham | 360 | 0 | 0 | 0 | 360 |
| Shelby | 660 | 517 | 0 | 0 | 1,177 |
| Spencer | 0 | 0 | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 | 0 | 0 |

# TABLE XII-3

## 1975 RAILROAD LOCOMOTIVE EMISSION SUMMARY

| | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| COUNTY | PARTICULATES EF= 25 lbs/$10^3$ gal | SULFUR DIOXIDE (1) EF=57 lbs/$10^3$ gal | CARBON MONOXIDE EF= 130 lbs/$10^3$ gal | HYDROCARBONS EF=94 lbs/$10^3$ gal | NITROGEN OXIDES EF=370 lbs/$10^3$ gal |
| Bullitt | 13.6 | 31.0 | 70.7 | 51.1 | 201.1 |
| Hardin | 19.9 | 45.3 | 103.4 | 74.7 | 294.2 |
| Henry | 6.5 | 14.7 | 33.5 | 24.3 | 95.5 |
| Oldham | 4.5 | 10.3 | 23.4 | 16.9 | 66.6 |
| Shelby | 14.7 | 24.0 | 76.5 | 55.3 | 217.7 |
| Spencer | 0 | 0 | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 | 0 | 0 |

(1) An emission factor of 40.7 lbs/$10^3$ gal was used for Shelby County to account for the low sulfur in fuel used by the Southern Railway.

# CHAPTER XIII

# VESSELS

This source category includes emissions from recreational and commercial cargo vessels including auxiliary equipment and heating. Emission factors are available in AP-42.

## A. 1975 EMISSION INVENTORY

The 1973 emission inventory for Jefferson County determined that 422 x $10^3$ gallons of diesel fuel and 275 x $10^3$ gallons of gasoline fuel were comsumed on the Ohio River. The diesel fuel quantity was based on a 1972 fuel survey of marine operators and a confirming analysis for 1973 of river-borne traffic into and out of Louisville Port.

River-borne traffic for 1975 is available in Waterborne Commerce of the United States, 1975. These data show a 9% decrease in traffic from 1973 to 1975. The 1973 fuel usage by vessels operating on the Ohio River bordering Jefferson County was reduced by 9% to estimate the 1975 fuel usage for both diesel commercial vessels and gasoline recreational boats. Fuel use by diesel and gasoline vessels operating on the Ohio River bordering Bullitt, Oldham, and Trimble Counties was estimated from the 1975 Jefferson County totals in accordance with the ratios of river bank length. In arbitrary units of length:

DIESEL FUEL USE

Bullitt: $\frac{1}{17} \times 384 \times 10^3 = 23 \times 10^3$ gal

Oldham: $\frac{1}{17} \times 384 \times 10^3 = 181 \times 10^3$ gal

Trimble: $\frac{10}{17} \times 384 \times 10^3 = 226 \times 10^3$ gal

GASOLINE FUEL USE

Bullitt: $\frac{1}{17} \times 250 \times 10^3 = 15 \times 10^3$ gal

Oldham: $\frac{8}{17} \times 250 \times 10^3 = 118 \times 10^3$ gal

Trimble: $\frac{10}{17} \times 250 \times 10^3 = 157 \times 10^3$ gal

Emissions from this source category are summarized in Table XIII-1 and XIII-2.

## B. 1975 EMISSIONS ALLOCATION

Emissions from this source category were allocated to subcounty areas in accordance with the length of river bank bordering each area.

## C. PROJECTED EMISSION INVENTORY

Historical growth factors for tons transported on the Ohio River at Louisville are as follows:

| | | | |
|---|---|---|---|
| 1965-66 | 1.062 | 1970-71 | 1.071 |
| 1966-67 | 0.960 | 1971-72 | 0.979 |
| 1967-68 | 1.058 | 1972-73 | 0.964 |
| 1968-69 | 1.107 | 1973-74 | 0.893 |
| 1969-70 | 0.946 | 1974-75 | 1.015 |

Over the 10-year period an annual growth rate of only 0.25%/year has occurred. Although larger growth may result from proposed new shipping terminals and industrial parks, emissions from diesel vessels are projected to increase at the historical rate. Emissions from gasoline recreational vessels are projected to increase in accordance with population growth for the entire study area including Jefferson, Floyd and Clark Counties. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with the length of river bank bordering each area.

*TABLE XIII-1*

1975 DIESEL VESSEL EMISSION SUMMARY

| | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| COUNTY | EF= 105 lbs/$10^3$ gal | EF= 27 lbs/$10^3$ gal | EF=100 lbs/$10^3$ gal | EF= 50 lbs/$10^3$ gal | EF=280 lbs/$10^3$ gal |
| Bullitt | 1.2 | 0.3 | 1.2 | 0.6 | 3.2 |
| Oldham | 9.5 | 2.4 | 9.1 | 4.5 | 25.3 |
| Trimble | 11.9 | 3.1 | 11.3 | 5.7 | 31.6 |



TABLE XIII-2

1975 GASOLINE VESSEL EMISSION SUMMARY

| | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| COUNTY | EF= Negligible | EF= 6.4 lbs/$10^3$ gal | EF=3300 lbs/$10^3$ gal | EF= 1100 lbs/$10^3$ gal | EF=6.6 lbs/$10^3$ gal |
| Bullitt | Negligible | Negligible | 24.8 | 8.3 | Negligible |
| Oldham | Negligible | 0.4 | 194.7 | 64.9 | 0.4 |
| Trimble | Negligible | 0.5 | 242.6 | 80.9 | 0.5 |

# CHAPTER XIV

# SMALL GASOLINE ENGINES

This source category includes exhaust emissions from small two-stroke and four-stroke, air-cooled, gasoline-powered motors. Examples of the uses of these engines are: lawnmowers, small electric generators, pumps, and garden tractors. Emission factors are found in AP-42.

## A. 1975 EMISSION INVENTORY

Volume 7 of the Guidelines states that fuel usage may be estimated by the factor, 13 gallons/person-year. On many occasions, this usage rate has been questioned. AP-42 provides emission factors by both g/gal of fuel and g/unit-year. These two factors permit calculating gal/unit-year. The results are shown below.

- o 2-stroke, lawn and garden - 20.6 gal/unit-year
- o 4-stroke, lawn and garden - 10.8 gal/unit-year
- o 4-stroke, miscellaneous - 12.3 gal/unit-year

Furthermore, AP-42 states that there are more than 44 million engines of this category in service or approximately one engine for each five persons.

The inconsistencies discussed above have been resolved by calculating emission as follows:

$$\text{Emissions (g/year)} = \text{EF(g/unit)} \times 0.2 \times \text{population}$$

The resulting emissions are shown in Table XIV-1.

## B. 1975 EMISSION ALLOCATION

Emissions from this category were allocated in accordance with population distribution.

## C. PROJECTED EMISSION INVENTORY

Emissions from this source category are projected to increase in accordance with population growth. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in accordance with the projected population distribution.

TABLE XIV-1

1975 SMALL GASOLINE ENGINES EMISSION SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| | EF = 0.17 lbs/unit-yr | EF = 0.06 lbs/unit-yr | EF = 45.42 lbs/unit-yr | EF = 6.40 lbs/unit-yr | EF = 0.62 lbs/unit-yr |
| Bullitt | 0.6 | 0.2 | 152.8 | 21.5 | 2.1 |
| Hardin | 0.8 | 0.3 | 210.5 | 29.7 | 2.9 |
| Henry | 0.2 | 0.1 | 52.4 | 7.4 | 0.7 |
| Oldham | 0.3 | 0.1 | 84.7 | 11.9 | 1.2 |
| Shelby | 0.3 | 0.1 | 91.4 | 12.9 | 1.2 |
| Spencer | 0.1 | Negligible | 24.4 | 3.4 | 0.3 |
| Trimble | 0.1 | Negligible | 25.8 | 3.6 | 0.4 |

# CHAPTER XV

# AGRICULTURAL EQUIPMENT

This source category includes exhaust emissions from diesel and gasoline farm tractors and other mobile agricultural equipment. Emission factors, based on the quantity of fuel consumed, are found in AP-42.

## A. 1975 EMISSION INVENTORY

The cost of pretroleum products for farming operations, the number of tractors, and the acres of harvested cropland were obtained from the 1974 Census of Agriculture for 1974 and 1969. With certain assumptions these data permit calculating the quantity of fuel consumed by county for 1975. These assumptions are as follows:

- The average price of diesel fuel in 1975 was $0.375/gallon[1].
- The average proce of gasoline in 1975 was $0.445/gallon[1].
- Harvested cropland changed at the same arithmetic rate from 1974 to 1975 as from 1969 to 1974.
- Fuel costs were stable from 1974 to 1975.

Table XV-1 summarizes the census data and the fuel use estimates by county and for the state. The diesel fueled tractor percentages were estimated by the respective U. S. Department of Agriculture county extension agents.

The 1974 fuel costs were factored by the change in harvested cropland from 1974 to 1975 to determine 1975 fuel costs. Diesel and gasoline fuel usage was then determined from the diesel/gasoline split and the costs of the fuels. This method assumes that the cost of fuel per acre harvested was constant from 1974 to 1975.

Tables XV-2 and XV-3 summarize the agricultural equipment exhaust emissions for gasoline and diesel fuels. In calculating the nonoperating evaporative losses (34.4 lbs/unit) the 1974 number of tractors was used.

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(1) Cost per gallon estimates provided by the Kentucky Independent Gasoline Marketers Association does not include road taxes.

TABLE XV-1

ESTIMATED FARM TRACTOR FUEL CONSUMPTION

| 1969 | STATE | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|---|
| Petroleum Products ($1,000) | 34,015 | 192 | 533 | 412 | 260 | 664 | 284 | 159 |
| Farm Tractors | 137,105 | 1,016 | 2,339 | 1,832 | 948 | 2,783 | 1,140 | 824 |
| Harvested Cropland (acres) | 3,128,222 | 18,122 | 54,625 | 28,228 | 24,261 | 56,933 | 21,179 | 12,576 |
| 1974 | | | | | | | | |
| Petroleum Products ($1,000) | 48,956 | 254 | 769 | 516 | 552 | 913 | 421 | 220 |
| Farm Tractors | 129,668 | 872 | 2,364 | 1,529 | 770 | 2,421 | 1,061 | 774 |
| Harvested Cropland (acres) | 3,612,537 | 15,905 | 61,661 | 29,592 | 26,383 | 58,607 | 25,035 | 14,257 |
| 1974/1969 Ratios | | | | | | | | |
| Petroleum Products | 1.44 | 1.32 | 1.44 | 1.25 | 2.12 | 1.38 | 1.48 | 1.38 |
| Farm Tractors | .95 | .86 | 1.01 | .83 | .81 | .87 | .93 | .94 |
| Harvested Cropland (acres) | 1.15 | .88 | 1.13 | 1.05 | 1.09 | 1.03 | 1.18 | 1.13 |
| 1975 | | | | | | | | |
| Harvested Cropland (acres) | 3,709,400 | 15,462 | 63,068 | 29,865 | 26,807 | 58,942 | 25,806 | 14,593 |
| % Farmed by Diesel Tractors | 40 | 40 | 75 | 75 | 60 | 40 | 50 | 10 |
| Petroleum Products ($1,000) | 50,269 | 247 | 787 | 521 | 561 | 918 | 434 | 225 |
| 1975 Fuel Use (1,000 gal) | | | | | | | | |
| Diesel @ $0.375/gal | 48,220 | 237 | 1,504 | 996 | 835 | 881 | 529 | 51 |
| Gasoline @ $0.445/gal | 72,329 | 355 | 501 | 332 | 557 | 1,321 | 529 | 462 |

TABLE XV-2

1975 GASOLINE TRACTOR EMISSION SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| | EF=8 lbs/$10^3$ gal | EF=5.31 lbs/$10^3$ gal | EF=3,260 lbs/$10^3$ gal | EF=150.1 lbs/$10^3$ gal + 34.4 lbs/tractor | EF=151 lbs/$10^3$ gal |
| Bullitt | 1.4 | 0.9 | 578.7 | 41.6 | 26.8 |
| Hardin | 2.0 | 1.3 | 816.6 | 78.3 | 37.8 |
| Henry | 1.3 | 0.9 | 541.2 | 51.2 | 25.1 |
| Oldham | 2.2 | 1.5 | 907.9 | 55.0 | 42.1 |
| Shelby | 5.3 | 3.5 | 2,153.2 | 140.8 | 99.7 |
| Spencer | 2.1 | 1.4 | 862.3 | 58.0 | 39.9 |
| Trimble | 1.8 | 1.2 | 753.1 | 48.0 | 34.9 |

TABLE XV-3

1975 DIESEL TRACTOR EMISSION SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| | EF=45.7 lbs/$10^3$ gal | EF=31.2 lbs/$10^3$ gal | EF=119 lbs/$10^3$ gal | EF=60.7 lbs/$10^3$ gal | EF=335 lbs/$10^3$ gal |
| Bullitt | 5.4 | 3.7 | 14.1 | 7.2 | 39.7 |
| Hardin | 34.3 | 23.5 | 89.5 | 45.6 | 251.9 |
| Henry | 22.8 | 15.5 | 59.3 | 30.2 | 166.8 |
| Oldham | 19.1 | 13.0 | 49.7 | 25.3 | 139.9 |
| Shelby | 20.1 | 13.7 | 52.4 | 26.7 | 147.6 |
| Spencer | 12.1 | 8.3 | 31.5 | 16.1 | 88.6 |
| Trimble | 1.2 | 0.8 | 3.0 | 1.5 | 8.5 |

B. 1975 EMISSIONS ALLOCATION

Agricultural equipment emissions were allocated in accordance with non-forest/nonurban acres.

C. PROJECTED EMISSION INVENTORY

Projected emissions from this source category are projected to change with the change in acreage of harvested cropland, found in Table XV-1 for 1969, 1974, and 1975, and repeated in Table XV-4 along with estimates of projected acreage for 1980 through 1995.

TABLE XV-4

PAST AND PROJECTED HARVESTED CROPLAND
(acres)

| COUNTY | 1969 | 1974 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|---|
| Bullitt | 18,122 | 15,905 | 15,462 | 14,337 | 13,293 | 11,429 |
| Hardin | 54,625 | 61,661 | 63,068 | 58,478 | 54,221 | 46,616 |
| Henry | 28,228 | 29,592 | 29,865 | 32,105 | 32,105 | 32,105 |
| Oldham | 24,261 | 26,383 | 26,807 | 24,856 | 23,047 | 19,815 |
| Shelby | 56,933 | 58,607 | 58,942 | 63,363 | 63,363 | 63,363 |
| Spencer | 21,179 | 25,035 | 25,806 | 27,741 | 27,741 | 27,741 |
| Trimble | 12,576 | 14,257 | 14,593 | 15,687 | 15,687 | 15,687 |

The Census of Agriculture reported a decrease in acreage in all counties between 1964 and 1969. Between 1969 and 1974, with the exception of Bullitt County, the trend was for increasing acreage. Because of the substantial increase in popula- tion predicted for Bullitt, Hardin and Oldham Counties, a decrease in farmland would be expected. On the other hand, cropland in the other four counties might be expected to continue to increase to 1980 and then remain constant.

Emissions are projected to decrease in Bullitt, Hardin, and Oldham Counties at a geometric rate of 1.5%/year through 1995. Emissions from the other counties are projected to increase at an arithmetic rate of 1.5% to 1980 and then to remain constant. Emissions are summarized in Chapter XXXII.

D. PROJECTED EMISSION ALLOCATION

Projected agricultural equipment emissions were allocated to subcounty areas in accordance with the projected nonforest/nonurban acres.

# CHAPTER XVI

# CONSTRUCTION EQUIPMENT

This source category includes emissions associated with fuel combustion by off-road construction equipment. Emission factors are found in AP-42. Three types of construction operations are considered.

## A. 1975 EMISSION INVENTORY

Road Construction Equipment. The number of miles of new road construction in 1975 for each county was provided by county works department officials. For Hardin County, the number of miles of heavy roadway maintenance was also available. Length of roadway maintenance in the other counties was estimated by the ratios of maintenance costs in each county to the Hardin County cost.

Hardin County officials were also able to provide the following data:

- Average diesel fuel usage for new construction - 2,125 gal/mile.
- Total gasoline fuel usage for construction and maintenance - 805,000 gallons.

If it is assumed that the fuel usage per mile of new construction and maintenance is constant throughout the area and that all gasoline is used in heavy maintenance activities, fuel consumption by road construction equipment and emissions can be calculated for each county. Table XVI-1 summarizes road construction data and fuel usage.

Residential Construction Equipment. Residential construction includes both land clearing and new road construction within housing developments. The number of housing starts by county was provided by the planning agencies. Typical residential lot sizes for the area, determined from historical data and maps, indicate that one-half acre of land with 0.03 miles of new road is required for each residence. Based on an average diesel equipment fuel usage of 5.5 gal/hour (from AP-42) and 20 hours of equipment time per lot, land preparation fuel requirements are 110 gallons per residence. Road construction fuel

requirements are 2,125 gal/mile. Table XVII-2 summarizes residential construction data and fuel usage.

Miscellaneous Construction and Landfill Equipment. Miscellaneous construction includes nonresidential building construction: commercial/institutional and industrial buildings and landfill operations. County officials stated that there was very little nonresidential building construction in 1975, varying from one acre of development in Spencer and Trimble Counties to seven acres in Henry County. Fuel usage at the same rate as for residential construction would be 220 gallons per acre developed.

Fuel usage for sanitary landfill operations was obtained from county authorities. Table XVII-3 summarizes miscellaneous construction data and fuel usage.

TABLE XVI-1

ROAD CONSTRUCTION EQUIPMENT OPERATING DATA

| COUNTY | ROAD MILES | | FUEL USAGE ($10^3$ gal) | |
|---|---|---|---|---|
| | CONSTRUCTION(1) | MAINTENANCE | DIESEL | GASOLINE |
| Bullitt | 10 | 27 | 21 | 31 |
| Hardin | 19 | 70 | 40 | 81 |
| Henry | 7 | 36 | 15 | 42 |
| Oldham | 12 | 27 | 26 | 31 |
| Shelby | 10 | 44 | 21 | 51 |
| Spencer | 3 | 20 | 6 | 23 |
| Trimble | 3 | 16 | 6 | 19 |

(1) Includes hard surfacing of gravel roads.

TABLE XVI-2

RESIDENTIAL CONSTRUCTION EQUIPMENT OPERATING DATA

| COUNTY | RESIDENTIAL CONSTRUCTION | | FUEL USAGE ($10^3$ gal diesel) |
|---|---|---|---|
| | NUMBER OF UNITS | ROAD MILES | |
| Bullitt | 381 | 11.4 | 66 |
| Hardin | 525 | 15.8 | 91 |
| Henry | 72 | 2.2 | 13 |
| Oldham | 502 | 15.1 | 87 |
| Shelby | 226 | 6.8 | 39 |
| Spencer | 49 | 1.5 | 9 |
| Trimble | 25 | 0.8 | 4 |

TABLE XVI-3

MISCELLANEOUS CONSTRUCTION EQUIPMENT OPERATING DATA

| COUNTY | CONSTRUCTION | | LANDFILL | TOTAL |
|---|---|---|---|---|
| | NUMBER OF ACRES | DIESEL FUEL USAGE (gal) | DIESEL FUEL USAGE (gal) | DIESEL FUEL USAGE ($10^3$ gal) |
| Bullitt | 1 | 220 | 19,485 | 20 |
| Hardin | 2 | 440 | 4,500 | 5 |
| Henry | 7 | 1,540 | 6,700 | 8 |
| Oldham | 2 | 440 | 10,800 | 11 |
| Shelby | 2 | 440 | 11,700 | 12 |
| Spencer | 2 | 440 | 3,100 | 4 |
| Trimble | 1 | 220 | 0 | 0 |

Table XV-4 shows the emission factors used in computations and Table XV-5 summarizes the emissions computed with these emission factors.

TABLE XVI-4

EMISSION FACTORS FOR CONSTRUCTION EQUIPMENT

| POLLUTANTS | EMISSION FACTORS[1] (lbs/$10^3$ gal) | |
|---|---|---|
| | DIESEL EQUIPMENT | GASOLINE EQUIPMENT |
| Particulates | 24.4 | 7.0 |
| Sulfur Dioxide | 31.2 | 5.3 |
| Carbon Monoxide | 91.1 | 3,728.2 |
| Hydrocarbons | 29.2 | 179.7 |
| Nitrogen Oxides | 419.2 | 112.5 |

(1) Weighted average emission factors estimated from AP-42.

TABLE XVI-5

1975 CONSTRUCTION EQUIPMENT EMISSIONS SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| Bullitt | 1.4 | 1.8 | 62.7 | 4.4 | 24.1 |
| Hardin | 2.0 | 2.3 | 157.2 | 9.3 | 33.1 |
| Henry | 0.5 | 0.7 | 80.0 | 4.3 | 10.0 |
| Oldham | 1.6 | 2.0 | 63.5 | 4.6 | 27.7 |
| Shelby | 1.1 | 1.2 | 98.4 | 5.7 | 18.0 |
| Spencer | 0.3 | 0.4 | 43.7 | 2.4 | 5.2 |
| Trimble | 0.2 | 0.3 | 35.9 | 1.8 | 3.2 |

## B. 1975 EMISSION ALLOCATION

Emissions from construction equipment were allocated by construction site locations. Where construction site locations were not available, allocations were done by population distribution.

## C. PROJECTED EMISSION INVENTORY

Emissions from this source category were projected to increase in accordance with construction employment projections as provided by KIPDA. Projected emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in accordance with the projected population change.

# CHAPTER XVII

## SMALL POINT SOURCES

This source category includes those small point sources included in the NEDS point source file which cannot be economically included as separate point sources for modeling pruposes. It was determined by the Department for Natural Resources and Environmental Protection that, for the time being and until the modeling requirements are formulated, no point sources would be included in the area source inventory.

# CHAPTER XVIII

# STRUCTURAL FIRES

This source category includes emissions from wild structural fires. It does not include emissions from structures burned in fire training, which are included under the open burning source category. There are no emission factors recorded in AP-42 which specifically apply to structural fires. Factors applicable to open burning of wood refuse have been used.

## A. 1975 EMISSION INVENTORY

The Office of the State Fire Marshall provided information on the number of fires and amount of dollar loss from fires for each county. The average cost of a 1,500 square foot single family dwelling, including furnishings, is $35,000, as estimated by the appraiser for First Federal Savings and Loan in Louisville.[1] Such a dwelling would include:

10,840 board feet of lumber = 791 $ft^3$
5,380 $ft^2$ of 3/8" plywood = 168 $ft^3$
Total = 959 $ft^3$

At a mean density of 35 $lbs/ft^3$, this is equivalent to 16.8 tons per house plus four tons of furnishings, or 20.8 tons of wood per house. Calculations are summarized in Table VXIII-1 and emissions in Table XVIII-2.

