Research Report
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IMPACTS OF THE EXTENDED-WEIGHT COAL HAUL ROAD SYSTEM (INTERIM REPORT)

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16. Abstract

The Extended-Weight Coal Haul Road System, created by Kentucky's Legislature in 1986, consists of all roads which carry over 50,000 tons of coal in a calendar year. Trucks hauling coal on this system are authorized to exceed nonnal weight limits through the payment of an annual decal fee. A research study was initiated in July of 1992 to analyze the impacts of the extended-weight system. This interim report, prepared after one year of a three-year study, describes the analyses performed thus far and presents preliminary findings, recommendations, and a discussion of future work.

Analyses in this report are based on: historical data on coal production and transportation; data from coal decal applications; interviews of legislators, transportation officials, coal company representatives, and coal trucking representatives; newspaper articles; vehicle classification data; a pavement cost analysis; and accident data.

Preliminary conclusions include: 1) The extended-weight system has apparently been somewhat successful in accomplishing its primary objectives: to enhance the competitiveness and economic viability of Kentucky's coal industry and to eliminate the perceived need for coal haulers to violate the law in order to be competitive; 2) Overall accident rates are no higher on the extended-weight system than on other comparable routes, but the fatal accident rate is significantly higher on the extended-weight system; 3) The coal-decal fee structure results in a net annual loss in Road Fund revenue of approximately $2 million; 4) Forty percent of the revenue from decal sales is allocated to the counties, although less than ten percent of the extended-weight system is county-maintained; 5) The heavier weights of coal-decal trucks add approximately $9 million annually to pavement overlay costs and increase other highway costs to an (as yet) undetermined extent; 6) Road users throughout the state are subsidizing the movement of Kentucky coal by underwriting the increased costs of maintaining and improving the infrastructure.

The following preliminary recommendations were developed: 1) Route geometry and cross section should be considered when deciding which routes will be included in the extended-weight system; 2) The selection of routes for the extended-weight system should include consideration of system connectivity; 3) Countermeasures should be evaluated and implemented to alleviate the braking problem for heavy trucks approaching signalized intersections; 4) A revision to the allocation of Energy Recovery Road Fund dollars should be considered to more accurately reflect the composition of the extended-weight system.

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METRIC CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO METRIC UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in.	inches	25.40000	millimetres	mm
ft	feet	0.30480	metres	m
yd	yards	0.91440	metres	m
mi	miles	1.60934	kilometres	km
		AREA		
$in.^2$	square inches	645.16000	millimetres squared	mm^2
ft^2	square feet	0.09290	metres squared	m^2
yd^2	square yards	0.83613	metres squared	m^2
ac	acres	0.40469	hectares	ha
mi^2	square miles	2.58999	kilometres squared	km^2
		FORCE		
kip	pound-force	4.44822	kilonewton	kN
		VOLUME		
fl oz	fluid ounces	29.57353	millilitres	ml
gal.	gallons	3.78541	litres	l
ft^3	cubic feet	0.02832	metres cubed	m^3
yd^3	cubic yards	0.76455	metres cubed	m^3
		PRESSURE		
psi	pound-force per square inch	6.89476	kilopascal	kPa
		MASS		
oz	ounces	28.34952	grams	g
lb	pounds	0.45359	kilograms	kg
T	short tons (2000 lb)	0.90718	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	(°F-32)/1.8	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM METRIC UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimetres	0.03937	inches	in.
m	metres	3.28084	feet	ft
m	metres	1.09361	yards	yd
km	kilometres	0.62137	miles	mi
		AREA		
mm^2	millimetres squared	0.00155	square inches	$in.^2$
m^2	metres squared	10.76392	square feet	ft^2
m^2	metres squared	1.19599	square yards	yd^2
ha	hectares	2.47103	acres	ac
km^2	kilometres squared	0.38610	square miles	mi^2
		FORCE		
kN	kilonewton	0.22481	pound-force	kip
		VOLUME		
ml	millilitres	0.03381	fluid ounces	fl oz
l	litres	0.26417	gallons	gal.
m^3	metres cubed	35.31448	cubic feet	ft^3
m^3	metres cubed	1.30795	cubic yards	yd^3
		PRESSURE		
kPa	kilopascal	0.14504	pound-force per square inch	psi
		MASS		
g	grams	0.03527	ounces	oz
kg	kilograms	2.20462	pounds	lb
Mg	megagrams	1.10231	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	(1.8C) + 32	Fahrenheit temperature	°F

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EXECUTIVE SUMMARY

INTRODUCTION

The Extended-Weight Coal Haul Road System was created (effective April 1, 1987) by the Kentucky State Legislature during the 1986 General Assembly. This system was defined to include those highways which had carried over 50,000 tons of coal during the previous year. Trucks hauling coal on the extended-weight system were authorized to exceed normal weight limits through the payment of an annual decal fee. The weight limits and the corresponding decal fees were established as follows:

Vehicle Type	Weight Limit	Decal Fee
Single-unit, 3-axle	90,000 lbs	$160
Single-unit, 4-axle	100,000 lbs	$260
Tractor-semitrailer, 5 or more axles	120,000 lbs	$360

A research study was initiated in July of 1992 to analyze the impacts of the Extended-Weight Coal Haul Road System. This interim report, prepared after one year of a three-year study, describes the analyses performed thus far, presents preliminary findings and recommendations, and briefly outlines the work to be accomplished during the remainder of the study.

STUDY METHODOLOGY

Information forming the basis for this interim report was extracted from a wide variety of sources. Historical data regarding the production and transportation of coal were summarized from the annual report published by the Kentucky Department of Mines and Minerals and from the Kentucky Transportation Cabinet's annual report entitled "Kentucky's Official Coal Haul Highway System." A listing of all extended-weight decals issued for license year 1992-93 was obtained, entered into a database, and analyzed. Interviews were conducted of a small sample of legislators, transportation officials, coal company representatives, and coal trucking representatives. Computerized files of newspapers were searched for those articles related to coal transportation and the extended-weight system. Vehicle classification data from coal-haul roads were analyzed to determine if changes were occurring in the truck fleet. A pavement cost analysis was extracted from an earlier study to estimate additional pavement overlay costs resulting from the extended-weight trucks. Accident data for the extended-weight system were analyzed and compared to data for other comparable roads. Pavement rideability data for the extended-weight roads (and for all state-maintained roads) were analyzed for selected years before and after the extended-weight legislation.

STUDY FINDINGS

The Coal Industry in Kentucky

Kentucky has long been a national leader in coal production and is currently second to Wyoming in the number of tons produced. Most of the coal mined in Kentucky (approximately three-fourths) comes from the eastern coal field. The primary customers of Kentucky coal are electric utilities, which purchase over three-fourths of the coal produced.

Kentucky's coal production has increased fairly steadily for over 100 years and has increased by approximately 40% in the last 20 years. Total coal production in Kentucky continues to increase each year, despite sharp declines (since 1985) in the number of licensed mines and the number of persons employed in coal mining. It is reasonable to expect a continued gradual increase or a leveling out of coal production. There is no reason to expect any rapid escalation of coal production in the foreseeable future.

The coal industry is a significant part of the state's economy and a major contributor to the state's budget. Kentucky collects approximately $190 million each year in coal severance tax. The coal industry, as a whole, generates about $550 million in annual revenue to the state's General Fund, thus accounting for approximately 13% of the total General Fund revenue.

Legislative Objectives

In establishing the extended-weight system, the primary legislative objective was apparently to reduce the cost of coal transportation, thereby maintaining the competitiveness of Kentucky coal and enhancing the economic viability of one of the state's leading industries. Another primary objective was to eliminate the perceived need for coal haulers to violate the law in order to be competitive. Although estimates of the magnitude of actual cost reductions have not been made, the willingness of coal transporters to purchase decals is evidence that cost reductions, of a magnitude at least equivalent to the decal fees, have been realized by the industry.

A secondary legislative objective may have been to develop a unique coal-haul road system which, by virtue of limited mileage and additional dedicated revenue, could be adequately maintained and improved so as to safely and efficiently accommodate both coal trucks and the other vehicles with which they must share the road. Added monies are being allocated for maintaining the extended-weight system, and ride quality is somewhat better than that of other "comparable" pavements. Certain elements of the system (such as bridges) are being upgraded as funding allows. Nevertheless, a conscious, systematic effort to improve the extended-weight system to a higher-than-normal standard and to maintain it that way has apparently not been made. Given the relatively high mileage of the system, the coal-decal revenues are insufficient to effect noticeable improvements.

The extended-weight legislation did not establish a coherent, interconnected system so much as a collection of roads with a common characteristic (more than

50,000 tons of coal hauled). As a result, there is no guarantee of coherence, with proper interconnections between routes, adequate access to origins/destinations, channelization onto preferred routes, and adequate bridges and roadway geometrics. For example, there is significant concern among some coal haulers, legislators, and state transportation officials over the lack of coordination between the extended-weight system and posted weight limits on bridges, sometimes resulting in extended-weight roads which cannot be traveled at extended weights without violating posted weight limits on bridges.

Trends in Coal Transportation

For over 50 years, highways have continued to garner an ever increasing share of the ton-miles of coal transported. Since the 1970's, highways have been the dominant mode for coal transportation in Kentucky. Tonnage transported by truck has more than doubled in the last twenty years, while tonnage transported by rail has declined steadily. Although adjustments will continue to be made in response to factors as potentially diverse as new markets and changing environmental requirements, the highway share of coal transportation can be expected to increase gradually or remain steady in the foreseeable future.

The total mileage of highways used to haul coal in Kentucky has declined since the mid-1980s, as has the mileage eligible for the extended-weight system. This has occurred while the total ton-miles for coal transported by highway has increased.

The extended-weight system is comprised primarily of state-maintained routes. Less than one-tenth of the system is county-maintained.

The Railroad Industry

Rail and highway are competitive alternatives for certain segments of the coal-transportation market. Because the extended-weight system has reduced the real costs of highway transport, some diversion of coal movement from rail to highway has probably occurred. Because available statistics are fairly gross and because the shift from rail to highway has been underway for many years, the diversion is difficult or impossible to accurately quantify. However, the annual tonnage of coal hauled by rail in 1988-90 was about 15% lower than in the pre-legislation years of 1984-87.

Economics of Coal Transportation

Transportation costs make up a sizeable portion of the total price which customers pay for coal, sometimes amounting to more than one-third of the total price. For coal transported by truck in Kentucky, the transportation costs generally represent 7 to 15 percent of the total price. Typical haul rates for coal range from 7 to 12 cents per ton-mile and are influenced greatly by the size of truck used.

Perceptions

Legislators, coal company representatives, trucking company representatives, and County Judge/Executives believe that the extended-weight legislation has made legal that which was already practiced before the legislation. These groups (with individual exceptions) are generally satisfied with the extended-weight system and feel that it has been successful in accomplishing its objectives. Transportation agency representatives feel that the conditions of pavements have improved in the eastern coal field but have deteriorated in the west.

Newspaper accounts have reflected the general perception of coal trucks as a "necessary evil". Significant concern was expressed over the impacts of coal trucks on safety and on the quality of life in communities affected by coal truck traffic.

The Coal Truck Fleet

The extent to which the coal-decal system has fundamentally transformed the coal-truck fleet rather than simply legalizing the operation of preexisting large trucks that had been operating illegally has not been quantified. Nevertheless, there has been a dramatic increase in the role of six-axle trucks in coal transportation since 1988, and larger trucks now dominate coal movement over Kentucky's highways. Approximately two-thirds of the trucks for which extended-weight decals are purchased register in the 120,000-pound category. It appears likely that fewer persons are gainfully employed in coal trucking now than a decade ago.

From 1987 to 1992, the number of extended-weight decals purchased declined by approximately 15 percent. Since the quantity of coal being transported by truck has not declined, the reduction in the number of decals must reflect either the shift toward larger (and fewer) trucks or a decision by some trucking companies to stop buying decals.

Coal haulers in Kentucky are predominantly small-scale operators. Nearly one-fourth of all decals are purchased by single-truck operators. Over half are purchased by operators that have five or fewer trucks.

The purchasing of extended-weight decals is heavily concentrated in eastern Kentucky. Although decals were purchased in 52 of Kentucky's 120 counties, five counties (all in eastern Kentucky) accounted for over one-half of the income from decal fees.

Road User Revenue

Because heavier payloads mean fewer truck registrations, the coal-decal fee structure results in a net loss of revenue to the Road Fund, estimated at almost $2 million annually.

Forty percent of the revenue from decal sales is allocated to the counties for their upkeep of the county-road portion of the extended-weight system. Although relative expenditures on county-maintained and state-maintained portions of the extended-weight system are unknown, county-maintained roads comprise only about eight percent of the extended-weight system.

Highway Costs

The heavier weights of coal-decal trucks add approximately $9 million annually to pavement overlay costs.

Larger and heavier trucks increase, to an (as yet) undetermined extent, other highway costs including:

- construction and reconstruction of pavements, shoulders, bridges, and culverts;
- rehabilitation of pavements, shoulders, and bridges;
- routine maintenance of pavements and shoulders; and
- others.

Road users throughout the state are subsidizing the extended-weight system (and thus the movement of Kentucky coal) by underwriting the increased costs of maintaining and improving the infrastructure.

Highway Safety

The accident pattern of heavy trucks is distinctly different from that of passenger cars. Heavy-truck accidents are generally more severe and, in multiple vehicle crashes involving both a heavy truck and a car, the car is more likely to sustain greater damage.

For rural two-lane roads (which make up approximately three-fourths of the extended-weight system), the overall accident rate is no higher on the extended-weight roads than on non-extended-weight roads. However, the overall fatality rate is significantly higher on extended-weight roads than on non-extended-weight roads.

For truck accidents on rural two-lane roads, the extended-weight system demonstrates the following characteristics (compared to non-extended-weight roads in the same counties): a significantly higher percentage of fatal accidents; a significantly higher percentage of head-on accidents; a significantly higher percentage of opposite-direction sideswipe accidents; and a higher percentage of accidents involving slippery surface, unsafe speed, oversize load, water pooling, alcohol, or defective brakes.

The frequency of accidents involving coal trucks is directly related to the extent of their travel. Reducing the vehicle miles of coal-truck travel is one certain means for proportionately reducing their accident frequency. To the extent that the extended-weight system has reduced the number of coal trucks on the road, then it has reduced the frequency of coal-truck accidents (unless the heavier trucks have a greater propensity for accident involvement).

The match between truck size and weight on the one hand and road cross section, geometry, and traffic control on the other certainly influences highway safety. The extended-weight legislation recognizes these interrelationships and provides limited mechanisms for the exclusion of highway segments from the extended-weight system on the basis of increased safety risk. The effectiveness of any procedures that may be in place to assure that potentially hazardous highway segments are excluded from the extended-weight system has not been evaluated.

Difficulty is experienced in safely stopping heavily laden coal trucks approaching signalized intersections (particularly on downgrade approaches and in more rural areas with faster approach speeds). Although wide variance in the braking capabilities of passenger cars and heavy trucks exacerbates the signal-timing task, the heavy-truck braking problem at these locations can be ameliorated through a combination of such traffic control strategies as all-red intervals, advanced signal systems, and restrictive speed zoning.

Pavement Condition

Between 1985 and 1990, the average rideability index (RI) of roads across the state rose by about three percent, while the average RI of extended-weight roads rose by twice that amount. The average RI for extended-weight roads in 1990 was slightly higher than the average for all roads.

For extended-weight roads, there was substantial difference between the eastern and western coal fields. Average rideability is much lower in the east than in the west. However, eastern roads showed a marked improvement from 1985 to 1990, while western roads were virtually unchanged.

CONCLUSIONS

The extended-weight legislation has, to an extent, been successful in accomplishing its primary objectives: to enhance the competitiveness and economic viability of the Kentucky coal industry and to eliminate the perceived need for coal haulers to violate the law in order to be competitive. Another possible success of the legislation is reflected in the reports (supported by rideability data) of improved road conditions in eastern Kentucky. The legislation may have focused attention (and expenditures) on the maintenance of coal-haul roads. In contrast, western Kentucky roads are reported to be experiencing increased pavement damage due to the heavy loads, but rideability data do not support that perception.

The extended-weight system does not exhibit a higher accident rate than other, comparable roads. However, accidents on the extended-weight system are more likely to cause fatalities. Heavily laden coal trucks experience difficulty stopping at signalized intersections, particularly where approaches are on downgrades and/or approach speeds are high.

The extended-weight system has negative implications on direct state revenue and highway expenditures. The coal-decal fee structure results in a net loss of revenue to the Road Fund estimated at almost $2 million annually, and the extended-weight trucks add approximately $9 million annually to pavement overlay costs. Other highway costs are increased as well, but the extent has yet to be determined. Thus, the extended-weight system represents a subsidy of the movement of Kentucky coal by the road users throughout the state.

PRELIMINARY RECOMMENDATIONS

Although specific recommendations will be developed during the remainder of this study, the following general recommendations can be offered based on preliminary findings:

1. The methodology for defining which routes are included in the extended-weight system should be revisited to include some consideration for route geometry, cross section, bridge weight limits, and other pertinent route characteristics.

2. The definition of the extended-weight system should include provisions to add sections of road to the system to prevent trucks from having to use non-extended-weight routes for portions of their trips.

3. Countermeasures for the heavy truck braking problem at signalized intersections should be evaluated and implemented expeditiously.

4. Consideration should be given to revising the allocation of dollars from the Energy Recovery Road Fund to more accurately reflect the composition of the extended-weight system mileage.

FUTURE WORK

The remainder of this study will focus on the following areas:

1. The magnitude of cost savings realized by the Kentucky coal industry as a result of the extended-weight legislation, and the effect of those cost savings on the competitiveness and economic viability of the industry.

2. Ride quality and pavement condition data for coal-haul roads in eastern and western Kentucky.

3. Accident rates and characteristics specifically for coal trucks, as well as potential causes for the higher fatal accident rate on the extended-weight system.

4. The effectiveness of existing procedures for excluding segments of roadway from the extended-weight system on the basis of increased safety risk.

5. The difficulty experienced by heavy coal trucks in stopping for signalized intersections.

6. Updating and expansion of the analysis of road user revenue and

highway costs.

7. Other impacts of the extended-weight system that have not yet been assessed.

8. Development of recommendations for mitigating negative impacts of the extended-weight system.

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INTRODUCTION

BACKGROUND

In 1986, legislation was passed by the Kentucky General Assembly to create the Extended-Weight Coal Haul Road System. That legislation is Kentucky Revised Statute (KRS) 177.9771. It had an effective date of April 1, 1987, and it accomplished the following:

1. Established the Extended-Weight Coal Haul Road System, which "shall consist of public highways over which quantities of coal in excess of 50,000 tons were transported by motor vehicle during the period from January 1, 1985, through December 31, 1985 and shall be updated annually thereafter" (quoted from KRS 177.9771).

2. Established that any vehicle having a registered gross weight of 80,000 pounds, when transporting coal on a highway included in the extended-weight system, may, by entering into a cooperative agreement or paying the corresponding decal fee, operate at the following weights.

Vehicle Type	Weight Limit	Decal Fee
Single-unit, 3-axle	90,000 lbs	$160
Single-unit, 4-axle	100,000 lbs	$260
Tractor-semitrailer, 5 or more axles	120,000 lbs	$360

A tolerance of five percent is specified for each of the weight limits. The decal fees are paid annually.

In addition to the three categories of trucks presented above, there is an incremental category which allows any motor carrier transporting coal to carry in excess of 80,000 pounds by paying a decal fee of $10 for every 1,000 pounds above 80,000. However, trucks registering in this category are limited to 12,000 pounds for the steering axle and 20,000 pounds each for other axles.

In order to purchase a decal and operate in any of the above categories, a truck must be registered in the 80,000-pound category at the standard registration fee of $1,260.

3. Established a special account within the road fund called the Energy Recovery Road Fund. All revenue generated from the decal fees is credited to that special account.

Forty percent of the Energy Recovery Road funds are distributed to the counties for construction, maintenance, and repair of the county-maintained

portion of the extended-weight system. This distribution is based on the miles of county-maintained extended-weight roads in each county and the tons of coal transported over county-maintained extended-weight roads in each county. The remaining sixty percent of the Energy Recovery Road funds are to be used by the Department of Highways for construction, maintenance, and repair of the state-maintained portion of the extended-weight system.

The total tons of coal transported over any public highway is determined from the official coal road system transportation report required by KRS 177.977. This report is published annually by the Division of Planning of the Department of Highways. Based upon this report, the Secretary of Transportation is required to certify, on or before November 1 of each year, those highways that are to be included in the extended-weight system.

The legislation allows, under certain circumstances, for roads or road segments that meet the criteria for the extended-weight system to be excluded from the system or posted at lower weight limits. Specifically, a fiscal court or governing body of a city (first through fourth class) or urban county government may recommend to the Secretary of Transportation that a certain road or road segment be excluded from the extended-weight system due to "inherent and definite hazards or special conditions." In such cases, the Secretary of Transportation must meet with the court or governing body and consider their concerns before adding to or deleting from the extended-weight system. In addition, the Department of Highways (or County Judge/Executives for county highways) may prescribe lower weight limits or speed limits when it determines that a highway may be damaged or destroyed by trucks exceeding those limits. The Department may reduce weight limits for bridges when it determines that those bridges would be damaged or destroyed to the point of catastrophic failure by trucks exceeding those limits. The Department (or County Judge/Executive) may regulate or prohibit trucking during certain periods of certain days if, due to heavy traffic, this is necessary to provide for the public safety and convenience.

Early in 1992, as part of a study entitled "Review of Highway Cost Allocation Methodologies" (1), the Kentucky Transportation Center was asked to conduct a limited study of the cost and revenue implications of the extended-weight system. That study focused on the revenue implications (resulting from decal fees and reduced number of trucks) as well as the pavement overlay costs. That study provided valuable insight into the impacts of the extended-weight system, but was very limited in scope.

The work plan for the current study was approved in October of 1993.

OBJECTIVES

The stated objectives of this study are:

1. To identify and qualitatively describe the impacts of the Extended-

Weight Coal Haul Road System.

2. To assess and quantify, where possible, the impacts associated with the extended-weight system, with emphasis on economic benefits/costs and environmental impacts.

3. To determine the legislative expectations in establishing the extended-weight system and compare actual impacts to expectations.

4. To develop recommendations for mitigating negative impacts of the extended-weight system.

SCOPE

This interim report has been prepared approximately one year into a three-year study. The intent during the first year of the study has been to take a "broad-brush" look at the impacts of the extended-weight legislation. The focus has been on identifying and describing the impacts, rather than on detailed analysis. In some areas, where data were readily available, quantitative analyses have been performed. In other areas, the impacts have only been described qualitatively. The remainder of the study will focus on more detailed analyses of those impacts that have been identified.

SIGNIFICANCE

The haulage of coal over Kentucky's public highways has, for many years, generated substantial controversy and public debate. Troubled by government's apparent inability to enforce trucking regulations, many of Kentucky's ordinary citizens consider coal trucks to be giant behemoths which destroy their roadways, threaten their safety, and disrupt their communities. Others, believing that efficient coal transportation is critical to maintaining the competitiveness and economic viability of Kentucky's coal, press for larger legal payloads. The result has been a classic clash between differing perspectives.

The extended-weight system represents a significant, public sector attempt to support one of the state's largest industries. The potential economic and social impacts of enhancing the competitiveness of Kentucky coal are considerable. At the same time, the potential cost to Kentucky's citizens, primarily due to increased pavement damage, is certainly substantial. To date, little has been known about the relative magnitudes of these impacts.

The current study was undertaken primarily to identify and objectively evaluate the major impacts of the extended-weight legislation. Its audience is expected to include 1) those wishing to know more about Kentucky's coal transportation system and the extended-weight legislation, 2) those wishing to evaluate the impacts and the effectiveness of the legislation, 3) those wishing to

consider modifications to the legislation, and 4) those wishing to better manage the extended-weight system. The ultimate measure of the study's success will be the effectiveness of actions it may support or precipitate to mitigate adverse effects of coal transportation in Kentucky and to enhance the state's coal industry.

THE COAL INDUSTRY IN KENTUCKY

Most of the information presented in this section was obtained from the "Kentucky Coal Facts--1991-92 Pocket Guide" prepared by the Governor's Office for Coal and Energy Policy and by the Kentucky Coal Association (2). It is suggested that the reader refer to this guide for additional information about the coal industry in Kentucky.

Kentucky has been a leading producer of U.S. coal for the last 45 years and is now second only to Wyoming in the number of tons mined. According to figures developed by the U.S. Department of Energy and the Energy Information Administration, Kentucky produced 173.3 million tons of coal in 1990 from its two coal fields. (The eastern field produced three-fourths of this total.) This is a substantial increase from the 152.3 million tons produced in 1985.

In spite of declines in the number of licensed coal mines in Kentucky (from over 2,500 in 1985 to less than 1,800 in 1990) and the number of persons directly employed in coal mining (36,814 in 1985 to 30,498 in 1990), productivity gains have resulted in an increase in tons mined. The average number of tons/miner/hour in Kentucky has increased from 2.23 in 1985 to 2.83 in 1990.

Coal mining in Kentucky paid over $1.1 billion in direct wages in 1990. The gross value of coal mined and processed in fiscal year 1990-91 was $4.34 billion, at an average value of $25.19 per ton. The severance tax paid in that fiscal year was over $190 million, of which nearly $23 million was returned to coal-producing and coal-impact counties and $167 million went to Kentucky's General Fund. The total contribution of the coal industry to the state's General Fund in that year was estimated to be $550 million ($323 million from the coal industry and its employees; $227 million from other jobs induced by the coal industry). This equates to about 13% of the total General Fund revenue.

Most of Kentucky's coal (over three-fourths) is sold to electric utilities. Another 10 percent is used for industrial use, and nearly 10 percent is exported to other countries.

HIGHWAY VERSUS OTHER MODES

The Kentucky Department of Mines and Minerals publishes an annual report (3) which gives information on coal production by type of mine and by mode of transportation from the mine. These reports are available dating back to the 1890's. A breakdown of truck versus rail tonnage has been reported every year since 1930, and a breakdown of underground versus surface mines has been reported since 1948. It is interesting to note that water transportation was not listed as a separate mode until 1987. In the 1982-1986 reports, truck and water tonnage were combined. In the 1964-1969 reports, "river mine production is included with rail mine production." The reports do not specify how water transportation was accounted for between 1970 and 1981.

Information from the Mines and Minerals Annual Report was entered into a spreadsheet, allowing graphs to be generated to show the trends in coal production and transportation. Those graphs are presented in Figures 1-3.

Figure 1. Coal Production by Transportation Mode (1895-1990)

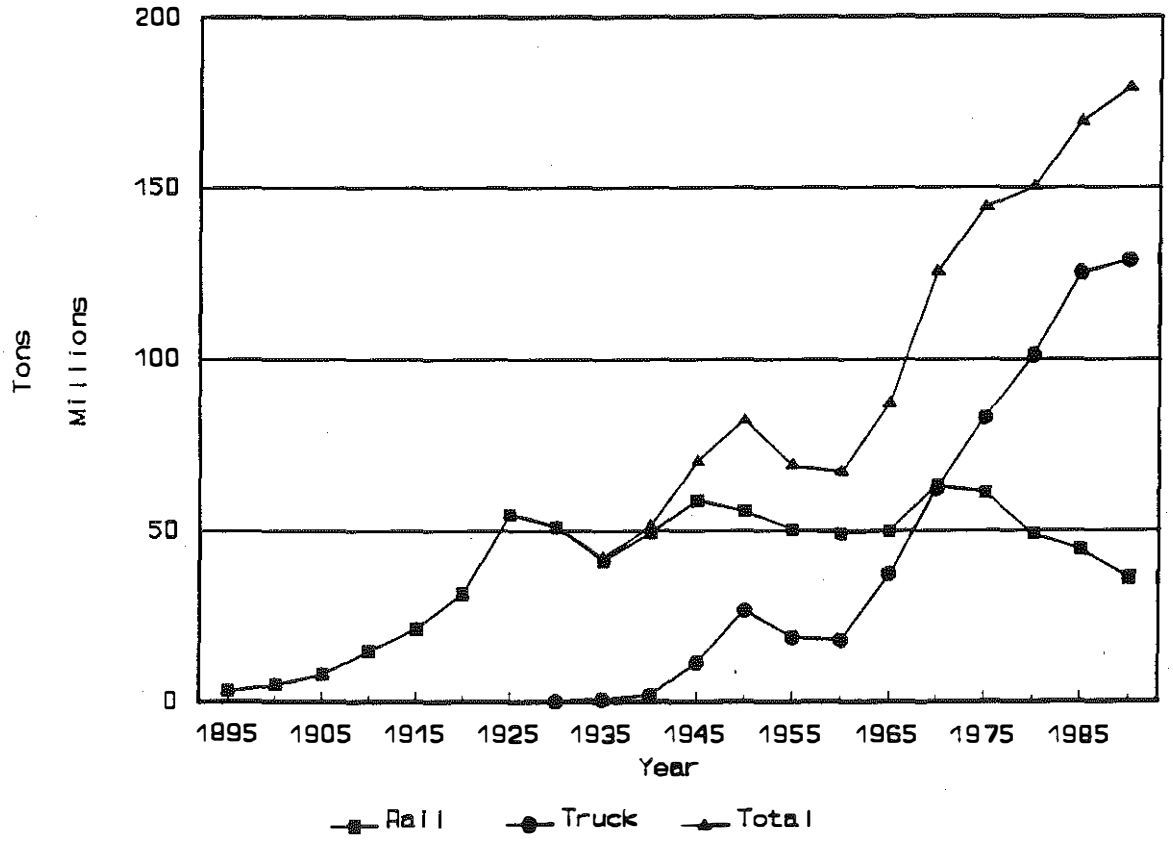


Figure 1 shows annual coal production in Kentucky dating back to 1895. Beginning in 1930, the production is broken down by transportation mode. Only rail and truck transportation are shown, since water transportation was not listed as a separate mode until 1987. It can be seen that rail was the dominant mode for coal

transportation until the 1960s, when truck transportation increased dramatically. Rail and truck tonnages were approximately equal in 1970, but truck tonnages have continued to increase since then, while rail tonnages have dropped off. In 1990, approximately 70% of coal mined in Kentucky was carried from the mine by truck.

