

**Volume I: FINAL REPORT**

**2003 OREGON HIGHWAY  
COST ALLOCATION STUDY**

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## Preface

Highway user revenues that are used to maintain, operate and improve Oregon's public highways, roads and streets are under constant review by the Legislative Assembly to ensure they are fairly and efficiently imposed on the citizens.

The vehicles using Oregon's highways can be categorized into two main groups: Light Vehicles – automobiles and smaller load-carrying vehicles weighing 8,000 pounds or less, and Heavy Vehicles – trucks, buses, and other vehicles weighing over 8,000 pounds.

How much each of these groups should pay, both between and within each group, is a subject reviewed periodically in highway cost allocation studies (HCASs). As changes occur in the number and types of vehicles using Oregon's highways, and the types of projects being undertaken, highway user taxes must be adjusted to maintain equity between and within the two groups.

Since changes in highway program and travel trends can occur fairly rapidly, updated highway cost allocation studies need to be performed on a regular basis. The Oregon Constitution now requires a study be conducted biennially and highway user tax rates be adjusted, if necessary, to ensure fairness and proportionality between light and heavy vehicles.

This 2003 Oregon HCAS uses the most current traffic, revenue and expenditure data available. It also re-examines and in some cases changes the approach and methodology used in previous Oregon studies. This report presents the major findings and results of the 2003 Study, and compares these findings to the results of prior Oregon studies.

## Summary of Major Findings

The 2003 Oregon Highway Cost Allocation Study finds that:

- Light vehicles (those weighing 8,000 pounds or less) paying full fees should contribute 66.6 percent of state highway user revenues, and heavy vehicles (those weighing over 8,000 pounds) paying full fees should contribute 33.4 percent during the 2003-05 biennium.
- For the 2003-05 biennium, and under existing, current law tax rates, it is projected full-fee-paying light vehicles will contribute 66.1 percent of state highway user revenues and full-fee-paying heavy vehicles, as a group, will contribute 33.9 percent.
- The calculated equity ratios for full-fee-paying vehicles, defined as the ratio of projected payments to responsibilities for the vehicles in each class, are 0.992 for light vehicles and 1.016 for heavy vehicles as a group. This means that, under existing tax rates and fees, light vehicles are projected to underpay their responsibility by 0.8 percent. Heavy vehicles, as a group, are projected to overpay their responsibility by 1.6 percent during the next biennium.
- The equity ratios for the individual heavy vehicle weight classes show some classes are projected to overpay and some to underpay their responsibility during the 2003-05 biennium. The recommended fees and tax rates presented in Chapter 7 of this report minimize this cross-subsidization of some heavy vehicle weight classes by others.
- The reduced rates paid by certain types of vehicles, principally publicly owned and farm vehicles, mean these vehicles are paying lower per-mile charges than comparable vehicles subject to full fees. The difference between what these vehicles are projected to pay and what they would pay if subject to full fees represents a cost which must be borne by all other highway users.

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# 1 Introduction and Background

Cost responsibility is the principle that those who use the public roads should pay for them and, more specifically, that users should pay in proportion to the road costs for which they are responsible. Cost responsibility requires categories of highway users to contribute to highway revenues in proportion to the costs they impose on the highway system. It is the process of apportioning the cost of highway work to the vehicles that cause it, and is therefore the implementation of the fundamental user pay policy of the state of Oregon.

For over 60 years Oregon has based the financing of its highways on the principle of cost responsibility. This tradition has served Oregon well over the years by ensuring the state's highway taxes and fees are levied in a fair and efficient manner. Periodic studies have been conducted to determine the "fair share" that each class of road users should pay for the maintenance, operation and improvement of the state's highways, roads and streets. Prior to the present study, 12 such studies had been completed; the first in 1937, the most recent in 2001.

Oregon voters ratified the principle of cost responsibility in the November 1999 special election by voting to add the following language to Article IX, Section 3a (3) of the Oregon Constitution:

*"Revenues . . . that are generated by taxes or excises imposed by the state shall be generated in a manner that ensures that the share of revenues paid for the use of light vehicles, including cars, and the share of revenues paid for the use of heavy vehicles, including trucks, is fair and proportionate to the costs incurred for the highway system because of each class of vehicle. The Legislative Assembly shall provide for a biennial review and, if necessary, adjustment, of revenue sources to ensure fairness and proportionality."*

## 1.1 Purpose of Study

The purpose of this 2003 Oregon Highway Cost Allocation Study (HCAS) is to (1) determine the fair share that each class of road users should pay for the maintenance, operation and improvement of Oregon's highways, roads and streets, and (2) recommend adjustments, if necessary, to existing tax rates and fees to bring about a closer match between payments and responsibilities for each vehicle class.

## 1.2 Past Oregon Highway Cost Allocation Studies

Oregon, more than any other state, has a long history of conducting highway cost allocation or responsibility studies and basing its system of road user taxation on the results of these studies. Past studies have been completed in 1937, 1947, 1963, 1974, 1980, 1984, 1986, 1990, 1992, 1994, 1999 and 2001. As noted above, the Oregon Constitution now requires a study be conducted biennially and highway user tax rates be adjusted, if necessary, to ensure fairness and proportionality between light and heavy vehicles.

Prior to 1999, Oregon used the terminology “cost responsibility” studies, while the federal government and most other states called their studies “cost allocation” studies. Oregon has now adopted the more conventional terminology, although the two terms are essentially equivalent and used interchangeably in this report.<sup>1</sup>

In all past studies, highway users and other interested parties have been given the opportunity to offer their input in an open and objective process. During the 1986 Study, for example, three large public meetings were held to provide information on the study and solicit the input of all user groups.

As part of the 1994 Study process, a Policy Advisory Committee was formed to address several cost responsibility issues that arose during the 1993 legislative session. This committee consisted of 12 members, including a representative of AAA Oregon and five representatives of the trucking industry. The committee held six meetings devoted to understanding and recommending policies for the 1994 Study as well as future Oregon studies.

In 1996, the Oregon Department of Transportation (ODOT) formed the Cost Responsibility Blue Ribbon Committee to evaluate the principles and methods of the Oregon cost responsibility studies and, if warranted, recommend improvements to the existing methodology. This eleven-member committee was chaired by the then Chairman of the Oregon Transportation Commission and included representatives of the trucking industry, AAA Oregon, local governments, academia, and Oregon business interests. The committee held a total of seven meetings and reached agreement on a number of recommendations for future studies. Since the trucking industry, in some cases, did not agree with the full committee recommendations, it was given the opportunity and elected to file a Minority Report, which was included in the committee report.

All studies prior to 1999 were conducted by ODOT staff. In February 1998, the ODOT and Oregon Department of Administrative Services (DAS) Directors reached agreement to transfer responsibility for the study from ODOT to DAS. Both the 1999 and 2001 studies were conducted by consultants for the DAS Office of Economic Analysis. ODOT’s role in these studies was to provide technical assistance and most of the data and other required information.

The Oregon studies prior to 1999 relied on an internal technical advisory committee to provide the expertise and some of the many data elements required for the studies. As noted, highway users and other interested parties were also provided the opportunity to offer their input as the studies were being conducted. For the 1999, 2001, and 2003 studies, DAS formed a Study Review Team (SRT) to provide overall direction for the studies. The SRT’s role has been to provide policy guidance and advisory input on all study methods and issues.

The SRT for the 1999 Study consisted of nine members, and for the 2001 Study ten members. The exact composition of the SRT has changed from study to study, but all have included motorist, trucking industry and Oregon business representatives, academics, and state officials. All three SRTs have been chaired by the State

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<sup>1</sup> It should be noted that to be precise, neither term is technically correct. Since all state studies, including Oregon’s, have to this point allocated expenditures rather than “true” costs, they are really “expenditure allocation” studies.

Economist. ODOT did not have a representative on the 1999 SRT, but was represented on the SRTs for the 2001 and 2003 studies.