TABLE XVIII-1

1975 STRUCTURAL FIRE DATA

| COUNTY | STRUCTURAL FIRES | DOLLAR LOSS ($10^3$ $) | EQUIVALENT NO. OF HOUSES | EQUIVALENT NO. OF TONS OF WOOD BURNED |
|---|---|---|---|---|
| Bullitt | 38 | 1,179.1 | 33.7 | 701.0 |
| Hardin | 51 | 148.5 | 4.2 | 87.4 |
| Henry | 25 | 109.5 | 3.1 | 64.5 |
| Oldham | 18 | 45.7 | 1.3 | 27.0 |
| Shelby | 52 | 317.5 | 9.1 | 189.3 |
| Spencer | 11 | 20.7 | 0.6 | 12.5 |
| Trimble | 5 | 2.5 | 0.1 | 2.1 |

(1) This estimate was made for 1973. In calculating the data given in Table XVIII-1, the value was inflated by 10%.

TABLE XVIII-2

1975 STRUCTURAL FIRE EMISSION SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDROCARBONS | NITROGEN OXIDES |
| | EF = 17 lbs/ton of wood | EF = Negligible | EF = 50 lbs/ton of wood | EF = 4 lbs/ton of wood | EF = 2 lbs/ton of wood |
| Bullitt | 6.0 | Negligible | 17.5 | 1.4 | 0.7 |
| Hardin | 0.7 | Negligible | 2.2 | 0.2 | 0.1 |
| Henry | 0.5 | Negligible | 1.6 | 0.1 | 0.1 |
| Oldham | 0.2 | Negligible | 0.7 | 0.1 | Negligible |
| Shelby | 1.6 | Negligible | 4.7 | 0.4 | 0.2 |
| Spencer | 0.1 | Negligible | 0.3 | Negligible | Negligible |
| Trimble | Negligible | Negligible | 0.1 | Negligible | Negligible |

## B. 1975 EMISSIONS ALLOCATION

Emissions from this source category were allocated to subcounty areas in accordance with the distribution of population.

## C. PROJECTED EMISSION INVENTORY

Base-line year structural fires and emissions were nonuniformly distributed among the seven counties; Bullitt County, for instance, having more than would be expected. There is no reason to assume that the same nonuniformity would continue in the future. Therefore, total seven-county emissions are projected to increase in accordance with the total population growth. Total emissions are then apportioned among the counties in proportion to population. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with the projected population distribution.

# CHAPTER XIX

## WILD FOREST FIRES

This source category includes emissions from forest wildfires. Emission factors based on both the number of acres burned and a regional factor to account for the type of vegetation in the area are found in AP-42.

### A. 1975 Emission Inventory

The State Forest Service provided information on the number of fires and forest acres burned[1] per county. In addition, data regarding fires in other open areas were also made available. These other fires would include grass fires in locations such as parks or open fields. There are no emission factors listed for these fires. The regional factor for Kentucky is nine tons of material per acre of forest burned. For grass fires, the factor was assumed to be 0.9 tons/acre. Forest fire data is summarized in Table XIX-1.

TABLE XIX-1

1975 FOREST FIRE DATA

| COUNTY | FOREST FIRES | | | OTHER FIRES | | |
|---|---|---|---|---|---|---|
| | NO. | ACRES | TONS | NO. | ACRES | TONS |
| Bullitt | 13 | 90 | 810 | 0 | 0 | 0 |
| Hardin | 18 | 94 | 846 | 7 | 27 | 24 |
| Henry | 0 | 0 | 0 | 0 | 0 | 0 |
| Oldham | 2 | 5 | 45 | 0 | 0 | 0 |
| Shelby | 1 | 4 | 36 | 1 | 2 | 2 |
| Spencer | 0 | 0 | 0 | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 | 0 | 0 | 0 |

Emissions from forest fires are given in Table XIX-2.

### B. 1975 Emissions Allocation

Emissions from this source category were assigned to subcounty areas in accordance with the location of major forest areas or, in the case of Bullitt and Hardin Counties, the location of the fires.

(1) Bullitt and Hardin County firefighters described most of the fires as underbrush fires.

## C. PROJECTED EMISSION INVENTORY

The State Forest Service reported that 1975 was not an unusual year with regard to the number of fires and acres burned. Because of the nature of the reported wildfires, the occurrence of a fire in one location is as likely as in another location. Consequently, emissions are projected to remain constant over time, but total emissions are redistributed among counties in accordance with land area. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with the location of major forest areas.

TABLE XIX-2

WILD FOREST FIRE EMISSIONS SUMMARY

| COUNTY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDRO-CARBONS | NITROGEN OXIDES |
| | EF = 17.2 lbs/ton | EF = 0 | EF=141 lbs/ton | EF=24.2 lbs/ton | EF = 4 lbs/ton |
| Bullitt | 7.0 | 0 | 57.1 | 9.8 | 1.6 |
| Hardin | 7.5 | 0 | 61.3 | 10.5 | 1.7 |
| Henry | 0 | 0 | 0 | 0 | 0 |
| Oldham | 0.4 | 0 | 3.2 | 0.5 | 0.1 |
| Shelby | 0.3 | 0 | 2.7 | 0.5 | 0.1 |
| Spencer | 0 | 0 | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 | 0 | 0 |

# CHAPTER XX

# UNPAVED ROADS

This source category, applicable to particulate matter only, includes emissions from reentrained dust resulting from vehicles traveling on unpaved road surfaces. It does not include particulate matter due to exhaust emissions. AP-42 provides a method for estimating emission factors.

## A. 1975 EMISSION INVENTORY

Unpaved road miles were measured from county maps provided by the Highway Department. ADT counts for these roads were not available; however, the county agents estimated that the traffic on the great majority of these roads would be minimal and would be proportional to the population in the immediate vicinity. Accordingly, ADT values ranging from <10 to 200 were assigned to all unpaved roads, based on the population density distribution.

The following empirical equation is given in AP-42, for estimating emission factors (lbs/vehicle-mile) for unpaved road emissions of particles $\leq$ 30 μm:

$$EF = 0.49\ s\ (\frac{S}{30})\ (\frac{365-W}{365})$$

where s is the silt content of road surface material (%), S is the vehicle average speed (mph) and W is the number of days with precipitation $\geq$ 0.01 inches.

Using the following parameters:

s = 15%, crushed rock

S = 30 mph

W = 120

$$EF = 0.49 \times 15\ (\frac{30}{30})\ (\frac{365-120}{365}) = 4.93 \text{ lbs/vehicle-mile}$$

Unpaved roads data and particulate emissions from this source category are shown on Tables XX-1 and XX-2.

## B. 1975 EMISSIONS ALLOCATION

Emissions from this source category were allocated in accordance with the unpaved road vehicle-miles traveled in each subcounty area.

## C. PROJECTED EMISSION INVENTORY

There is no rationale available for projecting emissions from unpaved roads. Traffic on many existing roads will tend to increase and new unpaved roads will be constructed. However, paving programs will tend to reduce the number of miles of unpaved roads and such programs give priority to the more heavily traveled segments. If it is assumed that these two opposite effects are equal, emissions will remain constant with time. Emissions, summarized in Chapter XXXII, are projected to remain constant.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions allocation of this source category were unchanged from the baseline year.

TABLE XX-1

UNPAVED ROADS DATA

| UNPAVED ROAD MILES | | | | | |
|---|---|---|---|---|---|
| COUNTY | ADT = 11.7[1] | ADT = 100 | ADT = 150 | ADT = 200 | VMT/DAY |
| Bullitt | 131.43 | 3.46 | 2.55 | 14.32 | 5130.2 |
| Hardin | 372.39 | 1.92 | 2.22 | 2.07 | 5296.0 |
| Henry | 128.04 | 0 | 0 | 0 | 1498.1 |
| Oldham | 100.67 | 8.07 | 0 | 0 | 1984.8 |
| Shelby | 38.75 | 0 | 0 | 0 | 453.4 |
| Spencer | 80.35 | 0 | 0 | 0 | 940.1 |
| Trimble | 93.07 | 0 | 0 | 0 | 1088.9 |

(1) A mean value for the range 0 - 100 ADT is 11.7 calculated using:

$$\text{ADT} = \#\ \text{Buildings} \times \left(\frac{3.3}{2}\right)$$

where 3.3 is the number of trips per vehicle per day from AP-42. The value is divided by two since, for the dead-end roads considered here, the average trip covers half the length of the road.

TABLE XX-2

1975 UNPAVED ROADS EMISSION SUMMARY

| COUNTY | PARTICULATE EMISSIONS (tons/year) EF = 4.93 lbs/vehicle-mile |
|---|---|
| Bullitt | 4,615.8 |
| Hardin | 4,764.9 |
| Henry | 1,347.8 |
| Oldham | 1,785.8 |
| Shelby | 407.9 |
| Spencer | 845.8 |
| Trimble | 979.7 |

# CHAPTER XXI

## UNPAVED AIRSTRIPS

This source category, applicable to particulate matter only, considers emissions from reentrained dust resulting from aircraft operation on unpaved airstrips. No emission factors are recorded in AP-42. With the exception of unpaved airstrips located within the Fort Knox reservation, there are no unpaved airstrips within the study areas. Emissions from Fort Knox are treated in a following chapter.

# CHAPTER XXII

# TILLING ACTIVITY

This source category, applicable to particulates only, includes emissions from reentrained dust resulting from agricultural tilling, plowing and cultivating of the land. AP-42 provides a method for estimating emission factors.

## A. 1975 EMISSION INVENTORY

Information relative to acreage farmed by crop, and number of cultivations per year, was provided by the county agents. In most of the counties, the no-tilling method is used on a portion of the corn and soybeans farmed.

AP-42 suggests the following empirical expression for calculating emission factors (lbs/acre) for tilling operations for particles $\leq$ 30 μm

$$E = \frac{0.80 \times 1.4\ s}{(PE/50)^2}$$

where s is the silt content of the surface soil, and PE is the Thornwaite precipitation-evaporation index. Parametric values used in the equation are:

$$s = 48\% \text{ (silty loam soil)}$$
$$PE = 111$$
$$EF = 0.80 \times \frac{1.4 \times 48}{(111/50)^2} = 10.91 \text{ lbs/acre}$$

Tilling activity data and emissions from this source category are summarized in Tables XXII-1 and XXII-2, respectively.

## B. 1975 EMISSIONS ALLOCATION

Tilling activity emissions were allocated in accordance with non-urban/nonforest area.

TABLE XXII-1

1975 ACREAGE TILLED AND NUMBER OF TILLINGS PER YEAR

| COUNTY | TOBACCO | | CORN | | SOYBEANS | | SMALL GRAINS | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | ACRES FARMED | AVERAGE NO. OF TILLINGS(1) | ACRES FARMED | AVERAGE NO. OF TILLINGS(1) | ACRES FARMED | AVERAGE NO. OF TILLINGS(1) | ACRES FARMED | AVERAGE NO. OF TILLINGS(1) | ACRES TILLED |
| Bullitt | 580 | 2 | 3,800 | 1 | 2,700 | 2 | 1,300 | 2 | 12,960 |
| Hardin | 1,850 | 2.5 | 30,800 | 1 | 7,000 | 2 | 6,900 | 0 | 49,425 |
| Henry | 2,470 | 3 | 10,600 | 1 | 700 | 0.5 | 4,000 | 0 | 18,360 |
| Oldham | 660 | 2 | 8,200 | 0.9 | 2,200 | 0.9 | 2,700 | 0 | 10,680 |
| Shelby | 4,560 | 4 | 23,400 | 2 | 2,200 | 0.8 | 8,600 | 1 | 75,400 |
| Spencer | 1,890 | 3 | 10,900 | 2.1 | 900 | 2.1 | 2,000 | 0 | 30,450 |
| Trimble | 1,520 | 3 | 3,400 | 2 | 3,000 | 1 | 2,400 | 0 | 14,360 |

(1) Adjusted to account for not-tilled acreage.

TABLE XXII-2

1975 TILLING ACTIVITY EMISSION INVENTORY

| COUNTY | PARTICULATE EMISSIONS (tons/year) EF = 10.91 lbs/acre |
|---|---|
| Bullitt | 70.7 |
| Hardin | 269.6 |
| Henry | 100.2 |
| Oldham | 58.3 |
| Shelby | 411.3 |
| Spencer | 166.1 |
| Trimble | 78.3 |

## C. PROJECTED EMISSION INVENTORY

Emissions from this source category are projected to change in accordance with the change in harvested cropland given in Table XV-4. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in accordance with the projected nonforest/nonurban areas.

# CHAPTER XXIII

# CONSTRUCTION ACTIVITY

This source category, applicable to particulate matter only, includes dust reentrained from construction sites by the activities of mobile equipment and by wind erosion. Not included are exhaust emissions from construction equipment. AP-42 suggests an emission factor of 1.2 tons/acre-month of construction operations.

## A. 1975 EMISSION INVENTORY

The emission factor above was developed from experimental data gathered at Las Vegas, Nevada. It is said to apply to operations with

- o Medium activity level.
- o Moderate silt content (≈30%).
- o Semiarid climate (PE ≈ 50).

The emission factor may be modified to more adequately represent the climatic and soil conditions in the study area. On an annual basis

$$C = K \frac{W^3}{PE^2}$$

where C is the climatic factor, W is the windspeed, and PE is the Thornthwaite precipitation-evaporation index.[1] The Louisville emission factor ($EF_{LO}$) may be estimated from the Las Vegas emission factor ($EF_{LV}$) by

$$EF_{LO} = EF_{LV} \left(\frac{W_{LO}}{W_{LV}}\right)^3 \left(\frac{PE_{LV}}{PE_{LO}}\right)^2 \left(\frac{S_{LO}}{S_{LV}}\right)$$

S is silt content, 48 for the Louisville area and 30 for Las Vegas.

$$EF_{LO} = 1.2 \left(\frac{8.9}{9.7}\right)^3 \times \left(\frac{50}{111}\right)^2 \times \frac{48}{30} = 0.30 \text{ tons/acre-month.}$$

With the assumption of 50% effectiveness of control by watering during dry weather and with an exposure period of three months,

$$EF = 0.30 \times 3 \times 0.5 \times 2{,}000 = 900 \text{ lbs/acre-year.}$$

---

(1) Source: Development of Emission Factors for Fugitive Dust Sources, EPA 450/3-74-037.

Tables XXIII-1 and XXIII-2 show the method for calculating emissions. Table XXIII-1 provides an estimate of contract value for three construction categories; residential, nonresidential building, and nonbuilding for each county. In Table XXIII-2, contract value for the three source categories are converted to acres of construction.

An alternative method of estimating acres of construction activity is available from the data in Table XVI-1 with the following assumptions:

- Residential construction - at 0.25 acres/unit of disturbed land, half the lot size.
- Road construction - 25% of road construction is for new roads disturbing 1.5 acres/mile.

These two assumptions plus other construction and sanitary landfill acreage lead to an estimate of construction acreage also shown in Table XXIII-2. This alternative method results in a total of 491 acres for the seven-county area as compared to 402 acres for the construction employment method. Since many of the construction employees commute from Louisville, it would be expected that the employment method would result in low estimates. Therefore, emissions in Table XXIII-2 were calculated from the alternative estimates of construction activity acreage.

## B. 1975 EMISSION ALLOCATION

Emissions from construction activity were allocated by construction site locations. Where construction site locations were not available, allocations were done by population distributions.

## C. PROJECTED EMISSION INVENTORY

Emissions from this source category were projected to increase in accordance with construction employment projections. Projected emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in accordance with the projected population change.

TABLE XXIII-1

CONSTRUCTION ACTIVITY CALCULATIONS

| COUNTY | CONTRACT CONSTRUCTION EMPLOYMENT[1] | CONTRACT VALUE ($10^6$ $)[2] | | | |
|---|---|---|---|---|---|
| | | RESIDENTIAL | NON-RESIDENTIAL | NON-BUILDING | TOTAL |
| Bullitt | 86 | 0.96 | 0.76 | 0.96 | 2.7 |
| Hardin | 339 | 3.80 | 3.01 | 3.81 | 10.6 |
| Henry | 62 | 0.70 | 0.55 | 0.70 | 2.0 |
| Oldham | 294 | 3.29 | 2.61 | 3.31 | 9.2 |
| Shelby | 190 | 2.13 | 1.69 | 2.14 | 6.0 |
| Spencer | 21 | 0.24 | 0.19 | 0.24 | 0.8 |
| Trimble | 26 | 0.28 | 0.23 | 0.29 | 0.8 |
| STATE[3] TOTAL | 49,510 | 521 | 413 | 523 | 1,457 |

(1) Source: County Business Patterns, 1974 (latest issue available).

(2) Apportioned from State totals in accordance with contract construction employment.

(3) Source: Statistical Abstracts, 1976.

TABLE XXIII-2

1975 CONSTRUCTION ACTIVITY EMISSION SUMMARY

| Acres of Construction | Factor[1] (Acre/$10^6$\$) | Bullitt | Hardin | Henry | Oldham | Shelby | Spencer | Trimble |
|---|---|---|---|---|---|---|---|---|
| Residential | 8.0 | 7.7 | 30.4 | 5.6 | 26.3 | 17.0 | 1.9 | 2.2 |
| Nonresidential | 2.7 | 2.1 | 8.1 | 1.5 | 7.0 | 4.6 | 0.5 | 0.6 |
| Nonbuilding | 25.0 | 24.0 | 95.3 | 17.5 | 82.8 | 53.5 | 6.0 | 7.3 |
| TOTAL (acres) | | 33.8 | 133.8 | 24.6 | 116.1 | 75.1 | 8.4 | 10.1 |
| TOTAL (acres) | | 102.0 | 141.4 | 28.6 | 133.0 | 63.3 | 14.4 | 8.4 |
| Emissions (tons/yr) | | 45.9 | 63.6 | 12.9 | 59.9 | 28.5 | 6.5 | 3.8 |

(1) Source: Development of Emission Factors for Fugitive Dust Sources, EPA 450/3-74-037.

# CHAPTER XXIV

## WIND BLOWN DUST

This source category applies to dust lost from temporary aggregate storage piles. It does not include permanent storage facilities associated with stone and sand and gravel quarrying operations, or hot-mix asphalt and concrete batching plants, which are contained in the point source inventory. Most significant temporary aggregate storage piles accompany large highway or industrial construction projects. None of these were reported in 1975 by highway authorities or local planning agencies. Emissions from this source category were negligible.

# CHAPTER XXV

# PAVED ROADS

This source category includes particulate emissions associated with dirt on paved roads and excludes particulates generated by tire wear which are included in Chapter X. Emission factors for this category are not available in AP-42.

## A. 1975 EMISSION INVENTORY

Two particulate emission factors were developed for this source category in the LAQMP: 1.17 g/VMT, based on a Seattle study, and 0.97 g/VMT, based on a Chicago study.(1) A growing body of evidence indicates that both of these factors are too small and that the real value lies between 2.0 and 6.0 g/VMT, depending upon street cleaning efficiency and the condition of road shoulders. Experience in Louisville indicated a value of 2.5 g/VMT to be appropriate, based upon the results of the model calibration.(2) This value was used for the calculations in this study area.

VMT, by county, from Chapter X and emissions from paved roads are summarized in Table XXV-1.

TABLE XXV-1

1975 PAVED ROAD EMISSION SUMMARY

| COUNTY | $10^6$ VMT | EMISSIONS (tons/year) |
|---|---|---|
| Bullitt | 314 | 864.8 |
| Hardin | 558 | 1,536.3 |
| Henry | 107 | 294.6 |
| Oldham | 122 | 335.9 |
| Shelby | 233 | 641.5 |
| Spencer | 28 | 77.1 |
| Trimble | 35 | 96.4 |

(1) The two studies referenced here are unpublished papers provided to Engineering-Science by EPA, Region IV.

(2) Corroborated by studies in North Carolina and South Carolina.

## B. 1975 EMISSION ALLOCATION

Emissions from this source category were allocated in accordance with the distribution of road vehicle exhaust particulate emissions.

## C. PROJECTED EMISSION INVENTORY

Emissions are projected to increase in accordance with the increase in VMT given in Chapter X. Emissions are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in accordance with the projected distribution of road vehicle exhaust particulate emissions.

# CHAPTER XXVI

# DRY CLEANING

This source category, applicable to hydrocarbons only, considers emissions resulting from evaporative solvents used in dry cleaning operations. Emission factors based on the amount and type of solvent used are found in AP-42.

## A. 1975 EMISSION INVENTORY

A search of the seven counties showed no dry cleaning establishments in operation in Trimble, Henry or Spencer Counties, and a very small number of them in the other four counties under study. Further investigation, which included a mail survey and a follow up by telephone contacts, determined that, because of the proximity to the Louisville metropolitan area, a large amount of the cloth to be cleaned in these surrounding counties is collected locally but sent out to be cleaned at the larger plants in Louisville. For this reason, as well as because of the rural nature of the study area, dry cleaning operations are a rather small source of hydrocarbon emissions. Survey results are discussed in Chapter III.

Table XXVI-1 summarizes dry cleaning operating data adjusted to reflect solvent used by those operators which did not respond or who could not provide usage. For the latter, adjustment was made by factoring cloth cleaned by the average solvent usage per ton of cloth obtained from the reporting operators. Hydrocarbons emissions are the same as solvent usage since all solvent is eventually evaporated to the air.

## B. 1975 EMISSION ALLOCATION

Emissions from this source category were assigned to the grid square in which the dry cleaning establishment was located.

## C. PROJECTED EMISSION INVENTORY

Emissions from this source category are projected to increase in accordance with population growth. Emissions are summarized in Chapter XXXII.

D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in accordance with the dry cleaning establishment locations.

TABLE XXVI-1

1975 DRY CLEANING OPERATING DATA

| COUNTY | CLEANING SOLVENT USED (tons/year) | | | |
|---|---|---|---|---|
| | PETROLEUM (STODDARD) | SYNTHETIC (PERCHLOROETHYLENE) | | TOTAL |
| | | AVG. CONTROL | UNCONTROLLED | |
| Bullitt | 0 | 0 | 2.2 | 2.2 |
| Hardin | 62.4 | 35.5 | 0 | 97.9 |
| Henry | 0 | 0 | 0 | 0 |
| Oldham | 0 | 0 | 0 | 0 |
| Shelby | 5.5 | 8.2 | 0 | 13.7 |
| Spencer | 0 | 0 | 0 | 0 |
| Trimble | 0 | 0 | 0 | 0 |

# CHAPTER XXVII

# SURFACE COATING

This source category, applicable to hydrocarbons only, considers emissions from solvent evaporation resulting from surface coating operations. Two types of operation are considered; automotive painting in garages or body shops and trade paint application, oil-based paint and water-borne paint. Emission factors for oil-based paints are found in AP-42. Emission factors for water-borne paints can be estimated from the quantity of organic volatiles in the paint.