Figure 2. Coal Production by Transportation Mode (1970-1990)

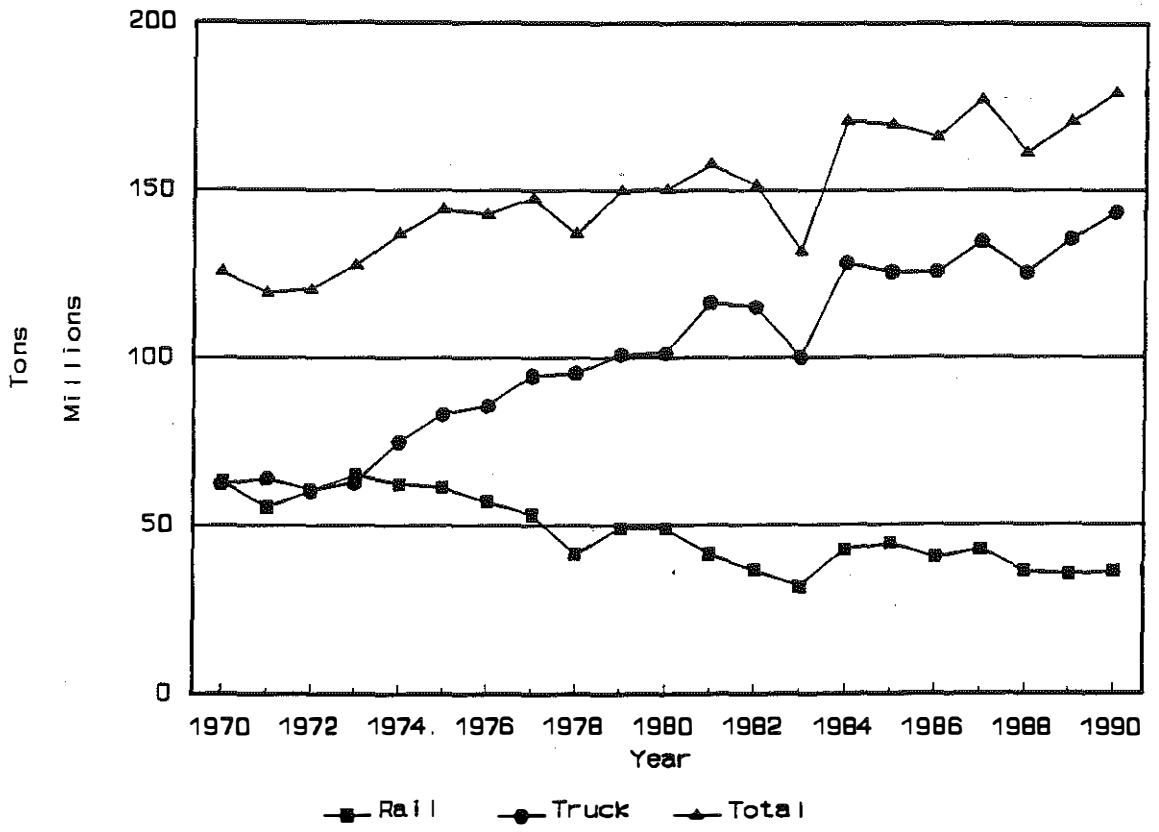
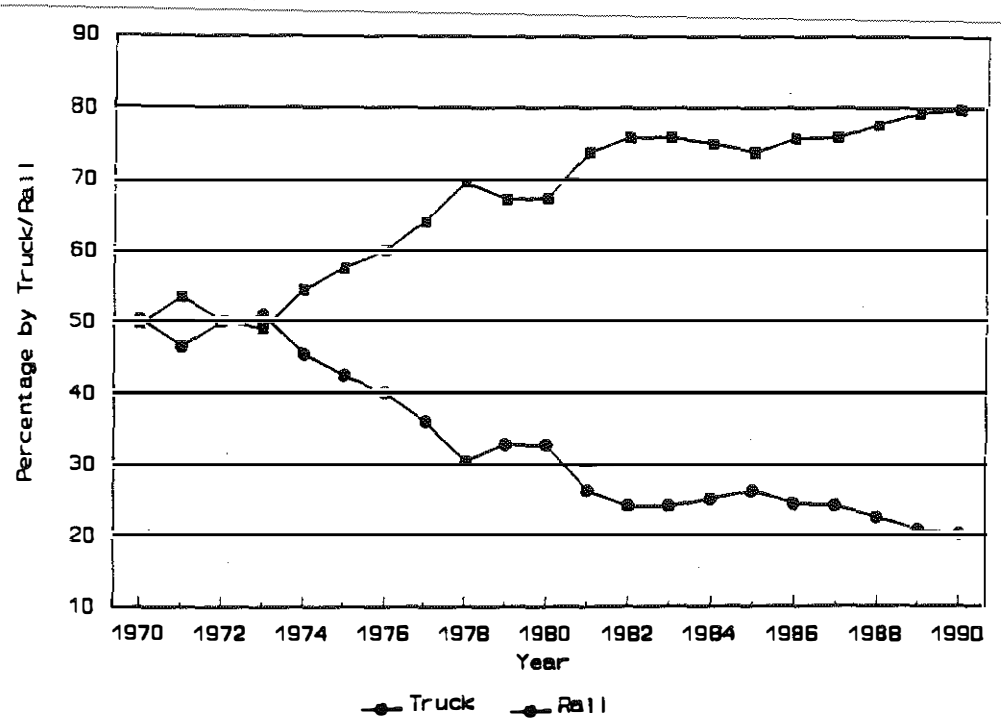


Figure 2 also shows coal production by transportation mode, concentrating on 1970 through 1990. For 1987-1990, the tonnage transported by water has been included with the truck tonnage, for consistency with the previous five years. It can be seen from this graph that the tonnage transported by rail has declined gradually and steadily, while the tonnage transported by truck has increased. Year-to-year fluctuations in total coal production appear to affect truck tonnage much more than rail tonnage. It appears that rail tonnages remain fairly constant from year to year, as truck tonnages fluctuate with the total production.

Figure 2 allows an examination of the impacts of the extended-weight legislation on the modal split of coal transportation. The legislation was passed in 1986 and went into effect in April of 1987, so it is worthwhile to look for any sudden shifts or changes in trends occurring around 1987. For the years 1984-87, coal tonnages hauled by rail remained relatively constant, with an average of 42,537,000 tons per year. For 1988-90, the rail tonnage again was fairly constant, but at a lower level of 35,820,000 tons per year. This represents a 16% drop in tonnage of coal hauled by rail.

To assist in further evaluating the modal split, Figure 3 was prepared, which

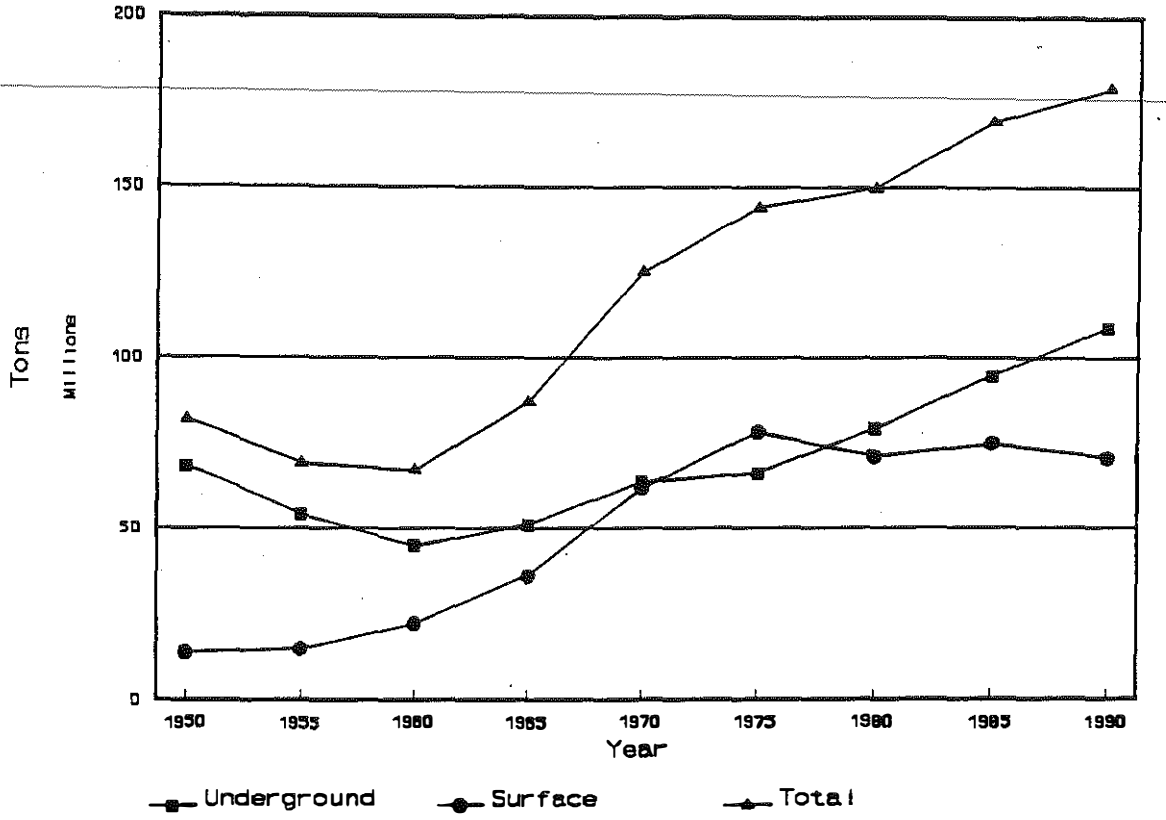
Figure 3. Percentage of Coal Hauled by *Truck* and by *Rail* (1970-1990)



shows the percentages of coal hauled by truck and by rail for 1970 through 1990. Again, for consistency, water tonnages have been included with truck tonnages. For 1982-87, the percent hauled by each mode was fairly constant. Since 1987, the percentage by truck has been increasing each year. This could reflect an impact of the extended-weight legislation, or it could simply reflect the continuation of the long-term trend.

Figure 4 shows coal production in Kentucky by type of mine (underground or surface), dating back to 1950. It can be seen that, except for a period in the 1970's (1971 through 1978), the majority of coal mined in Kentucky has been from underground mines.

Figure 4. Coal Production by Type of Mine (1950-1990)



THE COAL HAUL ROAD SYSTEM

The Division of Planning of the Kentucky Department of Highways has been publishing an annual report entitled "Kentucky's Official Coal Haul Highway System" (4) since 1979. That report is published to comply with the requirements of the Local Government Economic Assistance Act (KRS 42.455) and the Extended-Weight Coal Haul Road System Law (KRS 179.9771). Information in the report is collected from coal shippers, who submit details of their truck shipments to the Division of Planning.

Counties where coal is reported shipped from mines during the calendar year are designated as producing counties, while counties where coal was transported by truck but none was mined are designated as impact counties.

In the 1980 Coal Haul Highway System Report (1979 data), 44 counties were listed as producing counties, while 41 were listed as impact counties. The remaining 35 counties in Kentucky were neither producing nor impact counties.

In the 1992 Coal Haul Highway System Report (1991 data), the number of producing counties had shrunk to 39, while the number of impact counties had grown to 55. Only 26 counties were neither producing nor impact counties.

Table 1 shows the number of producing and impact counties by year from 1979 to 1991. As can be seen, the number of producing counties peaked at 47 in 1984, and the number of impact counties peaked at 56 in 1990. The total of producing and

impact counties peaked at 96 in 1986 through 1988.

Table 1. Number of Producing and Impact Counties by Year (1979-1991)

YEAR	PRODUCING	IMPACT	OTHER
91	39	55	26
90	38	56	26
89	39	54	27
88	44	52	24
87	44	52	24
86	44	52	24
85	45	47	28
84	47	45	28
83	43	48	29
82	43	49	28
81	45	44	31
80	43	36	41
79	44	41	35

Additional information on the coal-haul highway system is shown in Figures 5-8. Figure 5 shows how the number of miles of coal-haul highways has varied for the period from 1979 to 1991. (Any route on which coal was transported is considered a coal-haul highway.) It can be seen that the highway mileage used for coal hauling increased through the early 80's, peaked in the mid-80's, and has declined since then to approximately equal the 1979 value (5,644 miles in 1979, 5,732 in 1991). System mileage in producing counties has declined by about 500 miles (as the number of producing counties has declined) while system mileage in impact counties has increased by approximately 600 miles (corresponding to the increase in the number of impact counties).

Figure 6 shows the number of miles of highway eligible for the extended-weight system, based on tons of coal transported over the highway. The Division of Planning began including this information in the annual Coal Haul Highway System report in 1986 (1985 data). As indicated in Figure 6, the total miles eligible for the extended-weight system has declined by approximately 650 miles since 1985 (from 3,814 to 3,161). This is due to a decrease in the extended-weight system mileage in producing counties, for the mileage in impact counties is almost unchanged from its 1985 value. Referring again to Table 1, we see that, since 1985, the number of producing counties has decreased by 8 and the number of impact counties has increased by 10.

Figure 7 shows the ton-miles of coal transported within the state for producing counties, impact counties, and all counties. It can be seen that the majority (approximately 90%) of the ton-miles in the state occur in the producing counties. Since 1979, the total ton-miles in the state has more than doubled, peaking in 1990 at 2.6 billion.

Figure 8 shows the number of tons of coal shipped by highway from mines in producing counties. Approximately 80% of the coal shipped comes from eastern counties. Since 1979, the tonnage shipped has nearly doubled, peaking in 1990 at 140 million tons.

Figure 5. Highway Mileage of Coal Haul System

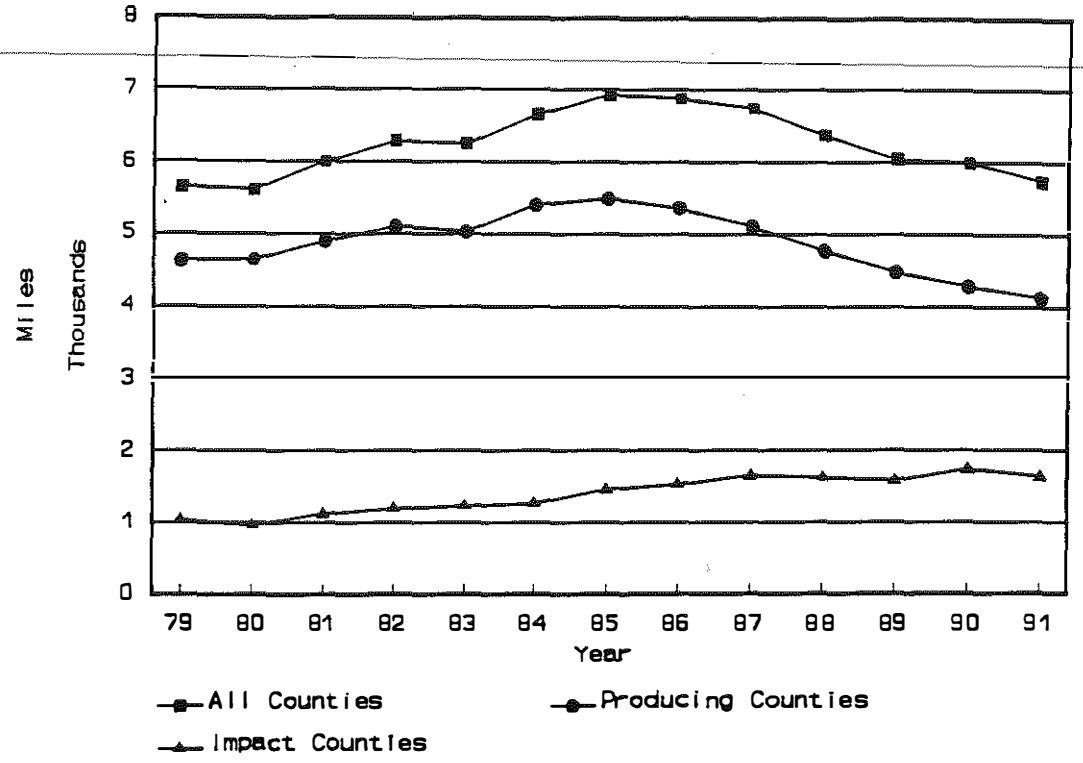


Figure 6. Highway Mileage of Extended-Weight System

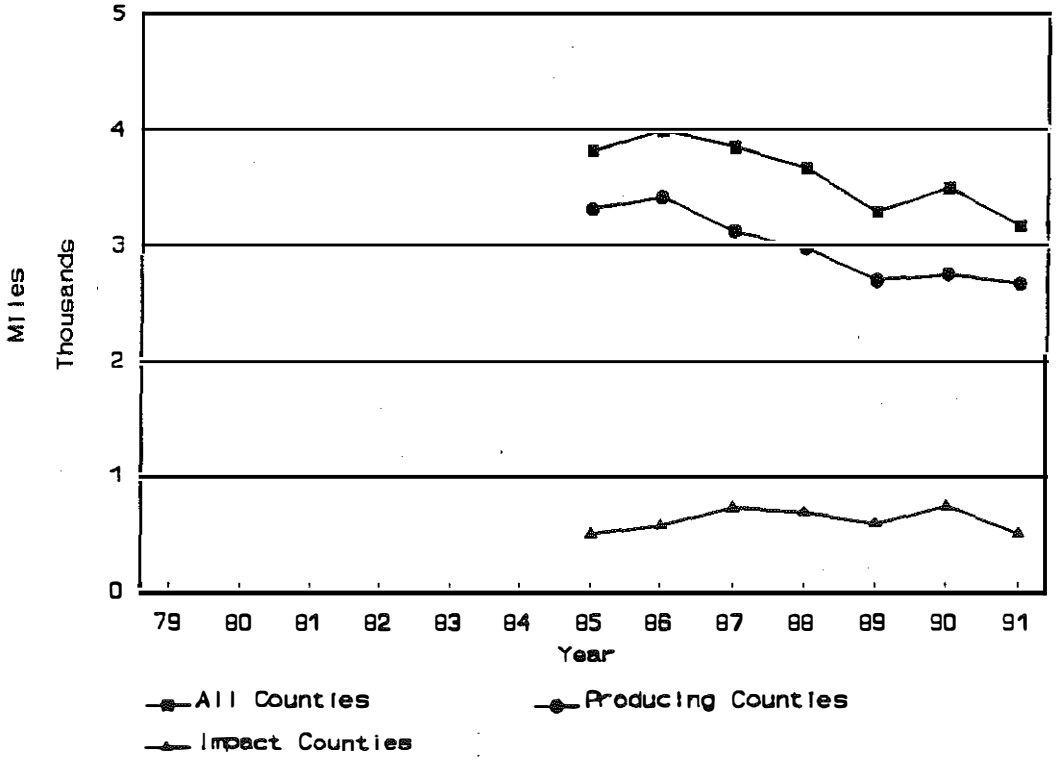


Figure 7. Ton-miles of Coal Transported by Highway in Kentucky

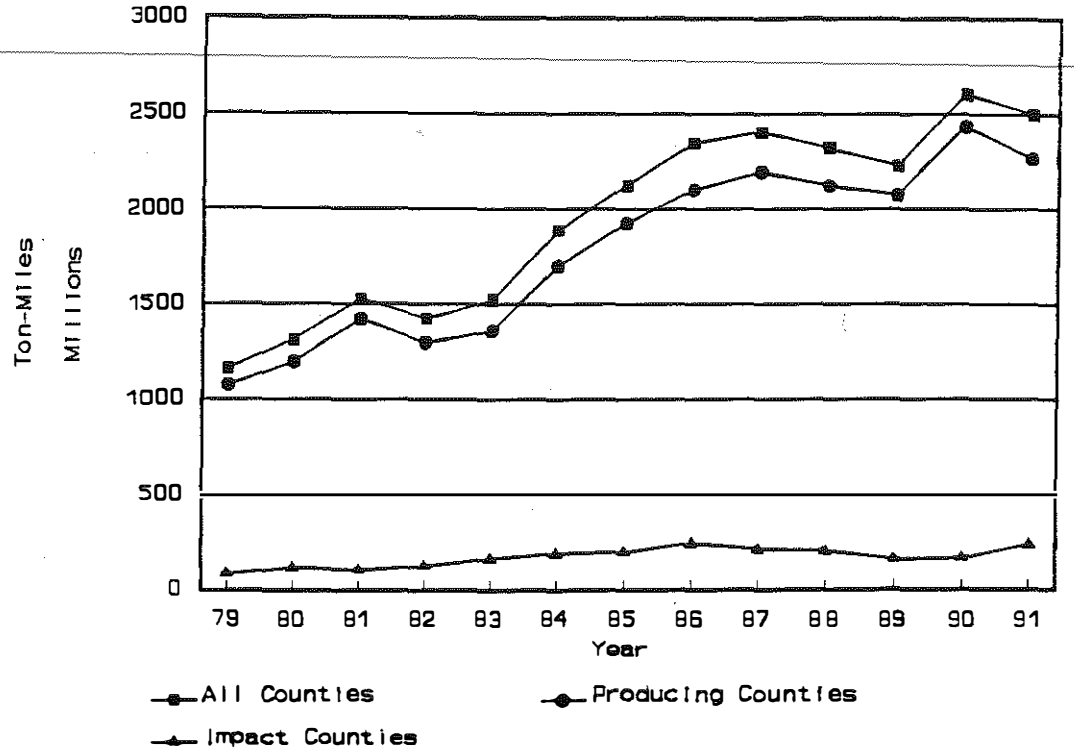


Figure 8. Tons of Coal Shipped by Highway in Kentucky

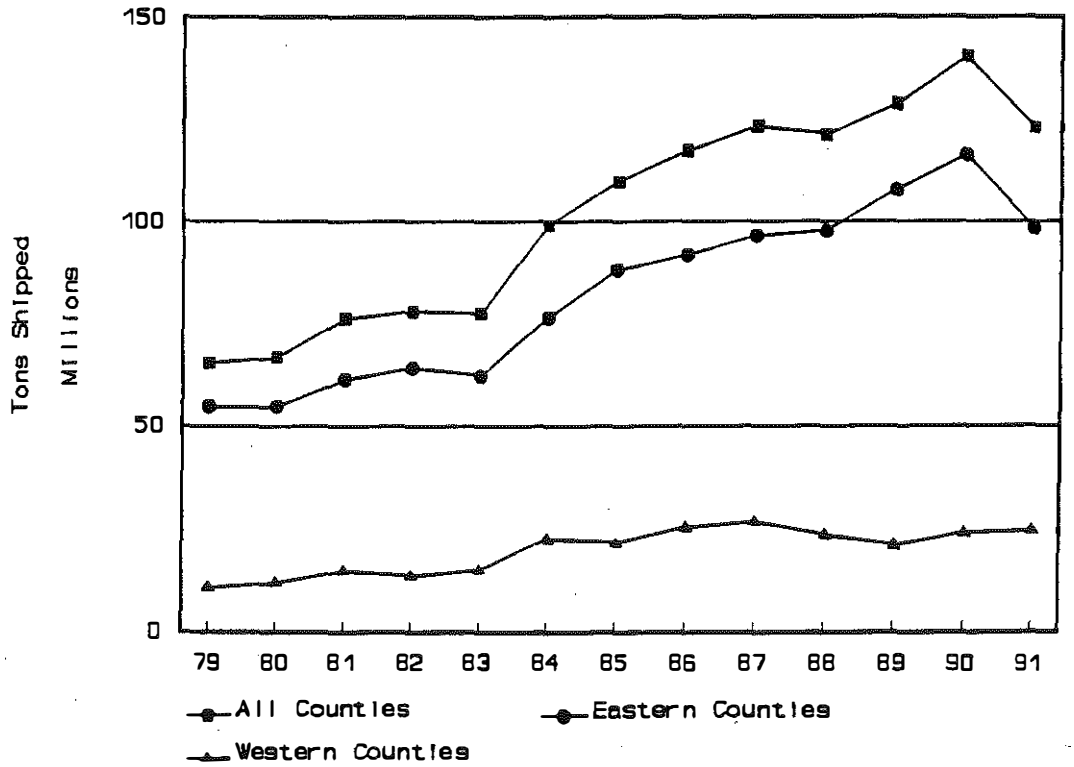


Figure 9. Breakdown of Extended-Weight System -- 1991 Data. State-maintained versus Non-state-maintained.

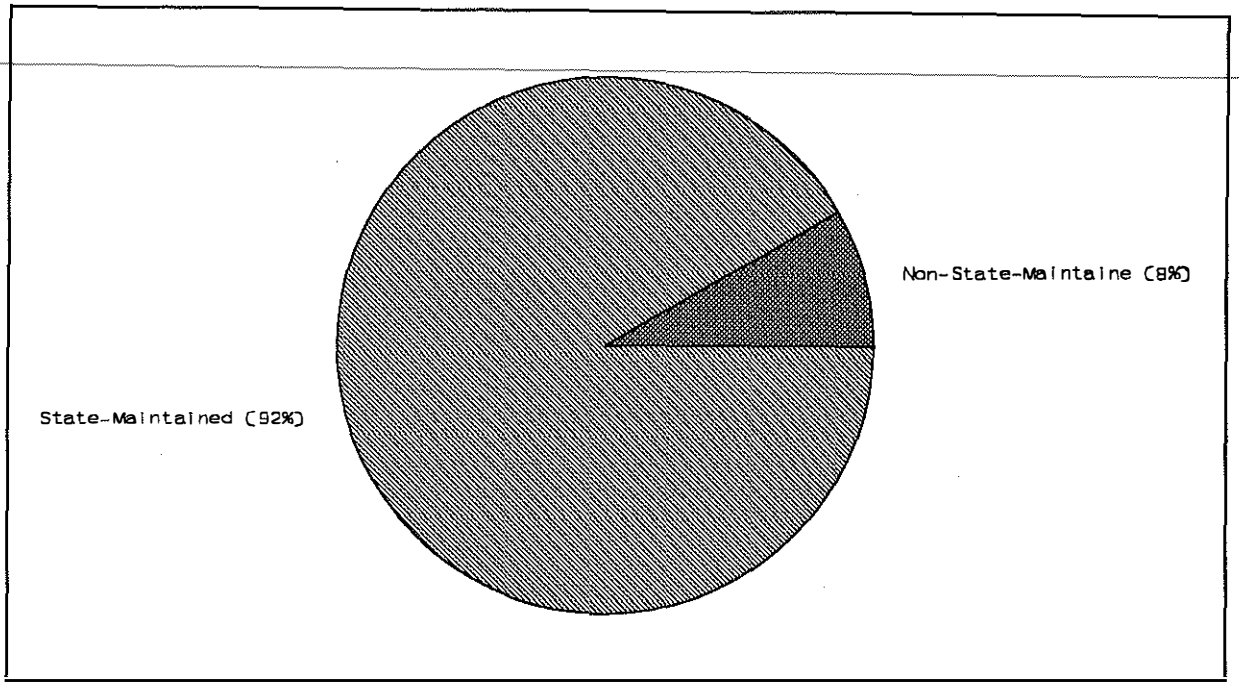


Figure 9 shows that 91.7% of the eligible mileage for the extended-weight system is state-maintained. This is a slight increase from 1985, when 90.4% was state-maintained.

SUMMARY

Since the 1970's, highways have been the dominant mode for coal transportation in Kentucky. Tonnage transported by truck has more than doubled in the last twenty years, while tonnage transported by rail has declined steadily.

Possible effects of the extended-weight legislation on the modal split for coal transportation are difficult to quantify, particularly in light of the long-term shift from rail to truck. However, the annual tonnage of coal hauled by rail in 1988-90 was about 15% lower than in the pre-legislation years of 1984-87.

The total mileage of highways used to haul coal in Kentucky has declined since the mid-1980s, as has the mileage eligible for the extended-weight system. This has occurred while the total ton-miles for coal transported by highway has more than doubled.

The extended-weight system is comprised primarily of state-maintained routes. Less than one-tenth of the system is county-maintained.

ECONOMICS OF COAL TRANSPORTATION

To provide an economic perspective on coal transportation in Kentucky, Dr. Curtis E. Harvey, of the University of Kentucky's College of Business and Economics, was asked to prepare a paper on the subject of coal transportation and, in particular, heavy coal trucks. Dr. Harvey, a Professor of Economics, was selected because of his extensive background in studies related to the coal industry and coal transportation in Kentucky. His paper, entitled "Issues Surrounding the Trucking of Kentucky Coal in the 1990's", is included as Appendix A of this report.

To gain further perspective on the costs of coal transportation, telephone interviews were conducted with representatives of three coal mining and/or trucking companies, one utility company, and two coal associations. Information from these different sources showed excellent agreement and is summarized here.

Kentucky coal is delivered to its customers by truck, rail or barge, or a combination of these modes. In some cases, where multiple modes are used involving several loading and off-loading processes, transportation costs can amount to more than a third of the total price customers pay. Approximately 80% of Kentucky's coal is shipped by truck for at least part of its journey.

Many variables determine the price of coal shipped by truck. The first factor is the price of coal at the mine (FOB mine). This reflects the current market price for coal and, therefore, varies accordingly. Other factors are the length of the haul and the weight allowed on the route, because this determines the size of the load carried and the overall truck mileage. If a paying load, or "haulback" (such as sand or gravel), is available for the truck's return trip, the price charged for hauling the coal may be less. Geography is also a factor. In eastern Kentucky, with its mountainous terrain, it is often impractical to use tractor-trailer trucks to haul from mines accessed by steep, winding roads. In such cases, smaller, single-unit trucks must be used.

Trucking companies usually operate under a contract with a mine or mines. Their transportation charges depend on what they can negotiate with the mining company and must be sufficient to cover their costs, which include labor, fuel, maintenance, truck capital, truck registration, other truck costs, workmen's compensation, etc. Truck owners also must pay for items like extended-weight decals (which cost from $160 to $360) and liability insurance premiums (ranging from $2,000 to $6,000 per year).

The following figures are current rates charged or paid by the persons interviewed. They are not reported as standard rates for the coal-haul industry, but are presented as reflective of rates currently encountered in Kentucky.

Coal hauled locally (less than 20 miles) by tractor-trailer is hauled for $1.50 to $2.50 per ton. For longer distances, such as from Pike County to the Ohio River, charges run $2.00 higher, or approximately $4.50 per ton. Drivers working for a trucking company which hauls with tractor-trailers on the extended-weight system were reported to receive 20% of the hauling charge.

In eastern Kentucky, haul rates were reported to range from 7 or 8 cents per ton-mile for larger trucks to 11 or 12 cents per ton-mile for smaller trucks. In western Kentucky, where most trucks are tractor-trailers, the cost is generally 7 to

8 cents per ton-mile. For a 20-mile haul, this would translate to an average of $1.50 per ton for tractor-trailers and $2.30 per ton for smaller trucks.

Depending on all the factors mentioned, the price for transporting coal by truck in Kentucky was reported to range from 7% to 15% of the total coal price paid by the consumer. This percentage is for the initial trucking only, which, in many cases, is just the first leg of a multi-modal journey.

Most of Kentucky's coal is sold to utility companies, both in Kentucky and out of state. In past years, coal prices ranged from the high $20s to the low $30s per ton. Now, however, it is selling in the lower $20s and is regarded as a buyer's market. Utilities, which have traditionally bought coal under long-term contracts, are now relying more on spot markets. Utilities are also attempting to determine where they stand with regard to environmental regulations.

While coal prices fluctuate, transportation costs generally remain fairly constant. Most of those interviewed felt that transportation costs have been forced as low as they can go. Trucking companies and drivers stated that they are hauling for lower rates now than a few years ago, while the costs they incur continue to rise. They also stated that the amount paid for transporting coal determines the dollars available for driver wages, driver training, truck maintenance, new trucks, etc.. This could potentially affect safety, driver courtesy, truck noise, air pollution, and other important factors.

One industry representative suggested that utilities should consider more than just price when contracting for coal. It was suggested that if major buyers, such as utilities, contracted only with coal haulers, suppliers, and mines which maintain a reputation for not "cutting corners" with regard to safety and responsibility to the community, many problems associated with the coal-haul industry would solve themselves. However, this would require paying a higher price for the coal.

PERCEPTIONS

INTERVIEWS

In an attempt to identify issues, concerns, and perceptions related to the extended-weight system, a series of interviews was conducted. Four categories of individuals were targeted for the interviews. The four categories were:

1. Legislators--to determine the intent of the original legislation and to assess whether the intent had been accomplished. Six Legislators were interviewed.

2. Public officials--to determine their assessment of the effects of the extended-weight legislation upon the transportation infrastructure. Eight officials were interviewed; five with Department of Highways District Offices, one with Motor Vehicle Enforcement, and two County Judge/Executives.

3. Representatives of coal producers--to determine their assessment of the effects of the extended-weight legislation on their costs, profitability, transportation arrangements, and overall operation. Eight coal company representatives were interviewed.

4. Representatives of coal trucking companies--to determine their assessment of the effects of the extended-weight legislation on their costs, truck fleet, profitability, and overall operation. Nine trucking company representatives were interviewed.