### 1.3 Other Highway Cost Allocation Studies

Although Oregon has the longest history of conducting highway cost allocation studies, a number of other states have also conducted such studies. The majority have been completed over the past two decades. During the 60 years up through 1998, 32 states performed a total of 71 cost allocation studies. Since the late 1970s, some 30 states have conducted such studies.

The interest of other states in undertaking these studies has, in many cases, been sparked by the completion of similar studies by the federal government. Several states undertook studies following the release of the 1982 Federal HCAS. With the release of the 1997 Federal HCAS and the Federal Highway Administration's (FHWA) interest in helping states do their own studies, there has again been a renewed interest among the states. Upon completion of the 1997 Federal Study, FHWA formed a state representatives' Steering Committee to assist the states in adopting the research and methods employed in that study.

It is difficult to make one-to-one comparisons of the results of different state studies. The reason is that every state is unique in terms of design policies and practices, climate, topography and soil conditions, and mix of traffic and highway expenditures.

A 1996 Oregon Legislative Revenue Office report concluded most of the differences in study results among states can be explained by differences in the factors listed above, principally differences in program mix.<sup>2</sup> Oregon, for example, includes no state police expenditures in its studies because, since 1980, state police do not receive Highway Fund monies. California, on the other hand, includes large Highway Patrol expenditures in its studies. Since policing expenditures are typically viewed as a common responsibility of all highway users, and assigned to all vehicle classes on the basis of each class's relative travel, they are predominantly the responsibility of automobiles and other light vehicles. Therefore, it is not surprising the California studies find a higher light/lower heavy vehicle responsibility share than the Oregon studies.

A review of state studies conducted in connection with the 1997 Federal Study found those studies attempting to clearly allocate costs between light and heavy vehicle classes have commonly found heavy vehicles to be responsible for 30 to 40 percent of total highway expenditures. The past several Oregon studies have produced results in this range. Both the 1982 and 1997 Federal HCASs found trucks and other heavy vehicles to be responsible for 41 percent of federal highway expenditures.<sup>3</sup>

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<sup>2</sup> "Oregon Cost Responsibility Studies Compared to Other States," Legislative Revenue Office Research Report #4-96, September 10, 1996.

<sup>3</sup> It should be noted, however, that the results of the federal studies are not directly comparable to those of state studies. The reasons are that highway maintenance is largely a state funded activity and so not included in the federal studies, and the heavy vehicle responsibility share is generally lower for most maintenance activities than for construction, particularly major rehabilitation projects. Therefore, the responsibility for federal expenditures will typically be more weighted toward heavy vehicles than is the case for state expenditures.

## **1.4 2003 Study Process and Schedule**

Work on the 2003 Study began in November 2001. As noted above, the 1999 and 2001 Oregon studies were performed by consultants, with ODOT's role being to supply technical expertise and most of the data elements required for these studies. In contrast, the 2003 Study was largely conducted by ODOT staff, with oversight by DAS and limited consultant assistance. This reduced the cost of performing the 2003 Study by \$150,000, as mandated by the 2001 Legislature.

DAS formed the SRT in early November 2001, and the first meeting was held on November 21. A detailed study work plan and schedule, listing of recommended consultant tasks, and listing of recommended SRT meeting dates and agenda items, as well as other background materials, were prepared for this meeting.

The SRT held eight meetings during 2002: January 23, March 15, May 1, July 26, September 4, October 16, November 20, and December 19. The tenth, and final, meeting was held on January 27, 2003. The SRT members are listed at the beginning of this report. Additionally, the agendas and minutes of the meetings are provided in the separate Volume II: Technical Results Report.

Following the initial November SRT meeting, the principal concentration of study staff was on preparing and refining ten methodology issue papers discussing the issues, options, and staff recommendations for the treatment of the major expenditure items to be allocated in the study. Staff also prepared a set of five matrices comparing the allocation methods and instruments proposed for the 2003 Study with those used in the 1992, 1999, and 2001 Oregon studies, as well as three discussion papers dealing with specific issues and a number of other information materials. The papers and other information materials were discussed extensively at the first several SRT meetings. The issue and discussion papers and other information materials are presented in the Volume II: Technical Results Report.

## **1.5 Oregon Road User Taxation**

Oregon's constitutionally dedicated State Highway Fund derives most of its revenue from three major highway user taxes: vehicle registration fees, motor vehicle fuel taxes (primarily the gasoline tax), and motor carrier fees (the weight-mile tax). The basis of each of these taxes is governed by the concept of cost responsibility. This three-tiered structure is used to collect a fair share of revenue from each highway user class.

Road user taxes were initially levied against motor vehicles to cover the cost of registration. A one-time fee of \$3 was instituted in 1905. Since this proved to be a productive source of revenue, the state soon annualized the fee and began to increase the rates, using the proceeds to finance highways.

The registration fee is considered payment for the fixed or non-use related costs of providing a highway system. These costs include minimal maintenance of facilities and equipment along with certain administrative functions necessary to keep the system accessible. Since these costs account for a small portion of total highway costs, registration fees in Oregon have traditionally been low (for both cars and trucks) in comparison to the corresponding fees in most other states. The current fee for

automobiles and other vehicles weighing 8,000 pounds or less is \$30 biennially. The fee was last increased in 1990.

The second tier in the Oregon system is the fuel tax. In 1919, Oregon became the first state in the nation to enact a fuel tax on gasoline. It was regarded as a “true” road user tax since those who used the roads more, paid more. The fuel tax came to be viewed as the most appropriate means of collecting the travel-related share of costs for which cars and other light vehicles are responsible.

The state fuel tax was extended to diesel and other fuels in 1943. Since that time, the tax on diesel and other fuels, referred to as a “use fuel” tax, has been at the same level as the tax on gasoline. Oregon’s fuel tax rate is \$0.24 per gallon. It was last increased in 1993.

The third tier in the Oregon highway finance system is the weight-mile tax. Oregon’s first third-structure tax was put into effect in 1925 in the form of a ton-mile tax. It was used to cover the responsibility of the growing number of trucks and other heavy vehicles appearing on the public roadways at that time.

Oregon’s first weight-mile tax was enacted in 1947 and implemented in 1948. The tax applies to all commercial motor vehicles with declared gross weights in excess of 26,000 pounds. It is based on the declared weight of the vehicle and the distance it travels in Oregon. The weight-mile tax is a use tax that takes the place of the fuel tax on heavy vehicles. Vehicles subject to the weight-mile tax are not subject to the state fuel tax.

The Oregon weight-mile tax system consists of a set of schedules and alternate flat fee rates. There are separate schedules for vehicles with declared weights of 26,001-80,000 pounds and those operated under special permit at weights above 80,000 pounds. Additionally, log, sand and gravel, and wood chip haulers have the option to pay flat fees in lieu of the mileage tax.

Since 1990, carriers hauling divisible load commodities under special permit at gross weights between 80,001 and 105,500 pounds pay a weight-mile tax (statutory Table “B”) based on the vehicle’s declared weight and number of axles. There are separate schedules for five, six, seven, eight, and nine or more axle vehicles, with each schedule graduated by declared weight. The rates are structured so that, at any declared weight, carriers can qualify for a lower per-mile rate by utilizing additional axles.

Also starting in 1990, carriers hauling non-divisible loads at gross weights in excess of 98,000 pounds under special, single-trip permits pay a per-mile road use assessment fee. Non-divisible (or “heavy haul”) permits are issued for the transportation of very heavy loads that cannot be broken apart, such as construction equipment, bridge beams and electrical transformers.

The road use assessment fees are expressed in terms of permit gross weight and number of axles, and are currently based on a charge of 5.2 cents per equivalent single axle load (ESAL) mile of travel. As with the Table “B” rates, carriers are assessed a lower per-mile charge the greater the number of axles used at any given gross weight. The road use assessment fee takes the place of the weight-mile tax for the loaded front haul portion of non-divisible load hauls. With rare exceptions, empty back haul miles

continue to be subject to the weight-mile tax and taxed at the vehicle's regular declared weight (most typically 80,000 pounds).

