Research Report
KTC-00-03

KENTUCKY TRANSPORTATION CENTER

College of Engineering

2000 HIGHWAY COST ALLOCATION UPDATE

UNIVERSITY OF KENTUCKY

UNIVERSITY OF KENTUCKY
College of Engineering
Kentucky Transportation Center

Our Mission

We provide services to the transportation community
through research, technology transfer and education.
We create and participate in partnerships to promote
safe and effective transportation systems.

We Value...

Teamwork -- Listening and Communicating, Along with Courtesy and Respect for Others
Honesty and Ethical Behavior
Delivering the Highest Quality Products and Services
Continuous Improvement in All That We Do

For more information or a complete publication list, contact us

KENTUCKY TRANSPORTATION CENTER
176 Raymond Building
University of Kentucky
Lexington, Kentucky 40506-0281

(859) 257-4513
(859) 257-1815 (FAX)
1-800-432-0719
www.ktc.uky.edu
ktc@engr.uky.edu

Research Report
KTC-00-3

2000 HIGHWAY COST ALLOCATION UPDATE

by

Monica L. Osborne
Research Engineer

Jerry G. Pigman
Research Engineer
Kentucky Transportation Center
College of Engineering

Eric Thompson
Associate Director
Center for Business and Economic Research

University of Kentucky
Lexington, Kentucky

in cooperation with

Kentucky Transportation Cabinet
Commonwealth of Kentucky

March 2000

1. Report No.
KTC-00-3

2. Government Accession No.

3. Recipient's Catalog No.

4. Title and Subtitle
2000 Highway Cost Allocation Update

5. Report Date
March 2000

6. Performing Organization Code

7. Author(s)
Monica L. Osborne, Jerry G. Pigman, and Eric Thompson

8. Performing Organization Report No.6
KTC-00-3

9. Performing Organization Name and Address
Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, KY 40506-0281

10. Work Unit No. (TRAIS)

11. Contract or Grant No.

12. Sponsoring Agency Name and Address
Kentucky Transportation Cabinet
State Office Building
Frankfort, KY 40622

13. Type of Report and Period Covered
Final

14. Sponsoring Agency Code

15. Supplementary Notes
Prepared in cooperation with the Kentucky Transportation Cabinet

16. Abstract

This update of the highway cost allocation study is the ninth in a recent series that began in the early 1980's by the Kentucky Transportation Cabinet and the Kentucky Transportation Center. The primary objectives are to determine the level of revenue contribution and cost responsibility for each class of highway user. The base year of this study is FY 1999; the most recent time period for which revenue and cost data are available. Highway user or travel activity for calendar year1998 is the most recent available. A basic premise of the study is that only state maintained highways are of interest in recouping the costs expended to construct and maintain the system. In 1998, this system comprised 27,415 miles of the 73,360 miles of roads and streets in Kentucky, while accommodating 84 percent of all travel in the state.

There are 17 highway user classes with which revenue contribution and cost responsibility are associated. Primary sources of revenue include fuel taxes, registration fees, usage taxes, tolls, and other motor carrier and federal taxes and fees. Primary expenditure categories include construction (subdivided into 6 categories), maintenance and traffic, administration, and enforcement. Construction was subdivided into planning and design; right of way; utility relocation; grade, drain, and surfacing; resurfacing; bridges; and miscellaneous.

Results from the analysis indicate that cost responsibility is borne most heavily by cars and motorcycles with 44.06 percent; followed by heavy trucks with gross weights of 60,000 pounds or more at 27.06 percent. Pickups and other vehicles registered in the 6,000 pound category are responsible for 21.63 percent of the cost. The ratio of percentage revenue attributed to percentage cost allocated was also determined in the study. A ratio of one indicates that the revenue and cost percentages are in balance for a particular vehicle type. Cars (0.98), buses (0.86), and heavy trucks (0.90) contribute less revenue than their cost responsibility dictates.

17. Key Words

Allocation	Highways	Transportation
Costs	Responsibility	Trucks
Economics	Revenue	
Expenditures	Taxes	

18. Distribution Statement
Unlimited, with approval of the
Kentucky Transportation Cabinet

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	161	

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In recent years, costs of highway facilities have generally been considered to be the responsibility of highway users. Although the private sector has recently been called upon to assume more cost responsibility, highways are primarily financed from tax revenues and user tolls. A continuing task related to the assessment of highway user fees is the determination of the appropriate level of taxation for each class of highway users. Cost allocation in various forms has traditionally been a tool to achieve an equitable assignment of user responsibility.

This highway cost allocation study is the ninth in a recent series that began in the early 1980s by the Kentucky Transportation Cabinet and the Kentucky Transportation Center (formerly the Kentucky Transportation Research Program). The primary objective of the study is to determine the level of revenue contribution and cost responsibility for each class of highway users.

The base year for this study is fiscal year (FY) 1999, which is the most recent time period for which revenue and cost data are available. Highway use or travel activity is generally reported on a calendar-year (CY) basis. This study uses CY 1998 because it is the most recent year for which complete data are available. A basic premise of the study is that only the state-maintained system of highways is of interest to those attempting to recoup costs (by assigning them to the appropriate highway user) expended to construct and maintain the system. In CY 1998, the state-maintained highway system comprised approximately 27,415 miles of the 73,360 miles of roads and streets in Kentucky (37 percent) while accommodating approximately 84 percent of all travel in the state. The revenue and cost data reported herein reflect estimates of monies associated with managing only the state-maintained mileage.

Highway user classes, with which revenue contribution and cost responsibility are associated, total 17 including motorcycles, cars, buses, and 14 registered or declared weight classes of trucks. The primary sources of revenue attributed to the various classes of highway users include fuel taxes, registration or license fees, usage taxes, road tolls, other motor carrier taxes, other federal taxes, and miscellaneous taxes and fees. Primary expenditure categories include construction, maintenance and traffic, administration, and enforcement. Construction expenditures are further subdivided into planning and design; right of way; utility relocation; grade, drain, and surfacing; resurfacing; bridges; and miscellaneous.

Results from the analysis indicate that cost responsibility is borne most heavily by passenger cars and motorcycles (44.06 percent). Heavy trucks, those with gross weights of 60,000 pounds or more, are responsible for 27.06 percent of the cost. Pickups and other vehicles registered in the 6,000-pound category are responsible for 21.63 percent of the cost. Cost responsibility borne by all other groups totals 7.25 percent. Annual cost responsibilities in dollars and percentages for grouped classes of vehicles are shown in the following tabulation.

Vehicle type	Total annual cost responsibility	
	Thousand dollars	Percent
Cars	592,156	44.06
Buses	13,710	1.02
Pickups and vans	290,623	21.63
Light trucks	26,227	1.95
Medium trucks	57,488	4.28
Heavy trucks	363,727	27.06
Total	1,343,931	100.00

Revenues contributed by vehicle class show that the groups bearing the most cost responsibility also contribute the largest share of revenue. Using current Kentucky tax rates, passenger cars generate the most (43.00 percent), followed by heavy trucks (24.44 percent), and pickups and vans (24.35 percent). All other vehicles contribute a total of 8.21 percent. Annual revenue generated for the grouped classes of vehicles is presented in the following tabulation.

Vehicle type	Total annual revenue contribution	
	Thousand dollars	Percent
Cars	560,389	43.00
Buses	11,491	0.88
Pickups and vans	317,351	24.35
Light trucks	38,705	2.97
Medium trucks	56,817	4.36
Heavy trucks	318,555	24.44
Total	1,303,307	100.00

In order to evaluate taxation equity, the ratio of percentage revenue attributed to percentage cost allocated was determined as shown in the following tabulation. A ratio of 1.00 indicates that the revenue and cost percentages are in balance for a particular vehicle type.

Vehicle type	Ratio of percent revenue contributed to percent cost responsibility
Cars	0.98
Buses	0.86
Pickups and vans	1.13
Light trucks	1.52
Medium trucks	1.02
Heavy trucks	0.90

Highway user revenue on a revenue per vehicle-mile basis is another means to examine revenue contributions among vehicle types. Using the most recent data available from this analysis and other sources, it was determined that passenger cars contribute approximately 2.4 cents per mile in revenue as compared to 54.8 cents-per-mile operational costs for a passenger car in 1998 (1). For large trucks, the revenue contribution is about 10.6 cents per mile.

A secondary objective of the study was to determine the efficiency with which various Kentucky taxes are being collected. Due to the methods of collecting user taxes and our ability to assess them, the analysis focused on the weight-distance tax and user-reported fuel taxes. Considering the estimated vehicle-miles of travel and the mileage based tax rate on heavy vehicles, revenue generated by the weight-distance tax should have totaled approximately $86,589,000 in FY 1999. This compares to actual receipts of $70,162,000 or a collection efficiency of about 81 percent. The user-reported fuel taxes were compared to revenues using reported gallons of fuel consumed, estimates of fuel-tax revenues from the heavy-vehicle surtax and from the carrier fuel surtax.

After correcting to gallonages reported by the Revenue Cabinet, the efficiency of collection was slightly higher than last year at 103.1 percent for normal fuels. For the heavy vehicle surtax, the estimated rate of collection was not included since the heavy vehicle surtax was repealed effective July 15, 1996. For the carrier surtax, the rate of collection was 77.7 percent.

ACKNOWLEDGMENTS

This report was prepared in consultation with and under the guidance of the following members of the Study Advisory Committee:

Glenn Mitchell, Chairman, Transportation Cabinet, Office of Policy and Budget
Annette Coffey, Transportation Cabinet, Division of Planning
Mark Coleman, Transportation Cabinet, Office of State Budget Director
Charles Harman, Transportation Cabinet, Office of General Counsel & Legislative Affairs
Marcie Mathews, Transportation Cabinet, Division of Program Management
Dwight Newton, Transportation Cabinet, Office of Policy and Budget
Rick Taylor, Transportation Cabinet, Division of Motor Carriers

Others whose contributions to this study are also gratefully acknowledged include the following:

Tim Adams, Department of Vehicle Regulation, Division of Vehicle Licensing
Cathy Bickers, Department of Vehicle Regulation, Division of Motor Vehicle Licensing
Nancy Craig, Transportation Cabinet, Division of Toll Facilities
Mike Kinnaird, Department of Administrative Services, Division of Information Technology
Ronnie O'Nan, Department of Administrative Services, Division of Accounts
Greg Witt, Transportation Cabinet, Division of Planning

An expression of appreciation is extended to the following employees of the Kentucky Transportation Center for their contributions toward completion of this research report: David Cain and Neil Tollner.

Finally, a special expression of appreciation is also extended to John A. Deacon for his contributions to the development of the concepts and procedures which guided the work on this and previous cost allocation reports.

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

In the United States, government bears primary responsibility for providing and maintaining public roads and streets. Although the private sector has recently been called upon to shoulder more of the load, highways are largely financed from tax revenues and user tolls. Primary goals of those responsible for drafting highway tax legislation include an equitable assignment of responsibility to various groups of taxpayers and an efficient system for tax administration. Highway cost allocation studies have traditional sought to assure that the goal of equity is met.

Primary objectives of the current highway cost allocation study--the ninth in a series that began in 1982--include the following:

- to determine an equitable assignment of cost responsibility to the various classes of highway users in Kentucky;
- to estimate revenue contributions from these classes based on current taxation policy;
- to determine the extent to which each user class is meeting its cost responsibility;
- to evaluate trends in cost responsibility, revenue contributions, and revenue-to-cost ratios;
- to evaluate the equity of proposed changes to Kentucky tax statutes; and
- to evaluate the efficiency of collection for certain Kentucky taxes.

The current study is directed toward management of the 27,415-mile, state-maintained highway system. The focus includes that portion of the revenue generated from road-user taxes which is expended on the state-maintained system. General-fund revenue is ignored because it is not relevant to the task of assigning cost responsibility among highway users[1]. User revenue which is used for off-system or non-highway purposes such as county/municipal aid and deficit reduction is also excluded primarily because conventional cost allocation strategies are either not appropriate or too imprecise for considering such expenditures. The relationship between the various revenue sources and the highway systems to which they are dedicated is illustrated schematically in Figure 1. This report focuses on elements in the highlighted (solid border) boxes.

The time period targeted for analysis was fiscal year (FY) 1999 covering the interval of July 1, 1998 through June 30, 1999. This is the most recent fiscal year for which detailed cost and revenue data are available (2). Travel information is collected and reported on a calendar year (CY) rather than a fiscal year basis and some, namely vehicle classification and weight data, requires a

---

[1]To pay for roads, both general taxes and those scaled specifically to road use are collected. In Kentucky, almost all of the revenue for financing the state highway system is generated from either user taxes or from tolls. Since the issue of user vs. non-user (General Fund) responsibility is thus largely preempted, the focus of state highway cost allocation studies in Kentucky is narrowed to one of assigning cost responsibility to the several groups of road users.

three-year cycle to complete statewide coverage. The convenience of using calendar-year travel data was judged to outweigh the potentially increased accuracy of projections to the fiscal year. Moreover, the proportionate amounts of travel by the various classes of highway users were not expected to significantly change from calendar year to its corresponding fiscal year. Accordingly, CY 1998 was taken as the base year for traffic data estimates. Actually, volume data from earlier years were also used as necessary to make projections to CY 1998, and all vehicle classification and weight data collected during CY's 1996, 1997, and 1998 were used.

STUDY MANAGEMENT

The Kentucky Transportation Center at the University of Kentucky was responsible for this update of Kentucky's highway cost allocation study as they have been for all previous such studies beginning in 1982. As in other investigations which the Center performs for the Kentucky Transportation Cabinet, a Study Advisory Committee, comprised principally of Cabinet employees, provided oversight. Specific responsibilities of the Study Advisory Committee for the highway cost allocation studies have included the following:

- Set goals and objectives,
- Monitor and supervise activity,
- Identify proposals for change in highway taxation; and
- Review and approve reports.

The Study Advisory Committee met periodically with Center staff during the course of the study.

EVALUATION OF THE FEDERAL AND KENTUCKY HIGHWAY COST ALLOCATION METHODS

The methodologies used for development of Kentucky's highway cost allocation studies have remained generally unchanged for the past several years. As part of an effort to ensure that the methodologies are valid and appropriate for assigning costs and revenues, a review of the most recent federal cost allocation study was conducted. An examination of highway cost allocation was made from an economic perspective.

The finding was that the state and federal approaches to highway cost allocation are broadly similar. Both focus on allocating highway agency costs and transportation revenues among vehicle classes. Both approaches compare combined state and federal revenues and expenditures during cost allocation studies, although the federal study sometimes focuses on federal costs and revenues alone. The federal methodology was sometimes more detailed than the state approach. Further, there were some additional differences in methodology between the two approaches, but it was unclear how much these differences would influence allocation results.

The current agency cost occasioned approach to highway cost allocation is very different from a marginal cost or "efficiency" approach, an approach that may in part be adopted in cost allocation studies at some time in the future. Despite these differences, however, the two approaches are related. In terms of some of the variable costs of highway use, both the current agency cost approach and the efficiency approach are related in the sense that both consider the variable nature of these costs. The biggest differences between the two approaches are in their treatment of fixed highway agency costs (costs that do not vary significantly with the level of highway use), and the non-agency social costs of highway travel such as pollution and congestion. The current approach ignores these social costs and focuses on allocating all agency costs. The efficiency approach argues that the fixed highway agency costs should not be allocated, but marginal social costs should be a focus of cost allocation.

The complete evaluation is included in Appendix A.

METHODOLOGY

Methods used in the current study were similar to those reported in 1998 (3). Despite the fact that only secondary sources of data are needed, much of the required effort is devoted to data collection, processing, and summary. Primary data sources include the following:

- Revenue and expenditures: Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999
- Construction costs: Statewide Accounting and Reporting System (STARS) database (FY 1999)
- Highway mileage and traffic volumes: Highway Information System (HIS) database (CY 1998)
- Traffic classifications and weights: vehicle classification and weight databases (CY 1996-1998)
- Distribution of registered vehicle weights: statewide accident database (CY 1994-1998)
- Miscellaneous: Federal Highway Administration's (FHWA) 1997 Highway Statistics (11) and 1998 American Automobile Manufacturers Association Motor Vehicle Facts & Figures (1).

A complex series of interrelated spreadsheets perform the necessary computations quickly and accurately. The 17 classes of road users (Table 1) reflect the distinctions commonly serving as the bases for differential taxation in Kentucky and elsewhere.

As explained earlier, focus is on the state-maintained portion of Kentucky's highway system. This subsystem is further divided by functional classification, land use (rural or urban), number of lanes, and, for portions of the analysis, terrain. The Cabinet's Highway Information System (HIS) provides much of the necessary data to define the highway system and to determine the traffic volumes operating on its specific segments. Vehicle classification and weight data from the Division of Transportation Planning allow traffic on each element to be accurately profiled.

Primary expenditure categories include construction, maintenance and traffic, administration, and enforcement. Construction expenditures are further subdivided into planning and design; right of way; utility relocation; grade, drain, and surfacing; resurfacing; bridges; and miscellaneous. Allocations of highway expenditures to the state-maintained highway system followed the guidelines of Table 2. Allocations of expenditures to the various user groups were based either on measures of use (vehicle-miles, axle-miles, or passenger-car-equivalent miles) or wear (equivalent-single-axle-load miles) according to the guidelines of Table 3. Passenger car equivalents provide a means for expressing the larger size and reduced performance of trucks in terms of an equivalent number of passenger cars. Equivalent single axle loads provide a means for expressing the relative pavement wear effects of different vehicle axle loads in terms of a standard, 18,000-pound single axle load.

Primary sources of user revenue include fuel taxes, registration and license fees, usage taxes, road tolls, other motor carrier taxes, other federal taxes, and miscellaneous taxes and fees. The allocation of highway user revenue to the state-maintained highway system followed the guidelines of Table 4. Their attribution to the various user classes is summarized in Table 5. In a few instances, available data are sufficiently detailed to identify the link between a specific revenue total and a specific user class. For example, available tabulations indicate the fees collected specifically from automobile registrations. In other cases, the link between revenue and user class is less direct. For example, revenue from truck weight-distance taxes must be attributed to the three classes of trucks having registered (or declared) weights in excess of 59,999 pounds. Although in this instance, estimated truck miles of travel for the three classes provided a direct basis for attribution, in other situations more arbitrary attribution rules were required.

Technical documentation for the analysis is included in Appendix B.

MODIFICATIONS TO 1998 PROCEDURES

Highway-cost-allocation research, as a means for evaluating the equity of highway user taxation, was first reported in Kentucky in 1956 (4). From 1982 through 1998, eight additional studies were conducted by the Kentucky Transportation Cabinet and the Kentucky Transportation Center (formerly the Kentucky Transportation Research Program); seven of which were eventually published (3, 5-10). Each study built on experience gained during prior studies, and the process was progressively streamlined and automated to permit analyses to be performed and evaluated within relatively short periods of time.

Previous modifications from the 1996 (5) to the 1998 (3) studies remained in place for this current study. First, the 1996 construction costs were reported in fiscal years instead of calendar years. In order to attenuate year-to-year fluctuations, the STARS-based construction-cost matrix for the current study was based on the average expenditure pattern from CY 1994 through FY 1996 before being scaled to reflect the FY 1996 total. The data period is different for the last year of data because construction spending costs have been switched from the calendar to the fiscal year as of FY 1996/97. Because the fiscal costs represent the same amount of time as the calendar costs, combining the two calendar systems did not present a problem.

The second change in methodology involved the estimation of the distribution of registered truck weights in the traffic stream. The highway cost allocation study has traditionally used the four most recent years of the Kentucky State Police accident database as a representative sample of the truck population. In order to gain a more accurate representation of the population, five years of accident data were considered for the current study. In addition, the match of license plate numbers which contain codes to determine the registered weights with the axle configuration on the accident report form provided sufficient data without the use of the VIN number in combination with the AVIS file.

DISTRIBUTION OF REGISTERED TRUCK WEIGHTS

One of the most difficult aspects of the cost allocation process is to reconcile the gross-weight classification of trucks. This serves as the basis for tax assessment within their axle-configuration classification which in turn serves as the basis for travel counts and measurements. Past studies have concluded that the sample of Kentucky trucks involved in reportable traffic crashes provides a reasonable basis for developing the necessary registered-weight distributions as a function of axle configuration (7,8). For each accident-involved truck, its registered weight can be determined directly by its license-plate coding, and its configuration (straight, single-trailer, or multiple-trailer) and number of axles are recorded on the accident report form.

Registered-weight distributions developed for the current study were based on accidents occurring during 1994-1998. This relatively long period was used in order to increase the sample size and, hence, the reliability of the estimates. As before, registered-weight distributions for straight trucks were based on Kentucky-licensed trucks with non-apportioned plates. Those for combination trucks were based on Kentucky-licensed trucks with apportioned plates. The resulting distributions are summarized in Table 6.

ANALYSIS AND RESULTS

FY 1999 revenues and costs, as extracted from the Cabinet's "Financial Report to Management..." (2), are itemized in Appendix C. Revenues associated with the state-maintained highway system experienced an annual increase of approximately 7.3 percent from FY 1997 to FY 1999. During the same period, allocatable costs increased at an annual rate of approximately 9.5 percent. Because state taxation practice did not change during this period, most of the fundamental growth in revenue can be attributed to increases in the level of travel activity. For example, one measure of activity, statewide vehicle miles of travel, grew at an annual rate of approximately 4.8 percent from CY 1996 to CY 1998.

Each of the major groups of highway users traveled more in CY 1998 than they did in CY 1996 (Table 7). The relative share of travel by buses, pickups and vans, and heavy trucks increased from CY 1996 to CY 1998 while the relative share of travel by cars, light trucks, and medium trucks declined slightly (Table 7). The vehicle-miles traveled for the period 1990-1998 by each vehicle type on state-maintained roads is demonstrated graphically in Figure 2. Table 8 itemizes changes in the use and wear measures that are used in the cost allocation process. There were variations in some of the use and wear measures; specifically noted were increases in all categories for the subtotals of all trucks and combination trucks.

ALLOCATION OF HIGHWAY COSTS

The process of allocating highway costs and revenues, summarized earlier and detailed in Appendix B, yields extensive tables for both cost and revenue allocations. For the FY 1999 analysis, these tables are presented in Appendix D (cost) and Appendix E (revenue). Cost and revenue elements on which the analyses are based are identified in Appendix C. Appendix F presents summary information about travel on each segment of Kentucky's Interstate system. This information is an important part of the travel estimations which are also key to accurate analysis.

The cost responsibility among six major types of road users is summarized in Table 9. Cars by far bear the greatest responsibility but heavy trucks and pickups and vans also share critical portions of the load. Cost responsibility is a complex function made up not only of the sizes, weights, and amounts of travel but also of the nature of highway expenditures (for example, relative expenditures on capital investments versus those on administration and maintenance). Table 10 tracks the trend in cost responsibility through time and examines impacts of relative changes in travel among the user types. A constant normalized ratio of cost to travel would signify that the percentage of cost responsibility for a specific road user class is a direct reflection of percentage of travel activity. The normalized ratios of cost to travel have remained relatively constant through time for cars and pickups and vans. For the three truck categories, there has been more variability in the ratios of cost to travel.

ATTRIBUTION OF HIGHWAY REVENUE

The revenue attribution among the six major types of road users is summarized in Table 11. Cars contribute most to the revenue stream, followed by heavy trucks and then pickups and vans. Taken together these three groups of vehicles contribute more than 91 percent of the revenue dedicated to the state-maintained highway system. A detailed breakdown of Kentucky's tax rates and the revenue stream they generate is presented in Table 12. Although the revenue shares for the six classes of vehicles were relatively stable for FY 1991 through 1993, elimination of the weight-distance surcharge decreased the contributions of heavy trucks to the revenue stream beginning in FY 1995 (Table 13). During FY 1997 and continuing in FY 1999, there was a decrease in the revenue contribution by cars; apparently partially attributed to the reduced percentage of cars in the travel stream. The decrease was offset largely by increased contributions by pickups and vans. These patterns reflect the continuing shift from cars to vans, pickups and utility vehicles by the driving public.

Combining the revenue estimates of Table 11 with the vehicle-mile estimates of Table 14 yields estimates of the revenue generated per vehicle mile of travel in Table 15. Such estimates are particularly useful because they provide information that is readily comprehended. Table 15 shows, for example, that passenger cars contribute approximately 2.4¢ in revenue for every mile they travel.

This represents approximately 4.4 percent of the 54.8 cents-per-mile cost to operate an intermediate-sized car in the 1998 model year (1). On a per mile basis, the heavy trucks paid 10.6¢ per mile, almost four and a half times more than cars. Expressed another way, the intermediate-sized car, traveling 15,000 miles annually on Kentucky highways, contributes approximately $360 in revenue to state highways. The large truck, when traveling 100,000 miles in Kentucky, contributes approximately $10,600.

Table 15 indicates that the revenue per vehicle mile increased from FY 1997 to FY 1999 for all user classes except pickups and vans. This apparent increase is an artificial one which largely resulted from the removal in this study of approximately 900 miles of urban streets from the state-maintained highway base. The ratio of state-maintained-system revenue to statewide vehicle miles of travel shows that the apparent decline experienced from FY 1991 to FY 1993 (2.82, and 2.74¢ per mile for FY 1991, and FY 1993, respectively) has been reversed and shows a pattern of increases from FY 1995 through FY 1999.

EQUITY EVALUATION

The primary measure that has been used for expressing the equity of user taxation is the ratio of the percentage share of revenue contributed to the percentage share of cost responsibility. A ratio of one indicates equity. Revenue to cost ratios, summarized in Table 16, generally indicate a variable pattern for the period from FY 1991 through FY 1997. For cars, there was a general pattern of decreasing equity ratios for the period FY 1991 through FY 1997 followed by an increase in FY 1999. For pickups and vans, there was a general pattern of increasing equity ratios from FY 1991 through FY 1997 followed by a decrease in 1999. The primary influence during this period was probably the elimination of the weight-distance surtax which dropped the equity ratio for heavy trucks from 0.99 in 1993 to 0.91 in 1995 and basically remained the same for FY 1995 through FY 1999. The general pattern of decrease in the equity ratio for cars appears to have been reversed in FY 1999. The ratio of revenue to cost moved closer to equity in FY 1999 for cars and pickups and vans. For heavy trucks, the pattern generally remained the same with a slightly greater divergence from equity.

The equity ratio for light trucks appears to be out of balance. Because they constitute such a small fraction of the travel stream, however, the revenue to cost ratio may be of questionable reliability. Equity ratios for pickups and vans and heavy trucks, though perhaps not seriously out of balance, warrant some concern. Both categories of vehicles are heavy contributors to revenue generation and to highway use, and their equity ratios have generally followed consistent trends in recent years. Pickups and vans now contribute approximately 13 percent more than their cost responsibility, and heavy trucks fall short by approximately 10 percent. Cars also contribute 2 percent less than their cost responsibility.

DETAILED ANALYSIS BY TRUCK TYPE

Although taxation practices generally group trucks into a few, selected categories, analysis of individual truck types offers the potential for better understanding the cost allocation and revenue attribution processes and for uncovering specific inequities in tax policy.

Figures 3 and 4 summarize the cost data. In general, as trucks increase in gross weight to about 38,000 pounds, an increasing portion of their cost responsibility is due to capital needs (Figure 3). Beyond 38,000 pounds, the change does not seem to be particularly significant or meaningful. The 73,280-pound truck is somewhat of an outlier, though, as convincingly demonstrated by the cost-per-vehicle-mile estimates of Figure 4. The cost responsibility of 73,280-pound trucks is relatively large because this category includes a particularly large percentage of straight trucks. With fewer axles and larger loads per axle, these trucks impose significantly larger pavement costs and, hence, affect both construction costs and total costs as well. As demonstrated by Figure 4, with the exception of the 73,280-pound category, truck cost responsibility generally increases with gross weight. Among the host of influential factors are favored tax status (for example, for farm trucks registered at 38,000 pounds), differences among the vehicle configurations and the numbers of axles, differences in the types of roads on which specific types of trucks concentrate, etc.

Revenue analyses, summarized in Figures 5 and 6, are of potentially greater interest and significance than cost analyses. First, revenue is dominated by fuel and usage taxes: carrier fees (particularly the weight-distance tax) is also quite important for heavy trucks. Second, the most readily apparent anomaly is the inordinately large contribution of usage taxes for 38,000-pound trucks and 10,000-pound trucks. The relatively large usage tax means that there are a relatively large number of trucks in these categories, and the large proportion of usage revenues reflects both the large number of trucks and a relatively low amount of travel (annual miles per truck). The 38,000-pound category is of particular interest because it contains all 38,000-pound and lesser weight farm trucks which are permitted to register at 38,000 pounds with minimum registration fees.

Revenue-to-cost ratios generally diminish with increasing truck weight, with the exception of the 38,000-pound category (Figure 7). Smaller trucks are more likely to contribute larger revenue surpluses, and medium and large trucks are deficit contributors, with the exception of the 62,000-pound category.

EFFICIENCY OF TAX COLLECTION

Highway cost allocation studies assimilate a great deal of information that is useful for a variety of purposes other than cost allocation. One such past use has been to evaluate the efficiency with which certain tax revenue is collected. Kentucky taxes that can be readily examined include the weight-distance tax and the various fuel taxes.

Estimating weight-distance-tax revenue is simply a matter of applying a 2.85¢ per mile tax to the estimated vehicle miles of travel by heavy trucks, those grossing more than 59,999 pounds. Table 17 compares the current estimate with estimates documented by the four prior studies. The results indicate that the efficiency of collection of the weight-distance tax increased slightly through

FY 1993 before reaching a level of about 80 percent where it has remained through FY 1999. However, when the surtax, interest, and penalties are removed from the weight-distance tax revenue, there is a relatively smooth pattern of increase for the period of 1990 through 1999 (Figure 8). Trends in travel by heavy trucks also show a consistent pattern of increase for the period 1990-1998 (Figure 9). Miles traveled for all vehicles show a pattern of increase that is less than the growth for heavy trucks (Figure 10). The trend in percentage of heavy truck travel continues to increase with the 1998 travel data showing 6.5 percent of the traffic stream (Figure 11). All of these patterns of truck travel and revenue tend to support the reasonableness of higher efficiency of collection of weight-distance tax.

Estimates of fuel-tax revenue are more complicated and require the estimation of gallonages of the various types of fuel. Such estimates, summarized in Table 18, are similar to reported gallonages. For all types of fuels combined, the gallonage reported by the Revenue Cabinet was within 2.0 percent of the study estimate in FY 1999. Accuracy of this magnitude typically increases confidence in predictions of fuel tax revenue. However, as shown in Table 19, the repeal of the heavy vehicle surtax and the subsequent revenue collection during only one fiscal quarter dramatically decreased collection efficiency of this tax in 1997 and eliminated revenue for 1999. Variations in collection efficiency are also noted for the carrier surtax which dropped from 77.6 percent in FY 1995 to 68.8 percent in FY 1997 and increased to 77.7 in 1999. Collection of normal fuel-taxes follow the general trend established over the past few years.

As part of the process of determining cost responsibilities for various highway users and the revenue expected from fuel taxes, there is an issue of demand and fuel usage based on price fluctuations. This is particularly important when fuel tax increases are considered or when the price of fuel increases dramatically due to worldwide oil supplies. As a means of examining the reaction of consumers to changes in the prices of motor fuel, a literature review was conducted to assess the price elasticity of motor fuels. The results of this literature review are summarized in Appendix G.

SUMMARY AND FINDINGS

The current highway cost allocation study is the ninth in a recent Kentucky series that began in 1982. Experience gained with each study has resulted in subsequent refinements that have enlarged the data base, enhanced the accuracy, and simplified the study process. One of the long-term aims--to develop an easy-to-use process for continuously monitoring effects of changes in traffic patterns, in finance and tax policy, and in highway expenditures--has largely been realized.

Passenger automobiles remain the largest single revenue source, contributing about 43 percent of the total user revenue, but they fail to reach their equitable cost assignment under current tax practice by about 2 percent. Pickups and vans, light trucks, and medium trucks continue to contribute more in revenue than their cost responsibility, by 13 percent, 52 percent, and 2 percent respectively. Removal of the 1.15¢ per mile weight-distance surcharge has reduced the revenue attributed to heavy trucks, and heavy trucks now contribute only about 90 percent of their cost responsibility. In 1993, heavy trucks failed to meet their cost assignment by 1 percent; however, they now fall short at their cost responsibility by about 10 percent. Medium trucks exceeded their cost responsibility by about 2 percent in FY 1999.

In FY 1999, approximately 2.4¢ per mile of operation were collected from passenger cars for the purpose of upgrading and maintaining Kentucky's state highways. Collections generally increase for progressively larger vehicles: the largest trucks contribute approximately 10.6¢ per mile. Although available data on vehicle operating expenses are limited, these road user taxes appear to comprise a relatively small portion of operating expenses, perhaps in the range of 5 to 10 percent. At current levels of taxation, the largest trucks traveling about 100,000 miles in Kentucky each year would make annual contributions of $10,600. At 15,000 miles a year, a car would contribute about $360.

In regard to tax collection efficiency, this study also sought to determine how completely current taxes are being collected. Although this is a difficult task, there appears to be little opportunity for most highway users to avoid full payment of those taxes that contribute most to the revenue totals, in particular, normal fuel taxes and vehicle usage taxes. Taxes assessed on the basis of user-reported information, in the form of quarterly tax reports required of motor carriers, exhibited lower collection efficiency results over the analysis period. The heavy vehicle surtax was repealed effective July 15, 1996 and collection efficiency will not be considered in the future. It should also be noted that the estimated revenue for all fuel taxes is derived from estimates of vehicle miles of travel, and therefore subject to the errors of collection and projections from short-term counts to yearly averages.

REFERENCES

1. American Automobile Manufacturers' Association, "AAMA Motor Vehicle Facts & Figures '98."

2. Commonwealth of Kentucky, Transportation Cabinet, "Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999," Frankfort, Kentucky.

3. Jones, Samantha S. and Pigman, Jerry G., "1998 Highway Cost Allocation Update: Technical Report," Research Report KTC-98-3, Kentucky Transportation Center, University of Kentucky, 1998.

4. College of Commerce, Bureau of Business Research, "Financing Kentucky's Roads and Streets," University of Kentucky, 1956.

5. Deacon, John A., Pigman, Jerry G., “1996 Highway Cost Allocation Update: Technical Report,” Research Report KTC-96-1, Kentucky Transportation Center, University of Kentucky, 1996.

6. Deacon, John A., Pigman, Jerry G., “Allocation of Highway Costs and Revenues,” Research Report KTC-94-2, Kentucky Transportation Center, University of Kentucky, 1994.

7. Deacon, John A., Pigman, Jerry G., and Stamatiadis, Nikiforos, “Review of Highway Cost Allocation Methodologies,” Research Report KTC-92-6, Kentucky Transportation Center, University of Kentucky, June 1992.

8. Pigman, J.G. and Deacon, J.A., "Allocation for Highway Costs and Revenues," Research Report KTC-90-1, Kentucky Transportation Center, University of Kentucky, Lexington, January 1990.

9. Pigman, Jerry G. and Deacon, John A., "Allocation of Highway Costs and Revenues," Research Report UKTRP-88-8, Kentucky Transportation Research Program, University of Kentucky, Lexington, March 1988.

10. Black, James E. and Pigman, Jerry G., "Allocation of Transportation Costs to Users," Research Report UKTRP-81-22, Kentucky Transportation Research Program, University of Kentucky, Lexington, May 1982.

11. U.S. Department of Transportation, Federal Highway Administration, "Highway Statistics - 1997," FHWA Report Number FHWA-PL-98-020, Washington, D.C., 1997.