The intent of these interviews was to gather preliminary data on existing perceptions of the extended-weight system. No attempt was made to ensure random samples or to provide sufficient sample sizes for statistical analysis. However, it was felt that these interviews would be helpful in identifying issues, impacts, and concerns that may otherwise have been overlooked. That was a primary reason for using oral interviews; they would provide the best forum for the interviewees to offer unsolicited comments.

Legislators:

The six Legislators were asked to give their perceptions of the following:

- The purpose of the extended-weight legislation and whether that purpose had been achieved.
- Impacts of the legislation on:
  - State government revenues
  - Volume of coal truck traffic

- Pavement deterioration
- Coal truck accident rate
- Profitability for mining companies, trucking companies, company drivers, independent drivers, and railroads

- Overall opinion of the legislation when it was passed.
- Overall opinion of the legislation now.
- What, if anything, should be changed about the legislation?

In general, the legislators responded that they felt the major purpose of the extended-weight legislation was to help coal producers and truckers be profitable. Another primary purpose was to legalize existing activity, i.e., to eliminate the need for coal haulers to violate the law in order to be competitive. The legislation was designed to allow coal companies and coal haulers to operate legally, while also allowing a measure of control as to which routes could be used. Counties would be able to keep some roads off the system, and coal trucks would be using the roads where the least damage would occur. Five of the six legislators felt that the extended-weight legislation had achieved its purpose (the other was unsure).

The legislators generally thought that revenues to state government had increased. Most felt that the volume of coal truck traffic had not been affected significantly by the extended-weight legislation. The legislators generally had expected pavement deterioration to be accelerated, but were unsure whether this had actually occurred. Regarding the coal truck accident rate, most responses indicated that it had decreased or that the effect was unknown.

With regard to profitability, the legislators generally thought it had increased for trucking companies and had either increased or stayed the same for coal mining companies. Responses were mixed as to the effect on truck drivers and the railroad industry.

Three of the legislators were pleased with the legislation when it was passed (two were not, one had a mixed opinion). Four stated that they were pleased with the legislation now.

When asked what should be changed about the legislation, responses ranged from "nothing" to "repeal it". Other recommendations included clarifying who is responsible for maintaining extended-weight system roads and allowing extended-weight trucks to travel on Interstates.

Public Officials:

This category included five Department of Highways' District Office personnel, one representative of the Division of Motor Vehicle Enforcement, and two County Judge/Executives. These individuals were asked to give their perceptions regarding the effect of the extended-weight system on the following:

- Number of coal trucks.
- Size and types of coal trucks.

- Use of non-extended-weight routes by extended-weight trucks.
- Pavement deterioration.
- Truck speeds.
- Safety.
- Dust, noise, etc.
- Required paperwork.

While there was disagreement regarding changes in numbers of coal trucks (this was apparently location-dependent), most of these public officials agreed that the size of coal trucks was now larger, with an increase in semitrailers. All reported that extended-weight trucks (carrying extended-weight loads) were using non-extended-weight routes.

Opinions on pavement condition were mixed, showing a sharp distinction between eastern and western Kentucky. Officials in eastern Kentucky indicated less pavement deterioration, while western Kentucky officials indicated an increase in deterioration. This was true for both extended-weight and non-extended-weight routes.

Most of the public officials felt that truck speeds had increased on the extended-weight routes and that those routes were less safe than before. Opinions on dust, noise, and required paperwork were mixed. Most felt that there had been an increase in public complaints related to coal trucks.

In addition to responding to the questions, the public officials offered comments, which are summarized in the following:

- Changes in loads and number of trips are market-driven and are not a result of the extended-weight legislation.
- The condition of pavements has improved in the eastern coal field because of the money spent for paving and other repairs.
- Pavements in the western coal field are failing because they were not constructed to support the loads to which they are now subjected.
- A safety problem is created by heavily-loaded trucks approaching signalized intersections. These trucks are often unable to stop when the signal changes, and, as a result, they run the red light.

The following recommendations were offered:

- More vehicle safety checks and more loadometer stations are needed in the eastern coal field. Truck braking systems should be inspected more frequently.
- In the west, extended weights should be allowed only for semitrailers (or only for six-axle semitrailers), not for single-unit trucks.
- The five percent weight tolerance should be eliminated.
- Enforcement of weight limits needs to be increased/improved.
- Better planning is needed in determining which routes will be on the extended-weight system.

- More tax money should be used for repair of extended-weight roads.
- We should either eliminate the extended-weight legislation or raise the weight limits for everybody.

Comments on the legislation itself ranged from, "It was a good move," to, "It was the biggest hoax ever perpetrated on the people of Kentucky."

Coal Company Representatives:

The eight coal company representatives were asked to give their perceptions on the following:

- Changes in the truck fleet.
- Benefits or adverse effects of the extended-weight legislation.
- Required paperwork.
- Effects of the legislation on transportation costs.

Most of the coal companies hire independent operators to haul their coal, although several companies own their own trucks (some do both). There were mixed opinions on whether the total number of trucks had increased or decreased, but there was agreement that the number of single-unit trucks had decreased while the number of semitrailers (especially five-axle) had increased.

The majority of the coal company representatives felt that the extended-weight legislation had improved their profitability and efficiency and reduced the number of truck trips. They indicated an increase in paperwork and reporting requirements.

Comments offered by the coal company representatives included the following:

- Very overloaded coal trucks are in the minority.
- Most coal truck drivers are very safety-conscious and some have been known to "kill themselves" to avoid hitting other vehicles.
- The commercial driver law has improved safety in the eastern coal field.
- Changes in the coal market may far overshadow any effects of the extended-weight legislation.
- Utilities are taking advantage of the "buyer's market" by purchasing on the spot market rather than signing long-term contracts.
- The extended-weight legislation legitimized practices that were already going on before the legislation.
- Fiscal courts can make it difficult for some companies to get roads placed on the extended-weight system.

In addition, the following recommendations were offered:

- Safety inspection stations are needed in the eastern coal field.
- Pavements for extended-weight roads should be designed and constructed to carry the heavy loads.

- Roads should be allowed to be placed on the system without requiring 50,000 tons to be hauled over the road in the prior year. Also, roads should be added to the system on a more timely basis.
- Utility companies should contract with the trucker directly, rather than with the coal company.
- Tax and license fees for truckers should be eliminated.
- Action should be taken to lower workmen's compensation fees.
- Tax money needs to be returned for repair of extended-weight roads. The money appears to be going elsewhere.

Coal Trucking Company Representatives:

The nine representatives of coal trucking companies were asked to give their perceptions of the effects of the extended-weight system on the following:

- The trucking company's overall operation.
- Vehicle enforcement activity.
- Number of trips.
- Driver employment.
- Typical haul distances.
- Types of trucks used.
- Upgrades to power units or trailers.
- Operating costs.
- Paperwork requirements.

Most of the trucking company representatives responded that their operations had been affected by the extended-weight legislation. Most said that they had made changes to their truck fleet as a result of the legislation, with a trend toward larger trucks. Most of the representatives indicated that the number of trucks in their fleet had either increased or remained the same. The majority indicated that they were using larger trailers, and they were fairly evenly split on whether they had upgraded their existing power units.

Nearly all of the trucking company representatives indicated that their total operating costs had increased since before the legislation. The costs mentioned most often as having increased were registration/taxes and workmen's compensation.

Specific comments offered by the trucking company representatives included the following:

- Workmen's compensation costs have "sky-rocketed" and have put most single truckers out of business. Others have survived only by joining forces with other truckers to get group rates. Rates in Kentucky are twice as high as in Indiana. These rates are "killing the coal industry."
- The extended-weight legislation did not change the truckers' hauling practices, but it did change them from being "outlaws" to being legal.
- Most of the changes in coal truck trips have been market-driven rather

than a result of the extended-weight legislation.

- Truckers are at the mercy of coal operators.
- The extended-weight legislation is a good law if it is complied with.
- Some truckers have purchased six-axle semitrailers rather than five-axle in order to gain additional braking capacity, thus achieving enhanced safety.
- Some truckers reported limiting their drivers to 118,000 pounds gross weight in order to ensure safety for the driver and for other vehicles.
- Before the extended-weight legislation, trucks would automatically be illegal on some roads, because the empty weight exceeded 30,000 pounds.
- Some truckers in the eastern coal field commented that, due to operating costs, it was difficult for them to break even for loads of 120,000 pounds. One commented that he had to haul 135,000 pounds to make any profit. In the western field, several commented that they could break even at 110,000 to 115,000 pounds and make a little profit for 120,000 pound loads.
- Kentucky has the most progressive weight laws in the eastern United States. The law permits more axles, which is better for the pavements.

The following recommendations were offered:

- Weight laws should be enforced.
- More tax money should be sent back to repair the roads on the extended-weight system.
- Repairs to the extended-weight roads should be scheduled for cool-weather periods to improve the quality of the repairs.
- It should be easier and faster to get a road placed on the extended-weight system.
- Action needs to be taken to reduce workmen's compensation costs.

NEWSPAPERS

The public looks to newspapers for information on current events and for commentary on local issues and concerns. Newspapers can both reflect and influence public perceptions and sentiment. Therefore, it was deemed useful for this study to include a review of newspaper accounts dealing with coal trucks, coal-haul roads, and the extended-weight system.

Two newspapers were selected for inclusion in the review; The Lexington Herald-Leader and the (Louisville) Courier-Journal. In an attempt to gauge public perceptions during the debate and passage of the extended-weight legislation, searches were conducted to identify newspaper articles appearing during the period from January 1986 to March 1988. These searches were conducted by Herald-Leader and Courier-Journal staff, who then provided copies of applicable articles. Of the articles received from the Herald-Leader, only one was specifically related to the

extended-weight legislation. Four articles were identified from the Courier-Journal focusing on the extended-weight legislation. A sampling of these articles is included in Appendix B.

Two of the articles served primarily to describe the legislation and to explain the changes from the previous (1984) legislation. The other three described concerns of various groups about the effects of the legislation.

Legislators, counties, and communities expressed concern about the safety of school buses and other highway users, pavement damage, and quality of life for residents. One article described attempts by three counties and one community to get coal trucks rerouted. It is interesting to note that, in at least one case, the concerns being voiced by a community about coal trucks on a certain road had little to do with the extended-weight legislation, but had resulted from a decision by a utility company to switch from rail to truck.

The coal industry and enforcement agencies expressed concern about gaps in the system, major coal-haul routes being left off the system, and reduced weight limits for bridges.

Additional searches were conducted to identify articles related to coal transportation that have appeared over the last 3-5 years. The searches included the period of April 1988 through June 1993 for the Courier-Journal and January 1990 through June 1993 for the Herald-Leader, and identified a total of 72 articles. Of these, 41 were reports of accidents involving coal trucks, 14 dealt primarily with coal truck safety issues, five were related to economic issues of coal transportation, four were primarily about coal truck routing, three described public relations efforts by coal truck drivers, three dealt with a dispute over cars yielding right-of-way to coal trucks, and two discussed legislation related to coal trucks.

These newspaper accounts revealed two types of public perception of coal trucks. When individuals who depended on the coal industry for their livelihood were interviewed, then coal haulers were generally viewed as legitimate users of the road, following as many safety measures as a strained economic situation will allow. However, when persons outside the coal business were interviewed, coal trucks were generally perceived as a menace to the public, with negative impacts on road conditions, safety, and quality of life.

Safety was mentioned as a concern in nearly every article, and the extended-weight issue was used as a forum to express concerns about issues not strictly related to the extended-weight system, such as tarps on trucks, and bridge load limits in general. The ability of heavily-loaded trucks to stop for traffic signals was also a concern. Although safety was universally acknowledged as an important issue, the general perception was that little was being done (or could be done) to improve the situation. Positive steps in the area of safety, such as gravel being placed on a dirt road or warning lights installed in advance of an upcoming traffic signal, were reported in only a few articles. Rerouting of coal trucks for safety reasons was mentioned in several articles and had been performed in some cases. Ironically, one accident involving four fatalities occurred when a truck was on a new route due to rerouting. Citations and fines for safety and weight violations were perceived to be ineffective deterrents, due to insufficient quantity and dollar amounts.

Of the 41 reports of accidents involving coal trucks, only a few reported that

the coal truck appeared to be at fault. In fact, most such articles reported that the accident appeared to be caused by the other motorist, who (1) lost control of his/her vehicle, (2) pulled out directly in the path of an oncoming coal truck, or (3) ran into the back of a slow-moving coal truck. However, whether at-fault or not, the coal truck's involvement was always included in the headline for the article.

Right-of-way concerns on narrow roads were identified as an issue in several articles. In general, these articles focused on the right-of-way dispute and gave little mention to the condition of the road. Although potential damage to bridges was often mentioned, damage to pavements did not appear to be a major concern. Only one article centered on the upgrading (graveling and adding culverts) of a road which had been deemed unsafe.

Both newspapers ran articles on efforts being made by coal truck drivers to improve their public image. These articles discussed safety issues from the truckers' perspectives.

SUMMARY

In establishing the extended-weight system, the primary legislative objective was apparently to reduce the cost of coal transportation, thereby enhancing the competitiveness and profitability of the coal industry. Another primary objective was to eliminate the perceived need for coal haulers to violate the law in order to be competitive. A secondary objective was to gain some control over which routes could be used for coal hauling. Most legislators and coal industry representatives felt that the legislation had been successful in achieving its purpose.

There was consensus that the size of coal trucks has increased, with an increase in semitrailers. There was also general agreement that non-extended-weight routes were being used by trucks carrying extended-weight loads.

Pavement conditions in eastern Kentucky were viewed as improved, which was attributed to increased expenditures for paving and repairs. Pavements in western Kentucky were described as deteriorating, due to inability of the pavements to support the extended-weight trucks.

A safety concern exists regarding the ability of heavily-loaded trucks to stop at signalized intersections.

In newspaper articles, coal trucks are often portrayed as a menace to the public, with negative impacts on road conditions, safety, and quality of life. Several articles described attempts by communities to prevent coal trucks from using certain routes due to concerns over these issues.

In most newspaper articles describing accidents involving coal trucks, the accident appeared to be the fault of the "other driver," rather than the coal truck.

THE POPULATION OF COAL TRUCKS

TRENDS IN TYPES OF COAL TRUCKS

With passage of legislation establishing the Extended-Weight Coal Haul Road System, significantly increased load limits became permissible for both single-unit and combination trucks. In order to carry the heaviest loads (120,000-pound gross weight), trucks had to be registered in the 80,000-pound category, had to be tractor-semitrailer combinations with five or more axles, and had to have an extended-weight decal. Since establishment of the system in 1987, there have been changes in the types of trucks being used, either related to the economics of hauling increased loads or for other reasons not yet identified.

A sample of data from coal-haul roads in eastern Kentucky was analyzed to determine the trends in types of trucks being used to haul coal. Twenty-two sites were identified where vehicle classification data and manual counts of coal trucks had been collected in 1988 and 1992. The total number of trucks classified at these sites was 19,100 in 1988 and 21,200 in 1992, with the manual counts indicating about 15 percent coal trucks each year. Table 2 presents a summary of the classification data for all trucks. The data indicate a major shift in the proportions of single-unit trucks (both three-axle and four-axle) and six-axle tractor-semitrailer combinations. In 1992, the proportion of all trucks that were single-unit had decreased by about 20 percent from its 1988 value. This decrease was apparent in both three-axle and four-axle trucks. The proportion of all trucks that were six-axle tractor-semitrailer combinations more than doubled from 1988 to 1992, increasing by nearly 150 percent. It can probably be assumed that the extended-weight legislation was the primary justification for changes in the mix of trucks being used to haul coal. Combination six-axle trucks are more capable of hauling heavier loads without exceeding axle capacity ratings than are five-axle trucks. Observations in the coal-hauling regions and analysis of classification data clearly indicate that the six-axle truck has become the preferred truck for hauling coal.

Table 2. Summary of Vehicle Classification Data From a Sample of Coal-Haul Roads in 1988 and 1992

Truck Category	Percentage of Total Truck Traffic			
	1988	1992	Difference	% Change
3-Axle Straight	16.18	13.02	-3.16	-20
4-Axle Straight	4.07	3.35	-0.72	-18
5-Axle Semi	39.50	36.77	-2.73	-7
6-Axle Semi	2.66	6.53	3.87	+145
Other Trucks	37.59	40.33	2.74	+7
Total	100.00	100.00	---	---

THE POPULATION OF DECAL COAL TRUCKS AND FEES GENERATED

Extended-weight decals are purchased through the Department of Vehicle Regulation's Division of Vehicle Licensing. During the first calendar year (1987) after establishment of the Extended-Weight Coal Haul Road System, 4,154 decals were issued. This number of decals increased to 4,181 in 1988 and then decreased during each of the next four years through 1992, when 3,505 decals were issued. A summary of the numbers of decals issued for the calendar years of 1987 through 1992 is presented in Table 3.

Table 3. Summary of Decals Issued from 1987-1992

YEAR	NUMBER OF DECALS
1987	4,154
1988	4,181
1989	4,078
1990	4,031
1991	3,648
1992	3,505

A more detailed analysis of extended-weight decals and fees was conducted for the 1992-93 license year, which includes the period from May 1, 1992 through April 30, 1993. Copies of all decal applications approved during that license year were obtained from the Division of Vehicle Licensing. Selected information was extracted from the decal applications and was summarized.

Table 4. Summary of Decals Issued and Fees Paid By State (1992-93 License Year)

STATE	DECALS ISSUED	FEES PAID (DOLLARS)
Florida	1	360
Kentucky	2,890	774,929
Michigan	1	360
Ohio	32	9,330
Tennessee	35	5,237
Virginia	91	21,813
West Virginia	365	112,855
Indiana	45	8,567
Not Listed	11	2,760
TOTAL	3,471	936,211

Of the 3,471 decals issued in license year 1992-93, 2,890 were issued to Kentucky-based trucks and the remaining 581 were issued outside of Kentucky. Of the decals issued outside of Kentucky, 63 percent were issued to trucks based in West Virginia and 16 percent were issued to Virginia-based trucks. Decals were also issued to trucks in Florida, Michigan, Ohio, Tennessee, and Indiana. A summary of the decals issued by state is presented in Table 4.

The total amount of extended-weight decal fees generated during the 1992-93 truck license year was $936,211. Approximately 83 percent of the total income was collected from owners of trucks registered in Kentucky. Table 4 contains a breakdown of decal fees paid by state of registration.

The three basic weight categories for extended-weight decals are 90,000 pounds, 100,000 pounds, and 120,000 pounds; with fees of $160, $260, and $360, respectively. For all cases, the truck must be registered in the 80,000-pound category at the standard registration fee of $1,260 before an extended-weight decal can be purchased. There is also an incremental weight category for decals, which requires a fee of $10 for every 1,000 pounds above 80,000 pounds. For this incremental category, there is an additional restriction of 12,000 pounds for the steering axle and 20,000 pounds each for all other axles. For the 1992-93 license year, 65 percent of the decals were issued to trucks in the 120,000-pound category, and 31 percent were issued for the 90,000-pound category. Very few decals (4 percent) were issued in the 100,000-pound or incremental categories. A summary of decals issued and fees paid by weight category during the 1992-93 license year is presented in Table 5.

Table 5. Summary of Decals Issued and Fees Paid By Weight Category (1992-93 License Year)

WEIGHT CATEGORY (POUNDS)	DECALS ISSUED	FEES PAID (DOLLARS)
81,000 - 89,000	6	190
90,000	1,065	156,024
91,000 - 99,000	20	2,400
100,000	121	25,370
101,000 - 119,000	0	0
120,000	2,259	752,197
TOTAL	3,471	936,211

Within Kentucky, during the 1992-93 license year, decals were issued to truck owners in 52 counties. Counties with the most decals issued were Pike (654), Perry (367), Letcher (273), Floyd (172), and Johnson (118). These five counties represented 55 percent of all the decals issued. The distribution of decals issued by county in Kentucky is shown in Table 6. Table 6 also shows the total decal fees collected in each county. The five counties issuing the most decals account for 50 percent of the total income from decal sales in Kentucky.

As part of the legislation establishing the Extended-Weight Coal Haul Road System, 60 percent of the revenue from the sale of decals was designated for the maintenance and repair of state-maintained extended-weight roads. The remaining 40 percent is to be used by counties for the repair and maintenance of county-maintained extended-weight roads. One-half of the 40 percent is distributed to counties based on the mileage of county-maintained extended-weight roads in each county. The other half of the 40 percent is distributed based on the tons of coal transported over county-maintained extended-weight roads in each county. Table 7 shows the distribution of funds by county (for those funds collected during fiscal year 1991-92).

Another analysis was performed to determine the number of decals issued to individual companies or operators. The objective was to determine if the population of extended-weight trucks was generally representative of large company fleets or smaller operators with only a small number of trucks. It was determined that

Table 6. Decals Issued and Fees Paid by County (1992-93 License Year)

County	Decals Issued	Fees Paid (Dollars)	County	Decals Issued	Fees Paid (Dollars)
Bell	32	7,557	Lewis	4	540
Boyd	24	8,370	Logan	1	120
Breathitt	78	21,850	Lyon	3	480
Butler	10	2,999	McCreary	1	360
Caldwell	4	640	McLean	8	2,310
Campbell	4	1,200	Madison	3	780
Carter	32	10,980	Magoffin	124	38,727
Christian	3	270	Marshall	9	3,240
Clay	63	20,240	Martin	55	18,490
Daviess	36	10,930	Menifee	1	360
Edmonson	7	2,520	Morgan	26	7,570
Elliott	16	4,643	Muhlenburg	128	39,720
Estill	24	7,040	NIcholas	1	360
Fleming	6	2,160	Ohio	10	3,600
Floyd	172	49,810	Owsley	4	1,440
Gallatin	2	480	Pendleton	1	90
Greenup	3	1,080	Perry	367	89,789
Harlan	42	7,636	Pike	654	140,904
Henderson	4	730	Powell	17	5,520
Hopkins	98	29,040	Pulaski	57	14,070
Jefferson	3	780	Rowan	6	1,960
Johnson	118	40,590	Todd	2	520
Knott	18	3,150	Union	88	29,664
Knox	6	2,010	Warren	7	2,520
Laurel	28	8,650	Webster	57	17,823
Lawrence	69	22,530	Whitley	5	1,500
Lee	9	2,880	Wolfe	36	10,640
Leslie	31	4,067			
Letcher	273	67,000	Total	2,890	774,929

approximately 62 percent of the total decals purchased in the 1992-93 license year were purchased by companies or operators who purchased five or fewer decals. There were 841 operators who purchased only one decal each, accounting for 24 percent of the total decals issued. On the opposite end of the scale, there were nine companies

Table 7. Distribution Of Energy Recovery Road Funds By County (for Funds Collected during FY 1991-92)

County	Funds Allocated (Dollars)	County	Funds Allocated (Dollars)
Bell	17,144	Leslie	15,242
Boyd	2,880	Letcher	21,850
Breathitt	11,320	McCreary	3,192
Butler	2,303	Magoffin	2,793
Carter	753	Martin	12,924
Christian	2,730	Mason	1,757
Clay	8,351	Morgan	1,472
Clinton	2,756	Muhlenburg	4,381
Daviess	3,449	Ohio	3,802
Floyd	32,541	Owsley	1,121
Greenup	1,889	Perry	31,296
Harlan	7,902	Pike	93,124
Henderson	5,245	Pulaski	9,269
Hopkins	15,391	Union	904
Jackson	592	Wayne	8,611
Jefferson	764	Webster	13,696
Johnson	800	Whitley	9,168
Knott	22,129	Wolfe	1,286
Knox	9,278		
Lawrence	4,319	Total	388,421

which purchased 25 or more decals; representing 10 percent of the total decals issued. The largest number of decals purchased by a single company was 62. A summary of the number of decals purchased per company is presented in Table 8.

SUMMARY

There has been a dramatic increase in the role of six-axle trucks in coal transportation since 1988, and larger trucks now dominate coal movement over Kentucky's highways.

From 1987 to 1992, the number of extended-weight decals purchased declined by approximately 15 percent. Since the quantity of coal being transported by truck has not declined, the reduction in the number of decals must reflect either the shift toward larger (and fewer) trucks or a decision by some trucking companies to stop buying decals.

Table 8. Summary of Decals by Number of Decals Purchased (1992-93 License Year)

NUMBER DECALS ISSUED	NUMBER OF COMPANIES/ OPERATORS	TOTAL NUMBER OF DECALS
1 - 5	1320	2138
6 - 10	84	622
11 - 25	22	347
> 25	9	364

Decal sales amount to just under $1 million annually, of which about $600,000 is allocated for use on state-maintained extended-weight routes. Approximately two-thirds of all decals are issued to trucks in the 120,000-pound category.

Coal haulers in Kentucky are predominantly small-scale operators. Nearly one-fourth of all decals are purchased by single-truck operators. Over half are purchased by operators that have five or fewer trucks.

The purchasing of extended-weight decals is heavily concentrated in eastern Kentucky. Although decals were purchased in 52 of Kentucky's 120 counties, five counties (all in eastern Kentucky) accounted for one-half of the income from decals sold in Kentucky.

REVENUE AND COST ANALYSIS

The following section of this report is excerpted from the Kentucky Transportation Center's Research Report KTC-92-6, "Review of Highway Cost Allocation Methodologies" (1). This preliminary analysis was conducted as a part of a comprehensive cost allocation study (at the request of the Study Advisory Committee for that study). The base year for the analysis was 1990.

METHODOLOGY

A conventional cost allocation analysis, comparing the revenue generated by highway operations with the cost responsibilities occasioned by them, was not an especially attractive approach to analyzing economic effects of the extended-weight system. Available data were not expected to be sufficiently detailed to permit an accurate analysis, and resources were insufficient to permit extended study. More importantly, the general thesis that underlies state cost allocation efforts--namely, that roads and streets should be financed principally by their users--was suspect. If the extended-weight system was originally implemented to promote the economic welfare of the Commonwealth generally, then the general taxpayer could be expected to share a portion of the increased highway costs occasioned by heavier coal trucks. Since the coal decal fees are relatively small and insufficient to cover the highway cost increment, this may well have been the intent of the Legislature when it established the extended-weight system in 1986.

Even though a comprehensive cost allocation study was inappropriate, the revenue and cost implications of the extended-weight system remained of considerable interest. Certainly, additional revenue is being generated as a result of the coal-decal fees, and additional highway costs are being incurred to accommodate the heavier loadings. Quantifying and documenting these revenue and cost increments became the focus of this investigation.

Revenue implications of the extended-weight system are both direct and indirect. The coal decal fee is a direct implication, adequately documented and easy to comprehend. The indirect implications are more subtle. Larger payloads mean fewer trucks[1], and fewer trucks mean reduced registration fees and perhaps reduced fuel taxes. Because the effect of truck weight on fuel efficiency and, hence, on fuel taxes is not well documented, only two revenue sources, coal decal fees and truck registration fees, are evaluated herein.

It is well recognized that the costs of providing the highway infrastructure are influenced by the sizes and weights of the trucks that use them. Almost all cost elements are affected: larger vehicles generally require flatter slopes, wider cross sections, thicker pavements, stronger bridges, more frequent and extensive maintenance, etc. Generally, however, most investigators of large-truck impacts focus on the costs of constructing, maintaining, and replacing bridges, pavements, and

[1]Larger trucks would also generally mean fewer drivers, an unfortunate economic consequence in a depressed economy.

shoulders (5,6,7). Other cost effects of heavy trucks are more difficult to quantify.

The analysis reported herein focused on pavement overlay or restoration costs. Pavement overlay costs are substantial in Kentucky, and excellent data are available to quantify implications of the extended-weight system. Detailed examination of other pavement cost elements (construction, reconstruction, rehabilitation, and recurring maintenance) as well as bridge and shoulder cost elements is left to future investigations.

Geographically, the study was limited to the 75 extended-weight-system counties: 38 are classified as coal-producing counties and 37, as coal-impact counties. Only state-maintained highways, classified as either on the extended-weight system or on a base system, were considered. The base system included all highways of comparable functional classification as those included within the extended-weight system. It provided a frame of reference to which the extended-weight system could be compared. Analyses were disaggregated to the level of functional highway classification. System mileages for extended-weight and base systems are summarized in Table 9.

The base year for this analysis was 1990. However, to reduce the effects of minor year-by-year fluctuations and thus increase accuracy, 1989-1991 vehicle classification and weight data were used. In addition, average resurfacing frequency was based on experience during the period, 1988-1990, and average resurfacing costs, 1988-1991.

Table 9. System Mileages (State-Maintained Components)

Location	Extended-Weight System	Base System
Coal-Producing Counties	2,455	9,307
Coal-Impact Counties	718	7,577
All Counties	3,173	16,884

DATA REQUIREMENTS

The analysis required development of detailed information describing:

- System mileage,
- Average traffic volumes,
- Typical composition of the traffic stream,
- Average pavement damage factors (ESALs) by vehicle type,
- Average annual resurfacing mileage,
- Average unit costs of resurfacing, and
- Average rideability indices.

Basic data sources included files of the Divisions of Maintenance and Planning and the Pavement Management Branch. The detailed analysis is documented in Appendix C.

EXTENT AND COST OF RESURFACING PROGRAM

Approximately 1,470 miles of roadway on the extended-weight and base systems are resurfaced annually (Table 10) at a total cost of approximately $45.2 million (Table 11). The unit cost of the 1-inch resurfacing layer, including cost of surface preparation such as leveling and milling, averages approximately $31,000 per mile.

Table 10. Average Annual Resurfacing Mileage

Location	Extended-Weight System	Base System	Total
Coal-Producing Counties	370	485	855
Coal-Impact Counties	86	529	615
All Counties	456	1,014	1,470

Table 11. Equivalent Average Annual Resurfacing Costs (Millions)

Location	Extended-Weight System	Base System	Total
Coal-Producing Counties	$15.0	$12.0	$27.0
Coal-Impact Counties	$4.2	$14.0	$18.2
All Counties	$19.2	$26.0	$45.2

When comparing the extended-weight system with the base system, a considerably larger percentage of the extended-weight system is resurfaced each year (14.4 percent vs. 6.0 percent) at a substantially greater unit cost ($42,100 per mile vs. $25,700 per mile) (Tables 12 and 13, respectively). To better comprehend the net result of these differences, approximately $13.6 million would be saved annually if resurfacing of the extended-weight system had been programmed to the same norms (annual percentage of mileage resurfaced and average unit resurfacing costs) as the base system (Table 14).

Importantly, the $13.6 million increment can not be attributed solely to the heavier weights of the coal-decal trucks. Coal haulage would be concentrated on the extended-weight system even if increased truck weights were not permitted, and any such concentration of heavy trucks would intensify the rate of pavement wear and, hence, the costs of pavement restoration. Moreover, extended-weight highways carry

Table 12. Percent of Mileage Resurfaced Annually

Location	Extended-Weight System	Base System
Coal-Producing Counties	15.0	5.2
Coal-Impact Counties	12.0	7.0
All Counties	14.4	6.0

Table 13. Average Resurfacing Costs (Dollars per Mile)

Location	Extended-Weight System	Base System
Coal-Producing Counties	40,600	24,700
Coal-Impact Counties	48,500	26,600
All Counties	42,100	25,700

Table 14. Annual Resurfacing Cost Increment Beyond Base System Norms

Location	Expenditure Increment (Millions)
Coal-Producing Counties	$11.44
Coal-Impact Counties	$2.14
All Counties	$13.58

almost twice the traffic volume of base highways (Table 15), and their pavements are maintained to a slightly superior condition on average (Table 16). To accurately assess the incremental effect of the extended-weight system requires substantially more detailed analysis.