In the years since 1947, the weight-mile rates have been adjusted 13 times based on the results of updated cost responsibility studies. The most recent revision occurred on September 1, 2000 when the rates were reduced across-the-board by approximately 12.3 percent to reflect the results of the 1999 Study. The rates were also reduced by 6.2 percent on January 1, 1996 based on the results of the 1994 Study. The last time the rates were increased was January 1, 1992, when they were increased to maintain equivalency with the fuel tax increases enacted by the 1991 Legislature.

The 1999 Oregon Legislature repealed the weight-mile tax and replaced it with a 29 cent per gallon diesel fuel tax and substantially higher heavy truck registration fees. This measure, House Bill 2082, was subsequently referred to the voters and defeated in the May 2000 primary election.

After the May 2000 vote, the trucking industry challenged the Oregon tax in the courts. The primary focus of the legal action was the feature that allows haulers of logs, sand and gravel, and wood chips to pay alternate flat fees in lieu of the mileage tax. The industry argued these fees are, from a practical standpoint, available only to Oregon intrastate motor carriers, and this provision of the Oregon system therefore unfairly discriminates against non-Oregon based interstate firms. In February 2002, the Third District Circuit Court ruled in favor of the State in the lawsuit. This decision is currently being appealed by the industry.

## **1.6 Organization of the Report**

This volume of the 2003 Study provides an overview of the study issues, methodology and results, as well as recommendations for future studies. There are a number of exhibits throughout this report to illustrate specific data. Please note that amounts shown are rounded, and may not total exactly.

This chapter has provided an introductory discussion of the purpose, scope and process of the 2003 Study, as well as a brief background discussion of the Oregon studies, the studies of the federal government and other states, and the evolution of Oregon road user taxation.

Chapter 2 of this volume briefly summarizes the basic structure and parameters of the 2003 Study, including the analysis periods, road (highway) systems, vehicle classes, revenues attributed, and expenditures allocated to the vehicle classes.

Chapter 3 presents the general methodology and approach used for the study. It includes a description of the special analyses conducted for the study and discussion of the major methodological and procedural changes from previous Oregon studies.

Chapter 4 summarizes the data and forecasts used in the study, and compares them to the data and forecasts used in recent studies.

Chapter 5 presents the study expenditure allocation and revenue attribution procedures and results, and compares the methods and results to those of previous Oregon studies.

Chapter 6 brings together the expenditure allocation and revenue attribution results from the previous chapter to develop ratios of projected payments to cost responsibilities for light vehicles and the detailed heavy vehicle weight classes. It also compares these ratios to those from the prior two Oregon studies.

Chapter 7 contains recommendations for changes in existing tax rates and fees to bring about a closer match between revenues contributed and cost responsibilities for each vehicle class.

The final chapter, Chapter 8, presents recommendations for future Oregon studies.

Since the intent is to keep this volume to a manageable length, a second Technical Results Report volume is also produced. This separate volume contains additional detailed information on the issues, methods, procedures, and results of the 2003 Study. In addition to the detailed study data, forecasts and results plus a description and documentation of changes to the study computer model, it includes:

- The full set of ten methodology issue papers and three discussion papers produced during the conduct of the study;
- A set of five allocation methodology matrices comparing the detailed allocation methods and instruments used in the present study with those used in the 1992, 1999, and 2001 Oregon studies;
- A Glossary of HCAS Terms and Acronyms;
- The agenda and minutes of each of the ten SRT meetings;
- A set of tables presenting the study expenditure allocation results by individual worktype category, funding source, and vehicle weight group;
- The Bridge Cost Responsibility Study Report; and
- The Interchange Cost Responsibility Study Report.

## **2 Basic Structure and Parameters of Study**

The underlying approach and methods used in this study are, with a few significant exceptions, similar to those used in the last couple Oregon studies. The analysis framework and basic parameters of the 2003 Study are briefly summarized below.

### **2.1 Study Approach and General Methodology**

Cost occasioned approach and incremental, design-based general methodology; same as in all previous Oregon studies and virtually all studies conducted by the federal government and other states.

### **2.2 Analysis Periods**

- Base Year: Calendar Year (CY) 2001
- Forecast (Study) Period: 2003-05 Biennium, or State Fiscal Years 2004 and 2005 (i.e., the period July 1, 2003 – June 30, 2005)
- Forecast (Study) Year: CY 2004, the mid year of the 2003-05 Biennium

The expenditures allocated are those projected for the 2003-05 biennium using ODOT's Cash Flow Forecast model. All traffic data used in the study is first developed for the CY 2001 base year, and then projected forward to the CY 2004 forecast year.

### **2.3 Road (Highway) Systems**

- Interstate Urban
- Interstate Rural
- Other State Urban
- Other State Rural
- County Roads
- City Streets

A total of six road (highway) systems; same as in the 1994, 1999, and 2001 Oregon studies. Although the study data and results are reported in terms of these six administrative or jurisdictional road systems, the Federal Highway Administration's Highway Performance Monitoring System (HPMS) functional classes are used in the actual allocation of expenditures in the model. The model contains a crosswalk between the six administrative systems listed above and the twelve HPMS classes. The HPMS functional classes are:

- Rural Interstates
- Rural Other Principal Arterials
- Rural Minor Arterials
- Rural Major Collectors

- Rural Minor Collectors
- Rural Local
- Urban Interstates
- Urban Other Freeways & Expressways
- Urban Other Principal Arterials
- Urban Minor Arterials
- Urban Collectors
- Urban Local

## 2.4 Vehicle Classes

Registered, declared, and observed (actual operating) 2,000-pound gross weight increments up to 200,000 pounds. The final class includes all gross weights in excess of 200,000 pounds.

- Light Vehicles: 1 – 8,000 pounds (1 class)
- Heavy Vehicles: 8,001 pounds and over (97 classes)

Total of 98 gross weight classes for expenditure allocation and revenue attribution computations.

The dividing line between light and heavy vehicles is selected to be consistent with the way vehicles are registered in Oregon. Under current law, vehicles with weights of 8,000 pounds or less pay a biennial registration fee of \$30. The graduated annual registration fees for trucks and other heavy vehicles start at 8,001 pounds. Since the weight-mile tax starts at 26,001 pounds, it may, for some purposes, be useful to divide vehicles weighing over 8,000 pounds into two broad groups: medium-heavy vehicles (8,001-26,000 pounds) and heavy vehicles (26,001 pounds and over).

For reporting purposes, the expenditure allocation and revenue attribution results reported in Chapters 5 and 6 are presented in terms of the following nine summary-level vehicle weight groups:

- 1 to 8,000 pounds
- 8,001 to 26,000 pounds
- 26,001 to 46,000 pounds
- 46,001 to 54,000 pounds
- 54,001 to 78,000 pounds
- 78,001 to 80,000 pounds
- 80,001 to 104,000 pounds
- 104,001 to 105,500 pounds
- 105,501 pounds and up

These groupings are the same as those used in the 2001 Oregon Study. They were selected on the basis of the characteristics of the vehicles in each group, logical divisions in the tax structure, and/or the number of vehicles and miles in each group. Operators of vehicles in the 8,001–26,000 pound group, for example, pay the state fuel tax and higher registration fees rather than the weight-mile tax. Additionally, a large majority of these vehicles are two-axle, single-unit trucks or buses used in local commercial delivery operations or passenger transport. Thus, they have relatively similar

characteristics with respect to their cost responsibility and tax payments, and it is therefore logical to combine them for reporting purposes.