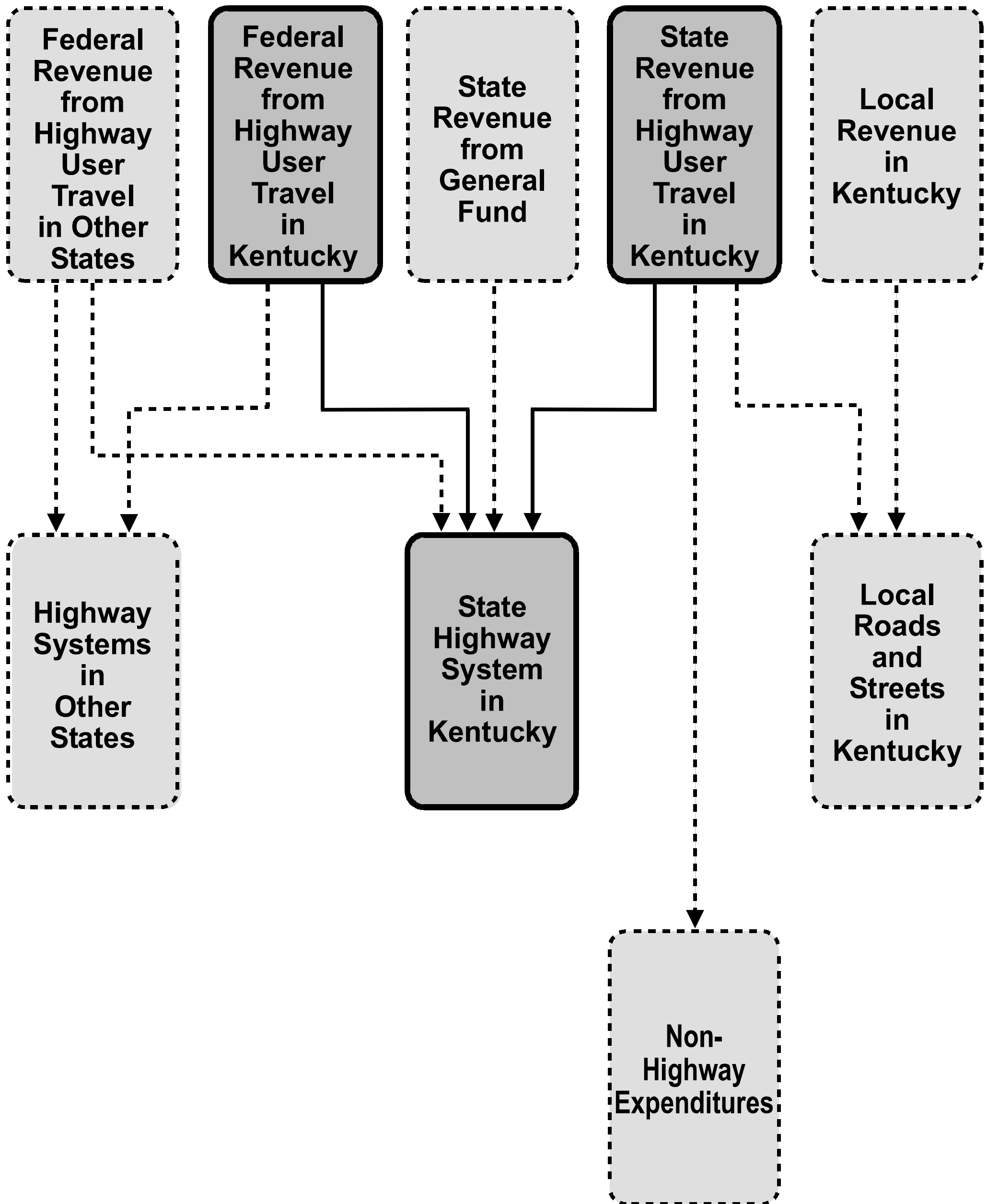

FIGURE 1. Revenue Sources for Kentucky's Highways Highlighting Road-User Contributions to the State-Maintained System

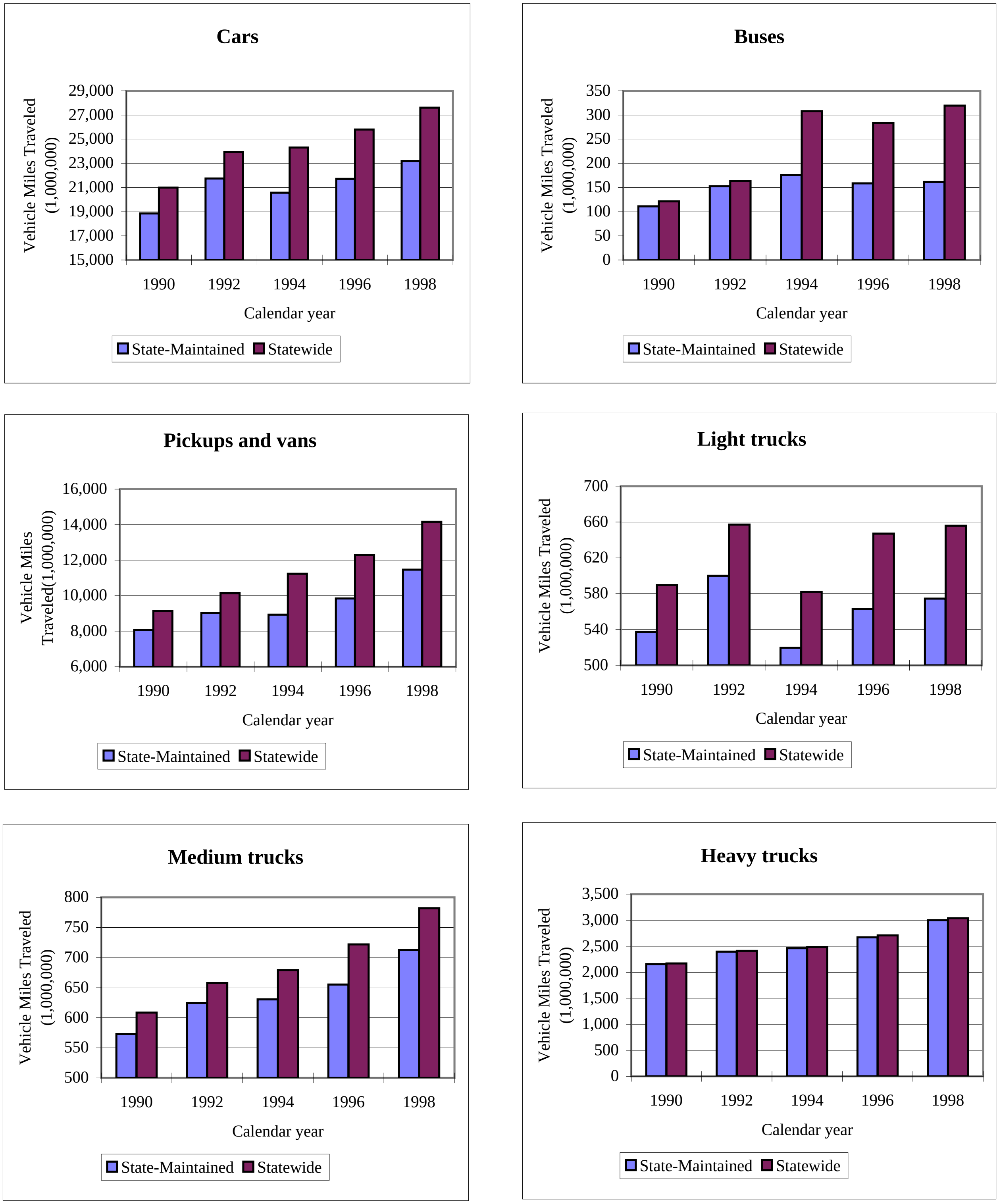

FIGURE 2. Trends in Travel by Vehicle Type

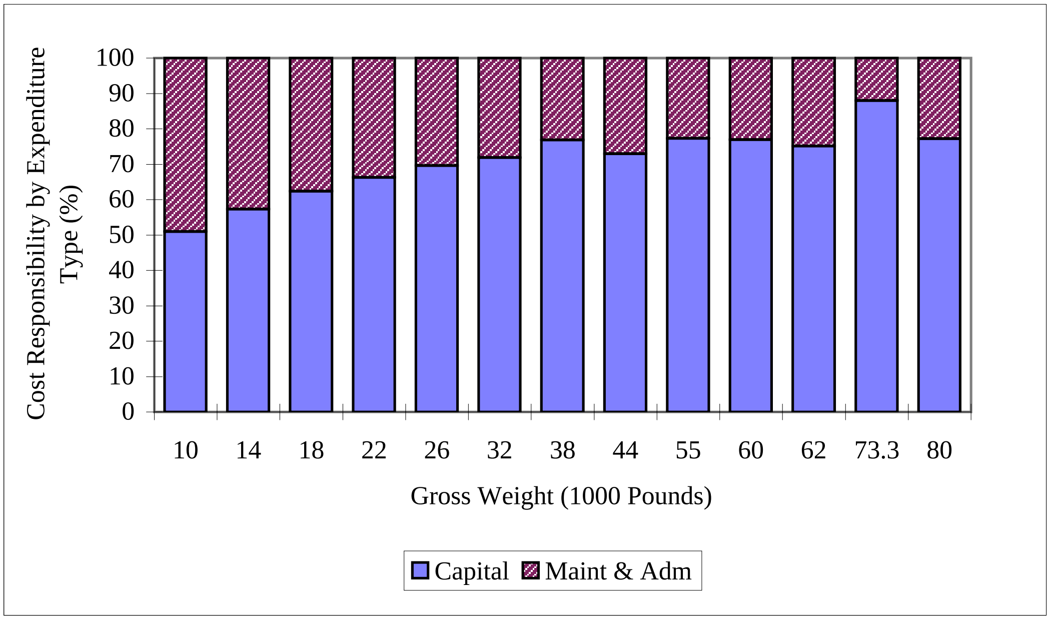

FIGURE 3. Cost Component Percentages by Truck Weight

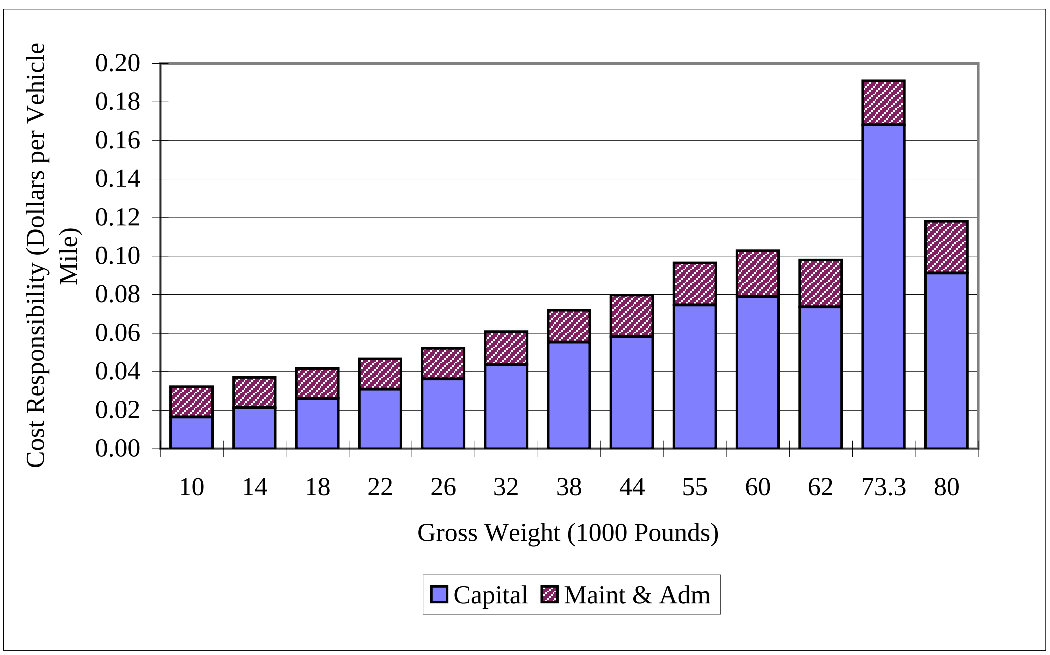

FIGURE 4. Per-Vehicle-Mile Cost Components by Truck Weight

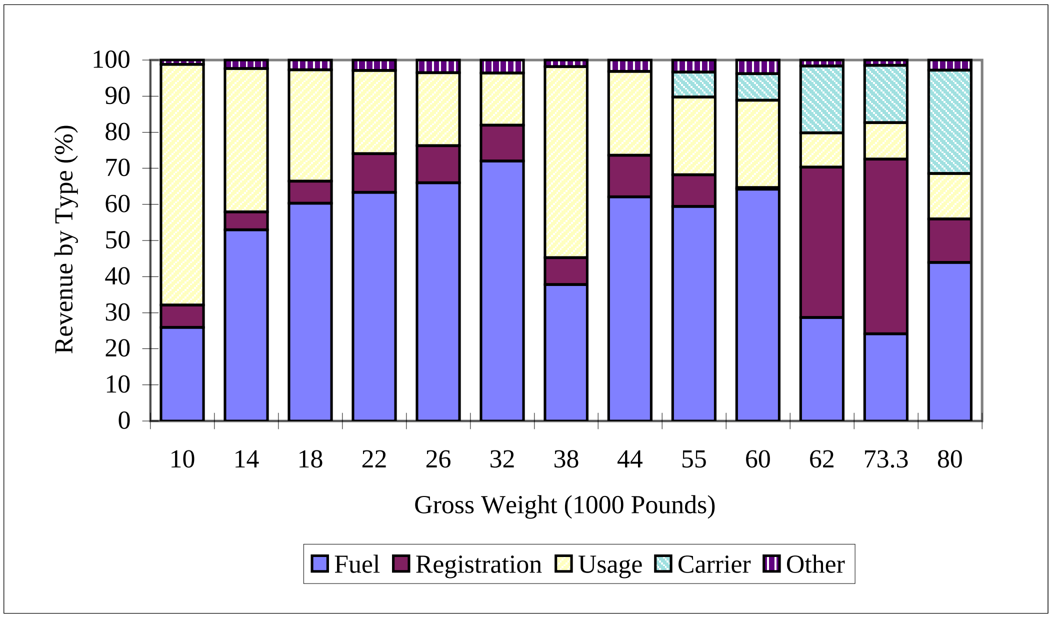

FIGURE 5. Revenue Component Percentages by Truck Weight

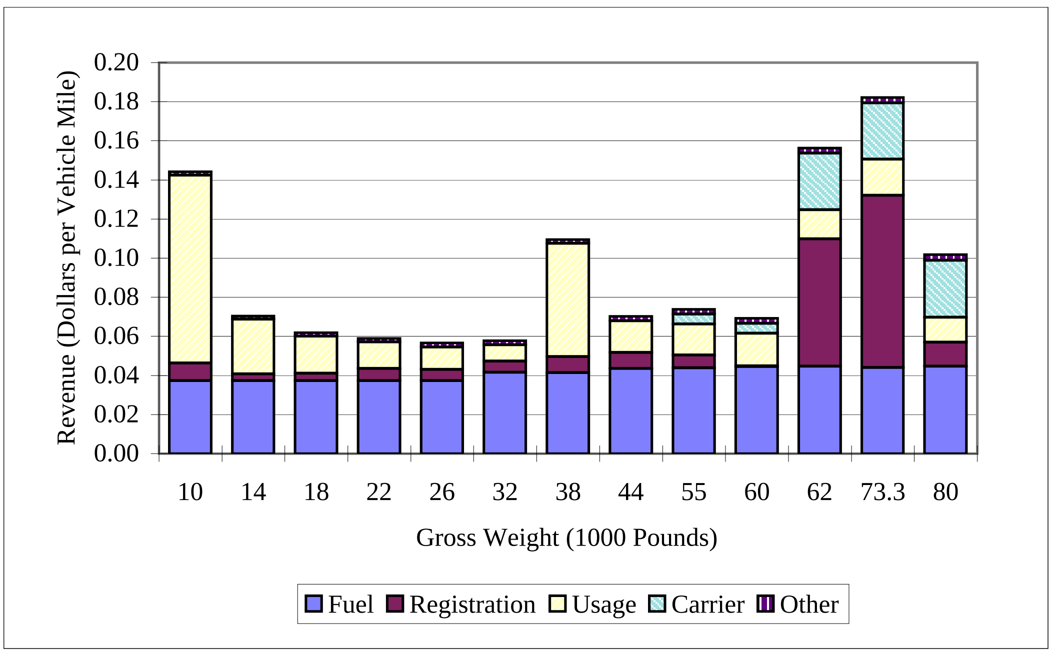

FIGURE 6. Per-Vehicle-Mile Revenue Components by Truck Weight

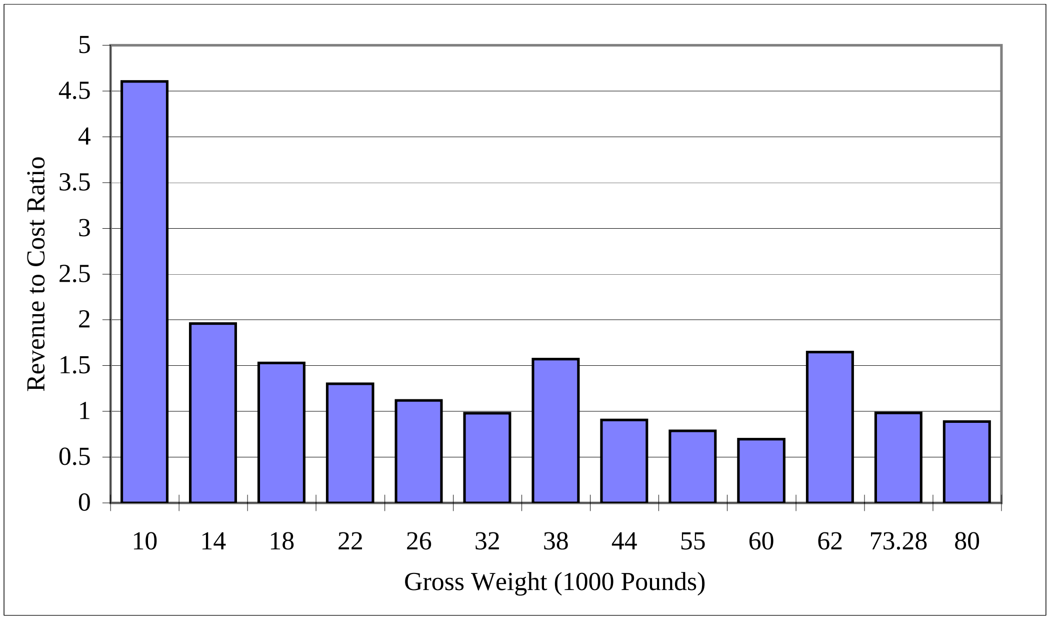

FIGURE 7. Revenue-to-Cost Ratio by Truck Weight

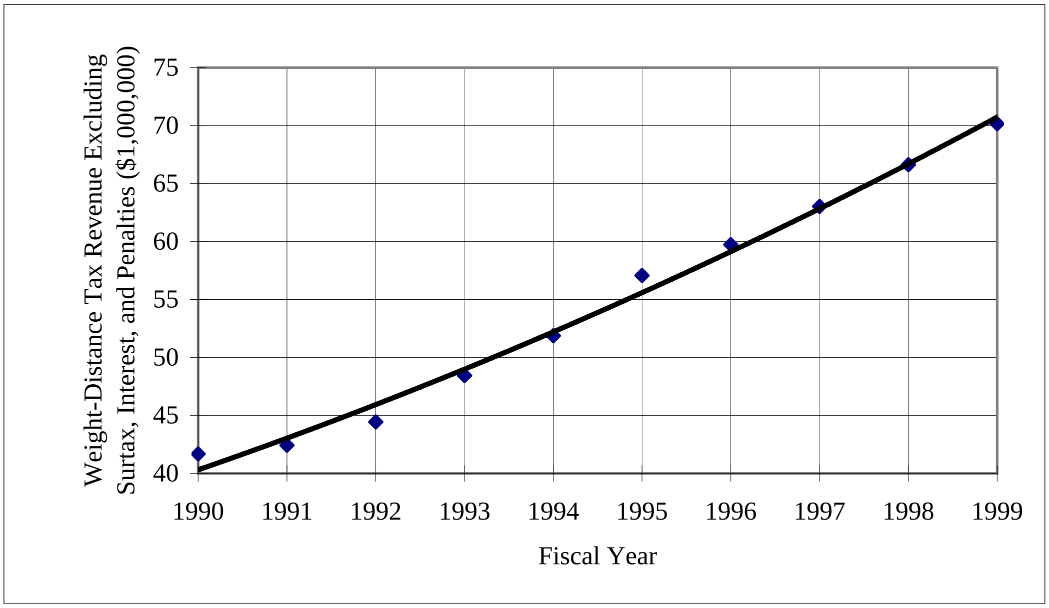

FIGURE 8. Trend in Weight-Distance Tax Revenue

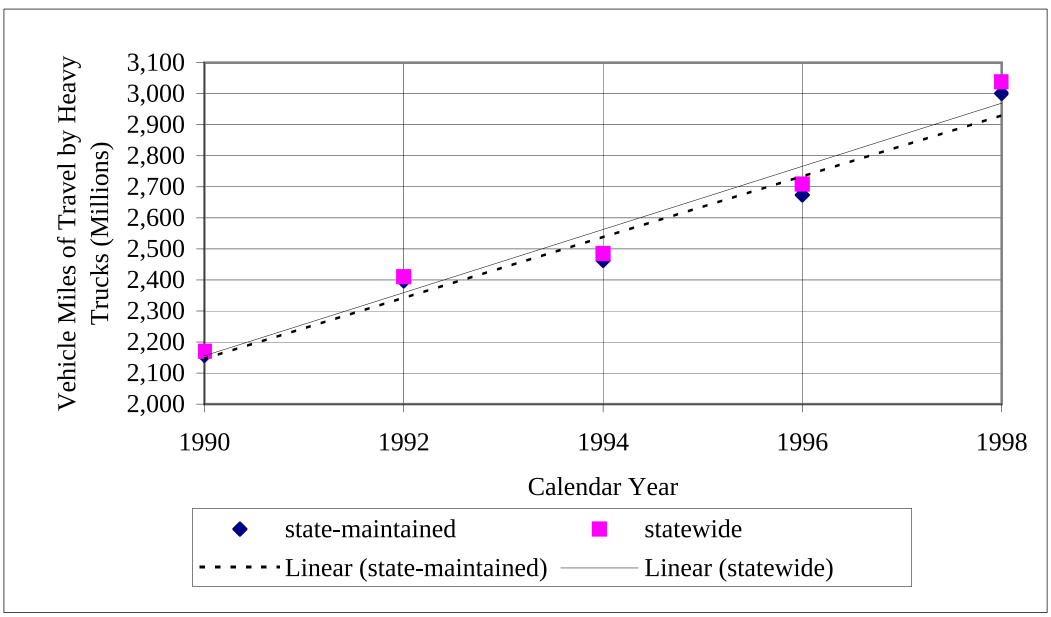

FIGURE 9. Trend in Travel by Heavy Trucks

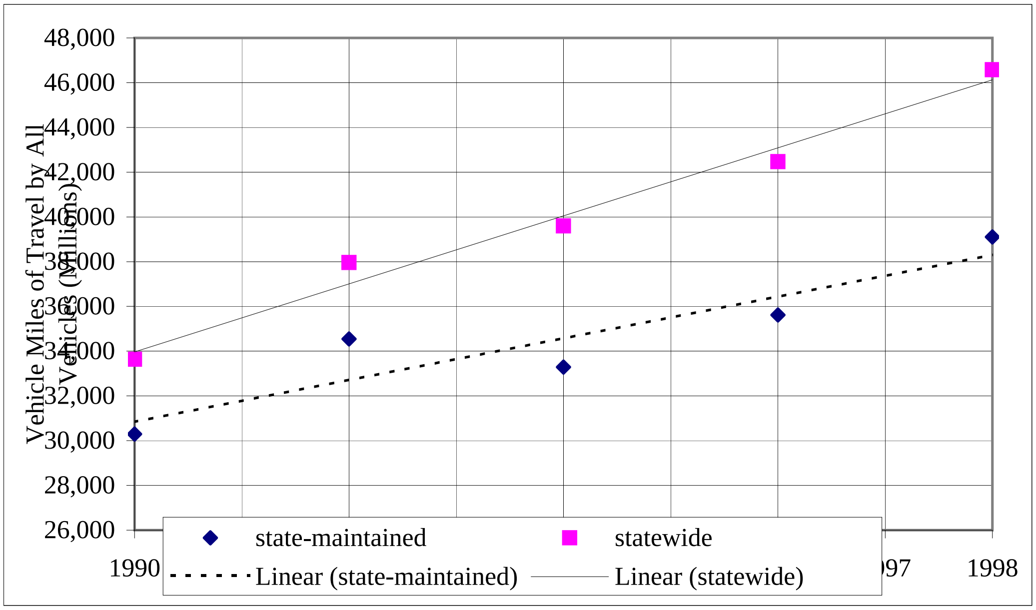

FIGURE 10. Trend in Travel by All Vehicles

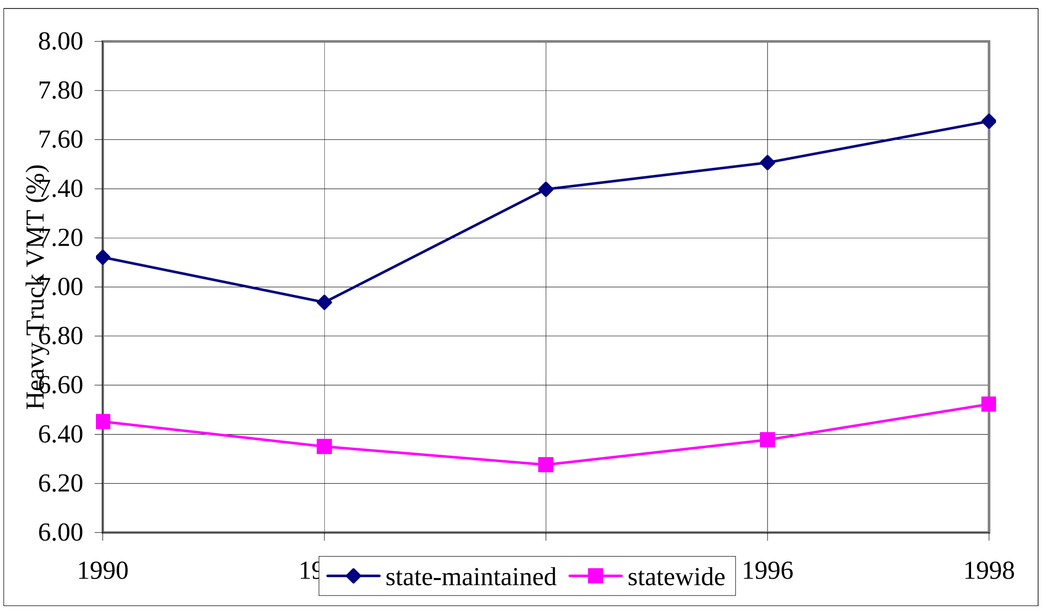

FIGURE 11. Trend in Percentage of Heavy-Truck Travel

TABLE 1. Vehicle Types for Cost and Revenue Allocation

Motorcycles
Cars
Buses
Trucks (registered or declared weight class, pounds)
6,000
10,000
14,000
18,000
22,000
26,000
32,000
38,000
44,000
55,000
59,999
62,000
73,280
80,000

TABLE 2. Guidelines for the Allocation of Total Costs to State-Maintained Highway System

Element	Method of allocation
Capital	Distribution of capital costs reflects expenditures on state-maintained system only, and costs are adjusted to meet the annual level of capital expenditures
...planning & design	
...right of way	
...utility relocation	
...grade, drain, & surfacing	
...resurfacing	
...bridges	
...miscellaneous	
M&O	All other costs are limited to expenditures from Road Fund
...roads	
...structures	
...traffic	
Administration	
Enforcement	
...motor carrier	
...other	
Miscellaneous	

TABLE 3. Guidelines for the Allocation of State-Maintained System Costs to Vehicle Classes

Element	Vehicle class	Basis (travel on state-maintained system)
Capital		
...planning & design	All	Veh miles
...right of way	All	Veh miles
...utility relocation	All	Veh miles
...grade, drain, & surfacing	All	15% veh miles, 55% PCE miles, 30% ESAL miles
...resurfacing	All	33% veh miles, 67% ESAL miles
...bridges	All	PCE miles
...miscellaneous	All	Veh miles
M&O		
...roads	20% to trucks (6 or more tires), 80% to all	Axle miles
...structures	All	PCE miles
...traffic	All	Veh miles
Administration	All	Veh miles
Enforcement		
...motor carrier	Trucks (6 or more tires)	Veh miles
...other	All	Veh miles
Miscellaneous	All	Axle miles

TABLE 4. Guidelines for the Allocation of Total Revenue to State-Maintained Highway System

Element	Method of allocation
Ad valorem taxes	None
Fuel tax	
...Ky heavy veh surtax	100%
...Ky carrier surtax	74%
...Ky normal and normal use	74%
...federal	100%
Veh registration & license	
...cars	100%
...buses	100%
...motorcycles	100%
...Ky trucks	70%
...apportioned trucks	70%
...truck ID cards	100%
...truck permits	100%
...other	100%
Miscellaneous	100%
Operator's license	Approximately 70%
Commercial driver's license	100%
Usage tax	
...Ky buses	100%
...Ky other veh	100%
...federal trucks & trailers	100%
Road tolls	100%
Other motor carrier taxes	
...Ky weight distance	100%
...Ky extended weight	60%
...federal use	100%
Other federal taxes	100%

TABLE 5. Guidelines for the Allocation of State-Maintained System Revenue to Vehicle Classes

Element	Vehicle class	Basis (travel on state-maintained system)
Fuel tax		
...Ky heavy veh surtax	Trucks over 59,999 lbs	Revenue estimates from veh mi, rates of fuel consumption, & tax rates
...Ky carrier surtax	Trucks over 26,000 lbs	See above
...Ky normal and normal use	All	See above
...federal	All	See above
Veh registration & license		
...cars	Cars	100%
...buses	Buses	100%
...motorcycles	Motorcycles	100%
...Ky trucks	Trucks	Revenue estimates from number of registered trucks & registration fees (with adjustments for farm, exempt, and 6,000-lb trucks)
...apportioned trucks	Trucks	Number of ID cards
...truck ID cards	Trucks	Number of ID cards
...truck permits	Trucks	Number of ID cards
...other	All	Veh miles
Miscellaneous	All	Veh miles
Operator's license	All	Veh miles
Commercial driver's license	Trucks over 22,000 lbs	Veh miles
Usage tax		
...Ky buses	Buses	100%
...Ky other veh	All excluding buses	As reported (R5421)
...federal trucks & trailers	Trucks over 33,000 lbs	Veh miles
Road tolls	All	Toll collection receipts
Other motor carrier taxes		
...Ky weight distance	Trucks over 59,999 lbs	Veh miles
...Ky extended weight	80,000-lb trucks	100%
...federal use	Trucks over 54,999	Veh miles
Other federal taxes	All	Veh miles

TABLE 6. Frequency Distribution of Registered Gross Weights

Gross weight (lbs)	Axle configuration									
	Straight trucks				Single trailer			Multiple trailers		
	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles
6,000	100.00									
10,000		5.12	0.19	0.25		0.05				
14,000		8.58	0.46	0.75		0.05				
18,000		10.90	0.65	0.75	0.21					
22,000		7.56	0.74							
26,000		27.28	2.41	1.76	1.27					
32,000		12.57	1.94	2.26	3.60	0.31				
38,000		17.69	6.66	1.01	1.48	0.21	0.27			
44,000		1.85	11.66	1.51	5.51	0.37	0.81	14.29		
55,000		4.11	27.84	9.80	25.64	2.47	0.27			
62,000		0.24	3.33	4.52	6.57	1.05	0.27			
73,280		1.25	12.95	51.26	5.08	1.78	0.27			
80,000		2.86	31.17	26.13	50.64	93.70	98.12	85.71	100.00	100.00
Sample Size		1,679	1,081	398	472	1,905	372	7	0	1

TABLE 7. Changes in Relative Travel Activity from CY 1996 to CY 1998

Vehicle type[a]	Statewide vehicle miles of travel (1,000)			Percentage within travel stream		
	CY 1996	CY 1998	Annual percent change	CY 1996	CY 1998	Annual percent change
Cars	25,806,143	27,616,698	3.5	60.762	59.293	-1.2
Buses	283,572	319,390	6.3	0.668	0.686	1.3
Pickups and vans	12,303,657	14,164,778	7.6	28.969	30.411	2.5
Light trucks	647,125	655,844	6.7	1.524	1.408	-3.8
Medium trucks	721,837	781,981	4.2	1.699	1.679	-0.6
Heavy trucks	2,708,698	3,038,228	6.1	6.378	6.523	1.1
Total	42,471,035	46,576,919	4.8	100.000	100.000	---

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 8. Percent of Contribution by Vehicle Type to Various Use and Wear Measures, State-Maintained System

Vehicle type	Vehicle miles			Axle miles			PCE miles			ESAL miles		
	1996	1998	2000	1996	1998	2000	1996	1998	2000	1996	1998	2000
Motorcycles	0.22	0.21	0.19	0.20	0.19	0.17	0.09	0.08	0.08	0.00	0.00	0.00
Cars	61.57	60.79	59.12	55.24	54.45	52.82	49.80	49.13	47.80	1.51	1.52	1.18
Buses	0.53	0.45	0.41	0.47	0.40	0.37	1.04	0.90	0.83	2.25	1.86	1.43
Straight trucks												
2 axles, 4 tires	26.83	27.63	29.31	24.07	24.74	26.19	21.70	22.33	23.70	1.32	1.38	1.17
2 axles, 6 tires	2.51	2.44	2.38	2.25	2.18	2.12	3.64	3.53	3.47	6.12	6.05	5.19
3 axles	0.76	0.85	0.74	1.03	1.15	0.99	1.84	2.13	1.84	5.13	5.53	5.51
4 or more axles	0.16	0.14	0.15	0.29	0.26	0.27	0.43	0.37	0.40	4.78	4.83	4.23
Single-trailer trucks												
4 or less axles	0.81	0.78	0.75	1.46	1.40	1.33	2.10	2.04	1.96	6.14	4.61	3.72
5 axles	5.95	5.96	6.20	13.35	13.34	13.85	17.30	17.11	17.58	53.42	51.31	47.58
6 or more axles	0.35	0.42	0.41	0.95	1.13	1.09	1.26	1.48	1.43	14.89	18.58	25.07
Multiple-trailer trucks												
5 or more axles	0.25	0.28	0.29	0.56	0.63	0.65	0.68	0.76	0.77	3.52	3.47	4.11
6 axles	0.03	0.03	0.04	0.09	0.09	0.10	0.08	0.10	0.11	0.51	0.40	0.53
7 or more axles	0.02	0.01	0.01	0.05	0.05	0.04	0.04	0.04	0.04	0.40	0.47	0.26
Subtotal, combinations	7.42	7.48	7.70	16.46	16.64	17.06	21.45	21.53	21.89	78.88	78.84	81.27
Subtotal, trucks	37.68	38.54	40.28	44.10	44.97	46.63	49.07	49.89	51.30	96.23	96.63	97.37
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE 9. Summary Distribution of Annual Cost Responsibility

Vehicle type[a]	Annual capital cost ($1000)	Annual maintenance/ administrative cost ($1000)	Total annual cost responsibility	
			Thousand dollars	Percent
Cars	412,656	179,500	592,156	44.061
Buses	12,418	1,291	13,710	1.020
Pickups and vans	201,919	86,704	290,623	21.625
Light trucks	17,146	9,082	26,227	1.952
Medium trucks	43,566	13,922	57,488	4.278
Heavy trucks	283,680	80,047	363,727	27.064
Total	971,386	372,545	1,343,931	100.000

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 10. Trend in Cost Responsibility

Vehicle type[a]	Year of report					
	1990	1992	1994	1996	1998	2000
	Percent cost responsibility					
Cars	45.69	44.16	45.22	45.93	45.74	44.06
Buses	1.11	1.34	1.29	1.14	1.04	1.02
Pickups & vans	20.23	20.40	19.80	19.99	20.72	21.63
Light trucks	3.04	2.53	2.44	1.95	2.07	1.95
Medium trucks	6.76	6.93	4.97	4.26	4.23	4.28
Heavy trucks	23.17	24.64	26.28	26.73	26.22	27.06
	Percent state-maintained system travel (VMT)					
Cars	62.93	62.22	62.92	61.79	61.00	59.31
Buses	0.38	0.37	0.44	0.53	0.45	0.41
Pickups & vans	25.59	26.63	26.15	26.83	27.63	29.31
Light trucks	1.91	1.77	1.73	1.56	1.58	1.47
Medium trucks	1.82	1.89	1.80	1.89	1.84	1.82
Heavy trucks	7.38	7.12	6.94	7.40	7.51	7.68
	Normalized ratio of cost to travel					
Cars	0.73	0.71	0.72	0.74	0.74	0.74
Buses	2.92	3.62	2.93	2.16	2.31	2.49
Pickups & vans	0.79	0.77	0.76	0.74	0.75	0.74
Light trucks	1.59	1.43	1.41	1.25	1.31	1.33
Medium trucks	3.71	3.67	2.76	2.25	2.30	2.35
Heavy trucks	3.14	3.46	3.79	3.61	3.49	3.52

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 11. Summary Distribution of Annual Revenue Generated, State-Maintained System (FY 1999)

Vehicle type[a]	Annual fuel tax revenue ($1000)	Annual usage tax revenue ($1000)	Other annual revenue ($1000)	Total annual revenue	
				Thousand dollars	Percent
Cars	266,514	224,883	68,991	560,389	42.997
Buses	11,143	9	340	11,491	0.882
Pickups & vans	171,151	116,735	29,465	317,351	24.350
Light trucks	21,424	13,097	4,184	38,705	2.970
Medium trucks	30,429	18,475	7,913	56,817	4.359
Heavy trucks	133,931	39,095	145,528	318,555	24.442
Total	634,592	412,294	256,421	1,303,307	100.000

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 12. FY 1999 Tax Rates and Estimated Revenue Supporting State-Maintained Highway System ($1000)

Source	Rate	Notes	Passenger Vehicles	Pickups & Vans	Light Trucks (10,000-26,000)	Medium Trucks (32,000-59,999)	Heavy Trucks (62,000-80,000)	Total	%
Fuel Taxes									
Kentucky, heavy veh. surtax	2.0¢ per gal	59,999 lbs & less exempt					51	51	0.004
Kentucky, carrier surtax	2.2¢ per gal gasoline, 5.2¢ per gal diesel	Totals excl. 26% to local govt; all 2-axle and all 26,000 lbs. & less exempt				3,057	14,629	17,687	1.357
Kentucky, normal & use	15.0¢ per gal gasoline, 12.0¢ per gal diesel	Totals excl. 26% to local govt; rates exclude 1.4¢ for environmental assurance	151,254	94,159	9,462	11,221	45,258	311,353	23.889
Federal	10.0¢ per gal gasoline, 16.0¢ per gal diesel, 4.0¢ per gal gasohol	Rates excl. 0.1¢ for LUSTs, 6.8¢ for debt, 1.5¢ for transit & 0.6¢ unspecified for gasohol; totals excl. amounts not returned to Kentucky	126,403	76,992	11,962	16,150	73,993	305,501	23.440
Vehicle Reg. & License Fees									
Cars	$12.00 per vehicle per year		25,511					25,511	1.957
Buses	$12.00 per vehicle per year		55					55	0.004
Motorcycles	$9.50 per vehicle per year		578					578	0.044
Trucks									
Kentucky	$24.50-$1,260.50 per veh per yr	Totals exclude 30% to local govt		7,302	2,966	4,666	5,610	20,544	1.576
Apportioned	Based on fraction of travel in KY	Totals exclude 30% to local govt			14	20	29,501	29,536	2.266
Vehicle ID Cards					3	4	6,126	6,133	0.471
Permits					4	5	7,423	7,432	0.570
Other			5,508	2,703	135	168	708	9,222	0.708
Miscellaneous		Totals exclude about 30% to local govt	23,521	11,542	578	718	3,022	39,382	3.022
Operator's License Fees	$8 per driver every 4 years, $6 instructional permit		4,773	2,342	117	146	613	7,991	0.613
Commercial Driver's License	$40 new, $35 renewal, $20 bus per year				77	208	874	1,159	0.089
Usage Taxes									
Kentucky, buses	6% of retail price		9					9	0.001
Kentucky, other vehicles	6% of retail value	Specified retail value differs by vehicle type	224,883	116,735	13,097	12,627	8,335	375,676	28.825
Federal, trucks & trailers	12% of retail price	33,000 lbs & less exempt				5,848	30,761	36,609	2.809
Road Tolls			5,473	3,655	192	429	3,686	13,434	1.031
Other motor carrier taxes									
Kentucky, weight distance	2.85¢ per vehicle mile	Total includes $0.15 million from 1.15¢ surtax (now expired)					71,395	71,395	5.478
Kentucky, ext.-weight permits	$160-$360 per vehicle per year	Totals exclude 40% to local govt					842	842	0.065
Federal, use	$100-$500 per vehicle per year					1,431	15,225	16,656	1.278
Other federal taxes	Tires		3,914	1,921	96	119	503	6,554	0.503
Total			571,880	317,351	38,705	56,817	318,555	1,303,307	100.000
Percent			43.879	24.350	2.970	4.359	24.442	100.000	

Notes: Table excludes ad valorem taxes assessed on all vehicles as well as corporate and employee taxes. Registration fee for farm trucks is $11.50 for 38,000 lbs or less and 40% of normal fees otherwise. Registration fee for exempt trucks greater than 18,000 lbs is 75% of normal truck fees. Heavy vehicle surtax was repealed effective July 15, 1996; however, quarterly tax returns by motor carriers resulted in previous quarter income of $51,000.