Not considered are manufacturing applications of surface coatings, can coating, automobile assembly, etc., which are included in the point source inventory.

## A. 1975 EMISSION INVENTORY

Automotive Painting. The quantity of automotive paint used in the seven-county area was determined from the survey results discussed in Chapter III. Table XXVII-1 summarizes the data collected, adjusted for nonresponding operators by county. Hydrocarbon emissions from automotive painting are shown in Table XXVII-2.

TABLE XXVII-1

1975 AUTOMOTIVE PAINTING DATA

| COUNTY | TYPE AND AMOUNT OF COATING USED (gal/yr) | | | | |
|---|---|---|---|---|---|
| | ENAMEL | LACQUER | PRIMER | | THINNER AND REDUCER |
| | | | ENAMEL | LACQUER | |
| Bullitt | 364 | 78 | 0 | 168 | 422 |
| Hardin | 3,154 | 4,676 | 104 | 3,410 | 15,716 |
| Henry | 260 | 156 | 104 | 156 | 832 |
| Oldham | 686 | 671 | 0 | 281 | 1,176 |
| Shelby | 236 | 585 | 16 | 288 | 1,239 |
| Spencer | 0 | 0 | 0 | 0 | 0 |
| Trimble | 104 | 0 | 12 | 0 | 48 |

## TABLE XXVII-2

## 1975 AUTOMOTIVE PAINTING EMISSION SUMMARY

| COUNTY | HYDROCARBON EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | ENAMEL EF=840 lbs/ton | LACQUER EF=1,540 lbs/ton | PRIMER EF=1,320 lbs/ton | THINNER, REDUCER EF=2,000 lbs/ton | TOTAL |
| Bullitt | 0.6 | 0.2 | 0.5 | 1.5 | 2.8 |
| Hardin | 5.4 | 15.5 | 10.7 | 56.6 | 88.2 |
| Henry | 0.4 | 0.5 | 0.8 | 3.0 | 4.7 |
| Oldham | 1.2 | 2.2 | 0.8 | 4.2 | 8.4 |
| Shelby | 0.4 | 1.9 | 0.9 | 4.5 | 7.7 |
| Spencer | 0 | 0 | 0 | 0 | 0 |
| Trimble | 0.2 | 0 | 0.1 | 0.2 | 0.5 |

In converting the volume units in Table XXVII-1 to weight units, the following density factors were used:

| | |
|---|---|
| Enamel: | 8.1 lbs/gal |
| Lacquer: | 8.6 lbs/gal |
| Enamel primer: | 11.0 lbs/gal |
| Lacquer primer: | 9.2 lbs/gal |
| Thinner and reducer: | 7.2 lbs/gal |

Trade Paint Application. This subcategory refers to paint, enamel, varnish, etc., used by individuals and contractors for exterior and interior surface coating. The National Paint and Coating Association provided an estimate of average trade paint usage for 1975. On a national basis, this average is 2.1 gallons/person of which 45% is water-borne paint and 55% oil-based paint.[1] Trade paint usage based on these national figures is summarized in Table XXVII-3.

TABLE XXVII-3

1975 TRADE PAINT CONSUMPTION
($10^3$ gal/yr)

| COUNTY | POPULATION | WATER-BORNE | OIL-BASE |
|---|---|---|---|
| Bullitt | 33,642 | 31.8 | 38.9 |
| Hardin | 46,360 | 43.8 | 53.5 |
| Henry | 11,532 | 10.9 | 13.3 |
| Oldham | 18,651 | 17.6 | 21.5 |
| Shelby | 20,126 | 19.0 | 23.2 |
| Spencer | 5,372 | 5.1 | 6.2 |
| Trimble | 5,683 | 5.4 | 6.6 |

An emission factor of 1120 lbs/ton of paint from AP-42 can be applied to calculate emissions from oil-based paints. Emission factors for water-borne paint were estimated from information provided by the Paint, Varnish and Laquer Association. The volatile section of water-borne paint is 25 to 50% (35% weighted average) by weight of the paint. Of this, 5 to 20% (15% weighted average) are volatile organics. An emission factor of 5.25% by weight of water-borne paint results. Hydrocarbon emissions from trade paint application are summarized in Table XXVII-4.

(1) Calculations from data in the 1972 Census of Manufacturers, Paints and Allied Products, indicate 2.04 gal/person, 48% water-borne.

TABLE XXVII-4

1975 TRADE PAINT EMISSION SUMMARY

(tons/year)

| COUNTY | WATER-BORNE | OIL-BASE | TOTAL |
|---|---|---|---|
| | EF = 5.25% | EF = 1120 lbs/ton | |
| Bullitt | 7.1 | 141.6 | 148.7 |
| Hardin | 9.8 | 194.7 | 204.5 |
| Henry | 2.4 | 48.4 | 50.8 |
| Oldham | 3.9 | 78.3 | 82.2 |
| Shelby | 4.2 | 84.4 | 88.6 |
| Spencer | 1.1 | 22.6 | 23.7 |
| Trimble | 1.2 | 24.0 | 25.2 |

In converting volume units in Table XXVII-3 to weight units, the following density factors were used:

Water-borne paint: 8.5 lbs/gal

Oil-based paint: 13.0 lbs/gal

B. 1975 EMISSION ALLOCATION

Emissions from this source category were allocated to subcounty areas in accordance with population distribution.

C. PROJECTED EMISSION INVENTORY

Emissions from this source category were projected to increase in accordance with population growth. Emissions are summarized in Chapter XXXII.

D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated to subcounty areas in accordance with population distribution.

# CHAPTER XXVIII

## PETROLEUM STORAGE

This source category, applicable to hydrocarbons only, includes evaporative losses associated with the storage of liquid organics in large vessels at oil fields, refineries and distribution terminals. In the study area, emissions from petroleum storage have been included in the point source inventory. There are no additional emissions from this category to be included as area sources.

# CHAPTER XXIX

# MARKETING OF PETROLEUM

This source category, applicable to hydrocarbons only, considers emissions resulting from motor vehicle refueling and underground gasoline storage at service stations. Storage emissions include loading losses and breathing losses. Vehicle refueling emissions are due to vapor displacement from the automobile tank and to spillage. Emission factors, based on the annual throughput and the tank-filling method, are found in AP-42. Factors are provided for each of the underground tank filling and vehicle refueling operations. These were combined as shown in Table XXIX-1 to obtain a single factor.

## TABLE XXIX-1

## EMISSION FACTORS FOR GASOLINE MARKETING

| EMISSION SOURCE | EMISSION FACTOR (lbs/$10^3$ gal) | |
|---|---|---|
| | SPLASH LOADING | SUBMERGED LOADING |
| Storage: | | |
| Underground tank loading | 11.5 | 7.3 |
| Tank breathing | 1.0 | 1.0 |
| Vehicle refueling: | | |
| Vapor displacement | 9.0 | 9.0 |
| Spillage | 0.7 | 0.7 |
| TOTAL | 22.2 | 18.0 |

## A. 1975 EMISSION INVENTORY

A mail survey of all gasoline stations was conducted to determine the volume of gasoline sold, the type of loading operations used and other related

parameters. Only 11% of the service station operators responded after an extensive follow-up by telephone. The survey was considered to be inadequate, and the information obtained from the gasoline distributing companies was used for the inventory. Gasoline sales by the one company that did not report this information were estimated from the number of pumps operated and the average throughput per pump calculated from the other, responding companies.

Table XXIX-2 summarizes the 1975 gasoline sales by county from the distributing companies survey. Hydrocarbon emissions from this source category are given in Table XXIX-3.

## B. 1975 EMISSION ALLOCATION

Emissions were allocated in accordance with service station locations.

TABLE XXIX-2

1975 GASOLINE MARKETING DATA

| COUNTY | 1975 THROUGHPUT BY TYPE OF LOADING[1] ($10^3$ gal) | |
|---|---|---|
| | SPLASH LOADING | SUBMERGED LOADING |
| Bullitt | 217 | 6,377 |
| Hardin | 415 | 12,408 |
| Henry | 0 | 1,508 |
| Oldham | 283 | 4,032 |
| Shelby | 0 | 2,946 |
| Spencer | 132 | 812 |
| Trimble | 0 | 989 |

(1) The 1975 throughput for splash and submerged loadings were obtained from gasoline distributing companies.

TABLE XXIX-3

1975 GASOLINE MARKETING EMISSION SUMMARY

| COUNTY | HYDROCARBON EMISSIONS (tons/year | | |
|---|---|---|---|
| | SPLASH LOADING EF= 22.2 lbs/$10^3$gal | SUBMERGED LOADING EF=18.0 lbs/$10^3$gal | TOTAL |
| Bullitt | 2.4 | 57.4 | 59.8 |
| Hardin | 4.6 | 111.7 | 116.3 |
| Henry | 0 | 13.6 | 13.6 |
| Oldham | 3.1 | 36.3 | 39.4 |
| Shelby | 0 | 26.5 | 26.5 |
| Spencer | 1.5 | 7.3 | 8.8 |
| Trimble | 0 | 8.9 | 8.9 |

C. PROJECTED EMISSION INVENTORY

Projected emissions from this source category are dependent upon three factors:

- o Projected VMT growth.
- o Increased fuel efficiency of future automobile models.
- o Age distribution of vehicles.

It is difficult to assess the effect of these factors in view of the current national debate on energy policy. Gasoline fuel usage has increased about 5% from 1975 to 1977. The stated policy of the President is to reduce this increase to 1%/year through 1985 with a further decrease after that. A best estimate of gasoline usage, based on the 1975 to 1977 increase and the policy, relative to the 1975 baseyear is as follows:

- o 1980 - 8% increase over 1975
- o 1985 - 13% increase over 1975
- o 1995 18% increase over 1975

Emissions from marketing of petroleum are projected to increase at those rates and are summarized in Chapter XXXII.

## D. PROJECTED EMISSION ALLOCATION

Projected emissions were allocated in proportion to the baseline year distribution.

# CHAPTER XXX

# ASPHALT PAVING

This source category, applicable to hydrocarbon emissions only, results from the use of petroleum distillate cutbacks to liquify asphalt paving material. Emulsified asphalts do not emit hydrocarbons.

Emissions from cutback asphalt vary with the type of cutback. The three types of cutback; Slow Cure, Medium Cure, and Rapid Cure; each have an average of 35% diluents but varying percentages of the volatile section. Emission factors were derived as the product of the diluent portion and the volatile section from information provided by the Asphalt Institute.

For the three types of cutback, emission factors are as follows:

Slow Cure - 8.75% by weight
Medium Cure - 19.25% by weight
Rapid Cure - 24.5% by weight

## A. 1975 EMISSION INVENTORY

The amount of cutback used in asphalt paving by county was provided by the Kentucky DOT. These data are summarized in Table XXX-1.

TABLE XXX-1

1975 CUTBACKS USED IN ASPHALT PAVING

| COUNTY | RAPID CURE | | MEDIUM CURE | |
|---|---|---|---|---|
| | TACK COAT (tons/year) | SEAL COAT (tons/year) | LINSEED OIL (tons/year) | PRIME COAT (tons/year) |
| Bullitt | 60.6 | 79.2 | 1.1 | 39.3 |
| Hardin | 102.0 | 10.6 | 1.4 | 149.2 |
| Henry | 98.7 | 79.0 | 0.9 | 3.2 |
| Oldham | 55.1 | 24.9 | 0 | 0 |
| Shelby | 27.5 | 19.8 | 0 | 0 |
| Spencer | 0 | 0 | 0 | 22.4 |
| Trimble | 5.8 | 0 | 0 | 55.4 |

Emissions resulting from asphalt cutbacks are shown in Table XXX-2.

TABLE XXX-2

1975 ASPHALT PAVING EMISSION SUMMARY

| COUNTY | HYDROCARBON EMISSIONS (tons/year) | | | | TOTAL |
|---|---|---|---|---|---|
| | RAPID CURE | | MEDIUM CURE | | |
| | TACK COAT | SEAL COAT | LINSEED OIL | PRIME COAT | |
| Bullitt | 14.8 | 19.4 | 0.2 | 7.6 | 42.0 |
| Hardin | 25.0 | 2.6 | 0.3 | 28.7 | 56.6 |
| Henry | 24.2 | 19.4 | 0.2 | 0.6 | 44.4 |
| Oldham | 13.5 | 6.1 | 0 | 0 | 19.6 |
| Shelby | 6.7 | 4.9 | 0 | 0 | 11.6 |
| Spencer | 0 | 0 | 0 | 4.3 | 4.3 |
| Trimble | 1.4 | 0 | 0 | 10.7 | 12.1 |

B. 1975 EMISSION ALLOCATION

Emissions from this source category were allocated in accordance with VMT.

C. PROJECTED EMISSION INVENTORY

Emissions are projected to increase in accordance with the growth in VMT shown in Chapter X. Emissions are summarized in Chapter XXXII.

D. PROJECTED EMISSION ALLOCATION

Projected emissions from asphalt paving were allocated in accordance with the projected VMT growth.

# CHAPTER XXXI

# FORT KNOX

## A. 1975 EMISSIONS INVENTORY

The Fort Knox Reservation cannot be treated in the same manner as the civilian counties and communities have been treated in the preceding chapters. Although Fort Knox is a "city" having emission sources like those of civilian cities, it also has a wide variety of sources which are unique to military bases. Even the sources common to civilian cities and military bases must be considered differently due to the fact that source data is more available in the military community, and, consequently, the inventory for the military base is more complete. A comparison of emissions from Fort Knox and from any of the counties is not warranted. For instance, the Fort Knox data permitted an estimate of particulate emissions from wind erosion of exposed soil. No such estimate was possible for the remainder of the study area.

The Directorate of Facility Engineers, Environmental and Energy Control Office[1] was extremely cooperative in providing source data and the opportunity to meet with military representatives of the various training commands. In general, the source data used to estimate the Fort Knox emissions is of much higher quality than the data appearing in the preceding chapters. However, for national security reasons, the Environmental and Energy Control Office has requested that some of the detailed source data used to calculate the emissions reported in this chapter be excluded from the text. Table XXXI-1 provides a partial listing of data made available for this analysis.

Emission factors for some of the military sources, such as artillery range impacts, low level helicopter operations, and movement of tanks, are not available in AP-42 or other documents. In these cases, subjective data were obtained from officers of various training commands, which allowed reasonable estimates of emissions. As an example, emission rates for direct

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[1] Contact is Mr. Duane Nelson, DFAE, Building 77, Fort Knox, Kentucky, 40121

TABLE XXXI-1

DATA AVAILABLE FROM FORT KNOX

On-post military and dependent population

On-post military and dependent housing

Off-post military and base employed civilian population by place of residence

Land use maps including military training areas

Total base heating fuels by type

Total base fuel use for vehicles and aviation

Fuel use by point sources

Construction equipment fuel use

Small gasoline engines

Fuel storage capacity

Total use of solvents

Total use of paints

On-post registration of privately owned vehicles

Aviation and Armor training data

Military vehicle data (mileage, speeds, track size, road types used)

Miles of roads maintained by type (excluding tank trails)

Artillery and non-artillery rounds expended

Explosives used by type

Classified waste and pathological incineration

Boiler and process point source data

Quarry throughput

Sanitary landfill throughput

Smoke and fire training

Open burning

Range, vehicle, and building fire losses

Acreage tilled

Acreage exposed to wind erosion

fire tank-defeating rounds were computed by taking part of the mass of earth ejected from the impact crater. A small fraction[1] was selected, as weapons experts indicated that the targets are very rarely obscured by ground impacts. Other factors considered in this example include dust generation by gun recoil[2] and use of nonexploding practice rounds.[3] Table XXXI-2 lists the total emissions for Fort Knox.

B. 1975 EMISSIONS ALLOCATION

Fort Knox emissions were allocated by activity in accordance with the land use overlay on the 1:50,000 Fort Knox contour map. For example, emissions due to artillery impacts were allocated to the impact area.

C. PROJECTED EMISSION INVENTORY

Fort Knox authorities anticipate no change in the post population or activity level. Emissions are projected to remain constant except for those related to road vehicle exhaust which are projected to decrease.

D. PROJECTED EMISSION ALLOCATION

Projected emissions allocations were unchanged from the baseline year.

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(1) For example, a .025 factor appears in Development of Emission Factors for Fugitive Dust Sources, USEPA, 1974, in reference to wind erosion losses measured as suspended particulate.

(2) Recoil-generated dust varies with gun elevation and is controlled by surface wetting (dust slows the rate of fire along a firing line).

(3) These rounds create a different crater shape than high explosive rounds.

TABLE XXXI-2

EMISSIONS SUMMARY FOR FORT KNOX KENTUCKY

| SOURCE CATEGORY | EMISSIONS (tons/year) | | | | |
|---|---|---|---|---|---|
| | PARTICULATES | SULFUR DIOXIDE | CARBON MONOXIDE | HYDRO-CARBONS | NITROGEN OXIDES |
| Space Heating[1] | 41.1 | 140.3 | 24.8 | 8.5 | 326.2 |
| Incineration | 0.1 | 0 | 0.1 | 0 | 0 |
| Vehicle Exhaust[2] | 51.7 | 33.1 | 3,960.6 | 566.2 | 496.2 |
| Aircraft Exhaust | 9.5 | 6.7 | 605.7 | 73.1 | 21.0 |
| Small Point Sources | 431.2 | 0 | 0 | 0 | 8.0 |
| Structural Fires | 0.1 | 0 | 0.9 | 0.2 | 0 |
| Wild Forest Fires | 23.0 | 0 | 189.0 | 32.4 | 5.4 |
| Off Road (Tracked Vehicle) | 7,228.0 | 0 | 0 | 0 | 0 |
| Off Road (Wheeled Vehicle) | 1,196.0 | 0 | 0 | 0 | 0 |
| Wind Erosion | 260.0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 3.3 | 0 | 0 | 0 | 0 |
| Construction Activity | 260.0 | 0 | 0 | 0 | 0 |
| Paved Roads | 77.7 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 98.3 | 0 |
| Surface Coating | 0 | 0 | 0 | 52.5 | 0 |
| Petroleum Storage and Marketing | 0 | 0 | 0 | 32.7 | 0 |
| Artillery | 46.0 | 0 | 0 | 0 | 0 |
| TOTAL | 9,627.7 | 180.1 | 4,781.1 | 863.9 | 856.8 |

(1) Includes all space heating fuels normally separated by residential, commercial/institutional, and industrial classes.

(2) Includes emissions from railroad locomotives, vessels, small gasoline engines, agricultural equipment, and construction equipment in addition to total vehicle exhaust emissions.

# CHAPTER XXXII

## EMISSIONS SUMMARY

Tables XXXII-1 through XXXII-5 are summaries of county-wide emissions by source category for the baseline year 1975. Tables XXXII-6 through XXXII-10, Tables XXXII-11 through XXXII-15, and Tables XXXII-16 through XXXII-20 summarize emissions by source category for the projection years 1980, 1985, and 1995, respectively. Finally, Table XXXII-21 is a summary of county-wide emissions by pollutant for all years. County-wide emissions by pollutant for Jefferson, Floyd, and Clark Counties have been taken from Appendix B.

The reader should be aware that such variables as spatial distribution, seasonal emission rates, and emission release parameters, as well as the mass emission rate, affect the ambient air quality at any given point. Consequently, one should draw conclusions about ambient air quality impact from the data presented in the following tables only after further analysis.

## TABLE XXXII-1

## AREA SOURCE EMISSIONS SUMMARY 1975 - PARTICULATES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 91.7 | 100.6 | 35.1 | 47.8 | 68.2 | 18.9 | 16.5 |
| Commercial/Institutional Fuel | 3.8 | 15.8 | 1.9 | 2.8 | 15.1 | 0.7 | 1.3 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 7.1 | 11.9 | 2.8 | 4.3 | 5.2 | 1.1 | 1.1 |
| Open Burning | 42.7 | 61.1 | 14.1 | 27.8 | 26.2 | 6.5 | 6.5 |
| Highway Vehicles | 254.8 | 452.1 | 84.2 | 98.3 | 182.8 | 21.8 | 25.8 |
| Aircraft | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 13.6 | 19.9 | 6.5 | 4.5 | 14.7 | 0 | 0 |
| Vessels | 1.2 | 0 | 0 | 9.5 | 0 | 0 | 11.9 |
| Small Gasoline Engines | 0.6 | 0.8 | 0.2 | 0.3 | 0.3 | 0.1 | 0.1 |
| Agricultural Equipment | 6.8 | 36.3 | 24.1 | 21.3 | 25.4 | 14.2 | 3.0 |
| Construction Equipment | 1.4 | 2.0 | 0.5 | 1.6 | 1.1 | 0.3 | 0.2 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 6.0 | 0.7 | 0.5 | 0.2 | 1.6 | 0.1 | 0 |
| Wild Forest Fires | 7.0 | 7.5 | 0 | 0.4 | 0.3 | 0 | 0 |
| Unpaved Roads | 4,615.8 | 4,764.9 | 1,347.8 | 1,785.8 | 407.9 | 845.8 | 979.7 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 70.7 | 269.6 | 100.2 | 58.3 | 411.3 | 166.1 | 78.3 |
| Construction Activity | 45.9 | 63.6 | 12.9 | 59.9 | 28.5 | 6.5 | 3.8 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 864.5 | 1,536.3 | 294.6 | 335.9 | 641.5 | 77.1 | 96.4 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 6,033.6 | 7,343.6 | 1,925.4 | 2,458.7 | 1,830.1 | 1,159.2 | 1,224.6 |

## TABLE XXXII-2

## AREA SOURCE EMISSIONS SUMMARY 1975 - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 178.8 | 244.9 | 125.4 | 177.5 | 232.3 | 64.3 | 58.7 |
| Commercial/Institutional Fuel | 16.5 | 68.5 | 8.1 | 12.2 | 96.3 | 2.9 | 8.4 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 2.3 | 3.8 | 0.9 | 1.4 | 1.7 | 0.3 | 0.4 |
| Open Burning | 2.7 | 3.8 | 0.9 | 1.7 | 1.6 | 0.4 | 0.4 |
| Highway Vehicles | 141.2 | 248.0 | 46.5 | 56.4 | 102.8 | 11.3 | 12.4 |
| Aircraft | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 31.0 | 45.3 | 14.7 | 10.3 | 24.0 | 0 | 0 |
| Vessels | 0.3 | 0 | 0 | 2.8 | 0 | 0 | 3.6 |
| Small Gasoline Engines | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0 | 0 |
| Agricultural Equipment | 4.6 | 24.8 | 16.4 | 14.5 | 17.2 | 9.7 | 2.0 |
| Construction Equipment | 1.8 | 2.3 | 0.7 | 2.0 | 1.2 | 0.4 | 0.3 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 379.4 | 642.0 | 213.7 | 278.9 | 477.2 | 89.3 | 86.2 |