Table 15. Average Annual Daily Traffic

Location	Extended-Weight System	Base System
Coal-Producing Counties	4,350	2,187
Coal-Impact Counties	7,297	3,291
All Counties	5,017	2,682

Table 16. Average Rideability Index

Location	Extended-Weight System	Base System
Coal-Producing Counties	2.66	2.53
Coal-Impact Counties	3.19	2.75
All Counties	2.78	2.63

INCREMENTAL RESURFACING COSTS

As summarized above, pavement resurfacing costs for both the extended-weight system and the base system are known with reasonable accuracy. In order to determine the incremental resurfacing costs due solely to the extended-weight/coal-decal system, estimates are also required of "normal" resurfacing costs, costs that would have been incurred if coal-truck weight limits had been held to pre-extended-weight system levels. The difference, then, is the impact directly attributable to extended-weight limits.

The approach taken herein required two key assumptions. The first is that resurfacing costs are directly related to traffic wear as measured by equivalent-single-axle-loads (ESALs). This assumption seems reasonable although some have argued 1) that environmental factors also contribute to pavement wear and affect the frequency and cost of resurfacing and 2) that ESALs, originally developed as a measure of traffic damage for designing new pavements, may not accurately reflect traffic effects on pavement resurfacing frequency and cost.

The second key assumption is that 1) the volume of coal transported by highway and 2) the routes used for coal transport are unaffected by the extended-weight/coal-decal system. To the extent that effective competition exists between truck and train, the increase in trucking productivity resulting from increased payloads would ultimately increase both the volume of coal moving by highway and the cost of maintaining pavement surface condition to acceptable levels. To assume that coal tonnages on the highway system remain constant effectively understates the

impact of the extended-weight system. Nevertheless, accurate techniques for estimating coal tonnages that may have been diverted from the railroads were unavailable. Because of the way the extended-weight system is designated, that is, by coal haulage exceeding 50,000 tons per year, any initial effect of the extended-weight designation on the routes used for coal transport is likely to have been small. Because the extended-weight system is redesignated annually, it is not likely to affect the shipper's choice of route unless the extended-weight system eventually evolves into a "super" system of roadways designated and provided specifically for efficient coal transport.

The following summarizes the procedure used to determine incremental resurfacing costs:

- Determine the annual resurfacing cost for the extended-weight and base systems in the 75 extended-weight counties (Table C26);
- Determine the respective annual ESAL-miles for all traffic loads (Tables C21 and C22);
- Determine the resurfacing cost per ESAL-mile (Table C28);
- Determine the annual ESAL-miles due solely to coal-decal trucks (Table C29);
- Determine the percentage reduction in ESAL-miles by substituting trucks of conventional loading for coal-decal trucks (Table C30);
- Determine the hypothetical annual ESAL-miles due solely to lighter trucks that would substitute for coal-decal trucks (Table C31); and
- Determine the hypothetical resurfacing cost increment associated with the extended-weight/coal-decal system (Table C32).

As outlined above, the overall process for determining the resurfacing cost increment is generally straightforward given the detailed information that was accumulated for the statewide highway cost allocation study. The first of two exceptions involves determining the travel patterns of coal-decal trucks. Manually collected vehicle classification data record the total number of coal trucks (based on body style) and permit summary tabulations such as those of Tables C5 and C6 which show the percentage of coal trucks within the truck population as a function of roadway classification, extended-weight or base system, and coal-producing or coal-impact counties. Although these percentages would represent reasonable upper bounds, it is unfortunate that no traffic database identifies the particular subset of coal trucks displaying the special coal decals associated with the extended-weight system.

As a result, it was necessary to rely primarily on a smaller data set, that containing weight data, to identify coal-decal trucks. Any truck was considered to be

a coal-decal truck if its weight exceeded normal legal maximums (59,400 pounds for three-axle straight trucks, 77,000 pounds for four-axle straight trucks, and 80,000 pounds for five- and six-axle single-trailer trucks). This assumption resulted in two kinds of unavoidable error: conventional trucks carrying overloads were considered to have been decaled, and decaled trucks traveling empty or with partial loads were considered to be conventional trucks. The resulting percentages of decaled trucks (Tables C7 and C8) very likely understate their presence in the typical traffic stream. Because the size of the data base prevented reliable estimates for each of the functional classes, the only possible class distinction was between rural and urban facilities.

In addition to the difficulty of identifying coal-decal trucks, information was required on typical payloads both of coal-decal trucks and conventional coal trucks. Typical payloads were assumed to be the difference between legal maximum loading and empty (tare) weights. To determine empty weights of coal-decal trucks, a rather involved procedure was followed. Focussing on the routes most likely to be heavily populated by coal-decal trucks, extended-weight-system routes in coal-producing counties, typical axle spacings were determined for the more heavily laden trucks. Still concentrating on extended-weight-system routes in coal-producing counties, gross weight distributions were then obtained for the entire population of trucks within these axle-spacing ranges (Figures 10-13). Gross weight distributions for five- and six-axle trucks were bimodally shaped with the smaller mode representing typical empty weight and the larger mode representing typical loaded weight (Figures 12-13). Using an average empty weight of 40,000 pounds, the estimated payload for these trucks is 86,000 pounds.

Weight data for four-axle straight trucks were limited in extent. The gross weight distribution showed a peak at around 70,000 pounds, much lower than expected, with no observable peak in the range of "empty" weights. When empty, these trucks are apparently operated with the lift axle raised, making them appear to be three-axle trucks. The gross-weight distribution for three-axle trucks showed a broad peak in the "empty" weight range with local maxima at 29,000 and 35,000 pounds. It was assumed that the smaller maximum, 29,000 pounds, represented the average empty weight for the three-axle truck and that the larger maximum, 35,000 pounds, was representative of the empty, four-axle truck. For conventional coal trucks, empty weights were assumed to be 4,000 to 5,000 pounds lighter than for coal-decal trucks. The assumed truck weights for empty and loaded trucks with and without the coal-decal are presented in Table 17.

Results of the payload analysis are summarized in Table C30. Coal-decal trucks can carry much heavier payloads than conventional trucks, up to 41,000 pounds more for combination vehicles. ESAL computations, assuming fully loaded trucks, show that the increased payload is gained at the expense of greater pavement wear (Table C30). A fully-loaded combination truck with decal results in about 6.5 times more wear than a comparable fully-loaded conventional truck (Table C30). This effect is somewhat offset by the fact that a considerably larger number of conventional truck operations is necessary to move a given volume of coal than the number of decaled truck operations. The net reduction in ESAL-miles expected by replacing coal-decal trucks with conventional coal trucks ranges from about 42 to

Figure 10. Gross Weight Distribution of Three-Axle Single-Unit Trucks

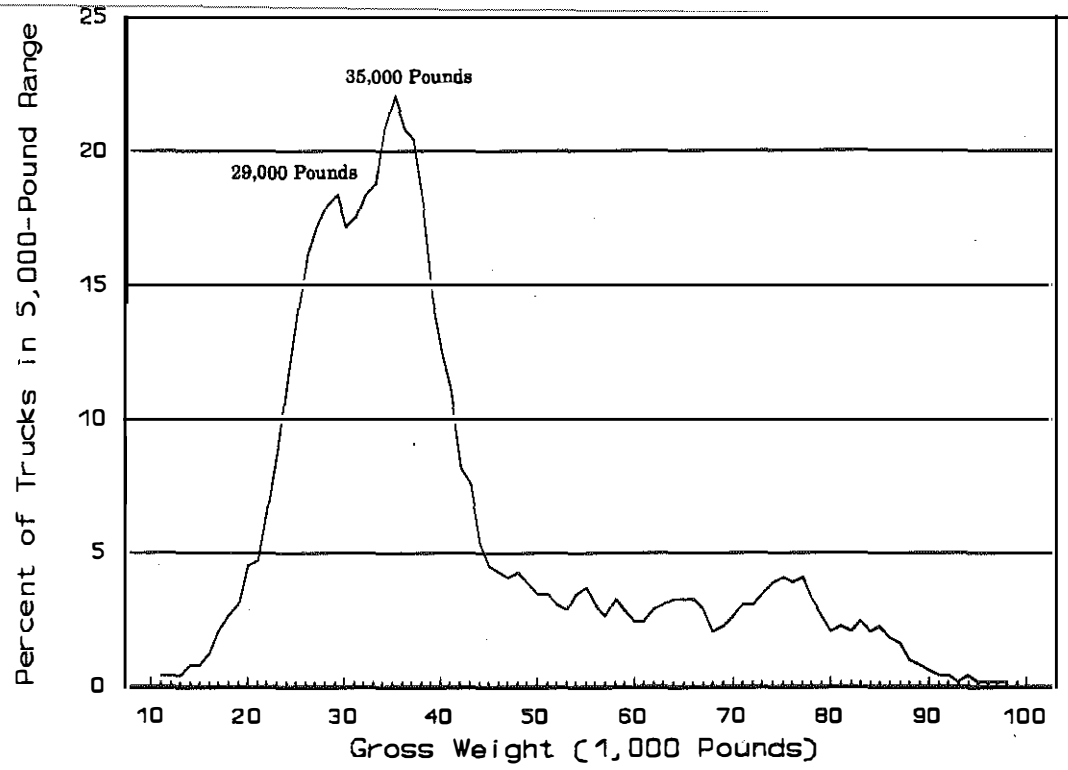


Figure 11. Gross Weight Distribution of Four-Axle, Single-Unit Trucks

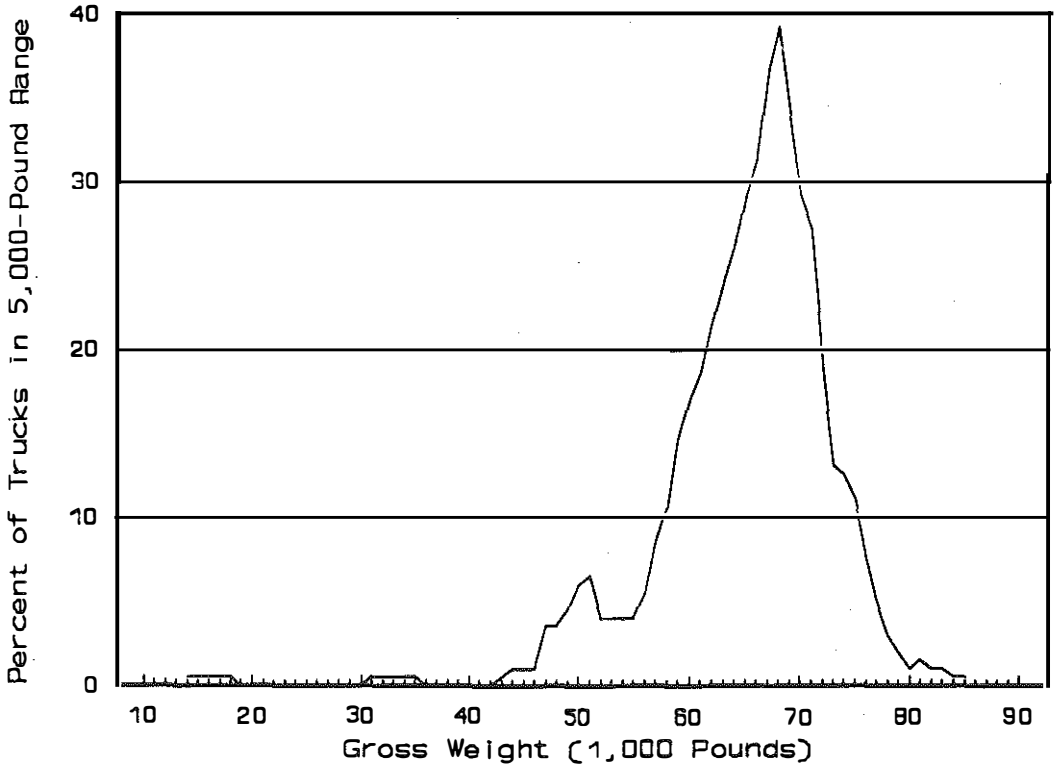


Figure 12. Gross Weight Distribution of Five-Axle, Semitrailer Trucks

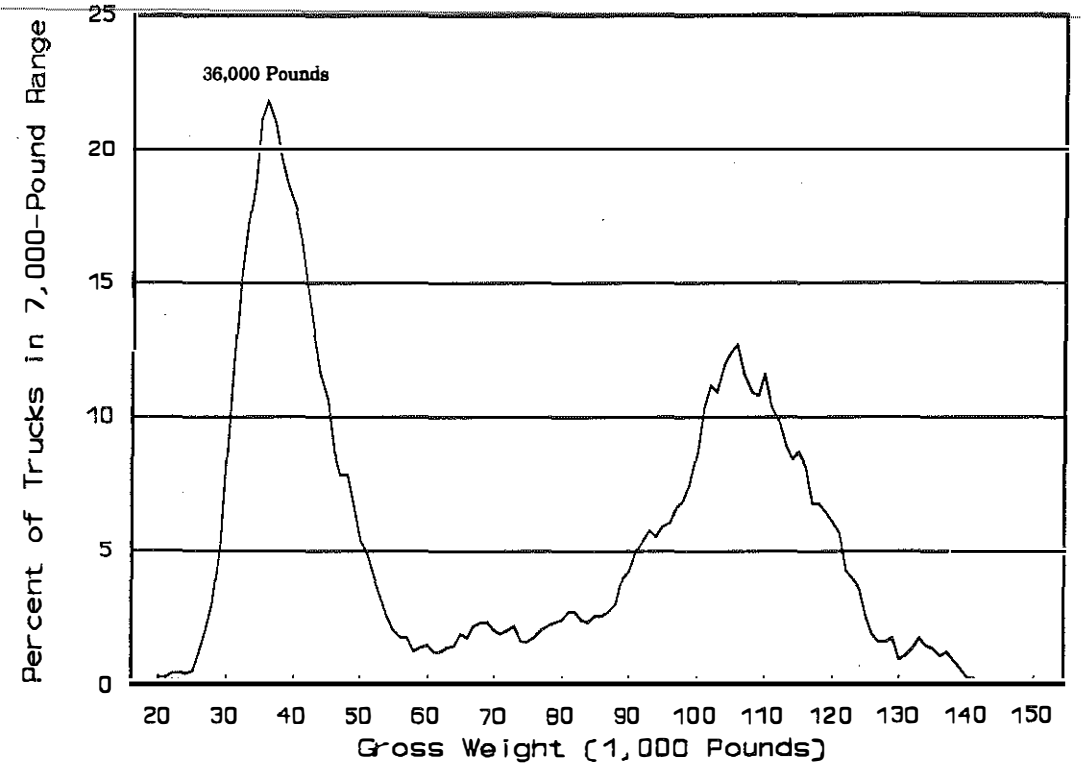


Figure 13. Gross Weight Distribution of Six-Axle, Semitrailer Trucks

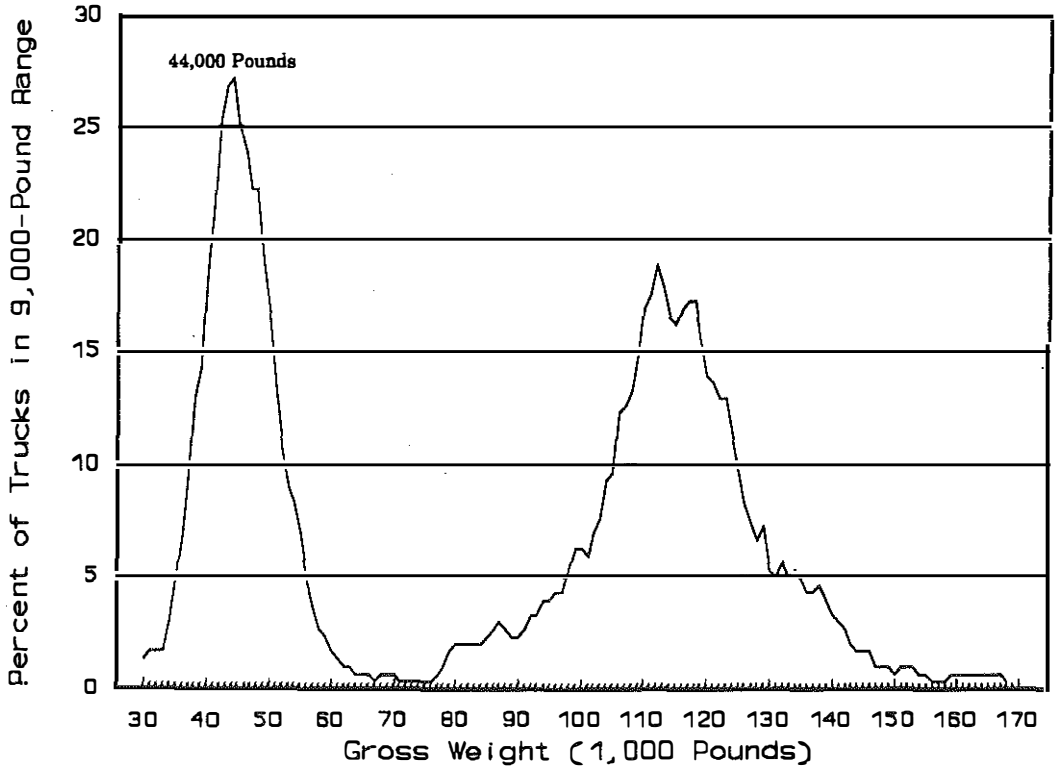


Table 17. Assumed Truck Weights

Coal-Truck Type	Gross Weight (Pounds)			
	Normal (Without Decal)		With Decal	
	Empty	Loaded[a]	Empty	Loaded[b]
3-Axle, Single-Unit	25,000	59,400	29,000	94,500
4-Axle, Single-Unit	31,000	77,000	35,000	105,000
Single-Trailer Trucks of 5 or More Axles	35,000	80,000	40,000	126,000

[a]Including 10-percent allowance for axle overload.
[b]Including 5-percent allowance for gross weight overload.

about 71 percent (Table C30).

Based on these considerations, the extended-weight/coal-decal system adds approximately $9.08 million annually to the cost of resurfacing pavements in the 75 extended-weight counties (Table 18). Interestingly, a full one-third of the added expense is for accommodating overweight trucks, whether decaled or not, on the base system.

Table 18. Annual Resurfacing Cost Increment Attributed to Coal-Decal System

Location	Expenditure Increment (Millions)		
	Extended-Weight System	Base System	Total
Coal-Producing Counties	$5.42	$2.03	$7.45
Coal-Impact Counties	$0.60	$1.03	$1.63
All Counties	$6.01	$3.07	$9.08

INCREMENTAL REVENUE

Of the total of 3,877 decaled coal trucks, approximately two-thirds were five- and six-axle combinations. Most of the remainder of the decals were issued to three-axle straight trucks (Table 19). Assuming the empty miles traveled by each truck equal the loaded miles, it is projected that average annual mileage are 26,000 miles, 60,000 miles, and 87,000 miles for three-axle, four-axle, and five- or six-axle coal trucks, respectively, assuming all operations are within the 75-county area.

Table 19. Annual Revenue Increment Generated by Coal-Decal System

Truck Type	Number of Coal Trucks with Decals	Decal Fees	Added Registration Fees (80,000-Pound Registration)	Lost Registration Fees (Fewer Trucks)	Total
3-Axle, Single Unit	1,217	$195,000	$871,000	($599,000)	$467,000
4-Axle, Single Unit	193	$50,000	$26,000	($113,000)	($37,000)
Single-Trailer Combination	2,467	$888,000	---	($2,832,000)	($1,944,000)
Total	3,877	$680,000*	$897,000	($3,544,000)	($1,967,000)

*Remaining 40 percent distributed to counties

Revenue from decal fees totaled approximately $1.1 million. Because 40 percent of these fees is distributed to local government, only about $680,000 is available for upkeep of the state-maintained highway system. Coal-decal trucks must also be registered at a gross weight of 80,000 pounds. Approximately $897,000 in added revenue was generated by this requirement, overwhelmingly from three-axle trucks.

Offsetting these sums are fees lost due to fewer truck registrations. To transport a given volume of coal requires a smaller fleet of heavier trucks than that of lighter trucks. Without the increased payload of decaled trucks, approximately 3,400 more coal trucks would theoretically be needed (Table C33). Because use of these trucks is not required under provisions of the extended-weight system, approximately $3.5 million in registration fees are lost annually. The net revenue effect of the extended-weight/coal-decal system is estimated to be a loss of almost $2 million in decal and registration fees (Table 19) that would otherwise be available for state-maintained highways.

PAVEMENT MAINTENANCE AND REHABILITATION COSTS

In Kentucky, pavement resurfacing and rehabilitation on the extended-weight system is addressed by two state-funded programs. The pavement resurfacing program (211 Account) is administered by the Division of Maintenance and essentially involves a thin overlay repair strategy. Usually, the thickness of this overlay varies from 1 to 1.5 inches, depending on the type of bituminous surface mix used. For pavements having more severe distress and for situations where estimates of ESALs indicate inadequate pavement structure, thick overlays are required in order to extend the fatigue life of the pavement structure. Those projects involving

thick overlays are administered through the Primary and Parkway rehabilitation program (212 Account). In addition to thick overlays, these projects also address other conditions for the roadway such as guardrail, drainage structures, etc. In summary, the resurfacing program typically addresses only the repair of the pavement where the parkway and primary rehabilitation program not only rehabilitates the pavement but also addresses the overall roadway section.

These two divergent approaches result in a considerable variation in cost per mile. The thin overlay costs are approximately $100,000 per mile for a four-lane roadway while the cost for the thicker overlay is approximately five times larger (ranging from approximately $350,000 to $730,000 per mile, with an average of $500,000 per mile). The cost per mile for the thin overlay rehabilitation concept probably is representative of average or perhaps below average rehabilitation costs whereas the expanded scope of the primary and parkway rehabilitation program results in much higher costs. Although a significant portion of the primary and parkway rehabilitation program costs has been spent on extended-weight system highways, determinations have not been made of the amount attributed specifically to the extended-weight/coal-decal system.

In addition to resurfacing and rehabilitation, pavements require annual maintenance, such as crack and joint filling, patching, chip sealing, and pothole repair. Preliminary indications suggest that pavement surface maintenance expenditures are greater in coal-producing regions than in other parts of the state. For example, maintenance costs in the four highway Districts producing most of Kentucky's coal (Districts 2, 10, 11, and 12) average almost $300 per mile more each year than in non-coal-producing regions (Table 20). However, whether more annual maintenance is required on extended-weight highways than on base-system highways has not yet been documented. Presumably, though, if maintenance programs are sensitive to the added pavement wear caused by heavier trucks, extended-weight pavements might prove more costly to maintain. On the other hand, their more frequent resurfacing might moderate maintenance demands.

Table 20. Average Annual Surface Maintenance Costs (Dollars per Mile)

Location	Rural Secondary (RS) System	Maintenance Project (MP) System	Total
Coal Producing Districts	$901	$1,035	$976
Other Highway Districts	$565	$723	$652

SUMMARY

The purpose of this special study was to examine the cost and revenue implications of Kentucky's extended-weight/coal-decal system. Although the

examination could be only partially completed within the framework of the available resources and time constraints, the following interim findings are significant:

- The extended-weight system, an extensive conduit for Kentucky coal, includes over 11 percent of the state-maintained mileage and carries over 19 percent of the vehicle miles of travel.

- Because heavier payloads mean fewer truck registrations, the coal-decal fee structure results in a net loss of revenue to the Road Fund, estimated at almost $2 million annually.

- The heavier weights of coal-decal trucks add approximate $9 million annually to pavement overlay costs.

- Larger and heavier trucks increase, to a yet undetermined extent, other highway costs including:

  - Construction and reconstruction of pavements, shoulders, bridges, and culverts;
  - Rehabilitation of pavements, shoulders, and bridges;
  - Routine maintenance of pavements and shoulders; and
  - Others.

ACCIDENT ANALYSIS

According to the 1992 Coal Haul Highway System Report (4), there were 39 coal producing counties and 55 coal impact counties in Kentucky in 1991. Within these 94 counties, 3,450 miles of roads were designated as being on the Extended-Weight Coal Haul Road System. For the analysis of accident data, all rural, two-lane, state-maintained highways within the 94 coal producing and coal impact counties were identified and classified as extended-weight or non-extended-weight. Accident rates and characteristics were then determined for each category. Accident rates were also determined for all rural, two-lane, state-maintained highways in Kentucky (all 120 counties). The process of determining accident rates and characteristics involved simultaneous use of three data files: the extended-weight system file, the Statewide Mileage File, and the accident data file. The accident data file included all accidents for the 1990-92 time period.

For the 94 coal producing and coal impact counties, segment lengths for rural, two-lane, state-maintained highways totalled 2,121 miles for extended-weight routes and 11,556 miles for non-extended-weight routes. The non-extended-weight routes were designated as the "base system" for this analysis. The total statewide mileage of rural,two-lane, state-maintained highways was 23,822 miles during the 1990-92 time period.

Table 21. Accident Rates for Rural Two-Lane Roads

Road System	System Mileage	Accident Rate per 100 Million Vehicle-Miles		
		All Accidents	Injury Accidents	Fatal Accidents
Extended-Weight	2,121	222	88	3.5
Base	11,556	241	90	2.9
Statewide	23,822	226	84	3.0

A basic comparison of accident rates is presented in Table 21. The results indicate that the overall accident rate for the extended-weight system is basically the same as the statewide rate. The rate for the base system is 7 to 9 percent higher than the extended-weight system rate and the statewide rate. Injury accident rates are similar for the three categories of highways, with the rates for the extended-weight and base systems slightly higher than the statewide rate. The greatest difference between the categories of highways occurs when comparing fatal accident rates. The extended-weight system shows a rate of 3.5 fatal accidents per 100 million vehicle-miles of travel, compared to rates of 2.9 for the base system and 3.0 statewide.

The analysis of accident characteristics focused on comparison of truck versus non-truck accidents on the extended-weight and base systems. The systems were again limited to rural, two-lane, state-maintained highways, and the 1990-92 time period was again used for the analysis. During the three-year time period considered, there were 4,649 truck accidents on the extended-weight system and 13,392 on the

base system. The results of this analysis are summarized in Tables 22-24.

Table 22 presents general accident characteristics for truck and non-truck accidents on the extended-weight and base systems. It is immediately apparent that a significantly higher percentage of truck accidents result in fatalities on the extended-weight system as compared to the base system (2.1 percent versus 1.2 percent). As expected, non-truck accidents have a lower percentage of fatal accidents on both systems. Truck accidents do not show a higher percentage of injury accidents than non-truck accidents, and there does not appear to be a significant difference between the extended-weight system and the base system with regard to percentage of injury accidents.

Table 23 presents directional analysis information for truck and non-truck accidents on the extended-weight and base systems. For truck accidents, the extended-weight system shows an overrepresentation of head-on collisions and opposite-direction sideswipe collisions. Comparing truck accidents to non-truck accidents, there is an overrepresentation of fixed object accidents (both systems), head-on collisions (extended-weight system only), same-direction sideswipe (both systems), opposite-direction sideswipe (both systems), parked vehicle (both systems), and vehicle overturned (both systems).

Table 24 contains a summary of data on contributing factors for truck and non-truck accidents on the extended-weight and base systems. For truck accidents, the extended-weight system shows higher percentages (compared to the base system) for the categories of slippery surface, unsafe speed, and oversize load. Water pooling, alcohol involvement, and defective brakes were also overrepresented on the extended-weight system. Comparing truck accidents to non-truck accidents on both systems, a higher percentage of truck accidents involved obstructed view, construction, improper passing, defective brakes, tire failure, and improper or oversize load.

Table 22. Characteristics of Truck and Non-Truck Accidents on Rural Two-Lane Roads

Accident Characteristics	TRUCK ACCIDENTS		NON-TRUCK ACCIDENTS	
	Extended-Weight	Base System	Extended-Weight	Base System
Number of Accidents	4,649	13,392	40,368	167,587
Percent Fatal Accidents	2.1	1.2	0.8	0.6
Percent Injury Accidents	29.4	25.1	29.2	27.4
Severity Index*	2.38	2.10	2.16	2.10
Road Surface				
Percent Wet Pavement	25.1	20.6	27.5	26.2
Percent Snow/Ice	1.8	2.5	2.7	3.1
Weather				
Percent Rain	19.3	15.6	21.5	20.1
Percent Snow/Ice	1.7	2.2	2.0	2.4
Light Condition				
Percent Darkness	16.4	18.2	23.9	24.8
Percent by Time of Day				
Midnight - 6 am	6.2	7.7	6.4	7.7
6 am - noon	37.1	35.9	24.2	24.5
noon - 6 pm	44.5	42.9	47.0	45.6
6 pm - midnight	12.2	13.6	22.4	22.2
Percent by Day of Week				
Weekday	89.1	85.6	74.6	74.8
Weekend	10.9	14.4	25.4	25.2
Percent by Month				
January - March	24.8	23.0	23.9	23.3
April - June	23.9	25.5	25.8	25.4
July - September	25.1	25.8	23.0	24.0
October - December	26.2	25.7	27.2	27.3

*Severity Index = (9.5(K+A) + 3.5(B+C) + PDO)/T

where K = number of fatal accidents
A = number of incapacitating injury accidents
B = number of non-incapacitating injury accidents
C = number of "possible" injury accidents
T = total number of accidents

Table 23. Directional Analysis for Truck and Non-Truck Accidents on Rural Two-Lane Roads

Directional Analysis Category	Percentage of Accidents for Each Directional Analysis Category			
	TRUCK ACCIDENTS		NON-TRUCK ACCIDENTS	
	Extended-Weight	Base System	Extended-Weight	Base System
Intersection	28.4	31.9	35.3	38.2
angle	9.5	10.5	15.8	17.1
rear end	9.9	10.0	12.1	12.5
left turn	0.7	0.7	1.4	1.6
fixed object	1.2	1.9	0.9	1.3
same-dir. sideswipe	3.5	4.1	2.5	2.5
other	3.6	4.8	2.6	3.2
Non-Intersection	71.6	68.1	64.7	61.8
rear end	17.3	16.6	21.0	17.9
head on	1.8	0.7	0.9	0.7
same dir. sideswipe	9.0	13.1	5.8	5.0
opp. dir. sideswipe	11.7	6.4	4.7	4.1
driveway-related	2.7	2.3	4.4	3.8
parked vehicle	3.1	3.6	1.8	2.1
fixed object	5.9	6.6	8.5	10.8
non-fixed object	1.0	0.8	0.8	0.7
ran off road	4.9	4.0	6.8	6.8
overturned	2.8	2.4	1.0	1.1
other	11.6	11.6	9.0	9.0

Table 24. Contributing Factors for Truck and Non-Truck Accidents on Rural Two-Lane Roads

	Contributing Factors	Percentage of Accidents for Each Contributing Factor			
		TRUCK ACCIDENTS		NON-TRUCK ACCIDENTS	
		Ext.-Weight	Base System	Ext.-Weight	Base System
ENVIRONMENTAL	Animals	1.5	1.7	3.4	3.5
	Glare	0.6	0.6	0.6	0.7
	Obstructed View	3.2	3.5	2.5	2.9
	Roadway Debris	0.6	0.9	0.7	0.6
	Poor Traffic Control	0.2	0.1	0.2	0.2
	Defective Shoulder	0.4	0.6	0.1	0.2
	Holes/Bumps	0.3	0.1	0.2	0.1
	Construction	0.7	1.2	0.2	0.5
	Poor Vehicle Parking	0.3	0.4	0.2	0.2
	Fixed Objects	0.3	0.2	0.1	0.1
	Slippery Surface	10.0	7.7	11.7	11.3
	Water Pooling	1.1	0.7	1.7	1.3
HUMAN	Unsafe Speed	4.8	3.6	5.1	4.8
	Ignore Right of Way	10.0	9.2	10.9	10.2
	Following Too Close	3.2	3.1	4.0	4.2
	Improper Passing	1.3	1.1	0.7	0.7
	Ignore Traffic Cont.	1.3	1.5	1.7	2.0
	Turning Improperly	1.5	2.2	1.3	1.3
	Alcohol Involvement	1.9	1.5	3.1	3.4
	Drug Involvement	0.1	0.1	0.2	0.2
	Sick	0.1	0.1	0.1	0.1
	Fell Asleep	0.7	1.0	0.7	0.9
	Lost Consciousness	0.1	0.1	0.2	0.2
	Driver Inattention	19.3	18.6	19.1	18.6
	Distraction	1.0	1.2	1.2	1.3
	Physical Disability	0.1	0.1	0.1	0.1
VEHICULAR	Defective Brakes	2.9	2.5	1.7	1.5
	Defective Headlights	0.1	0.0	0.1	0.0
	Other Lighting Def.	0.7	0.5	0.3	0.3
	Steering Failure	0.5	0.4	0.4	0.3
	Tire Failure	1.4	1.6	1.0	1.0
	Defective Tow Hitch	0.5	0.4	0.1	0.1
	Improper Load	1.4	1.1	0.2	0.1
	Oversized Load	1.2	0.7	0.1	0.1

PAVEMENT CONDITION ANALYSIS

In an attempt to measure changes in pavement conditions resulting from the extended-weight legislation, an analysis was performed of pavement rideability data for 1985 and 1990. Rideability indices are calculated from roughness data collected by the Pavement Management Branch, Division of Specialized Programs, Kentucky Department of Highways. Roughness measurements are collected with six sedans equipped with Mays Ride Meters and on-board microprocessors. Tests are conducted at 50 mph (when conditions allow) and in accordance with ASTM E 1082. The roughness results are converted to a rideability index (RI), with an RI scale ranging from zero to five. An RI value of zero means the pavement is too rough to be traveled at a reasonable speed without high risk to the driver. An RI value of five means the pavement is perfectly smooth. The RI scale can be viewed as follows (8):

Rideability Index	Rideability Assessment
4.0 to 5.0	Very Good Rideability
3.0 to 3.9	Good Rideability
2.0 to 2.9	Fair Rideability
1.0 to 1.9	Poor Rideability
0.0 to 0.9	Very Poor Rideability

For the analysis, copies of the statewide Rideability Index File for 1985 and 1990 were used. All segments for which data had been collected in both years were included in the analysis. The first summary included all such segments in the state. The second summary included only segments on the extended-weight system. The third summary further divided the extended-weight segments based on whether they were located in an eastern coal-producing county, western coal-producing county, or coal-impact county.