TABLE 13. Trend in Revenue Attribution (percent)

Vehicle type[a]	Fiscal year				
	1991	1993	1995	1997	1999
Cars	44.69	44.15	44.17	43.03	43.00
Buses	0.28	0.53	0.90	0.81	0.88
Pickups and vans	22.49	22.13	23.28	24.76	24.35
Light trucks	2.69	2.76	2.72	2.89	2.97
Medium trucks	4.39	4.43	4.60	4.56	4.36
Heavy trucks	25.46	26.00	24.33	23.96	24.44

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 14. Distribution of Vehicle-Miles Traveled (1000)

Vehicle type[a]	State maintained		Total	
	Vehicle miles	Percent	Vehicle miles	Percent
Cars	23,194,039	59.31	27,616,698	59.29
Buses	161,346	0.41	319,390	0.69
Pickups & vans	11,461,453	29.31	14,164,778	30.41
Light trucks	574,437	1.47	655,844	1.41
Medium trucks	712,511	1.82	781,981	1.68
Heavy trucks	3,001,247	7.68	3,038,228	6.52
Total	39,105,033	100.00	46,576,919	100.00

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 15. Trend in Revenue per Vehicle Mile (cents)

Vehicle type[a]	Fiscal year				
	1991	1993	1995	1997	1999
Cars	2.02	1.92	2.24	2.25	2.42
Buses	2.19	3.28	5.32	5.82	7.12
Pickups and vans	2.38	2.32	2.71	2.86	2.77
Light trucks	4.27	4.36	5.45	5.81	6.74
Medium trucks	6.54	6.72	7.59	7.92	7.97
Heavy trucks	10.07	10.27	10.29	10.20	10.61
Average	2.82	2.74	3.13	3.19	3.33

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 16. Trend in Revenue to Cost Ratio

Vehicle type[a]	Fiscal year				
	1991	1993	1995	1997	1999
Cars	1.01	0.98	0.96	0.94	0.98
Buses	0.21	0.41	0.79	0.78	0.86
Pickups and vans	1.10	1.12	1.16	1.19	1.13
Light trucks	1.06	1.13	1.40	1.39	1.52
Medium trucks	0.63	0.89	1.08	1.08	1.02
Heavy trucks	1.03	0.99	0.91	0.91	0.90

[a]Cars include motorcycles as well as passenger automobiles, 6,000-pound trucks are considered to be pickups and vans, light trucks have gross weights of 10,000 to 26,000 pounds, medium trucks have gross weights from 32,000 to 59,999 pounds, and heavy trucks have gross weights of 60,000 pounds or more.

TABLE 17. Trend in Weight-Distance-Tax Revenue and its Collection

Fiscal year	Vehicle miles of travel (1000)	Estimated revenue ($1000)	Reported revenue[a] ($1000)	Percent of estimate
1991	2,170,217	86,808	59,506	68.5
1993	2,410,543	96,422	67,895	70.4
1995	2,485,175	70,827	57,075	80.6
1997	2,708,699	77,198	63,024	81.6
1999	3,038,228	86,589	70,162	81.0

[a]Includes surtax when appropriate but excludes interest and penalties.

TABLE 18. Trend in Fuel Consumption and its Estimation

Fuel type	Fiscal year	Estimated gallonage (1000)	Reported gallonage (1000)	Percent of estimate
Gasoline/gasohol	1991	1,701,792	1,833,750	107.8
	1993	1,868,932	1,908,037	102.1
	1995	1,924,308	2,025,455	105.2
	1997	2,028,035	2,034,739	100.4
	1999	2,180,772	2,108,276	96.7
Special fuel	1991	528,113	488,179	92.4
	1993	556,814	521,073	93.6
	1995	578,459	577,117	99.8
	1997	623,143	704,817	113.1
	1999	675,940	690,621	102.2
Total	1991	2,229,905	2,321,929	104.1
	1993	2,425,746	2,429,110	100.1
	1995	2,502,766	2,602,573	104.0
	1997	2,651,178	2,739,557	103.3
	1999	2,856,712	2,798,897	98.0

TABLE 19. Trend in Fuel-Tax Revenue and its Estimation

Fuel tax	Fiscal year	Estimated revenue ($1000)	Reported revenue ($1000)	Percent of estimate
Heavy vehicle surtax	1991	7,782	5,528	71.0
	1993	8,378	6,272	74.9
	1995	8,385	7,310	87.2
	1997	10,032	2,008	20.0
	1999			
Carrier surtax	1991	17,861	12,435	69.6
	1993	19,136	14,808	77.4
	1995	19,350	15,008	77.6
	1997	20,987	14,439	68.8
	1999	22,753	17,687	77.7
Normal	1991	237,173	242,326	102.2
	1993	257,805	257,431	99.9
	1995	265,456	272,896	102.8
	1997	280,447	284,519	101.5
	1999	302,089	311,353	103.1

Note: The heavy vehicle surtax was repealed effective July 15, 1996.

APPENDIX A

ECONOMIC EVALUATION OF THE FEDERAL AND KENTUCKY HIGHWAY COST ALLOCATION METHODS

Eric Thompson
Associate Director
Center for Business and Economic Research
Carol Martin Gatton College of Business and Economics

Introduction

This document examines highway cost allocation methods from an economic perspective. A brief description and comparison was made of the cost allocation approaches used both in the current Kentucky highway cost allocation study and in the recent *1997 Federal Highway Cost Allocation Study*[1]. An analysis was then conducted of how the agency cost allocation approach common to the state and federal study would compare to an approach based on economic "efficiency." It is possible that elements of such an efficiency approach may be adopted into cost allocation studies in the future. The two approaches are quite different. However, as is described in the following discussion, the two are also related.

The Federal and Kentucky Highway Cost Allocation Study Approaches

The federal and Kentucky highway cost allocation studies each utilized a variety of methods to allocate or "occasion" costs among different vehicle classes. These vehicle classes included automobiles, buses, motorcycles, and trucks, and within the truck category, subgroups of trucks. The focus of each study was to allocate highway agency expenditures to the different classes of vehicles. In general, the approach differed for type of highway cost: new highway construction, reconstruction and rehabilitation, bridge construction, and others. The cost occasioning approach used in the federal highway cost allocation study (HCAS) is described in the publication *1997 Federal Highway Cost Allocation Study*, while the approach used in the Kentucky HCAS is described in the *1998 Highway Cost Allocation Update*[2].

Both the federal and Kentucky approaches to cost allocation stressed "equity" comparisons to ascertain whether each vehicle class is paying user charges proportionate to its share of highway agency costs. The two approaches both allocated highway agency costs using detailed costs categories, with the federal methodology being especially detailed. In addition to the agency cost occasioned approach, the federal study also considered an "efficiency" approach to cost allocation where only the marginal costs of highway use were considered. Marginal cost refers to the incremental cost that the last vehicle using a highway would impose on highway agencies or society in general. Thus the "efficiency" approach also considered a number of non-agency costs that highway travel may impose on society such as air and noise pollution, the time cost of congested roads, and certain accident costs. To reiterate, the federal analysis did not include such pollution or congestion costs in its final analysis of cost and revenue equity, but instead focused on allocating highway agency costs. These efficiency cost estimates simply were presented in addition to the agency cost allocation results for the benefit of readers interested in

---

[1]U.S. Department of Transportation, Federal Highway Administration, Federal Transit Administration, Federal Railroad Administration, "*1997 Federal Highway Cost Allocation Study*," HPP-10/9-97(3M)E, Washington, D.C., 1997.

[2]Jones, Samatha S. and Pigman, Jerry G., "*1998 Highway Cost Allocation Update*," Research Report KTC-98-3, Kentucky Transportation Center, University of Kentucky, 1998.

efficiency costs.

Some interesting features of the federal and Kentucky HCAS approaches are discussed below. A comparison of the agency cost occasioned and efficiency approaches to cost allocation is discussed in the next section.

The first major feature of both the federal and Kentucky HCAS is that each approach sometimes makes a distinction between costs that would accrue no matter which types of vehicles use a roadway from costs that occur only due to certain types of vehicles, such as heavy trucks. Examples of these costs include some bridge design costs, costs for operating weigh stations, or costs for state law enforcement for motor carriers. Costs that accrue to all types of vehicles are assigned to all vehicle classes and then allocated among all vehicle classes. Costs that occur due to certain types of vehicles are assigned only to the relevant vehicle classes, and then allocated among the relevant vehicle classes. One noteworthy difference between the federal and Kentucky HCAS is that the federal HCAS allocates some bridge costs solely to larger heavier trucks but the Kentucky HCAS does not. However, the Kentucky HCAS allocates all bridge costs by passenger car equivalent-vehicle miles traveled (PCE-VMT) (rather than VMT as in the federal HCAS), in effect shifting more costs to the larger heavier trucks. This causes a relatively greater allocation to larger heavier vehicles, as also occurs with the incremental federal approach.

The second major feature of the state and federal HCAS is that for costs assigned to all vehicle classes, or a group of vehicle classes, costs are allocated to particular vehicle classes using vehicle miles traveled (VMT) or some variant of VMT. VMT is used when the cost occasioned is not thought to vary by vehicle class. In these cases, costs are allocated to each vehicle class based on that vehicle class' share of VMT. A variant of VMT is used when the cost occasioned is thought to vary by vehicle class. Pavement costs are an example. For pavement costs, the total cost of construction and reconstruction must be divided among all vehicle classes, since all classes of vehicles contribute something to pavement wear. In making this allocation, the amount that a vehicle contributes to the wear of the pavement is influenced by the weight of that vehicle, or the weight per axle. The contribution of different vehicles to pavement deterioration per mile driven can be summed up by some scale, such as ESALs (equivalent single axle load). And, pavement costs can be allocated among vehicle classes using ESAL-VMT, or each vehicle classes share of VMT multiplied by the ESAL index.

Both the Kentucky and federal HCAS utilize ESAL-VMT and PCE-VMT to allocate costs, and the allocation approaches are broadly similar. One noteworthy difference between the two approaches is in the allocation of grading and draining costs to support all vehicle classes. The Kentucky HCAS allocates those costs according to VMT, as was done in the *1982 Federal Highway Cost Allocation Study*[3]. However, these grading and draining costs are now allocated according to PCE-VMT in the 1997 Federal HCAS. For the Kentucky HCAS, this suggests that a

[3]U.S. Department of Transportation, Federal Highway Administration, "*1982 Federal Highway Cost Allocation Study*," Washington, D.C., 1982.

larger share of grade, drain & surfacing costs could be allocated by PCE-VMT rather than VMT. One other noteworthy difference is that the federal HCAS uses an index based on the Nationwide Pavement Cost Model (NAPCOM) rather than the ESAL when allocating pavement resurfacing costs among vehicle classes. This different method, however, may not necessarily lead to greatly different results. As with the ESAL, the purpose of the NAPCOM model is to distinguish the greater impact that larger or heavier vehicles place on pavement wear. Thus the two approaches may yield similar cost allocations.

The third major feature of the federal and Kentucky HCAS is that both studies allow for cost equity comparisons combined for federal and state government. The federal HCAS presents equity comparisons for federal and state government combined as well as for the federal government alone (Table VI-21). The combined analysis therefore presents equity comparisons that reflect the overall costs and revenues experienced by different vehicle classes rather than only those costs related to one level of government. It also reflects the reality that federal and state expenditures and revenues are intertwined in the transportation system. The Kentucky HCAS includes state transportation revenues along with major federal transportation revenue sources that are eventually returned to the state such as federal fuel taxes, and federal usage taxes, as well as some miscellaneous federal taxes. On the cost side, the costs allocated are those supported by both federal and state funds on both state and interstate roadways.

The federal HCAS also considers a combined government equity analysis that includes local government as well as state and federal government (Table VI-21). Including local government in equity analysis, however, can be problematic. This is because much of the revenue to cover local road costs come from local property and sales taxes rather than transportation revenue such as the local share of registration fees and fuel taxes. Thus local transportation revenues are very low relative to local road costs for all vehicle classes. The inclusion of local government costs and transportation revenues in the federal HCAS tends to cause combined equity ratios of revenues to costs to be lower for all vehicle classes. This may accurately reflect that vehicle users do not pay enough local transportation revenues to support local road costs, but may also reflect that there has not been a concerted effort to balance road costs and transportation revenues at the local level. Therefore, it may be more appropriate to focus on equity measures only for the combined federal and state governments. The Kentucky HCAS does not consider local costs and revenues. Further, Kentucky HCAS revenue estimates do not include the local portion of Kentucky fuel tax or registration fee revenue.

The Cost Allocation Approach: Agency Costs versus Efficiency

Both the federal and Kentucky HCAS currently conduct cost allocation using an agency costs occasioned approach. This approach examines whether each vehicle class is paying user charges proportionate to its share of *highway agency costs*, including both fixed costs and costs that vary with the amount of vehicle use. The federal HCAS also examines an alternative approach to cost allocation, the “efficiency approach.” Such an efficiency approach would only allocate the marginal costs of highway use. The advantage of the efficiency or marginal cost approach is that each class of vehicles would be expected to pay revenues equal to the marginal cost they impose on society. This pricing approach would lead to the proper allocation of vehicle travel. As discussed below, the efficiency approach also would likely raise enough revenue to cover highway agency costs.

The agency cost and efficiency approaches do suggest different cost allocation methodologies. However, it is possible to argue that the allocations are in some cases “related” in the sense that both approaches allocate highway costs that vary with the amount of use. This can be illustrated using the example of reconstruction and resurfacing costs that result from vehicle use (rather than other causes like age and weather that are not directly tied to the level of vehicle use). These costs are clearly related to the number of vehicle miles traveled, and also vary based on the type of vehicle. Larger, heavier vehicles have higher costs of use. Both the Kentucky and federal HCAS allocate these costs to vehicle classes according to the VMT of that class, and impose higher per mile costs on larger, heavier vehicles. This approach is related to a marginal cost approach in the sense that highway agency costs are related to the level of vehicle use. But, the cost is allocated according to the average cost of all vehicles in that class on pavement wear. A marginal cost approach would only consider the additional cost of the last vehicle in a particular class. This marginal cost may be higher, perhaps substantially higher, than the average cost if the damage imposed by an additional vehicle load rises with the stress that the pavement is already experiencing from the current vehicle load. Thus, the agency cost occasioned approach methodology is in the spirit of the marginal cost approach, but is different and would lead to a different result.

To give another example, the current HCAS method for allocating costs for new construction or improvements to relieve traffic congestion also relies on vehicle use. The allocation approach considers that these efforts to reduce congestion are necessary due to the vehicles traveling on existing roadways. Thus, these existing vehicles should be allocated the cost of new roads, added lanes, or special projects to relieve congestion according to vehicle presence on the road during congested periods. This suggests that costs should be allocated to vehicle classes according to miles driven during congested periods. The mileage also should be weighted to reflect that larger vehicles such as trucks contribute more to congestion. This weighting is captured by the concept of PCE vehicle miles. Thus, the agency cost approach to allocating new construction costs according to PCE-VMT’s (or ESAL-VMT’s in the case of pavement on new roads) reflects vehicle use of existing roads. However, it is not truly marginal cost allocation. Also, this approach is only valid for new road construction costs to the extent that congestion relief is the main purpose rather than other purposes such as safety or economic development.

Another divergence between the current agency cost occasioned approach and an efficiency approach is in how the two methods would allocate “fixed” highway agency costs, or costs that are not related to how much vehicles utilize highways. Examples of such fixed costs are some portion of bridge construction costs, or some administrative costs to oversee the highway system.
The current Kentucky and federal HCAS system allocates most of these fixed highway costs

among vehicle classes based on each classes' share of VMT, either weighted or un-weighted. This allocation approach, however, may not be appropriate in the efficiency approach. Such fixed costs by definition have no marginal cost per mile driven, and therefore it may not be appropriate to assign costs within a vehicle class on that basis. Take the example of a bridge, where much of the cost for construction are based on simply providing a bridge, and varies little with the number of times the bridge is used. Automobiles do not impose more "dead load" costs on the bridge simply because autos use the bridge 10 times more than a light trucks uses it. Thus, if costs imposed do not vary with use, allocating costs based on the vehicle miles traveled approach may not be appropriate for allocating such fixed costs. Under the efficiency approach, such fixed costs would simply not be allocated to vehicle classes. Additional revenues to cover agency fixed costs would come from levies on various non-agency costs of vehicle use.

It is the inclusion of these non-agency social costs of travel that marks the primary divergence between the current agency cost approach to cost allocation and an efficiency approach. The current approach does not consider these costs but these costs are central to the efficiency approach. These costs include noise and air pollution, external accident costs, and congestion costs. Such costs clearly are not fixed, and vary with vehicle use. These costs therefore would be of interest for inclusion in a marginal cost or efficiency approach to highway cost allocation. These costs, however, are generally not considered in current cost occasioned methods that are primarily concerned with allocating highway agency costs. This said, it should be noted that the federal HCAS did discuss estimates of these marginal social costs, but did not include these costs in estimates of the equity of costs and revenues among different vehicle classes.

Finally, one major expectation with the efficiency approach to highway cost allocation is that taxes on the marginal costs imposed by vehicles would be sufficient to cover highway agency costs. Analysis in the *1997 Federal Highway Cost Allocation Study* suggests that marginal costs could cover at least a significant share of highway agency costs. That study found that combined federal and state highway agency costs were nearly $95 billion per year, and that the cost would rise to $125 billion annually if local costs were added. The same publication found that charging vehicles for the marginal social cost of travel (pollution, congestion, etc) would raise $405 billion in revenue each year. And, even this calculation did not include marginal pavement costs or air pollution costs. This figure is likely somewhat of an overestimate since it is based on miles traveled under the current tax system, and mileage traveled would certainly drop under a marginal cost tax system, particularly during peak travel hours. Further, some marginal taxes, such as time of day travel prices might be hard to implement on many types of roads. Still, the finding suggests that marginal cost allocation might be able to significantly cover highway agency costs.

Conclusions

This study found that the state and federal approaches to highway cost allocation are broadly similar. Both focus on allocating *highway agency* costs and transportation revenues among vehicle classes. Both approaches compare combined state and federal revenues and expenditures during cost allocation studies, although the federal study sometimes focuses on federal costs and revenues alone. The federal methodology was sometimes more detailed than the state approach. Further, there were some additional differences in methodology between the two approaches, but it was unclear how much these differences would influence allocation results.

The current agency cost occasioned approach to highway cost allocation is very different from a marginal cost or "efficiency" approach, an approach that may in part be adopted in cost allocation studies at some time in the future. Despite these differences, however, the two approaches are related. In terms of some of the variable costs of highway use, both the current agency cost approach and the efficiency approach are related in the sense that both consider the variable nature of these costs. However, the results are not the same in the sense that the current agency cost approach considers the average cost of a mile driven by vehicles in a class while the efficiency approach would consider the marginal cost of a mile driven by the last vehicle. The biggest differences between the two approaches are in their treatment of fixed highway agency costs, and the non-agency social costs of highway travel. The current approach ignores these social costs and focuses on allocating all agency costs. The efficiency approach argues that the fixed highway agency costs should not be allocated, but marginal social costs should be a focus of cost allocation.

APPENDIX B

TECHNICAL DOCUMENTATION

1. GENERAL CONCEPTS

- The analysis is limited to those costs and revenues associated with the state-maintained system of highways.
- Allocation guidelines are identified in Tables 2-5.

2. PROCEDURE

Two Excel workbooks provide the mechanism for updating the cost and revenue allocations. “2000 C Tables.xls” is used for cost allocation and “2000 R Tables.xls” is used for revenue attribution. The update requires that new information be supplied to both “2000 C Tables.xls” and “2000 R Tables.xls.” Input information is identified by red, italicized print. Some of the input information comes directly from printouts supplied by KYTC. Other input information must be calcuated in other Excel workbooks as listed in the METHODOLOGY section of this appendix.

Additionally, information from “2000 C Tables.xls” must be transferred to “2000 R Tables.xls” during the updating process. Specifically, the vehicle-miles-of-travel data of Table C8 and the registered-weight data of Table C19 must be copied to Tables R2 and R3, respectively.

The C and R Tables are printed automatically using a print macro embedded in each workbook. The print macro button is located in the “Title Page” worksheet in both the “2000 C Tables.xls” file and the 2000 R Tables.xls” file.

3. FILE IDENTIFICATION

2000 C Tables.xls	An Excel workbook used for allocating highway costs to various vehicle types and weight categories.
2000 R Tables.xls	An Excel workbook used for attributing highway revenues to various vehicle types and weight categories.
2000stars.xls	An Excel workbook designed to process construction cost data extracted from the Statewide Accounting and Reporting System (STARS) file.
stars.f	A Fortran program used to match the STARS file expenditures with the functional class, rural/urban designation and number of lanes for each roadway in the HPMS file.
2000hcai-1.xls	An Excel workbook into which Interstate classification data is entered on a segment by segment basis. A comma-separated-value file is produced for input to the QuickBasic4 program, 2000hcai.bas.

2000hcai-2.xls	An Excel workbook used to calculate travel (VMT) on Kentucky Interstates and the average composition of the traffic stream (percentages by vehicle type) on Interstate highways as a function of location (rural/urban) and number of lanes.
2000hcai.bas	A QuickBasic4 program to project Interstate classification data to the base year and to calculate vehicle-type percentages. The percentages are then transferred manually to 2000hcai-2.xls.
2000Hcafuels.xls	An Excel workbook which computes the average percentage of diesel fuel usage for input to Table R5 and Table R6.
2000Hcafunds.xls	An Excel workbook which categorizes and sums highway revenue and expenditure data extracted from "The Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999" (also contains historic information).
2000RegWt.xls	An Excel workbook used to store prior year registered weight information and to produce current averages for input into Table C19.
2000Hcausage.xls	An Excel workbook for processing and summarizing usage-tax revenue for input into Table R11.
2000TableC2.xls	An Excel workbook for calculating total mileage, vmt and aadt for HIS data by functional class. The data produced in this workbook is input for Table C2.

4. METHODOLOGY

APPENDIX C
Expenditures and Revenue Tables:

1) Open 2000Hcafunds.xls. This is the worksheet for the tables in Appendix C. Sort the worksheet by columns B & C for data entry. Carefully match entry blanks with information found in the Financial Report to Management. Use the previous year's Financial Report as a guide for choosing the appropriate numbers for each category. Make sure to note new categories in Appendix C that are relevant to the report. Add new categories in appropriate places, labeling each with a number in column A. This number is used for sorting.

2) Resort by column A to get the totals for each category found in Appendix C. Categories which have been added to the report will have to be placed in the appropriate group found in Appendix C. Make sure to check the formulas in the subtotal cells, as adding new categories will change the summation ranges.

APPENDIX D

Table C1:

Input:

Summary of Expenditures on State-Maintained System

The Transportation Cabinet's "Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999" was the primary source for expenditure data. The following essential expenditure categories were used:

Expenditures
- Capital
- Maintenance and Traffic Services
- Administration
- Enforcement
  - Motor Carriers
  - Other
- Miscellaneous

Appendix D links specific cost items identified in the "Financial Report ..." to the above categories.

Data from the STARS database is used to distribute capital costs into seven elements including planning and design; right of way; utility relocation; grade, drain, and surfacing; resurfacing; bridges; and miscellaneous (later, in Table C12)

Rural Secondary expenditures were distributed among capital, maintenance and administration categories based on information provided in the Transportation Cabinet's "Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999."

Input: Description: Annual expenditures for construction, maintenance and traffic services, administration, enforcement, and miscellaneous needs for state-maintained system
Source: Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999 (see Appendix C).

Procedures:

1) The information for Table C1 comes from the Expenditure data in “Appendix C, Identification of Cost and Revenue Elements.” New data which must be entered is in red and comes directly out of the appendix. The remaining cells that include data are updated automatically using formulas. Check that you are getting the correct figures out

of Appendix C by comparing last year's Table C1 with last year's appendix. Elements which must be entered include:

Expenditure Element	Source / Location of Data
Capital Subtotal	Expenditures, Capital Subtotal
Structures	Maintenance & Traffic, Mn-bridge maintenance
Traffic Services	Maintenance & Traffic, Mn-traffic
Main. & Traf. Subtotal	Maintenance & Traffic Subtotal
Administration	Administration Subtotal
Motor Carriers	Enforcement, Motor Carriers Subtotal
Other Enforcement	Enforcement, Other Subtotal

Table C2:

Input:

Highway System Mileage and Vehicle-Miles Traveled

This table is updated with data from the Highway Information System File (HIS). Information is categorized by functional classification, rural/urban designation, and number of lanes and includes data for mileage, vehicle-miles traveled (VMT), and annual average daily traffic (AADT). The mileage and vehicle-miles traveled were summed overall and a weighted mean for annual average daily traffic was calculated.

The mean AADT for each highway category was calculated based only on those records listing a non-zero AADT. This means the AADT was weighted by the section length. Vehicle-miles traveled was calculated using the following formula:

VMT = (Section length * AADT * 365)/1000

If a record did not have an AADT, the weighted mean AADT was used to estimate the vehicle-miles of travel.

This data set is sorted by functional classification, rural/urban designation and number of lanes.

Sums are calculated for number of sections, mileage, vehicle-miles traveled, number of sections with AADT, and mileage with AADT.

Input: Description: Highway miles, vehicle-miles traveled, and AADT by highway classification

Source: 1998 Highway Information System (HIS) file and total VMT estimates (both statewide and state-maintained system) provided by the Division of Planning, KYTC; FHWA's 1997 Highway Statistics

Procedures:

1) Two files are required to complete this table. The Universe HPMS format file for state-maintained roads (HPMS99.dat) and the file for local roads (FC 09-19 yr97.xls) were used. These files were provided by Neil Tollner. Use the programs his.f and loc.f to pull out desired fields in both data files. These programs also select only those routes which have roadway status "open" (codes 1 or 8).

2) Pull output files (his.out and loc.out) into KEDIT or similar editing program. Combine the files into one file and sort the rows by the control column (columns 10 & 11) and then by the roadway classification (columns 7 & 8). For the 1998 report, this combined file is called 2000TableC2.out.

3) Open Excel worksheet file 2000TableC2.xls. This file has a worksheet for each of the roadway specifications found in Table C2. Start with the worksheet for "int_rur" which stands for Interstate, Rural --the first category in Table C2. Copy the section from KEDIT which has control column=01 (state-maintained) and classification column=01 (Rural Interstate) into the appropriate columns in the Excel worksheet. You may have to copy it as one column and then use the Data>Text to Columns function to separate the data fields. Continue with the same procedure for the other categories. The categories are identified as follows:

Functional Class	Rural or Urban	Govt. Control	Functional Code
Interstate	Rural	01	01
Principal Arterial	Rural	01	02
Minor Arterial	Rural	01	06
Major Collector	Rural	01	07
Minor Collector	Rural	01	08
Local	Rural	01	09
Interstate	Urban	01	11
Freeway & X-way	Urban	01	12
Principal Arterial	Urban	01	14
Minor Arterial	Urban	01	16
Collector	Urban	01	17

Local	Urban	01	19
County Maintained	Rural	02	07, 08, 09
	Urban	02	17, 19
City Maintained	Rural	04	09
	Urban	04	14, 16, 17, 19
Other	Rural	11, 21, 60, 64, 66	09
	Urban	11, 70	16, 17, 19

The categories defined in the above table include only those found in the data set used in 2000. To determine the placement of other categories, refer to the codes listed in the HPMS File Layout Code Sheet on pages IV-23 and IV-27.

4) In each worksheet, there should be a column titled "Total Mileage" which calculates the section length by dividing the "Section Length" values by 1000. There should also be columns calculating the section lengths having AADT>0, the weighted AADT values and the VMTs. Make sure to check all the cell formulas to assure that the formula references are correct. The values in the Summary Table should be copied and pasted as values in the appropriate space in the worksheet titled "C2" in the "2000 C Tables" file.

5) Mileage, vehicle-miles, and AADT data for the interstates should be compared to the same values found in the Appendix F tables. Because the data in the Appendix F Tables is considered to be more accurate, replace the values in Table C2 with the values calculated from the F Tables for interstates only. The calculations are located in the Appendix F Tables file which is found in the 2000hcai-2.xls file in worksheet "Table C2".

6) The County, City and Other categories will need some adjustment to fit the totals provided by KYTC (Greg Witt provided those for the 2000 report). The totals provided by KYTC are the Mileage and Vehicle Miles Traveled for the State-maintained system and for the Total Statewide system as of December 1998. These totals should be entered into the appropriate cells in the worksheet titled "C2" in the "C Tables" file along with the calculated mileage and AADT figures. The adjustment procedure should be completed by using the Tools > Solver function in Excel to make the column sums equals those provided by KYTC. Make sure the interstates values do not change in the adjustment procedure. The changes in individual cells should be minor--make a visual check to assure that this is so.

Table C3:

Input:

Highway System Mileage and Travel by Terrain

Description: Highway-mileage and vehicle-mile percentages by terrain/facility type and functional classification
Source: HIS file, Division of Planning, KYTC

Procedures:

Note: (Steps 1-3) For the 2000 report, the assumption was made that the terrain type would not have changed in two years. So therefore, the same terrain values were used as in the 1998 report.

1) The information for Table C3 is found in the HPMS file. The desired information is extracted from the file using the terrain.f Fortran program which creates an output file titled "terrain.out." The program writes only those sections which are open and which are rural. The layout of this file is as follows:

Characters	Variable
1 - 2	Functional Class
3 - 8	Section Length
9 - 14	AADT
15 - 16	Number of Lanes
17 - 17	Type of Terrain (1=flat, 2=rolling, 3=mountainous, 0=urban section so don't use these)

2) Using the Open File > Fixed Width function in Excel, open the terrain.out file in Excel. The file used is called 2000 terrain.xls and contains several sheets for calculations. After opening the file as Fixed Width and defining the data fields, sort the data by the functional class and the number of lanes. Divide the Section Length by 1000 to get the "adjusted section length." The remaining columns set up in the worksheet calculate the mileage and VMT for each of the rural road types listed in Table C3. Summary tables are located at the far right of each worksheet page. The percentages in red are the figures which should be entered into the appropriate spaces in the Worksheet titled "C3" in the "C Tables" file.

3) Copy the red percentages at the end of each calculation table to the main table in the worksheet titled "C3" in the "C Tables" file.

4) This table references Table C2 for the mileage statistics used along with the percentages to calculate the desired information. The remaining cells are calculated automatically using cell formulas.

Table C4:

Input:

Percent of Traffic Stream by Vehicle Type

Because of the significance of travel on the Interstate system, Interstate travel was treated in greater detail than travel on other types of highways.

A. Data for all classification counts that had been conducted on Interstate highways during the period, 1987-98, were manually extracted from hard copy reports and entered into an Excel workbook, 2000hcai-1.xls. The data were sorted by route and milepoint, and a comma-separated-value file was produced therefrom. 2000hcai.bas read this file and, where multiple-year data were available for a segment, produced a least-squares estimate of 1998 classification data. When only single-year data were available, that data was assumed to provide the best estimate of 1998 traffic composition.

   The classification estimates, together with 1998 AADTs that had been extracted from the historical volume (TVS) file, were then manually entered into the Excel workbook, 2000hcai-2.xls. Rural/urban designation and number of lanes, obtained from the HIS file, were added as necessary to 2000hcai-2.xls. The computation of vehicle miles traveled by each vehicle type on each segment of Interstate was straightforward. A sort was then made on rural/urban designation and number of lanes of travel and cumulative vehicle miles of travel were obtained for each vehicle type on each category of Interstate highway. Percentage composition of the traffic stream was determined from these vehicle-mile estimates.

B. The figures for non-interstate road types are calculated using SAS programs which weight each segment in each functional class by roadway AADT. In the 2000 report, these figures were completed by Dave Cain.

Input: Description: Vehicle-type percentages by functional classification, rural/urban designation, and number of lanes
Source: 1996-1998 Vehicle Classification Files and 1998 HIS file, Division of Planning, KYTC

Procedures:

1) The first step in the table is to calculate the interstate traffic stream percentages. This is done in the “2000hcai-2.xls” file in the “Table C4" worksheet. The volume counts for each interstate section (found in the same file in the worksheet titled “Worksheet”) are copied to the “Table C4" worksheet along with the rural/urban designation and number of lanes for each section. These records are then sorted by rural/urban and lanes. Insert rows between each Rural/Urban and Number of Lanes class, sum the VMTs and calculate the percent of each vehicle class in the traffic stream. The final numbers in red are the percentages which are entered AS VALUES into the “C4" worksheet of the “C Tables” file.

2) The figures for non-interstate road types are calculated using SAS programs which weight each segment in each functional class by roadway AADT. In the 2000 report, these figures were completed by Dave Cain.

3) Some data were carried over from the 1998 report because there was a lack of sufficient data available for the 2000 report.

Table C5:

Procedures:

1) The calculation of Table C5 is straightforward. As shown in the worksheet “C5" in the file “C Tables”, all figures are calculated using cells in the “C4" and “C2" worksheets. Be sure to make a visual check of the results to assure that there are no formula errors or figures which are largely different from previous years.

2) The Fractional Vehicle Miles Table found below Table C5 is used in later calculations of Table C14.

Table C6:

Procedures:

1) Table C6 is created by multiplying each of the cells in C5 by the number of axles for that vehicle type. This calculation is shown in the “C6” worksheet in the “C Tables” file.

2) The information in the Fractional Axle Miles Table found below Table C6 is used later in Tables C14, C15, etc...

Table C7:

Input:

Passenger Car Equivalents as a Function of Registered Weight

Input: Description: Basic passenger car equivalents
Source: Highway Capacity Manual (TRB Special Report 209) and 1982 Federal Cost Allocation Study (24)

Procedures:

1) Table C7 remained the same from the 1998 to the 2000 report.

Table C8:

Procedures:

1) Table C8 is created with the formulas found in the table and the referenced worksheets (C19 & C7). No new data is added to this table.

Table C9:

Procedures:

1) No new information is added to Table C9. The cells reference Tables C3, C5 and C8.

Table C10:

Input:

Distribution of Equivalent-Single-Axle-Load-Miles Traveled

With exception of the damage factors, ESAL'S per vehicle, Table C10 is computed based on previously supplied information. Damage factors are usually developed using the three most recent years of weight data (1996-1998). Routine processing of the type used annually in updating the state's ESAL-estimation model provides the necessary averages. This processing is prepared by the KY Transportation Center (Dave Cain and Neil Tollner) for the KYTC.

Input: Description: Unit pavement damage factors (ESALs/vehicle) by vehicle type and highway type
Source: 1996-98 Loadometer (WIM) Files, Division of Planning, KYTC

Procedures:

1) The input numbers (in red) for Table C10 were calculated by Dave Cain for the 2000 report. This information is the ESALs/vehicle by vehicle type and 6 classes of roads. The unit ESALs are used to distribute the VMT in Table C5 to ESAL miles traveled in Table C10. The following table shows which unit ESAL categories are used to calculate ESAL miles for each of the roadway categories listed in Table C10. Be sure to check all cell references to assure proper translation of formulas.

Unit ESAL Roadtype Category	**Functional Class Category in Table C10**
Interstate-Rural	Interstate-Rural
Arterial-Rural	Principal & Minor Arterials-Rural
Collector & Local-Rural	Major & Minor Collectors, Locals-Rural

Interstate-Urban	Interstate-Urban
Major Arterial-Urban	Freeway, Expressway, Principal Arterial-Urban
Other-Urban	Minor Arterial, Collector, Local-Urban

Table C11:

Procedures:

1) Table C11 is the same as the one in the 1998 report. No new information is needed.

Table C12:

Input:

Distribution of Average Construction Expenditures

These fractions represent the average distribution of construction expenditures during FY 1997-1999. The basic data source is the STARS file. This large file is matched with the HIS file to determine, for each specific expenditure, the highway class to which it is to be attributed. Only expenditures having FDxx program project codes were considered to be construction related. Type of construction element was identified by phase/operation codes as follows:

Planning and design	P, D
Right of way	R
Utility relocation	U
Grade, drain, and surfacing	C, G, S
Resurfacing	H
Bridges	B
Miscellaneous	A, E, F, I, L, M, N, T, X, Y

Input: Description: Fraction of construction expenditures by highway type and construction element
Source: FY 1997-1999 STARS files, Division of Accounts, KYTC

Procedures:

Note: For the 2000 report, steps 1 and 2 were completed by Neil Tollner. The file for the 1997-98 data was stsum98.txt and for the 1998-99 data was stsum99.txt. This data was then used to complete steps 3 and 4.

1) There are two files required to obtain the information for this table. One file comes from the

STARS file at KYTC and is typically altered to include desired fields (Neil Tollner completed this task for the 2000 report). The file's title is cost97.txt and its layout is as follows:

Item	Characters
Year	1-2
Fund	3-4
Program	5-8
County	9-11
Route Number	12-15
Beginning Milepoint	16-18
Ending Milepoint	20-22
Phase Worktype	23-23
Project Auth. No.	24-28
Expenditure	29-43

The Stars file has some problems in it that must be edited before matching with the HPMS file. First, pull the entire file into an editing program such as KEDIT. Sort the file by the route number (characters 12-15). Remove the block at the top of the file which has no route numbers. Remove records toward the end of the file having illogical route numbers (combinations of letters) or no milepoints. Some route numbers will be a mix of letters and numbers. If these are reasonable, such as US27 instead of 0027, then replace the Us and the Ss with 0s using the Find>Replace function in KEDIT. Continue this process until a usable file is created. The non-standard lines must be removed prior to using the file as input for the matching program because they will cause fatal errors during the program run time. (Of the 180,453 Stars records in 1998, 38,933 were unusable due to missing and inappropriate route numbers, and missing or inappropriate milepoints.) However, save <u>all</u> expenditures in the original stars file in order to determine the total amount.

The second file required is the HPMS data file for both state-maintained roads and local roads. This file is created by combining the final96.ext and ext.loc files used in the Table C2 analysis. The file layout for these files is found in the Data Item Summary provided by KYTC for the HPMS file. (Greg Witt provided this layout for the 2000 report).

2) The stars.f program is used to match the STARS file expenditures with the functional class, rural/urban designation and number of lanes for each roadway in the HPMS file. The next step is to pull the stars.out file into KEDIT or a similar editing program. Sort the file based on functional class and by the number of lanes. This sort will place all unmatched records at the top of the file. These should be deleted since they can not be linked to any particular fund. (In the 1998 report, only 133,867 of the 141,520 stars records were matched with hpms data). Use SPSS or a similar statistical package to find summaries of expenditures for each class, number of lanes and construction element listed in Table C12. The Case Summaries function in SPSS was used to sum expenditures by class, lanes and type of work.