## TABLE XXXII-3

## AREA SOURCE EMISSIONS SUMMARY 1975 - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 360.9 | 404.0 | 146.1 | 198.9 | 289.0 | 78.2 | 67.1 |
| Commercial/Institutional Fuel | 5.0 | 20.6 | 2.4 | 3.7 | 14.5 | 0.9 | 1.2 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 10.0 | 16.8 | 4.0 | 6.0 | 7.4 | 1.5 | 1.6 |
| Open Burning | 226.6 | 324.7 | 74.8 | 147.6 | 139.1 | 34.6 | 34.7 |
| Highway Vehicles | 17,368.2 | 32,541.2 | 5,826.4 | 6,404.1 | 11,926.9 | 1,925.6 | 1,746.0 |
| Aircraft | 0 | 178.1 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 70.7 | 103.4 | 33.5 | 23.4 | 76.5 | 0 | 0 |
| Vessels | 26.0 | 0 | 0 | 203.8 | 0 | 0 | 253.9 |
| Small Gasoline Engines | 152.8 | 210.5 | 52.4 | 84.7 | 91.4 | 24.4 | 25.8 |
| Agricultural Equipment | 592.8 | 906.1 | 600.5 | 957.6 | 2,205.6 | 893.8 | 756.1 |
| Construction Equipment | 62.7 | 157.2 | 80.0 | 63.5 | 98.4 | 43.7 | 35.9 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 17.5 | 2.2 | 1.6 | 0.7 | 4.7 | 0.3 | 0.1 |
| Wild Forest Fires | 57.1 | 61.3 | 0 | 3.2 | 2.7 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 18,950.3 | 34,926.1 | 6,821.7 | 8,097.2 | 14,856.2 | 3,003.0 | 2,922.4 |

## TABLE XXXII-4

## AREA SOURCE EMISSIONS SUMMARY 1975 -HYDROCARBONS (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 275.3 | 242.6 | 48.4 | 65.4 | 98.5 | 27.7 | 36.8 |
| Commercial/Institutional Fuel | 1.7 | 7.0 | 0.8 | 1.2 | 4.0 | 0.3 | 0.3 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 3.8 | 6.4 | 1.5 | 2.3 | 2.8 | 0.6 | 0.6 |
| Open Burning | 80.0 | 114.6 | 26.4 | 52.1 | 49.1 | 12.2 | 12.2 |
| Highway Vehicles | 3,221.9 | 5,898.1 | 1,079.0 | 1,205.7 | 2,261.1 | 327.5 | 349.2 |
| Aircraft | 0 | 6.1 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 51.1 | 74.7 | 24.3 | 16.9 | 55.3 | 0 | 0 |
| Vessels | 8.9 | 0 | 0 | 69.4 | 0 | 0 | 86.6 |
| Small Gasoline Engines | 21.5 | 29.7 | 7.4 | 11.9 | 12.9 | 3.4 | 3.6 |
| Agricultural Equipment | 48.8 | 123.9 | 81.4 | 80.3 | 167.5 | 74.1 | 49.5 |
| Construction Equipment | 4.4 | 9.3 | 4.3 | 4.6 | 5.7 | 2.4 | 1.8 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 1.4 | 0.2 | 0.1 | 0.1 | 0.4 | 0 | 0 |
| Wild Forest Fires | 9.8 | 10.5 | 0 | 0.5 | 0.5 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 2.2 | 97.9 | 0 | 0 | 13.7 | 0 | 0 |
| Surface Coating | 151.5 | 292.7 | 55.5 | 90.6 | 96.3 | 23.7 | 25.7 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 59.8 | 116.3 | 13.6 | 39.4 | 26.5 | 8.8 | 8.9 |
| Asphalt Paving | 42.0 | 56.6 | 44.4 | 19.6 | 11.6 | 4.3 | 12.1 |
| TOTAL | 3,984.1 | 7,086.6 | 1,387.1 | 1,660.0 | 2,805.9 | 485.0 | 587.3 |

## TABLE XXXII-5

## AREA SOURCE EMISSIONS SUMMARY 1975 - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 99.0 | 110.0 | 27.1 | 43.6 | 46.1 | 13.1 | 17.4 |
| Commercial/Institutional Fuel | 21.4 | 88.7 | 10.6 | 15.8 | 38.0 | 3.7 | 2.8 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 2.6 | 4.4 | 1.1 | 1.6 | 1.9 | 0.4 | 0.4 |
| Open Burning | 16.0 | 22.9 | 5.3 | 10.4 | 9.8 | 2.4 | 2.4 |
| Highway Vehicles | 2,437.2 | 4,298.0 | 810.7 | 932.3 | 1,745.7 | 202.0 | 256.2 |
| Aircraft | 0 | 1.1 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 201.1 | 294.2 | 95.5 | 66.6 | 217.7 | 0 | 0 |
| Vessels | 3.2 | 0 | 0 | 25.7 | 0 | 0 | 32.1 |
| Small Gasoline Engines | 2.1 | 2.9 | 0.7 | 1.2 | 1.2 | 0.3 | 0.4 |
| Agricultural Equipment | 66.5 | 289.7 | 191.9 | 182.0 | 247.3 | 128.5 | 43.4 |
| Construction Equipment | 24.1 | 33.1 | 10.0 | 27.7 | 18.0 | 5.2 | 3.2 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.7 | 0.1 | 0.1 | 0 | 0.2 | 0 | 0 |
| Wild Forest Fires | 1.6 | 1.7 | 0 | 0.1 | 0.1 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2,875.5 | 5,146.8 | 1.153.0 | 1,307.0 | 2,326.0 | 355.6 | 358.3 |

## TABLE XXXII-6

## AREA SOURCE EMISSIONS SUMMARY 1980 - PARTICULATES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 98.1 | 100.7 | 29.6 | 41.7 | 57.8 | 16.1 | 15.2 |
| Commercial/Institutional Fuel | 2.4 | 9.4 | 1.1 | 1.7 | 6.0 | 0.4 | 0.5 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 12.0 | 12.7 | 3.7 | 6.7 | 6.1 | 1.4 | 1.3 |
| Open Burning | 54.2 | 74.9 | 15.4 | 35.8 | 28.6 | 7.0 | 7.0 |
| Highway Vehicles | 214.3 | 379.7 | 68.3 | 82.1 | 153.8 | 17.3 | 20.4 |
| Aircraft | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 17.7 | 25.9 | 8.5 | 5.9 | 19.1 | 0 | 0 |
| Vessels | 1.2 | 0 | 0 | 9.6 | 0 | 0 | 12.0 |
| Small Gasoline Engines | 0.7 | 1.0 | 0.2 | 0.4 | 0.4 | 0.1 | 0.1 |
| Agricultural Equipment | 6.3 | 33.7 | 25.9 | 19.7 | 27.3 | 15.3 | 3.2 |
| Construction Equipment | 2.2 | 2.1 | 0.7 | 2.1 | 1.1 | 0.3 | 0.3 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 2.7 | 3.7 | 0.8 | 1.5 | 1.4 | 0.4 | 0.4 |
| Wild Forest Fires | 2.4 | 3.3 | 2.3 | 1.5 | 3.1 | 1.5 | 1.2 |
| Unpaved Roads | 4,615.8 | 4,764.9 | 1,347.8 | 1,785.8 | 407.9 | 845.8 | 979.7 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 65.6 | 250.0 | 107.7 | 54.1 | 442.1 | 178.6 | 84.2 |
| Construction Activity | 73.6 | 67.8 | 19.0 | 80.0 | 29.3 | 6.5 | 5.6 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 951.0 | 1,689.9 | 324.1 | 369.5 | 705.7 | 84.8 | 106.0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 6,120.2 | 7,420.3 | 2,155.1 | 2.498.1 | 1,889.7 | 1,175.5 | 1,237.1 |

## TABLE XXXII-7

## AREA SOURCE EMISSIONS SUMMARY 1980 - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 160.9 | 212.7 | 105.2 | 151.8 | 191.7 | 53.6 | 53.0 |
| Commercial/Institutional Fuel | 18.1 | 69.1 | 8.4 | 13.2 | 96.8 | 3.0 | 8.4 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 3.8 | 4.1 | 1.2 | 2.2 | 1.9 | 0.5 | 0.4 |
| Open Burning | 3.4 | 4.7 | 1.0 | 2.2 | 1.8 | 0.4 | 0.4 |
| Highway Vehicles | 155.6 | 273.8 | 48.2 | 61.2 | 113.2 | 11.7 | 13.0 |
| Aircraft | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 40.3 | 58.9 | 19.1 | 13.4 | 31.2 | 0 | 0 |
| Vessels | 0.3 | 0 | 0 | 2.8 | 0 | 0 | 3.6 |
| Small Gasoline Engines | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 | 0 | 0 |
| Agricultural Equipment | 4.3 | 23.0 | 17.6 | 13.4 | 18.5 | 10.4 | 2.2 |
| Construction Equipment | 2.9 | 2.5 | 1.0 | 2.7 | 1.2 | 0.4 | 0.4 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 389.9 | 649.5 | 201.8 | 263.0 | 456.4 | 80.0 | 81.4 |

## TABLE XXXII-8

## AREA SOURCE EMISSIONS SUMMARY 1980 - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 382.6 | 398.5 | 121.5 | 170.3 | 241.7 | 65.5 | 60.5 |
| Commercial/Institutional Fuel | 5.2 | 20.6 | 2.5 | 3.8 | 14.6 | 0.9 | 1.2 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 16.9 | 17.9 | 5.2 | 9.5 | 8.5 | 2.0 | 1.8 |
| Open Burning | 287.8 | 397.9 | 81.9 | 190.0 | 151.7 | 37.4 | 37.4 |
| Highway Vehicles | 14,818.2 | 27,958.1 | 4,961.0 | 5,408.8 | 10,168.3 | 1,668.3 | 1,486.1 |
| Aircraft | 0 | 271.6 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 91.9 | 134.4 | 43.6 | 30.4 | 99.5 | 0 | 0 |
| Vessels | 28.4 | 0 | 0 | 222.8 | 0 | 0 | 277.5 |
| Small Gasoline Engines | 189.9 | 263.2 | 55.7 | 106.6 | 98.7 | 25.6 | 27.6 |
| Agricultural Equipment | 549.7 | 840.2 | 645.5 | 887.9 | 2,371.0 | 960.8 | 812.8 |
| Construction Equipment | 100.6 | 167.6 | 118.0 | 84.8 | 101.3 | 43.7 | 52.5 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 8.0 | 11.1 | 2.4 | 4.5 | 4.2 | 1.1 | 1.2 |
| Wild Forest Fires | 19.6 | 26.8 | 18.9 | 12.0 | 25.0 | 12.6 | 9.5 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 16,498.6 | 30,507.9 | 6,056.2 | 7,131.4 | 13,284.5 | 2,818.3 | 2,768.1 |

## TABLE XXXII-9

## AREA SOURCE EMISSIONS SUMMARY 1980 - HYDROCARBONS (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 327.2 | 279.0 | 43.7 | 64.3 | 90.7 | 25.5 | 36.8 |
| Commercial/Institutional Fuel | 1.7 | 7.0 | 0.8 | 1.3 | 4.0 | 0.3 | 0.3 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 6.5 | 6.9 | 2.0 | 3.6 | 3.3 | 0.8 | 0.8 |
| Open Burning | 101.6 | 140.4 | 28.9 | 67.1 | 53.5 | 13.2 | 13.2 |
| Highway Vehicles | 2,256.8 | 4,163.1 | 759.0 | 839.3 | 1,586.3 | 234.3 | 242.8 |
| Aircraft | 0 | 9.2 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 66.4 | 97.1 | 31.6 | 22.0 | 71.9 | 0 | 0 |
| Vessels | 9.7 | 0 | 0 | 75.8 | 0 | 0 | 94.5 |
| Small Gasoline Engines | 26.8 | 37.1 | 7.8 | 15.0 | 13.9 | 3.6 | 3.9 |
| Agricultural Equipment | 45.2 | 114.9 | 87.5 | 74.5 | 180.1 | 79.7 | 53.2 |
| Construction Equipment | 7.1 | 9.9 | 6.3 | 6.1 | 5.9 | 2.4 | 2.6 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.6 | 0.9 | 0.2 | 0.4 | 0.3 | 0.1 | 0.1 |
| Wild Forest Fires | 3.4 | 4.6 | 3.2 | 2.1 | 4.3 | 2.2 | 1.6 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0.2 | 14.0 | 0 | 0 | 1.3 | 0 | 0 |
| Surface Coating | 188.3 | 366.6 | 59.0 | 114.1 | 104.0 | 25.0 | 27.5 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 64.6 | 125.6 | 14.7 | 42.6 | 28.6 | 9.5 | 9.6 |
| Asphalt Paving | 46.2 | 62.3 | 48.8 | 21.6 | 12.8 | 4.7 | 13.3 |
| TOTAL | 3,154.8 | 5,547.0 | 1,093.5 | 1,349.8 | 2,174.4 | 401.3 | 500.2 |

## TABLE XXXII-10

## AREA SOURCE EMISSIONS SUMMARY 1980 - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 108.7 | 117.8 | 27.0 | 44.9 | 45.8 | 13.0 | 18.0 |
| Commercial/Institutional Fuel | 22.3 | 89.1 | 10.7 | 16.4 | 38.3 | 3.8 | 2.8 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 4.5 | 4.7 | 1.4 | 2.5 | 2.3 | 0.5 | 0.5 |
| Open Burning | 20.3 | 28.1 | 5.8 | 13.4 | 10.7 | 2.6 | 2.6 |
| Highway Vehicles | 2,394.4 | 4,189.8 | 774.3 | 191.8 | 1,723.1 | 182.6 | 250.8 |
| Aircraft | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 261.4 | 382.5 | 124.2 | 86.6 | 283.0 | 0 | 0 |
| Vessels | 3.2 | 0 | 0 | 26.0 | 0 | 0 | 32.5 |
| Small Gasoline Engines | 2.6 | 3.6 | 0.8 | 1.5 | 1.3 | 0.3 | 0.4 |
| Agricultural Equipment | 61.7 | 268.6 | 206.3 | 168.8 | 265.8 | 138.1 | 46.7 |
| Construction Equipment | 38.7 | 35.3 | 14.8 | 37.0 | 18.5 | 5.2 | 4.7 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.3 | 0.4 | 0.1 | 0.2 | 0.2 | 0 | 0 |
| Wild Forest Fires | 0.6 | 0.8 | 0.5 | 0.3 | 0.7 | 0.4 | 0.3 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2,918.7 | 5,122.2 | 1,165.9 | 1,317.4 | 2,389.7 | 346.5 | 359.3 |

## TABLE XXXII-11

## AREA SOURCE EMISSIONS SUMMARY 1985 - PARTICULATES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 105.6 | 104.2 | 25.5 | 36.5 | 49.7 | 14.4 | 14.1 |
| Commercial/Institutional Fuel | 2.4 | 9.5 | 1.1 | 1.8 | 6.1 | 0.4 | 0.5 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 15.6 | 13.5 | 4.2 | 8.1 | 6.9 | 1.7 | 1.5 |
| Open Burning | 66.6 | 90.5 | 16.7 | 40.3 | 31.1 | 8.0 | 7.6 |
| Highway Vehicles | 209.5 | 369.3 | 68.1 | 80.7 | 149.0 | 15.7 | 18.1 |
| Aircraft | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 19.4 | 28.5 | 9.3 | 6.4 | 21.0 | 0 | 0 |
| Vessels | 1.2 | 0 | 0 | 9.7 | 0 | 0 | 12.2 |
| Small Gasoline Engines | 0.9 | 1.2 | 0.2 | 0.4 | 0.4 | 0.1 | 0.1 |
| Agricultural Equipment | 5.8 | 31.2 | 25.9 | 18.3 | 27.3 | 15.3 | 3.2 |
| Construction Equipment | 2.9 | 2.3 | 0.9 | 2.5 | 1.2 | 0.3 | 0.4 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 3.2 | 4.6 | 0.8 | 1.7 | 1.5 | 0.4 | 0.4 |
| Wild Forest Fires | 2.4 | 3.3 | 2.3 | 1.5 | 3.1 | 1.5 | 1.2 |
| Unpaved Roads | 4,615.8 | 4,764.9 | 1,347.8 | 1,785.8 | 407.9 | 845.8 | 979.7 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 60.8 | 231.8 | 107.7 | 50.1 | 442.1 | 178.6 | 84.2 |
| Construction Activity | 93.9 | 71.8 | 23.3 | 93.6 | 31.4 | 6.5 | 7.3 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 1,037.4 | 1.843.6 | 353.5 | 403.1 | 769.8 | 92.5 | 115.7 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 6,243.4 | 7,151.0 | 1,987.3 | 2,540.5 | 1,948.5 | 1,181.2 | 1,246.2 |

## TABLE XXXII-12

## AREA SOURCE EMISSIONS SUMMARY 1985 - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 145.2 | 186.6 | 88.4 | 129.6 | 158.6 | 45.0 | 47.6 |
| Commercial/Institutional Fuel | 19.2 | 69.8 | 8.6 | 13.8 | 97.3 | 3.1 | 8.4 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 5.0 | 4.3 | 1.3 | 2.6 | 2.2 | 0.6 | 0.5 |
| Open Burning | 4.2 | 5.7 | 1.0 | 2.5 | 1.9 | 0.5 | 0.5 |
| Highway Vehicles | 170.7 | 299.2 | 56.0 | 66.9 | 123.0 | 12.1 | 13.2 |
| Aircraft | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 44.3 | 64.8 | 21.0 | 14.7 | 34.3 | 0 | 0 |
| Vessels | 0.3 | 0 | 0 | 3.0 | 0 | 0 | 3.8 |
| Small Gasoline Engines | 0.3 | 0.4 | 0.1 | 0.2 | 0.1 | 0 | 0 |
| Agricultural Equipment | 4.0 | 21.3 | 17.6 | 12.5 | 18.5 | 10.4 | 2.2 |
| Construction Equipment | 3.7 | 2.6 | 1.3 | 3.1 | 1.3 | 0.4 | 0.6 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 396.9 | 655.2 | 195.3 | 248.9 | 437.2 | 72.1 | 76.8 |

## TABLE XXXII-13

## AREA SOURCE EMISSIONS SUMMARY 1985 - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 409.9 | 407.9 | 102.5 | 146.2 | 204.8 | 57.4 | 55.7 |
| Commercial/Institutional Fuel | 5.3 | 20.7 | 2.5 | 3.9 | 14.6 | 0.9 | 1.2 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 22.0 | 19.0 | 5.9 | 11.4 | 9.7 | 2.5 | 2.1 |
| Open Burning | 353.8 | 481.0 | 88.7 | 214.2 | 166.0 | 42.3 | 40.2 |
| Highway Vehicles | 9,513.8 | 18,079.5 | 3,204.2 | 3,520.2 | 6,470.7 | 1,037.5 | 892.9 |
| Aircraft | 0 | 365.0 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 101.1 | 147.9 | 47.9 | 33.5 | 109.4 | 0 | 0 |
| Vessels | 30.8 | 0 | 0 | 241.6 | 0 | 0 | 301.0 |
| Small Gasoline Engines | 227.1 | 323.4 | 59.7 | 119.1 | 106.6 | 28.9 | 29.6 |
| Agricultural Equipment | 509.6 | 779.0 | 645.5 | 823.3 | 2,371.0 | 960.8 | 812.8 |
| Construction Equipment | 128.2 | 177.5 | 144.2 | 99.2 | 108.5 | 43.7 | 69.0 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 9.6 | 13.7 | 2.5 | 5.0 | 4.5 | 1.2 | 1.2 |
| Wild Forest Fires | 19.6 | 26.8 | 18.9 | 12.0 | 25.0 | 12.6 | 9.5 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 11,330.8 | 20,841.4 | 4,322.9 | 5,229.6 | 9,590.8 | 2,187.8 | 2,215.2 |

## TABLE XXXII-14

## AREA SOURCE EMISSIONS SUMMARY 1985 - HYDROCARBONS (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 380.3 | 324.2 | 40.7 | 62.0 | 85.4 | 26.0 | 37.4 |
| Commercial/Institutional Fuel | 1.8 | 7.0 | 0.8 | 1.3 | 4.1 | 0.3 | 0.3 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 8.4 | 7.3 | 2.3 | 4.4 | 3.7 | 0.9 | 0.8 |
| Open Burning | 124.9 | 169.8 | 31.3 | 75.6 | 58.2 | 14.9 | 14.2 |
| Highway Vehicles | 1,210.0 | 2,260.1 | 408.5 | 454.1 | 842.6 | 126.3 | 119.2 |
| Aircraft | 0 | 12.2 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 73.1 | 106.8 | 34.7 | 24.2 | 79.1 | 0 | 0 |
| Vessels | 10.5 | 0 | 0 | 82.0 | 0 | 0 | 102.3 |
| Small Gasoline Engines | 32.0 | 45.6 | 8.4 | 16.8 | 15.0 | 4.1 | 4.2 |
| Agricultural Equipment | 42.0 | 106.5 | 87.5 | 69.0 | 180.1 | 79.7 | 53.2 |
| Construction Equipment | 9.0 | 10.5 | 7.8 | 7.2 | 6.3 | 2.4 | 3.5 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.8 | 1.1 | 0.2 | 0.4 | 0.4 | 0.1 | 0.1 |
| Wild Forest Fires | 3.4 | 4.6 | 3.2 | 2.1 | 4.3 | 2.2 | 1.6 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0.3 | 17.2 | 0 | 0 | 16.0 | 0 | 0 |
| Surface Coating | 225.1 | 450.5 | 63.3 | 127.5 | 112.4 | 28.1 | 29.4 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 67.6 | 131.4 | 15.4 | 44.5 | 29.9 | 9.9 | 10.1 |
| Asphalt Paving | 50.4 | 67.9 | 53.3 | 23.5 | 13.9 | 5.2 | 14.5 |
| TOTAL | 2,242.6 | 3,855.9 | 757.4 | 994.6 | 1,451.3 | 300.1 | 390.8 |