The results of the analysis are presented in Table 25. Nearly 15,000 miles of road segments were sampled in both 1985 and 1990. For these segments, the average rideability index rose from 2.81 in 1985 to 2.89 in 1990, representing approximately a three percent increase. Looking just at the extended-weight system, the average RI rose from 2.74 to 2.91, which is about a six percent increase. It is interesting to note that in 1985 the average RI was lower on the extended-weight system than on all routes, but in 1990 the extended-weight system had actually risen to be slightly above the statewide average.

Comparing results for the extended-weight routes in different parts of the state, we see that the average RI has increased substantially for eastern producing counties and impact counties but has remained virtually unchanged for the western producing counties. In both years, impact counties had the highest average RI, followed by western producing counties, with eastern producing counties having the lowest average RI.

Table 25. Rideability Data for State-Maintained Roads in 1985 and 1990

Road System	System Mileage for which RI Data Collected	1985 Avg. RI	1990 Avg. RI
All Roads	14,767	2.81	2.89
Extended-Weight Roads	2,310	2.74	2.91
Ext-Wt Roads, Eastern Producing Counties	1,545	2.57	2.75
Ext-Wt Roads, Western Producing Counties	215	3.06	3.05
Ext-Wt Roads, Impact Counties	550	3.11	3.28

CONCLUSIONS

Although this is an interim report and the findings presented are preliminary in nature, some conclusions can be drawn from the available information. The more significant of these preliminary conclusions are summarized in the following:

Legislative Intent and Results

1. The extended-weight legislation has apparently been somewhat successful in accomplishing its primary objectives: to enhance the competitiveness and economic viability of the Kentucky coal industry and to eliminate the perceived need for coal haulers to violate the law in order to be competitive. The willingness of coal transporters to purchase decals provides some evidence that cost reductions (at least equivalent in magnitude to the decal fees) have been realized by the industry. The effect (if any) of these cost savings on the competitiveness and economic viability of the industry has yet to be evaluated.

2. Another possible success of the legislation is reflected in the reports (supported by rideability data) of improved road conditions in eastern Kentucky. Although the funds generated from decal sales are obviously insufficient in amount to realize noticeable improvements, the legislation may have focused attention (and expenditures) on the maintenance of coal-haul roads. Unfortunately, while the condition of eastern Kentucky roads have improved, roads in western Kentucky are reported to be experiencing increased pavement damage due to heavy loads. However, a summary of rideability data for extended-weight roads in western Kentucky showed no significant change from 1985 to 1990.

Safety

1. In the area of safety, there is no indication of higher overall accident rates on the extended-weight system versus comparable, non-extended-weight routes. The fatal accident rate, however, is significantly higher on the extended-weight system and bears further investigation.

2. To the extent that the extended-weight system has reduced the number of coal trucks on the road, then it has reduced the frequency of coal-truck accidents (unless the heavier trucks have a greater propensity for accident involvement). Rates of truck accidents (and, more specifically, coal-truck accidents) per vehicle-mile of travel have yet to be determined.

3. Highway safety is certainly influenced by the interaction of vehicle characteristics (size, weight, etc.) and roadway characteristics (cross

section, geometry, traffic control, traffic volumes, etc.). The extended-weight legislation recognizes these interrelationships and provides limited mechanisms for the exclusion of highway segments from the extended-weight system on the basis of increased safety risk. The effectiveness of these mechanisms has yet to be evaluated.

4. Difficulty is experienced in stopping heavily laden coal trucks approaching signalized intersections (particularly on downgrades and where approach speeds are high). The extent of this problem and the effectiveness of possible countermeasures has yet to be evaluated.

Road User Revenue

1. Because heavier payloads mean fewer truck registrations, the coal-decal fee structure results in a net loss of revenue to the Road Fund, estimated at almost $2 million annually.

2. Forty percent of the revenue from decal sales is allocated to the counties for their upkeep of the county-road portion of the extended-weight system. Although relative expenditures on county-maintained and state-maintained portions of the extended-weight system are unknown, county-maintained roads comprise only about eight percent of the extended-weight system.

Highway Costs

1. The heavier weights of coal-decal trucks add approximately $9 million annually to pavement overlay costs.

2. Larger and heavier trucks increase, to an (as yet) undetermined extent, other highway costs including:
   - Construction and reconstruction of pavements, shoulders, bridges, and culverts;
   - Rehabilitation of pavements, shoulders, and bridges;
   - Routine maintenance of pavements and shoulders; and
   - Others.

3. Road users throughout the state are subsidizing the extended-weight system (and thus the movement of Kentucky coal) by underwriting the increased costs of maintaining and improving the infrastructure.

PRELIMINARY RECOMMENDATIONS

Because this is an interim report describing preliminary findings, it would be premature to offer specific recommendations at this point. However, there are certain areas where preliminary findings suggest some action may be appropriate. These are described, using general terms, in the following:

1. The methodology for defining which routes are included in the extended-weight system should be revisited to include some consideration for route geometry and cross section.

2. The definition of the extended-weight system should include provisions to add a sections of road to the system to prevent trucks from having to use non-extended-weight routes for portions of their trips.

3. Countermeasures for the heavy truck braking problem at signalized intersections should be evaluated and implemented expeditiously.

4. Consideration should be given to revising the allocation of dollars from the Energy Recovery Road Fund to more accurately reflect the composition of the extended-weight system mileage.

FUTURE WORK

The following have been identified as areas where further research is needed. Unless otherwise indicated, these areas will be addressed (to the extent possible) within the remaining time of this study.

1. The magnitude of cost savings realized by the Kentucky coal industry as a result of the extended-weight legislation will be investigated. An attempt will be made to assess the effect of these cost savings on the competitiveness and economic viability of the industry.

2. Ride quality data for coal-haul roads in eastern and western Kentucky will be further evaluated to more fully assess the impact of the legislation on pavement conditions. The evaluation will include additional years of data to account for possible year-to-year fluctuations, thus enhancing the reliability of the conclusions.

3. Accident rates for trucks (and, more specifically, for coal trucks) will be developed. A more detailed analysis of accident characteristics will be conducted for accidents involving coal trucks. The higher fatal accident rate on the extended-weight system will be investigated.

4. The effectiveness of existing procedures for excluding segments of roadway from the extended-weight system on the basis of increased safety risk will be assessed.

5. The problem of heavy coal trucks experiencing difficulty in stopping for signalized intersections will be investigated. The magnitude of the problem will be determined, and countermeasures will be evaluated.

6. The analysis of impacts of the extended-weight system on road user revenue and highway costs will be updated and expanded. Additional costs not considered in the original analysis will be incorporated.

7. Other impacts of the extended-weight system that have not yet been assessed will be evaluated.

8. Recommendations will be developed for mitigating negative impacts of the extended-weight system and for enhancing the ongoing management of the system.

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APPENDIX A

ISSUES SURROUNDING THE TRUCKING OF KENTUCKY COAL IN THE 1990'S

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The Coal Industry in the 1990's

In the early 1990's, the world balance in energy demand and supply has remained largely unchanged. Demand for electric power, and for the direct use of petroleum and natural gas has displayed remarkable stability, and available supplies seem abundant. Aging nuclear power plants, on the other hand, particularly in the U.S. and in the turbulent eastern half of Europe will soon force new decisions on the uses of fossil fuels. Whether coal will emerge as the fuel of choice, as the energy source that will replace abandoned nuclear power plants is highly uncertain. The world is generously endowed with petroleum reserves, and so long as these continue to flow amply from OPEC, from Russia, Kazakhstan, China, Mexico, Canada, and from elsewhere, there is little prospect for a new coal boom borne out of oil shortages and/or rising oil prices.

Historically, the welfare of the coal industry has closely paralleled the fortunes of the oil industry. The price of coal moves in the same direction as the price of petroleum, albeit at a lower level and with a time lag. This 'price-tracking' occurs because when the price of crude oil rises, coal becomes an increasingly attractive substitute. Expanding market demand tends to raise its price, abatements tend to reduce it.

A vivid illustration of the parallels between the petroleum and coal industries is provided by the coal-boom years of 1974-1975, and 1980 - 1981. Following the unexpected Arab actions of late 1974, and again in 1980, the price of coal, in particular the spot market price, rose to heretofore unimagined levels. The explanation is simple: embargo restrictions sharply reduced available oil supplies and prices of imported oil rose fivefold. Uncertainties concerning the future availability of adequate oil imports, coupled with sharply higher prices, generated a strong upward shift in the demand for its most suitable substitute: coal. As expected, the price of coal rose dramatically.

A similar situation developed in 1979 and 1980 following the political upheavals in Iran. Since then, however, the major oil-importing nations have reduced their reliance on Middle Eastern oil, have effectively implemented conservation measures, have built up strategic oil reserves, and have expanded the use of alternative energy resources. The consequence of these actions is that future interruptions in world oil supplies, so long as they are confined to modest proportions, are unlikely to have serious impacts on the economies of the developed world. The recent conflagration in Kuwait and the restrictions imposed on Iraq are a good example of this situation.

Most experts support the view that, in the long run, real petroleum prices will remain stable or continue to decline modestly under intense supply pressures. These pressures arise from an insatiable need for convertible currency on the part of many oil-producing nations--Iraq, Iran, Nigeria, Kuwait. These countries find it difficult to ignore the rewards yielded by circumventing OPEC production quotas and prices. The potential profits are an irresistible lure. And coal, which is very vulnerable to falling oil prices, is systematically squeezed out of many electric utility markets except in markets located very close to the coal mining states. Moreover, oil is clean, versatile, easy to handle, and has a higher energy content per unit of weight. When

compared with those of coal, petroleum's virtues are many.

In short, in the United States and in most of the developed West it is the electric power producing industry that is the principle user of coal. The economic health of the coal industry hinges on the growth in electric power demand and on the extent to which this demand is satisfied by coal-fired generating capacity. In a capital-short world, the high investment costs for new coal plants often are a powerful deterrent to their construction. Consequently, electric utilities often opt for the less-capital-intensive oil-fired facilities when deciding on new power plants. This trend will probably continue well into the next century.

The Demand for Coal and for its Transport in the 1990's

The preceding section highlighted briefly the traditional coal-oil linkage and the current relationship between the two industries. The section also attempted to look into the future, which is, at best, a hazardous game of chance. The review is important, however, because it has a direct bearing on the gravity of the issues that surround the transport of coal in Kentucky.

For several decades and continuing today, the transport of coal to markets is at times an activity given to controversy. The rail transport, trucking, and even the barging of coal to certain destinations can be highly competitive. In a shrinking market, competition intensifies as carriers seek to secure the largest possible share of the business. Offers to transport coal at lower prices abound and so long as coal can be transported in ever larger trucks with impunity, truck and load sizes will expand. That is the character of coal transport in numerous regions of the state today.

One of the more important questions that needs to be raised is to what extent we can expect the heavyweight coal truck problem to remain unchanged, decline, or escalate. Given the earlier review it would seem that the propensity to use coal to meet future energy demand depends on new post-year-2000 power plants that can remove more than 95 percent of the sulfur dioxide and at least 90 percent of the nitrogen oxide they produce. The recent Clean Air Act amendments represent a technological challenge to the industry. In the future, more stringent sulfur dioxide standards will be applied, but, more importantly, sulfur dioxide emissions are going to be capped permanently. Testing and evaluating the next generation of fluidized bed combustors--the pressurized systems--is under way but up scaled commercial uses are unlikely to be implemented in this century. Consequently, for the remainder of the decade we should not expect an expansion of the demand for coal based on new coal-fired capacity. Similarly, we should also not expect an intensified coal hauling problem. It is more probable that, short of new enforcement procedures and a revised permitting system, heavyweight coal trucks will continue to damage the roads over which they travel and continue to create a hazard for others. The problems will not escalate because the demand for coal will not increase. The range of trucking is limited after all, and trucks cannot compete with the railroads beyond a certain distance. Also, their travel on Interstate highways is circumscribed by Federal weight limits. Smaller trucks can, of course, move coal over longer distances, but the

per-ton costs are high.

In summary, the existing heavyweight trucking problem is likely to continue unless new administrative regulations are implemented to cap load limits below their present levels. In the future, an intensified road problem due to an increased demand for coal and for its transport is unlikely to develop. Whether or not road destruction and safety hazards can in fact be reduced depends on the political and administrative willingness of decision-makers to revise existing practices.

The State of Coal Mining in Kentucky

In the 1990's, the Coal Industry and all its supporting businesses no longer represent a sizable portion of the state's economy. The table below shows the relative decline of coal as a major force in the State's economic activities.

Table 1
Employment in Kentucky Coal Mining

Year	Number Employed (thousands)	Percent of Total
1991	28.3	1.9
1986	35.7	2.8
1981	45.0	3.8
1976	41.7	3.8
1972	26.4	2.7

Source: Kentucky Cabinet for Human Resources, Bureau for Manpower Services, Research and Statistics Branch

Table 1 shows the dramatic decline in employment between 1976 and 1991, and the attendant decline in the percent share in total non-manufacturing employment. In 1991, only 28,300 persons worked in coal mining, which is but 1.9 percent of the non-manufacturing labor force. The drop in coal mining employment in Kentucky was particularly severe in 1991, the onset of the recession. It dropped by 13 percent during that year.

Coupled with the decline in employment is a constancy in production and value as shown in Table 2.

Table 2
Kentucky Coal Production (bituminous)
(thousands of short tons)

Year	Quantity	Value (millions of $)
1991	158,980	4,046.0
1986	153,933	3,994.5
1981	157,560	4,608.6
1976	140,000	2,665.0
1971	119,389	774.7

Source: U.S. Dept. of Interior, Bureau of Mines, Minerals Industry Surveys.

Fewer miners were able to produce equal or greater amounts of coal because productivity increased. Each miner was able to produce more with the equipment in use or with the new equipment. Prices per ton of coal declined, however, so that total value created changed only modestly.

Of the many sectors that make up the Kentucky economy and generate its aggregate income, only coal mining declined in value. Table 3 shows the steady decline in personal income earned in coal mining over the past ten years.

Table 3
Personal Income in Mining
(in millions of $)

1991	1,516.0
1986	1,821.0
1981	2,182.0

Source: U.S. Department of Commerce, Bureau of Economic Analysis, State Personal Income, Kentucky Economic Information System, September 1992.

Finally, it may be useful to briefly review Severance Tax Collections for coal. Table 4 shows that for the past ten years, taxes collected declined substantially.

Table 4
Coal Tax Collections
(in millions of $)

1991	184.103
1986	193.881
1981	209.708

Between 1981 and 1991, these tax revenues declined by more than 12 percent.

In summary, the coal industry today is a far smaller industry in the state than it once was. Based on employment, it ranks in size with the apparel and other textile products industry and the industrial machinery production industry. It is inevitable that its influence has declined.

The Trucking of Coal in Eastern Kentucky

Historically, while trucks are important in the movement of coal from mine to consumer, they are most important in the move from mine to rail or mine to waterway. In Appalachia, typically 20 percent of the coal moved to consumers directly has been by truck; in Eastern Kentucky, the percentage was only 12 percent[1]. The statistics, unfortunately, are somewhat dated, but more current ones do not appear to be available. When heavy coal trucks use public roads for haulage, they impose considerable maintenance costs on the public. They are large and intimidating and, because the terrain in Eastern Kentucky is extreme and subject to the effects of seasonal temperature variations, maintenance problems with deteriorating roads emerge. One such problem, often ignored, is the isolation of many rural regions. Another is the cost burden of repairs which is carried by Kentucky taxpayers who live elsewhere and have nothing to do with the coal industry. Because so many coal consumers are located outside of Kentucky--in New England, the mid- and south-Atlantic regions--their consumption of Kentucky coal is indirectly subsidized by all those whose tax dollars support road maintenance and repair.

In the mid to late 1980s, the average distance of truck shipments of coal declined by nearly one half. The striking decline is explained in part by the closure of distant, inefficient mines and competition from more efficient, closer mines. The trend is continuing in the present, very weak market for coal, except for a few power plants located at or near the coal producing regions.

Externality Costs In The Market Place

Under most conditions, markets can solve quite efficiently the problem of resource allocation. Prices, which fluctuate in accordance with the levels of demand for and the supply of goods represent signals to buyers and sellers and allow them to adjust their behavior. In an ideal situation, the system functions as described. In the world around us, however, relationships are much more complex and the market system sometimes fails. From the standpoint of resource management, which is at the heart of most regulation of the coal industry, the market fails often.

Two major sources of market failure can be distinguished. Both are the result of the fact that everyone's economic activities directly or indirectly affect the well-

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[1] Wilbur Smith and Associates, The Coal Transportation Role of the Appalachian Development Highway System, 1982, p9

being of others. Many of these effects are termed externalities--or spillover effects--and they are ubiquitous.

First, many resources are not governed by a well-defined and enforceable set of property rights. These resources are not owned privately and therefore are not sold in the market. Because the absence of prices precludes their sale, no market signals exist to govern their use. Roads are not sold; their use is open to all (except, of course, in the case of a few remaining toll roads).

Second, the public-good nature of many environmental resources, including roads, requires some form of non-private, i.e. public, intervention in the market. The intervenor is usually a government agency or a quasi-public institution, and its role is to ascertain that appropriate quantities of the resources are used and preserved by society. Roads, which are used by all, are such a public-good resource.

Because external (or spillover) costs are often ignored by the market, the true cost of production and consumption of a commodity can be understated. The competitive price system is based on the premise of full-cost pricing, that is, on the premise that the total cost of producing a commodity (e.g., electric power generated by coal) is borne by the person using it. If the user bears only part of the cost, the private cost, resources are not put to their socially optimal use. Someone other than the user bears a portion of the cost. This is exactly the situation with public roads damaged by overweight coal trucks. Someone other than the ultimate user of the coal is bearing a portion of the cost of bringing a kilowatt-hour to market. These others include the users of the damaged roads and the general taxpayers who subsidize the maintenance, repair, and construction of these roads.

The use of roads over which coal is hauled is distributed without charge because it would be infeasible to collect revenues from those who use them. And even if some revenues are collected from trucks whose loads exceed a given limit--the 'extended weight decal'--these amounts are rarely adequate to defray road maintenance expenses. Ultimately, the use of general public funds becomes inevitable.

Whenever a good or service has a "publicness" about it, as roads do, its full marginal cost cannot be captured easily or completely. Consequently, the use of these roads remains below the social optimum. In an effort to approach the socially optimal quantity of public goods or services produced, a public authority is often set up. Its purpose is to maintain an appropriate quantity of undamaged usable roads. It attempts to meet its goals through regulation and the enforcement of road standards.

Shifting the 'Spillover' Costs

For at least 25 years, evidence collected by state authorities shows that weight limitations on Eastern Kentucky roads are regularly exceeded by coal trucks. Tolerated by several state enforcing bureaus, and practically ignored by County Judicial authorities, overweight coal trucks represent a safety and health hazard to all persons obliged to travel the affected roads. Heavyweight coal trucks, which often exceed the load-bearing capacities of the travelled roads, create a cost which is not

paid by the truck owners, by the coal consumer (i.e. electric power utility and their customers), or by the coal mining companies. Instead, the costs--termed 'externality costs' in the literature because they arise 'external' to the transacted production-distribution-consumption axis--are shifted to those who travel the roads. In effect, the final consumer of coal transported by truck (or by any other type of carrier) fails to pay the entire cost of consuming that which he (or she) buys. If he happens to be a typical city resident who uses coal-generated electricity, he fails to pay the complete cost of producing and distributing a kilowatt-hour of electricity. Instead, he pays somewhat less, and, as a consequence, consumes more than he would if he were required to pay full cost.

Actually, the consumer cannot be faulted--he pays what is asked of him. He is the captive of a natural monopoly sanctioned by society for time-honored reasons. It would be clearly unwise to allow two electric utilities to compete for the same business, although prices would probably be lower. One cannot fault the public utility either for paying less for the delivered coal than it should if the externality costs were properly distributed and imputed. One can also not fault the truck owner for driving his (or her) truck with heavy loads. The truck driver is typically a small entrepreneur attempting to maximize profits by loading as much onto the truck as capacity will permit.

The coal mine operator also cannot be held responsible because, once the coal leaves the mining site, the mine operator has no further jurisdiction or interest in the nature of the distribution or consumption cycle.

The clear responsibility for safeguarding the road system--its construction, maintenance, rehabilitation, and expansion--lies with the public authorities charged with these tasks. The marketplace cannot accommodate every possible externality cost created by producers and even consumers. The marketplace functions, but not always perfectly. When there is a divergence between the private and social cost of producing a commodity or service, a clear case can be made for public intervention. There is no one else; unless, of course, the industry itself decides to 'internalize' the externality costs--that is, to distribute them according to their appropriate source within the industry. But this is unlikely to occur. The industry itself is far too fragmented, its interests far too diverse to be able to properly absorb and allocate the externality costs. Therefore, by default, it becomes the responsibility of a public agency to protect the interests of those to whom the externality cost is shifted--the travelers of the affected roads.

Redistributing the Road Degradation Burden

The road degradation generated by heavyweight coal trucks can be viewed as a tax on mining area residents because it is a burden the residents cannot escape unless mining activity is removed from the region. For obvious economic, sociological, and political reasons, this is not a feasible alternative. Until the late 1960s, the residents largely accepted the burden, which materially lowered their real income and well-being. Moreover the burden (or tax) is regressive when related to income, because most coal-consuming regions have higher income levels than the coal-

producing regions.

People in Appalachia accepted damaged roads because there was no alternative, and poor roads became part of their expectations. Their cars would require earlier and more frequent repairs, as would school buses, ambulances, fire trucks, etc.. It took longer to travel from point A to point B, and, because trucks regularly violated the law with impunity, respect for the law began to erode.

After the late 1960's, new safety and environmental legislation at state and federal levels was adopted, designed to forestall the emergence of externalities. The intent was to internalize these so that the private costs would correspond more closely with the social costs of mining coal. In the case of road usage by coal trucks, the intent was to enforce weight limits diligently, levy fines where appropriate, and use the funds to rehabilitate or strengthen the road surfaces. It was hoped that coal trucks would abide by load limits and avoid the time/costs of being weighed, cited, and when appropriated, fined by the judicial authorities. However, insurmountable political, legal, and administrative obstacles rendered the intent void. Today, the problem of road degradation continues, as does the redistributed burden away from coal consumers and onto the private road users.

Strategies to Regulate Road Use

There exist many different forms of regulation and control in the coal industry. To review them all would be an immense task. It is however, useful to examine several strategies that are available to regulatory bodies for intervening in the market on behalf of road users.

First, charges could be levied on the users of roads which would vary in accordance with the marginal damage created by each use. Although many would consider this the best and fairest strategy, from an administrative and political standpoint it would be infeasible to implement.

A second strategy represents a piecemeal approach to road preservation. Maximum weight limits per truck axle could be set that correspond to the ability of the road to bear the burden. So long as the predetermined flow of trucks remains constant, road integrity could be preserved. If however, more coal trucks use the haul roads, their integrity will deteriorate despite the statutory limits. The piece-meal approach can be and is used selectively, but it is not a comprehensive or optimal solution.

The third and often widely used strategy, although not necessarily the best, is government regulation and containment of the effects on roads. State authorities issue licenses and permits to those whose activities affect the environment, i.e. affect public roads. But users of these roads often select their own transport mix--that is, a mix of small, medium, or heavy, trucks with different numbers of axles. The problem is that what may be optimum for one transport firm in a particular mining region may be less than optimum for another. What is appropriate from a cost and effect standpoint in region A may not be appropriate for region B. Consequently, final product prices may once again fail to reflect the true social resource cost of transporting coal.

All three strategies identified require some enforcement. If voluntary compliance could be elicited, this would be ideal and far less expensive. It would obviate the need to use court procedures to adjudicate conflicts and violations. it would also reduce court-induced time delays and the use of technicalities to override substance.

Relying on voluntary compliance with road standards generates another benefit. It eliminates "perverse incentive" behavior. For example, a violator of weight limits can devise that it is less expensive in the long run to fight a licensing or decal requirement in the courts than to comply with it. The violator may conclude that it is to his (or her) advantage to transport coal without a decal and to fight a citation or desist order in the courts rather than to comply. By the time a verdict is rendered, the transporter may have no further use for the roads, and even after paying legal costs and a possible fine, the profit from transporting heavy loads is sufficient to have made the venture financially successful. Voluntary compliance would have been preferable in such a case.

Finally, it ought to be recognized that regulations--and particularly their enforcement--are subject to political whim. Bargaining strengths and political influence frequently dictate outcome. More often than not, controversies are resolved in favor of the regulated and, over time, regulatory zeal and effectiveness diminish. Over the long term, regulatory effects are typically less certain, particularly when contrasted with the more enduring nature of charges imposed on road damage.

The Acceptable-Standards Approach to Road Integrity

The ideal method of preventing road degradation during coal transport would be to implement an optimal tax rate on degradation which would make it 'profitable' for truck operators not to damage the roads they use transporting coal.
Unfortunately, information required to implement such a tax is practically unavailable. Public authorities in Kentucky, however, attempt to attain the same objective not through taxation, but through the sale of extended weight decals. Unfortunately, the revenues thus collected are woefully inadequate to restore road integrity or encourage transporters to carry smaller loads. The decal cost is so minimal as to have little influence, if any, on load sizes.

There is, however, another way--through the use of an acceptable-standards approach which promotes economic satisficing (in essence making the best of a bad situation) rather than optimizing[2]. For each mining region, however circumscribed, a standard would be established in terms of an 'acceptable' amount of road degradation. This standard could be established by querying users of the roads, or by putting before the voters in the region the question of how much road damage they would be willing to tolerate.

If they are willing to tolerate substantial road degradation, the decal fee would

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[2] W.J. Baumol, "Taxation and Control of Externalities," American Economic Review, June 1972.

be set at a low level. In contrast, if they are intent on experiencing zero road degradation, the decal fee would be set at a high level. Modest amounts of acceptable road damage would engender a fee in between.

If an acceptable standard of road degradation and the costs of repair can be defined, and there is no reason why this cannot be done, then specifying a workable tax, incentives, or decal-fee policy becomes the primary question. The extended-weight decal for trucking coal is an existing policy tool that is, in fact, quite close to a tax on road degradation. The decal fees, however, need to be higher than the costs of road repair if the authorities wish to induce truckers to pay for the road damage they create. In Kentucky, they are not.

If the externality costs created by heavyweight coal trucks are a function of road usage, which they probably are, the level of the decal fees should be structured accordingly. The fees need not necessarily be a uniform charge, but could rise with the intensity of road use. In short, the more a heavyweight coal truck uses and degrades a given road section, the higher the decal fee ought to be. A uniform decal fee, as presently in use, encourages rather than discourages intensive road usage, and thereby road damage.

Tailoring the decal fee system to achieve a road standard may also reduce the administrative costs of some of the regulatory controls such as axle weight inspections. Some of each region's resources presently devoted to direct road and truck inspections and control probably could be shifted elsewhere. In fact, when the aim is to achieve an acceptable standard of road reclamation, direct controls on trucks may be redundant. If the decal fee on road degradation is set high enough, truckers would choose to alter their trucking process--lighter loads, smaller trucks. A small number of inspections of the roads should be sufficient to determine whether the state of road conditions meets the acceptable standards.

It is probable that during the initial period of implementing a decal fee system some truckers will reject the purchase of an expensive decal and haul coal without it. In such a situation, it may be necessary for the authorities to strictly enforce the extended-weight decal requirement. They may have to monitor such purchases diligently and carry out occasional road inspections. It may also be necessary to couple this with a bonding requirement, very much like the performance bonds that are required in surface mining. If a trucker rejects the purchase of an extended-weight decal, he (or she) may be required to deposit a performance bond.

Finally, communities and regions should be free to change the acceptable standard for road degradation at a future time. When heightened concern over road degradation by heavyweight trucks is evident to citizens and policymakers, one would expect tighter standards to emerge. A change in standards need not imply an expansion of control over the industry. An upward adjustment in the decal fee should be sufficient to ensure that the rate of degradation is adjusted and road integrity is preserved.

APPENDIX B

SAMPLING OF NEWSPAPER ARTICLES RELATED TO EXTENDED WEIGHT COAL HAUL ROAD SYSTEM

(Articles Reproduced by Permission of the Louisville Courier-Journal and the Associated Press)

The Courier-Journal April 2, 1986

Overweight fee for coal trucks is increased by legislature

By LIVINGSTON TAYLOR
Staff Writer

FRANKFORT, Ky. — State approval of overweight coal hauling would become easier next year under the Kentucky legislature's latest plan to deal with the persistent problem.

The House and Senate yesterday passed and sent to Gov. Martha Layne Collins an amended version of House Bill 978 which would direct, rather than authorize, the Department of Highways to approve applications from coal interests for cooperative agreements to maintain coal-haul roads carrying overweight loads.

The bill would permit truckers to haul loads up to 120,000 pounds, compared to the usual 80,000-pound maximum, by paying an additional fee of up to $360 a year.

The bill will take effect on next April 1, unless vetoed by Collins. A veto seems unlikely because the Transportation Cabinet did not oppose the bill.