3) Insert expenditure sums into the appropriate categories in Excel file 2000stars.xls. The

numbers for Table C12 are a combination of three years of data as shown by the worksheet names in the file. For the 2000 report, the table is a combination of 1996/97, 1997-98, and 1998-99 data. When updating, remove the two oldest years and add the two newest years so that three years of data are always maintained.

4) As found in the 2000stars.xls worksheet the ‘cost’ sheet sums the data over the three year periods. The ‘%’ sheet determines the percent of the total expenditures made up by each category. These are the numbers that should be copied as values into the ‘C12’ worksheet in the “C Tables” file. The values in red are those that should be replaced. Make sure to add any new categories of roads. Also, check the formulas to make sure the correct years are summed.

Table C13:

Procedures:

1) The first step in creating Table C13 is to recalculate the values found in Table C12. The recalculation is found directly below Table C12 in the “C12" worksheet of the “C Tables” file. This bottom table is the distribution of expenditures without the consideration of resurfacing. The resurfacing category is separated from the rest of the categories at this point in order to properly calculate the figures for Table C13. Table C13 uses the Capitol Costs found in Table C1 and the distribution percents in Table C12 to get approximate dollar values. The Capitol costs in Table C1 are broken into Resurfacing Costs and Other costs. Therefore, in order to most accurately calculate Table C13, it is necessary to break the distribution figures into Resurfacing and Other categories. The Other categories are represented in this bottom table. The Resurfacing category distributions are calculated in the formulas for that column in Table C13 which is found in the “C13" worksheet in the “C Tables” file.

Table C14:

Procedures:

1) No new input information is needed for Table C14. The formulas in the table refer to the worksheet titled “WS1" which is found just prior to the “C14" worksheet in the C Tables file. Worksheet WS1 gathers information from other worksheets as shown in the cell formulas. Make sure to check the formulas to assure that they are reading what you want them to.

Table C15:

Procedures:

1) No new input is needed for Table C15. The cell formulas refer to Tables C5, C6, C9, C10 and C11. Be sure to check formulas!

Table C16:

Procedures:

1) No new input is needed for Table C16. Make sure to check all cell formulas for accuracy when copying.

Table C17:

Procedures:

1) No new input is needed for Table C17. Make sure to check all cell formulas for accuracy when copying. The tables found below Table C17 make the calculations necessary to complete Table C17.

Table C18:

Procedures:

1) The information for Table C18 is found in Tables C15 and C16, as shown in the cell formulas.

Table C19:

Input:

Percentage of Vehicles by Axle Class in Registered Weight Categories

Input: Description: Percentage of vehicles by axle type in various registered weight categories, number of cab cards issued
Source: Sample comprised of Kentucky-licensed trucks involved in reported accidents for the period 1994-1998. Type of truck (straight, single-trailer combination, or multiple-trailer combination), number of axles, and license number obtained from accident file (Department of State Police). Registered weight determined from license number. In accordance with past practice, straight-truck weight distributions were determined from non-apportioned trucks (farm, commercial, and limited), and combination-truck weight distributions were determined from apportioned trucks. Data from the cab card file was used to proportion 62,000-pound trucks between 59,999- and 62,000-pound declared weight categories. Excel workbook 2000RegWt.xls was used in processing the data.

Procedures:

1) The first step in creating Table C19 is to collect the necessary data. The truck population from the KY accident database is matched with registered weight information using license plate numbers. This process was completed by Neil Tollner in the 2000 report. The distributions for apportioned and non-apportioned trucks are then entered into the appropriate sheets in the 2000RegWt.xls file. This file uses five years of accident data to produce truck distributions in the traffic stream.

2) These distributions are then entered into Table C19 in the appropriate cells. The distributions for the 62,000 lb. trucks are entered in the line below the table, as shown. This 62,000 lb. distribution is automatically divided into distributions (by formulas) for 59,999 and 62,000 trucks in the table using the cab card percentages listed below the table. Since the 1998 report, cab cards are no longer being used. Therefore, the cab card values from the 1998 report were carried over to the 2000 report. Be sure to enter the percentages to 10-15 decimal places, it is necessary for use of these numbers in other tables.

Table C20:

Procedures:

1) No new input is needed for Table C20, all info needed is found in Tables C14 and C19. Make sure to check all cell formulas for accuracy when copying**.**

Table C21:

Procedures:

1) All info needed is in Tables C16 & C19. Make sure to check cell formulas.

Table C22:

Procedures:

1) All info needed is in Table C20. Make sure to check cell formulas.

APPENDIX E

Table R1:

Input:

Summary of Revenue Attributed to State-Maintained System

The Transportation Cabinet's "Financial Report to Management and Supplemental Information Schedules for the Period of July 1, 1998 to June 30, 1999" was used to determine the revenue deposited in the state road and federal funds and, hence, attributed to the state-maintained system. The following essential categories were used:

- Revenue
  - Fuel Tax
    - Heavy Vehicle Surtax
    - Carrier Surtax
    - Normal
  - Registration and License Fees
    - Cars
    - Buses
    - Motorcycles
    - Trucks
      - Kentucky
      - Apportioned
      - Vehicle Identification Cards
      - Permits
    - Other
  - Miscellaneous
  - Operator's License Fees
  - Commercial Driver's License
  - Usage Taxes
    - Buses
    - Other Vehicles
  - Road Tolls
  - Other Motor Carrier Taxes
    - Weight-Distance
    - Extended-Weight Permits
  - Federal Aid

In addition, federal-aid revenue was distributed to fuel, usage (trucks and trailers), use, and other categories based on the proportion of federal aid shown in the Federal Aid Highway Trust Fund receipts from Kentucky (the highway account of Table FE-9 of FHWA's "Highway Statistics").

Input: Description: Statewide revenue totals
Source: FHWA’s 1997 Highway Statistics (11); Financial Report to Management and Supplemental Information Schedules for the Period July 1, 1998 to June 30, 1999, KYTC, Division of Accounts (see Appendix C)

Procedures:

1) The non-federal (red) numbers for Table R1 come directly out of the revenue portion of Appendix C. Be sure to match the categories. The federal information or green numbers are calculated based on the percentages of each type of revenue found in Table FE-9 of the 1997 Highway Statistics report. These proportions are then multiplied by the Federal

Aid total found in Appendix C.

Table R2:

Procedures:

1) Table R2 is the same as Table C5 so just copy over the values only. Be sure to check all of the cell formulas.

Table R3:

Procedures:

1) Table R3 is the same as Table C19 so just copy over the values only. Be sure to check all of the cell formulas.

Table R4:

Procedures:

1) The figures in Table R4 are calculated using cell references to Tables R2 and R3. Be sure to check the formulas for accuracy. Another check can be made by comparing the totals in R4 with the totals in R2 to be sure they are the same.

Table R5:

Input:

Diesel Powered Trucks by Truck Class

Input: Description: Percentage of trucks that are diesel powered as a function of gross weight
Source: Annual sales/production data from "AAMA Motor Vehicle Facts & Figures '98," (contacts: Lisa Smith at Ward's Automotive 248-799-2642. Ward's Automotive has replaced the AAMA publication.)

Procedures:

1) Information for Table R5 is calculated using the worksheet in the 2000Hcafuels.xls file. The first step is to update the information in the 2000Hcafuels.xls file using the factory sales information provided in the AAMA's Motor Vehicle Facts and Figures 1998. Information for cars for the first table comes from page 3, Annual Factory Sales of Passenger Cars. The remaining information for the first table comes from page 7, US Total Factory Sales of Trucks and Buses by Weight Categories. Be sure to match the sales figures with the appropriate weight categories.

2) The second step is to update the second table in the 2000Hcafuels.xls file. The information comes from page 8 in the AAMA report, US Total Factory Sales of Diesel Trucks. Enter the appropriate data to update this table.

3) The next step is to add new lines in the remaining tables for additional years of data. Copy down the formulas in the third table. Add travel information in the fourth table from the AAMA report, pages 43 & 44, Vehicles in operation by model year. The final table calculates and sums the percentages which are entered into the red spaces in Table R5. Be sure to translate the percentages to the appropriate weight categories--they are different in Table R5 and the 2000Hcafuels.xls tables (maroon figures at the bottom of the spreadsheet).

4) The remaining values in Table R5 are calculated with formulas referencing Table R2 and R3.

Table R6:

Input:

Fuel Consumption by Vehicle Type

Input: Description: Fuel consumption rates (Table VM-1), percentage of cars and buses that are diesel powered (assumed to be 1 percent and 75 percent respectively), and statewide gallons of gasoline/LPG, gasohol, and diesel fuel
Source: 1997 Highway Statistics for fuel consumption rates, Motor Vehicle Manufacturers' Association for percentage of diesel powered cars, KYTC, Division of Planning for consumption totals for all fuel classes (Keith White), and Department of Pupil Transportation (Perry Watson, 564-4718) for percentage of diesel-powered school buses

Procedures:

1) Information for Table R6 in the 2000 R Tables.xls comes from various sources. The first set of numbers in red in the table are the Fuel Efficiency (mpg) numbers for the different user classes. This information comes from the 1997 Highway Statsistics book, Table

VM-1, page V-89. The numbers we are interested in are under the 1997 Average Miles Traveled per Gallon of Fuel Consumed category. Transfer these numbers into the first line of Table R6, using last year's table as a model.

2) The second set of required numbers are the percent special fuels for cars and buses. The percent of special fuels for cars comes from the 2000Hcafuels.xls file calculated for Table R6. The cars percentage sum is listed in the last table in that file (green numbers at the bottom of the page). The percent of diesel powered buses is the same as the last report (75%). This estimate of the percent of diesel-powered school buses was made for the last report by Perry Watson, Department of Pupil Transportation, 564-4718.

3) The third set of required numbers are the gallons of fuel used statewide. These are the red figures in the lower right side of the tables under the categories "Gasoline (includes LPG)", "Gasohol," and "Special Fuels" (diesel). These numbers come from the monthly motor fuel consumption tables produced by KYTC (Dave Jackson 564-7183). The monthly motor fuel consumption table numbers are tabulated in the worksheet "Fuels" in the file 2000R Tables.xls. Use the values under the category of "Net Gallons Taxed" from the monthly motor fuel reports. The totals from the "Fuels" worksheet are then transferred into Table R6.

4) The remainder of the cells are calculated using references to Tables R2 and R5.

5) It should be noted that the adjustment process using gallons of fuel as reported by KYTC has been eliminated from the procedure beginning with Report KTC-98-3. The step to force the estimated gallons of fuel to match the reported gallons of fuel was eliminated because it appeared to introduce an inappropriate adjustment process that widened the gap even further between estimated and reported revenue as shown in Table 19.

Table R7:

<u>Input:</u>

Motor Fuel Tax Revenue by Registered Weight Categories

Exclusions to reported tax rates include Kentucky's $0.014 per gallon petroleum environmental assurance fee and federal contributions dedicated to transit ($0.015 per gallon), leaking underground storage tanks ($0.001 per gallon), deficit reduction ($0.068 per gallon), and unspecified ($0.006 per gallon)

Input: Description: Kentucky and federal fuel tax rates by vehicle type
Source: Kentucky Revised Statutes for Kentucky rates; supplemental

information from a revenue source summary prepared by Sandra Pullen, KYTC; Highway Statistics 1997 (Table FE101) for federal rates; a summary of federal tax rates prepared by James Getzewich from FHWA's Office of Highway Funding and Motor Fuels Division (202-366-0170)

Description: Percentage of Kentucky regular fuel taxes deposited in Road Fund
Source: Kentucky Revised Statutes

Procedures:

1) The red figures in the top sections of Table R7 are rates set by legislation. These may change from year to year so they must be verified by the appropriate representative at KYTC. The other item which must be verified is the Kentucky tax for the Road Fund deposit found at the bottom of the table. For this report, the figure of 74% did not change from last year. Tables R1, R3, R6 and R7 are referenced in the remaining cell formulas.

Table R8:

Input:

Motor Vehicle Registration Fees

Input: Description: Motor vehicle registration fees (truck fees are automatically transferred for computations to Table R9)
Source: Department of Motor Vehicle Regulation, KYTC; Kentucky Revised Statutes

Procedures:

1) The fees in Table R8 are also set rates and should be verified by a representative at KYTC. For the 2000 report, no fees were increased.

Table R9:

Input:

Truck Registration Revenue

Input: Description: Number of Kentucky trucks by registered weight class
Source: Report No. R2145, Department of Motor Vehicle Regulation, Division of Motor Vehicle Licensing, KYTC

Description: Equation for reduction in registration fees for farm trucks
Source: Kentucky Revised Statutes

Description: Equation for reduction in registration fees for exempt trucks
Source: Kentucky Revised Statutes

Description: Number of Truck I.D. cards issued
Source: Department of Administrative Services, Division of Automated Services; Department of Vehicle Regulation, Division of Motor Carriers

Procedures:

1) The first step for Table R9 is to enter the number of Kentucky registrations in the first section of the table. The info for this section is found in the KY Motor Vehicle Registration Summary Report from KYTC, Cathy Bickers, 184-3298. Enter the number of registrations into the appropriate weight categories. Enter Farm registrations in the Farm category, Commercial registrations in the Other category, and sum the remaining categories for entry in the Exempt category.

2) The second step is to verify the registration fees in the second section of the table. The figures in red for the Farm and Exempt categories are calculated as a percentage of the Other registration fees. For this report, Farm fees are 40% of the Other fees (as shown in the cell formulas) and Exempt fees are 75% of the Other fees. Make sure to check that these percentages have not changed for a new report.

3) The third step is to enter the number of vehicle ID cards. These numbers were produced by Mike Kinnaird, Division of Information Technology, at KYTC.

4) The remainder of the cells are formulas referencing other cells or worksheets and should be verified. The formulas depend on information in worksheets R1 and R8.

Table R10:

Input:

Toll Road Revenues and Their Allocation

Input: Description: Revenue from toll roads by toll-system vehicle code
Source: Department of Fiscal Management, Division of Toll Facilities, KYTC (Nancy Craig)

Procedures:

1) For each toll road, input toll road revenue data from KYTC (Nancy Craig) into worksheet

WS-R10 in the file 2000RTables.xls. The red totals are summarized into categories 1-8 and are then transferred into Table R10.

Table R11:

Input:

Total Revenue Generated by Weight Class

The distribution of usage tax among the vehicle classes is determined by a special analysis of the AVIS file. Results, developed with the Excel workbook 2000Hcausage.xls, are entered manually into Table R11. The total is adjusted as necessary to conform with Table R1 entries.

Input: Description: Distribution of usage tax revenue among vehicle classes
Source: Special analysis of AVIS file, Division of Automated Services (Mike Kinnaird)

Procedures:

1) The first step in completing Table R11 is to update the information in the 2000Hcausage.xls file. The update info comes from the 2000HcaRegWt.xls file in the section titled "Transfer to Hcausage.xls" which is located to the right of the first table in the worksheet. Copy this column of numbers into the 2000Hcausage.xls file and paste the values only into the section of green text under the heading KY Apport.

2) The second input data for the 2000Hcausage.xls file is the figure in cell A5, the KY Usage Tax for Other Vehicles. This number comes directly out of the Appendix C Revenue table under the Usage Taxes, Other Kentucky Vehicles category subtotal.

3) The third set of input data for the 2000Hcausage.xls file is entered under the heading "Data" in the cells with pink numbers. This data comes from a printout titled the Vehicle Usage Tax Report Fiscal Year 99 which was provided by KYTC, Mike Kinnaird. The column of information titled "Total Usage Tax" should be entered into the 2000Hcausage.xls file under the Data heading. Change the previous years vehicle categories to match the current years vehicle usage tax report, deleting old categories or adding new ones, if necessary. Check the "Distribute as" column to make sure the appropriate categories have been entered correctly since the spreadsheet categories may be in a different order than the vehicle usage tax report. Be sure to check all the cell references in the remaining columns to include any new categories that were added.

4) The last column of the table in the 2000Hcausage.xls file, Adj Total, is the column of numbers which is entered into Table R11 in the red numbers under Usage Taxes, Kentucky, Other vehicles. Be careful when transferring the numbers as the 2000Hcausage.xls file does not have a calculation for the 59,999 category. The 62

category in the 2000Hcausage.xls file is split between the 59,999 and 62,000 categories in Table R11. The split was made using the same proportion used in the 1998 report: 46% of the 62 category goes to the 59,999 category and 54% of the 62 category goes to the 62,000 category.

5) In order to complete Table R11, it is necessary to check all cell references to other worksheets including R1, R4, R7, R9 and WS1, a worksheet set up in the same file.

Table R12:

Procedure:

1) No new info is required for Table R12. Just be sure to check that all cell references are correct. The worksheets used in this analysis are R11 and WS2.

Table R13:

Procedure:

1) The info in Table R13 comes directly out of Table R11. The cells automatically reference the desired information.

Table R14:

Procedure:

1) The info for Table R14 is coped directly out of Table C22 and pasted into R14. The percentages are calculated automatically.

Table R15:

Procedure:

1) No new information is required for Table R15. The cells reference Tables R13 and R14 for the necessary information.

Tables R16-R19:

Procedure:

1) In order to update Tables R16-R19, several worksheets must be updated. The "axle-to-

weight," "vehicle miles," "axle-miles," "PCE miles" and "ESAL miles" worksheets must all be updated with new information. Update the "axle-to-weight" sheet with the info found in Table C19 (or R3). The miles traveled info for each wear measure comes out of the respective C Table: use C5 for vehicle miles, C6 for axle miles, C9 for PCE miles, and C10 for ESAL miles. Be sure to check that the cell references in Tables R16-R19 are still accurate after the update. Ten years worth of vehicle classification data should be used.

APPENDIX F

Tables F1 — F10:

Procedure:

1) Update classification count data in file 2000hcai-1.xls.

A list of classification count locations for each year can be found in the EAL printout. Make sure to find both Rural and Urban Interstate locations.

Using this list, locate count data for each location in "Daily Volumes by Vehicle Type for 1997" and "Daily Volumes by Vehicle Type for 1998"

- We are interested in the "AADT" count for the location and the "Annual Average" counts for each type of vehicle.
- At the end of the 2000hcai.xls file, add this count data for each location listed in the EAL report. Follow the input format in the current 2000hcai.xls file. Be sure to pay attention to the spacing of the interstate names, if you don't put the right number of spaces between the "I" and the "Number", the data will not sort correctly. Likewise, make sure to enter milepoints to 3 decimal places.
- Sort the 2000hcai.xls file first by route, then by milepoint and then by year.
- Scan the data to assure all entries are sorted correctly.
- Save the 2000hcai.xls file as a CSV (comma delimited) file and also save it to a floppy.
- Open the 2000hcai.csv file in an editor such as KEDIT. Remove the first line of the file which is the heading line from the spreadsheet.

Save the altered 2000hcai.csv file to c:\ and a:\.

2) Compute classification estimates using 2000hcai.bas QuickBasic Program.

This program uses the 2000hcai.csv file as input.

Open the 2000hcai.bas file in QuickBasic. This file is also saved as a text file (2000hcai.txt) so that it can be read by a general editor as well. Make sure that the input file is listed as a:\2000hcai.csv (or appropriate year). The Basic program does not like input files on the hard drive so make sure you use the a:\ drive for input. Likewise, Basic will print the output file to the a:\ drive. Make sure to note the name of the output file (it is currently a:\output).

Run the program by using the Run\Start path on the menu. The program will ask you to enter the “last two digits of the forecast year.” So, if your last year of classification data is 1998, the enter “98".

This program makes a least-squares estimate of the classification counts for count locations having more than one year of classification data.

The program will automatically print a hard copy of the output and will also place a copy on the a:\ drive.

3) Compute percentages of vehicle type traffic

Open the a:\output file created with the Basic program in an Excel worksheet. Make sure columns of data transferred properly into Excel.

Open the 2000hcai-2.xls file and click on the sheet labeled “Worksheet.” Copy the output data into the “Worksheet” page table where indicated. The table to the far right calculates the percent. The percent calculations are straightforward. The number of vehicles counted in each category is divided by the total number of vehicles in all categories. Make sure to copy the formulas down the page to accommodate the new classification data and that the cell references are correct.

This is the data that will be entered into the other worksheets found in the 2000hcai-2.xls file (I24, I64, I65, I71, I75, I264, I265, I275 and I471).

4) Update the 2000hcai-2.xls file

Open the first interstate-numbered sheet in the file (I24). Check the HPMS data file for new breakdowns of section lengths. Some of the sections listed in the previous year’s worksheet may now be broken into smaller sections in the HPMS data file. If this is true, add these sections in the appropriate places in each of the interstate worksheets.

Because there is not classification count data for every range of interstate listed in this table, the update should be done one entry at a time. Each of the classification counts are taken at a specific milepoint. Find the count location that fits within the milepoint range of each interstate section and update the info in that section with the traffic stream percentages. Make sure that if you use the Copy function to transfer the data, you use the Paste Values function to paste. You don’t want to paste the formulas into the table. Repeat this for each interstate-numbered sheet.

Insert a column for the latest AADT counts. These counts are taken from the state’s CTS volume file for the year 1998.

Insert column for 1998 VMT calculation. Multiply roadway section length by volume by 365 then divide by 1,000,000 to get this figure.

Calculate VMT for each vehicle type by multiplying the 1998 VMT by each vehicle category classification percentage.

Find Table F1 at far right of calculation table. Copy over 1998 AADT. Sum percentages for all trucks (all categories except cars, motorcycles, buses and 2-axle, 4-tire trucks). Sum VMT for cars (cars, motorcylces and 2-axle, 4-tire trucks), buses and trucks (as defined above).

In the “Weighted Totals” table, calculate the totals for the last row of the F1 table. For the AADT total, take the section length divided by the total roadway mileage and multiply by the AADT. For the truck percentage total, take the same ratio and multiply it by the truck percentages. Sum the columns and this is the number that goes in the Totals slot on Table F1.

Transfer the Table F1 info into the Wordperfect tables set up in the report (AppendixF.wpd).

Repeat these steps for Tables F2-F9. Table F10 is a summary of the other F Tables and most of the info comes directly out of Tables F1-F9. The AADT and % Trucks totals are weighted totals and are calculated at the far right of the Table F9 calculations in 2000hcai-2.xls, sheet I 471.

5) Update rural/urban code and # of lanes using the HPMS data file

Look up each interstate section in the HPMS file by route number and milepoint. Record the correct number of lanes and rural/urban code for each section in Tables F1 – F9. The # of lanes and rural/urban codes are interpreted as follows:

1 = Rural	1, 2 & 3 = 2-lanes
2, 3, & 4 = Urban	4 & 5 = 4-lanes
	6 & 7 = 6-lanes
	8 + = 8-lanes

REPORT TABLES

These tables are located in the text portion of the report in WordPerfect.

Tables 1 to 5: No change in these tables since 1996.

Table 6: The information for Table 6 comes from Table C19.

Table 7: The information for Table 7 comes from Table R4. The VMT sums for each category are calculated below Table R4 as labeled in the worksheet. The percent change is calculated using the typical formula: 100*(new-old)/(old*2). The percentage in travel stream side of Table 7 is calculated directly from the left side of Table 7 (example: 100*cars/total).

Table 8: The information for Table 8 is found in several worksheets. The percent contribution of vehicle miles by each vehicle type is found in the Table C5 worksheet, below the actual Table C5. Use the column totals for input into Table 8. Use the same process for Axle miles in Table C6, PCE miles in Table C9 and ESAL miles in Table C10. The subtotal for combination trucks is calculated by adding together the percentages for the single- and multiple-trailer trucks. The subtotal for all trucks is calculated by adding the straight truck percentages to the single- and multiple-trailer percentages.

Table 9: The info for Table 9 is found in Table C22. A summary of the cost responsibility based on the vehicle categories in Table 9 is shown below Table C22. Sum the costs and input them into Table 9.

Table 10: The first section (percent cost responsibility) in Table 10 comes directly out of Table 9. The second section (percent travel) comes from the second-to-last line in Table R4 (state-maintained system average %). The percents in Table R4 must be summed into the categories listed in Table 10 as shown below Table R4. The third section of the table is simple ratios using the info in the first two sections (cost/travel).

Table 11: The information for Table 11 is found in Table R11. The summary calculations are made to the far right of Table R11. These numbers should then be carefully transferred to Table 11.

Table 12: The info for Table 12 comes out of Table R11. The revenues are summarized into the vehicle categories listed in Table 12. The calculations for this table are shown just below Table R11. It should be noted that buses are included in the passenger vehicle category for this table.

Table 13: The revenue trend update info for Table 13 comes directly from the last column in Table 11.

Table 14: The info for Table 14 is found in Table R4. The VMT sums and percentages for the vehicle categories listed in Table 14 are calculated below Table R4. The sums and percentages are then transferred to Table 14.

Table 15: The info for Table 15 is a calculation based on Tables 11 & 14. Divide the revenue total in each vehicle category in Table 11 by the State-Maintained vehicle miles in Table 14 to get the revenue to vehicle mile trend values. Make sure to multiply by 100 since the table is in cents. These figure are then entered into Table 15 under the 1999 column. The average figure on the last line of the table is a weighted average. It is calculated based on the ratios and the state-maintained vehicle miles in Table 14.

Table 16: The info in Table 16 is calculated from the figures in Tables 11 and 9. Divide the percent revenue for each vehicle class in Table 11 by the percent cost

responsibility for each vehicle class in Table 9. Enter the ratio into Table 16.

Table 17: The first column of this table, Vehicle Miles of Travel (1000), comes from the Statewide total line in Table R4. The total VMTs for the 62,000, 73,280 and 80,000 lb categories are summed and entered into Table 17 under the first column. The figure for the second column, Estimated Revenue ($1000), comes from multiplying the VMT in the first column by 2.85% tax. This figure is then entered into column 2. The third column, Reported Revenue, comes from the Appendix C revenue table under the line-item for weight-distance tax. Finally, the Percent of Estimate calculation is straightfoward, divide the Reported Revenue by the Estimated Revenue and multiply by 100.

Table 18: The information for Table 18 comes out of Table R6. The figures for the Estimated Gallonage column in Table 18 come from the Unadjusted Statewide Gallons totals in Table R6. The figures for the Reported Gallonage column in Table 18 come from the Adjusted Statewide Gallonage totals in Table R6. The final step is to calculate the Percent of Estimate by dividing the Reported by the Estimated and multiplying by 100.

Table 19: The information for Table 19 is located in Table R7. For the Estimated Revenue column in Table 19, totals were taken from Table R7 under the Fuel Revenue, State-Maintained System (unadjusted), Kentucky section for the three categories listed (heavy vehicle surtax, carrier surtax and normal use). For the Reported Revenue column in Table 19, figures were taken from the Totals column of Table R7 under the Fuel revenue, State-Maintained system (adjusted), Kentucky section for the three categories listed (heavy vehicle surtax, carrier surtax and normal use). The Percent of Estimate calculation was then straightforward.

REPORT FIGURES

Figure 1: The Figure 1 diagram is an embedded object in the HCA Report.wpd file.

Figure 2: The information for Figure 2 comes from Table 7. The data is entered into the appropriate spaces in the worksheet titled 2000fig2.xls. Be sure to update the data ranges in the graphs to include the new year of data.

Figures 3-7: These figures are all found in the file titled 2000figs 3- 7.xls. New data is entered into the blue areas on the first worksheet. There are notes next to these areas telling where the info for each update is located. The figures update automatically once new data is entered into the blue areas.

Figures 8-11: These figures are all found in the file titled 2000figs 8-11.xls. New data is entered into the blue areas of the first worksheet. There are notes next to these areas telling where the info for each update is located. The figures update automatically once new data is entered into the blue areas.

APPENDIX C

IDENTIFICATION OF COST AND REVENUE ELEMENTS

EXPENDITURES ON STATE-MAINTAINED SYSTEM

Category	Expenditure
CAPITAL	
Constr-compensation leave	173,136.69
Constr-construction	186,958,086.78
Constr-contingency accounts	291,500.00
Constr-emergency/discretionary fund	31,391,931.62
Constr-federal aid projects	93,894,185.41
Constr-industrial access	2,687,886.03
Constr-insurance clearing	-117,790.34
Constr-regular leave overlay	825,349.02
Constr-special projects	5,338.13
Constr-specialized contracts	551,972.75
Constr-state bridge replacement	339,023.67
Constr-statewide resurfacing	59,581,622.84
Debt svc-econ dev (lease rentals)	93,874,046.26
Debt svc-res rec (lease rentals)	43,440,779.49
Debt svc-toll roads (lease rentals)	14,474,230.37
Engr adm-bridges	313,805.82
Engr adm-construction	1,812,030.78
Engr adm-planning	613,242.82
Engr adm-professional services (1/3)	121,622.62
Federal Aid Projects	367,564,164.29
Opns-district legal	127,765.89
Opns-state highway engineer	2,259,847.72
Planning-highway planning	1,169,436.82
Planning-highway planning (fed)	4,221,336.73
Planning-metropolitan planning	50,545.99
Planning-metropolitan planning (fed)	808,725.80
Planning-transportation planning	162,014.56
Research-research	395,492.20
Research-research (fed)	1,716,052.12
RS-rural secondary (bridge replace)	75,095.02
RS-rural secondary (construction)	50,618,728.51
RS-rural secondary (jt local proj)	341,837.51
RS-rural secondary (phase II bridge)	1,079,662.09
Special programs (fed)	261,237.83
Transfers to capital construction	9,302,000.00
Subtotal	971,385,943.84
MAINTENANCE AND TRAFFIC SERVICES	
Adm svcs-central sign shop	51,627.17
Constr-toll road 4-R	9,717,618.51
Engr adm-professional services (1/3)	121,622.63
Equip svc-depreciation of equipment	-6,268,230.94

Equip svc-equipment	24,708,884.85
Equip svc-est equipment earnings	-29,095,227.87
Equip svc-new mn and const equipment	7,072,027.32
ER-energy recovery	1,281,696.10
Fiscal mgmt-toll facilities	2,680,670.07
Maintenance capital improvements	45,870.38
Mn-bridge maintenance	8,495,116.91
*Mn-FEMA projects (fed)**	*297,205.15*
*Mn-FEMA projects**	*4,241.83*
Mn-maintenance	128,871,459.98
Mn-maintenance revolving	-49,986.11
Mn-traffic	30,498,074.88
Rest area maintenance	8,173,193.27
RS-rural secondary (maintenance)	36,021,851.39
Subtotal	222,627,715.52
ADMINISTRATION	
Adm svcs-adm support earnings	-768,425.10
Adm svcs-data processing	20,354,789.16
Adm svcs-disposal of excess land	11,767.48
Adm svcs-employee safety & health	432,365.20
Adm svcs-management svcs	881,870.22
Adm svcs-office & engr equipment	705,201.11
Adm svcs-office of commissioner	381,517.92
Adm svcs-purchases	221,909.05
Adm svcs-real property (KB13)	3,455,429.30
Adm svcs-service & supply	5,384,554.97
*Adm svcs-toll facilities**	*3,401,298.82*
Capital projects (cap proj fund)	9,725,419.27
Engr adm-design	2,331,582.86
Engr adm-environmental analysis	242,824.79
Engr adm-materials	-117,731.34
Engr adm-professional services (1/3)	121,622.62
*Engr adm-program mgmt**	*324,966.87*
Engr adm-right of way	469,170.25
Engr adm-utilities	196.80
Fin cab-inform. resources mgmt comm.	125,000.00
Fin cab-postal services	256,999.51
Fiscal mgmt-accounts	1,740,922.83
Fiscal mgmt-audits	2,031,790.85
Fiscal mgmt-office of commissioner	820,412.86
*Fiscal mgmt-purchases**	*279,352.19*
*Human res mgmt-commissioner's office**	*138,438.67*
*Human res mgmt-empl recruit & dev**	*525,462.66*
*Human res mgmt-empl safety & health**	*525,627.18*
*Human res mgmt-personnel serv**	*526,663.70*

*Human res mgmt-unempl insurance**	*26,068.62*
*Human res mgmt-workers compensation**	*2,046,965.06*
Non-budget-unredeemed checks	10,977.00
Opns-administration earnings (RS)	-1,131,015.76
Opns-contract procurement	1,068,459.64
Opns-district operations	14,901,180.20
Opns-office of commissioner	432,817.31
Planning-district overhead planning	78,502.49
RS-rural secondary (adm)	2,681,862.44
Sec-administrative support earnings	-622,042.03
Sec-board of claims	588,402.14
Sec-environmental affairs	169,038.56
Sec-general counsel	1,772,607.39
Sec-office of minority affairs	660,634.26
Sec-Office of the Secretary	1,769,131.62
Sec-personnel management	459,690.47
Sec-policy and budget	775,636.69
Sec-public relations	357,687.58
Sec-unemployment insurance	40,618.63
Sec-workmen's compensation	1,552,782.63
Veh reg-commercial drivers' licenses	1,648,898.65
Veh reg-office of commissioner	1,027,066.01
Veh reg-office of commissioner (fed)	303,066.31
Veh reg-solid waste transport licenses	57,616.25
Subtotal	85,443,115.54

ENFORCEMENT, MOTOR CARRIER

Veh reg-mtr carriers	1,867,534.14
Veh reg-vehicle enforcement	10,572,749.60
Veh reg-vehicle enforcement (fed)	11,996.71
Veh reg-mtr carrier sfty asst	1,924,783.52
Veh reg-mtr carrier sfty asst (fed)	1,510,190.43
Subtotal	15,887,254.40

ENFORCEMENT, OTHER

Justice cab-state police operations	34,989,165.66
*Revenue cab-motax postage**	*286,000.00*
*Revenue cab-motor fuels**	*1,007,525.63*
*Revenue cab-motor veh usage tax**	*58,474.37*
Veh reg-driver education	623,601.60
Veh reg-driver history record (DUI)	181,355.51
Veh reg-driver's license	2,477,594.29
Veh reg-motor vehicle licensing	4,586,620.23
Veh reg-motorcycle rider ed pgm	459,439.85
Veh reg-photo license	1,021,544.49

Veh reg-traffic offender's school	780,693.01
Veh reg-vehicle titling	2,115,360.17
Subtotal	48,587,374.81
EXCLUDED EXPENDITURES (NON-USER OR OFF-SYSTEM)	
Constr-other economic development	9,137.77
Constr-resource recovery (Series A)	-25,526.14
Constr-resource recovery (RR27)	1,273,088.12
MA-municipal aid	33,101,912.82
Nonbudget-pay prior yr disbursements	12,868,539.20
Planning-ADD financial assistance	640,113.71
Research-transportation center	290,000.00
Rev shr-county road aid (coop)	74,515,863.99
Rev shr-county road aid (counties)	2,907,659.70
Subtotal	125,580,789.17

*Note: Italicized items are new for the 2000 HCA report.

REVENUE ATTRIBUTED TO STATE-MAINTAINED SYSTEM

Category	Revenue
FUEL, KENTUCKY, HEAVY VEHICLE	
Heavy vehicle fuel surtax	51,289.50
Subtotal	51,289.50
FUEL, KENTUCKY, CARRIER SURTAX	
Motor fuels surtax 22.2%	5,306,004.42
Motor fuels surtax 51.8%	12,380,676.97
Subtotal	17,686,681.39
FUEL, KENTUCKY, NORMAL	
Motor fuels normal 22.2%	94,982,278.14
Motor fuels normal 51.8%	221,625,315.67
Motor fuels normal use 22.2%	-1,576,238.85
Motor fuels normal use 51.8%	-3,677,890.65
Subtotal	311,353,464.31
VEHICLE REGISTRATION AND LICENSE FEES, BUSES	
Bus certificates and permits	18,425.75
Bus-except city & suburban	36,253.01
Subtotal	54,678.76
VEHICLE REGISTRATION AND LICENSE FEES, CARS	
Amateur radio plates	22,779.00
Army reserve license plates	28,519.00
*Child victims license plates**	*232,009.13*
Civic event license plates	710.00
Civil air patrol license	657.00
Collegiate license plates	283,662.00
Contract taxicab permits	9,930.00
Dealer demonstrator tags	5,641.50
DES license plates	12,369.50
Environmental license plates	615,569.00
Fraternal order of police plates	98,264.00
General Assembly license plates	3,932.00
Historic vehicle license	125,113.25
*Horse council license plates**	*23,232.00*
Judicial license plates	1,712.00
Masonic license plates	55,927.00
National Guard license plates	23,184.00
Passenger car license	23,356,526.06
Pearl Harbor survivor plates	1,224.00
Personalized license plates	489,387.55
POW license plates	3,819.50

Purple heart recipient plates	49,036.00
Street rod plates	3,280.00
Taxi license	29,601.82
Volunteer fireman license plates	34,455.00
Subtotal	25,510,540.31
VEHICLE REGISTRATION AND LICENSE FEES, MOTORCYCLES	
Motorcycle license	224,772.00
Motorcycle rider safety (KRS186.890)	352,735.48
Subtotal	577,507.48
VEHICLE REGISTRATION AND LICENSE FEES, KENTUCKY TRUCKS	
Truck license (70%)	20,543,524.36
Subtotal	20,543,524.36
VEHICLE REGISTRATION AND LICENSE FEES, APPORTIONED TRUCKS	
Proportionate trk registration (70%)	29,536,039.54
Subtotal	29,536,039.54
VEHICLE REGISTRATION AND LICENSE FEES, TRUCK ID CARDS	
Motor carrier ID cards	443,881.83
ICC authorized fees	5,689,274.04
Subtotal	6,133,155.87
VEHICLE REGISTRATION AND LICENSE FEES, TRUCK PERMITS	
Highway special permits	6,586,592.50
Non-reciprocal permits	262,387.50
Truck permits	73,544.95
Truck trip permits	443,910.00
U-Drive-It permits	4,392.35
Waste transport permits	60,831.55
Subtotal	7,431,658.85
VEHICLE REGISTRATION AND LICENSE FEES, OTHER	
County clerks penalty	60,629.12
Dealer license	288,694.00
Drive away & utility trailer	4,405.00
Motor vehicle title receipts	3,834,392.33
Temporary tags	450,955.00
Trailer license	1,258,017.06
Transfer motor license	561,277.58
U-Drive-It license	2,763,204.05
Subtotal	9,221,574.14
MISCELLANEOUS	
Highway miscellaneous receipts	703,748.11
Interest earned on investments	35,588,556.61

Logo receipts	534,263.52
Miscellaneous rentals	430,530.45
Opn transfer from cap constr	56,722.89
Proceeds from asset distribution	290,546.90
Property damages & loss claims	496,141.02
Proposal sales	80,394.06
Sale of hwy equip (agency fund)	827,312.40
Specification and blue print	205,749.93
State and other agency aid	167,542.89
Subtotal	39,381,508.78
OPERATOR'S LICENSE FEES	
Driver's lic-driver education	621,897.81
Driver's lic. photograph	1,217,146.00
Motor vehicle operator's license	3,401,282.24
Operator's license reinstatement	1,175,171.93
Traffic offender school	1,575,741.50
Subtotal	7,991,239.48
COMMERCIAL DRIVER'S LICENSE	
Commercial driver's license	1,158,804.64
Subtotal	1,158,804.64
USAGE TAXES, KENTUCKY BUSES	
Usage tax on buses	8,677.72
Subtotal	8,677.72
USAGE TAXES, OTHER KENTUCKY VEHICLES	
Motor vehicle rental usage	44,475,115.17
Motor vehicle usage	331,187,817.42
Sales and use tax	-3,529.32
U-Drive-It penalty & int	16,753.64
Subtotal	375,676,156.91
ROAD TOLLS	
Audubon Parkway	1,368,654.47
Cumberland Parkway	4,299,693.82
Daniel Boone Parkway	3,188,377.90
Green River Parkway	4,485,941.16
Toll credit card fees	91,515.58
Subtotal	13,434,182.93
OTHER MOTOR CARRIER TAXES, KENTUCKY WEIGHT-DISTANCE	
Weight distance int & penalty	1,229,660.18
Weight distance surtax	4,137.53

Weight distance tax	70,161,607.89
Subtotal	71,395,405.60
OTHER MOTOR CARRIER TAXES, KENTUCKY EXTENDED-WEIGHT	
Coal road recovery fines (60%)	19,506.51
Overweight coal truck decal (60%)	822,073.88
Subtotal	841,583.39
FEDERAL AID	
Federal Aid Motor Carrier Safety	1,546,814.00
FHWA Aid	363,555,747.82
Special Projects-Federal Road Aid	216,537.86
Subtotal	365,319,099.68
EXCLUDED REVENUE (NON-USER OR OFF-SYSTEM FUNDS)	
Driver history record fees	4,458,956.77
DUI service fees	137,472.92
Fines and forfeitures	2,724.62
Junk yard license	5,270.64
Medical alert stickers	626.00
Motor fuels normal 18.3%	78,296,202.25
Motor fuels normal 7.7%	32,944,303.68
Motor fuels normal use 18.3%	-1,299,332.03
Motor fuels normal use 7.7%	-546,713.48
Motor fuels surtax 18.3%	4,373,868.50
Motor fuels surtax 7.7%	1,840,370.90
Motor Vehicle Commission receipts	849,030.95
MV license computer service	616,399.05
Operator's license name sales	50,744.28
Resource recovery (1981, 1985, 1987A)	1,409,817.07
Subtotal	123,139,742.12

*Note: Italicized items are new for the 2000 HCA report.