## TABLE XXXII-15

## AREA SOURCE EMISSIONS SUMMARY 1985 - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 117.4 | 125.9 | 26.7 | 45.0 | 45.3 | 13.2 | 18.1 |
| Commercial/Institutional Fuel | 23.0 | 89.5 | 10.8 | 16.7 | 38.6 | 3.9 | 2.8 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 5.8 | 5.0 | 1.6 | 3.0 | 2.5 | 0.6 | 0.6 |
| Open Burning | 25.0 | 34.0 | 6.3 | 15.1 | 11.6 | 3.0 | 2.8 |
| Highway Vehicles | 2,083.5 | 3,614.0 | 688.7 | 793.1 | 1,484.9 | 146.2 | 206.0 |
| Aircraft | 0 | 1.8 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 287.6 | 420.7 | 136.6 | 95.2 | 311.3 | 0 | 0 |
| Vessels | 3.3 | 0 | 0 | 26.4 | 0 | 0 | 33.0 |
| Small Gasoline Engines | 3.1 | 4.4 | 0.8 | 1.6 | 1.5 | 0.4 | 0.4 |
| Agricultural Equipment | 57.2 | 249.1 | 206.3 | 156.5 | 265.8 | 138.1 | 46.7 |
| Construction Equipment | 49.3 | 37.4 | 18.0 | 43.3 | 19.9 | 5.2 | 6.2 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.4 | 0.5 | 0.1 | 0.2 | 0.2 | 0 | 0 |
| Wild Forest Fires | 0.6 | 0.8 | 0.5 | 0.3 | 0.7 | 0.4 | 0.3 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2,656.2 | 4,583.1 | 1,096.4 | 1,196.4 | 2,182.3 | 311.0 | 316.9 |

## TABLE XXXII-16

## AREA SOURCE EMISSIONS SUMMARY 1995 - PARTICULATES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 130.1 | 109.3 | 19.8 | 29.7 | 38.8 | 11.6 | 13.0 |
| Commercial/Institutional Fuel | 2.6 | 9.5 | 1.2 | 1.8 | 6.1 | 0.4 | 0.5 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 25.0 | 15.0 | 5.3 | 11.3 | 8.5 | 2.4 | 1.9 |
| Open Burning | 96.3 | 113.3 | 19.6 | 50.8 | 36.3 | 10.1 | 8.8 |
| Highway Vehicles | 243.8 | 430.5 | 80.4 | 96.2 | 176.2 | 20.1 | 22.9 |
| Aircraft | 0 | 1.1 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 23.0 | 33.6 | 11.0 | 7.6 | 24.8 | 0 | 0 |
| Vessels | 1.3 | 0 | 0 | 10.0 | 0 | 0 | 12.5 |
| Small Gasoline Engines | 1.2 | 1.5 | 0.3 | 0.6 | 0.5 | 0.1 | 0.1 |
| Agricultural Equipment | 5.0 | 26.8 | 25.9 | 15.7 | 27.3 | 15.3 | 3.2 |
| Construction Equipment | 4.4 | 2.5 | 1.2 | 3.3 | 1.4 | 0.4 | 0.6 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 4.6 | 5.8 | 1.0 | 2.1 | 1.8 | 0.5 | 0.5 |
| Wild Forest Fires | 2.4 | 3.3 | 2.3 | 1.5 | 3.1 | 1.5 | 1.2 |
| Unpaved Roads | 4,615.8 | 4,764.9 | 1,347.8 | 1,785.8 | 407.9 | 845.8 | 979.7 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 52.3 | 199.3 | 107.7 | 43.1 | 442.1 | 178.6 | 84.2 |
| Construction Activity | 144.3 | 79.9 | 30.7 | 124.7 | 35.5 | 8.5 | 11.4 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 1,210.3 | 2,150.8 | 412.4 | 470.3 | 898.1 | 107.9 | 135.0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 6,562.4 | 7,947.1 | 2,066.6 | 2,654.5 | 2,108.4 | 1,203.2 | 1,275.5 |

## TABLE XXXII-17

## AREA SOURCE EMISSIONS SUMMARY 1995 - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 126.7 | 149.4 | 64.7 | 98.8 | 111.8 | 32.8 | 40.0 |
| Commercial/Institutional Fuel | 21.6 | 71.0 | 9.0 | 15.0 | 98.4 | 3.4 | 8.5 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 8.0 | 4.8 | 1.7 | 3.6 | 2.7 | 0.8 | 0.6 |
| Open Burning | 6.0 | 7.1 | 1.2 | 3.2 | 2.3 | 0.6 | 0.5 |
| Highway Vehicles | 195.9 | 347.8 | 66.3 | 80.8 | 147.1 | 16.2 | 17.6 |
| Aircraft | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 52.4 | 76.6 | 24.8 | 17.4 | 40.6 | 0 | 0 |
| Vessels | 0.3 | 0 | 0 | 3.1 | 0 | 0 | 4.0 |
| Small Gasoline Engines | 0.4 | 0.5 | 0.1 | 0.2 | 0.2 | 0 | 0 |
| Agricultural Equipment | 3.4 | 18.3 | 17.6 | 10.7 | 18.5 | 10.4 | 2.2 |
| Construction Equipment | 5.7 | 2.9 | 1.7 | 4.2 | 1.5 | 0.5 | 0.9 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 420.4 | 679.2 | 187.1 | 237.0 | 423.1 | 64.7 | 74.3 |

## TABLE XXX-18

## AREA SOURCE EMISSIONS SUMMARY 1995 - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 503.7 | 421.6 | 76.5 | 114.7 | 154.4 | 44.6 | 49.9 |
| Commercial/Institutional Fuel | 5.7 | 20.9 | 2.6 | 4.0 | 14.8 | 0.9 | 1.2 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 35.2 | 21.1 | 7.5 | 15.9 | 11.9 | 3.4 | 2.7 |
| Open Burning | 511.7 | 601.8 | 104.1 | 269.7 | 192.9 | 53.6 | 46.5 |
| Highway Vehicles | 7,486.7 | 14,101.2 | 2,471.8 | 2,725.1 | 5,005.3 | 852.5 | 710.0 |
| Aircraft | 0 | 551.9 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 119.5 | 174.7 | 56.6 | 39.5 | 129.3 | 0 | 0 |
| Vessels | 35.6 | 0 | 0 | 278.9 | 0 | 0 | 347.4 |
| Small Gasoline Engines | 320.6 | 409.7 | 68.8 | 147.8 | 123.6 | 36.3 | 33.7 |
| Agricultural Equipment | 438.2 | 669.7 | 645.5 | 707.8 | 2,371.0 | 960.8 | 812.8 |
| Construction Equipment | 197.1 | 197.6 | 190.2 | 132.2 | 125.4 | 56.8 | 107.7 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 13.5 | 17.3 | 2.9 | 6.2 | 5.2 | 1.5 | 1.4 |
| Wild Forest Fires | 19.6 | 26.8 | 18.9 | 12.0 | 25.0 | 12.6 | 9.5 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 9,687.1 | 17,214.3 | 3,645.4 | 4,453.8 | 8,158.8 | 2,023.0 | 2,122.8 |

## TABLE XXXII-19

## AREA SOURCE EMISSIONS SUMMARY 1995 - HYDROCARBONS (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 519.7 | 389.0 | 37.5 | 61.9 | 80.4 | 25.3 | 39.6 |
| Commercial/Institutional Fuel | 1.8 | 7.0 | 0.9 | 1.3 | 4.1 | 0.3 | 0.3 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 13.5 | 8.1 | 2.9 | 6.1 | 4.6 | 1.3 | 1.0 |
| Open Burning | 180.6 | 212.4 | 36.7 | 95.2 | 68.1 | 18.9 | 16.4 |
| Highway Vehicles | 903.2 | 1,692.2 | 299.6 | 332.9 | 616.3 | 101.4 | 86.7 |
| Aircraft | 0 | 18.3 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 86.4 | 126.2 | 41.1 | 28.6 | 93.5 | 0 | 0 |
| Vessels | 12.1 | 0 | 0 | 94.5 | 0 | 0 | 117.9 |
| Small Gasoline Engines | 45.2 | 57.7 | 9.7 | 20.8 | 17.4 | 5.1 | 4.7 |
| Agricultural Equipment | 36.1 | 91.6 | 87.5 | 59.4 | 180.1 | 79.7 | 53.2 |
| Construction Equipment | 13.8 | 11.7 | 10.2 | 9.6 | 7.3 | 3.1 | 5.4 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 1.1 | 1.4 | 0.2 | 0.5 | 0.4 | 0.1 | 0.1 |
| Wild Forest Fires | 3.4 | 4.6 | 3.2 | 2.1 | 4.3 | 2.2 | 1.6 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 4.6 | 190.5 | 0 | 0 | 18.5 | 0 | 0 |
| Surface Coating | 317.8 | 570.8 | 72.9 | 158.0 | 130.3 | 35.3 | 33.5 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 70.6 | 137.2 | 16.0 | 46.5 | 31.3 | 10.4 | 10.5 |
| Asphalt Paving | 58.8 | 79.2 | 62.2 | 27.4 | 16.2 | 6.0 | 16.9 |
| TOTAL | 2,268.7 | 3,518.7 | 680.6 | 944.8 | 1,272.8 | 289.1 | 387.8 |

## TABLE XXXII-20

## AREA SOURCE EMISSIONS SUMMARY 1995 - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | BULLITT | HARDIN | HENRY | OLDHAM | SHELBY | SPENCER | TRIMBLE |
|---|---|---|---|---|---|---|---|
| Residential Fuel | 140.0 | 137.6 | 26.5 | 45.8 | 45.1 | 13.3 | 18.3 |
| Commercial/Institutional Fuel | 24.5 | 90.2 | 11.0 | 17.4 | 39.3 | 4.0 | 2.9 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 9.3 | 5.6 | 2.0 | 4.2 | 3.1 | 0.9 | 0.7 |
| Open Burning | 36.1 | 42.5 | 7.3 | 19.0 | 13.6 | 3.8 | 3.3 |
| Highway Vehicles | 1,800.0 | 3,150.6 | 597.7 | 692.6 | 1,295.1 | 137.8 | 196.7 |
| Aircraft | 0 | 2.5 | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 339.9 | 497.2 | 161.4 | 112.6 | 367.9 | 0 | 0 |
| Vessels | 3.4 | 0 | 0 | 27.2 | 0 | 0 | 33.9 |
| Small Gasoline Engines | 4.4 | 5.6 | 0.9 | 2.0 | 1.7 | 0.5 | 0.5 |
| Agricultural Equipment | 49.2 | 214.1 | 206.3 | 194.5 | 265.8 | 138.1 | 46.7 |
| Construction Equipment | 75.8 | 41.6 | 23.8 | 57.7 | 22.9 | 6.8 | 9.6 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.6 | 0.7 | 0.1 | 0.3 | 0.2 | 0.1 | 0.1 |
| Wild Forest Fires | 0.6 | 0.8 | 0.5 | 0.3 | 0.7 | 0.4 | 0.3 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surface Coating | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Petroleum Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Asphalt Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2,483.8 | 4,189.0 | 1,037.5 | 1,113.6 | 2,055.4 | 305.7 | 313.0 |

TABLE XXXII-21

BASELINE YEAR AND PROJECTED EMISSION SUMMARY (tons/year)

| | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| BULLITT COUNTY | | | | |
| Particulates | 6,033.6 | 6,120.2 | 6,243.4 | 6,562.4 |
| Sulfur Dioxide | 379.4 | 389.9 | 396.9 | 420.4 |
| Carbon Monoxide | 18,950.3 | 16,498.6 | 11,330.8 | 9,687.1 |
| Hydrocarbons | 3,984.1 | 3,154.8 | 2,242.6 | 2,268.7 |
| Nitrogen Oxides | 2,875.5 | 2,918.7 | 2,656.2 | 2,483.8 |
| HARDIN COUNTY | | | | |
| Particulates | 7,343.6 | 7,420.3 | 7,151.0 | 7,947.1 |
| Sulfur Dioxide | 642.0 | 649.5 | 655.2 | 679.2 |
| Carbon Monoxide | 34,926.1 | 30,507.9 | 20,841.4 | 17,214.3 |
| Hydrocarbons | 7,086.6 | 5,547.0 | 3,855.9 | 3,518.7 |
| Nitrogen Oxides | 5,146.8 | 5,122.2 | 4,583.1 | 4,189.0 |
| HENRY COUNTY | | | | |
| Particulates | 1,925.4 | 2,155.1 | 1,987.3 | 2,066.6 |
| Sulfur Dioxide | 213.7 | 201.8 | 195.3 | 187.1 |
| Carbon Monoxide | 6,821.7 | 6,056.2 | 4,322.9 | 3,645.4 |
| Hydrocarbons | 1,387.1 | 1,093.5 | 757.4 | 680.6 |
| Nitrogen Oxides | 1,153.0 | 1,165.9 | 1,096.4 | 1,037.5 |
| OLDHAM COUNTY | | | | |
| Particulates | 2,458.7 | 2,498.1 | 2,540.5 | 2,654.5 |
| Sulfur Dioxide | 278.9 | 263.0 | 248.9 | 237.0 |
| Carbon Monoxide | 8,097.2 | 7,131.4 | 5,229.6 | 4,453.8 |
| Hydrocarbons | 1,660.0 | 1,349.8 | 994.6 | 944.8 |
| Nitrogen Oxides | 1,307.0 | 1,317.4 | 1,196.4 | 1,113.6 |
| SHELBY COUNTY | | | | |
| Particulates | 1,830.1 | 1,889.7 | 1,948.5 | 2,108.4 |
| Sulfur Dioxide | 477.2 | 456.4 | 437.2 | 423.1 |
| Carbon Monoxide | 14,856.2 | 13,284.5 | 9,590.8 | 8,158.8 |
| Hydrocarbons | 2,805.9 | 2,174.4 | 1,451.3 | 1,272.8 |
| Nitrogen Oxides | 2,326.0 | 2,389.7 | 2,182.3 | 2,055.4 |

TABLE XXXII-21 (Continued)

BASELINE YEAR AND PROJECTED EMISSION SUMMARY (tons/year)

| | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| SPENCER COUNTY | | | | |
| Particulates | 1,803.1 | 1,175.5 | 1,181.2 | 1,203.2 |
| Sulfur Dioxide | 89.3 | 80.0 | 72.1 | 64.7 |
| Carbon Monoxide | 3,003.0 | 2,818.3 | 2,187.8 | 2,023.0 |
| Hydrocarbons | 485.0 | 401.3 | 300.1 | 289.1 |
| Nitrogen Oxides | 355.6 | 346.5 | 311.0 | 305.7 |
| TRIMBLE COUNTY | | | | |
| Particulates | 1,224.6 | 1,237.1 | 1,246.2 | 1,275.5 |
| Sulfur Dioxide | 86.2 | 81.4 | 76.1 | 74.3 |
| Carbon Monoxide | 2,922.4 | 2,768.1 | 2,215.2 | 2.122.8 |
| Hydrocarbons | 587.3 | 500.2 | 390.8 | 387.8 |
| Nitrogen Oxides | 358.3 | 359.3 | 316.9 | 313.0 |
| FORT KNOX | | | | |
| Particulates | 9,627.7 | 9,627.7 | 9,627.7 | 9,627.7 |
| Sulfur Dioxide | 180.1 | 180.1 | 180.1 | 180.1 |
| Carbon Monoxide | 4,781.1 | 4,781.1 | 4,781.1 | 4,781.1 |
| Hydrocarbons | 863.9 | 863.9 | 863.9 | 863.9 |
| Nitrogen Oxides | 856.8 | 856.8 | 856.8 | 856.8 |
| JEFFERSON COUNTY | | | | |
| Particulate | 17,436.4 | 19,081.2 | 19,636.7 | 22,353.5 |
| Sulfur Dioxide | 3,200.0 | 3,494.2 | 3,720.0 | 4,196.0 |
| Carbon Monoxide | 205,126.7 | 171,326.0 | 122,124.5 | 101,019.7 |
| Hydrocarbons | 41,069.3 | 30,782.2 | 21,829.0 | 19,823.6 |
| Nitrogen Oxides | 31,265.5 | 30,592.8 | 28,388.8 | 26,620.8 |

TABLE XXXII-21 (Continued)

BASELINE YEAR AND PROJECTED EMISSION SUMMARY (tons/year)

| | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|
| FLOYD COUNTY | | | | |
| Particulates | 1,450.4 | 1,510.2 | 1,560.9 | 1,715.4 |
| Sulfur Dioxide | 288.3 | 316.2 | 331.5 | 370.5 |
| Carbon Monoxide | 13,191.7 | 11,083.9 | 8,030.6 | 6,670.2 |
| Hydrocarbons | 3,407.3 | 2,599.1 | 1,888.6 | 1,760.1 |
| Nitrogen Oxides | 1,870.3 | 1,887.0 | 1,805.4 | 1,776.8 |
| CLARK COUNTY | | | | |
| Particulates | 10,181.9 | 10,323.8 | 10,495.3 | 10,878.4 |
| Sulfur Dioxide | 852.1 | 1,102.5 | 1,383.8 | 1,935.4 |
| Carbon Monoxide | 34,731.4 | 29,105.5 | 20,866.4 | 17,185.7 |
| Hydrocarbons | 7,046.8 | 5,232.3 | 3,630.0 | 3,282.7 |
| Nitrogen Oxides | 6,097.5 | 6,267.9 | 6,278.5 | 6,702.7 |
| AREA TOTAL | | | | |
| Particulates | 60,671.6 | 63,038.9 | 63,618.7 | 68,392.7 |
| Sulfur Dioxide | 6,687.2 | 7,215.0 | 7,697.8 | 8,767.8 |
| Carbon Monoxide | 347,407.8 | 295,361.5 | 211,521.1 | 176,961.9 |
| Hydrocarbons | 66,976.0 | 53,698.5 | 38,202.2 | 35,092.8 |
| Nitrogen Oxides | 53,612.3 | 53,224.2 | 49,671.8 | 47,455.1 |

# APPENDIX A

# JEFFERSON, FLOYD, AND CLARK COUNTIES

# 1973 EMISSION INVENTORY

# APPENDIX A

## JEFFERSON, FLOYD, AND CLARK COUNTIES
## 1973 EMISSION INVENTORY

Tables A-1 and A-2, taken from the report of the Louisville Air Quality Maintenance Planning and Analysis summarize the 1973 emission inventory for TSP and $SO_2$. Tables A-3 through A-5 summarize the 1973 emission inventory for CO, HC, and $NO_x$.

In expanding the earlier inventory to include the three new pollutants, the same baseline year data were used with the AP-42 emission factor appropriate to the pollutant. The following additional assumptions were made:

- Industrial and Commercial/Institutional Fuel - In calculating $NO_x$ emissions from residual oil burned, all units were assumed to be horizontally fired.
- Railroad Locomotive Emissions - The same emission factor was used for both railyard and road-haul operations.
- In calculating gasoline farm tractor hydrocarbon emissions, both the exhaust and crankcase emission factors were added together and entered as one factor.

TABLE A-1

1973 AREA SOURCE PARTICULATE EMISSIONS SUMMARY

(tons/year)

| SOURCE CATEGORY | JEFFERSON | FLOYD | CLARK |
|---|---|---|---|
| 1. Residential Fuel | 305.8 | 48.3 | 48.5 |
| 2. Industrial Fuel | 0 | 22.2 | 61.2 |
| 3. C & I Fuel | 409.4 | 15.1 | 45.8 |
| 4. Internal Fuel Combustion | 0.6 | 0 | 0 |
| 5. Agricultural Equipment | 13.1 | 3.5 | 8.5 |
| 6. Small Gasoline Engines | 50.4 | 4.0 | 5.7 |
| 7. Construction Equipment | 166.9 | 3.0 | 2.7 |
| 8. Railroad Locomotives | 50.1 | 13.3 | 16.7 |
| 9. Vessels | 22.2 | 6.2 | 20.8 |
| 10. LDV | 1,986.6 | 86.1 | 212.8 |
| 11. HDGV | 368.7 | 14.9 | 39.4 |
| 12. HDDV | 198.3 | 8.1 | 21.2 |
| 13. Aircraft | 29.1 | 0 | 0.1 |
| 14. On-Site Incineration | 64.7 | 8.7 | 12.4 |
| 15. Open Burning | 680.0 | 41.8 | 1,589.5 |
| 16. Structural Fires | 22.3 | 3.2 | 3.3 |
| 17. Frost Control | 0 | 0 | 0 |
| 18. Slash Burning | 0 | 0 | 0 |
| 19. Wild Forest Fires | 1.5 | 0 | 0 |
| 20. Agricultural Burning | 0 | 0 | 0 |
| 21. Unpaved Roads | 1,681.9 | 1,217.1 | 7,585.5 |
| 22. Unpaved Airstrips | 0 | 0 | 2.5 |
| 23. Tilling Activity | 65.3 | 31.0 | 222.8 |
| 24. Mineral Processing | 0 | 0 | 0 |
| 25. Construction Activity | 457.3 | 10.8 | 17.3 |
| 26. Windblown Dust | 6.7 | 0 | 0 |
| 27. Small Point Sources | 186.0 | 131.0 | 61.5 |
| 28. Paved Roads | 4,769.8 | 203.8 | 510.6 |
| TOTAL | 11,536.7 | 1,872.1 | 10,488.8 |

TABLE A-2

1973 AREA SOURCE SULFUR DIOXIDE EMISSIONS SUMMARY

(tons/year)

| SOURCE CATEGORY | JEFFERSON | FLOYD | CLARK |
|---|---|---|---|
| 1. Residential Fuel | 497.4 | 89.5 | 82.6 |
| 2. Industrial Fuel | 0 | 53.7 | 246.9 |
| 3. C&I Fuel | 703.1 | 30.7 | 122.5 |
| 4. Internal Fuel Combustion | 23.7 | 0 | 0 |
| 5. Agricultural Equipment | 9.0 | 2.4 | 5.7 |
| 6. Small Gasoline Engines | 23.7 | 2.0 | 2.7 |
| 7. Construction Equipment | 199.2 | 3.6 | 3.2 |
| 8. Railroad Locomotives | 98.0 | 26.0 | 32.6 |
| 9. Vessels | 6.6 | 1.8 | 6.1 |
| 10. LDV | 478.3 | 20.7 | 51.2 |
| 11. HDGV | 100.7 | 4.1 | 10.7 |
| 12. HDDV | 260.6 | 10.6 | 27.9 |
| 13. Aircraft | 46.3 | 0 | 0.1 |
| 14. On-Site Incineration | 17.1 | 3.1 | 4.4 |
| 15. Open Burning | 0 | 2.6 | 3.7 |
| 16. Structural Fires | 0 | 0 | 0 |
| 17. Frost Control | 0 | 0 | 0 |
| 18. Slash Burning | 0 | 0 | 0 |
| 19. Wild Forest Fires | 0 | 0 | 0 |
| 20. Agricultural Burning | 0 | 0 | 0 |
| 21. Unpaved Roads | 0 | 0 | 0 |
| 22. Unpaved Airstrips | 0 | 0 | 0 |
| 23. Tilling Activity | 0 | 0 | 0 |
| 24. Mineral Processing | 0 | 0 | 0 |
| 25. Construction Activity | 0 | 0 | 0 |
| 26. Windblown Dust | 0 | 0 | 0 |
| 27. Small Point Sources | 61.0 | 0 | 0 |
| 28. Paved Roads | 0 | 0 | 0 |
| TOTAL | 2,501.0 | 250.8 | 600.3 |