Similarly, it makes sense to combine the individual weight classes above 105,500 pounds because these vehicles are (a) operated under special, single-trip, non-divisible load permits, (b) operated with multiple axles and legally allowed higher axle weights than regular commercial trucks, (c) subject to the road use assessment fee rather than the weight-mile tax for their loaded front haul miles, and (d) typically used for short-mileage hauls (e.g., transporting heavy equipment from one construction site to another) and so account for a very small proportion of total truck miles in the state.

The weight classes of 78,001-80,000 and 104,001-105,500 pounds are by far the largest two truck classes in terms of miles of travel. These two classes alone account for a majority of the total commercial truck miles in Oregon. Because of the dominant role of these two classes in terms of miles of travel, cost responsibilities, and revenue contributions, it is logical they be kept as separate groups.

## **2.5 Expenditures Allocated**

Projected state plus local expenditures from all (state, federal, and local) funding sources for the 2003-05 biennium forecast period. The four major expenditure categories are:

- Modernization (New Construction/Reconstruction)
- Preservation (Rehabilitation)
- Maintenance and Operations
- Administration, Collection and Other Costs

Within each of these major categories, expenditures are further broken down into a number of individual work types. Maintenance and Operations, for example, includes 16 individual work types ranging from pothole patching and other pavement maintenance activities to maintenance of bridges, pavement striping and marking, sanding and snow/ice removal, roadside litter pickup and maintenance of rest areas. A separate allocation is performed for the expenditures in each individual work category. A full listing of these work categories and the allocators used is contained in Exhibit 3-1 of Chapter 3.

The 2003 HCAS is the first Oregon study to include all highway expenditures anticipated for the study forecast period regardless of funding source. All previous studies included only expenditures financed with state (Highway Fund) revenues. Because of this significant change, in some cases the expenditure allocation results presented in Chapter 5 are shown both for all expenditures and state-funded expenditures only.

## **2.6 Revenues Attributed**

Forecasted 2003-05 biennium collections by major state revenue source and vehicle class under the existing tax structure and current law tax rates (i.e., current registration and title fees, 24 cent per gallon fuel tax rate, current weight-mile tax, flat fee, and road use assessment fee rates).

## **2.7 Basis for Allocation of Pavement Expenditures**

National Pavement Cost Model (NAPCOM) and the load equivalence factors (LEFs) developed from the results of the NAPCOM research for use in highway cost allocation studies; same as the 1999 and 2001 Oregon studies. The Oregon studies prior to 1999 based the allocation of pavement expenditures on the ESAL factors derived from the results of the older American Association of State Highway Officials (AASHO) Road Test research.

## **2.8 Treatment of Debt Service Expenditures**

Overhead cost approach: expenditures financed by bonds are treated as a separate program and debt service on each issue of bonds allocated proportionately to the allocation of the expenditures financed by these bonds. Previous Oregon studies had generally treated debt service as a common cost assigned to all vehicle classes based on each class's relative vehicle miles of travel (VMT).

### **3 General Methodology and Study Approach**

This chapter presents the general methodology and approach used in the 2003 Oregon HCAS. It concludes with a discussion of the several special analyses conducted for the study.

#### **3.1 Cost Occasioned Approach**

The Oregon studies, as well as the studies conducted by the federal government and most other states, use a cost occasioned approach. This approach starts from the premise that the best way to determine the fair share to be paid by each class of road users is to quantify the costs associated with each class's use of the road system. The equity of any tax system is then judged by how well payments by road users match the costs resulting from their use of the road system.

The principal alternative to the cost occasioned approach is the benefits approach in which an attempt is made to identify and measure the benefits received by both direct users of the system and nonusers. The benefits approach starts from the recognition of significant benefits from highways to society in general, and therefore to others besides the direct users of highways.

At both the state and federal levels there has been a long history of studies and debate regarding the proper balance of cost responsibility and tax burden between highway users and nonusers. The argument for using nonuser fees to pay for highways is based on the benefits society receives from the highway system in terms of increased mobility, safety, and economic development. An intuitive way of classifying these benefits is to divide them into those which accrue to society in general, and those which accrue to individuals and businesses in their role as property owners.

Property owners benefit from road improvements in increased safety (e.g., better access for fire trucks and police vehicles), increased property valuations, and increased convenience through the provision of access for service vehicles such as mail trucks and small delivery vehicles. Society (or, more precisely, individuals and businesses in their roles as consumers and producers) also gains economic benefits through the provision of highways. Efficient highways lower transportation costs to businesses. These cost savings are passed on to eventual consumers as lower prices and a wider variety of products, higher wages for workers, or retained as profits. Since all members of society realize these benefits, it is argued all individuals should pay for them regardless of whether they use the highways for personal travel.

The principal weakness of the benefits approach is that there are a number of conceptual and practical problems in attempting to assign responsibility for highway costs to nonusers. Benefits, particularly nonuser benefits, are inherently difficult to quantify. This stems partly from a lack of available data and research and, perhaps most importantly, from the fact there are some serious conceptual problems in defining benefits and deciding which accrue to users and which to nonusers.

Most of the conceptual problems in defining and measuring nonuser benefits result from the fact that the vast majority of individuals in our society function as both users and

nonusers. There are many cases where highway improvements benefit individuals or businesses simultaneously as both users and nonusers. Additionally, many of the more readily understood effects of highway improvements on the economy are simply user benefits which are transferred to nonusers -- the clearest example being reduced shipping costs which are passed along to businesses and consumers in the form of lower product prices. Thus, counting these effects as *both* user *and* nonuser benefits would seriously overstate their magnitude.

Because of these problems, and because of the inherent advantages of user fees in promoting an economically efficient allocation of scarce resources, the federal government and most states conducting cost allocation studies now rely on a cost occasioned approach to determine responsibility for highways. Study staff recommended, and the SRT agreed, the Oregon studies continue to use a cost occasioned approach.

### **3.2 Incremental Methodology**

Within the cost occasioned approach, there are different methods that may be used to allocate costs or expenditures to the various vehicle classes. Virtually all recent studies, including Oregon's, have used some version of what is referred to as the incremental method. This method divides selected aspects of highway costs into increments, allocating the costs of successive increments to only those vehicles needing the higher cost increment. The design considered adequate for light vehicles only is viewed as a common responsibility of all highway users and shared by all vehicle classes. Each group of successively larger and heavier vehicles also shares in the incremental costs they occasion.

For a new bridge, for example, the first increment represents the cost of building the bridge to support its own weight, withstand other non-load-related stresses such as stream flow, high winds and potential seismic forces, and carry light vehicle traffic only.<sup>1</sup> This cost is a common responsibility of all vehicles and assigned to all classes on the basis of each class's share of total VMT. The second increment represents the additional cost of building the bridge to accommodate trucks and other heavy vehicles weighing up to 50,000 pounds. This cost is assigned to all vehicles with gross weights exceeding 8,000 pounds on the basis of the relative VMT of each class over 8,000 pounds. Similarly, the additional cost of the third increment is assigned to all vehicles with gross weights over 50,000 pounds, and the cost of the fourth and final increment to vehicles having gross weights over 78,000 pounds.

Highway cost allocation studies typically also use an incremental methodology to allocate pavement costs. Increased depth and strength of the surface and base is required to support increases in the number, and particularly weights, of the vehicles anticipated to use the pavement during its design life. The Oregon studies, like the recent studies conducted by the federal government and other states, use two increments in the allocation of pavement costs.

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<sup>1</sup> The factors influencing the design requirements, and therefore costs of bridges, are sometimes expressed by the terms "dead load," "live load," and "total load." Bridges need to be designed to support their own weight and the other non-load-related forces such as stream flow, wind, and seismic forces (the dead load) plus the traffic loadings anticipated to be applied to the bridge (the live load). The total design load is the sum of the dead and live loads. Although the precise relationships differ by the type and location of bridge under consideration, as a general rule the longer the span length, the greater the relative importance of the non-load-related factors in determining the total cost of the bridge.