Under existing law, passed in 1984, coal truckers can run at weights up to 120,000 pounds by either paying a $50 fee and getting state approval of a cooperative road-maintenance agreement or by paying a 5-cent or 10-cent-a-ton tax based on hauling distance.

The revenue goes to a restricted fund for maintenance of coal-haul roads.

However, the 1984 law has not worked as intended. Since it went into effect July 13, 1984, only $394,000 has been collected.

Of 2,129 applications, the state Transportation Cabinet has approved less than half, 1,034, according to cabinet figures.

Cabinet engineers found that many bridges on proposed coal-haul routes were "not of sufficient strength or durability" to allow use by overweight trucks, Sandra Pullen, a staff adviser to the transportation secretary, said in an interview yesterday.

"We couldn't approve the plans because our approving the plans said, 'Yes, we think it's perfectly all right for you all to run at those weights over those bridges,'" she said.

"When we didn't approve the plans, we didn't collect any money and they (the truckers) continued to operate overweight without our approval and without paying," Ms. Pullen said.

Under HB 978, the Department of Highways retains the power to set lower weight limits on bridges "when in its judgment any bridge ... may by reason of its design or deterioration be damaged or destroyed to the point of catastrophic failure."

"It changes the position of the cabinet because now the legislature has said it's OK for them to run over everything that is not in danger of actual collapse," Ms. Pullen said.

"The fact that ... the bridge deck is going to get rough and so forth is not to be a concern of the Transportation Cabinet," she said.

Of the cabinet's position on the bill, she said, "We believe it to be better than the existing law and in that respect we are for it."

HB 978 also provides that:

✔ Overweight trucks could run on any road over which more than 50,000 tons of coal is transported per year, except federal interstate highways.

✔ Yearly fees for overweight trucks would be $160 for a single-unit truck having one steering axle and two axles in tandem and gross weight up to 90,000 pounds; $260 for a single-unit truck having one steering axle and three axles in tridem arrangement and gross weight up to 100,000 pounds; $360 for tractor-semitrailer combinations with five or more axles and gross weight up to 120,000 pounds.

All limits are subject to a five per cent tolerance, meaning legal loads could reach 126,000 pounds.

✔ Heavy coal trucks would be exempt from the above fee as well as the normal $840-a-year registration fee if the truck while full is driven only on roads covered by cooperative agreements calling for the operators to contribute to road-maintenance costs.

✔ Sixty percent of the revenue would be used on state-maintained coal-haul roads and 40 per cent would be divided among coal counties in proportion to miles of coal-haul roads and tonnage transported.

✔ A county fiscal court or governing body of a first- through fourth-class city could ask the state transportation secretary to delete roads from the overweight system because of "inherent and definite hazards or special conditions."

✔ Violators of weight limits could be fined up to $500 on a sliding scale ranging from three cents per pound for the first 3,000 pounds over the limit to nine cents a pound when the excess exceeds 5,000 pounds.

✔ Overweight trucks operating without paying the extra fee or not in accordance with a cooperative agreement could be impounded by the Transportation Cabinet until the fee and all costs have been paid.

Drafting a law which could win support from elected judges in coal-field counties and also protect roads from undue damage has been a longstanding problem.

The version of HB 978 passed yesterday came out of the Senate Transportation Committee.

The chairman, Sen. Woody May, D-West Liberty, said the committee was trying "to seek some solution where district judges could enforce the law and still allow trucks to haul coal on certain roads in Eastern Kentucky."

Asked if he's concerned about damage to roads and bridges caused by the bill, May said, "Not particularly because they (coal truckers) are already hauling the same amount of (over) weight.

May said the bill may lead to lighter loads because it will encourage truckers to stay within the new limits and because of the sliding scale of fines.

The House sponsor of HB 978, Rep. Clayton Little, D-Hartley, predicted district judges would be more inclined to enforce weight limits under the new system.

"It sets up a system where a judge can be equitable in his fining," Little said.

NOTE: This news article also included photographs of Rep. Clayton Little and Sen. Woody May. However, these photographs could not be reproduced with proper quality for this appendix.

Danville, three counties protest higher weight limits for trucks

Associated Press

HARRODSBURG, Ky. — Resolutions from three Central Kentucky counties and Danville that object to heavy coal trucks passing through their areas will be reviewed by the Transportation Cabinet next week at a public hearing on a new truck-weight law.

Under the law passed last year, truck owners who pay a $360 annual fee can exceed the 80,000-pound limit and operate five-axle trucks weighing up to 120,000 pounds or six-axle trucks weighing up to 140,000 pounds.

"We should just do away with them, really, but we can't do that," Mercer County Attorney Doug Greenburg said.

Mercer, Boyle and Jessamine counties, as well as Danville in Boyle County, have asked the state to reroute the trucks, and Transportation spokeswoman Mary Mulloy said the matter will be reviewed at the Jan. 22 hearing in Frankfort.

The traffic has been especially heavy on U.S. 68 in Jessamine and Mercer counties since Lexington-based Kentucky Utilities Co. switched from trains to trucks in early 1985 to save money in transporting coal to its E. W. Brown power plant at Dix Dam.

Greenburg said county officials would like the state to throw out the new law or limit the provision that allows coal trucks to exceed the 80,000-pound limit with payment of the annual fee.

His county's resolution notes damage along U.S. 68, U.S. 127, KY 33 and KY 342, and to the nuisance that county officials say property owners in the areas must endure.

The truck traffic is a "general detraction from the quality of the area," said Ed Music, Danville's city manager.

The city asked last May that KY 33 through Danville be exempted from the new weight law. In December, city officials passed a resolution against any coal-truck traffic on KY 33 and KY 34.

Jessamine County officials also passed a resolution in December to restrict coal-truck travel on U.S. 27 and U.S. 68, and Boyle County officials passed their resolution in the same month pertaining to KY 33 and KY 52.

U.S. 68 in Mercer County is a two-lane highway not constructed to stand up to heavy coal-truck traffic, Greenburg said.

"You can see where the edges of the road are crumbling away," he said. "The guardrails have been knocked down and bent over, and there are a lot of indications of other damage along U.S. 68."

The dangers do not end with the physical condition of the roads, area residents said.

Jean Long, who lives along U.S. 68 in Mercer County, said she and her husband "are just very careful getting in and out of the driveway.

"If they come around the corner on us, we've had it," Long said.

Coal-truck weight law is criticized by all sides

By AL CROSS
Staff Writer

FRANKFORT, Ky. — The third time hasn't been the charm for Kentucky lawmakers, regulators, citizens and coal haulers who want to do something about one of the state's most chronic problems — overweight coal trucks.

All four sides were represented yesterday at a hearing on regulations implementing the latest law on coal hauling, the third in three regular sessions of the General Assembly. As usual, none of the four was happy.

One legislator said the 1986 session capitulated to the coal industry when it raised the legal maximum weight for coal trucks on major coal-haul roads from 84,000 pounds to 126,000 pounds. One of his colleagues said the law isn't being implemented liberally enough.

A map shows coal-haul roads that will have higher weight limits. Page B 1.

Spokesmen for the industry said the state Transportation Cabinet has interpreted the statute so narrowly that many major coal-haul roads won't get higher weight limits.

Cabinet officials said during interviews that the law doesn't allow them to change the list of roads before summer at the earliest, and that the new scheme poses huge enforcement and safety problems — particularly on bridges and other short sections of major coal-haul routes that will still have lower weight limits.

The problem goes beyond the coalfields; several citizens from Mercer and Boyle counties in Central Kentucky complained about coal-truck traffic in their area.

Here's a look at each of the problems:

List of roads — The new law, which takes effect April 1, allows truckers who pay extra fees to haul heavier loads on highways used to carry more than 50,000 tons of coal in 1985.

That would seem to include all the state's major coal-haul roules and many of the minor ones, but the proposed regulation does not.

That's because the state depends on coal companies to tell it how much coal is hauled where, and many companies filed inaccurate reports or no reports at all, because the reporting law has no penalties, said Bill Caylor, vice president and attorney for the Kentucky Coal Association.

That has left sections of some major coal-haul routes — the Bert T. Combs Mountain Parkway, for example — off the list of roads getting heavier weights.

The list includes 3,812 miles of roads in

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Back page, col. 3, this section

Coal-hauling law is criticized

Continued from Page One

67 counties. The coal industry wants the opportunity to amend its reports, so that roads can be added, but state Transportation officials say the law doesn't allow them to do that, especially because the reports have already been used to distribute severance-tax money to local governments.

The officials say they are trying to assemble the 1986 reports as fast as they can so the list of roads can be changed as early as next summer. The law requires the list to be updated no later than Nov. 1 of each year, using figures from the previous year.

But the law's sponsor, Rep. Clayton Little, D-Virgie, said it was passed with the intention that every coal-haul road get a heavier weight limit. Caylor submitted about 175 miles of roads that he said should be added to the list, including at least one that would serve a mine that hasn't opened yet.

Enforcement — There are three kinds of gaps in the system of heavy-weight roads: the sections missing because of bad reporting; interstate highways, which federal law bars from the system; and bridges, which have been the major obstacle to coal interests' efforts for higher weight limits.

Taken together, the gaps will pose major enforcement problems for the Department of Vehicle Regulation, officials of the Transportation Cabinet said before the hearing.

Sandra Pullen, assistant to Transportation Secretary C. Leslie Dawson, and Mike Noyes, an attorney for the cabinet, said they expect many truckers to shoot the gaps and hope to avoid detection.

One of the best examples, they said, is the 1.4-mile section of Interstate 64 at Winchester that connects the Bert T. Combs Mountain Parkway and KY 627, a major coal route leading north.

The weight limits vary with the type of truck: 90,000 pounds for a single-unit truck with two load-bearing axles, 100,000 for a single-unit truck with three load-bearing axles and 120,000 for tractor-trailer combinations with five or more axles.

All limits are subject to a 5 percent tolerance, so the effective legal maximum is 126,000 pounds, or 63 tons.

The officials said it will be difficult to keep trucks off the less-sturdy bridges, because state law appears to require that a vehicle-enforcement officer actually see an overweight truck cross a bridge before issuing a citation.

Safety — About 600 of the 3,000 bridges on the heavy-weight system will have weight limits lower than those on the roads that cross them, under a section of the law allowing the Cabinet to set lower limits for bridges that "may ... be damaged or destroyed to the point of catastrophic failure" by heavy vehicles.

Transportation officials said they use national standards to determine which bridges can carry heavier weights.

Little said, however, that the bridges are already bearing weights double the legal limits and that the officials "are building hypothetical situations" in considering the risk of bridge collapses.

However, Pullen said at the hearing that the weight limits are as low as one ton. She told the audience, "There is a glitch in the system."

Local problems — The law allows counties and fourth-class and larger cities to ask the Transportation secretary to remove roads in their jurisdictions from the heavy-weight system.

The fiscal courts of Boyle, Jessamine and Mercer counties and the Danville City Commission have asked Dawson to remove U.S. 68, U.S. 127 and KY 33, which truckers use to deliver coal to a Kentucky Utilities Co. steam plant at Dix Dam.

Several people from the area came to the hearing to urge Dawson to grant the local officials' request. They said coal trucks pose big traffic hazards now and would become even more dangerous if the weight limit were increased — especially on U.S. 68, which winds around hills bordering the Kentucky River.

State Rep. Tom Jones, D-Lawrenceburg, who represents Mercer County, said the legislature "capitulated to the coal industry" by passing the law.

David Burnett, who works for a Williamsburg coal company, apologized for the "inconveniences" caused by the coal traffic and said such problems could be alleviated if the state used more coal-tax money to build better roads.

APPENDIX C

DETAILS OF REVENUE AND COST ANALYSIS FOR EXTENDED WEIGHT COAL HAUL ROAD SYSTEM

TABLE C1. MILEAGE OF EXTENDED-WEIGHT SYSTEM (ROADWAY MILES)

FUNCTIONAL CLASS	STATE-MAINTAINED HIGHWAYS	NON-STATE-MAINTAINED HIGHWAYS	TOTAL
	COAL-PRODUCING COUNTIES		
2	539.0	---	539.0
6	163.4	---	163.4
7	936.3	---	936.3
8	480.4	---	480.4
9	102.1	---	102.1
12	27.6	---	27.6
14	25.4	---	25.4
16	80.6	---	80.6
17	5.8	---	5.8
Unclassified	94.4	264.3	358.7
Subtotal	2,455.0	264.3	2,719.3
	COAL-IMPACT COUNTIES		
2	112.2	---	112.2
6	227.9	---	227.9
7	145.7	---	145.7
8	1.8	---	1.8
9	11.0	---	11.0
12	22.7	---	22.7
14	91.9	---	91.9
16	41.9	---	41.9
17	---	---	---
Unclassified	63.1	2.8	65.9
Subtotal	718.2	2.8	721.0
	ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	651.2	---	651.2
6	391.3	---	391.3
7	1,082.0	---	1,082.0
8	482.2	---	482.2
9	113.1	---	113.1
12	50.3	---	50.3
14	117.3	---	117.3
16	122.5	---	122.5
17	5.8	---	5.8
Unclassified	157.5	267.1	424.6
Total	3,173.2	267.1	3,440.3

TABLE C2. MILEAGE OF BASE SYSTEM (ROADWAY MILES)

FUNCTIONAL CLASS	STATE-MAINTAINED HIGHWAYS	NON-STATE-MAINTAINED HIGHWAYS	TOTAL
	COAL-PRODUCING COUNTIES		
2	662.5	---	662.5
6	379.1	---	379.1
7	2,476.2	---	2,476.2
8	3,439.5	2.3	3,441.8
9	1,015.4	1.6	1,017.0
12	41.5	---	41.5
14	95.1	.7	95.8
16	179.7	14.7	194.4
17	83.7	37.4	121.1
Unclassified	934.7	---	934.7
Subtotal	9,307.4	56.7	9,364.1
	COAL-IMPACT COUNTIES		
2	252.0	---	252.0
6	479.4	---	479.4
7	1,780.8	---	1,780.8
8	2,631.6	---	2,631.6
9	795.1	1.5	796.6
12	51.9	---	51.9
14	269.9	2.4	272.3
16	397.5	15.5	413.0
17	105.3	56.5	161.8
Unclassified	813.1	---	813.1
Subtotal	7,576.6	75.9	7,652.5
	ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	914.5	---	914.5
6	858.5	---	858.5
7	4,257.0	---	4,257.0
8	6,071.1	2.3	6,073.4
9	1,810.5	3.1	1,813.6
12	93.4	---	93.4
14	365.0	3.1	368.1
16	577.2	30.2	607.4
17	189.0	93.9	282.9
Unclassified	1,747.8	---	1,747.8
Total	16,884.0	132.6	17,016.6

TABLE C3. AVERAGE ANNUAL DAILY TRAFFIC ON EXTENDED-WEIGHT SYSTEM (VEHICLES PER DAY)

FUNCTIONAL CLASS	STATE-MAINTAINED HIGHWAYS	NON-STATE-MAINTAINED HIGHWAYS	TOTAL
COAL-PRODUCING COUNTIES			
2	7,464	---	7,464
6	4,460	---	4,460
7	2,638	---	2,638
8	1,675	---	1,675
9	4,154	---	4,154
12	16,539	---	16,539
14	23,180	---	23,180
16	9,208	---	9,208
17	4,568	---	4,568
Unclassified	4,389	N/A	N/A
Average	4,350	N/A	N/A
COAL-IMPACT COUNTIES			
2	7,862	---	7,862
6	4,303	---	4,303
7	3,206	---	3,206
8	428	---	428
9	713	---	713
12	22,049	---	22,049
14	13,037	---	13,037
16	16,072	---	16,072
17	---	---	---
Unclassified	8,397	N/A	N/A
Average	7,297	N/A	N/A
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	7,533	---	7,533
6	4,369	---	4,369
7	2,714	---	2,714
8	1,670	---	1,670
9	3,819	---	3,819
12	19,026	---	19,026
14	15,233	---	15,233
16	11,556	---	11,556
17	4,568	---	4,568
Unclassified	5,995	N/A	N/A
Average	5,017	N/A	N/A

TABLE C4. AVERAGE ANNUAL DAILY TRAFFIC ON BASE SYSTEM (VEHICLES PER DAY)

FUNCTIONAL CLASS	STATE-MAINTAINED HIGHWAYS	NON-STATE-MAINTAINED HIGHWAYS	TOTAL
COAL-PRODUCING COUNTIES			
2	6,825	---	6,825
6	3,975	---	3,975
7	1,894	---	1,894
8	678	646	678
9	729	83	728
12	10,846	---	10,846
14	15,531	9,480	15,486
16	6,236	8,215	6,385
17	2,592	3,112	2,753
Unclassified	3,526	---	3,526
Average	2,187	4,328	2,200
COAL-IMPACT COUNTIES			
2	6,450	---	6,450
6	3,436	---	3,436
7	1,642	---	1,642
8	557	---	557
9	430	133	429
12	14,350	---	14,350
14	17,186	26,525	17,268
16	9,429	10,422	9,467
17	4,239	4,199	4,225
Unclassified	9,045	---	9,045
Average	3,291	6,095	3,319
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	6,722	---	6,722
6	3,674	---	3,674
7	1,789	---	1,789
8	626	646	626
9	598	107	597
12	12,793	---	12,793
14	16,755	22,676	16,804
16	8,435	9,348	8,478
17	3,510	3,766	3,594
Unclassified	6,094	---	5,785
Average	2,682	5,340	2,671

TABLE C5. PERCENTAGE OF TRUCKS WITH COAL ON EXTENDED-WEIGHT SYSTEM

FUNCTIONAL CLASS	STATE-MAINTAINED HIGHWAYS	NON-STATE-MAINTAINED HIGHWAYS
COAL-PRODUCING COUNTIES		
2	16.32	---
6	17.69	---
7	25.79	---
8	36.43	---
9	N/A	---
12	5.05	---
14	8.57	---
16	1.06	---
17	N/A	---
Unclassified	N/A	N/A
COAL-IMPACT COUNTIES		
2	.09	---
6	.81	---
7	3.64	---
8	N/A	---
9	N/A	---
12	.00	---
14	.00	---
16	N/A	---
17	---	---
Unclassified	N/A	N/A
ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	11.47	---
6	12.06	---
7	23.27	---
8	36.43	---
9	N/A	---
12	2.54	---
14	4.65	---
16	1.06	---
17	N/A	---
Unclassified	N/A	N/A

TABLE C6. PERCENTAGE OF TRUCKS WITH COAL ON BASE SYSTEM

FUNCTIONAL CLASS	STATE-MAINTAINED HIGHWAYS	NON-STATE-MAINTAINED HIGHWAYS
COAL-PRODUCING COUNTIES		
2	19.75	---
6	8.84	---
7	19.00	---
8	25.10	N/A
9	N/A	N/A
12	N/A	---
14	.00	N/A
16	.08	N/A
17	N/A	N/A
Unclassified	N/A	---
COAL-IMPACT COUNTIES		
2	.00	---
6	.73	---
7	2.16	---
8	N/A	---
9	N/A	N/A
12	.00	---
14	.00	N/A
16	.00	N/A
17	N/A	N/A
Unclassified	N/A	---
ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	10.55	---
6	7.04	---
7	16.23	---
8	25.10	N/A
9	N/A	N/A
12	.00	---
14	.00	N/A
16	.03	N/A
17	N/A	N/A
Unclassified	N/A	---

TABLE C7. PERCENTAGE OF TRUCKS WITH COAL DECAL ON EXTENDED-WEIGHT SYSTEM

FUNCTIONAL CLASS	PERCENT OF SU-3A WITH DECAL (59,400 LBS +)	PERCENT OF SU-4A WITH DECAL (77,000 LBS +)	PERCENT OF C-5A + WITH DECAL (80,000 LBS +)
	COAL-PRODUCING COUNTIES		
2	11.76	11.89	22.77
6	11.76	11.89	22.77
7	11.76	11.89	22.77
8	11.76	11.89	22.77
9	11.76	11.89	22.77
12	2.35	2.56	3.25
14	2.35	2.56	3.25
16	2.35	2.56	3.25
17	2.35	2.56	3.25
Unclassified			
Average			
	COAL-IMPACT COUNTIES		
2	3.25	3.51	6.71
6	3.25	3.51	6.71
7	3.25	3.51	6.71
8	3.25	3.51	6.71
9	3.25	3.51	6.71
12	1.99	.82	2.04
14	1.99	.82	2.04
16	1.99	.82	2.04
17	1.99	.82	2.04
Unclassified			
Average			

TABLE C8. PERCENTAGE OF TRUCKS WITH COAL DECAL ON BASE SYSTEM

FUNCTIONAL CLASS	PERCENT OF SU-3A WITH DECAL (59,400 LBS +)	PERCENT OF SU-4A WITH DECAL (77,000 LBS +)	PERCENT OF C-5A + WITH DECAL (80,000 LBS +)
	COAL-PRODUCING COUNTIES		
2	4.33	.00	11.48
6	4.33	.00	11.48
7	4.33	.00	11.48
8	4.33	.00	11.48
9	4.33	.00	11.48
12	1.49	15.38	18.88
14	1.49	15.38	18.88
16	1.49	15.38	18.88
17	1.49	15.38	18.88
Unclassified			
Average			
	COAL-IMPACT COUNTIES		
2	1.99	2.56	6.09
6	1.99	2.56	6.09
7	1.99	2.56	6.09
8	1.99	2.56	6.09
9	1.99	2.56	6.09
12	2.50	3.45	3.85
14	2.50	3.45	3.85
16	2.50	3.45	3.85
17	2.50	3.45	3.85
Unclassified			
Average			

TABLE C9. VEHICLE-TYPE PERCENTAGES ON EXTENDED-WEIGHT SYSTEM

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS				SINGLE-TRAILER TRUCKS			MULTI-TRAILER TRUCKS			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	
COAL-PRODUCING COUNTIES														
2	.17	54.06	.20	31.61	2.72	2.04	.78	.33	4.57	2.86	.64	.02	.00	100.00
6	.28	56.99	.12	32.64	1.90	1.99	.34	.23	1.91	3.56	.03	.01	.00	100.00
7	.21	55.01	.27	33.20	2.17	2.65	.93	.27	3.55	1.56	.17	.01	.00	100.00
8	.40	47.14	.38	37.22	2.09	2.35	3.64	.59	4.43	1.73	.03	.00	.00	100.00
9														.00
12	.09	71.96	.29	20.23	1.23	.91	.67	.35	2.36	1.84	.06	.01	.00	100.00
14	.42	63.76	.18	25.71	2.32	1.17	.37	.51	4.88	.57	.10	.00	.01	100.00
16	1.09	75.83	.35	17.66	1.33	1.35	.24	.69	1.09	.17	.00	.00	.20	100.00
17														.00
Unclassified														.00
COAL-IMPACT COUNTIES														
2	.21	63.72	.16	25.73	2.45	1.10	.21	.80	3.72	1.54	.25	.10	.01	100.00
6	.44	57.05	.21	30.68	1.89	2.75	1.23	.63	3.05	2.03	.04	.00	.00	100.00
7	.10	59.56	.29	32.26	2.72	.69	.24	.32	3.42	.38	.02	.00	.00	100.00
8														.00
9														.00
12	.33	59.46	.21	30.41	4.12	.71	.08	.86	3.46	.08	.26	.02	.00	100.00
14	.17	76.96	.96	16.13	1.22	1.23	.36	.96	.84	1.04	.06	.03	.04	100.00
16														.00
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Unclassified														.00

TABLE C10. VEHICLE-TYPE PERCENTAGES ON BASE SYSTEM

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS				SINGLE-TRAILER TRUCKS			MULTI-TRAILER TRUCKS			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	
COAL-PRODUCING COUNTIES														
2	.19	54.94	.20	30.75	2.60	1.06	.35	.35	6.55	2.81	.10	.10	.00	100.00
6	.38	59.40	.18	34.63	1.61	1.13	.84	.15	.91	.76	.01	.00	.00	100.00
7	.59	56.89	.31	32.25	2.69	1.73	.82	.54	3.30	.84	.02	.01	.01	100.00
8	.30	50.13	.36	39.74	2.27	1.48	1.49	.08	2.79	1.32	.03	.01	.00	100.00
9														.00
12														.00
14	.73	67.56	.31	21.28	1.83	.94	.26	.88	3.72	2.19	.15	.11	.04	100.00
16	.26	72.05	23.06	.06	.96	1.60	.43	.08	.23	1.23	.04	.00	.00	100.00
17														.00
Unclassified														.00
COAL-IMPACT COUNTIES														
2	.51	68.61	.27	19.21	2.17	1.39	.69	1.47	4.30	1.11	.23	.01	.03	100.00
6	.47	59.10	.39	33.76	2.58	1.93	.26	.19	.70	.62	.00	.00	.00	100.00
7	.28	69.29	.34	24.72	2.46	.95	.15	.28	1.18	.27	.08	.00	.00	100.00
8														.00
9														.00
12	.37	81.74	.10	13.72	1.04	1.39	.27	.26	.71	.36	.03	.00	.01	100.00
14	.17	71.90	.37	23.57	1.71	.83	.11	.29	.84	.15	.05	.00	.01	100.00
16	.21	77.90	1.04	17.76	1.39	1.28	.08	.04	.07	.23	.00	.00	.00	100.00
17														.00
Unclassified														.00

TABLE C11. VEHICLE-TYPE PERCENTAGES INCLUDING DECAL COAL TRUCKS ON EXTENDED-WEIGHT SYSTEM

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	.17	54.06	.20	31.61	2.72	1.80	.24	.69	.09	.33	3.53	2.21	1.69	.64	.02	.00	100.00
6	.28	56.99	.12	32.64	1.90	1.76	.23	.30	.04	.23	1.48	2.75	1.25	.03	.01	.00	100.00
7	.21	55.01	.27	33.20	2.17	2.34	.31	.82	.11	.27	2.74	1.20	1.16	.17	.01	.00	100.00
8	.40	47.14	.38	37.22	2.09	2.07	.28	3.21	.43	.59	3.42	1.34	1.40	.03	.00	.00	100.00
9																	
12	.09	71.96	.29	20.23	1.23	.89	.02	.65	.02	.35	2.28	1.78	.14	.06	.01	.00	100.00
14	.42	63.76	.18	25.71	2.32	1.14	.03	.36	.01	.51	4.72	.55	.18	.10	.00	.01	100.00
16	1.09	75.83	.35	17.66	1.33	1.32	.03	.23	.01	.69	1.05	.16	.04	.00	.00	.20	100.00
17																	
Unclassified																	
COAL-IMPACT COUNTIES																	
2	.21	63.72	.16	25.73	2.45	1.06	.04	.20	.01	.80	3.47	1.44	.35	.25	.10	.01	100.00
6	.44	57.05	.21	30.68	1.89	2.66	.09	1.19	.04	.63	2.85	1.89	.34	.04	.00	.00	100.00
7	.10	59.56	.29	32.26	2.72	.67	.02	.23	.01	.32	3.19	.35	.25	.02	.00	.00	100.00
8																	
9																	
12	.33	59.46	.21	30.41	4.12	.70	.01	.08	.00	.86	3.39	.08	.07	.26	.02	.00	100.00
14	.17	76.96	.96	16.13	1.22	1.21	.02	.36	.00	.96	.82	1.02	.04	.06	.03	.04	100.00
16																	
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
Unclassified																	
ALL EXTENDED-WEIGHT SYSTEM COUNTIES (ESTIMATED)																	
2	.18	55.80	.19	30.55	2.67	1.67	.20	.60	.08	.41	3.52	2.07	1.45	.57	.03	.00	100.00
6	.37	57.02	.17	31.52	1.89	2.27	.15	.81	.04	.46	2.26	2.26	.73	.04	.00	.00	100.00
7	.19	55.73	.27	33.05	2.26	2.07	.27	.73	.09	.28	2.81	1.07	1.02	.15	.01	.00	100.00
8	.40	47.15	.38	37.21	2.09	2.07	.28	3.20	.43	.59	3.42	1.34	1.40	.03	.00	.00	100.00
9	.26	53.42	.24	33.59	2.22	1.98	.26	1.24	.17	.36	2.80	1.86	1.36	.22	.01	.00	100.00
12	.22	65.42	.25	25.55	2.74	.79	.02	.35	.01	.62	2.86	.89	.10	.16	.02	.00	100.00
14	.25	72.61	.70	19.29	1.58	1.18	.03	.36	.01	.81	2.11	.86	.08	.07	.02	.03	100.00
16	.69	72.21	.46	20.33	1.97	1.14	.03	.23	.00	.79	1.55	.35	.05	.08	.01	.11	100.00
17	.53	70.52	.27	21.20	1.63	1.12	.03	.42	.01	.52	2.69	.83	.12	.05	.00	.07	100.00
Unclassified	.31	62.18	.32	27.60	2.25	1.42	.09	.62	.05	.59	2.75	1.16	.49	.14	.02	.02	100.00

TABLE C12. VEHICLE-TYPE PERCENTAGES INCLUDING DECAL COAL TRUCKS ON BASE SYSTEM

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	.19	54.94	.20	30.75	2.60	1.01	.05	.35	.00	.35	5.80	2.49	1.07	.10	.10	.00	100.00
6	.38	59.40	.18	34.63	1.61	1.08	.05	.84	.00	.15	.81	.67	.19	.01	.00	.00	100.00
7	.59	56.89	.31	32.25	2.69	1.66	.07	.82	.00	.54	2.92	.74	.48	.02	.01	.01	100.00
8	.30	50.13	.36	39.74	2.27	1.42	.06	1.49	.00	.08	2.47	1.17	.47	.03	.01	.00	100.00
9																	
12																	
14	.73	67.56	.31	21.28	1.83	.93	.01	.22	.04	.88	3.02	1.78	1.12	.15	.11	.04	100.00
16	.26	72.05	23.06	.06	.96	1.58	.02	.36	.07	.08	.19	1.00	.28	.04	.00	.00	100.00
17																	
Unclassified																	
COAL-IMPACT COUNTIES																	
2	.51	68.61	.27	19.21	2.17	1.36	.03	.67	.02	1.47	4.04	1.04	.33	.23	.01	.03	100.00
6	.47	59.10	.39	33.76	2.58	1.89	.04	.25	.01	.19	.66	.58	.08	.00	.00	.00	100.00
7	.28	69.29	.34	24.72	2.46	.93	.02	.15	.00	.28	1.11	.25	.09	.08	.00	.00	100.00
8																	
9																	
12	.37	81.74	.10	13.72	1.04	1.36	.03	.26	.01	.26	.68	.35	.04	.03	.00	.01	100.00
14	.17	71.90	.37	23.57	1.71	.81	.02	.11	.00	.29	.81	.14	.04	.05	.00	.01	100.00
16	.21	77.90	1.04	17.76	1.39	1.25	.03	.08	.00	.04	.07	.22	.01	.00	.00	.00	100.00
17																	
Unclassified																	
ALL EXTENDED-WEIGHT SYSTEM COUNTIES (ESTIMATED)																	
2	.27	58.55	.22	27.70	2.49	1.11	.04	.44	.00	.65	5.33	2.11	.88	.13	.08	.01	100.00
6	.43	59.24	.29	34.18	2.12	1.50	.04	.53	.00	.17	.73	.63	.13	.00	.00	.00	100.00
7	.47	61.65	.32	29.36	2.60	1.38	.05	.56	.00	.44	2.22	.56	.33	.04	.01	.01	100.00
8	.35	56.13	.35	34.40	2.32	1.41	.05	1.05	.00	.30	2.26	.96	.35	.06	.01	.00	100.00
9	.38	58.60	.28	31.67	2.33	1.32	.05	.71	.00	.40	2.66	1.07	.43	.06	.02	.00	100.00
12	.42	77.24	4.46	12.57	1.17	1.32	.03	.27	.03	.34	1.03	.74	.29	.05	.02	.01	100.00
14	.31	70.85	.36	23.02	1.74	.84	.02	.13	.01	.43	1.34	.54	.30	.07	.03	.02	100.00
16	.22	76.55	6.11	13.69	1.29	1.32	.03	.14	.02	.05	.09	.40	.07	.01	.00	.00	100.00
17	.33	74.77	4.16	15.84	1.38	1.17	.03	.20	.02	.29	.87	.61	.25	.05	.02	.01	100.00
Unclassified	.36	67.94	1.55	23.46	1.92	1.27	.03	.39	.01	.40	1.63	.70	.25	.06	.01	.01	100.00