TABLE A-3

1973 AREA SOURCE CARBON MONOXIDE EMISSIONS SUMMARY

(tons/year)

| SOURCE CATEGORY | JEFFERSON | FLOYD | CLARK |
|---|---|---|---|
| 1. Residential Fuel | 763.5 | 84.6 | 70.4 |
| 2. Industrial Fuel | 0 | 7.8 | 35.4 |
| 3. C & I Fuel | 333.7 | 11.9 | 25.2 |
| 4. Internal Fuel Combustion | 0 | 0 | 0 |
| 5. Agricultural Equipment | 601.1 | 455.5 | 1,115.4 |
| 6. Small Gasoline Engines | 18,223.3 | 1,446.4 | 2,061.0 |
| 7. Construction Equipment | 608.8 | 10.9 | 9.7 |
| 8. Railroad Locomotives | 259.9 | 69.4 | 86.9 |
| 9. Vessels | 191.6 | 53.7 | 179.8 |
| 10. LDV | 262,329.1 | 11,353.2 | 28,081.2 |
| 11. HDGV | 60,867.6 | 2,478.2 | 6,467.6 |
| 12. HDDV | 2,671.2 | 108.7 | 286.0 |
| 13. Aircraft | 4,075.4 | 0 | 55.7 |
| 14. On-Site Incineration | 25.4 | 35.4 | 24.8 |
| 15. Open Burning | 2,000.0 | 221.8 | 4,816.1 |
| 16. Structural Fires | 65.5 | 9.5 | 9.6 |
| 17. Frost Control | 0 | 0 | 0 |
| 18. Slash Burning | 0 | 0 | 0 |
| 19. Wild Forest Fires | 12.6 | 0 | 0 |
| 20. Agricultural Burning | 0 | 0 | 0 |
| 21. Unpaved Roads | 0 | 0 | 0 |
| 22. Unpaved Airstrips | 0 | 0 | 0 |
| 23. Tilling Activity | 0 | 0 | 0 |
| 24. Mineral Processing | 0 | 0 | 0 |
| 25. Construction Activity | 0 | 0 | 0 |
| 26. Windblown Dust | 0 | 0 | 0 |
| 27. Small Point Sources | 10.7 | 0 | 0 |
| 28. Paved Roads | 0 | 0 | 0 |
| TOTAL | 353,039.4 | 16,347.0 | 43,324.8 |

TABLE A-4

1973 AREA SOURCE HYDROCARBONS EMISSIONS SUMMARY

(tons/year)

| SOURCE CATEGORY | JEFFERSON | FLOYD | CLARK |
|---|---|---|---|
| 1. Residential Fuel | 317.9 | 55.5 | 48.3 |
| 2. Industrial Fuel | 0 | 4.5 | 11.2 |
| 3. C & I Fuel | 113.2 | 4.0 | 7.7 |
| 4. Internal Fuel Combustion | 0 | 0 | 0 |
| 5. Agricultural Equipment | 47.8 | 28.6 | 70.0 |
| 6. Small Gasoline Engines | 2,110.3 | 167.5 | 238.7 |
| 7. Construction Equipment | 185.4 | 3.3 | 3.0 |
| 8. Railroad Locomotives | 188.7 | 50.2 | 62.7 |
| 9. Vessels | 22.4 | 6.3 | 21.0 |
| 10. LDV | 27,226.3 | 1,178.3 | 2,914.5 |
| 11. HDGV | 7,412.6 | 301.8 | 787.6 |
| 12. HDDV | 428.1 | 17.5 | 45.8 |
| 13. Aircraft | 652.3 | 0 | 1.8 |
| 14. On-Site Incineration | 19.8 | 26.6 | 18.7 |
| 15. Open Burning | 160.0 | 78.3 | 471.6 |
| 16. Structural Fires | 5.2 | 0.8 | 0.8 |
| 17. Frost Control | 0 | 0 | 0 |
| 18. Slash Burning | 0 | 0 | 0 |
| 19. Wild Forest Fires | 2.2 | 0 | 0 |
| 20. Agricultural Burning | 0 | 0 | 0 |
| 21. Unpaved Roads | 0 | 0 | 0 |
| 22. Unpaved Airstrips | 0 | 0 | 0 |
| 23. Tilling Activity | 0 | 0 | 0 |
| 24. Mineral Processing | 0 | 0 | 0 |
| 25. Construction Activity | 0 | 0 | 0 |
| 26. Windblown Dust | 0 | 0 | 0 |
| 27. Small Point Sources | 2.1 | 0 | 0 |
| 28. Paved Roads | 0 | 0 | 0 |
| TOTAL | 38.894.3 | 1,923.2 | 4,703.4 |

TABLE A-5

1973 AREA SOURCE NITROGEN OXIDES EMISSIONS SUMMARY

(tons/year)

| | SOURCE CATEGORY | JEFFERSON | FLOYD | CLARK |
|---|---|---|---|---|
| 1. | Residential Fuel | 1,288.3 | 112.2 | 132.7 |
| 2. | Industrial Fuel | 0 | 135.5 | 450.5 |
| 3. | C & I Fuel | 1,451.1 | 64.3 | 145.8 |
| 4. | Internal Fuel Combustion | 36.9 | 0 | 0 |
| 5. | Agricultural Equipment | 112.6 | 38.7 | 112.2 |
| 6. | Small Gasoline Engines | 193.2 | 15.3 | 21.9 |
| 7. | Construction Equipment | 2,602.6 | 46.8 | 41.5 |
| 8. | Railroad Locomotives | 742.5 | 197.6 | 247.1 |
| 9. | Vessels | 77.1 | 21.7 | 64.0 |
| 10. | LDV | 16,188.6 | 700.6 | 1,732.9 |
| 11. | HDGV | 2,573.4 | 104.8 | 273.4 |
| 12. | HDDV | 1,945.2 | 79.1 | 208.3 |
| 13. | Aircraft | 378.1 | 0 | 0.2 |
| 14. | On-Site Incineration | 18.2 | 3.5 | 2.5 |
| 15. | Open Burning | 80.0 | 15.7 | 202.3 |
| 16. | Structural Fires | 2.6 | 0.4 | 0.4 |
| 17. | Frost Control | 0 | 0 | 0 |
| 18. | Slash Burning | 0 | 0 | 0 |
| 19. | Wild Forest Fires | 0.4 | 0 | 0 |
| 20. | Agricultural Burning | 0 | 0 | 0 |
| 21. | Unpaved Roads | 0 | 0 | 0 |
| 22. | Unpaved Airstrips | 0 | 0 | 0 |
| 23. | Tilling Activity | 0 | 0 | 0 |
| 24. | Mineral Processing | 0 | 0 | 0 |
| 25. | Construction Activity | 0 | 0 | 0 |
| 26. | Windblown Dust | 0 | 0 | 0 |
| 27. | Small Point Sources | 47.3 | 0 | 0 |
| 28. | Paved Roads | 0 | 0 | 0 |
| | TOTAL | 27,738.1 | 1,536.2 | 3,635.7 |

# APPENDIX B

## JEFFERSON, FLOYD, AND CLARK COUNTIES

## 1975 EMISSION INVENTORY UPDATE AND PROJECTION

## APPENDIX B

## JEFFERSON, FLOYD AND CLARK COUNTIES
## 1975 EMISSION INVENTORY UPDATE AND PROJECTION

Source categories being considered in this appendix are listed below. These categories include 12 which were updated from the 1973 inventory and the five new hydrocarbon sources. The 1973 inventory and projections were used for all other source categories.

1. Residential Fuel
2. Commercial/Institutional Fuel
3. Open Burning
4. Highway Vehicles
5. Aircraft
6. Railroad Locomotives
7. Small Gasoline Engines
8. Agricultural Equipment
9. Construction Equipment
10. Unpaved Roads
11. Construction Activity
12. Paved Roads
13. Dry Cleaning
14. Surface Coating
15. Petroleum Storage
16. Marketing of Petroleum
17. Asphalt Paving

Unless otherwise stated, emission factors and procedures discussed in the basic report for the seven outlying counties were applied to the SMSA counties. Allocation of emissions for the 12 old source categories was made proportional to the distribution of emissions by source category in the LAQMP. Procedures for allocation of the new hydrocarbon sources are defined for each category.

RESIDENTIAL FUEL

The results of the fuel use survey showed that $3.149 \times 10^{13}$ Btu were used for residentail heating in 1975, a reduction of 0.8% from 1973. At the same per capita rate, Floyd County required $0.255 \times 10^{13}$ Btu and Clark County $0.363 \times 10^{13}$ Btu. The fuel use distribution update by fuel type is summarized in Table B-1.

TABLE B-1

1975 ESTIMATED TOTAL RESIDENTIAL FUEL USE

BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS[1] ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL[2] (1000 gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Jefferson | 28,285 | 6,202 | 10,586 | 7,628 | 3,421 |
| Floyd | 1,461 | 3,088 | 3,892 | 472 | 1,189 |
| Clark | 1,784 | 4,585 | 4,177 | 150 | 1,020 |

(1) As reported by the Louisville Gas and Electric Company and by the Indiana Gas Company.

(2) 1973 fuel oil usage factored by 1.02, as determined by the fuel oil survey.

Emissions were updated using the revised fuel type distribution and new emission factors from AP-42, Revision 6.

Emissions were projected using the same assumptions found in Chapter V except that a split of 10% distillate oil and 90% electric for new hookups was used. The projected fuel type distributions are shown in Tables B-2 through B-4.

TABLE B-2

1980 ESTIMATED TOTAL RESIDENTIAL FUEL USE

BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS[1] ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL[2] (1000 gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Jefferson | 28,285 | 6,202 | 13,406 | 6,057 | 3,681 |
| Floyd | 1,461 | 3,088 | 4,460 | 375 | 1,313 |
| Clark | 1,784 | 4,585 | 4,893 | 119 | 1,167 |

TABLE B-3

1985 ESTIMATED TOTAL RESIDENTIAL FUEL USE

BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS[1] ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL[2] (1000 gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Jefferson | 28,285 | 6,202 | 15,185 | 4,813 | 3,944 |
| Floyd | 1,461 | 3,088 | 4,640 | 298 | 1,438 |
| Clark | 1,784 | 4,585 | 5,137 | 95 | 1,287 |

TABLE B-4

1995 ESTIMATED TOTAL RESIDENTIAL FUEL USE

BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS[1] ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL[2] (1000 gal) | COAL (tons) | WOOD (tons) |
|---|---|---|---|---|---|
| Jefferson | 28,285 | 6,202 | 18,708 | 3,036 | 4,468 |
| Floyd | 1,461 | 3,088 | 5,021 | 188 | 1,703 |
| Clark | 1,784 | 4,585 | 5,652 | 60 | 1,541 |

(1) As reported by the Louisville Gas and Electric Company and by the Indiana Gas Company.

(2) 1973 fuel oil usage factored by 1.02, as determined by the fuel oil survey.

COMMERCIAL/INSTITUTIONAL FUEL

The results of the fuel survey found a 2.9% decrease in the commercial/institutional use of natural gas and a 0.3% decrease in the use of distillate oil from 1973 to 1975. A similar 0.3% reduction may be assumed for residual oil usage. The fuel use distribution update by fuel type is summarized in Table B-5.

TABLE B-5

1975 ESTIMATED TOTAL COMMERCIAL/INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL (1000 gal) | RESIDUAL OIL (1000 gal) | COAL (tons) |
|---|---|---|---|---|---|
| Jefferson | 18,335 | 514 | 22,909 | 396 | 17,210 |
| Floyd | 775 | 151 | 1,360 | 20 | 94 |
| Clark | 1,240 | 229 | 3,766 | 858 | 150 |

Emissions were updated using the revised fuel type distribution and new emission factors from AP-42 Revision 6.

Emissions were projected using the same assumptions found in Chapter VI except that a split of 10% oil and 90% electric for new hookups was used. The projected fuel type distributions are shown in Tables B-6 through B-8.

TABLE B-6

1980 ESTIMATED TOTAL COMMERCIAL/INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL (1000 gal) | RESIDUAL OIL (1000 gal) | COAL (tons) |
|---|---|---|---|---|---|
| Jefferson | 18,335 | 514 | 25,925 | 444 | 17,210 |
| Floyd | 775 | 151 | 1,493 | 21 | 94 |
| Clark | 1,240 | 229 | 3,920 | 889 | 150 |

TABLE B-7

1985 ESTIMATED TOTAL COMMERCIAL/INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL (1000 gal) | RESIDUAL OIL (1000 gal) | COAL (tons) |
|---|---|---|---|---|---|
| Jefferson | 18,335 | 514 | 27,599 | 471 | 17,210 |
| Floyd | 775 | 151 | 1,571 | 22 | 94 |
| Clark | 1,240 | 229 | 4,037 | 915 | 150 |

TABLE B-8

1995 ESTIMATED TOTAL COMMERCIAL/INSTITUTIONAL FUEL USE BY COUNTY AND FUEL TYPE

| COUNTY | NATURAL GAS ($10^6$ ft$^3$) | LPG (1000 gal) | DISTILLATE OIL (1000 gal) | RESIDUAL OIL (1000 gal) | COAL (tons) |
|---|---|---|---|---|---|
| Jefferson | 18,335 | 514 | 31,189 | 529 | 17,210 |
| Floyd | 775 | 151 | 1,737 | 25 | 94 |
| Clark | 1,240 | 229 | 4,288 | 968 | 150 |

## OPEN BURNING

Emissions from open burning for Floyd and Clark Counties were updated using revised population estimates and projections. No open burning is permitted in Jefferson County.

## HIGHWAY VEHICLES

The SAPOLLUT transportation model utilized for the LAQMP has not been updated since that project was completed. VMT data taken from the report of that project are summarized in Table B-9. It should be noted that the

1973 through 1985 values are linearly interpolated between the 1970 base year and the 1995 projection year.

TABLE B-9

SAPOLLUT MODEL RESULTS ($10^6$ VMT)

| CLASSIFICATION | 1970 | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|---|
| Freeway | 1059 | 1315 | 1486 | 1913 | 2339 | 3193 |
| Arterial | 1786 | 1866 | 1920 | 2054 | 2188 | 2456 |
| Local | 939 | 1050 | 1124 | 1309 | 1494 | 1863 |
| TOTAL | 3784 | 4231 | 4530 | 5276 | 6021 | 7512 |
| GROWTH FACTOR | 0.84 | 0.93 | 1.00 | 1.16 | 1.33 | 1.66 |

An updated estimate of 1975 VMT for the SMSA was provided by KIPDA. This estimate included both the traditional historical data and a 0.3% adjustment for VMT not assigned to the historical data. In addition, suggested vehicle speeds, cold starts, and distribution of VMT among road classes were provided. These KIPDA data are summarized in Table B-10, with VMT for each road classification distributed among vehicle types in accordance with Table X-1.

The VMT split between the two weight categories of light duty gasoline powered trucks was based on the average national weighting distribution by sales of the two categories.

With the computed emission factors discussed in Chapters X and the above traffic data, the 1975 highway vehicle emissions were calculated and summarized in Table B-11.

The Louisville SMSA highway vehicle TSP and $SO_2$ emissions were distributed to Jefferson County in Kentucky and Clark and Floyd Counties in Indiana in accordance with the distribution of TSP and $SO_2$ emissions in the previous LAQMP analysis studies, while the HC, CO, and $NO_x$ emissions were distributed in accordance with the SAPOLLUT emissions data.

TABLE B-10

1975 SMSA TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Starts (LDGV) | 0 | 25 | 20 | |
| % Stabilized (LDGV) | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 1,046 | 1,373 | 780 | 3,199 |
| $LDGT_1$ VMT ($10^6$) | 176 | 234 | 133 | 543 |
| $LDGT_2$ VMT ($10^6$) | 70 | 93 | 53 | 216 |
| LDDV VMT ($10^6$) | 61 | 81 | 48 | 190 |
| HDGV VMT ($10^6$) | 16 | 20 | 16 | 52 |
| HDDV VMT ($10^6$) | 113 | 149 | 80 | 342 |
| TOTAL VMT ($10^6$) | 1,482 | 1,950 | 1,110 | 4,542 |

TABLE B-11

1975 LOUISVILLE SMSA HIGHWAY VEHICLE EMISSIONS

| LOUISVILLE SMSA | PARTICULATE (tons/yr) | SULFUR DIOXIDE | HYDRO-CARBON | CARBON MONOXIDE | NITROGEN OXIDES |
|---|---|---|---|---|---|
| Jefferson | 2,817.8 | 1,556.8 | 33,745.5 | 195,179.3 | 24,874.0 |
| Clark | 314.2 | 173.4 | 6,035.1 | 32,330.3 | 4,606.3 |
| Floyd | 117.8 | 64.5 | 2,720.0 | 11,974.2 | 1,282.4 |
| TOTAL | 3,249.8 | 1,794.7 | 42,500.6 | 239,483.8 | 30,708.7 |

VMT was projected using the same assumptions found in Chapter X and the results are summarized in Table B-12 through B-14.

TABLE B-12

1980 SMSA TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Starts (LDGV) | 10 | 25 | 40 | |
| % Hot Start (LDGV) | 0 | 25 | 20 | |
| % Stabilized (LDGV) | 90 | 50 | 40 | |
| LDGA VMT ($10^6$) | 1,151 | 1,510 | 858 | 3,519 |
| $LDGT_1$ VMT ($10^6$) | 194 | 257 | 146 | 597 |
| $LDGT_2$ VMT ($10^6$) | 77 | 102 | 58 | 237 |
| LDDV VMT ($10^6$) | 67 | 89 | 53 | 209 |
| HDGV VMT ($10^6$) | 18 | 22 | 18 | 58 |
| HDDV VMT ($10^6$) | 124 | 164 | 88 | 376 |
| TOTAL | 1,631 | 2,144 | 1,221 | 4,996 |

TABLE B-13

1985 SMSA TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Start (LDGV) | 10 | 25 | 40 | |
| % Hot Start (LDGV) | 0 | 25 | 20 | |
| % Stabilized (LDGV) | 90 | 50 | 40 | |
| LDGV VMT ($10^6$) | 1,255 | 1,648 | 936 | 3,839 |
| $LDGT_1$ VMT ($10^6$) | 211 | 281 | 160 | 652 |
| $LDGT_2$ VMT ($10^6$) | 84 | 112 | 64 | 260 |
| LDDV VMT ($10^6$) | 73 | 97 | 58 | 228 |
| HDGV VMT ($10^6$) | 19 | 24 | 19 | 62 |
| HDDV VMT ($10^6$) | 136 | 179 | 96 | 411 |
| TOTAL | 1,778 | 2,341 | 1,333 | 5,452 |

TABLE B-14

1995 SMSA TRAFFIC DATA

| | FREEWAY | ARTERIAL | LOCAL | TOTAL |
|---|---|---|---|---|
| Speed | 54 | 35 | 25 | |
| % Cold Start (LDGV) | 10 | 25 | 40 | |
| % Hot Start (LDGV) | 0 | 25 | 20 | |
| % Stabilized (LDGV) | 90 | 50 | 40 | |
| LDGV VMT ($10^6$) | 1,464 | 1,922 | 1,092 | 4,478 |
| $LDGT_1$ VMT ($10^6$) | 246 | 328 | 186 | 760 |
| $LDGT_2$ VMT ($10^6$) | 98 | 130 | 74 | 302 |
| LDDV VMT ($10^6$) | 85 | 113 | 67 | 265 |
| HDGV VMT ($10^6$) | 22 | 28 | 22 | 72 |
| HDDV VMT ($10^6$) | 158 | 209 | 112 | 479 |
| TOTAL | 2,073 | 2,730 | 1,553 | 6,356 |

With the projected HC, CO, $NO_x$, particulate, and the unchanging emission factors discussed in Chapter X and with the projected VMT contained in Table B-12 through B-14, the projected highway vehicle emissions were calculated and summarized in Table B-24 through B-38.

The projected highway emissions were allocated to the subcounty study area using the same allocation techniques discussed for the baseline year.

AIRCRAFT

Emissions from aircraft operating from Staniford and Bowman Field were updated using the 1975 edition of the FAA Air Traffic Activity Report. No change in equipment mix was apparent. The operator of HAP's airport reported little change in operating tempo from 1973 to 1975. The 1975 operating data and emissions are summarized in Table B-15. Projected emissions are expected to follow the growth in FAA Terminal Area Forecasts and are not changed from the LAQMP.