The first increment represents the cost of building a basic facility, i.e., a minimum pavement thickness adequate to support light vehicle traffic only and withstand environmental influences such as freeze-thaw cycles. This cost is shared by all vehicle classes on the basis of a relative use measure such as VMT or passenger car equivalent (PCE) weighted VMT. The additional cost required to bring the pavement up to the full thickness required to support all (both car and truck) traffic is assigned to all classes based on each class's contribution to the need for that thickness, as measured by the LEF weighted miles of travel of each class.

The incremental method is considered a sound approach to the allocation of certain highway costs among vehicle groups. It is based on the fact many aspects of highway construction and maintenance are attributable to vehicles of different sizes, weights, and other operating characteristics. Accepted engineering principles are used to relate these attributable costs to the responsible classes of vehicles. These principles are based on the results of substantial research at both the state and federal level, including the new NAPCOM research results.

### **3.3 The Choice of Appropriate Cost Allocators**

The incremental method specifies which groups of vehicles are responsible for each increment of highway costs. Once this determination is made, some quantifiable measure must be used to distribute the cost of each increment to the individual vehicle classes within that increment. Such a measure is termed a "cost allocator." For many costs, there are logical relationships that suggest the use of a particular allocator as most appropriate. There are a number of cost allocators that might be used in a HCAS. These include numbers of registered vehicles plus several measures of system usage.

VMT are the most general measure of system use and considered a logical measure for assigning many types of common costs, i.e., costs considered a common responsibility of all highway users. VMT represent a reasonable and accepted measure to assign costs among the members of a subgroup (e.g., the individual vehicle classes within a cost increment), especially when members of the subgroup have similar characteristics or when an investment is made to provide a safer or more direct highway route. VMT are a logical allocator for many traffic-oriented services, such as the provision of lighting, signs and traffic signals, since these services are generally related to traffic volumes.

There are also a number of methods used to weight VMT in order to allocate costs more appropriately. Ton miles of travel are VMT weighted by vehicle weight in tons. Ton miles of travel have not been used as an allocator in recent Oregon studies, but might be considered a logical allocator for the cost of projects undertaken for the purpose of improving freight mobility on intermodal connector routes.

Axle miles of travel are VMT weighted by number of axles. Axle miles are a logical allocator for costs related to or influenced by the number of a vehicle's axles, wheels or tires. The wearing of pavement striping and marking, for example, is a function of the number of tire passes applied to the striping and marking. Hence, axle miles (as a proxy for number of wheel or tire passes) have been used to allocate these costs in most past Oregon studies.

VMT can be modified to account for the effective roadway space occupied by various types of vehicles relative to a standard passenger car. This is accomplished by using

PCE factors to weight VMT, producing PCE-VMT. Because trucks are larger and heavier than cars, and require greater acceleration and braking distances, they occupy more effective roadway space, and therefore have higher PCE factors. Since congestion levels are dependent on both the number and sizes of vehicles using a highway, PCE-VMT is considered the most appropriate allocator for expenditures that increase highway capacity.

There are different sets of PCE factors for different traffic conditions and/or roadway configurations. Congested (or peak period) PCE-VMT is VMT weighted by the PCE factors during peak traffic periods (e.g., the morning and evening rush hour periods in urban areas). It is a logical allocator for the common cost portion of projects undertaken to expand an urban area's highway system and thereby reduce congestion. Uphill PCE-VMT is VMT weighted by the PCE factors appropriate for uphill highway grades, and is therefore reasonably used to allocate costs associated with constructing, reconstructing, or rehabilitating climbing lanes.

VMT can also be weighted to reflect the stress applied to pavements by vehicles of various weights, types, and axle configurations using LEFs. LEFs are based on the results of the new NAPCOM research and were developed in the course of the 1997 Federal HCAS for assigning pavement cost responsibility to vehicle classes. For the purposes of assigning responsibility for pavement expenditures, they replace the older ESAL factors used in studies prior to 1997.

Rather than using one of the allocators discussed above, some cost items may most appropriately be treated as overhead costs. In this case, the overall program responsibility shares become the "allocator" used to assign the overhead cost to individual vehicle classes. This approach lends itself to allocating expenditures not directly attributable to vehicle classes, but required to support operations of transportation system programs. The treatment of certain expenses (e.g., clerical or bookkeeping assistance) as overhead costs is a common practice in private businesses.

Light and heavy vehicles account for different shares of the various allocators discussed above. On a statewide basis, heavy vehicles account for roughly 5 percent of registered vehicles, 8 percent of VMT, 20 percent of PCE-VMT, and 50 percent of ton miles of travel. Different allocators will, therefore, produce different outcomes in assigning responsibility to vehicle classes. This, however, should not be a criteria in choosing allocators. The goal instead is to select allocators that relate most logically and appropriately to each particular expenditure item being allocated in the study.

The allocators and allocation methods used in the study were discussed extensively at the SRT meetings. The allocators used for both state and local expenditures are displayed in Exhibit 3-1.

### **3.4 Prospective View**

The costs or expenditures allocated in a HCAS can be those for a past period or those anticipated for a future period. Some studies conducted by the federal government and other states have allocated both historical and planned expenditures.

The Oregon studies have traditionally used a prospective, forward-looking approach in which the expenditures allocated are those planned for a future period, specifically the

**Exhibit 3-1: Cost Allocators Used in the 2003 OR HCAS  
Part A: State Expenditures**

<b>Worktype Code</b>	<b>Worktype Description</b>	<b>Worktype Category</b>	<b>Allocator</b>	<b>Share</b>
1	Preliminary and Construction Engineering (and etc.)	Any	Congested PCE	0.4835
1	Preliminary and Construction Engineering (and etc.)	Any	Other Construction	0.5165
2	Right of Way (and Utilities)	Any	Congested PCE	0.4485
2	Right of Way (and Utilities)	Any	Other Construction	0.5515
3	Grading and Drainage	Modernization	Congested PCE	1.0000
4	New Pavements-Rigid	Modernization	Congested PCE	0.0600
4	New Pavements-Rigid	Modernization	Rigid Pave	0.9400
5	New Pavements-Flexible	Modernization	Congested PCE	0.0700
5	New Pavements-Flexible	Modernization	Flex Pave	0.9300
6	New Shoulders-Rigid	Modernization	Congested PCE	1.0000
7	New Shoulders-Flexible	Modernization	Congested PCE	1.0000
8	Pavement and Shoulder Reconstruction-Rigid	Modernization	Congested PCE	0.2400
8	Pavement and Shoulder Reconstruction-Rigid	Modernization	Rigid Pave	0.7600
9	Pavement and Shoulder Reconstruction-Flexible	Modernization	Congested PCE	0.2600
9	Pavement and Shoulder Reconstruction-Flexible	Modernization	Flex Pave	0.7400
10	Pavement and Shoulder Rehabilitation-Rigid	Preservation	All VMT	0.2400
10	Pavement and Shoulder Rehabilitation-Rigid	Preservation	Rigid Pave	0.7600
11	Pavement and Shoulder Rehabilitation-Flexible	Preservation	All VMT	0.2600
11	Pavement and Shoulder Rehabilitation-Flexible	Preservation	Flex Pave	0.7400
12	Pavement and Shoulder Rehabilitation-Other	Preservation	All VMT	1.0000
13	New Structures	Bridge	None-Bridge Split	1.0000
14	Replacement Structures	Bridge	None-Bridge Split	1.0000
15	Structures Rehabilitation	Bridge	None-Bridge Split	1.0000
16	Climbing Lanes	Modernization	Uphill PCE	1.0000
17	Truck Weight/Inspection Facilities	Modernization	Over26 VMT	1.0000
18	Truck Escape Ramps	Modernization	Over26 VMT	1.0000
19	Interchanges	Bridge	None-Bridge Split	1.0000
20	Roadside Improvements	Modernization	All VMT	1.0000
21	Safety Improvements	Modernization	Congested PCE	1.0000
22	Traffic Service Improvements	Modernization	Congested PCE	1.0000
23	Other Construction	Modernization	Other Construction	1.0000
24	Other Rehabilitation	Preservation	All VMT	1.0000
25	Surface and Shoulder-Rigid	Maintenance	All VMT	0.2400
25	Surface and Shoulder-Rigid	Maintenance	Rigid Pave	0.7600
26	Surface and Shoulder-Flexible	Maintenance	All VMT	0.2600
26	Surface and Shoulder-Flexible	Maintenance	Flex Pave	0.7400
27	Surface and Shoulder-Other	Maintenance	All AMT	1.0000
28	Drainage Facilities	Maintenance	All VMT	1.0000
29	Structures	Maintenance	All VMT	1.0000
30	Roadside Items	Maintenance	All VMT	1.0000
31	Safety Items	Highway Safety	All VMT	1.0000
32	Traffic Service Items	Maintenance	Congested PCE	1.0000
33	Pavement Striping and Marking	Maintenance	All AMT	1.0000