APPENDIX D

FY 1999 COST ALLOCATION TABLES

TABLE C1. Summary of Expenditures on State-Maintained System

Activity		Expenditure ($1000)	
Capital			
	Resurfacing	112,311	
	Other	859,075	
	Subtotal		*971,386*
Maintenance and Traffic			
	Roads	183,635	
	Structures	*8,495*	
	Traffic Services	*30,498*	
	Subtotal		*222,628*
Administration			*85,443*
Enforcement			
	Motor Carriers	*15,887*	
	Other Enforcement	*48,587*	
	Subtotal		64,475
Miscellaneous			*0*
Total			1,343,931

TABLE C2. Highway System Mileage and Vehicle-Miles Traveled

Functional class	Rural or Urban	Number of lanes	Mileage	Vehicle-miles traveled (1000)	Annual average daily traffic
Interstate	Rural	4	*503.88*	5,313,799	*28,893*
		6	*39.51*	759,817	*52,688*
Principal arterial	Rural	2	*1,104.46*	2,418,393	*5,995*
		4	*938.95*	3,604,890	*10,513*
Minor arterial	Rural	2	*1,557.26*	2,265,146	*3,982*
		4	*49.94*	179,748	*9,761*
Major collector	Rural	2	*6,903.39*	5,382,647	*2,135*
		4	*33.95*	115,219	*9,153*
Minor collector	Rural		*9,415.57*	2,506,095	*729*
Local	Rural		*4,476.60*	1,173,359	*717*
Interstate	Urban	4	*112.62*	1,977,998	*48,119*
		6	*87.00*	2,711,791	*85,397*
		8	*19.19*	971,489	*138,698*
Freeway & X-way	Urban	2	*3.92*	22,229	*14,256*
		4	*87.53*	799,935	*24,981*
Principal arterial	Urban	2	*228.21*	996,550	*11,942*
		4	*397.15*	3,221,363	*22,210*
		6	*18.82*	287,881	*41,634*
Minor arterial	Urban	2	*760.17*	2,259,095	*8,135*
		4	*145.66*	930,851	*17,474*
		6	*2.97*	508,593	*17,116*
Collector	Urban	2	*404.62*	544,475	*3,674*
		4	*11.56*	68,940	*15,907*
Local	Urban		*114.22*	84,730	*1,989*
County maintained	Rural		*34,754.06*	3,972,170	*319*
	Urban		*3,074.62*	693,773	*690*
City maintained	Rural		*1,728.61*	136,575	*344*
	Urban		*5,324.35*	2,348,765	*1,250*
Other	Rural		*917.96*	217,060	*888*
	Urban		*147.05*	103,543	*3,428*
State-maintained system			27,417.15	39,105,033	3,907,666
Total statewide			73,363.81	46,576,919	1,739,386

TABLE C3. Highway System Mileage and Travel by Terrain

Functional class	Rural or Urban	Number of lanes	Terrain/ facility type	Percent mileage	Mileage	Percent vehicle-miles traveled	Vehicle-miles traveled (1000)
Interstate	Rural	4	Flat	*9.079*	45.75	*5.628*	299,079
			Rolling	*87.605*	441.42	*91.640*	4,869,549
			Mountain	*3.316*	16.71	*2.732*	145,170
		6	Flat	*0.000*	0.00	*0.000*	0
			Rolling	*100.000*	39.51	*100.000*	759,817
			Mountain	*0.000*	0.00	*0.000*	0
Principal arterial	Rural	2	Flat	*4.353*	48.08	*5.071*	122,634
			Rolling	*64.529*	712.70	*63.595*	1,537,968
			Mountain	*31.118*	343.69	*31.334*	757,791
		4	Flat	*3.903*	36.65	*4.039*	145,586
			Rolling	*79.497*	746.44	*78.668*	2,835,902
			Mountain	*16.600*	155.86	*17.293*	623,401
Minor arterial	Rural	2	Flat	*5.219*	81.28	*5.298*	120,014
			Rolling	*84.347*	1,313.50	*85.663*	1,940,393
			Mountain	*10.434*	162.48	*9.039*	204,740
		4	Flat	*6.041*	3.02	*6.063*	10,899
			Rolling	*66.965*	33.45	*60.850*	109,377
			Mountain	*26.994*	13.48	*33.086*	59,472
Major collector	Rural	2	Flat	*5.790*	399.68	*7.817*	420,746
			Rolling	*74.077*	5,113.79	*74.988*	4,036,315
			Mountain	*20.134*	1,389.91	*17.196*	925,586
		4	Flat	*11.990*	4.07	*16.798*	19,354
			Rolling	*87.811*	29.81	*83.040*	95,678
			Mountain	*0.199*	0.07	*0.162*	187
Minor collector	Rural		Flat	*5.294*	498.48	*4.907*	122,985
			Rolling	*82.462*	7,764.22	*78.666*	1,971,447
			Mountain	*12.244*	1,152.86	*16.427*	411,664
Local	Rural		Flat	*8.190*	366.64	*8.733*	102,467
			Rolling	*82.115*	3,675.95	*79.771*	936,002
			Mountain	*9.695*	434.01	*11.496*	134,889
Interstate	Urban	4	Freeway	100.000	112.62	100.000	1,977,998
		6	Freeway	100.000	87.00	100.000	2,711,791
		8	Freeway	100.000	19.19	100.000	971,489
Freeway & X-way	Urban	2	Freeway	100.000	3.92	100.000	22,229
		4	Freeway	100.000	87.53	100.000	799,935
Principal arterial	Urban	2	Street	100.000	228.21	100.000	996,550
		4	Street	100.000	397.15	100.000	3,221,363
		6	Street	100.000	18.82	100.000	287,881
Minor arterial	Urban	2	Street	100.000	760.17	100.000	2,259,095
		4	Street	100.000	145.66	100.000	930,851
		6	Street	100.000	2.97	100.000	508,593
Collector	Urban	2	Street	100.000	404.62	100.000	544,475
		4	Street	100.000	11.56	100.000	68,940
Local	Urban		Street	100.000	114.22	100.000	84,730
State-maintained system					27,417.15		39,105,033

TABLE C4. Percent of Traffic Stream by Vehicle Type

Functional Class	Rural or Urban	Number of Lanes	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Total
Interstate	Rural	4	*0.242*	*47.327*	*0.389*	*22.816*	*2.838*	*0.603*	*0.112*	*2.177*	*21.762*	*0.283*	*1.248*	*0.179*	*0.024*	100.000
		6	*0.142*	*42.570*	*0.191*	*26.674*	*3.323*	*0.600*	*0.099*	*0.686*	*24.160*	*0.127*	*1.256*	*0.165*	*0.007*	100.000
Principal Arterial	Rural	2	*0.260*	*60.649*	*0.461*	*29.100*	*2.855*	*1.208*	*0.238*	*1.018*	*3.348*	*0.790*	*0.064*	*0.006*	*0.003*	100.000
		4	*0.159*	*52.897*	*0.241*	*35.479*	*2.865*	*1.167*	*0.198*	*0.507*	*4.124*	*2.255*	*0.083*	*0.015*	*0.010*	100.000
Minor Arterial	Rural	2	*0.280*	*65.448*	*0.510*	*26.714*	*2.307*	*1.496*	*0.270*	*0.825*	*1.876*	*0.256*	*0.014*	*0.003*	*0.001*	100.000
		4	*0.755*	*67.464*	*0.404*	*23.081*	*2.295*	*1.364*	*0.226*	*0.914*	*3.343*	*0.145*	*0.007*	*0.002*		100.000
Major Collector	Rural	2	*0.202*	*63.557*	*0.604*	*29.263*	*2.319*	*0.962*	*0.203*	*0.546*	*2.048*	*0.244*	*0.031*	*0.008*	*0.013*	100.000
		4	*0.066*	*51.895*	*0.224*	*36.356*	*2.914*	*0.935*	*0.098*	*0.426*	*6.141*	*0.831*	*0.090*	*0.024*		100.000
Minor Collector	Rural		*0.127*	*57.150*	*0.512*	*37.660*	*2.070*	*0.358*	*0.037*	*0.280*	*1.382*	*0.421*	*0.003*			100.000
Local	Rural		*0.326*	*81.816*	*0.284*	*15.895*	*1.052*	*0.302*	*0.003*	*0.216*		*0.035*			*0.071*	100.000
Interstate	Urban	4	*0.122*	*55.928*	*0.302*	*27.414*	*2.637*	*0.505*	*0.135*	*0.956*	*11.261*	*0.090*	*0.586*	*0.050*	*0.014*	100.000
		6	*0.126*	*57.686*	*0.234*	*30.055*	*2.362*	*0.559*	*0.175*	*0.506*	*7.785*	*0.071*	*0.383*	*0.041*	*0.017*	100.000
		8	*0.093*	*58.773*	*0.231*	*26.888*	*2.401*	*0.670*	*0.100*	*0.679*	*9.487*	*0.073*	*0.485*	*0.082*	*0.038*	100.000
Freeway & X-way	Urban	2	*0.083*	*58.644*	*0.351*	*35.501*	*3.648*	*0.730*	*0.157*	*0.175*	*0.683*	*0.028*				100.000
		4	*0.137*	*63.815*	*0.246*	*30.499*	*1.980*	*0.563*	*0.123*	*0.250*	*2.149*	*0.065*	*0.090*	*0.008*	*0.075*	100.000
Principal Arterial	Urban	2	*0.198*	*64.892*	*0.771*	*30.193*	*2.001*	*0.460*	*0.151*	*0.310*	*0.946*	*0.054*	*0.016*		*0.008*	100.000
		4	*0.120*	*61.334*	*0.400*	*33.152*	*2.066*	*0.472*	*0.158*	*0.363*	*1.788*	*0.089*	*0.050*	*0.006*	*0.002*	100.000
		6	*0.036*	*63.566*	*0.491*	*32.167*	*1.828*	*0.241*	*0.081*	*0.143*	*1.371*	*0.008*	*0.055*	*0.012*	*0.001*	100.000
Minor Arterial	Urban	2	*0.244*	*65.487*	*0.410*	*30.051*	*1.949*	*0.535*	*0.102*	*0.337*	*0.812*	*0.045*	*0.018*	*0.003*	*0.007*	100.000
		4	*0.149*	*63.812*	*0.464*	*31.205*	*2.005*	*0.832*	*0.208*	*0.249*	*0.875*	*0.174*	*0.024*	*0.003*		100.000
		6	*0.034*	*74.235*	*0.140*	*24.091*	*1.171*	*0.106*	*0.026*	*0.085*	*0.112*					100.000
Collector	Urban	2	*0.167*	*57.890*	*0.218*	*35.822*	*2.548*	*0.470*	*0.145*	*0.145*	*2.491*	*0.028*	*0.076*			100.000
		4	*0.038*	*68.558*	*0.368*	*27.220*	*2.274*	*0.213*	*0.008*	*0.284*	*1.020*	*0.017*				100.000
Local	Urban			*56.553*	*4.545*	*38.076*	*0.590*	*0.236*								100.000
County Maintained	Rural		*0.155*	*60.954*	*0.348*	*34.801*	*2.664*	*0.569*	*0.212*	*0.198*	*0.071*	*0.009*			*0.019*	100.000
	Urban			*56.553*	*4.545*	*38.076*	*0.590*	*0.236*								100.000
City Maintained	Rural		*0.155*	*60.954*	*0.348*	*34.801*	*2.664*	*0.569*	*0.212*	*0.198*	*0.071*	*0.009*			*0.019*	100.000
	Urban			*56.553*	*4.545*	*38.076*	*0.590*	*0.236*								100.000
Other	Rural		*0.155*	*60.954*	*0.348*	*34.801*	*2.664*	*0.569*	*0.212*	*0.198*	*0.071*	*0.009*			*0.019*	100.000
	Urban			*56.553*	*4.545*	*38.076*	*0.590*	*0.236*								100.000

TABLE C5. Distribution of Vehicle-Miles Traveled (1000)

						Single-unit Trucks				Single Trailer			Multiple Trailer			
Functional Class	Rural/ Urban	Number of Lanes	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Total
Interstate	Rural	4	12,859	2,514,862	20,671	1,212,396	150,806	32,042	5,951	115,681	1,156,389	15,038	66,316	9,512	1,275	5,313,799
		6	1,079	323,454	1,451	202,674	25,249	4,559	752	5,212	183,572	965	9,543	1,254	53	759,817
Principal Arterial	Rural	2	6,288	1,466,731	11,149	703,752	69,045	29,214	5,756	24,619	80,968	19,105	1,548	145	73	2,418,393
		4	5,732	1,906,879	8,688	1,278,979	103,280	42,069	7,138	18,277	148,666	81,290	2,992	541	360	3,604,890
Minor Arterial	Rural	2	6,342	1,482,493	11,552	605,111	52,257	33,887	6,116	18,687	42,494	5,799	317	68	23	2,265,146
		4	1,357	121,265	726	41,488	4,125	2,452	406	1,643	6,009	261	13	4		179,748
Major Collector	Rural	2	10,873	3,421,049	32,511	1,575,124	124,824	51,781	10,927	29,389	110,237	13,134	1,669	431	700	5,382,647
		4	76	59,793	258	41,889	3,357	1,077	113	491	7,076	957	104	28		115,219
Minor Collector	Rural		3,183	1,432,234	12,831	943,796	51,876	8,972	927	7,017	34,634	10,551	75			2,506,095
Local	Rural		3,825	959,995	3,332	186,505	12,344	3,544	35	2,534		411			833	1,173,359
Interstate	Urban	4	2,413	1,106,255	5,974	542,248	52,160	9,989	2,670	18,910	222,742	1,780	11,591	989	277	1,977,998
		6	3,417	1,564,324	6,346	815,029	64,053	15,159	4,746	13,722	211,113	1,925	10,386	1,112	461	2,711,791
		8	903	570,973	2,244	261,214	23,325	6,509	971	6,596	92,165	709	4,712	797	369	971,489
Freeway & X-way	Urban	2	18	13,036	78	7,891	811	162	35	39	152	6				22,229
		4	1,096	510,478	1,968	243,972	15,839	4,504	984	2,000	17,191	520	720	64	600	799,935
Principal Arterial	Urban	2	1,973	646,681	7,683	300,888	19,941	4,584	1,505	3,089	9,427	538	159		80	996,550
		4	3,866	1,975,790	12,885	1,067,946	66,553	15,205	5,090	11,694	57,598	2,867	1,611	193	64	3,221,363
		6	104	182,995	1,413	92,603	5,262	694	233	412	3,947	23	158	35	3	287,881
Minor Arterial	Urban	2	5,512	1,479,414	9,262	678,881	44,030	12,086	2,304	7,613	18,344	1,017	407	68	158	2,259,095
		4	1,387	593,994	4,319	290,472	18,664	7,745	1,936	2,318	8,145	1,620	223	28		930,851
		6	173	377,554	712	122,525	5,956	539	132	432	570					508,593
Collector	Urban	2	909	315,197	1,187	195,042	13,873	2,559	789	789	13,563	152	414			544,475
		4	26	47,264	254	18,765	1,568	147	6	196	703	12				68,940
Local	Urban			47,917	3,851	32,262	500	200								84,730
County Maintained	Rural		6,157	2,421,197	13,823	1,382,355	105,819	22,602	8,421	7,865	2,820	357			755	3,972,170
	Urban			392,349	31,532	264,161	4,093	1,637								693,773
City Maintained	Rural		212	83,248	475	47,529	3,638	777	290	270	97	12			26	136,575
	Urban			1,328,297	106,751	894,316	13,858	5,543								2,348,765
Other	Rural		336	132,307	755	75,539	5,782	1,235	460	430	154	20			41	217,060
	Urban			58,557	4,706	39,425	611	244								103,543
State-maintained System			73,412	23,120,627	161,346	11,461,453	929,697	289,678	59,523	291,361	2,425,703	158,680	112,958	15,266	5,329	39,105,033
Total Statewide			80,117	27,536,581	319,390	14,164,778	1,063,498	321,716	68,694	299,926	2,428,775	159,069	112,958	15,266	6,151	46,576,919
State-maintained Percent			0.188	59.124	0.413	29.309	2.377	0.741	0.152	0.745	6.203	0.406	0.289	0.039	0.014	100.000
Statewide Percent			0.172	59.121	0.686	30.412	2.283	0.691	0.147	0.644	5.215	0.342	0.243	0.033	0.013	100.000

TABLE C6. Distribution of Axle-Miles Traveled (1000)

Functional Class	Rural/ Urban	Number of Lanes	Motor-cycles	Cars	Buses	Single-unit Trucks				Single Trailer			Multiple Trailer			Total
						2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	
Interstate	Rural	4	25,719	5,029,723	41,341	2,424,793	301,611	96,127	23,806	462,726	5,781,944	90,228	331,581	57,070	8,927	14,675,596
		6	2,158	646,908	2,903	405,347	50,497	13,677	3,009	20,849	917,859	5,790	47,717	7,522	372	2,124,609
Principal Arterial	Rural	2	12,576	2,933,462	22,298	1,407,505	138,090	87,643	23,023	98,477	404,839	114,632	7,739	871	508	5,251,660
		4	11,464	3,813,757	17,376	2,557,958	206,560	126,207	28,551	73,107	743,328	487,742	14,960	3,244	2,523	8,086,778
Minor Arterial	Rural	2	12,685	2,964,986	23,104	1,210,222	104,514	101,660	24,464	74,750	212,471	34,793	1,586	408	159	4,765,800
		4	2,714	242,530	1,452	82,975	8,250	7,355	1,625	6,572	30,045	1,564	63	22		385,167
Major Collector	Rural	2	21,746	6,842,098	65,022	3,150,248	249,647	155,343	43,707	117,557	551,183	78,802	8,343	2,584	4,898	11,291,179
		4	152	119,586	516	83,778	6,715	3,232	452	1,963	35,378	5,745	518	166		258,201
Minor Collector	Rural		6,365	2,864,467	25,662	1,887,591	103,752	26,915	3,709	28,068	173,171	63,304	376			5,183,382
Local	Rural		7,650	1,919,991	6,665	373,011	24,687	10,631	141	10,138		2,464			5,832	2,361,209
Interstate	Urban	4	4,826	2,212,510	11,947	1,084,497	104,320	29,967	10,681	75,639	1,113,712	10,681	57,955	5,934	1,938	4,724,607
		6	6,834	3,128,648	12,691	1,630,058	128,105	45,477	18,983	54,887	1,055,565	11,552	51,931	6,671	3,227	6,154,627
		8	1,807	1,141,947	4,488	522,428	46,651	19,527	3,886	26,386	460,826	4,255	23,559	4,780	2,584	2,263,123
Freeway & X-way	Urban	2	37	26,072	156	15,783	1,622	487	140	156	759	37				45,248
		4	2,192	1,020,957	3,936	487,944	31,677	13,511	3,936	7,999	85,953	3,120	3,600	384	4,200	1,669,408
Principal Arterial	Urban	2	3,946	1,293,362	15,367	601,776	39,882	13,752	6,019	12,357	47,137	3,229	797		558	2,038,183
		4	7,731	3,951,581	25,771	2,135,892	133,107	45,614	20,359	46,774	287,990	17,202	8,053	1,160	451	6,681,686
		6	207	365,989	2,827	185,206	10,525	2,081	933	1,647	19,734	138	792	207	20	590,307
Minor Arterial	Urban	2	11,024	2,958,828	18,525	1,357,762	88,060	36,258	9,217	30,453	91,719	6,100	2,033	407	1,107	4,611,491
		4	2,774	1,187,989	8,638	580,944	37,327	23,234	7,745	9,271	40,725	9,718	1,117	168		1,909,649
		6	346	755,108	1,424	245,050	11,911	1,617	529	1,729	2,848					1,020,563
Collector	Urban	2	1,819	630,393	2,374	390,084	27,746	7,677	3,158	3,158	67,814	915	2,069			1,137,207
		4	52	94,527	507	37,531	3,135	441	22	783	3,516	70				140,585
Local	Urban			95,835	7,702	64,524	1,000	600								169,660
County Maintained	Rural		12,314	4,842,393	27,646	2,764,710	211,637	67,805	33,684	31,460	14,101	2,145			5,283	8,013,178
	Urban			784,699	63,064	528,322	8,187	4,912								1,389,183
City Maintained	Rural		423	166,495	951	95,059	7,277	2,331	1,158	1,082	485	74			182	275,516
	Urban			2,656,595	213,503	1,788,632	27,715	16,629								4,703,074
Other	Rural		673	264,613	1,511	151,078	11,565	3,705	1,841	1,719	771	117			289	437,881
	Urban			117,114	9,412	78,850	1,222	733								207,331
State-maintained System			146,824	46,241,253	322,693	22,922,906	1,859,393	869,033	238,092	1,165,445	12,128,517	952,080	564,789	91,596	37,305	87,539,926
Total Statewide			160,234	55,073,162	638,779	28,329,556	2,126,996	965,149	274,775	1,199,706	12,143,873	954,416	564,789	91,596	43,058	102,566,089
State-maintained Percent			0.168	52.823	0.369	26.186	2.124	0.993	0.272	1.331	13.855	1.088	0.645	0.105	0.043	100.000
Statewide Percent			0.156	53.695	0.623	27.621	2.074	0.941	0.268	1.170	11.840	0.931	0.551	0.089	0.042	100.000

TABLE C7. Passenger Car Equivalents as a Function of Registered Weight

Registered weight (pounds)	Rural flat	Rural rolling	Rural mountain	Urban freeway	Urban street
6,000	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
10,000	*1.05*	*1.15*	*1.40*	*1.05*	*1.05*
14,000	*1.10*	*1.30*	*1.80*	*1.10*	*1.10*
18,000	*1.15*	*1.50*	*2.20*	*1.15*	*1.15*
22,000	*1.20*	*1.65*	*2.50*	*1.20*	*1.20*
26,000	*1.25*	*1.80*	*2.80*	*1.25*	*1.25*
32,000	*1.35*	*2.05*	*3.40*	*1.35*	*1.35*
38,000	*1.40*	*2.30*	*3.95*	*1.40*	*1.40*
44,000	*1.50*	*2.50*	*4.50*	*1.50*	*1.50*
55,000	*1.65*	*2.95*	*5.50*	*1.65*	*1.65*
59,999	*1.70*	*3.15*	*5.95*	*1.70*	*1.70*
62,000	*1.75*	*3.25*	*6.15*	*1.75*	*1.75*
73,280	*1.90*	*3.70*	*7.20*	*1.90*	*1.90*
80,000	*2.00*	*4.00*	*8.00*	*2.00*	*2.00*

TABLE C8. Passenger Car Equivalents as a Function of Vehicle Type

				Single-unit trucks				Single trailer			Multiple trailers		
Terrain	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles
Rural flat	0.50	1.00	1.50	1.00	1.30	1.73	1.85	1.82	1.98	1.99	1.93	2.00	2.00
Rural rolling	0.50	1.00	3.00	1.00	1.95	3.21	3.54	3.45	3.94	3.98	3.79	4.00	4.00
Rural mountain	0.50	1.00	4.00	1.00	3.19	6.12	6.86	6.70	7.86	7.95	7.50	8.00	8.00
Urban freeway	0.50	1.00	1.50	1.00	1.30	1.73	1.85	1.82	1.98	1.99	1.93	2.00	2.00
Urban street	0.50	1.00	1.50	1.00	1.30	1.73	1.85	1.82	1.98	1.99	1.93	2.00	2.00

TABLE C9. Distribution of Passenger-Car-Equivalent-Miles Traveled (1000)

Functional class	Rural or urban	Number of lanes	Motor-cycles	Cars	Buses	Single-unit trucks 2-axle 4-tire	Single-unit trucks 2-axle 6-tire	Single-unit trucks 3-axle	Single-unit trucks 4 or more axles	Single trailer 4 or less axles	Single trailer 5-axle	Single trailer 6 or more axles	Multiple trailers 5 or less axles	Multiple trailers 6-axle	Multiple trailers 7 or more axles	Total
Interstate	Rural	4	6,430	2,514,862	59,882	1,212,396	291,376	101,715	20,800	394,666	4,503,215	59,084	248,040	37,581	5,039	9,455,087
		6	539	323,454	4,354	202,674	49,231	14,643	2,662	17,997	723,707	3,838	36,128	5,015	213	1,384,455
Principal arterial	Rural	2	3,144	1,466,731	36,188	703,752	159,265	118,432	25,893	108,092	411,031	97,940	7,523	748	374	3,139,114
		4	2,866	1,906,879	26,997	1,278,979	219,982	153,037	28,721	71,775	671,423	370,602	12,955	2,480	1,653	4,748,349
Minor arterial	Rural	2	3,171	1,482,493	34,958	605,111	106,874	116,527	23,220	69,249	180,552	24,866	1,293	293	98	2,648,706
		4	679	121,265	2,309	41,488	9,260	9,584	1,760	6,948	29,334	1,285	59	18		223,987
Major collector	Rural	2	5,436	3,421,049	101,256	1,575,124	269,804	192,253	44,902	117,876	509,053	61,227	7,385	2,019	3,281	6,310,667
		4	38	59,793	728	41,889	6,294	3,276	377	1,602	26,286	3,588	370	104		144,345
Minor collector	Rural		1,591	1,432,234	39,046	943,796	107,232	31,315	3,575	26,406	149,563	45,985	311			2,781,054
Local	Rural		1,913	959,995	9,911	186,505	24,895	11,954	131	9,208		1,725			3,519	1,209,755
Interstate	Urban	4	1,207	1,106,255	8,960	542,248	67,968	17,323	4,927	34,348	441,176	3,547	22,354	1,978	554	2,252,846
		6	1,708	1,564,324	9,518	815,029	83,465	26,289	8,756	24,925	418,142	3,836	20,030	2,224	922	2,979,169
		8	452	570,973	3,366	261,214	30,395	11,288	1,792	11,982	182,548	1,413	9,087	1,593	738	1,086,842
Freeway & x-way	Urban	2	9	13,036	117	7,891	1,057	281	64	71	301	12				22,840
		4	548	510,478	2,952	243,972	20,639	7,810	1,815	3,633	34,049	1,036	1,388	128	1,200	829,648
Principal arterial	Urban	2	987	646,681	11,525	300,888	25,984	7,950	2,776	5,612	18,672	1,072	308		159	1,022,615
		4	1,933	1,975,790	19,328	1,067,946	86,724	26,369	9,391	21,241	114,082	5,712	3,106	387	129	3,332,137
		6	52	182,995	2,120	92,603	6,857	1,203	430	748	7,817	46	305	69	6	295,252
Minor arterial	Urban	2	2,756	1,479,414	13,893	678,881	57,374	20,960	4,251	13,829	36,333	2,025	784	136	316	2,310,953
		4	693	593,994	6,479	290,472	24,320	13,431	3,572	4,210	16,132	3,227	431	56		957,018
		6	86	377,554	1,068	122,525	7,761	935	244	785	1,128					512,087
Collector	Urban	2	455	315,197	1,780	195,042	18,078	4,438	1,457	1,434	26,863	304	798			565,845
		4	13	47,264	381	18,765	2,043	255	10	356	1,393	23				70,502
Local	Urban			47,917	5,776	32,262	651	347								86,954
State-maintained system			36,706	23,120,627	402,893	11,461,453	1,677,529	891,615	191,529	946,991	8,502,802	692,394	372,657	54,829	18,201	48,370,226
State-maintained percent			0.076	47.799	0.833	23.695	3.468	1.843	0.396	1.958	17.579	1.431	0.770	0.113	0.038	100.000

TABLE C10. Distribution of Equivalent-Single-Axle-Load-Miles Traveled (1000)

Functional class	Rural or urban	Number of lanes	Motor-cycles	Cars	Buses	Single-unit trucks: 2-axle 4-tire	Single-unit trucks: 2-axle 6-tire	Single-unit trucks: 3-axle	Single-unit trucks: 4 or more axles	Single trailer: 4 or less axles	Single trailer: 5-axle	Single trailer: 6 or more axles	Multiple trailers: 5 or less axles	Multiple trailers: 6-axle	Multiple trailers: 7 or more axles	Total
Interstate	Rural	4		7,545	13,335	7,274	50,218	24,753	20,880	70,853	1,225,668	25,499	148,625	13,927	3,922	1,612,500
		6		970	936	1,216	8,408	3,522	2,639	3,192	194,570	1,636	21,388	1,836	164	240,477
Principal arterial	Rural	2		4,400	7,006	4,223	25,998	45,969	31,513	25,376	137,988	230,192	2,387	286	167	515,505
		4		5,721	5,460	7,674	38,889	66,197	39,079	18,838	253,360	979,435	4,615	1,064	828	1,421,160
Minor arterial	Rural	2		4,447	7,260	3,631	19,677	53,321	33,485	19,262	72,420	69,867	489	134	52	284,044
		4		364	456	249	1,553	3,858	2,224	1,693	10,241	3,140	19	7		23,805
Major collector	Rural	2		10,263	9,075	9,451	47,088	42,165	44,156	15,026	137,688	72,100	3,920	7,742		398,673
		4		179	72	251	1,267	877	456	251	8,838	5,256	244	497		18,188
Minor collector	Rural			4,297	3,581	5,663	19,570	7,306	3,747	3,588	43,259	57,920	177			149,106
Local	Rural			2,880	930	1,119	4,657	2,885	142	1,296		2,254				16,164
Interstate	Urban	4		3,319	4,102	3,253	14,056	8,620	6,098	19,952	247,647	3,118	23,695	1,656	429	335,944
		6		4,693	4,357	4,890	17,261	13,081	10,838	14,478	234,717	3,372	21,231	1,861	715	331,495
		8		1,713	1,541	1,567	6,286	5,617	2,219	6,960	102,470	1,242	9,632	1,333	573	141,152
Freeway & x-way	Urban	2		39	63	47	241	220	166	30	142	17				966
		4		1,531	1,578	1,464	4,712	6,120	4,669	1,562	16,029	1,457	1,389	105	6,881	47,498
Principal arterial	Urban	2		1,940	6,163	1,805	5,933	6,229	7,141	2,414	8,790	1,508	308		914	43,145
		4		5,927	10,336	6,408	19,800	20,661	24,153	9,136	53,704	8,036	3,108	316	739	162,325
		6		549	1,134	556	1,566	943	1,107	322	3,680	65	305	57	33	10,315
Minor arterial	Urban	2		4,438	3,246	4,073	9,067	5,989	6,167	3,015	19,497	2,398	62	85		58,038
		4		1,782	1,513	1,743	3,844	3,838	5,182	918	8,657	3,821	34	35		31,367
		6		1,133	249	735	1,227	267	354	171	605					4,742
Collector	Urban	2		946	416	1,170	2,857	1,268	2,113	313	14,416	360	63			23,921
		4		142	89	113	323	73	15	78	747	28				1,606
Local	Urban			144	1,349	194	103	99								1,889
State-maintained system				69,362	84,247	68,769	304,600	323,878	248,542	218,723	2,795,133	1,472,723	241,691	30,940	15,417	5,874,025
State-maintained percent				1.18	1.43	1.17	5.19	5.51	4.23	3.72	47.58	25.07	4.11	0.53	0.26	100
Unit ESALs (ESALs/vehicle)																
Interstate	Rural			*0.0030*	*0.6451*	*0.0060*	*0.3330*	*0.7725*	*3.5084*	*0.6125*	*1.0599*	*1.6956*	*2.2412*	*1.4642*	*3.0755*	
Arterial	Rural			*0.0030*	*0.6284*	*0.0060*	*0.3765*	*1.5735*	*5.4750*	*1.0307*	*1.7042*	*12.0486*	*1.5424*	*1.9685*	*2.2976*	
Collector & local	Rural			*0.0030*	*0.2791*	*0.0060*	*0.3772*	*0.8143*	*4.0411*	*0.5113*	*1.2490*	*5.4897*	*2.3491*	*17.9801*		
Interstate	Urban			*0.0030*	*0.6867*	*0.0060*	*0.2695*	*0.8629*	*2.2837*	*1.0551*	*1.1118*	*1.7513*	*2.0442*	*1.6739*	*1.5509*	
Major arterial	Urban			*0.0030*	*0.8021*	*0.0060*	*0.2975*	*1.3588*	*4.7455*	*0.7813*	*0.9324*	*2.8030*	*1.9294*	*1.6372*	*11.4695*	
Other	Urban			*0.0030*	*0.3504*	*0.0060*	*0.2059*	*0.4955*	*2.6763*	*0.3961*	*1.0629*	*2.3592*	*0.1527*	*1.2477*		

TABLE C11. Cost Allocation Basis in Percent

Activity	Vehicle miles	Axle miles	PCE miles	ESAL miles
Construction				
Planning & design	*100*			
Right of way	*100*			
Utility relocation	*100*			
Grade, drain, & surfacing	*15*		*55*	*30*
Resurfacing	*33*			*67*
Bridges			*100*	
Miscellaneous			*100*	
Maintenance and traffic				
Roads (80% all, 20% trucks)		*100*		
Structures			*100*	
Traffic services	*100*			
Administration	*100*			
Enforcement				
Motor carriers (100% trucks)	*100*			
Other enforcement	*100*			
Miscellaneous		*100*		

TABLE C12. Distribution of Average Construction Expenditures for 1996-1998 in Percent (Source: STARS)

Functional class	Rural or Urban	Number of lanes	Construction element							Total percent
			Planning & design	Right of way	Utility relocation	Grade, drain & surfacing	Resurfacing	Bridges	Miscellaneous	
Interstate	Rural	4	*0.750*	*0.003*	*0.121*	*4.460*	*0.285*	*0.103*	*0.261*	5.981
		6	*0.003*	*0.000*	*-0.019*	*0.046*	*0.000*	*0.008*	*0.017*	0.054
Principal arterial	Rural	2	*2.051*	*2.288*	*0.425*	*10.061*	*1.650*	*0.783*	*0.012*	17.269
		4	*0.477*	*0.311*	*0.141*	*6.492*	*0.765*	*0.099*	*0.047*	8.331
Minor arterial	Rural	2	*1.485*	*1.517*	*0.275*	*5.693*	*1.160*	*1.363*	*0.000*	11.493
		4	*0.072*	*0.006*	*0.009*	*0.251*	*0.031*	*0.000*	*0.000*	0.369
Major collector	Rural	2	*1.526*	*1.701*	*0.405*	*8.117*	*4.231*	*0.922*	*0.100*	17.002
		4	*0.053*	*0.001*	*0.000*	*0.029*	*0.015*	*0.010*	*0.000*	0.108
Minor collector	Rural		*0.465*	*0.464*	*0.194*	*2.301*	*0.794*	*0.525*	*0.026*	4.770
Local	Rural		*0.138*	*0.099*	*0.080*	*1.112*	*0.579*	*0.213*	*0.021*	2.243
Interstate	Urban	4	*0.636*	*0.094*	*0.038*	*6.796*	*0.000*	*0.670*	*0.186*	8.420
		6	*0.058*	*0.531*	*0.018*	*1.281*	*0.036*	*0.302*	*0.181*	2.406
		8	*0.046*	*0.000*	*0.026*	*0.007*	*0.000*	*0.013*	*0.052*	0.143
Freeway & X-way	Urban	2	*0.043*	*0.000*	*0.000*	*0.011*	*0.000*	*0.000*	*0.000*	0.053
		4	*0.013*	*0.003*	*0.002*	*0.311*	*0.286*	*0.051*	*0.052*	0.718
Principal arterial	Urban	2	*0.623*	*0.355*	*0.129*	*2.443*	*0.226*	*1.731*	*0.035*	5.544
		4	*0.371*	*0.402*	*0.035*	*3.164*	*0.634*	*0.129*	*0.070*	4.804
		6	*0.025*	*0.032*	*0.007*	*1.227*	*0.013*	*0.000*	*0.031*	1.335
Minor arterial	Urban	2	*0.495*	*0.730*	*0.210*	*2.687*	*0.529*	*0.382*	*0.063*	5.096
		4	*0.193*	*0.448*	*0.030*	*0.550*	*0.172*	*0.000*	*0.014*	1.407
		6	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	0.000
Collector	Urban	2	*0.213*	*0.146*	*0.092*	*1.758*	*0.108*	*0.010*	*0.015*	2.343
		4	*0.000*	*0.000*	*0.001*	*0.002*	*0.031*	*0.000*	*0.000*	0.035
Local	Urban		*0.004*	*0.000*	*0.000*	*0.040*	*0.017*	*0.002*	*0.012*	0.075
Total percent			9.740	9.130	2.217	58.839	11.562	7.315	1.197	100.000