TABLE B-15

1975 AIRCRAFT OPERATIONS AND EMISSIONS

| | Operations/ Year | No. of Engines | LTOs | Particulates | | Sulfur Dioxide | | Carbon Monoxide | | Hydrocarbons | | Nitrogen Oxides | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | EF (lbs/LTO-eng.) | Emissions (lbs/yr.) | EF (lbs/LTO-eng.) | Emissions (lbs/yr.) | EF (lb/LTO-eng.) | Emissions (lbs/yr.) | EF (lb/LTO-eng.) | Emissions (lbs/yr.) | EF lb/LTO-eng.) | Emissions (lbs/yr.) |
| STANDIFORD AIRPORT | | | | | | | | | | | | | |
| Air Carrier | 65,046 | | | | | | | | | | | | |
| Jumbo Jet | | 4 | 0 | 1.30 | 0 | 1.82 | 0 | 46.8 | 0 | 12.2 | 0 | 31.4 | 0 |
| Long-Range Jet | | 4 | 650 | 1.21 | 3,146 | 1.56 | 4,056 | 47.4 | 123,240 | 41.2 | 107,120 | 7.9 | 20,540 |
| Medium-Range Jet | | 2.26 | 27,970 | 0.41 | 25,917 | 1.01 | 63,844 | 17.0 | 1,074,607 | 4.9 | 309,740 | 10.2 | 644,764 |
| Turbo-Prop | | 2 | 3,903 | 1.10 | 8,587 | 0.40 | 3,122 | 6.6 | 51,520 | 2.9 | 22,637 | 2.5 | 19,515 |
| Air Taxi | 5,717 | | | | | | | | | | | | |
| Piston Transport | | 1.5 | 953 | 0.56 | 800 | 0.28 | 400 | 304.0 | 434,568 | 40.7 | 58,181 | 0.40 | 572 |
| Turbo-Prop | | 2 | 1,906 | 0.20 | 762 | 0.18 | 686 | 3.1 | 11,817 | 1.1 | 4,193 | 1.2 | 4,574 |
| *Military* | *6,196* | | | | | | | | | | | | |
| Piston | | 1 | 929 | 0.28 | 260 | 0.14 | 130 | 152.0 | 141,208 | 20.4 | 18,952 | 0.20 | 186 |
| Jet | | 2 | 2,169 | 0.31 | 1,345 | 0.76 | 3,297 | 15.1 | 65,504 | 9.93 | 43,076 | 3.29 | 14,272 |
| General Aviation | 51,167 | | | | | | | | | | | | |
| Business Jet | | 2 | 2,558 | 0.11 | 563 | 0.37 | 1,893 | 15.8 | 80,833 | 3.6 | 18,418 | 1.6 | 8,186 |
| Turbo-Prop | | 2 | 1,279 | 0.20 | 512 | 0.18 | 461 | 3.1 | 7,930 | 1.1 | 2,814 | 1.2 | 3,070 |
| Piston Transport | | 2 | 1,279 | 0.56 | 1,433 | 0.28 | 716 | 304.0 | 777,632 | 40.7 | 104,111 | 0.40 | 1,023 |
| Helicopter | | 1 | 256 | 0.25 | 64 | 0.18 | 46 | 5.7 | 1,459 | 0.52 | 133 | 0.57 | 146 |
| Piston | | 1 | 20,211 | 0.02 | 404 | 0.014 | 283 | 12.2 | 246,574 | 0.4 | 8,084 | 0.047 | 950 |
| TOTAL STANDIFORD AIRPORT | | | | | 43,793 | | 78,934 | | 3,016,892 | | 697,459 | | 717,798 |

TABLE B-15 (Continued)

1975 AIRCRAFT OPERATIONS AND EMISSIONS

| | Operations/ Year | No. of Engines | LTOs | Particulates EF (lbs/LTO-eng.) | Particulates Emissions (lbs/yr.) | Sulfur Dioxide EF (lbs/LTO-eng.) | Sulfur Dioxide Emissions (lbs/yr.) | Carbon Monoxide EF (lbs/LTO-eng.) | Carbon Monoxide Emissions (lbs/yr.) | Hydrocarbons EF (lb/LTO-eng.) | Hydrocarbons Emissions (lbs/yr.) | Nitrogen Oxides EF (lb/LTO-eng.) | Nitrogen Oxides Emissions (lbs/yr.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BOWMAN FIELD | | | | | | | | | | | | | |
| Air Carrier | 69 | | | | | | | | | | | | |
| Jumbo Jet | | 4 | 0 | 1.30 | 0 | 1.82 | 0 | 46.8 | 0 | 12.2 | 0 | 31.4 | 0 |
| Long-Range Jet | | 4 | 0 | 1.21 | 0 | 1.56 | 0 | 47.4 | 0 | 41.2 | 0 | 7.9 | 0 |
| Medium-Range Jet | | 2.26 | 30 | 0.41 | 28 | 1.01 | 68 | 17.0 | 1,153 | 4.9 | 332 | 10.2 | 692 |
| Turbo-Prop | | 2 | 4 | 1.10 | 9 | 0.40 | 3 | 6.6 | 53 | 2.9 | 23 | 2.5 | 20 |
| Air Taxi | 2,134 | | | | | | | | | | | | |
| Piston Transport | | 1.5 | 356 | 0.56 | 299 | 0.28 | 150 | 304.0 | 162,336 | 40.7 | 21,734 | 0.40 | 213 |
| Turbo-Prop | | 2 | 711 | 0.20 | 284 | 0.18 | 256 | 3.1 | 4,408 | 1.1 | 1,564 | 1.2 | 1,706 |
| Military | 1,385 | | | | | | | | | | | | |
| Piston | | 1 | 138 | 0.28 | 39 | 0.14 | 19 | 152.0 | 20,976 | 20.4 | 2,815 | 0.20 | 28 |
| Helicopter | | 1 | 554 | 0.25 | 139 | 0.18 | 100 | 5.7 | 3,158 | 0.52 | 288 | 0.57 | 316 |
| General Aviation | 240,463 | | | | | | | | | | | | |
| Business Jet | | 2 | 12,023 | 0.11 | 2,645 | 0.37 | 8,897 | 15.8 | 379,927 | 3.6 | 86,566 | 1.6 | 38,474 |
| Turbo-Prop | | 2 | 6,012 | 0.20 | 2,405 | 0.18 | 2,164 | 3.1 | 37,274 | 1.1 | 13,226 | 1.2 | 14,429 |
| Piston Transport | | 2 | 6,011 | 0.56 | 6,732 | 0.28 | 3,366 | 304.0 | 3,654,688 | 40.7 | 489,295 | 0.40 | 4,809 |
| Helicopter | | 1 | 1,202 | 0.25 | 301 | 0.18 | 216 | 5.7 | 6,851 | 0.52 | 625 | 0.57 | 685 |
| Piston | | 1 | 94,983 | 0.02 | 1,900 | 0.014 | 1,330 | 12.2 | 1,158,793 | 0.4 | 37,993 | 0.047 | 4,464 |
| TOTAL BOWMAN FIELD | | | | | 14,781 | | 16,570 | | 5,429,617 | | 654,461 | | 65,836 |

TABLE B-15 (Continued)

1975 AIRCRAFT OPERATIONS AND EMISSIONS

| | Operations/ Year | No. of Engines | LTOs | Particulates | | Sulfur Dioxide | | Carbon Monoxide | | Hydrocarbons | | Nitrogen Oxides | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | EF (lbs/LTO-eng.) | Emissions (lbs/yr.) | EF (lbs/LTO-eng.) | Emissions (lbs/yr.) | EF (lbs/LTO-eng.) | Emissions (lbs/yr.) | EF (lb/LTO-eng.) | Emissions (lbs/yr.) | EF (lb/LTO-eng.) | Emissions (lbs/yr.) |
| HAP's AIRPORT | | | | | | | | | | | | | |
| General Aviation | 18,250 | | | | | | | | | | | | |
| Piston | | 1 | 9,125 | 0.02 | 182 | 0.014 | 128 | 12.2 | 111,325 | 0.4 | 3,650 | 0.047 | 429 |
| TOTAL JEFFERSON COUNTY (tons/yr.) | | | | | 29.3 | | 47.8 | | 4,223.2 | | 676 | | 391.8 |
| TOTAL CLARK COUNTY (tons/yr.) | | | | | 0.1 | | 0.1 | | 55.7 | | 1.8 | | 0.2 |

## RAILROAD LOCOMOTIVES

An attempt was made to update emissions from railroad locomotives by obtaining fuel usage from each of the companies operating in Jefferson County. Only the Louisville and Nashville was able to provide definitive information, reporting a 1975 fuel usage of 2717 x $10^3$ gallons in the county. This compares with a value of 3179 x $10^3$ gallons estimated in the 1972 inventory and 2146 x $10^3$ gallons calculated in the 1973 inventory. From the discussion in Chapter XII, it appears that the 1972 estimate was accurate since there was a decrease of 12.6% in train miles traveled from 1973 to 1975 and a corresponding 14.5% decrease in fuel usage. Fuel usage by other railroads and in Floyd and Clark Counties was determined from ratios of train miles traveled. Totals for all companies are as follow:

Jefferson County - 3782 x $10^3$ gallons
Floyd County - 1006 x $10^3$ gallons
Clark County - 1259 x $10^3$ gallons

Emissions are projected to increase in accordance with the growth factors given in Chapter XII.

## SMALL GASOLINE ENGINES

Emissions and projections for this source category were updated using revised population estimates.

## AGRICULTURAL EQUIPMENT

Emissions from agricultural equipment were updated with the data included in the 1974 Census of Agriculture, Preliminary Report, and with information provided by the U.S. Department of Agriculture county extension agents. A rather sharp decrease in the number of tractors was reported in Jefferson County and a shift from gasoline to diesel tractors in all counties.

The decreasing trend in farm land noted in the LAQMP continued from 1969 to 1974. Consequently, emissions from agricultural equipment are projected to decrease at a compound decay rate of 1.00%/year as suggested in the LAQMP.

CONSTRUCTION EQUIPMENT

Emissions from this source category were updated using 1975 construction employment estimates from County Business Patterns and the Department of Human Resources and revised emission factors found in Chapter XVI. Such estimates showed a 12% decrease in employment from 1973 to 1975. On the other hand, the Mineral Institute Survey showed a 3% increase in Kentucky and a 4% decrease in Indiana in miscellaneous off-highway diesel. It is believed that the employment figures more accurately reflect the known 1975 downturn in construction.

Based on the 12% reduction in employed, 1975 fuel usage estimates are as follows:

Jefferson County - 11,254,320 gallons
Floyd County - 202,400 gallons
Clark County - 179,520 gallons

Emissions were projected to increase in accordance with the Jefferson County projected growth in construction employment.

UNPAVED ROADS

Emissions from unpaved roads in Floyd and Clark Counties were updated with revised unpaved road mileage and traffic data provided by the offices of the County Commissioners. The revised estimates, shown in Table B-16, resulted in a substantial decrease in emissions in Floyd County. The emission factor and control efficiency was unchanged from 1973 to 1975.

TABLE B-16

COMPARISON OF 1973 AND 1975 UNPAVED ROAD DATA FOR FLOYD AND CLARK COUNTIES

| COUNTY | 1973 | | 1975 | |
|---|---|---|---|---|
| | MILES | ADT | MILES | ADT |
| FLOYD | 76 | 45 | 35 | 45 |
| CLARK | 203 | 105 | 197 | 117 |

In Jefferson County the JCAPCA is conducting a comprehensive inventory of unpaved roads and the character of the road surface and traffic. They suggested that the unpaved road source category not be updated for this report.

As in the LAQMP, emissions are projected to remain constant.

## CONSTRUCTION ACTIVITY

Since the completion of the 1973 inventory, Supplement 6 to AP-42 was published containing an emission factor for construction operations. This factor, applicable to a semiarid climate, was modified to more adequately represent the climatic and soil conditions in the study area (see Chapter XXIII). Furthermore, a 12% reduction of construction employment was reported for Jefferson County by the Department of Human Resources.

Emissions from construction activity were updated using the revised emission factor of 900 lbs/acre-year, factored by the decrease in construction employment.

Emissions were projected in accordance with the Jefferson County projected growth in construction employment.

## PAVED ROADS

Emissions from this source category were updated with the revised three-county VMT estimates provided by KIPDA and the revised emission factors discussed in Chapter XXV. Emissions were projected in accordance with the projected growth in VMT. In both cases, allocation of total VMT to counties was made in accordance with the county distribution determined from the SAPOLLUT traffic model and link specific data from the LAQMP.

## DRY CLEANING

This source category was not included in the 1973 emission inventory. A list of dry cleaning establishments in Jefferson County was available from the JCAPCD. Type and amount of solvent and emissions were available from those plants which had been visited and permitted. A telephone survey was conducted to determine the number of remaining establishments which performed cleaning on the premises as opposed to those which were only pick-up

centers. A total of 95 plants were found to be operating in Jefferson County. Operating and emission data were available for 47 of these. The average hydrocarbon emissions for the permitted plants is summarized in Table B-17.

TABLE B-17

AVERAGE EMISSION DATA

| SOLVENT | | EMISSION |
|---|---|---|
| TYPE | % | (lbs/day-plant) |
| Perchloroethylene | 86 | 23.2 |
| Stoddard | 14 | 115.7 |

The average emissions compare favorably with a similar information available from a survey in the Los Angeles metropolitan area of over a thousand plants. It was found there that perchloroethylene plants averaged 30 lbs/day and Stoddard plants, 175 lbs/day.

The average emission rates were assumed to apply to the other 48 plants for which no data were available. Similarly, the averages were applied to the seven establishments in Floyd County and the 13 establishments in Clark County, determined from the survey and telephone follow-up. The resulting emissions are summarized in Table B-18.

TABLE B-18

1975 DRY CLEANING HYDROCARBON EMISSION SUMMARY

(tons/year)(1)

| COUNTY | PERCHLOROETHYLENE | STODDARD | TOTAL |
|---|---|---|---|
| Jefferson | 295.7 | 240.1 | 535.8 |
| Floyd | 21.8 | 17.7 | 39.5 |
| Clark | 40.5 | 32.8 | 73.3 |

(1) Based on six-day operating week.

The total of 648.6 tons/year compares to a total of 877 tons per year calculated from the factor given in AP-42 of 2 lbs/person-year. It is noted,

however, that the factor is based on an equal split between the two types of solvents.

Emissions from dry cleaning are projected to increase in accordance with population growth.

Emissions were allocated in accordance with the distribution of commercial/institutional fuel usage emissions.

## SURFACE COATING

This source category was not included in the 1973 emission inventory. As in Chapter XXVII, two types of surface coating operations are considered.

### Automotive Painting

Automotive painting sales by county resulting from the paint supplies survey are summarized in Table B-19. Resulting emissions are summarized in Table B-20.

TABLE B-19

1975 REPORTED AUTOMOTIVE PAINT SALES

| TYPE OF COATING | VOLUME SOLD (gal/year) | | |
|---|---|---|---|
| | JEFFERSON | FLOYD | CLARK |
| Enamel | 16,877 | 2,024 | 3,676 |
| Lacquer | 10,270 | 1,410 | 2,328 |
| Enamel primer | 1,082 | 83 | 167 |
| Lacquer primer | 6,123 | 388 | 798 |
| Thinner and reducer | 47,192 | 7,345 | 12,860 |

TABLE B-20

1975 AUTOMOTIVE PAINTING EMISSION SUMMARY

| TYPE OF COATING | EMISSION FACTOR[1] (lbs/ton) | HYDROCARBON EMISSIONS (tons/year) | | |
|---|---|---|---|---|
| | | JEFFERSON | FLOYD | CLARK |
| Enamel | 840 | 28.7 | 3.4 | 6.2 |
| Lacquer | 1,540 | 34.0 | 4.7 | 7.7 |
| Primer | 1,320 | 22.6 | 1.5 | 3.1 |
| Thinner and reducer | 2,000 | 170.0 | 26.4 | 46.3 |
| Total | | 255.3 | 36.0 | 63.3 |

(1) In converting volume units to weight units, the following density values were used:

| | |
|---|---|
| Enamel: | 8.1 lbs/gal |
| Lacquer: | 8.6 lbs/gal |
| Enamel primer | 11.0 lbs/gal |
| Lacquer primer | 9.2 lbs/gal |
| Thinner and reducer: | 7.2 lbs/gal |

Trade Paint Application

Emissions from trade paint application were calculated using the factors given in Chapter XXVII. Data and emissions are summarized in Table B-21.

TABLE B-21

TRADE PAINT USAGE AND EMISSIONS

| COUNTY | POPULATION | PAINT USE ($10^3$ gal/yr) | | EMISSIONS (tons/year) | | |
|---|---|---|---|---|---|---|
| | | OIL | WATER | OIL | WATER | TOTAL |
| Jefferson | 733,212 | 847 | 693 | 3,083.1 | 154.6 | 3,237.7 |
| Floyd | 59,457 | 69 | 56 | 251.2 | 12.5 | 263.7 |
| Clark | 84,595 | 98 | 80 | 356.7 | 17.9 | 374.6 |

Emissions from surface coating operations are projected to increase in accordance with population growth.

Emissions were allocated in accordance with the distribution of population.

## PETROLEUM STORAGE

All sources from this category are retained in the point source inventory.

## MARKETING OF PETROLEUM

This source category was not included in the 1973 emission inventory.

Sales data obtained from the survey of gasoline distributors is summarized in Table B-22. Resulting emissions are summarized in Table B-23.

TABLE B-22

1975 GASOLINE MARKETING DATA

| COUNTY | THROUGHPUT BY TYPE OF LOADING ($10^3$ gal) | |
|---|---|---|
| | SPLASH LOADING | SUBMERGED LOADING |
| Jefferson | 1,898 | 131,485 |
| Floyd | 46 | 4,948 |
| Clark | 263 | 9,031 |

TABLE B-23

1975 PETROLEUM MARKETING EMISSION SUMMARY

| COUNTY | HYDROCARBON EMISSIONS (tons/year) | | |
|---|---|---|---|
| | SPLASH LOADING EF = 24.17 lbs/$10^3$ gal | SUBMERGED LOADING EF = 19.97 lbs/$10^3$ gal | TOTAL |
| Jefferson | 21.1 | 1,183.4 | 1,204.5 |
| Floyd | 0.5 | 44.5 | 45.0 |
| Clark | 2.9 | 81.3 | 84.2 |

Emissions are projected to increase 8% by 1980, 13% by 1985, and 18% by 1995. Emissions were allocated in accordance with service station locations.

## ASPHALT PAVING

This source category was not included in the 1973 emission inventory.

The quantity of cutback used in asphalt paving in Jefferson County in 1975, provided by the Department of Transportation and Jefferson County Public Works, is as follows:

Rapid Cure - 266.7 tons, volatile section 24.5%
Medium Cure - 151.0 tons, volatile section 19.25%

Indiana highway authorities reported that cutback asphalt has not been used for the last ten years in their jurisdiction. Resulting emissions are summarized in Table B-27. Emissions are projected to increase in accordance with the growth in VMT. Emissions were allocated in accordance with VMT.

TABLE B-24

AREA SOURCE EMISSION SUMMARY

JEFFERSON COUNTY - PARTICULATES (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 305.8 | 262.3 | 252.1 | 243.9 | 234.4 |
| Commercial/Institutional Fuel | 409.4 | 254.9 | 258.2 | 260.0 | 263.9 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 64.7 | 35.2 | 38.9 | 43.0 | 50.8 |
| Open Burning | 680.0 | 0 | 0 | 0 | 0 |
| Highway Vehicles | 2,553.6 | 2,817.8 | 2,368.1 | 2,303.8 | 2,684.8 |
| Aircraft | 29.1 | 29.3 | 35.0 | 43.3 | 59.9 |
| Railroad Locomotives | 50.1 | 47.3 | 61.5 | 67.6 | 79.9 |
| Vessels | 22.2 | 23.8 | 28.2 | 33.5 | 43.2 |
| Small Gasoline Engines | 50.4 | 12.5 | 13.4 | 14.4 | 16.3 |
| Agricultural Equipment | 13.1 | 6.7 | 6.4 | 6.1 | 5.5 |
| Construction Equipment | 166.9 | 137.3 | 168.5 | 178.8 | 198.7 |
| Small Point Sources | 186.0 | 186.0 | 204.4 | 218.4 | 250.8 |
| Structural Fires | 22.3 | 23.0 | 24.7 | 26.7 | 30.4 |
| Wild Forest Fires | 1.5 | 1.5 | 1.0 | 1.0 | 1.0 |
| Unpaved Roads | 1,681.9 | 1,681.9 | 1,681.9 | 1,681.9 | 1,681.9 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 65.3 | 64.0 | 60.9 | 57.9 | 51.8 |
| Construction Activity | 457.3 | 2,298.8 | 2,821.3 | 2,992.8 | 3,327.1 |
| Wind Blown Dust | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Paved Roads | 4,769.8 | 9,547.4 | 11,050.2 | 11,456.9 | 13,366.4 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 11,536.1 | 17,436.4 | 19,081.2 | 19,636.7 | 22,353.5 |

TABLE B-25

AREA SOURCE EMISSION SUMMARY

JEFFERSON COUNTY - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 497.4 | 503.9 | 498.4 | 485.5 | 485.9 |
| Commercial/Institutional Fuel | 703.1 | 734.2 | 795.4 | 829.4 | 902.4 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 17.1 | 12.5 | 13.7 | 15.2 | 17.9 |
| Open Burning | 0 | 0 | 0 | 0 | 0 |
| Highway Vehicles | 839.6 | 1,556.8 | 1,711.0 | 1,868.8 | 2,177.8 |
| Aircraft | 46.3 | 47.8 | 56.1 | 70.1 | 98.1 |
| Railroad Locomotives | 98.0 | 92.3 | 120.0 | 132.0 | 156.0 |
| Vessels | 6.6 | 7.1 | 8.2 | 9.7 | 12.3 |
| Small Gasoline Engines | 23.7 | 4.4 | 4.7 | 5.1 | 5.7 |
| Agricultural Equipment | 9.0 | 4.4 | 4.2 | 4.0 | 3.6 |
| Construction Equipment | 199.2 | 175.6 | 215.5 | 228.6 | 254.1 |
| Small Point Sources | 61.0 | 61.0 | 67.0 | 71.6 | 82.2 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 2,501.0 | 3,200.0 | 3,494.2 | 3,720.0 | 4,196.0 |

TABLE B-26

AREA SOURCE EMISSION SUMMARY

JEFFERSON COUNTY - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 763.5 | 761.3 | 705.4 | 651.8 | 606.3 |
| Commercial/Institutional Fuel | 333.7 | 328.2 | 335.8 | 340.1 | 349.2 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 25.4 | 18.6 | 20.3 | 22.6 | 26.6 |
| Open Burning | 2,000.0 | 0 | 0 | 0 | 0 |
| Highway Vehicles | 325,867.9 | 195,179.3 | 160,191.8 | 109,449.8 | 85,220.8 |
| Aircraft | 4,075.4 | 4,223.2 | 4,990.1 | 6,211.6 | 8,654.5 |
| Railroad Locomotives | 259.9 | 245.8 | 319.5 | 351.5 | 415.4 |
| Vessels | 191.6 | 206.1 | 238.0 | 281.6 | 357.1 |
| Small Gasoline Engines | 18,223.3 | 3,330.2 | 3,584.2 | 3,840.2 | 4,347.5 |
| Agricultural Equipment | 601.1 | 230.5 | 219.2 | 208.5 | 188.5 |
| Construction Equipment | 608.8 | 512.6 | 629.0 | 667.4 | 741.7 |
| Small Point Sources | 10.7 | 10.7 | 11.8 | 12.6 | 14.4 |
| Structural Fires | 65.5 | 67.6 | 72.5 | 78.4 | 89.3 |
| Wild Forest Fires | 12.6 | 12.6 | 8.4 | 8.4 | 8.4 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 353,039.4 | 205,126.7 | 171,326.0 | 122,124.5 | 101,019.7 |

TABLE B-27

AREA SOURCE EMISSION SUMMARY

JEFFERSON COUNTY - HYDROCARBONS (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 317.9 | 316.8 | 311.6 | 309.2 | 311.2 |
| Commercial/Institutional Fuel | 113.2 | 111.0 | 112.5 | 113.4 | 115.2 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 19.8 | 14.5 | 15.9 | 17.6 | 20.7 |
| Open Burning | 160.0 | 0 | 0 | 0 | 0 |
| Highway Vehicles | 35,067.0 | 33,745.5 | 22,797.7 | 13,193.0 | 9,945.4 |
| Aircraft | 652.3 | 676.0 | 798.7 | 994.3 | 1,385.3 |
| Railroad Locomotives | 188.7 | 177.8 | 231.1 | 254.3 | 300.5 |
| Vessels | 22.4 | 24.1 | 27.8 | 32.9 | 41.7 |
| Small Gasoline Engines | 2,110.3 | 469.3 | 505.0 | 541.1 | 612.6 |
| Agricultural Equipment | 47.8 | 32.6 | 31.0 | 29.5 | 26.7 |
| Construction Equipment | 185.4 | 164.3 | 201.6 | 213.9 | 237.7 |
| Small Point Sources | 2.1 | 2.1 | 2.3 | 2.5 | 2.8 |
| Structural Fires | 5.2 | 5.4 | 5.8 | 6.2 | 7.1 |
| Wild Forest Fires | 2.2 | 2.2 | 1.5 | 1.5 | 1.5 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 535.8 | 576.5 | 617.8 | 699.8 |
| Surface Coating | - | 3,493.0 | 3,758.5 | 4,027.4 | 4,561.9 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 1,204.5 | 1,300.9 | 1,361.1 | 1,421.3 |
| Asphalt Paving | - | 94.4 | 103.8 | 113.3 | 132.2 |
| TOTAL | 38,894.3 | 41,069.3 | 30,782.2 | 21,829.0 | 19,823.6 |