**Exhibit 3-1: Cost Allocators Used in the 2003 OR HCAS  
Part A: State Expenditures (Continued)**

<b>Worktype Code</b>	<b>Worktype Description</b>	<b>Worktype Category</b>	<b>Allocator</b>	<b>Share</b>
34	Sanding and Snow/Ice Removal	Maintenance	All VMT	1.0000
35	Extraordinary Maintenance	Maintenance	All VMT	1.0000
36	Truck Scale-Flexible	Maintenance	Over26 VMT	1.0000
37	Truck Scale-Rigid	Maintenance	Over26 VMT	1.0000
38	Truck Scale-Buildings and Grounds	Maintenance	Over26 VMT	1.0000
39	Studded Tire Damage	Preservation	Basic VMT	1.0000
40	Miscellaneous/Unspecified	Maintenance	All VMT	1.0000
41	Bike/Pedestrian Projects	Bikeped	All VMT	1.0000
42	Railroad Safety Projects	Highway Safety	All VMT	1.0000
43	Transit and Rail Support Projects	Transit	Congested PCE	1.0000
44	Fish, Wildlife Enabling Projects	Fish	All VMT	1.0000
45	Planning	Highway Planning	All VMT	1.0000
46	Transportation Demand and Transportation System Management	Highway Planning	Congested PCE	1.0000
47	Multimodal	Multimodal	Congested PCE	1.0000
48	Reserve Money, Fund Exchange, Immediate Opportunity Fund	Unknown	All VMT	1.0000
49	Seismic Retrofits	Bridge	All VMT	1.0000
50	Other Common Costs	Administrative	All VMT	1.0000
55	Other-Over 26,000 Pounds Only	Administrative	Over26 VMT	1.0000
56	Other-Basic Only	Administrative	Basic VMT	1.0000
57	Other-Over 8,000 Pounds Only	Administrative	Over8 VMT	1.0000
58	Other-Under 26,000 Pounds Only	Administrative	Under26 VMT	1.0000
59	Other Administration	Administrative	Other Construction	1.0000
60	Bridge Type 1-All Vehicles Share	Bridge Reclass	All VMT	1.0000
61	Bridge Type 1-Over 8,000 Pounds Vehicles Share	Bridge Reclass	Over8 VMT	1.0000
62	Bridge Type 1-Over 50,000 Pounds Vehicles Share	Bridge Reclass	Over50 VMT	1.0000
63	Bridge Type 1-Over 78,000 Pounds Vehicles Share	Bridge Reclass	Over78 VMT	1.0000
65	Bridge Type 2-All Vehicles Share	Bridge Reclass	All VMT	1.0000
66	Bridge Type 2-Over 8,000 Pounds Vehicles Share	Bridge Reclass	Over8 VMT	1.0000
67	Bridge Type 2-Over 50,000 Pounds Vehicles Share	Bridge Reclass	Over50 VMT	1.0000
68	Bridge Type 2-Over 78,000 Pounds Vehicles Share	Bridge Reclass	Over78 VMT	1.0000
70	Bridge Type 3-All Vehicles Share	Bridge Reclass	All VMT	1.0000
71	Bridge Type 3-Over 8,000 Pounds Vehicles Share	Bridge Reclass	Over8 VMT	1.0000
72	Bridge Type 3-Over 50,000 Pounds Vehicles Share	Bridge Reclass	Over50 VMT	1.0000
73	Bridge Type 3-Over 78,000 Pounds Vehicles Share	Bridge Reclass	Over78 VMT	1.0000
75	Interchange-All Vehicles Share	Bridge Reclass	All VMT	1.0000
76	Interchange-Over 8,000 Pounds Vehicles Share	Bridge Reclass	Over8 VMT	1.0000
77	Interchange-Over 50,000 Pounds Vehicles Share	Bridge Reclass	Over50 VMT	1.0000
78	Interchange-Over 78,000 Pounds Vehicles Share	Bridge Reclass	Over78 VMT	1.0000

Note: Worktype Codes 64, 69, 74, and 79 were not used in the HCAS model.

**Exhibit 3-1: Cost Allocators Used in the 2003 OR HCAS  
Part B: Local Expenditures**

<b>Worktype Code</b>	<b>Worktype Description</b>	<b>Worktype Category</b>	<b>Allocator</b>	<b>Share</b>
101	Preliminary and Construction Engineering (and etc.)	PE	Other Construction	0.5210
101	Preliminary and Construction Engineering (and etc.)	PE	Congested PCE	0.4790
102	Right of Way (and Utilities)	ROW	Congested PCE	0.4790
102	Right of Way (and Utilities)	ROW	Other Construction	0.5210
103	Grading and Drainage	Modernization	Congested PCE	1.0000
104	New Pavements-Rigid	Modernization	Congested PCE	0.0600
104	New Pavements-Rigid	Modernization	Rigid Pave	0.9400
105	New Pavements-Flexible	Modernization	Congested PCE	0.0700
105	New Pavements-Flexible	Modernization	Flex Pave	0.9300
106	New Shoulders-Rigid	Modernization	Congested PCE	1.0000
107	New Shoulders-Flexible	Modernization	Congested PCE	1.0000
108	Pavement and Shoulder Reconstruction-Rigid	Modernization	All VMT	0.2400
108	Pavement and Shoulder Reconstruction-Rigid	Modernization	Rigid Pave	0.7600
109	Pavement and Shoulder Reconstruction-Flexible	Modernization	All VMT	0.2600
109	Pavement and Shoulder Reconstruction-Flexible	Modernization	Flex Pave	0.7400
110	Pavement and Shoulder Rehabilitation-Rigid	Preservation	All VMT	0.2400
110	Pavement and Shoulder Rehabilitation-Rigid	Preservation	Rigid Pave	0.7600
111	Pavement and Shoulder Rehabilitation-Flexible	Preservation	All VMT	0.2600
111	Pavement and Shoulder Rehabilitation-Flexible	Preservation	Flex Pave	0.7400
112	Pavement and Shoulder Rehabilitation-Other	Preservation	All VMT	1.0000
113	New Structures	Bridge	None-Bridge Split	1.0000
114	Replacement Structures	Bridge	None-Bridge Split	1.0000
115	Structures Rehabilitation	Bridge	None-Bridge Split	1.0000
116	Climbing Lanes	Modernization	Uphill PCE	1.0000
117	Truck Weight/Inspection Facilities	Modernization	Over26 VMT	1.0000
118	Truck Escape Ramps	Modernization	Over26 VMT	1.0000
119	Interchanges	Bridge	None-Bridge Split	1.0000
120	Roadside Improvements	Modernization	All VMT	1.0000
121	Safety Improvements	Modernization	All VMT	1.0000
122	Traffic Service Improvements	Modernization	Congested PCE	1.0000
123	Other Construction	Modernization	Other Construction	1.0000
124	Other Rehabilitation	Preservation	All VMT	1.0000
125	Surface and Shoulder-Rigid	Maintenance	All VMT	0.2400
125	Surface and Shoulder-Rigid	Maintenance	Rigid Pave	0.7600
126	Surface and Shoulder-Flexible	Maintenance	All VMT	0.2600
126	Surface and Shoulder-Flexible	Maintenance	Flex Pave	0.7400
127	Surface and Shoulder-Other	Maintenance	All AMT	1.0000
128	Drainage Facilities	Maintenance	All VMT	1.0000
129	Structures	Maintenance	All VMT	1.0000
130	Roadside Items	Maintenance	All VMT	1.0000