TABLE C13. UNIT ESALs ON EXTENDED-WEIGHT SYSTEM (ESALs PER VEHICLE)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS		
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES
COAL-PRODUCING COUNTIES																
2	.000	.003	.927	.006	.474	.791	13.928	2.347	9.335	11.278	.501	.429	8.596	1.297	8.616	3.570
6	.000	.003	.927	.006	.474	.791	13.928	2.347	9.335	11.278	.501	.429	8.596	1.297	8.616	3.570
7	.000	.003	.927	.006	.474	.791	13.928	2.347	9.335	11.278	.501	.429	8.596	1.297	8.616	3.570
8	.000	.003	.927	.006	.474	.791	13.928	2.347	9.335	11.278	.501	.429	8.596	1.297	8.616	3.570
9	.000	.003	.927	.006	.474	.791	13.928	2.347	9.335	11.278	.501	.429	8.596	1.297	8.616	3.570
12	.000	.003	.414	.006	.424	.669	6.625	2.132	4.861	.458	.627	.439	5.007	1.361	2.308	1.169
14	.000	.003	.414	.006	.424	.669	6.625	2.132	4.861	.458	.627	.439	5.007	1.361	2.308	1.169
16	.000	.003	.414	.006	.424	.669	6.625	2.132	4.861	.458	.627	.439	5.007	1.361	2.308	1.169
17	.000	.003	.414	.006	.424	.669	6.625	2.132	4.861	.458	.627	.439	5.007	1.361	2.308	1.169
Unclassified																
COAL-IMPACT COUNTIES																
2	.000	.003	.437	.006	.492	.649	12.109	2.358	11.832	.830	.547	.485	5.798	1.007	2.121	8.757
6	.000	.003	.437	.006	.492	.649	12.109	2.358	11.832	.830	.547	.485	5.798	1.007	2.121	8.757
7	.000	.003	.437	.006	.492	.649	12.109	2.358	11.832	.830	.547	.485	5.798	1.007	2.121	8.757
8	.000	.003	.437	.006	.492	.649	12.109	2.358	11.832	.830	.547	.485	5.798	1.007	2.121	8.757
9	.000	.003	.437	.006	.492	.649	12.109	2.358	11.832	.830	.547	.485	5.798	1.007	2.121	8.757
12	.000	.003	.365	.006	.249	.689	6.194	2.193	9.466	.491	.497	.407	3.376	.947	1.467	.579
14	.000	.003	.365	.006	.249	.689	6.194	2.193	9.466	.491	.497	.407	3.376	.947	1.467	.579
16	.000	.003	.365	.006	.249	.689	6.194	2.193	9.466	.491	.497	.407	3.376	.947	1.467	.579
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Unclassified																

TABLE C14. UNIT ESALs ON BASE SYSTEM (ESALs PER VEHICLE)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS		
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES
COAL-PRODUCING COUNTIES																
2	.000	.003	2.340	.006	6.302	1.049	12.295	1.845	16.392	.888	.616	.375	12.040	12.574	22.142	6.104
6	.000	.003	2.340	.006	6.302	1.049	12.295	1.845	16.392	.888	.616	.375	12.040	12.574	22.142	6.104
7	.000	.003	2.340	.006	6.302	1.049	12.295	1.845	16.392	.888	.616	.375	12.040	12.574	22.142	6.104
8	.000	.003	2.340	.006	6.302	1.049	12.295	1.845	16.392	.888	.616	.375	12.040	12.574	22.142	6.104
9	.000	.003	2.340	.006	6.302	1.049	12.295	1.845	16.392	.888	.616	.375	12.040	12.574	22.142	6.104
12	.000	.003	1.345	.006	.404	.650	12.217	1.740	16.288	.588	.533	.578	9.749	2.122	.180	1.596
14	.000	.003	1.345	.006	.404	.650	12.217	1.740	16.288	.588	.533	.578	9.749	2.122	.180	1.596
16	.000	.003	1.345	.006	.404	.650	12.217	1.740	16.288	.588	.533	.578	9.749	2.122	.180	1.596
17	.000	.003	1.345	.006	.404	.650	12.217	1.740	16.288	.588	.533	.578	9.749	2.122	.180	1.596
Unclassified																
COAL-IMPACT COUNTIES																
2	.000	.003	.728	.006	.268	.809	5.796	2.339	7.728	.619	.640	.640	2.912	1.265	1.140	1.330
6	.000	.003	.728	.006	.268	.809	5.796	2.339	7.728	.619	.640	.640	2.912	1.265	1.140	1.330
7	.000	.003	.728	.006	.268	.809	5.796	2.339	7.728	.619	.640	.640	2.912	1.265	1.140	1.330
8	.000	.003	.728	.006	.268	.809	5.796	2.339	7.728	.619	.640	.640	2.912	1.265	1.140	1.330
9	.000	.003	.728	.006	.268	.809	5.796	2.339	7.728	.619	.640	.640	2.912	1.265	1.140	1.330
12	.000	.003	1.096	.006	.431	.982	10.886	2.279	9.966	.651	.626	.446	3.015	.706	.233	1.771
14	.000	.003	1.096	.006	.431	.982	10.886	2.279	9.966	.651	.626	.446	3.015	.706	.233	1.771
16	.000	.003	1.096	.006	.431	.982	10.886	2.279	9.966	.651	.626	.446	3.015	.706	.233	1.771
17	.000	.003	1.096	.006	.431	.982	10.886	2.279	9.966	.651	.626	.446	3.015	.706	.233	1.771
Unclassified																

TABLE C15. VEHICLE MILES ON EXTENDED-WEIGHT SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	2,496	793,833	2,937	464,171	39,941	26,433	3,523	10,092	1,362	4,846	51,827	32,434	24,843	9,398	294	0	1,468,430
6	745	151,593	319	86,822	5,054	4,671	623	797	108	612	3,924	7,313	3,313	80	27	0	265,999
7	1,893	495,935	2,434	299,310	19,563	21,081	2,810	7,387	997	2,434	24,717	10,862	10,490	1,533	90	0	901,535
8	1,175	138,452	1,116	109,317	6,138	6,090	812	9,420	1,271	1,733	10,048	3,924	4,120	88	0	0	293,705
9	410	82,511	375	52,119	3,437	3,084	411	1,940	262	550	4,322	2,902	2,130	337	15	0	154,805
12	150	119,895	483	33,706	2,049	1,481	36	1,088	29	583	3,804	2,966	227	100	17	0	166,614
14	903	137,021	387	55,251	4,986	2,455	59	775	20	1,096	10,146	1,185	381	215	0	21	214,902
16	2,953	205,416	948	47,839	3,603	3,571	86	633	17	1,869	2,857	446	111	0	0	542	270,890
17	52	6,819	26	2,050	157	108	3	40	1	50	260	80	11	5	0	7	9,670
Unclassified	575	91,763	387	42,834	2,973	2,445	247	1,353	153	642	4,154	2,159	1,266	223	11	45	151,227
Subtotal	11,351	2,223,239	9,413	1,193,419	87,902	71,419	8,608	33,525	4,219	14,414	116,059	64,272	46,891	11,978	454	615	3,897,777
COAL-IMPACT COUNTIES																	
2	676	205,161	515	82,844	7,888	3,427	115	652	24	2,576	11,174	4,626	1,136	805	322	32	321,972
6	1,575	204,195	752	109,811	6,765	9,523	320	4,248	155	2,255	10,184	6,778	1,220	143	0	0	357,923
7	170	101,548	494	55,002	4,638	1,138	38	395	14	546	5,440	604	435	34	0	0	170,497
8	1	169	1	83	7	4	0	2	0	2	9	3	1	0	0	0	281
9	7	1,721	6	846	67	42	1	15	1	17	91	35	9	3	1	0	2,863
12	603	108,626	384	55,555	7,527	1,271	26	145	1	1,571	6,192	143	132	475	37	0	182,687
14	743	336,551	4,198	70,538	5,335	5,272	107	1,561	13	4,198	3,598	4,455	168	262	131	175	437,307
16	614	167,658	1,438	57,197	6,563	2,337	47	536	4	2,237	5,177	1,348	136	393	61	49	245,797
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0
Unclassified	483	122,516	708	52,298	4,796	2,434	72	796	24	1,381	5,306	1,850	410	244	58	19	193,396
Subtotal	4,874	1,248,145	8,496	484,173	43,585	25,448	727	8,351	236	14,781	47,171	19,843	3,646	2,360	610	276	1,912,722
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	3,172	998,994	3,452	547,014	47,830	29,860	3,638	10,744	1,386	7,422	63,001	37,060	25,979	10,203	616	32	1,790,403
6	2,320	355,788	1,071	196,633	11,819	14,194	942	5,045	262	2,867	14,108	14,092	4,533	223	27	0	623,922
7	2,064	597,482	2,929	354,312	24,201	22,219	2,848	7,782	1,011	2,980	30,157	11,466	10,925	1,567	90	0	1,072,032
8	1,176	138,621	1,117	109,400	6,145	6,094	812	9,421	1,271	1,734	10,057	3,928	4,120	88	0	0	293,986
9	417	84,232	382	52,965	3,504	3,126	412	1,956	262	566	4,413	2,937	2,139	340	16	0	157,668
12	753	228,521	867	89,261	9,576	2,752	61	1,233	30	2,154	9,996	3,109	359	575	53	0	349,301
14	1,646	473,573	4,585	125,789	10,321	7,727	166	2,336	33	5,294	13,745	5,640	548	477	131	196	652,208
16	3,567	373,074	2,386	105,036	10,166	5,908	133	1,170	21	4,106	8,034	1,794	247	393	61	591	516,687
17	52	6,819	26	2,050	157	108	3	40	1	50	260	80	11	5	0	7	9,670
Unclassified	1,058	214,279	1,095	95,132	7,769	4,879	319	2,148	177	2,022	9,460	4,009	1,675	466	69	65	344,623
Total	16,225	3,471,383	17,909	1,677,592	131,487	96,867	9,335	41,876	4,455	29,196	163,230	84,116	50,538	14,337	1,064	891	5,810,500

TABLE C16. VEHICLE MILES ON BASE SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	3,136	906,713	3,301	507,489	42,910	16,736	757	5,776	0	5,776	95,689	41,052	17,734	1,650	1,650	0	1,650,370
6	2,090	326,716	990	190,474	8,855	5,946	269	4,620	0	825	4,431	3,700	1,054	55	0	0	550,027
7	10,100	973,855	5,307	552,063	46,048	28,332	1,282	14,037	0	9,244	50,005	12,729	8,136	342	171	171	1,711,822
8	2,554	426,693	3,064	338,256	19,322	12,052	545	12,682	0	681	21,021	9,946	4,016	255	85	0	851,173
9	986	149,519	709	92,787	6,194	3,490	158	2,364	0	757	8,102	3,426	1,495	108	81	7	270,183
12	813	114,682	19,197	17,530	2,292	2,055	31	480	87	789	2,632	2,279	1,143	156	90	33	164,290
14	3,935	364,219	1,671	114,721	9,866	4,992	76	1,186	216	4,744	16,268	9,577	6,015	809	593	216	539,104
16	1,063	294,701	94,321	245	3,927	6,447	98	1,488	271	327	763	4,081	1,127	164	0	0	409,022
17	392	55,276	9,253	8,449	1,105	991	15	231	42	380	1,269	1,098	551	75	44	16	79,187
Unclassified	4,912	723,715	48,960	318,200	23,979	15,374	545	8,188	213	4,170	30,472	15,732	7,227	702	461	100	1,202,950
Subtotal	29,981	4,336,090	186,773	2,140,215	164,496	96,416	3,776	51,053	828	27,693	230,653	103,620	48,499	4,316	3,176	54	7,428,128
COAL-IMPACT COUNTIES																	
2	3,026	407,043	1,602	113,967	12,874	8,082	164	3,989	105	8,721	23,957	6,184	1,955	1,365	59	178	593,271
6	2,826	355,330	2,345	202,977	15,512	11,373	231	1,523	40	1,142	3,952	3,501	483	0	0	0	601,235
7	2,988	739,523	3,629	263,833	26,255	9,937	202	1,560	41	2,988	11,827	2,706	942	854	0	0	1,067,287
8	2,247	351,328	1,783	138,552	12,858	7,464	152	1,912	50	3,460	10,350	3,350	888	553	18	54	535,017
9	524	81,946	416	32,317	2,999	1,741	35	446	12	807	2,414	781	207	129	4	12	124,791
12	1,006	222,201	272	37,296	2,827	3,684	94	709	25	707	1,856	941	112	82	0	27	271,839
14	2,878	1,217,305	6,264	399,053	28,951	13,701	351	1,798	64	4,910	13,674	2,442	645	847	0	169	1,693,053
16	2,873	1,065,695	14,228	242,962	19,016	17,073	438	1,057	38	547	921	3,025	158	0	0	0	1,368,030
17	407	125,745	820	29,897	2,248	1,853	48	241	9	320	846	386	49	43	0	11	162,924
Unclassified	8,993	1,917,280	11,230	593,876	50,780	33,991	772	6,782	197	11,319	32,934	11,586	2,635	1,745	45	224	2,684,389
Subtotal	27,768	6,483,397	42,588	2,054,730	174,320	108,900	2,486	20,016	581	34,922	102,731	34,903	8,076	5,617	126	675	9,101,836
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	6,161	1,313,757	4,903	621,456	55,784	24,819	922	9,765	105	14,497	119,647	47,236	19,688	3,015	1,710	178	2,243,641
6	4,916	682,046	3,335	393,451	24,367	17,319	500	6,143	40	1,967	8,383	7,201	1,538	55	0	0	1,151,261
7	13,088	1,713,379	8,935	815,896	72,303	38,270	1,484	15,597	41	12,232	61,832	15,435	9,078	1,196	171	171	2,779,109
8	4,801	778,021	4,848	476,808	32,180	19,515	697	14,594	50	4,141	31,372	13,295	4,904	808	103	54	1,386,191
9	1,510	231,465	1,125	125,104	9,193	5,230	193	2,810	12	1,563	10,516	4,207	1,702	237	85	19	394,974
12	1,819	336,884	19,469	54,826	5,119	5,739	126	1,188	112	1,495	4,488	3,220	1,255	238	90	60	436,129
14	6,814	1,581,524	7,936	513,774	38,817	18,693	427	2,984	280	9,654	29,942	12,019	6,661	1,655	593	385	2,232,157
16	3,936	1,360,396	108,548	243,208	22,942	23,520	535	2,545	308	874	1,684	7,106	1,285	164	0	0	1,777,052
17	799	181,021	10,073	38,346	3,353	2,844	63	472	51	701	2,115	1,485	600	119	44	27	242,111
Unclassified	13,905	2,640,994	60,190	912,076	74,758	49,366	1,316	14,970	410	15,489	63,406	27,318	9,863	2,447	506	324	3,887,338
Total	57,749	10,819,486	229,361	4,194,945	338,817	205,315	6,262	71,069	1,409	62,615	333,384	138,522	56,575	9,933	3,302	1,218	16,529,963

TABLE C17. AXLE MILES ON EXTENDED-WEIGHT SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	4,993	1,587,667	5,874	928,341	79,883	79,299	10,568	40,368	5,447	19,383	259,135	194,606	134,870	46,990	1,762	0	3,399,186
6	1,490	303,186	638	173,644	10,108	14,013	1,868	3,187	430	2,447	19,619	43,880	18,855	399	160	0	593,922
7	3,786	991,869	4,868	598,619	39,127	63,243	8,429	29,550	3,988	9,737	123,585	65,170	56,071	7,663	541	0	2,006,245
8	2,350	276,905	2,232	218,634	12,277	18,271	2,435	37,679	5,085	6,931	50,242	23,545	21,912	441	0	0	678,938
9	820	165,022	751	104,238	6,873	9,251	1,233	7,761	1,047	2,198	21,610	17,413	11,600	1,684	93	0	351,595
12	300	239,791	966	67,412	4,099	4,442	107	4,351	114	2,333	19,021	17,796	1,247	500	100	0	362,579
14	1,805	274,043	774	110,502	9,971	7,366	177	3,099	81	4,384	50,732	7,111	1,950	1,075	0	150	473,221
16	5,905	410,832	1,896	95,678	7,206	10,713	258	2,534	67	7,477	14,284	2,673	572	0	0	3,792	563,887
17	103	13,639	53	4,100	315	324	8	161	4	200	1,299	483	60	26	2	47	20,823
Unclassified	1,149	183,525	773	85,668	5,945	7,335	740	5,410	613	2,567	20,769	12,956	6,814	1,113	65	318	335,761
Subtotal	22,702	4,446,477	18,826	2,386,838	175,803	214,257	25,823	134,100	16,876	57,656	580,295	385,633	253,178	59,889	2,722	4,308	8,785,384
COAL-IMPACT COUNTIES																	
2	1,352	410,322	1,030	165,687	15,777	10,280	345	2,610	95	10,303	55,868	27,754	6,059	4,025	1,932	225	713,664
6	3,150	408,390	1,503	219,621	13,529	28,569	960	16,992	618	9,020	50,921	40,670	6,642	716	0	0	801,300
7	341	203,096	989	110,004	9,275	3,415	115	1,579	57	2,182	27,199	3,626	2,225	170	0	0	364,274
8	1	338	1	166	13	12	0	6	0	7	45	21	5	1	1	0	618
9	14	3,442	13	1,692	135	126	4	62	2	67	454	211	48	15	6	1	6,290
12	1,206	217,251	767	111,110	15,053	3,814	77	580	5	6,284	30,960	859	663	2,375	219	0	391,225
14	1,487	673,102	8,396	141,075	10,670	15,815	321	6,246	52	16,793	17,992	26,731	939	1,312	787	1,224	922,943
16	1,229	335,316	2,876	114,394	13,126	7,010	142	2,145	18	8,947	25,884	8,090	712	1,966	369	344	522,569
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Unclassified	967	245,032	1,416	104,596	9,592	7,303	216	3,183	97	5,523	26,531	11,098	2,170	1,218	348	135	419,426
Subtotal	9,747	2,496,289	16,991	968,347	87,171	76,344	2,181	33,402	944	59,126	235,853	119,061	19,455	11,799	3,661	1,930	4,142,303
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	6,345	1,997,988	6,904	1,094,029	95,659	89,579	10,914	42,977	5,542	29,686	315,003	222,360	140,929	51,014	3,694	225	4,112,851
6	4,639	711,576	2,142	393,266	23,637	42,582	2,827	20,179	1,048	11,467	70,539	84,550	25,497	1,115	160	0	1,395,223
7	4,127	1,194,965	5,857	708,624	48,402	66,658	8,543	31,129	4,045	11,919	150,784	68,796	58,295	7,834	541	0	2,370,519
8	2,351	277,243	2,233	218,800	12,290	18,283	2,435	37,685	5,085	6,938	50,287	23,565	21,917	442	1	0	679,556
9	835	168,464	763	105,930	7,008	9,377	1,237	7,823	1,050	2,265	22,063	17,624	11,648	1,698	99	1	357,885
12	1,506	457,042	1,734	178,522	19,152	8,255	184	4,931	119	8,617	49,982	18,655	1,910	2,875	319	0	753,804
14	3,292	947,145	9,170	251,578	20,642	23,181	498	9,345	133	21,177	68,724	33,842	2,889	2,386	787	1,375	1,396,164
16	7,134	746,148	4,772	210,072	20,331	17,724	400	4,679	84	16,424	40,168	10,764	1,284	1,966	369	4,137	1,086,456
17	103	13,639	53	4,100	315	324	8	161	4	200	1,299	483	60	26	2	47	20,823
Unclassified	2,116	428,557	2,189	190,264	15,538	14,638	957	8,593	710	8,090	47,300	24,054	8,984	2,331	413	453	755,187
Total	32,449	6,942,766	35,817	3,355,185	262,974	290,602	28,004	167,502	17,820	116,782	816,149	504,694	272,633	71,687	6,384	6,238	12,927,686

TABLE C18. AXLE MILES ON BASE SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	6,271	1,813,427	6,601	1,014,978	85,819	50,209	2,272	23,105	0	23,105	478,447	246,309	94,695	8,252	9,902	0	3,863,395
6	4,180	653,432	1,980	380,949	17,711	17,839	807	18,481	0	3,300	22,153	22,202	5,800	275	0	0	1,149,109
7	20,199	1,947,711	10,613	1,104,125	92,096	84,997	3,847	56,148	0	36,975	250,025	76,371	42,583	1,712	1,027	1,198	3,729,628
8	5,107	853,386	6,128	676,512	38,643	36,156	1,636	50,730	0	2,724	105,107	59,674	21,535	1,277	511	0	1,859,127
9	1,972	299,038	1,418	185,575	12,388	10,469	474	9,456	0	3,026	40,509	20,556	7,978	540	486	47	593,934
12	1,626	229,365	38,395	35,059	4,584	6,166	93	1,919	349	3,154	13,161	13,674	6,297	780	542	230	355,394
14	7,871	728,438	3,342	229,443	19,731	14,976	227	4,744	862	18,976	81,342	57,464	32,567	4,043	3,558	1,509	1,209,095
16	2,127	589,401	188,641	491	7,853	19,341	293	5,953	1,082	1,309	3,816	24,487	6,613	818	0	0	852,224
17	784	110,553	18,506	16,898	2,209	2,972	45	925	168	1,520	6,343	6,591	3,035	376	261	111	171,298
Unclassified	9,824	1,447,429	97,920	636,400	47,958	46,123	1,634	32,751	851	16,681	152,361	94,389	38,901	3,509	2,767	702	2,630,200
Subtotal	59,963	8,672,180	373,546	4,280,431	328,992	289,247	11,328	204,212	3,312	110,771	1,153,264	621,717	259,483	21,582	19,055	3,798	16,412,881
COAL-IMPACT COUNTIES																	
2	6,051	814,086	3,204	227,935	25,748	24,247	492	15,955	419	34,884	119,785	37,106	10,236	6,823	356	1,246	1,328,573
6	5,652	710,659	4,690	405,954	31,024	34,119	693	6,093	160	4,569	19,762	21,004	2,666	0	0	0	1,247,043
7	5,977	1,479,046	7,258	527,667	52,511	29,812	605	6,240	164	11,954	59,135	16,237	4,915	4,269	0	0	2,205,789
8	4,494	702,656	3,567	277,103	25,717	22,391	455	7,646	201	13,839	51,751	20,097	4,691	2,764	107	375	1,137,853
9	1,048	163,892	832	64,633	5,998	5,223	106	1,783	47	3,228	12,071	4,688	1,094	645	25	87	265,400
12	2,012	444,403	544	74,593	5,654	11,052	283	2,835	101	2,827	9,279	5,646	602	408	0	190	560,428
14	5,756	2,434,610	12,529	798,105	57,902	41,103	1,054	7,192	257	19,639	68,371	14,651	3,340	4,233	0	1,185	3,469,928
16	5,746	2,131,391	28,455	485,924	38,031	51,219	1,313	4,227	151	2,189	4,604	18,152	916	0	0	0	2,772,318
17	815	251,489	1,640	59,793	4,497	5,560	143	965	34	1,282	4,230	2,318	264	217	0	76	333,322
Unclassified	17,985	3,834,560	22,459	1,187,753	101,559	101,974	2,315	27,130	788	45,277	164,671	69,518	13,959	8,724	268	1,566	5,600,505
Subtotal	55,536	12,966,793	85,176	4,109,459	348,641	326,699	7,459	80,065	2,323	139,688	513,657	209,416	42,719	28,083	756	4,725	18,921,197
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	12,323	2,627,513	9,805	1,242,912	111,567	74,456	2,765	39,060	419	57,990	598,233	283,415	104,931	15,074	10,258	1,246	5,191,968
6	9,832	1,364,091	6,670	786,902	48,735	51,957	1,500	24,574	160	7,870	41,915	43,206	8,466	275	0	0	2,396,152
7	26,176	3,426,757	17,871	1,631,792	144,607	114,809	4,452	62,388	164	48,929	309,160	92,608	47,498	5,981	1,027	1,198	5,935,417
8	9,601	1,556,042	9,695	953,616	64,360	58,546	2,091	58,376	201	16,563	156,858	79,771	26,225	4,041	618	375	2,996,979
9	3,021	462,930	2,250	250,208	18,386	15,691	580	11,240	47	6,254	52,579	25,244	9,072	1,185	511	135	859,334
12	3,638	673,768	38,938	109,652	10,238	17,218	377	4,753	450	5,981	22,439	19,319	6,900	1,188	542	420	915,823
14	13,627	3,163,048	15,871	1,027,548	77,634	56,079	1,280	11,937	1,119	38,616	149,712	72,115	35,908	8,276	3,558	2,695	4,679,023
16	7,873	2,720,792	217,096	486,415	45,884	70,560	1,606	10,180	1,233	3,498	8,419	42,639	7,529	818	0	0	3,624,541
17	1,599	362,042	20,146	76,692	6,706	8,532	188	1,890	203	2,802	10,573	8,909	3,300	593	261	187	504,621
Unclassified	27,809	5,281,989	120,379	1,824,153	149,517	148,097	3,949	59,881	1,639	61,958	317,031	163,907	52,860	12,233	3,035	2,268	8,230,705
Total	115,499	21,638,973	458,722	8,389,890	677,633	615,946	18,787	284,277	5,635	250,460	1,666,921	831,133	302,202	49,665	19,811	8,523	35,334,078

TABLE C19. PASSENGER-CAR-EQUIVALENT MILES ON EXTENDED-WEIGHT SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	1,248	793,833	4,405	464,171	75,090	77,713	10,357	34,312	4,630	16,476	204,198	129,089	98,379	33,833	1,175	0	1,948,909
6	372	151,593	479	86,822	9,501	13,732	1,830	2,709	366	2,080	15,459	29,107	13,120	287	106	0	327,565
7	947	495,935	3,651	299,310	36,779	61,979	8,260	25,117	3,389	8,276	97,385	43,229	41,540	5,517	361	0	1,131,674
8	587	138,452	1,674	109,317	11,540	17,906	2,386	32,027	4,322	5,892	39,591	15,618	16,314	317	0	0	395,943
9	205	82,511	563	52,119	6,461	9,066	1,208	6,597	890	1,868	17,028	11,551	8,435	1,212	62	0	199,777
12	75	119,895	725	33,706	3,853	4,353	105	3,698	97	1,983	14,989	11,805	901	360	67	0	196,611
14	451	137,021	580	55,251	9,373	7,218	174	2,634	69	3,726	39,977	4,717	1,507	774	0	86	263,560
16	1,476	205,416	1,422	47,839	6,773	10,499	253	2,154	57	6,355	11,256	1,773	439	0	0	2,167	297,879
17	26	6,819	40	2,050	296	317	8	137	4	170	1,024	320	45	19	1	27	11,302
Unclassified	287	91,763	580	42,834	5,589	7,188	726	4,599	521	2,182	16,366	8,594	5,012	801	43	181	187,265
Subtotal	5,675	2,223,239	14,119	1,193,419	165,255	209,972	25,306	113,985	14,345	49,008	457,273	255,803	185,690	43,120	1,815	2,462	4,960,486
COAL-IMPACT COUNTIES																	
2	338	205,161	773	82,844	14,830	10,074	338	2,218	81	8,758	44,024	18,410	4,500	2,898	1,288	129	396,663
6	787	204,195	1,127	109,811	12,718	27,998	940	14,443	525	7,667	40,126	26,978	4,831	515	0	0	452,661
7	85	101,548	742	55,002	8,719	3,346	112	1,342	49	1,855	21,433	2,406	1,722	123	0	0	198,483
8	0	169	1	83	12	12	0	5	0	6	35	14	4	1	0	0	343
9	4	1,721	9	846	127	123	4	53	2	57	357	140	36	11	4	0	3,493
12	301	108,626	575	55,555	14,150	3,738	76	493	4	5,342	24,397	570	522	1,710	146	0	216,205
14	372	336,551	6,297	70,538	10,030	15,499	315	5,309	44	14,274	14,178	17,732	664	945	525	700	493,971
16	307	167,658	2,157	57,197	12,338	6,870	139	1,823	15	7,605	20,397	5,367	538	1,416	246	197	284,270
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Unclassified	242	122,516	1,062	52,298	9,017	7,157	212	2,706	82	4,695	20,906	7,362	1,623	877	232	77	231,064
Subtotal	2,437	1,248,145	12,744	484,173	81,941	74,817	2,138	28,392	802	50,257	185,852	78,977	14,440	8,495	2,441	1,103	2,277,153
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	1,586	998,994	5,178	547,014	89,920	87,788	10,696	36,531	4,711	25,233	248,222	147,499	102,879	36,730	2,463	129	2,345,572
6	1,160	355,788	1,606	196,633	22,219	41,730	2,771	17,152	891	9,747	55,585	56,085	17,951	803	106	0	780,226
7	1,032	597,482	4,393	354,312	45,498	65,325	8,372	26,460	3,438	10,131	118,818	45,635	43,261	5,640	361	0	1,330,157
8	588	138,621	1,675	109,400	11,553	17,918	2,387	32,032	4,322	5,897	39,626	15,632	16,317	318	0	0	396,287
9	209	84,232	573	52,965	6,588	9,189	1,212	6,650	892	1,925	17,386	11,691	8,470	1,223	66	0	203,270
12	376	228,521	1,300	89,261	18,003	8,090	181	4,191	101	7,324	39,385	12,375	1,423	2,070	213	0	412,816
14	823	473,573	6,877	125,789	19,403	22,718	488	7,943	113	18,000	54,155	22,449	2,172	1,718	525	786	757,531
16	1,784	373,074	3,579	105,036	19,111	17,369	392	3,977	72	13,960	31,652	7,140	977	1,416	246	2,364	582,150
17	26	6,819	40	2,050	296	317	8	137	4	170	1,024	320	45	19	1	27	11,302
Unclassified	529	214,279	1,642	95,132	14,606	14,345	937	7,304	603	6,876	37,272	15,956	6,634	1,678	275	259	418,329
Total	8,112	3,471,383	26,863	1,677,592	247,196	284,790	27,444	142,377	15,147	99,265	643,125	334,780	200,130	51,615	4,256	3,565	7,237,639