TABLE C13. Annual Construction Expenditures ($1000)

Functional class	Rural or Urban	Number of lanes	Construction element: Planning & design	Right of way	Utility relocation	Grade, drain & surfacing	Resurfacing	Bridges	Miscel-laneous	Total	Percent
Interstate	Rural	4	7,285	30	1,172	43,320	2,765	998	2,530	58,100	5.981
		6	25	2	-188	448		77	164	528	0.054
Principal arterial	Rural	2	19,921	22,230	4,129	97,727	16,029	7,603	112	167,750	17.269
		4	4,638	3,018	1,367	63,059	7,426	958	461	80,926	8.331
Minor arterial	Rural	2	14,428	14,734	2,672	55,300	11,263	13,240	2	111,639	11.493
		4	697	54	87	2,441	301	3	0	3,583	0.369
Major collector	Rural	2	14,819	16,527	3,932	78,849	41,100	8,958	969	165,154	17.002
		4	519	7	1	285	145	94		1,050	0.108
Minor collector	Rural		4,515	4,506	1,885	22,353	7,711	5,104	257	46,331	4.770
Local	Rural		1,340	966	778	10,805	5,625	2,066	207	21,785	2.243
Interstate	Urban	4	6,177	911	367	66,016	5	6,512	1,804	81,793	8.420
		6	564	5,154	177	12,440	351	2,933	1,756	23,376	2.406
		8	443	0	252	64		125	508	1,393	0.143
Freeway & X-way	Urban	2	413			105				518	0.053
		4	125	28	18	3,024	2,778	493	509	6,976	0.718
Principal arterial	Urban	2	6,051	3,452	1,256	23,735	2,199	16,818	342	53,853	5.544
		4	3,609	3,901	337	30,736	6,154	1,251	680	46,669	4.804
		6	245	313	63	11,921	124		304	12,970	1.335
Minor arterial	Urban	2	4,807	7,091	2,040	26,097	5,142	3,710	615	49,501	5.096
		4	1,876	4,351	292	5,342	1,669		139	13,668	1.407
		6									0.000
Collector	Urban	2	2,073	1,417	893	17,079	1,053	95	145	22,756	2.343
		4			8	22	306			336	0.035
Local	Urban		41	0		385	166	22	117	731	0.075
State-Maintained System			94,611	88,692	21,537	571,552	112,311	71,060	11,623	971,386	100.000
Percent			9.740	9.130	2.217	58.839	11.562	7.315	1.197	100.000	

TABLE C14. Cost Responsibility by Axle Class for Annual Construction Expenditure by Construction Element ($1000)

				Single-unit trucks				Single trailer			Multiple trailers				
Construction element	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Total	Percent
Planning & design	195	57,832	426	27,339	2,272	849	168	719	4,215	394	167	22	12	94,611	9.740
Right of way	192	55,219	422	26,425	2,113	853	174	566	2,297	362	56	7	6	88,692	9.130
Utility relocation	47	13,296	101	6,386	508	190	37	145	703	95	23	3	2	21,537	2.217
Grade, drain, & surfacing	432	214,327	8,199	107,592	27,940	22,853	14,102	14,442	109,414	45,483	5,253	992	523	571,552	58.839
Resurfacing	79	25,651	2,425	12,934	8,873	8,384	6,679	3,511	23,681	18,445	721	591	337	112,311	11.562
Bridges	66	39,720	765	18,466	2,474	1,522	338	1,148	5,705	657	161	19	19	71,060	7.315
Miscellaneous	8	5,594	80	2,776	355	140	33	202	2,226	79	110	15	5	11,623	1.197
State-maintained system	1,018	411,638	12,418	201,919	44,536	34,790	21,532	20,734	148,241	65,515	6,490	1,650	905	971,386	100.000
Percent	0.105	42.376	1.278	20.787	4.585	3.581	2.217	2.134	15.261	6.744	0.668	0.170	0.093	100.000	

TABLE C15. Cost Responsibility by Axle Class for Annual Construction Expenditure by Functional Class ($1000)

Functional class	Rural or urban	Number of lanes	Motor-cycles	Cars	Buses	Single-unit trucks 2-axle 4-tire	Single-unit trucks 2-axle 6-tire	Single-unit trucks 3-axle	Single-unit trucks 4 or more axles	Single trailer 4 or less axles	Single trailer 5-axle	Single trailer 6 or more axles	Multiple trailers 5 or less axles	Multiple trailers 6-axle	Multiple trailers 7 or more axles	Total	Percent
Interstate	Rural	4	57	14,869	358	7,202	1,757	618	270	2,140	27,774	451	2,285	265	55	58,100	5.981
		6	0	75	2	47	19	7	2	7	341	2	24	3	0	528	0.054
Principal arterial	Rural	2	234	69,228	1,558	33,380	7,029	6,691	3,113	4,762	20,988	20,328	375	41	22	167,750	17.269
		4	55	25,666	347	17,279	2,926	2,521	917	969	10,228	19,756	193	40	29	80,926	8.331
Minor arterial	Rural	2	175	53,509	1,417	21,995	4,445	7,108	3,346	3,140	9,952	6,459	69	18	6	111,639	11.493
		4	14	1,622	37	560	146	227	101	120	622	133	1	0	0	3,583	0.369
Major collector	Rural	2	168	68,767	2,387	32,269	9,732	7,621	6,172	3,256	23,221	9,923	584	1,016	36	165,154	17.002
		4	0	426	3	300	42	20	6	8	172	64	4	5	0	1,050	0.108
Minor collector	Rural		31	19,038	619	12,771	2,587	841	327	500	4,626	4,974	17	0	0	46,331	4.770
Local	Rural		34	13,135	489	2,795	2,258	1,352	63	639	0	992	0	0	29	21,785	2.243
Interstate	Urban	4	45	31,818	472	15,692	2,633	939	481	2,023	25,296	270	1,942	145	39	81,793	8.420
		6	17	10,655	107	5,581	716	302	177	310	5,041	61	362	34	13	23,376	2.406
		8	1	766	4	350	36	12	2	13	193	2	10	2	1	1,393	0.143
Freeway & x-way	Urban	2	0	286	3	138	21	11	6	4	45	1	2	0	0	518	0.053
		4	4	2,707	105	1,346	374	391	280	107	1,075	89	87	7	406	6,976	0.718
Principal arterial	Urban	2	55	29,191	1,652	13,811	2,249	1,551	1,525	690	2,518	341	77	0	192	53,853	5.544
		4	31	20,671	1,030	11,260	2,415	1,915	2,061	922	5,288	705	279	29	62	46,669	4.804
		6	2	5,999	463	3,139	760	369	405	136	1,522	24	117	22	12	12,970	1.335
Minor arterial	Urban	2	60	25,529	827	12,255	2,600	1,423	1,251	754	4,267	489	24	19	4	49,501	5.096
		4	16	7,118	188	3,519	568	436	475	114	870	353	6	3	0	13,668	1.407
		6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000
Collector	Urban	2	17	10,157	146	5,975	1,161	411	548	110	4,102	94	33	0	0	22,756	2.343
		4	0	104	12	49	45	10	2	11	100	4	0	0	0	336	0.035
Local	Urban		0	302	190	207	17	14	0	0	0	0	0	0	0	731	0.075
State-maintained system			1,018	411,638	12,418	201,919	44,536	34,790	21,532	20,734	148,241	65,515	6,490	1,650	905	971,386	100.000
Percent			0.105	42.376	1.278	20.787	4.585	3.581	2.217	2.134	15.261	6.744	0.668	0.170	0.093	100.000	

TABLE C16. Cost Responsibility by Axle Class for Annual Maintenance and Administration Expenditure by Expenditure Category ($1000)

				Single-unit trucks				Single trailer			Multiple trailers				
Element	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Total	Percent
Maintenance & traffic															
Roads	246	77,601	542	38,469	6,934	3,241	888	4,346	45,230	3,551	2,106	342	139	183,635	49.292
Structures	6	4,061	71	2,013	295	157	34	166	1,493	122	65	10	3	8,495	2.280
Traffic services	57	18,032	126	8,939	725	226	46	227	1,892	124	88	12	4	30,498	8.186
Administration	160	50,518	353	25,043	2,031	633	130	637	5,300	347	247	33	12	85,443	22.935
Enforcement															
Motor carriers					3,444	1,073	221	1,079	8,987	588	418	57	20	15,887	4.265
Other enforcement	91	28,727	200	14,241	1,155	360	74	362	3,014	197	140	19	7	48,587	13.042
Miscellaneous															
State-maintained system	562	178,938	1,291	88,704	14,585	5,689	1,393	6,818	65,916	4,928	3,065	472	184	372,545	100.000
Percent	0.151	48.031	0.347	23.810	3.915	1.527	0.374	1.830	17.693	1.323	0.823	0.127	0.050	100.000	

TABLE C17. Cost Responsibility by Axle Class for Annual Maintenance and Administration Expenditure by Functional Class ($1000)

						Single-unit trucks				Single trailer			Multiple trailers				
Functional class	Rural or urban	Number of lanes	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Total	Percent
Interstate	Rural	4	98	19,463	167	9,383	2,369	630	140	2,710	31,503	466	1,805	295	44	69,073	18.541
		6	8	2,503	12	1,569	397	90	18	122	5,002	30	260	39	2	10,051	2.698
Principal arterial	Rural	2	48	11,352	91	5,447	1,089	579	136	581	2,223	596	42	5	3	22,190	5.956
		4	44	14,758	70	9,898	1,626	830	168	430	4,066	2,527	82	17	13	34,530	9.269
Minor arterial	Rural	2	49	11,474	94	4,683	822	668	144	439	1,160	180	9	2	1	19,723	5.294
		4	10	939	6	321	65	49	10	39	165	8	0	0		1,611	0.432
Major collector	Rural	2	83	26,477	264	12,190	1,966	1,023	257	692	3,017	409	46	13	24	46,461	12.471
		4	1	463	2	324	53	21	3	11	193	30	3	1		1,103	0.296
Minor collector	Rural		24	11,085	104	7,304	816	177	22	165	946	328	2			20,973	5.630
Local	Rural		29	7,430	27	1,443	194	70	1	59		13			29	9,295	2.495
Interstate	Urban	4	18	8,562	47	4,197	814	194	62	438	5,993	55	312	30	10	20,730	5.564
		6	26	12,107	50	6,308	999	294	110	318	5,680	59	279	34	16	26,280	7.054
		8	7	4,419	18	2,022	364	126	22	153	2,480	22	127	24	13	9,796	2.629
Freeway & x-way	Urban	2	0	101	1	61	13	3	1	1	4	0				184	0.050
		4	8	3,951	15	1,888	247	87	23	46	463	16	19	2	21	6,787	1.822
Principal arterial	Urban	2	15	5,005	60	2,329	311	89	35	72	254	16	4		3	8,192	2.199
		4	30	15,291	101	8,265	1,038	295	118	271	1,550	88	43	6	2	27,098	7.274
		6	1	1,416	11	717	82	13	5	10	106	1	4	1	0	2,368	0.636
Minor arterial	Urban	2	42	11,450	72	5,254	687	235	53	176	494	31	11	2	5	18,513	4.969
		4	11	4,597	34	2,248	291	150	45	54	219	50	6	1		7,705	2.068
		6	1	2,922	6	948	93	10	3	10	15					4,009	1.076
Collector	Urban	2	7	2,439	9	1,509	216	50	18	18	365	5	11			4,649	1.248
		4	0	366	2	145	24	3	0	5	19	0				564	0.152
Local	Urban			371	30	250	8	4								662	0.178
State-maintained system			562	178,938	1,291	88,704	14,585	5,689	1,393	6,818	65,916	4,928	3,065	472	184	372,545	100.000
Percent			0.151	48.031	0.347	23.810	3.915	1.527	0.374	1.830	17.693	1.323	0.823	0.127	0.050	100.000	

TABLE C18. Summary Distribution of Cost Responsibility by Axle Class ($1000)

Element	Motor-cycles	Cars	Buses	Single-unit trucks 2-axle 4-tire	Single-unit trucks 2-axle 6-tire	Single-unit trucks 3-axle	Single-unit trucks 4 or more axles	Single trailer 4 or less axles	Single trailer 5-axle	Single trailer 6 or more axles	Multiple trailers 5 or less axles	Multiple trailers 6-axle	Multiple trailers 7 or more axles	Total	Percent
Capital	1,018	411,638	12,418	201,919	44,536	34,790	21,532	20,734	148,241	65,515	6,490	1,650	905	971,386	72.279
Maintenance & administration	562	178,938	1,291	88,704	14,585	5,689	1,393	6,818	65,916	4,928	3,065	472	184	372,545	27.721
State-maintained system	1,580	590,576	13,710	290,623	59,121	40,479	22,924	27,552	214,157	70,442	9,555	2,122	1,090	1,343,931	100.000
Percent	0.118	43.944	1.020	21.625	4.399	3.012	1.706	2.050	15.935	5.242	0.711	0.158	0.081	100.000	

TABLE C19. Percentage of Vehicles by Axle Class in Registered Weight Categories

	Single-unit trucks				Single trailer			Multiple trailers		
Registered weight (pounds)	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles
6,000	100.00									
10,000		*5.12*	*0.19*	*0.25*		*0.05*				
14,000		*8.58*	*0.46*	*0.75*		*0.05*				
18,000		*10.90*	*0.65*	*0.75*	*0.21*					
22,000		*7.56*	*0.74*							
26,000		*27.28*	*2.41*	*1.76*	*1.27*					
32,000		*12.57*	*1.94*	*2.26*	*3.60*	*0.31*				
38,000		*17.69*	*6.66*	*1.01*	*1.48*	*0.21*	*0.27*			
44,000		*1.85*	*11.66*	*1.51*	*5.51*	*0.37*	*0.81*	*14.29*		
55,000		*4.11*	*27.84*	*9.80*	*25.64*	*2.47*	*0.27*			
59,999		0.11	1.58	2.14	2.28	0.36	0.09			
62,000		0.13	1.76	2.38	4.29	0.69	0.18			
73,280		*1.25*	*12.95*	*51.26*	*5.08*	*1.78*	*0.27*			
80,000		*2.86*	*31.17*	*26.13*	*50.64*	*93.70*	*98.12*	*85.71*	*100.00*	*100.00*
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	SU	Combo
Fraction of cab cards issued for 55,001-59,999:	*0.473*	*0.347*
Fraction of cab cards issued for 60,000-62,000:	0.527	0.653

62,000		*0.24*	*3.33*	*4.52*	*6.57*	*1.05*	*0.27*

TABLE C20. Cost Responsibility by Registered Weight for Annual Construction Expenditure by Construction Element ($1000)

				Truck registered weight class (pounds)															
Construction element	Motor-cycles	Cars	Buses	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total	Percent
Planning & design	195	57,832	426	27,339	121	202	256	178	652	345	481	226	636	52	82	337	5,251	94,611	9.740
Right of way	192	55,219	422	26,425	111	188	238	166	607	314	447	192	544	41	62	297	3,227	88,692	9.130
Utility relocation	47	13,296	101	6,386	27	45	57	40	146	76	107	47	132	10	16	70	934	21,537	2.217
Grade, drain, & surfacing	432	214,327	8,199	107,592	503	1,190	1,932	1,632	7,094	4,566	7,662	4,215	13,985	1,311	2,010	14,820	180,083	571,552	58.839
Resurfacing	79	25,651	2,425	12,934	2	11	39	60	422	460	1,299	487	3,000	276	416	6,941	57,811	112,311	11.562
Bridges	66	39,720	765	18,466	44	103	168	143	616	382	643	269	939	75	118	657	7,884	71,060	7.315
Miscellaneous	8	5,594	80	2,776	6	15	24	20	88	56	91	43	146	14	24	99	2,538	11,623	1.197
State-maintained system	1,018	411,638	12,418	201,919	814	1,754	2,714	2,239	9,625	6,199	10,729	5,478	19,381	1,780	2,729	23,222	257,728	971,386	100.000
Percent	0.105	42.376	1.278	20.787	0.084	0.181	0.279	0.231	0.991	0.638	1.105	0.564	1.995	0.183	0.281	2.391	26.532	100.000	

TABLE C21. Cost Responsibility by Registered Weight for Annual Maintenance and Administration Expenditure by Expenditure Category ($1000)

				Truck registered weight class (pounds)															
Element	Motor-cycles	Cars	Buses	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total	Percent
Maintenance & traffic																			
Roads	246	77,601	542	38,469	387	640	793	548	2,040	1,253	1,620	1,254	3,514	345	589	1,999	51,792	183,635	49.292
Structures	6	4,061	71	2,013	5	12	20	17	73	47	77	37	125	11	19	86	1,814	8,495	2.280
Traffic services	57	18,032	126	8,939	39	65	81	57	207	111	151	73	203	18	29	108	2,204	30,498	8.186
Administration	160	50,518	353	25,043	108	181	228	158	580	310	424	206	567	49	81	302	6,175	85,443	22.935
Enforcement																			
Motor carriers					184	307	386	268	983	526	719	349	962	83	137	512	10,470	15,887	4.265
Other enforcement	91	28,727	200	14,241	62	103	130	90	330	176	241	117	323	28	46	172	3,511	48,587	13.042
Miscellaneous																			
State-maintained system	562	178,938	1,291	88,704	785	1,308	1,638	1,139	4,213	2,423	3,233	2,036	5,694	534	902	3,179	75,966	372,545	100.000
Percent	0.151	48.031	0.347	23.810	0.211	0.351	0.440	0.306	1.131	0.650	0.868	0.547	1.528	0.143	0.242	0.853	20.391	100.000	

TABLE C22. Summary Distribution of Cost Responsibility by Registered Weight ($1000)

Element	Motor-cycles	Cars	Buses	Truck registered weight class (pounds)														Total	Percent
				6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000		
Capital	1,018	411,638	12,418	201,919	814	1,754	2,714	2,239	9,625	6,199	10,729	5,478	19,381	1,780	2,729	23,222	257,728	971,386	72.279
Maintenance & administration	562	178,938	1,291	88,704	785	1,308	1,638	1,139	4,213	2,423	3,233	2,036	5,694	534	902	3,179	75,966	372,545	27.721
State-maintained system	1,580	590,576	13,710	290,623	1,598	3,061	4,352	3,378	13,838	8,622	13,963	7,514	25,075	2,314	3,631	26,401	333,695	1,343,931	100.000
Percent	0.118	43.944	1.020	21.625	0.119	0.228	0.324	0.251	1.030	0.642	1.039	0.559	1.866	0.172	0.270	1.964	24.830	100.000	

APPENDIX E

FY 1999 REVENUE ATTRIBUTION TABLES

TABLE R1. Summary of Revenue Attributed to State-Maintained System

Source	Revenue ($1000)	
Fuel tax revenue		
Kentucky, heavy vehicle surtax	*51*	
Kentucky, carrier surtax	*17,687*	
Kentucky, normal & normal use	*311,353*	
Federal	*305,501*	
Subtotal		634,592
Vehicle registration and license fees		
Cars	*25,511*	
Buses	*55*	
Motorcycles	*578*	
Trucks		
Kentucky	*20,544*	
Apportioned	*29,536*	
Vehicle ID cards	*6,133*	
Permits	*7,432*	
Other	*9,222*	
Subtotal		99,009
Miscellaneous		*39,382*
Operator's license fees		*7,991*
Commercial driver's license		*1,159*
Usage taxes		
Kentucky, buses	*9*	
Kentucky, other vehicles	*375,676*	
Federal, trucks and trailers	*36,609*	
Subtotal		412,294
Road tolls		*13,434*
Other motor carrier taxes		
Kentucky, weight-distance	*71,395*	
Kentucky, extended-weight permit	*842*	
Federal, use	*16,656*	
Subtotal		88,893
Other federal taxes		*6,554*
Total		1,303,307

TABLE R2. Distribution of Vehicle-Miles Traveled by Axle Class (1000)

Functional class	Rural or urban	Number of lanes	Motor-cycles	Cars	Buses	Single-unit trucks: 2-axle 4-tire	Single-unit trucks: 2-axle 6-tire	Single-unit trucks: 3-axle	Single-unit trucks: 4 or more axles	Single trailer: 4 or less axles	Single trailer: 5-axle	Single trailer: 6 or more axles	Multiple trailers: 5 or less axles	Multiple trailers: 6-axle	Multiple trailers: 7 or more axles	Total
Interstate	Rural	4	11,709	2,098,971	32,591	1,177,497	140,278	25,823	5,046	114,389	1,041,735	14,407	60,384	9,254	1,786	4,733,871
		6	1,483	744,739	3,544	432,597	49,521	8,682	1,305	9,476	320,917	1,614	16,077	1,771	128	1,591,855
Principal arterial	Rural	2	8,999	1,531,057	13,384	747,696	73,354	46,664	9,487	30,588	82,918	18,025	1,538	154	77	2,563,940
		4	7,721	2,067,961	12,110	1,526,670	125,651	46,083	8,615	21,253	151,253	94,279	1,626	284	244	4,063,751
Minor arterial	Rural	2	11,376	1,630,532	16,432	639,251	65,033	29,815	7,633	26,048	45,181	6,593	421	50	25	2,478,389
		4	190	110,986	727	51,509	5,209	1,639	574	1,709	7,711	204	18	4	20	180,500
Major collector	Rural	2	17,197	3,911,856	42,303	1,618,131	135,478	71,125	14,501	54,467	105,219	17,137	3,116	360	1,079	5,991,967
		4	261	52,121	634	52,228	3,490	511	180	312	5,021	2,983	14			117,755
Minor collector	Rural		5,749	1,371,459	20,109	882,010	65,573	16,214	2,331	15,261	260,700	6,703	2,941	344		2,649,395
Local	Rural		987	644,667	1,965	150,802	14,085	12,037	58	2,661	1,733					828,994
Interstate	Urban	4	2,232	1,053,792	16,364	559,930	48,623	10,848	3,466	17,140	171,728	4,460	8,361	951	167	1,898,062
		6	2,498	1,609,451	23,385	1,041,045	73,906	19,175	4,029	13,304	308,697	6,281	16,890	1,607	722	3,120,990
		8	2,433	434,293	3,870	172,670	12,465	6,092	624	13,349	74,266	297	4,222	1,240	1,464	727,285
Freeway & x-way	Urban	2	13	9,258	55	5,604	576	115	25	28	108	4				15,787
		4	689	484,629	1,021	307,296	16,545	2,964	1,411	1,212	13,548	224	556	58	17	830,171
Principal arterial	Urban	2	3,908	628,577	4,824	377,798	25,091	8,019	2,630	2,843	10,170	767	277	32	32	1,064,969
		4	5,711	2,133,372	13,640	1,270,762	78,641	23,170	7,020	18,733	79,441	4,329	2,001	436	145	3,637,400
		6	165	153,436	509	86,530	4,496	1,023	387	536	2,245	92	40	22		249,481
Minor arterial	Urban	2	5,673	1,466,452	6,921	735,262	52,801	25,894	11,158	12,265	34,228	1,766	1,436	165	24	2,354,044
		4	1,575	665,408	3,920	369,579	24,142	4,290	1,010	1,564	13,282	847	337	54		1,086,008
		6	8	16,707	32	5,422	264	24	6	19	25					22,506
Collector	Urban	2	846	337,064	3,189	179,309	16,089	3,267	269	4,691	14,627	179	768	106	6	560,409
		4	27	49,571	266	19,681	1,644	154	6	205	738	12				72,304
Local	Urban		681	35,802	1,631	21,535	3,076	3,303	3,944	971	10,200	660		42	1,322	83,167
County maintained	Rural		3,998	1,572,377	8,977	897,731	68,721	14,678	5,469	5,108	1,832	232			490	2,579,612
	Urban			299,007	24,030	201,315	3,119	1,248								528,720
City maintained	Rural		433	170,445	973	97,314	7,449	1,591	593	554	199	25			53	279,629
	Urban			1,339,763	107,673	902,035	13,977	5,591								2,369,039
State-maintained system			92,132	23,242,161	223,426	12,430,814	1,036,033	366,932	85,715	363,022	2,755,690	181,863	121,023	16,935	7,256	40,923,000
Total statewide			96,564	26,623,753	365,079	14,529,210	1,129,299	390,039	91,777	368,683	2,757,720	182,120	121,023	16,935	7,799	46,680,000
State-maintained average (%)			0.225	56.795	0.546	30.376	2.532	0.897	0.209	0.887	6.734	0.444	0.296	0.041	0.018	100.000
Statewide average (%)			0.207	57.035	0.782	31.125	2.419	0.836	0.197	0.790	5.908	0.390	0.259	0.036	0.017	100.000

TABLE R3. Percentage of Vehicles by Axle Class in Registered Weight Categories

	Single-unit trucks				Single trailer			Multiple trailers		
Registered weight (pounds)	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles
6,000	100.00									
10,000		*4.17*	*0.11*	*0.24*		*0.06*				
14,000		*7.87*	*0.42*	*0.96*		*0.06*				
18,000		*10.69*	*0.74*	*0.72*						
22,000		*7.47*	*0.84*							
26,000		*29.52*	*2.10*	*1.69*	*1.21*					
32,000		*12.44*	*1.78*	*1.93*	*3.87*	*0.35*	*0.31*			
38,000		*17.55*	*5.77*	*1.45*	*1.94*	*0.18*	*0.31*			
44,000		*2.02*	*11.02*	*1.21*	*5.81*	*0.23*	*0.93*	*25.00*		
55,000		*4.17*	*27.60*	*9.40*	*26.15*	*2.51*	*0.93*			
62,000		*0.34*	*3.15*	*4.58*	*7.51*	*0.64*	*0.31*			
73,280		*1.28*	*13.01*	*49.16*	*4.12*	*1.69*	*0.62*			
80,000		*2.49*	*33.47*	*28.68*	*49.40*	*94.28*	*96.61*	*75.00*	*100.00*	*100.00*
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE R4. Distribution of Vehicle Miles Traveled by Registered Weight (1000)

Functional class	Rural or Urban	Number of Lanes	Motor-cycles	Cars	Buses	Truck registered weight class (pounds)													
						6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	62,000	73,280	80,000	Total
Interstate	Rural	4	11,709	2,098,971	32,591	1,177,497	6,492	11,798	15,226	10,688	43,427	26,132	30,268	30,050	69,643	16,834	30,067	1,122,467	4,733,859
		6	1,483	744,739	3,544	432,597	2,263	4,132	5,369	3,770	14,939	7,836	9,962	7,307	15,131	3,276	8,237	327,266	1,591,851
Principal arterial	Rural	2	8,999	1,531,057	13,384	747,696	3,178	6,107	8,255	5,867	23,166	11,672	16,499	9,258	27,074	5,034	14,447	132,245	2,563,940
		4	7,721	2,067,961	12,110	1,526,670	5,395	10,251	13,837	9,766	38,466	18,265	25,806	10,584	28,993	5,125	15,854	266,945	4,063,749
Minor arterial	Rural	2	11,376	1,630,532	16,432	639,251	2,787	5,342	7,228	5,105	20,270	9,957	13,850	6,474	19,663	3,772	10,341	76,008	2,478,388
		4	190	110,986	727	51,509	225	427	573	403	1,603	782	1,064	416	1,366	274	764	9,191	180,500
Major collector	Rural	2	17,197	3,911,856	42,303	1,618,131	5,819	11,159	15,114	10,710	42,394	20,935	29,386	15,093	43,682	8,175	22,243	177,770	5,991,966
		4	261	52,121	634	52,228	149	281	378	265	1,048	486	669	190	539	101	316	8,090	117,755
Minor collector	Rural		5,749	1,371,459	20,109	882,010	2,908	5,401	7,148	5,031	19,923	10,016	13,251	5,431	18,024	3,677	9,177	270,077	2,649,392
Local	Rural		987	644,667	1,965	150,802	601	1,160	1,595	1,152	4,444	2,077	3,222	1,770	4,654	640	1,914	7,344	828,994
Interstate	Urban	4	2,232	1,053,792	16,364	559,930	2,146	4,004	5,304	3,721	14,849	7,588	9,857	5,747	14,180	3,066	7,377	187,902	1,898,060
		6	2,498	1,609,451	23,385	1,041,045	3,290	6,113	8,073	5,678	22,451	11,230	14,954	9,428	20,037	4,036	11,233	328,085	3,120,986
		8	2,433	434,293	3,870	172,670	571	1,055	1,382	982	3,980	2,450	2,938	2,938	7,617	1,742	3,067	85,296	727,285
Freeway & x-way	Urban	2	13	9,258	55	5,604	24	46	63	44	173	76	109	27	68	9	38	180	15,787
		4	689	484,629	1,021	307,296	704	1,336	1,801	1,260	4,985	2,234	3,143	921	2,299	392	1,571	15,889	830,171
Principal arterial	Urban	2	3,908	628,577	4,824	377,798	1,067	2,039	2,761	1,940	7,655	3,463	4,980	1,687	4,512	738	2,951	16,068	1,064,969
		4	5,711	2,133,372	13,640	1,270,762	3,366	6,399	8,630	6,065	24,049	11,350	15,757	6,038	17,265	3,244	9,614	102,138	3,637,399
		6	165	153,436	509	86,530	191	363	491	344	1,362	614	868	255	704	120	441	3,089	249,481
Minor arterial	Urban	2	5,673	1,466,452	6,921	735,262	2,275	4,391	5,917	4,159	16,469	7,846	11,226	5,221	14,479	2,649	10,624	54,480	2,354,044
		4	1,575	665,408	3,920	369,579	1,021	1,935	2,620	1,838	7,253	3,209	4,556	1,186	3,035	468	1,658	16,746	1,086,007
		6	8	16,707	32	5,422	11	21	28	20	79	34	48	9	24	4	11	49	22,506
Collector	Urban	2	846	337,064	3,189	179,309	683	1,291	1,746	1,228	4,880	2,299	3,133	1,188	3,193	616	1,205	18,539	560,409
		4	27	49,571	266	19,681	69	130	177	124	491	218	303	64	184	31	65	903	72,304
Local	Urban		681	35,802	1,631	21,535	147	300	382	257	1,056	593	826	560	1,926	435	2,624	14,410	83,167
County maintained	Rural		3,998	1,572,377	8,977	897,731	2,895	5,522	7,496	5,253	20,751	9,122	13,091	3,372	8,813	1,339	5,719	13,155	2,579,612
	Urban		0	299,007	24,030	201,315	131	251	343	243	947	410	620	200	474	50	202	495	528,720
City maintained	Rural		433	170,445	973	97,314	314	599	813	569	2,249	989	1,419	366	955	145	620	1,426	279,629
	Urban		0	1,339,763	107,673	902,035	589	1,123	1,536	1,090	4,244	1,839	2,776	898	2,126	223	906	2,219	2,369,039
State-maintained system			92,132	23,242,161	223,426	12,430,814	45,382	85,481	114,100	80,418	319,412	161,362	216,676	121,841	318,292	64,458	165,839	3,241,176	40,922,969
Total statewide			96,564	26,623,753	365,079	14,529,210	49,311	92,976	124,286	87,575	347,603	173,721	234,581	126,678	330,661	66,215	173,286	3,258,471	46,679,969
State-maintained average (%)			0.225	56.795	0.546	30.376	0.111	0.209	0.279	0.197	0.781	0.394	0.529	0.298	0.778	0.158	0.405	7.920	100.000
Statewide average (%)			0.207	57.035	0.782	31.125	0.106	0.199	0.266	0.188	0.745	0.372	0.503	0.271	0.708	0.142	0.371	6.980	100.000

TABLE R5. Diesel Powered Trucks by Truck Class

	Statewide VMT (1000)										
	Single-unit trucks				Single trailer			Multiple trailers			
Registered weight (pounds)	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Percent diesel by weight class
6,000	14,529,210										*0.30*
10,000		47,080	410	221		1,599					*11.54*
14,000		88,853	1,638	885		1,599					*7.41*
18,000		120,756	2,867	664							*41.17*
22,000		84,302	3,272								*45.41*
26,000		333,403	8,187	1,548	4,465						*45.41*
32,000		140,496	6,958	1,769	14,283	9,652	563				*66.94*
38,000		198,215	22,509	1,327	7,141	4,826	563				*99.68*
44,000		22,778	42,975	1,106	21,424	6,453	1,686	30,256			*99.68*
55,000		47,080	107,639	8,625	96,411	69,219	1,686				*99.68*
62,000		3,794	12,278	4,202	27,673	17,705	563				*99.68*
73,280		14,432	50,752	45,115	15,175	46,688	1,124				*99.68*
80,000		28,097	130,558	26,317	182,111	2,599,951	175,937	90,767	16,935	7,799	*99.68*
Percent diesel by axle class	0.30	58.34	96.59	96.61	97.75	99.46	99.58	99.68	99.68	99.68	

TABLE R6. Fuel Consumption by Vehicle Type

	Motor-cycles	Cars	Buses	Single-unit trucks: 2-axle 4-tire	Single-unit trucks: 2-axle 6-tire	Single-unit trucks: 3-axle	Single-unit trucks: 4 or more axles	Single trailer: 4 or less axles	Single trailer: 5-axle	Single trailer: 6 or more axles	Multiple trailers: 5 or less axles	Multiple trailers: 6-axle	Multiple trailers: 7 or more axles	Total
Fuel efficiency (mpg)	*50.00*	*21.50*	*6.70*	*17.20*	*7.00*	*7.00*	*7.00*	*6.10*	*6.10*	*6.10*	*6.10*	*6.10*	*6.10*	
Percent special fuel		*0.31*	*75.00*	0.30	57.85	96.37	96.63	97.69	99.48	99.68	99.68	99.68	99.68	
Statewide, 1,000 gallons (unadjusted)														
Gasoline & gasohol														
Gasoline (includes LPG)	1,574	1,254,386	11,708	806,649	62,912	1,640	325	1,117	2,026	82	58	8	3	2,142,488
Gasohol	28	22,415	209	14,414	1,124	29	6	20	36	1	1	0	0	38,285
Special fuels		3,970	35,753	2,471	87,893	44,290	9,482	48,031	396,098	25,993	18,458	2,495	1,005	675,940
Total	1,602	1,280,771	47,670	823,534	151,928	45,959	9,813	49,168	398,160	26,077	18,518	2,503	1,008	2,856,712
Statewide, 1,000 gallons (adjusted)														
Gasoline & gasohol														
Gasoline (includes LPG)	1,574	1,254,386	11,708	806,649	62,912	1,640	325	1,117	2,026	82	58	8	3	2,142,488
Gasohol	28	22,415	209	14,414	1,124	29	6	20	36	1	1	0	0	38,285
Special fuels		3,970	35,753	2,471	87,893	44,290	9,482	48,031	396,098	25,993	18,458	2,495	1,005	675,940
Total	1,602	1,280,771	47,670	823,534	151,928	45,959	9,813	49,168	398,160	26,077	18,518	2,503	1,008	2,856,712

TABLE R7. Motor Fuel Tax Revenue by Registered Weight Categories ($1000)

	Motor-cycles	Cars	Buses	Truck registered weight class (pounds)														Total
				6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	
Kentucky rates ($/gallon)																		
Heavy vehicle surtax															*0.022*	*0.022*	*0.022*	
Carrier surtax, gasoline										*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	
Carrier surtax, gasohol										*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	
Carrier surtax, special fuels										*0.052*	*0.052*	*0.052*	*0.052*	*0.052*	*0.052*	*0.052*	*0.052*	
Normal & normal use, gasoline	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	
Normal & normal use, gasohol	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	*0.150*	
Normal & normal use, special fuels	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	*0.120*	
Federal rates ($/gallon)																		
Gasoline	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	
Gasohol	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	*0.040*	
Special fuels	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	*0.160*	
Statewide fuel, 1,000 gallons (unadjusted)																		
Gasoline	1,574	1,254,386	11,708	806,649	3,227	5,407	6,872	4,771	17,220	7,992	11,262	1,436	3,410	137	177	1,259	5,000	2,142,488
Gasohol	28	22,415	209	14,414	58	97	123	85	308	143	201	26	61	2	3	22	89	38,285
Special fuels		3,970	35,753	2,471	4,816	8,022	10,040	6,976	25,818	15,098	20,207	13,876	39,029	3,561	5,935	21,277	459,091	675,940
Total	1,602	1,280,771	47,670	823,534	8,101	13,526	17,035	11,832	43,346	23,233	31,670	15,337	42,501	3,700	6,115	22,559	464,181	2,856,712
Fuel revenue, state-maintained system (unadjusted)																		
Kentucky																		
Heavy vehicle surtax															135	496	10,212	10,843
Carrier surtax										713	964	558	1,558	139	231	840	17,749	22,753
Normal & normal use	178	142,077	4,498	91,357	792	1,323	1,668	1,158	4,238	2,244	3,067	1,394	3,851	332	547	2,032	41,332	302,089
Total	178	142,077	4,498	91,357	792	1,323	1,668	1,158	4,238	2,957	4,031	1,952	5,409	471	778	2,871	59,081	324,842
Federal																		
Gasoline	157	125,439	1,171	80,665	323	541	687	477	1,722	799	1,126	144	341	14	18	126	500	214,249
Gasohol	1	897	8	577	2	4	5	3	12	6	8	1	2	0	0	1	4	1,531
Special fuels		635	5,720	395	771	1,284	1,606	1,116	4,131	2,416	3,233	2,220	6,245	570	950	3,404	73,455	108,150
Total	159	126,970	6,900	81,637	1,096	1,828	2,299	1,597	5,865	3,221	4,367	2,365	6,588	584	967	3,531	73,958	323,930
Fuel revenue, state-maintained system (adjusted)																		
Kentucky																		
Heavy vehicle surtax															1	2	48	51
Carrier surtax										555	749	434	1,211	108	180	653	13,797	17,687
Normal & normal use	183	146,435	4,636	94,159	817	1,364	1,719	1,194	4,368	2,312	3,161	1,437	3,969	342	564	2,094	42,600	311,353
Total	183	146,435	4,636	94,159	817	1,364	1,719	1,194	4,368	2,867	3,910	1,871	5,181	450	744	2,747	56,397	329,091
Federal																		
Gasoline	148	118,302	1,104	76,076	304	510	648	450	1,624	754	1,062	135	322	13	17	119	472	202,059
Gasohol	1	846	8	544	2	4	5	3	12	5	8	1	2	0	0	1	3	1,444
Special fuels		599	5,395	373	727	1,211	1,515	1,053	3,896	2,278	3,049	2,094	5,889	537	896	3,211	69,275	101,997
Total	150	119,747	6,507	76,992	1,033	1,724	2,168	1,506	5,532	3,037	4,119	2,230	6,213	550	912	3,330	69,750	305,501
Kentucky state-maintained	183	146,435	4,636	94,159	817	1,364	1,719	1,194	4,368	2,867	3,910	1,871	5,181	450	744	2,747	56,397	329,091
Federal state-maintained	150	119,747	6,507	76,992	1,033	1,724	2,168	1,506	5,532	3,037	4,119	2,230	6,213	550	912	3,330	69,750	305,501

Kentucky normal & normal use tax & carrier surtax for road fund deposit: *74%*

Note: The Kentucky heavy vehicle surtax was repealed effective July 15, 1996; however, quarterly tax returns by motor carriers resulted in previous quarter income of $51,290.