**Exhibit 3-1: Cost Allocators Used in the 2003 OR HCAS  
Part B: Local Expenditures (Continued)**

<b>Worktype Code</b>	<b>Worktype Description</b>	<b>Worktype Category</b>	<b>Allocator</b>	<b>Share</b>
131	Safety Items	Highway Safety	All VMT	1.0000
132	Traffic Service Items	Maintenance	Congested POE	1.0000
133	Pavement Striping and Marking	Maintenance	All AMT	1.0000
134	Sanding and Snow/Ice Removal	Maintenance	All VMT	1.0000
135	Extraordinary Maintenance	Maintenance	All VMT	1.0000
136	Truck Scale-Flexible	Maintenance	Over26 VMT	1.0000
137	Truck Scale-Rigid	Maintenance	Over26 VMT	1.0000
138	Truck Scale-Buildings and Grounds	Maintenance	Over26 VMT	1.0000
139	Studded Tire Damage	Preservation	Basic VMT	1.0000
140	Miscellaneous/Unspecified	Maintenance	All VMT	1.0000
141	Bike/Pedestrian Projects	Bikeped	All VMT	1.0000
142	Railroad Safety Projects	Highway Safety	All VMT	1.0000
143	Transit and Rail Support Projects	Transit	Congested POE	1.0000
144	Fish, Wildlife Enabling Projects	Fish	All VMT	1.0000
145	Planning	Highway Planning	All VMT	1.0000
146	Transportation Demand and Transportation System Management	Highway Planning	Congested POE	1.0000
147	Multimodal	Multimodal	Congested POE	1.0000
148	Reserve Money, Fund Exchange, Immediate Opportunity Fund	Unknown	All VMT	1.0000
149	Seismic Retrofits	Bridge	All VMT	1.0000
150	Other Admin	Admin	All VMT	1.0000
160	Bridge Type 1-All Vehides Share	Bridge Redass	All VMT	1.0000
161	Bridge Type 1-Over 8,000 Pound Vehides Share	Bridge Redass	Over8 VMT	1.0000
162	Bridge Type 1-Over 50,000 Pound Vehides Share	Bridge Redass	Over50 VMT	1.0000
163	Bridge Type 1-Over 78,000 Pound Vehides Share	Bridge Redass	Over78 VMT	1.0000
165	Bridge Type 2-All Vehides Share	Bridge Redass	All VMT	1.0000
166	Bridge Type 2-Over 8,000 Pound Vehides Share	Bridge Redass	Over8 VMT	1.0000
167	Bridge Type 2-Over 50,000 Pound Vehides Share	Bridge Redass	Over50 VMT	1.0000
168	Bridge Type 2-Over 78,000 Pound Vehides Share	Bridge Redass	Over78 VMT	1.0000
170	Bridge Type 3-All Vehides Share	Bridge Redass	All VMT	1.0000
171	Bridge Type 3-Over 8,000 Pound Vehides Share	Bridge Redass	Over8 VMT	1.0000
172	Bridge Type 3-Over 50,000 Pound Vehides Share	Bridge Redass	Over50 VMT	1.0000
173	Bridge Type 3-Over 78,000 Pound Vehides Share	Bridge Redass	Over78 VMT	1.0000
175	Interchange-All Vehides Share	Bridge Redass	All VMT	1.0000
176	Interchange-Over 8,000 Pound Vehides Share	Bridge Redass	Over8 VMT	1.0000
177	Interchange-Over 50,000 Pound Vehides Share	Bridge Redass	Over50 VMT	1.0000
178	Interchange-Over 78,000 Pound Vehides Share	Bridge Redass	Over78 VMT	1.0000

Note: Worktype Codes 164, 169, 174, and 179 were not used in the HCAS model.

next biennium. Similarly, the traffic data used in the studies is that projected for a future year. This is done to allow for changes in expenditure and/or traffic trends, and so that the study results will be applicable for the period in which legislation enacted to implement the study recommendations will become effective.

There are some disadvantages associated with allocating only projected future expenditures. Specifically, it (1) does not allow for a view of cost responsibilities and revenues contributed for past periods, (2) requires relying on forecasts, which may be subject to greater error than the historical data, and (3) does not allow for an explicit incorporation of past forecast (or other) errors.

Given the arguments, the 1996 Cost Responsibility Blue Ribbon Committee recommended the Oregon studies continue allocating only projected future expenditures. The Committee also recommended, however, that staff analyze how closely actual expenditures match planned expenditures, and use the information from this analysis to improve the expenditure projections for future studies. The consultants for the 1999 Study made this same suggestion in their recommendations for future studies.

Staff recommended, and the SRT concurred, the present study continue the practice of allocating only projected future expenditures. Some members, however, specifically requested a “look back” to ascertain how well actual expenditures for the past biennium match those projected at the time of the 1999 Study. This analysis is contained in the Volume II: Technical Results Report.

### **3.5 Exclusion of Social Costs**

The Oregon studies, as well as the studies conducted by most other states, have chosen to allocate direct governmental expenditures and exclude social costs associated with highway use. The proponents of a cost-based approach argue that, to be consistent, a HCAS should include all costs that result from use of the highway system. They further argue the correct, economically efficient pricing of highways requires the inclusion of all costs, and that failure to do so encourages an over-utilization of highways. Including congestion and other social costs adds to the breadth and completeness of the analysis, and could help determine appropriate user charges necessary to capture these costs. Congestion charges can provide an explicit financial incentive for drivers to forego using congested roads during peak periods, and use alternative modes or other, less congested routes.

At the same time, there are several disadvantages associated with including social costs in a HCAS. Although these costs represent real costs to society, they are decidedly more difficult to quantify and incorporate in the analysis than are direct highway costs. Inclusion of social costs therefore increases the data requirements and complexity of the studies, and could reduce their overall accuracy.

Additionally, including social costs without having in place a set of user charges to capture these costs raises the issue of how to relate the results of such an analysis back to actual highway budgets. Finally, although some individuals argue that including some

social costs but not others (e.g., congestion, but not pollution costs) is a step in the right direction, others contend doing so paints an incomplete and possibly biased picture. These individuals believe that, from a practical standpoint, if it is not possible to include *all* social costs, then it is preferable not to include any.

For these reasons, the 1996 Blue Ribbon Committee recommended the Oregon studies continue to exclude social costs until such time as the state implements explicit user charges to capture these costs. Both the 1982 and 1997 Federal HCASs included some social costs in supplementary analyses. The 1999 Oregon Study recommended future studies include “a separate assessment of the impacts of proposed changes in highway user taxes on the total costs of highway use including all major external costs.” The 2001 Study made this same recommendation.

Staff recommended, and the SRT concurred, that work continue to quantify the social costs of highway use for possible inclusion in future studies. The SRT agreed, however, that this work be considered supplementary and social costs continue to be excluded from the primary analysis for the present study.

### **3.6 Expenditure Allocation**

The Oregon studies allocate expenditures rather than costs. Over the long run, expenditures must cover the full direct costs being imposed on the system or the system will permanently deteriorate. Over any shorter period, however, expenditures may fall short of the costs being imposed on the system. In some past periods, for example, the damage to Oregon roads from studded tires significantly exceeded the amount being expended to repair this damage.