TABLE C20. PASSENGER-CAR-EQUIVALENT MILES ON BASE SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	1,568	906,713	4,951	507,489	80,670	49,205	2,227	19,639	0	19,639	377,016	163,385	70,225	5,941	6,601	0	2,215,272
6	1,045	326,716	1,485	190,474	16,648	17,482	791	15,709	0	2,805	17,457	14,727	4,176	198	0	0	609,713
7	5,050	973,855	7,960	552,063	86,570	83,297	3,770	47,726	0	31,429	197,020	50,660	32,218	1,233	685	685	2,074,219
8	1,277	426,693	4,596	338,256	36,325	35,433	1,604	43,120	0	2,315	82,825	39,584	15,904	919	340	0	1,029,191
9	493	149,519	1,064	92,787	11,645	10,259	464	8,038	0	2,572	31,921	13,636	5,920	389	324	27	329,059
12	407	114,682	28,796	17,530	4,309	6,043	91	1,631	296	2,681	10,371	9,070	4,526	562	361	131	201,488
14	1,968	364,219	2,507	114,721	18,547	14,677	222	4,033	733	16,130	64,097	38,118	23,821	2,911	2,372	863	669,938
16	532	294,701	141,481	245	7,382	18,954	287	5,060	920	1,113	3,007	16,243	4,465	589	0	0	494,977
17	196	55,276	13,879	8,449	2,077	2,913	44	786	143	1,292	4,999	4,372	2,182	271	174	63	97,116
Unclassified	2,456	723,715	73,440	318,200	45,080	45,201	1,601	27,839	723	14,179	120,060	62,612	28,620	2,526	1,845	401	1,468,497
Subtotal	14,991	4,336,090	280,159	2,140,215	309,253	283,462	11,102	173,580	2,815	94,156	908,772	412,406	192,057	15,539	12,703	2,170	9,189,470
COAL-IMPACT COUNTIES																	
2	1,513	407,043	2,403	113,967	24,203	23,762	482	13,562	356	29,652	94,391	24,613	7,740	4,912	237	712	749,550
6	1,413	355,330	3,517	202,977	29,162	33,436	679	5,179	136	3,884	15,572	13,933	1,914	0	0	0	667,132
7	1,494	739,523	5,443	263,833	49,360	29,216	593	5,304	139	10,161	46,598	10,771	3,732	3,074	0	0	1,169,242
8	1,124	351,328	2,675	138,552	24,174	21,943	446	6,499	171	11,763	40,780	13,331	3,518	1,990	71	214	618,578
9	262	81,946	624	32,317	5,638	5,118	104	1,516	40	2,744	9,512	3,109	821	464	17	50	144,281
12	503	222,201	408	37,296	5,315	10,831	278	2,409	86	2,403	7,312	3,745	443	294	0	109	293,633
14	1,439	1,217,305	9,396	399,053	54,428	40,281	1,033	6,114	218	16,694	53,876	9,718	2,555	3,047	0	677	1,815,835
16	1,436	1,065,695	21,341	242,962	35,749	50,195	1,287	3,593	128	1,861	3,628	12,041	626	0	0	0	1,440,542
17	204	125,745	1,230	29,897	4,227	5,449	140	820	29	1,089	3,333	1,538	195	156	0	43	174,095
Unclassified	4,496	1,917,280	16,845	593,876	95,466	99,934	2,269	23,060	670	38,485	129,761	46,114	10,436	6,281	179	895	2,986,046
Subtotal	13,884	6,483,397	63,882	2,054,730	327,722	320,165	7,310	68,055	1,974	118,735	404,762	138,913	31,981	20,220	504	2,700	10,058,934
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	3,081	1,313,757	7,354	621,456	104,873	72,967	2,709	33,201	356	49,291	471,407	187,998	77,966	10,854	6,839	712	2,964,822
6	2,458	682,046	5,002	393,451	45,810	50,918	1,470	20,888	136	6,689	33,029	28,660	6,090	198	0	0	1,276,845
7	6,544	1,713,379	13,403	815,896	135,930	112,513	4,363	53,029	139	41,590	243,618	61,430	35,950	4,306	685	685	3,243,460
8	2,400	778,021	7,271	476,808	60,498	57,375	2,049	49,620	171	14,078	123,604	52,915	19,422	2,910	412	214	1,647,769
9	755	231,465	1,688	125,104	17,283	15,377	568	9,554	40	5,316	41,433	16,745	6,741	853	341	77	473,340
12	910	336,884	29,204	54,826	9,624	16,874	369	4,040	382	5,084	17,682	12,815	4,970	855	361	240	495,121
14	3,407	1,581,524	11,903	513,774	72,976	54,958	1,255	10,146	951	32,824	117,973	47,836	26,376	5,959	2,372	1,540	2,485,774
16	1,968	1,360,396	162,822	243,208	43,131	69,148	1,574	8,653	1,048	2,973	6,635	28,284	5,090	589	0	0	1,935,519
17	400	181,021	15,110	38,346	6,304	8,361	184	1,606	172	2,382	8,331	5,910	2,377	427	174	107	271,211
Unclassified	6,952	2,640,994	90,285	912,076	140,546	145,135	3,870	50,899	1,393	52,664	249,821	108,725	39,056	8,808	2,023	1,296	4,454,543
Total	28,875	10,819,486	344,042	4,194,945	636,975	603,627	18,412	241,636	4,790	212,891	1,313,534	551,319	224,038	35,759	13,207	4,870	19,248,404

TABLE C21. EQUIVALENT-SINGLE-AXLE-LOAD MILES ON EXTENDED-WEIGHT SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	0	2,381	2,722	2,785	18,932	20,909	49,066	23,686	12,713	54,651	25,965	13,914	213,551	12,189	2,530	0	455,996
6	0	455	296	521	2,396	3,695	8,670	1,870	1,004	6,900	1,966	3,137	28,479	104	229	0	59,721
7	0	1,488	2,256	1,796	9,273	16,675	39,131	17,338	9,306	27,452	12,383	4,660	90,170	1,988	777	0	234,694
8	0	415	1,035	656	2,910	4,817	11,305	22,108	11,866	19,543	5,034	1,683	35,412	114	0	0	116,899
9	0	248	348	313	1,629	2,439	5,724	4,554	2,444	6,198	2,165	1,245	18,309	437	133	0	46,186
12	0	360	200	202	869	990	236	2,319	139	267	2,385	1,302	1,139	136	38	0	10,583
14	0	411	160	332	2,114	1,643	391	1,652	99	502	6,362	520	1,906	292	0	25	16,409
16	0	616	393	287	1,528	2,389	569	1,351	81	856	1,791	196	555	0	0	633	11,245
17	0	20	11	12	67	72	17	86	5	23	163	35	57	7	1	8	585
Unclassified	0	275	318	257	1,390	1,901	3,398	3,152	1,419	5,423	2,161	928	10,806	289	90	53	31,861
Subtotal	0	6,670	7,739	7,161	41,107	55,531	118,509	78,115	39,076	121,815	60,376	27,621	400,385	15,556	3,799	719	984,178
COAL-IMPACT COUNTIES																	
2	0	615	225	497	3,881	2,224	1,394	1,538	281	2,138	6,112	2,243	6,589	811	683	282	29,513
6	0	613	328	659	3,328	6,180	3,874	10,017	1,828	1,872	5,571	3,287	7,074	144	0	0	44,775
7	0	305	216	330	2,282	739	463	931	170	453	2,976	293	2,521	34	0	0	11,711
8	0	1	0	0	3	3	2	4	1	1	5	2	5	0	0	0	27
9	0	5	3	5	33	27	17	36	7	14	50	17	52	3	2	1	272
12	0	326	140	333	1,874	876	160	318	11	771	3,077	58	445	450	54	0	8,894
14	0	1,010	1,532	423	1,328	3,632	663	3,424	122	2,061	1,788	1,813	566	248	192	101	18,907
16	0	503	525	343	1,634	1,610	294	1,176	42	1,098	2,573	549	459	372	90	28	11,297
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Unclassified	0	368	270	314	1,776	1,617	755	1,838	281	866	2,808	849	2,242	238	107	31	14,360
Subtotal	0	3,744	3,240	2,905	16,140	16,909	7,621	19,282	2,743	9,275	24,959	9,113	19,953	2,301	1,129	444	139,757
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	0	2,997	2,948	3,282	22,813	23,132	50,460	25,224	12,994	56,789	32,077	16,158	220,140	13,000	3,213	282	485,509
6	0	1,067	624	1,180	5,724	9,875	12,544	11,887	2,832	8,771	7,537	6,425	35,553	248	229	0	104,496
7	0	1,792	2,473	2,126	11,555	17,414	39,594	18,269	9,476	27,905	15,359	4,953	92,691	2,022	777	0	246,405
8	0	416	1,035	656	2,913	4,820	11,307	22,112	11,867	19,545	5,039	1,685	35,417	115	0	0	116,926
9	0	253	351	318	1,662	2,466	5,741	4,590	2,451	6,212	2,215	1,262	18,361	440	135	1	46,458
12	0	686	340	536	2,743	1,866	396	2,637	150	1,038	5,463	1,360	1,584	586	92	0	19,477
14	0	1,421	1,692	755	3,442	5,275	1,054	5,076	221	2,563	8,150	2,334	2,472	541	192	126	35,316
16	0	1,119	917	630	3,162	3,999	863	2,527	123	1,954	4,364	744	1,014	372	90	662	22,542
17	0	20	11	12	67	72	17	86	5	23	163	35	57	7	1	8	585
Unclassified	0	643	588	571	3,166	3,519	4,153	4,989	1,701	6,289	4,968	1,777	13,048	527	198	84	46,221
Total	0	10,414	10,979	10,066	57,247	72,439	126,130	97,396	41,819	131,090	85,335	36,734	420,338	17,857	4,928	1,163	1,123,934

TABLE C22. EQUIVALENT-SINGLE-AXLE-LOAD MILES ON BASE SYSTEM (1000s)

FUNCTIONAL CLASS	MOTOR-CYCLES	CARS	BUSES	SINGLE-UNIT TRUCKS						SINGLE-TRAILER TRUCKS				MULTI-TRAILER TRUCKS			TOTAL
				2-AXLE 4-TIRE	2-AXLE 6-TIRE	3-AXLE W/O DECAL	3-AXLE WITH DECAL	4-AXLE W/O DECAL	4-AXLE WITH DECAL	4-AXLE W/O DECAL	5-AXLE W/O DECAL	6-AXLE W/O DECAL	ALL WITH DECAL	5 OR LESS AXLES	6-AXLE	7 OR MORE AXLES	
COAL-PRODUCING COUNTIES																	
2	0	2,720	7,724	3,045	270,416	17,557	9,313	10,657	0	5,129	58,945	15,394	213,514	20,752	36,542	0	671,709
6	0	980	2,317	1,143	55,807	6,238	3,309	8,524	0	733	2,729	1,388	12,696	692	0	0	96,555
7	0	2,922	12,418	3,312	290,195	29,720	15,766	25,898	0	8,209	30,803	4,773	97,955	4,305	3,790	1,045	531,111
8	0	1,280	7,170	2,030	121,765	12,642	6,707	23,399	0	605	12,949	3,730	48,354	3,211	1,885	0	245,725
9	0	449	1,660	557	39,034	3,661	1,942	4,362	0	672	4,991	1,285	18,000	1,359	1,795	41	79,805
12	0	344	25,820	105	926	1,336	380	835	1,420	464	1,403	1,317	11,143	331	16	52	45,893
14	0	1,093	2,248	688	3,986	3,245	922	2,064	3,511	2,790	8,671	5,536	58,644	1,716	107	344	95,564
16	0	884	126,861	1	1,586	4,190	1,191	2,590	4,406	192	407	2,359	10,992	347	0	0	156,007
17	0	166	12,445	51	446	644	183	402	684	223	676	635	5,371	160	8	25	22,120
Unclassified	0	2,171	70,578	1,909	133,814	15,031	6,694	15,039	3,466	3,371	18,506	6,518	83,472	6,381	7,498	342	374,791
Subtotal	0	13,008	269,240	12,841	917,976	94,264	46,407	93,770	13,487	22,387	140,080	42,935	560,140	39,253	51,642	1,850	2,319,280
COAL-IMPACT COUNTIES																	
2	0	1,221	1,166	684	3,450	6,539	951	9,330	810	5,398	15,333	3,958	5,692	1,726	68	237	56,562
6	0	1,066	1,707	1,218	4,157	9,201	1,338	3,563	309	707	2,529	2,240	1,407	0	0	0	29,444
7	0	2,219	2,642	1,583	7,036	8,039	1,169	3,649	317	1,850	7,569	1,732	2,744	1,080	0	0	41,630
8	0	1,054	1,298	831	3,446	6,038	878	4,471	388	2,142	6,624	2,144	2,587	699	20	71	32,692
9	0	246	303	194	804	1,408	205	1,043	91	500	1,545	500	603	163	5	17	7,625
12	0	667	298	224	1,218	3,618	1,028	1,615	252	460	1,162	420	338	58	0	48	11,405
14	0	3,652	6,866	2,394	12,478	13,454	3,824	4,098	640	3,196	8,560	1,089	1,946	598	0	300	63,095
16	0	3,197	15,593	1,458	8,196	16,766	4,766	2,408	376	356	576	1,349	476	0	0	0	55,518
17	0	377	899	179	969	1,820	517	550	86	209	530	172	149	31	0	19	6,506
Unclassified	0	5,752	11,020	3,563	17,163	30,349	6,605	15,747	1,679	7,106	20,964	6,760	7,722	1,962	51	343	136,786
Subtotal	0	19,450	41,791	12,328	58,918	97,232	21,283	46,473	4,948	21,924	65,392	20,365	23,665	6,317	144	1,035	441,263
ALL EXTENDED-WEIGHT SYSTEM COUNTIES																	
2	0	3,941	8,890	3,729	273,867	24,095	10,264	19,987	810	10,528	74,277	19,352	219,206	22,478	36,610	237	728,271
6	0	2,046	4,024	2,361	59,964	15,438	4,647	12,087	309	1,440	5,259	3,628	14,103	692	0	0	125,998
7	0	5,140	15,059	4,895	297,231	37,760	16,935	29,547	317	10,058	38,372	6,505	100,700	5,385	3,790	1,045	572,740
8	0	2,334	8,469	2,861	125,211	18,680	7,585	27,870	388	2,746	19,573	5,873	50,941	3,910	1,905	71	278,418
9	0	694	1,962	751	39,838	5,069	2,147	5,405	91	1,171	6,536	1,785	18,603	1,522	1,799	58	87,431
12	0	1,011	26,118	329	2,144	4,954	1,408	2,450	1,672	924	2,565	1,737	11,481	389	16	101	57,298
14	0	4,745	9,113	3,083	16,464	16,699	4,747	6,162	4,152	5,986	17,231	6,625	60,589	2,314	107	644	158,659
16	0	4,081	142,455	1,459	9,782	20,956	5,957	4,998	4,782	549	983	3,708	11,468	347	0	0	211,525
17	0	543	13,344	230	1,415	2,464	700	952	770	432	1,206	807	5,520	190	8	45	28,626
Unclassified	0	7,923	81,597	5,472	150,977	45,381	13,299	30,786	5,144	10,477	39,470	13,279	91,194	8,344	7,549	685	511,577
Total	0	32,458	311,031	25,170	976,893	191,496	67,690	140,242	18,435	44,311	205,472	63,299	583,805	45,570	51,785	2,884	2,760,543

TABLE C23. AVERAGE ANNUAL RESURFACING MILEAGE (ROADWAY MILES)
(1988-1990 DATA)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
COAL-PRODUCING COUNTIES			
2	92.53	42.47	135.00
6	28.10	19.37	47.47
7	147.60	96.77	244.37
8	63.10	145.10	208.20
9	13.33	82.27	95.60
12	5.57	5.27	10.84
14	6.17	.97	7.14
16	8.50	11.57	20.07
17	.00	7.40	7.40
Unclassified	4.70	74.30	79.00
Subtotal	369.60	485.49	855.09
COAL-IMPACT COUNTIES			
2	26.43	35.03	61.46
6	15.70	27.70	43.40
7	12.13	113.83	125.96
8	.00	147.87	147.87
9	.00	55.90	55.90
12	3.60	3.03	6.63
14	15.27	23.40	38.67
16	3.73	19.50	23.23
17	---	8.53	8.53
Unclassified	9.47	93.93	103.40
Subtotal	86.33	528.72	615.05
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	118.96	77.50	196.46
6	43.80	47.07	90.87
7	159.73	210.60	370.33
8	63.10	292.97	356.07
9	13.33	138.17	151.50
12	9.17	8.30	17.47
14	21.44	24.37	45.81
16	12.23	31.07	43.30
17	.00	15.93	15.93
Unclassified	14.17	168.23	182.40
Total	455.93	1014.21	1470.14

TABLE C24. AVERAGE PERCENTAGE OF MILEAGE RESURFACED ANNUALLY

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
COAL-PRODUCING COUNTIES			
2	17.17	6.41	11.24
6	17.20	5.11	8.75
7	15.76	3.91	7.16
8	13.13	4.22	5.31
9	13.06	8.10	8.55
12	20.18	12.70	15.69
14	24.29	1.02	5.93
16	10.55	6.44	7.71
17	.00	8.84	8.27
Unclassified	4.98	7.95	7.68
Subtotal	15.05	5.22	7.27
COAL-IMPACT COUNTIES			
2	23.56	13.90	16.88
6	6.89	5.78	6.14
7	8.33	6.39	6.54
8	.00	5.62	5.62
9	.00	7.03	6.93
12	15.86	5.84	8.89
14	16.62	8.67	10.69
16	8.90	4.91	5.29
17	---	8.10	8.10
Unclassified	15.01	11.55	11.80
Subtotal	12.02	6.98	7.41
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	18.27	8.47	12.55
6	11.19	5.48	7.27
7	14.76	4.95	6.94
8	13.09	4.83	5.43
9	11.79	7.63	7.88
12	18.23	8.89	12.16
14	18.28	6.68	9.50
16	9.98	5.38	6.19
17	.00	8.43	8.18
Unclassified	9.00	9.63	9.57
Total	14.37	6.01	7.33

TABLE C25. AVERAGE UNIT COSTS (DOLLARS/MILE) OF RESURFACING (1988-1991 MP SYSTEM DATA)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM
COAL-PRODUCING COUNTIES		
2	77,308	59,564
6	43,824	38,276
7	40,262	28,644
8	43,207	28,100
9	45,771	28,433
12		
14	97,644	66,686
16	64,516	35,685
17	---	10,436
Unclassified	85,140	32,474
COAL-IMPACT COUNTIES		
2	66,423	54,381
6	53,153	43,599
7	30,672	31,152
8	---	26,734
9	---	21,836
12	23,363	95,895
14	78,800	56,959
16	47,815	31,878
17	---	38,440
Unclassified		43,799
ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	76,517	57,124
6	46,858	41,966
7	39,579	29,856
8	43,207	27,558
9	45,771	25,523
12	23,363	95,895
14	85,272	57,320
16	59,373	32,769
17		27,828
Unclassified	85,140	39,345

TABLE C26. EQUIVALENT AVERAGE ANNUAL RESURFACING COSTS (DOLLARS) ADJUSTED TO 1990 EXPENDITURE LEVEL (MILEAGE FROM TABLE C23 AND UNIT COSTS FROM TABLE C25)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
COAL-PRODUCING COUNTIES			
2	5,430,337	1,920,374	7,350,712
6	934,842	562,828	1,497,670
7	4,511,298	2,104,235	6,615,533
8	2,069,680	3,095,234	5,164,915
9	463,170	1,775,759	2,238,929
12	412,877	266,787	679,664
14	457,352	49,105	506,457
16	416,300	313,429	729,729
17	0	58,625	58,625
Unclassified	303,774	1,831,658	2,135,433
Subtotal	14,999,630	11,978,035	26,977,665
COAL-IMPACT COUNTIES			
2	1,332,709	1,446,129	2,778,839
6	633,501	916,803	1,550,304
7	282,438	2,691,922	2,974,360
8	0	3,000,985	3,000,985
9	0	926,626	926,626
12	63,849	220,576	284,425
14	913,451	1,011,808	1,925,258
16	135,392	471,895	607,287
17	0	248,916	248,916
Unclassified	825,528	3,123,117	3,948,645
Subtotal	4,186,867	14,058,778	18,245,645
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	6,763,047	3,366,504	10,129,550
6	1,568,343	1,479,631	3,047,974
7	4,793,736	4,796,157	9,589,892
8	2,069,680	6,096,219	8,165,900
9	463,170	2,702,385	3,165,555
12	476,725	487,363	964,089
14	1,370,803	1,060,913	2,431,715
16	551,692	785,324	1,337,016
17	0	307,541	307,541
Unclassified	1,129,303	4,954,775	6,084,078
Total	19,186,497	26,036,813	45,223,310

TABLE C27. ANNUAL RESURFACING EXPENDITURE INCREMENT FOR EXTENDED-WEIGHT SYSTEM BEYOND BASE-SYSTEM NORMS

FUNCTIONAL CLASS	EQUIVALENT EXTENDED-WEIGHT SYSTEM EXPENDITURES (DOLLARS)	HYPOTHESIZED RESURFACING ON EXTENDED-WEIGHT MILEAGE			EXPENDITURE INCREMENT (DOLLARS)
		MILEAGE RESURFACED ANNUALLY	UNIT COSTS (DOLLARS/MILE)	HYPOTHESIZED EXPENDITURES (DOLLARS)	
COAL-PRODUCING COUNTIES					
2	5,430,337	34.6	45,217	1,562,388	3,867,950
6	934,842	8.3	29,057	242,591	692,251
7	4,511,298	36.6	21,745	795,653	3,715,645
8	2,069,680	20.3	21,332	432,316	1,637,364
9	463,170	8.3	21,585	178,555	284,615
12	412,877	3.5	0	0	412,877
14	457,352	.3	50,624	13,115	444,237
16	416,300	5.2	27,090	140,581	275,719
17	0	.5	7,922	4,062	-4,062
Unclassified	303,774	7.5	24,652	184,988	118,786
Subtotal	14,999,630	128.1	27,755	3,554,249	11,445,381
COAL-IMPACT COUNTIES					
2	1,332,709	15.6	41,283	643,872	688,838
6	633,501	13.2	33,098	435,816	197,685
7	282,438	9.3	23,649	220,245	62,192
8	0	.1	20,295	2,053	-2,053
9	0	.8	16,577	12,820	-12,820
12	63,849	1.3	72,797	96,475	-32,627
14	913,451	8.0	43,240	344,517	568,934
16	135,392	2.1	24,200	49,742	85,650
17	---	---	---	---	---
Unclassified	825,528	7.3	33,249	242,367	583,161
Subtotal	4,186,867	50.1	40,862	2,047,907	2,138,960
ALL EXTENDED-WEIGHT SYSTEM COUNTIES					
2	6,763,047	55.2	39,978	2,206,259	4,556,787
6	1,568,343	21.5	31,622	678,407	889,936
7	4,793,736	53.5	18,979	1,015,898	3,777,837
8	2,069,680	23.3	18,667	434,369	1,635,312
9	463,170	8.6	22,172	191,375	271,795
12	476,725	4.5	21,583	96,475	380,250
14	1,370,803	7.8	45,664	357,632	1,013,170
16	551,692	6.6	28,863	190,323	361,369
17	0	.5	8,310	4,062	-4,062
Unclassified	1,129,303	15.2	28,190	427,355	701,947
Total	19,186,497	190.6	29,390	5,602,156	13,584,341

TABLE C28. AVERAGE ANNUAL RESURFACING COSTS PER ESAL-MILE (CENTS PER ESAL-MILE)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
COAL-PRODUCING COUNTIES			
2	1.191	.286	.652
6	1.565	.583	.958
7	1.922	.396	.864
8	1.770	1.260	1.424
9	1.003	2.225	1.777
12	3.901	.581	1.203
14	2.787	.051	.452
16	3.702	.201	.436
17	.000	.265	.258
Unclassified	.953	.489	.525
Average	1.524	.516	.817
COAL-IMPACT COUNTIES			
2	4.516	2.557	3.228
6	1.415	3.114	2.089
7	2.412	6.466	5.576
8	.000	9.179	9.172
9	.000	12.152	11.733
12	.718	1.934	1.401
14	4.831	1.604	2.348
16	1.198	.850	.909
17	---	3.826	3.826
Unclassified	5.749	2.283	2.612
Average	2.996	3.186	3.140
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	1.393	.462	.835
6	1.501	1.174	1.322
7	1.945	.837	1.171
8	1.770	2.190	2.066
9	.997	3.091	2.364
12	2.448	.851	1.256
14	3.882	.669	1.254
16	2.447	.371	.571
17	.000	1.074	1.053
Unclassified	2.443	.969	1.091
Average	1.707	.943	1.164

TABLE C29. ANNUAL ESAL-MILES OF COAL DECAL TRUCKS (1000s)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
COAL-PRODUCING COUNTIES			
2	275,330	222,827	498,157
6	38,153	16,005	54,158
7	138,608	113,721	252,329
8	58,583	55,060	113,643
9	26,477	19,942	46,419
12	1,514	12,943	14,457
14	2,396	63,078	65,474
16	1,206	16,589	17,795
17	80	6,238	6,318
Unclassified	15,624	93,631	109,255
Subtotal	557,970	620,034	1,178,003
COAL-IMPACT COUNTIES			
2	8,263	7,453	15,716
6	12,776	3,055	15,831
7	3,153	4,231	7,384
8	7	3,854	3,861
9	76	899	975
12	617	1,618	2,235
14	1,351	6,410	7,762
16	795	5,618	6,413
17	---	752	752
Unclassified	3,278	16,006	19,284
Subtotal	30,317	49,895	80,213
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	283,593	230,280	513,873
6	50,929	19,060	69,989
7	141,761	117,952	259,713
8	58,591	58,914	117,504
9	26,553	20,841	47,394
12	2,130	14,561	16,692
14	3,748	69,488	73,236
16	2,000	22,207	24,207
17	80	6,990	7,070
Unclassified	18,902	109,637	128,539
Total	588,287	669,929	1,258,216

TABLE C30. HYPOTHETICAL PERCENT REDUCTION IN ESAL-MILES WITHOUT COAL DECAL SYSTEM

COAL TRUCK TYPE	DECAL	EMPTY WEIGHT (POUNDS)	MAXIMUM LOAD (POUNDS)	PAYLOAD (POUNDS)	ESALs PER TRUCK	REDUCTION IN ESAL-MILES BY ELIMINATION OF DECALS (PERCENT)
3-Axle Single-Unit	With Decal	29,000	94,500	65,500	26.4	61.1
	Without Decal	25,000*	59,400	34,400	5.4	
4-Axle Single-Unit	With Decal	35,000	105,000	70,000	13.9	42.0
	Without Decal	31,000*	77,000	46,000	5.3	
5- and 6-Axle Single-Trailer	With Decal	40,000	126,000	86,000	9.1	70.6
	Without Decal	35,000*	80,000	45,000	1.4	

*Assumed

TABLE C31. HYPOTHETICAL ANNUAL ESAL-MILES OF COAL TRUCKS WITHOUT COAL DECAL SYSTEM (1000s)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
	COAL-PRODUCING COUNTIES		
2	89,274	66,404	155,678
6	12,333	5,022	17,354
7	47,152	34,941	82,092
8	21,700	16,829	38,529
9	9,031	6,049	15,079
12	507	4,248	4,755
14	770	19,639	20,409
16	432	6,252	6,684
17	27	2,048	2,074
Unclassified	5,324	29,160	34,484
Subtotal	186,549	190,590	377,139
	COAL-IMPACT COUNTIES		
2	2,643	2,514	5,157
6	4,649	1,115	5,764
7	1,020	1,446	2,466
8	3	1,328	1,330
9	26	310	336
12	200	646	846
14	496	2,433	2,929
16	274	2,214	2,488
17	---	295	295
Unclassified	1,116	5,817	6,933
Subtotal	10,426	18,118	28,544
	ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	91,917	68,918	160,834
6	16,982	6,136	23,118
7	48,172	36,387	84,559
8	21,702	18,157	39,859
9	9,057	6,358	15,415
12	707	4,894	5,601
14	1,266	22,072	23,338
16	706	8,467	9,172
17	27	2,343	2,369
Unclassified	6,441	34,977	41,417
Total	196,975	208,708	405,683

TABLE C32. HYPOTHETICAL ANNUAL RESURFACING COST INCREMENT DUE TO COAL DECAL SYSTEM (DOLLARS)

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
	COAL-PRODUCING COUNTIES		
2	2,215,695	447,204	2,662,899
6	404,182	64,023	468,205
7	1,757,971	312,124	2,070,094
8	653,013	481,573	1,134,587
9	174,960	309,141	484,101
12	39,261	50,546	89,806
14	45,321	22,321	67,642
16	28,643	20,767	49,410
17	0	11,107	11,107
Unclassified	98,201	315,080	413,280
Subtotal	5,417,247	2,033,885	7,451,132
	COAL-IMPACT COUNTIES		
2	253,798	126,278	380,076
6	114,977	60,425	175,402
7	51,452	180,055	231,507
8	0	231,835	231,835
9	0	71,585	71,585
12	2,992	18,801	21,793
14	41,347	63,780	105,127
16	6,243	28,932	35,175
17	---	17,480	17,480
Unclassified	124,277	232,633	356,910
Subtotal	595,087	1,031,803	1,626,890
	ALL EXTENDED-WEIGHT SYSTEM COUNTIES		
2	2,469,493	573,482	3,042,975
6	519,159	124,448	643,607
7	1,809,423	492,179	2,301,601
8	653,013	713,408	1,366,422
9	174,960	380,725	555,686
12	42,253	69,347	111,599
14	86,669	86,100	172,769
16	34,886	49,699	84,585
17	0	28,587	28,587
Unclassified	222,478	547,713	770,191
Total	6,012,334	3,065,688	9,078,023

TABLE C33. ANNUAL REVENUE GENERATED BY COAL DECAL SYSTEM (DOLLARS)

TRUCK TYPE	NUMBER WITH DECALS	DECAL FEES		ADDED FEES DUE TO 80,000-POUND REGISTRATION*		LOST FEES DUE TO FEWER TRUCK REGISTRATIONS			TOTAL
		UNIT	TOTAL	UNIT	TOTAL	NUMBER	UNIT	TOTAL	
3-Axle, Single-Unit	1,217	160	194,720	716	871,372	1,100	544	-598,538	467,554
4-Axle, Single-Unit	193	260	50,180	135	26,055	101	1,125	-113,283	-37,048
Single-Trailer Combination	2,467	360	888,120	0	0	2,248	1,260	-2,832,116	-1,943,996
Total	3,877		679,812**		897,427			-3,543,936	-1,966,697

*Assumes registration fees of $544, $1,125, and $1,260 for 3-axle single-unit trucks, 4-axle single-unit trucks, and single-trailer combinations, respectively, without the coal decal system
**Remaining 40 percent distributed to counties

TABLE C34. AVERAGE RIDEABILITY INDEX

FUNCTIONAL CLASS	EXTENDED-WEIGHT SYSTEM	BASE SYSTEM	TOTAL
COAL-PRODUCING COUNTIES			
2	3.15	3.12	3.13
6	2.91	3.12	3.06
7	2.75	2.75	2.75
8	2.07	2.36	2.32
9	2.30	2.29	2.29
12	2.89	2.85	2.87
14	3.25	3.04	3.08
16	2.78	2.83	2.81
17	2.41	2.52	2.51
Unclassified	1.71	2.06	2.03
Average	2.66	2.53	2.56
COAL-IMPACT COUNTIES			
2	3.19	3.37	3.31
6	3.20	3.14	3.16
7	3.15	2.95	2.97
8	2.44	2.63	2.63
9	2.99	2.41	2.42
12	3.70	3.16	3.32
14	2.98	2.95	2.96
16	3.14	2.83	2.86
17	---	2.74	2.74
Unclassified	3.49	2.50	2.57
Average	3.19	2.75	2.79
ALL EXTENDED-WEIGHT SYSTEM COUNTIES			
2	3.16	3.19	3.18
6	3.08	3.13	3.11
7	2.80	2.83	2.83
8	2.07	2.48	2.45
9	2.37	2.34	2.34
12	3.26	3.02	3.10
14	3.04	2.97	2.99
16	2.90	2.83	2.84
17	2.41	2.64	2.64
Unclassified	2.42	2.26	2.28
Average	2.78	2.63	2.65