TABLE R8. Motor Vehicle Registration Fees (Dollars)

General fees	
Passenger car	*12.00*
Farm truck	*12.00*
School and church bus	*12.00*
Motorcycle	*9.50*
Motor vehicle dealer	*25.50*
House car	*20.50*
Trailer drawn by passenger car	*5.00*
Trailer drawn by truck	*20.00*
House trailer	*10.00*
Truck fees	
0 - 6,000	*12.00*
6,001 - 10,000	*24.50*
10,001 - 14,000	*30.50*
14,001 - 18,000	*50.50*
18,001 - 22,000	*132.50*
22,001 - 26,000	*160.50*
26,001 - 32,000	*216.50*
32,001 - 38,000	*300.50*
38,001 - 44,000	*474.50*
44,001 - 55,000	*544.50*
55,001 - 62,000	*882.50*
62,001 - 73,280	*1,125.50*
73,281 - 80,000	*1,260.50*

TABLE R9. Truck Registration Revenue

	Truck registered weight class (pounds)														
	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total
Number of Kentucky registrations															
Farm								123,117	155	597		57	62	945	124,933
Other	744,865	20,894	10,654	8,925	3,948	10,821	4,123	1,278	1,467	2,705		339	980	3,217	814,216
Exempt					182	545	395	136	522	853		150	434	444	3,661
Total	744,865	20,894	10,654	8,925	4,130	11,366	4,518	124,531	2,144	4,155		546	1,476	4,606	942,810
Registration fee ($)															
Farm								12.00	189.80	217.80		353.00	450.20	504.20	
Other	12.00	24.50	30.50	50.50	132.50	160.50	216.50	300.50	474.50	544.50		882.50	1125.50	1260.50	
Exempt					99.38	120.38	162.38	225.38	355.88	408.38		661.88	844.13	945.38	
Unadjusted revenue from Kentucky trucks ($1000)															
Farm								1,034	21	91		14	20	334	1,513
Other	6,257	358	227	315	366	1,216	625	269	487	1,031		209	772	2,839	14,972
Exempt					13	46	45	21	130	244		69	256	294	1,119
Total	6,257	358	227	315	379	1,262	670	1,324	638	1,366		293	1,048	3,466	17,604
Adjusted revenue ($1000)															
Kentucky															
Farm								1,207	24	106		16	23	389	1,766
Other	7,302	418	265	368	427	1,419	729	314	569	1,203		244	901	3,313	17,473
Exempt					15	54	52	25	152	285		81	299	343	1,305
Apportioned	0	9	0	3	1	2	2	3	0	13	1	1,415	7,480	20,607	29,536
Vehicle ID cards	0	2	0	1	0	0	0	1	0	3	0	294	1,553	4,279	6,133
Permits	0	2	0	1	0	0	0	1	0	3	0	356	1,882	5,185	7,432
Total	7,302	431	266	373	443	1,475	784	1,550	745	1,614	2	2,406	12,138	34,115	63,644
Number of vehicle ID cards:	2	43	1	15	3	8	9	14	2	66	7	6,954	36,769	101,295	145,188
Kentucky registration fees for road fund deposit:			70%												

TABLE R10. Toll Road Revenues and Their Allocation (Unadjusted)

Vehicle toll code	Revenue (dollars)	Allocation procedure
1	*8,777,274*	To cars and 6,000-pound trucks based on relative VMT
2	*146,347*	Same as above
3	*215,787*	Same as above
4	*316,571*	To buses and SU-2A-6T based on relative VMT and registered weight distribution of SU-2A-6T
5	*204,863*	To registered weight distribution of SU-3A
6	*316,508*	To SU-4A and ST-4A based on relative VMT and registered weight distributions
7	*3,228,365*	To registered weight distribution of ST-5A
8	*281,606*	To registered weight distribution of MT-6A
Total	13,487,322	

VMT allocations based on travel on 4-lane, rural, principal arterials

TABLE R11. Total Revenue Generated by Weight Class ($1000)

	Motor-cycles	Cars	Buses	Truck registered weight class (pounds) 6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total
Fuel taxes																		
Kentucky, heavy vehicle surtax															1	2	48	51
Kentucky, carrier surtax										555	749	434	1,211	108	180	653	13,797	17,687
Kentucky, normal & normal use	183	146,435	4,636	94,159	817	1,364	1,719	1,194	4,368	2,312	3,161	1,437	3,969	342	564	2,094	42,600	311,353
Federal	150	119,747	6,507	76,992	1,033	1,724	2,168	1,506	5,532	3,037	4,119	2,230	6,213	550	912	3,330	69,750	305,501
Vehicle registration and license fees																		
Cars		25,511																25,511
Buses			55															55
Motorcycles	578																	578
Trucks																		
Kentucky				7,302	418	265	368	442	1,472	782	1,546	744	1,594		342	1,223	4,045	20,544
Apportioned				0	9	0	3	1	2	2	3	0	13	1	1,415	7,480	20,607	29,536
Vehicle ID cards				0	2	0	1	0	0	0	1	0	3	0	294	1,553	4,279	6,133
Permits				0	2	0	1	0	0	0	1	0	3	0	356	1,882	5,185	7,432
Other	17	5,452	38	2,703	12	20	25	17	63	33	46	22	61	5	9	33	666	9,222
Miscellaneous	74	23,284	162	11,542	50	83	105	73	267	143	196	95	262	23	37	139	2,846	39,382
Operator's license fees	15	4,725	33	2,342	10	17	21	15	54	29	40	19	53	5	8	28	577	7,991
Commercial driver's license									77	41	57	27	76	7	11	40	823	1,159
Usage taxes																		
Kentucky, buses			9															9
Kentucky, other vehicles	*4,733*	*220,150*		*116,735*	*4,770*	*2,316*	*1,986*	*984*	*3,040*	*1,184*	*9,253*	*566*	*1,477*	*148*	*173*	*1,134*	*7,027*	375,676
Federal, trucks and trailers											1,990	966	2,661	231	380	1,416	28,965	36,609
Road tolls		5,449	24	3,655	17	28	34	24	89	61	76	55	215	22	38	144	3,503	13,434
Other motor carrier taxes																		
Kentucky, weight distance															882	3,287	67,226	71,395
Kentucky, extended-weight permits																	842	842
Federal, use													1,317	114	188	701	14,335	16,656
Other federal taxes	12	3,875	27	1,921	8	14	17	12	44	24	33	16	44	4	6	23	474	6,554
Total	5,762	554,626	11,491	317,351	7,148	5,832	6,448	4,268	15,009	8,204	21,268	6,612	19,173	1,560	5,795	25,165	287,595	1,303,307
Percentage	0.442	42.555	0.882	24.350	0.548	0.447	0.495	0.327	1.152	0.629	1.632	0.507	1.471	0.120	0.445	1.931	22.067	100.000

TABLE R12. Total Revenue Generated by Axle Class ($1000)

				Single-unit trucks				Single trailer			Multiple trailers			
	Motor-cycles	Cars	Buses	2-axle 4-tire	2-axle 6-tire	3-axle	4 or more axles	4 or less axles	5-axle	6 or more axles	5 or less axles	6-axle	7 or more axles	Total
Fuel taxes														
Kentucky, heavy vehicle surtax					1	2	1	3	40	3	2	0	0	51
Kentucky, carrier surtax					1,544	1,293	272	1,363	11,794	774	547	75	26	17,687
Kentucky, normal & normal use	183	146,435	4,636	94,159	15,139	4,442	907	4,438	36,606	2,393	1,706	230	80	311,353
Federal	150	119,747	6,507	76,992	19,807	6,897	1,431	7,042	59,736	3,913	2,772	377	132	305,501
Vehicle registration and license fees														
Cars		25,511												25,511
Buses			55											55
Motorcycles	578													578
Trucks														
Kentucky				7,302	5,326	1,522	371	1,158	4,325	245	266	22	8	20,544
Apportioned				0	888	2,888	1,819	2,359	19,556	1,169	706	111	39	29,536
Vehicle ID cards				0	184	600	378	490	4,061	243	147	23	8	6,133
Permits				0	223	727	458	594	4,921	294	178	28	10	7,432
Other	17	5,452	38	2,703	219	68	14	69	572	37	27	4	1	9,222
Miscellaneous	74	23,284	162	11,542	936	292	60	293	2,443	160	114	15	5	39,382
Operator's license fees	15	4,725	33	2,342	190	59	12	60	496	32	23	3	1	7,991
Commercial driver's license					184	83	17	85	706	46	33	4	2	1,159
Usage taxes														
Kentucky, buses			9											9
Kentucky, other vehicles	4,733	220,150		116,735	21,908	2,448	430	1,459	7,001	423	338	38	13	375,676
Federal, trucks and trailers					2,667	2,779	575	2,834	24,757	1,626	1,158	156	55	36,609
Road tolls		5,449	24	3,655	388	262	61	296	2,950	195	129	19	7	13,434
Other motor carrier taxes														
Kentucky, weight distance					937	3,162	1,130	4,159	55,495	3,721	2,303	363	127	71,395
Kentucky, extended-weight permits					8	27	5	44	677	46	29	5	2	842
Federal, use					399	1,107	277	1,300	12,182	796	491	77	27	16,656
Other federal taxes	12	3,875	27	1,921	156	49	10	49	407	27	19	3	1	6,554
Total	5,762	554,626	11,491	317,351	71,103	28,705	8,226	28,094	248,722	16,144	10,986	1,554	542	1,303,307
Percentage	0.442	42.555	0.882	24.350	5.456	2.202	0.631	2.156	19.084	1.239	0.843	0.119	0.042	100.000

TABLE R13a. Annual Revenue Attribution by Weight Class

Registered Weight Category	Total Annual Revenue Attribution ($)	Total Annual Revenue Attribution (%)
Motorcycles	5,762,228.34	0.442
Cars	554,626,439.10	42.555
Buses	11,491,034.74	0.882
6,000	317,351,057.61	24.350
10,000	7,148,393.30	0.548
14,000	5,831,813.58	0.447
18,000	6,448,064.88	0.495
22,000	4,267,514.53	0.327
26,000	15,008,812.74	1.152
32,000	8,203,553.82	0.629
38,000	21,268,230.64	1.632
44,000	6,611,981.63	0.507
55,000	19,172,830.09	1.471
59,999	1,560,277.01	0.120
62,000	5,794,675.02	0.445
73,280	25,164,625.47	1.931
80,000	287,595,241.14	22.067
Total	1,303,306,773.64	100.000

TABLE R13b. Summary Distribution of Annual Revenue Attribution

Vehicle Type Category	Total Annual Revenue Attribution ($)	Total Annual Revenue Attribution (%)
Motorcycles & Cars	560,388,667.44	42.997
Buses	11,491,034.74	0.882
Pickups & Vans	317,351,057.61	24.350
Light Trucks	38,704,599.03	2.970
Medium Trucks	56,816,873.19	4.359
Heavy Trucks	318,554,541.62	24.442
Total	1,303,306,773.64	100.000

TABLE R14a. Annual Cost Responsibility by Weight Class

Registered Weight Category	Total Annual Cost Responsibility ($)	Total Annual Cost Responsibility (%)
Motorcycles	1,579,754.38	0.118
Cars	590,576,459.19	43.944
Buses	13,709,583.50	1.020
6,000	290,623,246.57	21.625
10,000	1,598,342.29	0.119
14,000	3,061,155.39	0.228
18,000	4,351,620.30	0.324
22,000	3,378,054.13	0.251
26,000	13,838,307.39	1.030
32,000	8,622,103.33	0.642
38,000	13,962,685.58	1.039
44,000	7,514,118.09	0.559
55,000	25,075,184.67	1.866
59,999	2,313,988.07	0.172
62,000	3,631,383.16	0.270
73,280	26,400,851.92	1.964
80,000	333,694,566.15	24.830
Total	1,343,931,404.11	100.000

TABLE R14b. Summary Distribution of Annual Cost Responsibility

Vehicle Type Category	Total Annual Cost Responsibility ($)	Total Annual Cost Responsibility (%)
Motorcycles & Cars	592,156,213.57	44.061
Buses	13,709,583.50	1.020
Pickups & Vans	290,623,246.57	21.625
Light Trucks	26,227,479.50	1.952
Medium Trucks	57,488,079.73	4.278
Heavy Trucks	363,726,801.24	27.064
Total	1,343,931,404.11	100.000

TABLE R15a. Revenue-to-Cost Ratio by Weight Class

Registered Weight Category	Revenue-to-Cost Ratio
Motorcycles	3.76
Cars	0.97
Buses	0.86
6,000	1.13
10,000	4.61
14,000	1.96
18,000	1.53
22,000	1.30
26,000	1.12
32,000	0.98
38,000	1.57
44,000	0.91
55,000	0.79
59,999	0.70
62,000	1.65
73,280	0.98
80,000	0.89

TABLE R15b. Summary of Revenue-to-Cost Ratio

Vehicle Type Category	Revenue-to-Cost Ratio
Motorcycles & Cars	0.98
Buses	0.86
Pickups & Vans	1.13
Light Trucks	1.52
Medium Trucks	1.02
Heavy Trucks	0.90

TABLE R16. Trend in Vehicle Miles Traveled (1000) by Registered Weight Categories

Year	Motor-cycles	Cars	Buses	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	56,900	59,999	62,000	73,280	80,000	Total
State-Maintained System VMT (1,000)																		
1990	76,064	18,773,176	110,902	8,067,708	69,916	67,347	115,938	69,918	214,262	165,654	96,505	100,233	183,087	27,595	36,607	163,071	1,957,768	30,295,750
1992	91,504	21,649,831	152,692	9,033,112	91,113	90,603	123,348	67,157	227,721	150,066	152,335	95,843	194,061	32,359	48,628	178,604	2,169,613	34,548,590
1994	72,585	20,497,587	175,458	8,931,861	74,344	78,004	98,127	53,834	215,209	126,108	177,399	87,244	209,514	30,221	48,893	189,826	2,223,975	33,290,190
1996	74,531	21,651,662	158,582	9,838,731	74,799	81,503	102,949	62,220	241,314	132,523	152,807	93,110	249,223	27,461	43,199	173,030	2,457,232	35,614,875
1998	73,412	23,120,627	161,346	11,461,453	49,579	82,798	104,273	72,466	265,322	141,942	194,188	94,207	259,664	22,509	37,074	138,188	2,825,985	39,105,033
Annual Percent Change in VMT on State-Maintained System																		
1990-92	10.1	7.7	18.8	6.0	15.2	17.3	3.2	-2.0	3.1	-4.7	28.9	-2.2	3.0	8.6	16.4	4.8	5.4	7.0
1992-94	-10.3	-2.7	7.5	-0.6	-9.2	-7.0	-10.2	-9.9	-2.7	-8.0	8.2	-4.5	4.0	-3.3	0.3	3.1	1.3	-1.8
1994-96	1.3	2.8	-4.8	5.1	0.3	2.2	2.5	7.8	6.1	2.5	-6.9	3.4	9.5	-4.6	-5.8	-4.4	5.2	3.5
1996-98	-0.8	3.4	0.9	8.2	-16.9	0.8	0.6	8.2	5.0	3.6	13.5	0.6	2.1	-9.0	-7.1	-10.1	7.5	4.9
Statewide System VMT (1,000)																		
1990	86,659	20,911,998	121,615	9,148,395	76,837	74,007	127,220	76,439	235,075	180,381	104,315	105,226	190,567	28,048	37,098	166,461	1,966,658	33,636,999
1992	102,319	23,833,117	163,628	10,134,826	99,966	99,391	135,119	73,554	249,192	162,884	161,299	100,176	200,383	32,905	49,253	181,735	2,179,555	37,959,302
1994	85,098	24,225,301	307,952	11,233,777	83,352	87,535	109,988	60,288	240,787	139,797	196,883	92,187	219,339	31,027	49,931	196,975	2,238,269	39,598,485
1996	81,423	25,724,720	283,572	12,303,657	85,909	93,863	118,463	71,594	277,296	150,725	173,999	101,361	266,972	28,780	44,796	184,730	2,479,172	42,471,035
1998	80,117	27,536,581	319,390	14,164,778	56,516	94,492	119,151	82,824	302,861	159,905	220,217	101,036	277,255	23,568	38,412	149,203	2,850,613	46,576,919
Annual Percent Change in VMT on State-Maintained System																		
1990-92	9.0	7.0	17.3	5.4	15.1	17.1	3.1	-1.9	3.0	-4.9	27.3	-2.4	2.6	8.7	16.4	4.6	5.4	6.4
1992-94	-8.4	0.8	44.1	5.4	-8.3	-6.0	-9.3	-9.0	-1.7	-7.1	11.0	-4.0	4.7	-2.9	0.7	4.2	1.3	2.2
1994-96	-2.2	3.1	-4.0	4.8	1.5	3.6	3.9	9.4	7.6	3.9	-5.8	5.0	10.9	-3.6	-5.1	-3.1	5.4	3.6
1996-98	-0.8	3.5	6.3	7.6	-17.1	0.3	0.3	7.8	4.6	3.0	13.3	-0.2	1.9	-9.1	-7.1	-9.6	7.5	4.8

TABLE R17. Trend in Axle Miles Traveled (1000) by Registered Weight Categories

Year	Motor-cycles	Cars	Buses	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total
State-Maintained System Axle-Miles Traveled (1,000)																		
1990	152,128	37,546,352	221,803	16,137,998	142,383	136,624	239,934	151,263	445,209	376,531	238,078	317,250	631,480	119,901	162,581	685,730	9,649,982	67,355,225
1992	183,009	43,299,661	305,385	18,066,224	184,952	184,019	253,677	138,185	475,107	347,092	462,801	301,910	693,831	135,015	209,997	778,166	10,633,899	76,652,930
1994	145,169	40,995,174	350,916	17,863,723	153,645	158,927	199,997	110,390	444,866	289,560	396,148	284,006	741,860	126,361	211,239	832,160	10,914,668	74,218,808
1996	149,061	43,303,324	317,165	19,677,463	156,872	165,938	210,204	127,324	499,812	304,751	347,368	301,903	889,483	110,904	181,793	705,757	12,085,372	79,534,493
1998	146,824	46,241,253	322,693	22,922,906	168,512	177,447	223,907	135,405	531,827	324,818	366,350	312,045	935,733	119,974	198,081	776,083	13,636,068	87,539,926
Annual Percent Change in Axle-Miles Traveled on State-Maintained System																		
1990-92	10.1	7.7	18.8	6.0	14.9	17.3	2.9	-4.3	3.4	-3.9	47.2	-2.4	4.9	6.3	14.6	6.7	5.1	6.9
1992-94	-10.3	-2.7	7.5	-0.6	-8.5	-6.8	-10.6	-10.1	-3.2	-8.3	-7.2	-3.0	3.5	-3.2	0.3	3.5	1.3	-1.6
1994-96	1.3	2.8	-4.8	5.1	1.1	2.2	2.6	7.7	6.2	2.6	-6.2	3.2	9.9	-6.1	-7.0	-7.6	5.4	3.6
1996-98	-0.8	3.4	0.9	8.2	3.7	3.5	3.3	3.2	3.2	3.3	2.7	1.7	2.6	4.1	4.5	5.0	6.4	5.0
Statewide System Axle-Miles Traveled (1,000)																		
1990	173,317	41,823,995	243,229	18,299,482	156,302	150,028	262,782	164,574	487,173	407,023	254,661	329,683	651,158	121,357	164,269	696,962	9,682,796	74,068,790
1992	204,639	47,666,233	327,256	20,269,652	202,754	201,695	277,479	151,125	518,526	373,447	482,081	312,902	711,082	136,786	212,138	788,537	10,669,735	83,506,067
1994	170,197	48,450,601	615,903	22,467,553	171,882	178,226	223,901	123,458	496,612	317,903	436,298	296,727	769,847	129,074	214,888	857,584	10,969,512	86,890,167
1996	162,846	51,449,440	567,144	24,607,315	179,318	190,978	241,627	146,388	573,083	342,908	392,057	323,977	940,413	115,082	187,059	745,227	12,164,696	93,329,559
1998	160,234	55,073,162	638,779	28,329,556	117,798	195,333	242,691	168,029	623,502	373,721	489,149	355,000	992,808	95,950	162,540	572,748	13,975,090	102,566,089
Annual Percent Change in Axle-Miles Traveled on State-Maintained System																		
1990-92	9.0	7.0	17.3	5.4	14.9	17.2	2.8	-4.1	3.2	-4.1	44.7	-2.5	4.6	6.4	14.6	6.6	5.1	6.4
1992-94	-8.4	0.8	44.1	5.4	-7.6	-5.8	-9.7	-9.2	-2.1	-7.4	-4.7	-2.6	4.1	-2.8	0.6	4.4	1.4	2.0
1994-96	-2.2	3.1	-4.0	4.8	2.2	3.6	4.0	9.3	7.7	3.9	-5.1	4.6	11.1	-5.4	-6.5	-6.6	5.4	3.7
1996-98	-0.8	3.5	6.3	7.6	-17.2	1.1	0.2	7.4	4.4	4.5	12.4	4.8	2.8	-8.3	-6.6	-11.6	7.4	4.9

TABLE R18. Trend in Passenger-Car-Equivalent Miles Traveled (1000) by Registered Weight Categories

Year	Motor-cycles	Cars	Buses	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total
State-Maintained System PCE-Miles Traveled (1,000)																		
1990	38,032	18,773,176	166,353	8,083,270	128,929	124,312	217,801	136,576	402,239	337,654	211,304	278,171	538,736	92,135	124,042	541,080	6,968,979	37,162,791
1992	45,752	21,649,831	229,038	9,033,112	162,557	161,872	223,886	122,059	417,997	300,710	380,721	263,547	583,074	107,006	164,079	599,069	8,080,175	42,524,483
1994	36,292	20,497,589	426,812	8,931,863	136,985	142,445	180,067	99,783	401,144	255,122	355,009	246,496	626,446	98,901	162,531	613,402	7,947,348	41,158,234
1996	37,265	21,651,662	397,284	9,838,731	138,896	148,692	189,355	115,068	449,732	268,538	312,375	267,334	758,255	88,705	142,218	554,749	8,709,539	44,068,397
1998	36,706	23,120,627	402,893	11,461,453	92,519	153,905	192,063	133,487	494,450	293,355	391,810	280,015	790,382	73,236	122,441	436,394	9,894,488	48,370,226
Annual Percent Change in PCE-Miles Traveled on State-Maintained System																		
1990-92	10.1	7.7	18.8	5.9	13.0	15.1	1.4	-5.3	2.0	-5.5	40.1	-2.6	4.1	8.1	16.1	5.4	8.0	7.2
1992-94	-10.3	-2.7	43.2	-0.6	-7.9	-6.0	-9.8	-9.1	-2.0	-7.6	-3.4	-3.2	3.7	-3.8	-0.5	1.2	-0.8	-1.6
1994-96	1.3	2.8	-3.5	5.1	0.7	2.2	2.6	7.7	6.1	2.6	-6.0	4.2	10.5	-5.2	-6.2	-4.8	4.8	3.5
1996-98	-0.8	3.4	0.7	8.2	-16.7	1.8	0.7	8.0	5.0	4.6	12.7	2.4	2.1	-8.7	-7.0	-10.7	6.8	4.9

TABLE R19. Trend in Equivalent-Single-Axle-Load Miles Traveled (1000) by Registered Weight Categories

Year	Motor-cycles	Cars	Buses	6,000	10,000	14,000	18,000	22,000	26,000	32,000	38,000	44,000	55,000	59,999	62,000	73,280	80,000	Total
State-Maintained System ESAL-Miles Traveled (1,000)																		
1990	0	56,320	74,414	56,171	25,564	24,315	46,293	30,823	81,647	91,545	65,539	115,252	225,453	40,489	54,409	233,090	2,063,362	3,284,685
1992	0	64,949	97,837	54,199	36,937	36,438	51,538	27,832	94,669	79,593	111,853	93,158	212,652	43,117	62,814	314,131	2,981,989	4,363,706
1994	0	61,493	91,668	53,591	25,581	26,178	31,426	17,889	71,116	53,594	70,888	70,939	196,806	33,670	54,212	315,539	2,895,367	4,069,955
1996	0	64,955	79,221	59,032	25,445	26,816	32,759	20,232	79,322	53,785	63,270	74,305	208,214	26,069	40,374	260,654	3,153,983	4,268,436
1998	0	69,362	84,247	68,769	18,293	30,963	37,633	25,437	98,031	66,872	91,023	115,845	256,046	27,303	43,119	238,116	4,602,967	5,874,025
Annual Percent Change in ESAL-Miles Traveled on State-Maintained System																		
1990-92	--	7.7	15.7	-1.8	22.2	24.9	5.7	-4.9	8.0	-6.5	35.3	-9.6	-2.8	3.2	7.7	17.4	22.3	16.4
1992-94	--	-2.7	-3.2	-0.6	-15.4	-14.1	-19.5	-17.9	-12.4	-16.3	-18.3	-11.9	-3.7	-11.0	-6.8	0.2	-1.5	-3.4
1994-96	--	2.8	-6.8	5.1	-0.3	1.2	2.1	6.6	5.8	0.2	-5.4	2.4	2.9	-11.3	-12.8	-8.7	4.5	2.4
1996-98	--	3.4	3.2	8.2	-14.1	7.7	7.4	12.9	11.8	12.2	21.9	28.0	11.5	2.4	3.4	-4.3	23.0	18.8

APPENDIX F

INTERSTATE TRAVEL

TABLE F1. Travel on I 24 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions) Total	Cars	Buses	Trucks
1	4	0.000	1.402	26,700	18.23	13.66	11.13	0.05	2.49
2	4	1.402	2.212	26,700	15.03	7.89	6.69	0.02	1.19
2	4	2.212	2.958	26,700	15.03	7.27	6.16	0.02	1.09
2	4	2.958	4.328	31,200	11.60	15.60	13.77	0.03	1.81
2	4	4.328	6.387	43,600	14.57	32.77	27.76	0.24	4.77
2	4	6.387	6.895	32,400	11.60	6.01	5.30	0.01	0.70
2	4	6.895	9.772	32,400	19.25	34.02	27.36	0.11	6.55
2	4	9.772	11.117	32,400	23.65	15.91	12.08	0.07	3.76
1	4	11.117	15.100	28,900	23.65	42.01	31.90	0.18	9.94
2	4	15.100	15.785	28,900	23.65	7.23	5.49	0.03	1.71
1	4	15.785	16.160	28,900	23.65	3.96	3.00	0.02	0.94
1	4	16.160	17.320	25,000	25.33	10.59	7.84	0.07	2.68
1	4	17.320	20.359	25,000	25.33	27.73	20.53	0.18	7.02
1	4	20.359	24.941	25,000	23.00	41.81	31.87	0.32	9.62
1	4	24.941	26.558	26,400	25.33	15.58	11.54	0.10	3.95
1	4	26.558	29.352	26,300	19.10	26.82	21.69	0.00	5.12
1	4	29.352	29.543	26,300	17.82	1.83	1.51	0.00	0.33
1	4	29.543	33.659	22,400	19.10	33.65	27.22	0.00	6.43
1	4	33.659	33.880	22,400	29.77	1.81	1.26	0.00	0.54
1	4	33.880	39.505	22,400	31.06	45.99	31.54	0.16	14.28
1	4	39.505	40.480	20,400	29.77	7.26	5.08	0.02	2.16
1	4	40.480	40.720	20,400	29.77	1.79	1.25	0.00	0.53
1	4	40.720	40.770	20,400	29.77	0.37	0.26	0.00	0.11
1	4	40.770	40.850	20,400	29.77	0.60	0.42	0.00	0.18
1	4	40.850	41.603	20,400	29.77	5.61	3.93	0.01	1.67
1	4	41.603	42.752	13,500	23.09	5.66	4.33	0.02	1.31
1	4	42.752	43.550	13,500	23.09	3.93	3.01	0.01	0.91
1	4	43.550	45.133	13,500	23.09	7.80	5.97	0.03	1.80
1	4	45.133	49.457	13,500	27.09	21.31	15.29	0.24	5.77
1	4	49.457	51.351	13,500	23.09	9.33	7.14	0.04	2.15
1	4	51.351	54.842	13,500	23.09	17.20	13.17	0.07	3.97
1	4	54.842	57.389	13,200	23.09	12.27	9.39	0.05	2.83
1	4	57.389	59.404	13,200	23.09	9.71	7.43	0.04	2.24
1	4	59.404	65.349	13,200	23.09	28.64	21.92	0.11	6.61
1	4	65.349	69.830	13,200	24.38	21.59	16.09	0.23	5.26
1	4	69.830	85.298	13,300	30.80	75.09	51.35	0.61	23.13
1	4	85.298	89.211	23,700	30.09	33.85	23.35	0.32	10.19
1	4	89.211	93.373	27,900	30.80	42.38	28.98	0.35	13.05
Totals				20,437	25.02	696.53	523.99	3.75	168.79

TABLE F2. Travel on I 64 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	4	0.000	0.650	72,600	11.33	17.224	15.25	0.02	1.95
2	6	0.650	0.852	72,600	12.14	5.353	4.70	0.01	0.65
2	6	0.852	1.106	57,600	9.99	5.340	4.79	0.02	0.53
2	6	1.106	4.790	78,200	11.22	105.152	93.15	0.20	11.80
2	6	4.790	5.062	101,000	9.99	10.027	8.99	0.03	1.00
2	6	5.062	5.179	101,000	9.99	4.313	3.87	0.01	0.43
2	6	5.179	5.541	164,000	8.44	21.669	19.77	0.07	1.83
2	6	5.541	5.967	84,900	8.44	13.201	12.04	0.04	1.11
2	4	5.967	6.332	95,400	8.40	12.710	11.60	0.04	1.07
2	4	6.332	6.454	95,400	8.44	4.248	3.88	0.01	0.36
2	4	6.454	7.945	78,400	8.35	42.666	38.91	0.20	3.56
2	4	7.945	12.275	105,000	8.84	165.947	151.06	0.22	14.66
2	4	12.275	12.320	127,000	8.85	2.086	1.90	0.01	0.18
2	4	12.320	12.810	127,000	8.85	22.714	20.65	0.06	2.01
2	6	12.810	13.135	127,000	8.59	15.065	13.74	0.03	1.29
2	6	13.135	17.074	84,100	9.79	120.914	108.79	0.28	11.84
2	6	17.074	17.678	71,000	10.63	15.653	13.94	0.04	1.66
2	6	17.678	17.812	71,000	10.63	3.473	3.09	0.01	0.37
2	6	17.812	18.588	71,000	10.63	20.110	17.92	0.06	2.14
2	4	18.588	18.888	71,000	8.59	7.775	7.09	0.01	0.67
2	4	18.888	19.550	41,100	21.55	9.931	7.77	0.02	2.14
2	4	19.550	19.565	41,100	21.55	0.225	0.18	0.00	0.05
2	4	19.565	20.765	41,100	21.65	18.002	14.08	0.03	3.90
1	4	20.765	23.974	41,100	21.55	48.140	37.69	0.08	10.38
1	4	23.974	31.842	41,100	21.55	118.032	92.40	0.19	25.44
1	4	31.842	34.460	36,000	21.73	34.401	26.85	0.07	7.48
1	4	34.460	35.845	36,000	21.73	18.199	14.21	0.04	3.96
1	4	35.845	35.870	32,400	21.73	0.296	0.23	0.00	0.06
1	4	35.870	38.184	32,400	21.73	27.365	21.36	0.06	5.95
1	4	38.184	43.332	32,400	22.36	60.880	47.10	0.17	13.61
1	4	43.332	46.303	31,600	23.43	34.268	26.12	0.12	8.03
1	4	46.303	47.740	31,600	23.31	16.574	12.68	0.03	3.86
1	4	47.740	49.413	31,100	23.31	18.991	14.53	0.03	4.43
1	4	49.413	49.830	31,100	21.92	4.734	3.68	0.01	1.04
1	4	49.830	51.240	31,100	21.68	16.006	12.48	0.05	3.47
1	4	51.240	53.118	31,100	21.92	21.318	16.58	0.07	4.67
1	4	53.118	57.322	36,300	19.36	55.701	44.85	0.07	10.79
1	4	57.332	57.843	36,300	19.36	6.770	5.45	0.01	1.31
1	4	57.843	59.431	28,500	19.36	16.519	13.30	0.02	3.20
1	4	59.431	67.106	28,500	23.90	79.839	60.64	0.11	19.08
1	4	67.106	71.000	31,200	23.48	44.345	33.87	0.06	10.41
1	4	71.000	71.721	28,300	25.65	7.448	5.52	0.02	1.91
1	4	71.721	74.729	28,300	21.26	31.071	24.47	0.00	6.60
2	4	81.037	89.480	31,000	19.36	95.533	76.88	0.16	18.50
1	4	89.480	93.953	35,300	16.08	57.632	48.28	0.09	9.26
2	4	93.953	94.044	35,300	14.39	1.172	0.99	0.01	0.17

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	4	94.044	94.233	35,300	14.39	2.435	2.06	0.02	0.35
2	4	94.233	96.076	39,500	15.96	26.571	22.00	0.34	4.24
2	4	96.076	96.470	39,500	14.39	5.680	4.81	0.06	0.82
1	4	96.470	97.675	38,500	14.39	16.933	14.33	0.17	2.44
1	4	97.675	104.260	37,500	14.39	90.132	76.26	0.90	12.97
1	4	104.260	109.205	20,400	22.05	36.820	28.21	0.49	8.12
1	4	109.205	109.621	20,400	21.13	3.098	2.41	0.03	0.65
1	4	109.621	110.115	19,100	21.13	3.444	2.68	0.03	0.73
1	4	110.115	112.366	19,100	15.73	15.693	13.22	0.00	2.47
1	4	112.366	115.647	19,200	15.73	22.993	19.37	0.00	3.62
1	4	115.647	120.627	19,200	15.30	34.900	29.38	0.18	5.34
1	4	120.627	120.797	19,200	15.30	1.191	1.00	0.01	0.18
1	4	120.797	128.955	18,200	25.14	54.194	39.88	0.69	13.62
1	4	128.955	136.301	14,800	23.55	39.683	30.05	0.28	9.35
2	4	136.301	137.282	15,800	27.61	5.657	4.08	0.01	1.56
2	4	137.282	137.831	10,500	27.61	2.104	1.52	0.01	0.58
1	4	137.831	146.105	10,500	27.61	31.710	22.88	0.08	8.76
1	4	146.105	148.665	10,500	25.79	9.811	7.16	0.12	2.53
1	4	148.665	158.965	10,500	33.19	39.475	26.37	0.00	13.10
1	4	158.965	160.765	14,500	32.30	9.526	6.41	0.04	3.08
1	4	160.765	171.607	14,500	20.07	57.381	45.46	0.40	11.52
1	4	171.607	173.765	17,400	27.58	13.705	9.85	0.07	3.78
1	4	173.765	176.265	17,400	27.58	15.878	11.41	0.09	4.38
1	4	176.265	180.812	17,400	16.18	28.878	23.99	0.22	4.67
1	4	180.812	184.712	17,400	31.18	24.769	17.01	0.04	7.72
1	4	184.712	186.612	32,400	31.18	22.469	15.43	0.04	7.01
1	4	186.612	190.712	19,700	28.87	29.481	20.96	0.01	8.51
1	4	190.712	191.507	20,700	47.96	6.007	3.12	0.00	2.88
Totals				31,211	21.44	2,109.65	1,718.67	7.19	383.80

TABLE F3. Travel on I 65 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
1	4	0.000	2.018	35,600	45.69	26.22	14.22	0.12	11.98
1	4	2.018	2.048	33,900	30.38	0.37	0.26	0.00	0.11
1	4	2.048	3.410	33,900	30.38	16.85	11.65	0.07	5.12
1	4	3.410	3.910	33,900	30.38	6.19	4.28	0.03	1.88
1	4	3.910	5.979	33,900	49.84	25.60	12.82	0.04	12.76
1	4	5.979	9.211	36,700	39.96	43.29	25.92	0.08	17.30
1	4	9.211	9.711	36,700	39.96	6.70	4.01	0.01	2.68
1	4	9.711	12.711	36,700	25.95	40.19	29.68	0.07	10.43
1	4	12.711	13.102	36,700	39.96	5.24	3.14	0.01	2.09
1	4	13.102	13.711	36,700	39.96	8.16	4.88	0.01	3.26
1	4	13.711	20.539	36,700	28.82	91.46	64.63	0.45	26.36
1	4	20.539	21.582	41,900	28.82	15.95	11.27	0.08	4.60
2	4	21.582	22.069	41,900	28.82	7.45	5.26	0.04	2.15
2	4	22.069	22.349	41,900	28.82	4.28	3.03	0.02	1.23
2	4	22.349	23.049	40,000	30.41	10.22	7.07	0.04	3.11
2	4	23.049	24.911	40,000	26.97	27.19	19.51	0.11	7.33
2	4	24.911	27.987	40,000	30.41	44.91	31.06	0.18	13.66
2	4	27.987	29.015	40,900	30.41	15.35	10.62	0.06	4.67
1	4	29.015	42.890	40,900	40.18	207.13	123.52	0.80	83.22
1	4	42.890	43.307	34,900	27.07	5.31	3.85	0.02	1.44
1	4	43.307	45.935	26,300	27.07	25.23	18.30	0.10	6.83
1	4	45.935	46.747	26,300	27.07	7.79	5.65	0.03	2.11
1	4	46.747	47.538	26,300	47.11	7.59	3.96	0.05	3.58
1	4	47.538	49.835	28,200	47.11	23.64	12.34	0.15	11.14
1	4	49.835	51.631	28,200	30.81	18.49	12.26	0.12	5.70
1	4	51.631	52.427	28,200	47.11	8.19	4.28	0.05	3.86
1	4	52.427	53.956	33,600	47.11	18.75	9.79	0.12	8.83
1	4	53.956	61.132	33,600	43.68	88.01	49.30	0.20	38.44
1	4	61.132	63.700	29,300	43.02	27.46	15.58	0.07	11.81
1	4	63.700	64.151	29,300	43.02	4.82	2.74	0.01	2.07
1	4	64.151	64.450	26,200	43.02	2.86	1.62	0.01	1.23
1	4	64.450	74.622	29,900	36.58	111.01	69.91	0.48	40.61
1	4	74.622	78.661	33,900	32.62	49.98	33.45	0.19	16.30
1	4	78.661	89.383	36,100	44.66	141.28	77.76	0.45	63.10
2	4	89.383	90.153	43,300	27.88	12.17	8.72	0.04	3.39
2	6	90.153	90.793	43,300	27.31	10.11	7.31	0.04	2.76
2	6	90.793	91.130	43,300	27.31	5.33	3.85	0.02	1.45
2	6	91.130	91.341	46,800	27.31	3.60	2.61	0.01	0.98
2	6	91.341	93.299	46,800	37.39	33.45	20.86	0.11	12.51
2	6	93.299	95.317	40,200	29.25	29.61	20.85	0.10	8.66
1	6	95.317	97.478	45,000	41.81	35.49	20.61	0.04	14.84
1	6	97.478	102.308	45,000	41.81	79.33	46.06	0.09	33.17
1	6	102.308	103.308	47,800	35.54	17.45	11.19	0.05	6.20
1	6	103.308	103.951	47,800	35.52	11.22	7.20	0.03	3.98
1	6	103.951	115.496	52,200	29.05	219.97	155.70	0.37	63.89
1	6	115.496	116.666	64,200	26.31	27.42	20.12	0.09	7.21