TABLE B-28

AREA SOURCE EMISSION SUMMARY

JEFFERSON COUNTY - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 1,288.3 | 1,278.5 | 1,302.8 | 1,318.3 | 1,349.9 |
| Commercial/Institutional Fuel | 1,451.1 | 1,418.6 | 1,453.2 | 1,472.4 | 1,513.6 |
| Industrial Fuel | 0 | 0 | 0 | 0 | 0 |
| On-Site Incineration | 18.2 | 13.3 | 14.6 | 16.2 | 19.1 |
| Open Burning | 80.0 | 0 | 0 | 0 | 0 |
| Highway Vehicles | 20,707.2 | 24,874.0 | 23,306.0 | 20,662.2 | 18,026.6 |
| Aircraft | 378.1 | 391.8 | 462.9 | 576.3 | 802.9 |
| Railroad Locomotives | 742.5 | 699.7 | 909.6 | 1,000.6 | 1,182.5 |
| Vessels | 77.1 | 82.9 | 95.8 | 113.3 | 143.7 |
| Small Gasoline Engines | 193.2 | 45.4 | 48.9 | 52.4 | 59.3 |
| Agricultural Equipment | 112.6 | 51.9 | 49.4 | 46.9 | 42.4 |
| Construction Equipment | 2,602.6 | 2,358.9 | 2,894.4 | 3,071.3 | 3,413.3 |
| Small Point Sources | 47.3 | 47.3 | 52.0 | 55.5 | 63.7 |
| Structural Fires | 2.6 | 2.7 | 2.9 | 3.1 | 3.5 |
| Wild Forest Fires | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 27,701.2 | 31,265.5 | 30,592.8 | 28,388.8 | 26,620.8 |

TABLE B-29

AREA SOURCE EMISSION SUMMARY

FLOYD COUNTY - PARTICULATES (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 48.3 | 28.7 | 29.4 | 29.7 | 31.1 |
| Commercial/Institutional Fuel | 15.1 | 6.2 | 6.4 | 6.5 | 6.6 |
| Industrial Fuel | 22.2 | 24.3 | 27.0 | 28.9 | 33.5 |
| On-Site Incineration | 8.7 | 8.8 | 10.0 | 10.9 | 13.0 |
| Open Burning | 41.8 | 43.4 | 47.9 | 52.5 | 62.1 |
| Highway Vehicles | 109.1 | 117.8 | 92.9 | 87.7 | 102.2 |
| Aircraft | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 13.3 | 12.6 | 16.4 | 12.6 | 21.3 |
| Vessels | 6.2 | 6.6 | 7.9 | 9.4 | 12.2 |
| Small Gasoline Engines | 4.0 | 1.0 | 1.1 | 1.2 | 1.4 |
| Agricultural Equipment | 3.5 | 4.0 | 3.8 | 3.6 | 3.3 |
| Construction Equipment | 3.0 | 2.5 | 3.1 | 3.3 | 3.6 |
| Small Point Sources | 131.0 | 131.0 | 147.4 | 153.4 | 175.8 |
| Structural Fires | 3.2 | 3.3 | 3.5 | 3.8 | 4.3 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 1,217.1 | 560.5 | 560.5 | 560.5 | 560.5 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 31.0 | 30.4 | 28.9 | 27.5 | 24.6 |
| Construction Activity | 10.8 | 61.4 | 75.3 | 79.9 | 88.8 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 203.8 | 407.9 | 448.7 | 489.5 | 571.1 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 1,872.1 | 1,450.4 | 1,510.2 | 1,560.9 | 1,715.4 |

TABLE B-30

AREA SOURCE EMISSION SUMMARY

FLOYD COUNTY - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 89.5 | 93.9 | 101.2 | 101.8 | 105.1 |
| Commercial/Institutional Fuel | 30.7 | 31.9 | 33.9 | 35.5 | 38.9 |
| Industrial Fuel | 53.7 | 59.4 | 66.3 | 71.0 | 82.6 |
| On-Site Incineration | 3.1 | 3.1 | 3.6 | 3.9 | 4.7 |
| Open Burning | 2.6 | 2.7 | 3.0 | 3.3 | 3.9 |
| Highway Vehicles | 35.4 | 64.5 | 67.1 | 71.1 | 82.9 |
| Aircraft | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 26.0 | 24.6 | 32.0 | 35.2 | 41.6 |
| Vessels | 1.8 | 1.9 | 2.2 | 2.7 | 3.5 |
| Small Gasoline Engines | 2.0 | 0.4 | 0.4 | 0.4 | 0.5 |
| Agricultural Equipment | 2.4 | 2.7 | 2.6 | 2.4 | 2.2 |
| Construction Equipment | 3.6 | 3.2 | 3.9 | 4.2 | 4.6 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 250.8 | 288.3 | 316.2 | 331.5 | 370.5 |

TABLE B-31

AREA SOURCE EMISSION SUMMARY

FLOYD COUNTY - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 84.6 | 84.3 | 85.0 | 85.8 | 89.7 |
| Commercial/Institutional Fuel | 11.9 | 11.8 | 12.2 | 12.3 | 12.8 |
| Industrial Fuel | 7.8 | 8.6 | 9.6 | 10.3 | 12.0 |
| On-Site Incineration | 35.4 | 35.4 | 10.1 | 10.9 | 13.2 |
| Open Burning | 221.8 | 230.6 | 254.5 | 278.8 | 330.2 |
| Highway Vehicles | 13,940.1 | 11,974.2 | 9,827.8 | 6,714.7 | 5,228.3 |
| Aircraft | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 69.4 | 65.4 | 85.0 | 93.5 | 110.5 |
| Vessels | 53.7 | 56.7 | 65.6 | 80.6 | 104.4 |
| Small Gasoline Engines | 1,446.4 | 270.1 | 298.1 | 326.5 | 386.7 |
| Agricultural Equipment | 455.5 | 435.6 | 414.3 | 393.9 | 356.3 |
| Construction Equipment | 10.9 | 9.2 | 11.3 | 12.0 | 13.3 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 9.5 | 9.8 | 10.4 | 11.3 | 12.8 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 16,347.0 | 13,191.7 | 11,083.9 | 8,030.6 | 6,670.2 |

TABLE B-32

AREA SOURCE EMISSION SUMMARY

FLOYD COUNTY - HYDROCARBONS (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 55.5 | 55.3 | 58.9 | 62.6 | 71.0 |
| Commercial/Institutional Fuel | 4.0 | 4.0 | 4.1 | 4.1 | 4.2 |
| Industrial Fuel | 4.5 | 5.0 | 5.6 | 5.9 | 6.9 |
| On-Site Incineration | 26.6 | 26.6 | 30.9 | 33.5 | 40.3 |
| Open Burning | 78.3 | 81.4 | 89.8 | 98.4 | 116.5 |
| Highway Vehicles | 1,497.6 | 2,720.0 | 1,837.6 | 1,063.4 | 801.7 |
| Aircraft | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 50.2 | 47.3 | 61.5 | 67.6 | 79.9 |
| Vessels | 6.3 | 6.6 | 7.7 | 9.5 | 12.2 |
| Small Gasoline Engines | 167.5 | 38.1 | 42.0 | 46.0 | 54.5 |
| Agricultural Equipment | 28.6 | 35.0 | 33.3 | 31.7 | 28.6 |
| Construction Equipment | 3.3 | 3.0 | 3.7 | 3.9 | 4.3 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.8 | 0.8 | 0.9 | 1.0 | 1.1 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 39.5 | 43.6 | 47.8 | 56.6 |
| Surface Coating | - | 299.7 | 330.9 | 362.3 | 429.2 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 45.0 | 48.6 | 50.9 | 53.1 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 1,923.2 | 3,407.3 | 2,599.1 | 1,888.6 | 1,760.1 |

TABLE B-33

AREA SOURCE EMISSION SUMMARY

FLOYD COUNTY - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 112.2 | 111.7 | 117.3 | 119.4 | 124.0 |
| Commercial/Institutional Fuel | 64.3 | 63.2 | 64.7 | 65.6 | 67.5 |
| Industrial Fuel | 135.5 | 149.9 | 167.3 | 179.2 | 208.4 |
| On-Site Incineration | 3.5 | 3.5 | 4.1 | 4.4 | 5.3 |
| Open Burning | 15.7 | 16.3 | 18.0 | 19.7 | 23.3 |
| Highway Vehicles | 884.5 | 1,228.4 | 1,150.9 | 1,020.4 | 890.2 |
| Aircraft | 0 | 0 | 0 | 0 | 0 |
| Railroad Locomotives | 197.6 | 186.1 | 241.9 | 266.1 | 314.5 |
| Vessels | 21.7 | 22.9 | 26.5 | 32.6 | 42.2 |
| Small Gasoline Engines | 15.3 | 3.7 | 4.1 | 4.5 | 5.3 |
| Agricultural Equipment | 38.7 | 41.8 | 39.8 | 37.8 | 34.2 |
| Construction Equipment | 46.8 | 42.4 | 52.0 | 55.2 | 61.4 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 1,536.2 | 1,870.3 | 1,887.0 | 1,805.4 | 1,776.8 |

TABLE B-34

AREA SOURCE EMISSION SUMMARY

CLARK COUNTY - PARTICULATES (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 48.5 | 27.5 | 29.2 | 30.2 | 32.4 |
| Commercial/Institutional Fuel | 45.8 | 15.0 | 16.4 | 16.7 | 17.2 |
| Industrial Fuel | 61.2 | 88.3 | 124.8 | 170.1 | 251.9 |
| On-Site Incineration | 12.4 | 13.6 | 16.4 | 19.6 | 25.6 |
| Open Burning | 1,589.5 | 61.8 | 70.6 | 80.0 | 93.3 |
| Highway Vehicles | 273.4 | 314.2 | 270.4 | 265.7 | 309.7 |
| Aircraft | 0.1 | 0.1 | 0.1 | 0.2 | 0.4 |
| Railroad Locomotives | 16.7 | 15.7 | 20.4 | 22.5 | 26.5 |
| Vessels | 20.8 | 22.3 | 26.4 | 31.4 | 40.5 |
| Small Gasoline Engines | 5.7 | 1.4 | 1.6 | 1.8 | 2.2 |
| Agricultural Equipment | 8.5 | 12.8 | 12.2 | 11.6 | 10.5 |
| Construction Equipment | 2.7 | 2.2 | 2.7 | 2.9 | 3.2 |
| Small Point Sources | 61.5 | 61.5 | 75.8 | 85.9 | 110.3 |
| Structural Fires | 3.3 | 3.6 | 4.2 | 4.9 | 6.2 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 7,585.5 | 8,202.6 | 8,202.6 | 8,202.6 | 8,202.6 |
| Unpaved Airstrips | 2.5 | 2.7 | 0 | 0 | 0 |
| Tilling Activity | 222.8 | 218.4 | 207.7 | 197.5 | 176.6 |
| Construction Activity | 17.3 | 96.2 | 118.1 | 125.3 | 139.3 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 510.6 | 1,022.0 | 1,124.2 | 1,226.4 | 1,430.0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 10,488.8 | 10,181.9 | 10,323.8 | 10,495.3 | 10,878.4 |

TABLE B-35

AREA SOURCE EMISSION SUMMARY

CLARK COUNTY - SULFUR DIOXIDE (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 82.6 | 87.1 | 99.8 | 103.6 | 112.4 |
| Commercial/Institutional Fuel | 122.5 | 138.9 | 144.0 | 148.1 | 156.7 |
| Industrial Fuel | 246.9 | 394.7 | 593.2 | 839.5 | 1,284.3 |
| On-Site Incineration | 4.4 | 4.8 | 5.8 | 6.9 | 9.0 |
| Open Burning | 3.7 | 3.9 | 4.4 | 4.9 | 5.8 |
| Highway Vehicles | 89.8 | 173.4 | 195.4 | 215.6 | 251.2 |
| Aircraft | 0.1 | 0.1 | 0.1 | 0.2 | 0.4 |
| Railroad Locomotives | 32.6 | 30.7 | 39.9 | 43.9 | 92.1 |
| Vessels | 6.1 | 6.5 | 7.6 | 9.0 | 11.5 |
| Small Gasoline Engines | 2.7 | 0.5 | 0.6 | 0.6 | 0.8 |
| Agricultural Equipment | 5.7 | 8.7 | 8.3 | 7.9 | 7.1 |
| Construction Equipment | 3.2 | 2.8 | 3.4 | 3.6 | 4.1 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0 | 0 | 0 | 0 | 0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 600.3 | 852.1 | 1,102.5 | 1,383.8 | 1,935.4 |

TABLE B-36

AREA SOURCE EMISSION SUMMARY

CLARK COUNTY - CARBON MONOXIDE (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 70.4 | 70.1 | 74.9 | 78.0 | 85.4 |
| Commercial/Institutional Fuel | 25.2 | 24.9 | 25.4 | 25.8 | 26.5 |
| Industrial Fuel | 35.4 | 56.6 | 85.1 | 120.4 | 184.1 |
| On-Site Incineration | 24.8 | 27.1 | 32.7 | 38.9 | 50.7 |
| Open Burning | 4,816.1 | 328.1 | 375.3 | 414.1 | 495.8 |
| Highway Vehicles | 34,834.8 | 32,330.3 | 26,534.8 | 18,129.7 | 14,116.3 |
| Aircraft | 55.7 | 55.7 | 79.8 | 116.0 | 188.4 |
| Railroad Locomotives | 86.9 | 81.8 | 106.3 | 117.0 | 138.2 |
| Vessels | 179.8 | 191.6 | 224.0 | 265.3 | 339.0 |
| Small Gasoline Engines | 2,061.0 | 384.2 | 439.6 | 485.0 | 580.7 |
| Agricultural Equipment | 1,115.4 | 1,162.3 | 1,105.3 | 1,051.2 | 950.7 |
| Construction Equipment | 9.7 | 8.2 | 10.1 | 10.7 | 11.9 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 9.6 | 10.5 | 12.2 | 14.3 | 18.0 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 43,324.8 | 34,731.4 | 29,105.5 | 20,866.4 | 17,185.7 |

TABLE B-37

AREA SOURCE EMISSION SUMMARY

CLARK COUNTY - HYDROCARBONS (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 48.3 | 48.1 | 53.4 | 57.4 | 66.2 |
| Commercial/Institutional Fuel | 7.7 | 7.6 | 7.7 | 7.7 | 7.9 |
| Industrial Fuel | 11.2 | 17.9 | 26.9 | 38.1 | 58.3 |
| On-Site Incineration | 18.7 | 20.4 | 24.6 | 29.3 | 38.2 |
| Open Burning | 471.6 | 115.8 | 132.5 | 146.2 | 175.0 |
| Highway Vehicles | 3,747.9 | 6,035.1 | 4,077.2 | 2,359.5 | 1,778.7 |
| Aircraft | 1.8 | 1.8 | 2.6 | 3.8 | 6.2 |
| Railroad Locomotives | 62.7 | 59.2 | 77.0 | 84.7 | 100.0 |
| Vessels | 21.0 | 22.4 | 26.2 | 31.0 | 39.6 |
| Small Gasoline Engines | 238.7 | 54.1 | 61.9 | 68.3 | 81.8 |
| Agricultural Equipment | 70.0 | 65.5 | 62.3 | 59.2 | 53.6 |
| Construction Equipment | 3.0 | 2.6 | 3.2 | 3.4 | 3.8 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.8 | 0.9 | 1.0 | 1.2 | 1.5 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 73.3 | 83.9 | 92.5 | 110.8 |
| Surface Coating | - | 437.9 | 501.0 | 552.6 | 661.7 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 84.2 | 90.9 | 95.1 | 99.1 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 4,703.4 | 7,046.8 | 5,232.3 | 3,630.0 | 3,282.7 |

TABLE B-38

AREA SOURCE EMISSION SUMMARY

CLARK COUNTY - NITROGEN OXIDES (tons/year)

| SOURCE CATEGORY | 1973 | 1975 | 1980 | 1985 | 1995 |
|---|---|---|---|---|---|
| Residential Fuel | 132.7 | 131.5 | 138.6 | 141.4 | 147.2 |
| Commercial/Institutional Fuel | 145.8 | 143.3 | 146.0 | 148.0 | 152.4 |
| Industrial Fuel | 450.5 | 720.2 | 1,082.4 | 1,531.8 | 2,343.4 |
| On-Site Incineration | 2.5 | 2.7 | 3.3 | 3.9 | 5.1 |
| Open Burning | 202.3 | 23.2 | 26.5 | 29.2 | 35.0 |
| Highway Vehicles | 2,214.6 | 4,606.3 | 4,316.0 | 3,826.3 | 3,338.3 |
| Aircraft | 0.2 | 0.2 | 0.3 | 0.5 | 0.9 |
| Railroad Locomotives | 247.1 | 232.9 | 302.8 | 333.0 | 393.6 |
| Vessels | 64.0 | 68.2 | 79.7 | 94.4 | 120.7 |
| Small Gasoline Engines | 21.9 | 5.2 | 6.0 | 6.6 | 7.9 |
| Agricultural Equipment | 112.2 | 125.7 | 119.5 | 113.7 | 102.8 |
| Construction Equipment | 41.5 | 37.7 | 46.3 | 49.1 | 54.6 |
| Small Point Sources | 0 | 0 | 0 | 0 | 0 |
| Structural Fires | 0.4 | 0.4 | 0.5 | 0.6 | 0.8 |
| Wild Forest Fires | 0 | 0 | 0 | 0 | 0 |
| Unpaved Roads | 0 | 0 | 0 | 0 | 0 |
| Unpaved Airstrips | 0 | 0 | 0 | 0 | 0 |
| Tilling Activity | 0 | 0 | 0 | 0 | 0 |
| Construction Activity | 0 | 0 | 0 | 0 | 0 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0 |
| Paved Roads | 0 | 0 | 0 | 0 | 0 |
| Dry Cleaning | - | 0 | 0 | 0 | 0 |
| Surface Coating | - | 0 | 0 | 0 | 0 |
| Petroleum Storage | - | 0 | 0 | 0 | 0 |
| Marketing of Petroleum | - | 0 | 0 | 0 | 0 |
| Asphalt Paving | - | 0 | 0 | 0 | 0 |
| TOTAL | 3,635.7 | 6,097.5 | 6,267.9 | 6,278.5 | 6,702.1 |

# APPENDIX C

# TOTAL POINT SOURCE HYDROCARBON EMISSIONS BY SIC CODE

# APPENDIX C

## TOTAL POINT SOURCE HYDROCARBON EMISSIONS BY SIC CODE

Table C-1 summarizes total hydrocarbon emissions by SIC code for all Kentucky counties except Jefferson County. The data for Jefferson County is not available at this time. Table C-2 summarizes total hydrocarbon emissions by SIC code for Floyd and Jefferson Counties.

TABLE C-1

TOTAL POINT SOURCE HYDROCARBON EMISSIONS
BY SIC CODE FOR BULLITT, HARDIN, HENRY, OLDHAM,
SHELBY AND SPENCER COUNTIES (TONS/YEAR)

| OPERATION | SIC CODE | EMISSIONS |
|---|---|---|
| Crushed and Broken Limestone | 1422 | 805.8 |
| Misc. Nonmetallic Minerals Not Elsewhere Classified | 1499 | 8,597.0 |
| Flour and Other Grain Mill Products | 2041 | 52.0 |
| Prepared Feeds and Feed Ingredients for Animals and Foul Not Elsewhere Classified | 2048 | 26.9 |
| Distilled, Rectified, and Blended Liquors | 2085 | 2,722.8 |
| Sawmills and Planing Mills - General | 2421 | 0.1 |
| Wood Pallets and Skids | 2448 | 1.0 |
| Plastic Materials, Synthetic Resins and Non Vulcanizable Elastomers | 2821 | 95.3 |
| Synthetic Rubber (Vulcanized Elastomers) | 2822 | 2.4 |
| Fertilizers, Mixing Only | 2875 | 50.0 |
| Paving Mixtures and Blocks | 2951 | 69.4 |
| Fabricated Rubber Products Not Elsewhere Classified | 3069 | 200.0 |
| Miscellaneous Plastic Products | 3079 | 101.3 |
| Concrete Products, Except Block and Brick | 3272 | 0.3 |
| Ready-Mixed Concrete | 3272 | 88.3 |
| Steel Wire Drawing and Steel Nails and Spikes | 3315 | 41.7 |

TABLE C-1 (CONT'D.)

TOTAL POINT SOURCE HYDROCARBON EMISSIONS
BY SIC CODE FOR BULLITT, HARDIN, HENRY, OLDHAM,
SHELBY AND SPENCER COUNTIES (TONS/YEAR)

| OPERATION | SIC CODE | EMISSIONS |
|---|---|---|
| Primary Production of Aluminum | 3334 | 194.2 |
| Fabricated Metal Products, Not Elsewhere classified | 3499 | 11.1 |
| Conveyors and Conveying Equipment | 3535 | 4.0 |
| Sporting and Athletic Good, Not Elsewhere Classified | 3949 | 1.0 |
| Costime Jewelry, Costume Novelties, Buttons and Miscellaneous Notions, Except Precious Metal | 3960 | 1.7 |
| Petroleum Bulk Stations and Terminals | 5171 | 228.5 |
| Grocery Stores | 5411 | 4.5 |
| General Medical and Surgical Hospitals | 8062 | 94.5 |

TABLE C-2

TOTAL POINT SOURCE HYDROCARBON EMISSIONS
BY SIC CODE FOR CLARK AND FLOYD COUNTIES (TONS/YEAR)

| OPERATION | SIC CODE | EMISSIONS |
|---|---|---|
| Distilled, Rectified and Blended Liquors | 2085 | 1,707 |
| Wood Kitchen Cabinets | 2434 | 735 |
| Hardwood Veneer and Plywood | 2435 | 137 |
| Wood Household Furniture, Except Upholstered | 2511 | 1,640 |
| Industrial Inorganic Chemicals, Not Elsewhere Classified | 2819 | 1 |
| Soap and Other Detergents, Except Specialty Cleaners | 2841 | 5 |
| Explosives | 2892 | 57 |
| Aluminum Extruded Products | 3354 | 111 |
| Electroplating, Plating, Polishing, Anodizine and Coloring | 3471 | 7 |
| Electric Services | 4911 | 215 |
| Refuse Systems | 4953 | 270 |
| Petroleum Bulk Stations and Terminals | 5171 | 146 |