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
1	6	116.666	118.242	70,900	26.31	40.78	29.92	0.13	10.73
1	6	118.242	118.988	70,900	26.31	19.31	14.16	0.06	5.08
2	6	118.988	121.388	70,900	23.10	62.11	47.71	0.05	14.34
2	6	121.388	123.180	82,900	25.11	54.22	40.50	0.11	13.61
2	6	123.180	123.925	82,900	22.25	22.54	17.50	0.03	5.02
2	8	123.925	125.027	127,000	21.47	51.08	40.05	0.07	10.97
2	8	125.027	125.587	127,000	21.47	25.96	20.35	0.03	5.57
2	8	125.587	126.746	127,000	21.47	53.73	42.12	0.07	11.54
2	8	126.746	126.778	136,000	10.94	1.59	1.41	0.00	0.17
2	8	126.778	127.570	136,000	10.53	39.31	35.15	0.02	4.14
2	8	127.570	128.066	136,000	10.94	24.62	21.91	0.02	2.69
2	8	128.066	128.135	136,000	12.33	3.43	2.99	0.01	0.42
2	8	128.135	128.880	156,000	12.33	42.42	37.02	0.17	5.23
2	6	128.880	129.750	156,000	12.26	49.54	43.26	0.20	6.07
2	6	129.750	130.870	139,000	12.33	56.82	49.59	0.22	7.00
2	6	130.870	131.290	130,000	12.33	19.93	17.39	0.08	2.46
2	6	131.290	131.320	130,000	12.33	1.42	1.24	0.01	0.18
2	6	131.320	132.955	130,000	11.47	77.58	68.43	0.25	8.90
2	6	132.955	135.451	116,000	12.55	105.68	92.22	0.20	13.27
2	6	135.451	135.919	125,000	13.06	21.35	18.53	0.03	2.79
2	6	135.919	136.152	125,000	13.09	10.63	9.22	0.02	1.39
2	4	136.152	136.324	125,000	13.09	7.85	6.81	0.01	1.03
2	4	136.324	136.634	125,000	13.09	14.14	12.27	0.02	1.85
2	4	136.634	137.318	119,000	13.09	29.71	25.77	0.05	3.89
Totals				49,162	33.84	2,464.08	1,728.23	7.45	728.39

TABLE F4. Travel on I 71 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	4	0.000	4.521	58,900	11.08	97.19	86.16	0.27	10.77
2	4	4.521	4.966	58,900	11.44	9.57	8.45	0.03	1.09
2	4	4.966	5.271	57,100	11.44	6.36	5.61	0.02	0.73
2	4	5.271	9.191	57,100	18.34	81.70	66.61	0.11	14.98
2	4	9.191	11.315	51,100	22.53	39.62	30.65	0.04	8.93
1	4	11.315	15.000	51,100	22.53	68.73	53.17	0.08	15.49
1	4	15.000	17.608	49,000	22.83	46.64	35.92	0.07	10.65
1	4	17.608	21.869	44,600	30.93	69.36	47.81	0.11	21.45
1	4	21.869	22.685	33,200	30.93	9.89	6.82	0.02	3.06
1	4	22.865	23.298	33,200	34.93	7.43	4.82	0.01	2.59
1	4	23.298	23.585	33,200	30.93	3.48	2.40	0.01	1.08
1	4	23.585	24.727	33,200	30.14	13.84	9.65	0.02	4.17
1	4	24.727	25.897	33,200	30.93	14.18	9.77	0.02	4.38
1	4	25.897	28.325	33,200	30.93	29.42	20.28	0.04	9.10
1	4	28.325	30.835	28,000	30.93	25.65	17.68	0.04	7.93
1	4	30.835	31.705	28,000	30.93	8.89	6.13	0.01	2.75
1	4	31.705	33.825	28,000	40.46	21.67	12.82	0.08	8.77
1	4	33.825	38.086	24,900	42.36	38.73	22.19	0.13	16.41
1	4	38.086	38.808	24,900	40.46	6.56	3.88	0.02	2.65
1	4	38.808	53.433	24,900	33.20	132.92	88.40	0.40	44.13
1	4	53.433	61.774	21,900	34.96	66.67	43.28	0.09	23.31
1	4	61.774	69.890	24,600	35.93	72.87	46.61	0.08	26.18
1	4	69.890	77.724	27,300	33.57	78.06	51.63	0.22	26.21
Totals				33,467	30.69	949.43	680.73	1.90	266.80

TABLE F5. Travel on I 75 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
1	4	0.000	0.484	27,100	25.68	4.79	3.54	0.01	1.23
1	4	0.484	3.169	27,100	33.51	26.56	17.50	0.16	8.90
1	4	3.169	10.018	27,100	33.51	67.75	44.63	0.41	22.70
2	4	10.018	10.079	27,100	33.51	0.60	0.40	0.00	0.20
2	4	10.079	10.548	27,100	33.51	4.64	3.06	0.03	1.55
2	4	10.548	11.242	34,000	33.51	8.61	5.67	0.05	2.89
2	4	11.242	11.895	34,000	33.51	8.10	5.34	0.05	2.72
2	4	11.895	12.384	34,000	33.51	6.07	4.00	0.04	2.03
1	4	12.384	24.370	31,400	33.51	137.37	90.50	0.83	46.04
2	4	24.370	27.943	23,200	25.29	30.26	22.48	0.12	7.65
2	4	27.943	28.851	23,200	25.29	7.69	5.71	0.03	1.94
1	4	28.851	29.113	36,600	25.29	3.50	2.60	0.01	0.89
1	4	29.113	31.448	36,600	25.29	31.19	23.18	0.12	7.89
1	4	31.448	33.152	36,600	26.78	22.76	16.65	0.02	6.10
1	4	33.152	38.187	36,600	26.54	67.26	49.33	0.08	17.85
2	4	38.187	40.837	39,900	29.89	38.59	26.99	0.07	11.54
1	4	40.837	45.901	28,800	100.00	53.23	0.00	0.00	53.23
1	4	45.901	49.132	28,800	59.77	33.96	13.63	0.03	20.30
1	4	49.132	50.767	29,400	36.69	17.55	11.06	0.04	6.44
1	4	50.767	56.317	29,400	38.67	59.56	36.35	0.17	23.03
1	4	56.317	58.954	29,400	34.55	28.30	18.43	0.09	9.78
1	4	58.954	62.008	31,600	36.69	35.22	22.21	0.09	12.92
1	4	62.008	65.210	39,000	27.13	45.58	33.10	0.11	12.37
1	4	65.210	71.818	39,000	30.39	94.06	65.22	0.26	28.59
1	4	71.818	73.408	39,000	14.86	22.63	19.18	0.09	3.36
1	4	73.408	74.563	39,000	14.86	16.44	13.93	0.07	2.44
2	4	74.563	75.516	39,000	14.86	13.57	11.50	0.06	2.02
2	4	75.516	78.800	36,200	14.86	43.39	36.77	0.18	6.45
1	4	78.800	86.135	53,600	21.91	143.50	111.81	0.25	31.44
2	4	86.135	86.806	54,700	23.20	13.40	10.27	0.02	3.11
2	4	86.806	87.398	54,700	21.91	11.82	9.21	0.02	2.59
2	4	87.398	89.802	49,800	20.41	43.70	34.63	0.15	8.92
2	4	89.802	90.844	48,900	16.81	18.60	15.45	0.03	3.13
1	4	90.844	94.730	48,900	20.41	69.36	54.97	0.23	14.15
1	4	94.730	97.543	50,000	20.41	51.34	40.69	0.17	10.48
2	4	97.543	97.866	50,700	20.41	5.98	4.74	0.02	1.22
2	4	97.866	98.516	50,700	20.41	12.03	9.53	0.04	2.45
2	4	98.516	100.344	54,800	19.94	36.56	29.07	0.20	7.29
2	4	100.344	103.890	54,800	17.52	70.93	58.42	0.08	12.43
2	4	103.890	106.287	40,500	34.90	35.43	23.01	0.05	12.37
2	6	106.287	107.438	40,500	24.58	17.01	12.80	0.03	4.18
2	6	107.438	108.853	40,500	24.58	20.92	15.74	0.04	5.14
2	6	108.853	109.705	54,100	20.65	16.82	13.32	0.03	3.47
2	6	109.705	110.247	55,800	20.65	11.04	8.74	0.02	2.28
2	6	110.247	111.227	55,800	20.65	19.96	15.80	0.04	4.12
2	6	111.227	112.826	70,400	20.65	41.09	32.52	0.08	8.49

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	6	112.826	115.226	65,900	20.65	57.73	45.69	0.12	11.92
2	6	115.226	116.022	76,400	22.64	22.20	17.14	0.04	5.02
2	6	116.022	117.452	76,400	22.64	39.88	30.79	0.06	9.03
2	4	117.452	117.665	76,400	22.64	5.94	4.59	0.01	1.34
2	4	117.665	117.935	76,400	22.64	7.53	5.81	0.01	1.70
2	6	117.935	120.792	49,900	22.64	52.04	40.17	0.08	11.78
1	6	120.792	124.346	52,500	27.62	68.10	49.24	0.05	18.81
2	6	124.346	125.797	39,100	25.22	20.71	15.47	0.02	5.22
1	6	125.797	129.048	39,400	25.22	46.75	34.93	0.03	11.79
2	6	129.048	130.288	49,500	29.48	22.40	15.74	0.06	6.60
1	6	130.288	132.240	49,500	28.50	35.27	25.15	0.06	10.05
1	6	132.240	134.040	49,500	29.48	32.52	22.84	0.09	9.59
1	6	134.040	135.160	49,500	29.48	20.24	14.21	0.06	5.97
1	6	135.160	136.140	49,500	29.48	17.71	12.44	0.05	5.22
1	6	136.140	136.366	49,500	29.48	4.08	2.87	0.01	1.20
1	6	136.366	136.790	47,800	29.48	7.40	5.20	0.02	2.18
1	6	136.790	137.070	47,800	29.48	4.89	3.43	0.01	1.44
1	4	137.070	143.070	47,800	29.48	104.68	73.53	0.29	30.86
1	4	143.070	143.239	47,800	29.48	2.95	2.07	0.01	0.87
1	4	143.239	144.443	47,800	29.48	21.01	14.76	0.06	6.19
1	4	144.443	166.263	40,900	22.13	325.74	251.25	2.41	72.08
1	4	166.263	169.439	45,100	22.91	52.28	39.98	0.32	11.98
1	4	169.439	172.544	45,100	20.17	51.11	40.49	0.31	10.31
1	4	172.544	172.806	60,400	21.32	5.78	4.53	0.01	1.23
1	4	172.806	173.322	87,500	18.29	16.48	13.29	0.18	3.01
1	6	173.322	173.509	87,500	18.29	5.97	4.81	0.06	1.09
1	6	173.509	174.426	87,500	26.69	29.29	21.43	0.04	7.82
1	6	174.426	174.590	87,500	26.69	5.24	3.83	0.01	1.40
1	6	174.590	174.640	87,500	26.69	1.60	1.17	0.00	0.43
1	8	174.640	175.572	87,500	26.69	29.77	21.78	0.04	7.95
2	8	175.572	176.740	85,900	26.69	36.62	26.80	0.05	9.77
2	8	176.740	178.541	85,900	22.42	56.47	43.07	0.74	12.66
2	8	178.541	183.312	139,000	20.99	242.06	190.92	0.32	50.81
2	6	183.312	184.595	157,000	17.16	73.52	60.84	0.07	12.61
2	6	184.595	184.708	142,000	17.16	5.86	4.85	0.01	1.00
2	6	184.708	184.857	142,000	10.65	7.72	6.88	0.02	0.82
2	6	184.857	185.179	156,000	10.65	18.33	16.34	0.04	1.95
2	6	185.179	186.958	156,000	10.64	101.30	90.28	0.24	10.78
2	6	186.958	187.461	140,000	10.65	25.70	22.91	0.06	2.74
2	6	187.461	187.502	140,000	10.65	2.10	1.87	0.00	0.22
2	6	187.502	188.071	127,000	10.29	26.38	23.61	0.05	2.71
2	6	188.071	188.319	127,000	10.29	11.50	10.29	0.02	1.18
2	6	188.319	190.424	127,000	10.29	97.58	87.35	0.19	10.04
2	6	190.424	190.508	135,000	10.29	4.14	3.71	0.01	0.43
2	6	190.508	191.222	120,000	9.15	31.27	28.37	0.04	2.86
2	6	191.222	191.315	132,000	17.66	4.48	3.68	0.01	0.79
2	6	191.315	191.408	132,000	9.15	4.48	4.06	0.01	0.41
2	6	191.408	191.489	132,000	9.15	3.90	3.54	0.01	0.36

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	6	191.489	191.777	132,000	9.15	13.88	12.59	0.02	1.27
Totals				49,333	27.97	3,453.27	2,584.27	11.17	857.83

TABLE F6. Travel on I 264 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	6	0.000	0.388	36,700	8.61	5.20	4.69	0.06	0.45
2	4	0.388	1.736	36,700	10.33	18.06	16.13	0.07	1.86
2	6	1.736	5.219	60,600	9.97	77.04	69.36	0.00	7.68
2	6	5.219	7.098	54,500	8.66	37.38	34.07	0.07	3.24
2	6	7.098	7.461	54,500	8.66	7.22	6.58	0.01	0.63
2	6	7.461	7.521	104,000	6.49	2.28	2.12	0.01	0.15
2	6	7.521	8.168	104,000	6.49	24.56	22.90	0.07	1.59
2	6	8.168	9.233	104,000	3.94	40.43	38.29	0.55	1.59
2	6	9.233	11.280	140,000	6.37	104.60	97.74	0.20	6.67
2	6	11.280	12.280	194,000	6.25	70.81	66.26	0.13	4.43
2	6	12.280	12.660	182,000	4.26	25.24	24.09	0.08	1.07
2	8	12.660	13.278	180,000	5.02	40.60	38.43	0.14	2.04
2	8	13.278	15.815	174,000	6.96	161.12	149.62	0.28	11.22
2	8	15.815	17.093	161,000	2.46	75.10	73.10	0.16	1.85
2	8	17.093	19.150	156,000	7.18	117.13	108.58	0.14	8.41
2	4	19.150	19.386	110,000	7.18	9.48	8.78	0.01	0.68
2	4	19.386	19.640	110,000	7.18	10.20	9.45	0.01	0.73
2	4	19.640	19.913	110,000	7.18	10.96	10.16	0.01	0.79
2	4	19.913	20.102	67,100	7.18	4.63	4.29	0.01	0.33
2	4	20.102	20.630	67,100	5.81	12.93	12.18	0.00	0.75
2	4	20.630	22.430	67,100	8.25	44.08	40.40	0.05	3.63
2	4	22.430	22.600	50,500	5.81	3.13	2.95	0.00	0.18
2	4	22.600	22.927	50,500	5.81	6.03	5.68	0.00	0.35
Totals				108,529	7.30	908.21	845.83	2.05	60.33

TABLE F7. Travel on I 265 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	4	10.250	11.196	69,200	6.83	23.89	22.21	0.06	1.63
2	4	11.196	11.729	69,200	7.50	13.46	12.40	0.05	1.01
2	4	11.729	13.355	61,800	6.68	36.68	34.03	0.20	2.45
2	4	13.355	16.134	46,700	8.40	47.37	43.20	0.18	3.98
2	4	16.134	17.295	46,700	10.22	19.79	17.72	0.04	2.02
2	4	17.295	22.995	43,100	11.32	89.67	79.31	0.21	10.15
2	4	22.995	23.279	43,600	9.93	4.52	4.05	0.02	0.45
2	4	23.279	25.159	41,800	12.76	28.68	24.94	0.09	3.66
2	4	25.159	25.599	41,800	12.47	6.71	5.86	0.02	0.84
2	4	25.599	25.869	52,200	12.47	5.74	5.00	0.02	0.71
2	4	25.869	26.667	58,200	12.47	16.95	14.79	0.05	2.11
2	4	26.667	27.495	42,400	12.47	12.81	11.18	0.04	1.60
2	4	27.495	29.807	42,400	12.47	35.78	31.22	0.10	4.46
2	4	29.807	30.420	42,400	14.50	9.49	8.10	0.01	1.38
2	4	30.420	32.227	29,500	14.50	19.46	16.61	0.03	2.82
2	4	32.227	34.338	54,200	14.30	41.76	35.79	0.00	5.97
2	4	34.338	34.727	48,500	14.50	6.89	5.88	0.01	1.00
Totals				46,972	11.31	419.65	372.28	1.13	46.24

TABLE F8. Travel on I 275 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	6	0.000	0.670	80,900	8.37	19.78	18.07	0.05	1.66
2	6	0.670	0.711	80,900	8.37	1.21	1.11	0.00	0.10
2	6	0.711	1.582	80,900	8.37	25.72	23.50	0.07	2.15
2	6	1.582	3.968	66,100	8.82	57.57	52.33	0.16	5.08
2	6	3.968	7.037	38,600	8.11	43.24	39.62	0.11	3.51
2	4	7.037	8.415	29,200	8.11	14.69	13.46	0.04	1.19
1	4	8.415	11.431	29,200	9.94	32.14	28.85	0.10	3.20
1	4	11.431	12.501	30,000	9.94	11.72	10.52	0.04	1.17
1	4	12.501	12.992	30,000	9.04	5.38	4.87	0.02	0.49
1	4	12.992	13.447	30,000	9.94	4.98	4.47	0.02	0.50
1	4	13.447	13.858	30,000	9.94	4.50	4.04	0.01	0.45
2	6	73.061	74.985	59,700	3.60	41.92	40.07	0.35	1.51
2	6	74.985	77.023	71,300	4.17	53.04	50.55	0.28	2.21
2	6	77.023	77.579	96,200	4.17	19.52	18.61	0.10	0.81
2	6	77.579	81.538	96,200	0.13	139.01	138.82	0.00	0.19
2	6	81.538	81.817	101,000	1.49	10.29	10.12	0.01	0.15
2	6	81.817	82.027	101,000	1.49	7.74	7.62	0.01	0.12
2	6	82.027	83.393	107,000	5.54	53.35	50.27	0.12	2.96
2	6	83.393	83.780	107,000	5.54	15.11	14.24	0.03	0.84
Totals				62,528	6.22	560.91	531.14	1.51	28.26

TABLE F9. Travel on I 471 in Kentucky

Rural/ Urban	No. Lanes	Begin Milept.	End Milept.	1998 AADT	1998 % Trucks	1998 VMT (millions)			
						Total	Cars	Buses	Trucks
2	4	0.000	0.128	89,100	3.53	4.16	4.01	0.01	0.15
2	4	0.128	0.729	89,100	3.53	19.55	18.83	0.03	0.69
2	6	0.729	1.745	89,100	6.15	33.04	30.95	0.06	2.03
2	6	1.745	4.643	103,000	5.83	108.95	102.43	0.17	6.35
2	6	4.643	5.016	69,300	6.53	9.43	8.80	0.02	0.62
Totals				95,658	5.61	175.13	165.02	0.28	9.83

TABLE F10. 1998 Travel on Kentucky Interstate Highways

Highway Number	1998 AADT	1998 % Trucks	1998 VMT (millions)			
			Total	Cars	Buses	Trucks
I 24	20,437	25.02	696.53	523.99	3.75	168.79
I 64	31,211	21.44	2,109.65	1,718.67	7.19	383.80
I 65	49,162	33.84	2,464.08	1,728.23	7.45	728.39
I 71	33,467	30.70	949.43	680.73	1.90	266.80
I 75	49,333	27.97	3,453.27	2,584.27	11.17	857.83
I 264	108,529	7.30	908.21	845.83	2.05	60.33
I 265	46,972	11.31	419.65	372.28	1.13	46.24
I 275	62,528	6.22	560.91	531.14	1.51	28.26
I 471	95,658	5.61	175.14	165.02	0.28	9.83
Total	42,178	25.35	11,736.87	9,150.16	36.43	2,550.27

APPENDIX G

LITERATURE REVIEW REGARDING THE PRICE ELASTICITY OF MOTOR FUELS

Eric Thompson
Associate Director
Center for Business and Economic Research
Carol Martin Gatton College of Business and Economics

January 2000

Introduction

The analysis presented earlier in this highway cost allocation report focuses to a substantial degree on the measurement of tax revenue growth over time. Conclusions about tax equity often reflect not just current year equity values for particular vehicle classes but trends in equity during the 1990s. Current and future highway cost allocation studies will be influenced by the path that tax revenue growth takes over time.

This raises the question of what factors will influence the future growth of transportation tax revenues. A key factor naturally is economic stability. Transportation tax revenues will grow in a much steadier manner over time if the economy grows at a steady rate, avoiding the recessions that can lead to stagnation or even a dip in revenues. Another important factor is the price of motor fuel. Tax revenues can potentially be effected if the price of fuel fluctuates, as it has in the past, and consumers respond to these fluctuations by changing their travel behavior. In particular, if motor fuel consumption varies strongly with motor fuel prices, substantial changes in motor fuel prices can greatly alter the amount of fuel consumed, and the fuel taxes that are assessed on a per gallon basis. On the other hand, transportation revenues will grow in a steadier manner if fuel prices are stable, or if consumers do not vary consumption much when motor fuel prices change.

The response of motor fuel consumption to changes in its price is also an important issue when simulating transportation tax revenue changes under alternative fuel tax strategies. Particularly, it is useful when assessing how much fuel tax increases could be expected to raise fuel tax revenue, or how much fuel tax decreases would lower revenue. Increases in fuel taxes will be more effective in raising revenue if drivers only make smaller changes in fuel consumed in response to the higher total price of a gallon of gasoline or diesel fuel. But, revenue would grow less if motorists respond by purchasing substantially less fuel.

This reaction of consumers to a change in the price of fuel is the focus of the discussion that follows. The text discusses the findings of economic studies examining how consumers react to motor fuel price changes both in the short-term and in the long-term.

The Elasticity Concept

Economists have conducted a substantial body of research examining how travel behavior, and the consumption of motor fuel, reacts to changes in the price of motor fuels like gasoline. In these efforts, numerous economic studies have attempted to estimate a measure known as the price elasticity of gasoline consumption. This elasticity concept indicates how much gasoline consumption will change for each 1% change in the price of gasoline. Thus, the elasticity indicates the percentage change in gasoline consumption for a given percentage change in the price of gasoline. Naturally, such an elasticity concept would be quite useful for assessing how much the consumption of gasoline might fall for a given increase in price.

A brief example shows how the price elasticity measure works. Take the example of an estimated price elasticity of gasoline consumption of –.5. This elasticity indicates that the consumption of gasoline falls by .5% for each 1% increase in the price of gasoline. So, given this price elasticity estimate, if the price of gasoline is expected to rise by 2%, then the consumption of gasoline would be expected to fall by 1%.

In addition to estimating the price elasticity of gasoline consumption, economists also have sometimes estimated the elastic relationship between the price of gasoline and the quantity of vehicle miles traveled (VMT). In parallel with the price elasticity of consumption concept, this elasticity indicates by what percent VMT will change in reaction to a 1% change in the price of gasoline.

The Literature Review

Over the last few decades, economists have conducted scores of studies regarding the impact of gasoline price changes on the fuel consumption behavior of consumers. These studies provide a wealth of information regarding the price elasticity of gasoline consumption under a number of different conditions, and estimated using a variety of estimation methods. The following document results from a review of a number of these studies produced over the last few decades, including other "survey" studies that reviewed much of the literature. The goal is to summarize the main issues influencing the price elasticity of gasoline consumption and to report any consensus estimates that emerge from the reviewed research.

Several important factors emerged while reviewing previous research. The first of these was the distinction between the short-term and long-term price elasticity of gasoline consumption. The second was the difference between the response of gasoline consumption to gasoline price changes versus the response of VMT to gasoline price changes. The importance of each of these issues is examined below. Afterwards, the literature pertaining to each issue is reviewed. In the last section, some conclusions are reached regarding the price elasticity of gasoline consumption.

Another factor that emerges is the distinct methodological groupings between studies. A large number of studies tended to focus on aggregate national data on consumption and price changes. These studies usually examined time-series data, that is, data over a large number of years, quarters or months. These studies tended to focus on estimates of the response of gasoline consumption to price changes, rather than the response of VMT. These studies typically provided estimates of both short-term and long-term elasticities for comparison, which was useful for examining how elasticities grow over time based on data from a single study. Another grouping of studies relied on data gathered from household surveys. These studies tended to have data for only a single period or short periods of time. These studies tended to focus on estimates of the response of VMT to price changes, given the relative ease for survey respondents to keep track of miles driven rather than fuel consumption. Due to the detailed household data available in these studies, the studies were also able to provide detailed information about how households adjust their driving behavior.

One other point about the studies discussed below is that in general these studies focused on responses to changes to the delivered price of gasoline at the pump, which is the sum of the fuel price and fuel taxes. Thus these studies typically did not distinguish between the consumer reactions to fuel price increases versus fuel tax increases. Although, it is not clear that such a distinction would exist, apart from the point made below.

As noted above, the studies examined in the literature review tended to examine national or household level responses. Thus, the elasticities estimated in these studies would not reflect any sort of "border effect" that can lead to additional consumer responses at the state level. In particular, when the delivered fuel price increases in a state but not its bordering states, as can occur with a state fuel tax increase, there may be an additional response by gasoline consumers to purchase fuel in an adjacent state, where possible. This provides a way of avoiding the tax increase, and it also tends to magnify the drop in state gasoline sales in response to a price increase. The elasticity estimates in the literature that is examined below do not reflect any such border effect. Any border effect would need to be added to the elasticities discussed below.

Issues Related to the Price Elasticity of Gasoline Consumption

One important distinction in the elasticity estimates is the difference between short-term and long-term price elasticity. Short-term refers to the more immediate response of consumers. Conceptually, it is their response when they can vary their gasoline use given their existing stock of vehicles, but there has not been enough time to acquire new types of vehicles, presumably more fuel-efficient vehicles in the case of a fuel price hike. How can consumers vary their fuel consumption in the short-term? One way to vary fuel consumption in the short-term is to vary the number of trips taken, presumably by expanding or cutting back on some unnecessary trips. One implication of this is that fuel consumption during leisure trips may be altered more in the short-term than fuel consumption during work trips or commuting. Another way to alter fuel consumption is to change driving habits. For example, in response to a higher gasoline price, consumers could drive in a slower, more fuel-efficient way, or, in the case of a two or three car household, utilize the vehicles with higher mileage per gallon more often.

Over the long term, consumers have an opportunity to change the types and number of vehicles they own. This can allow consumers the opportunity to greatly enhance their response to gasoline price changes. Again take the example of a gasoline price increase. A worker might need to drive to work regardless of the price of gasoline (if no public transportation is available). In the short-term, with less choice in the kind of vehicle to drive, this worker in response to a gasoline price increase could only cut back on fuel consumption during the commute in a limited way. But, in the long-term, the worker may choose a more fuel-efficient car the next time he or she is planning to purchase a vehicle. This could allow the worker a chance to significantly reduce gasoline consumption during the commute in response to a gasoline price increase.

There is no set number of years required before reaching the long-term. Generally speaking, consumers as a group can increasingly vary their consumption behavior over time in response to a price hike. Over time consumers can eventually reach their full long-term price response, where estimated long-term elasticities apply. One study found that it would take 2 to 4 years for consumers to reach 50% of their long-term response to a change in the price of gasoline

(Dahl, 1986). Another study indicated that it would take consumers from 5 to 10 years to reach 90% of their long-term reaction (Drollas, 1984).

This difference between the short-term and long-term consumer reaction to fuel price changes has important distinctions for the effect of price changes on VMT versus fuel consumption. Take the case of a gasoline price increase. In the short-term, consumers are best able to reduce gasoline consumed by driving less, in the case of discretionary trips, or using public transportation on necessary trips such as commuting to work. Another option in multi-vehicle households is to utilize more fuel-efficient car(s) more often. But, generally speaking, in the short-term the best way to reduce gasoline consumption is to reduce the miles driven. The miles driven can fall nearly as much as the amount of gasoline consumed, in percentage terms. Thus the short-term price elasticity of fuel consumption is similar to the VMT elasticity. However, in the long-term, consumers have time to purchase more fuel-efficient cars. This allows fuel consumption to drop much more rapidly than miles driven. In the long-term, the price elasticity of fuel consumption can be much greater than the VMT elasticity.

Short-Term Versus Long-Term Elasticity

The research examined found a substantial growth in the price elasticity of gasoline consumption between the short-term and the long-term. In particular, a number of time-series studies that focused on changes in aggregate consumption over time found a substantial increase in elasticities in the long-term. Dahl (1979), Drollas (1984), Khazzoom (1991) and Hsing (1990) found that the price elasticity for gasoline consumption rose from a range of -.2 to -.45 in the short-term to a range of -.6 to -.8 in the long-term. All of these findings suggest that the consumer reaction to a change in prices can double or more over the long-term compared to the short-term reaction.

Some studies only looked at either the long-term elasticity, or the short-term elasticity. Estimates in these studies tended to be fairly consistent with Dahl, Drollas, Khazzoom, and Hsing, although the estimates fell within a wider range. Espy (1996) surveyed estimates of the long-term elasticity of gasoline consumption in previous studies and found a mean estimate of the long-term elasticity of -.53, an estimate which is slightly below that of the four authors (Dahl, Drollas, Khazzoom, and Hsing). Other surveys of the literature by Dahl and Sterner (1991) and Dahl (1986) found mean long-term elasticity estimates from -.8 to –1.0, somewhat above that of the four authors. These same survey articles found mean short-term elasticity estimates from -.22 to -.31 using annual data, but of only -.13 to -.2 when using monthly or quarterly data. Hsing (1994) examined the short-term elasticity using aggregate monthly data from 1978 to 1991. Hsing's work indicates that the short-term (delivered) price elasticity of fuel consumption is roughly -.19. Houthakker, Verleger, and Sheehan (1974) estimated a lower short-term elasticity of -.08 using quarterly data. It is not suprising that these short-term elasticity estimates using quarterly or monthly data are lower than those made with annual data (as in Dahl, Drollas, Khazzoom, and Hsing), since the short-term in these models means a month or quarter rather than a year.

One study indicated that there may have been some changes in regard to the long-term price elasticity of gasoline consumption over time. Hsing (1990) found that the long-term price elasticity tended to fluctuate over time, and was higher during the volatile period for fuel prices during the 1970s, and lower during the more stable periods of the 1960s and 1980s.

Elasticity for Fuel Consumption Versus Elasticity for Vehicle Miles Traveled

The proceeding section examined the price elasticity for fuel consumption, that is, the change in fuel usage by consumers in response to changes in the price of motor fuels. This section examines the related issue of the price elasticity of travel, or the change in VMT in response to fuel price changes. The finding in this section is that the elasticities for VMT are similar to the short-term elasticity for fuel consumption, which is consistent with the discussions earlier in this report.

The studies that estimated the price elasticity for VMT typically were based on survey data from households, rather than time series studies using aggregate national data. This was the case in part due to the relative ease during household surveys in taking occasional odometer readings (to estimate miles driven) versus tracking all fuel purchases. These studies estimated price elasticities for VMT that ranged between -.1 to -.4 (Hensher, 1985; Greene and Hu, 1985; Train & Lohrer, 1982; Berkowitz, Gallini, Miller, and Wolfe, 1990; Khazzoom, 1991; Mannering, 1983). Dahl (1979), in a time series study, estimated a price elasticity for VMT of -.29. These elasticity estimates included both long-term and short-term estimates. This is consistent with the observation earlier that the VMT elasticity may not rise over time, since VMT responses would not benefit from household switching to more fuel-efficient vehicles. In fact, Khazzoom (1991) argues that VMT elasticity actually may fall in the long-term (from -.24 to -.1) compared to the short-term. This occurs because as households switch to more fuel-efficient vehicles, the cost of traveling per mile falls, creating an incentive to increase VMT.

Due to the detailed data available from the household surveys, these studies provided some interesting insights into consumer reactions to fuel price changes. Greene and Hu (1985) found that the elasticity of VMT in response to price changes was much higher for existing large cars (-.28) in a household than for small cars (-.13), indicating how households tend to switch towards driving vehicles with better fuel economy when fuel prices are higher. Mannering (1983) found that the price elasticity of VMT fell as income rose. Compared to an overall average of -.11, the price elasticity of VMT was -.16 for low income households but fell to -.04 for high income households. Finally Gomez-Ibanez and Fouth (1980) considered all the marginal costs of travel, including maintenance and time costs as well as fuel costs, and found that the elasticity of the number of trips (driving versus taking public transit) with respect to total travel costs was in the range of -.32 to -.36, and perhaps somewhat higher.

Conclusions

The general conclusions from this review of economic literature is that the consumer response to changes in fuel price increases with time, and is greater for fuel consumption in gallons than in miles traveled. The consumer response can grow over time because households can choose to change the types of vehicles owned in response to rising or falling prices. The change in fuel consumed in response to a price change exceeds the change in miles driven because drivers can also take steps to change their fuel efficiency when driving, as well as their miles driven.

Based on the literature reviewed, it is estimated that the price elasticity of fuel consumption (the percent change in fuel consumption for each percent change in price) is from -.1 to -.45 in the short-term, but rises over time. The long-term price elasticity can be twice as high, ranging from -.5 to –1.0 in the studies that were examined. However, it may take a long time to achieve this long-term price response, perhaps from 5 to 10 years. Thus, the short-term price elasticity may be more appropriate for many studies and simulations of consumer response, while the long-term elasticity may be more appropriate for long-term planning. As for application to fuel tax changes, it should be noted that the studies reviewed tended to use national or household data, and not state data. Thus, the elasticity estimates above do not include any sort of "border effect," or additional loss in fuel sales when a state faces rising (or falling) fuel prices, but neighboring states do not. This can occur any time that a state raises or lowers its fuel tax. The border effect occurs as some consumers buy fuel across state lines in order to avoid the increased tax. This border effect can lead to sales reactions in excess of those implied by the elasticity estimates listed above. Therefore, the elasticity estimates presented above may be somewhat too low for use in simulating tax revenue responses, although the importance of this issue depends on the size of the border effect.

References

Archibald, Robert and Robert Gillingham, 1981. "A decomposition of the price and income elasticities of the consumer demand for gasoline," *Southern Economic Journal*. 47: 1021-1031.

Berkowitz, Micheal K, Nancy T. Gallini, eric J. Miller, and Robert A. Wolfe, 1990. "Disaggregate analysis of the demand for gasoline," *Canadian Journal of Economics*. 2(May): 253-275.

Dahl, Carol A., 1979. "Consumer Adjustment to a Gasoline Tax," *The Review of Economics and Statistics*. August: 427-431.

Dahl, Carol A., 1986. "Gasoline Demand Survey," *The Energy Journal*. 7(1): 67-82.

Dahl, Carol A. and Thomas Sterner, 1991. "Analysing gasoline demand elasticities: a survey," *Energy Economics*. July: 203-210.

DeJong, John G. J., 1984. "Estimation of Gasoline Price Elasticities for New Jersey," *Transportation Research Record.* 812: 64-67.

Drollas, Lennidas P., 1984. "The demand for gasoline," *Energy Economics*. Jan: 71-82.

Espy, Molly, 1996. "Explaining the Variation in Elasticity Estimates of Gasoline Demand in the United States: A Meta-Analysis," *The Energy Journal*. 17(3): 49-60.

Goel, Rajeev K., 1994. "Quasi-experimental taxation elasticities of US gasoline demand," *Energy Economics*. 16(2): 133-137.

Gomez-Ibanez, Jose A. and Gary R. Fauth, 1980. "Using Demand Elasticities from Disaggregate Mode Choice Models," *Transportation*. 9: 105-124.

Greene, David L. and Patricia S. Hu, 1985. "The Influence of the Price of Gasoline on Vehicle Use in Multivehicle Households," *Transportation Research Record*. 988: 19-24.

Hsing, Yu, 1990. "On the variable elasticity of the demand for gasoline," *Energy Economics*. April: 132-136.

Hsing, Yu, 1994. "Estimating the impact of the higher fuel tax on U.S. gasoline consumption and policy implications," *Applied Economics Letters.* 1: 4-7.

Hensher, 1985. "An Econometric Model of Vehicle Use In The Household Sector," *Transportation Research B.* 19B(4): 303-313.

Houthakker, H.S., Philip K. Verleger, Jr., and Dennis P. Sheehan, 1974. "Dynamic Demand Analyses for Gasoline and Residential Electricity," *American Journal of Agricultural Economics*. May: 12-418.

Khazzoom, J. Daniel, 1991. "The Impact of A Gasoline Tax on Auto Exhaust Emissions," Journal of Policy analysis and Management. 10(3): 434-454.

Mannering, Fred L., 1983. "An Econometric Analysis of Vehicle Use in Multivehicle Households," *Transportation Research*. 17A(3): 183-189.

Train, Kenneth and Michael Lohrer, 1982. *Vehicle Ownership and Usage: An Intergrated System of Disaggregate Demand Models.* Working paper prepared for the California Energy Commission (June).