Some past Oregon studies attempted to estimate and allocate a full cost budget in addition to a base (actual expenditure) level budget. The intent was to approximate costs by estimating the level of expenditures required to preserve service levels and pavement conditions at existing levels. In these studies heavy vehicles were found to be responsible for a greater share of the preservation level budget than of the base level budget. This was because the majority of unmet needs at that time involved pavement rehabilitation and maintenance, items for which heavy vehicles have the predominant responsibility.

By far the largest portion of total costs stems from vehicle, fuel, opportunity and other costs borne directly by highway users. Some individuals contend that, while we may not wish to allocate these costs, we should at least consider the costs imposed by users on other users (e.g., the time loss and emotional stress caused by congestion). Some also argue that since user cost savings provide the primary justification for investment in additional highway capacity, they should be viewed as an occasioner of highway investment costs. Either view justifies considering user costs in some manner in a HCAS.

In short, there exist strong arguments for moving toward a full cost-based approach in highway cost allocation studies. The problem to this time has been that “true” costs, particularly the indirect or social costs associated with highway use, are more difficult to quantify and incorporate in the analysis than are direct highway expenditures. As a

practical matter, therefore, most studies have chosen to focus on the allocation of expenditures rather than costs.

Staff recommended, and the SRT agreed, the work begun in the 2001 Oregon Study to develop and refine the data required to move toward a full cost-based approach in future studies be continued. It was also agreed, however, this work be considered supplementary and the primary focus for the present study continue to be the allocation of projected expenditures.

### **3.7 Treatment of Debt-Financed Expenditures and Debt Service**

Oregon traditionally has relied much less on debt financing of its highway program than many other states. This is now changing with the enactment of the Oregon Transportation Investment Act (OTIA) by the 2001 Legislature. The OTIA provides \$400 million for projects to be completed across Oregon over the next several years. The act provides \$200 million for projects that add lane capacity or improve interchanges and \$200 million for bridge and pavement rehabilitation projects. Revenues from increased automobile and truck title fees are to finance the sale of construction bonds to fund the OTIA projects.<sup>2</sup>

The issue of how to treat OTIA project expenditures and the associated debt service was discussed at some length by the SRT. The purpose of a HCAS is to determine whether highway user classes are generating shares of revenue similar to the shares of expenditures for which they are responsible. Debt finance introduces a disconnect between revenues and expenditures in that the time period in which the revenues are received differs from the period in which the funds are expended. Care needs to be taken to avoid double-counting, which would occur if both the debt-financed project expenditures and full debt service expenditures (including interest and repayment of principal) were included.

For the purposes of a HCAS, the appropriate amount to include is the debt service payment made during the study period. Projects funded through the OTIA bonding program are easily identifiable, as well as the associated debt service expenses. The amount allocated in the model is therefore the annual debt payment amortized over the life of the bonds, in this case 20 years. This method allows the project detail to be retained in order to assign expenditure shares by vehicle class over the life of the debt. Additionally, it allows the model to handle multiple issues of bonds in future studies.

### **3.8 Treatment of Alternative-Fee-Paying Vehicles**

Under Oregon's existing highway taxation structure, some types of vehicles qualify to pay reduced rates and others pay according to alternative-fee schedules. These types of vehicles are collectively referred to in this report as "alternative-fee-paying" vehicles. The two main types of such vehicles are publicly owned vehicles and farm trucks. Publicly owned vehicles pay a nominal registration fee, and are not subject to the weight-mile

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<sup>2</sup> The Legislature dedicated \$71.2 million of biennial state highway revenues for debt service on the OTIA bonds, with this amount to come primarily from increased vehicle title fees. The Act further specified that any portion of the \$71.2 million not needed for payment of principal and interest on the bonds be allocated 50 percent to ODOT, 30 percent to counties, and 20 percent to cities. Due to the present favorable interest rate situation, a 2002 special session of the Legislature authorized the issuance of an additional \$100 million of bonds beyond the \$400 million approved by the 2001 regular session.

tax. Most types of publicly owned vehicles are now subject to the state fuel tax, but some are not. Operators of farm trucks pay lower annual registration fees than operators of regular commercial trucks, and most pay fuel rather than weight-mile taxes.

The reduced rates paid by certain types of vehicles mean they are paying less per-mile than comparable vehicles subject to full fees. The difference between what alternative-fee-paying vehicles are projected to pay and what they would pay if subject to full fees is termed the “alternative-fee difference.” The approach used in past Oregon studies is to calculate this difference for each weight class and sum these amounts. The total alternative-fee difference is then reassigned to all other (i.e., full-fee-paying) vehicles on a per-mile basis, i.e., this amount is treated as a common cost to be shared proportionately by all full-fee-paying vehicles.

The rationale for this approach is that the granting of these reduced fees represents a public policy decision, and most vehicles paying reduced fees are providing some public service that arguably should be paid for by all taxpayers in relation to their use of the system. Because the heavy vehicle share of the total alternative-fee difference is greater than their share of total statewide travel, reassigning this amount on the basis of relative vehicle miles has the effect of increasing the light vehicle responsibility share and reducing the heavy vehicle share.

An optional approach is to treat the alternative-fee difference as an overhead cost. The amount of the difference associated with light vehicles, for example, might be reassigned to these vehicles, and that associated with heavy vehicles to those vehicles. In this case, reassignment of the alternative-fee difference would not alter the overall light and heavy vehicle responsibility shares. This approach was suggested by the consultants for the 1999 Study, but not adopted by the SRT for that study. The 2001 Study followed the traditional approach of treating this amount as a common cost, as does the present study.

### **3.9 Treatment of Tax Evasion**

Virtually any tax is subject to some evasion. While it is generally agreed evasion of the state gasoline tax and vehicle registration fees is quite low, there is more debate concerning evasion of the weight-mile and use fuel (primarily diesel) taxes. The issue of how to deal with tax evasion in a HCAS was discussed by the SRT. It was also discussed at some length in Issue Paper 10, which is reprinted in the Volume II: Technical Results Report.

The SRT agreed the study should use a weight-mile tax evasion rate of 5 percent. This is the midpoint of the 3 to 7 percent evasion rate estimated by the Oregon Weight-Mile Tax Study conducted by consultants for the Legislative Revenue Office in 1996.

Some SRT members raised the concern that taxes other than the weight-mile tax are also subject to evasion. Specifically, it was noted there is evidence of evasion of the Oregon use fuel tax. It was agreed the study should include an estimate of this evasion as well as that associated with the weight-mile tax. Staff was directed to develop a best estimate of use fuel tax evasion and the breakdown of this evasion between light and heavy vehicles.

A 1995 ODOT internal audit report estimated total use fuel tax evasion in Oregon to be \$3 to \$6 million annually. The SRT agreed to use the midpoint of this range, or \$4.5 million, as the best available estimate of annual use fuel tax evasion. The ODOT Fuels Tax Group estimates 35 percent (approximately \$1.6 million) of this evasion is by light vehicles and 65 percent (approximately \$2.9 million) by heavy vehicles, specifically those in the 8,001-26,000 pound weight classes. The SRT decided these amounts should be used in the study.

In some past Oregon studies, evasion of the weight-mile tax was handled by inflating the reported miles of travel of vehicles subject to the tax by the estimated evasion rate. This approach was not used in the present study. Instead, the estimated evasion rates were applied in the revenue attribution portion of the model. This was accomplished by subtracting the estimated revenue loss due to evasion from the revenues projected in the absence of this evasion.

### 3.10 Special Analyses for the 2003 Study

A number of special studies and analyses were conducted for the 2003 Study. These are briefly discussed below.

- **Special Truck Weight Study** – A special truck weight study is conducted for each HCAS. The purpose of these special studies is to obtain up-to-date information on truck registered, declared and actual operating weights, vehicle types and configurations, individual axle types and weights, and commodities hauled. This information is used to establish relationships between registered or declared and actual operating gross weights, gross weights and individual axle weights, and registered or declared weight and numbers of axles. This is critically important because responsibilities are calculated on the basis of actual operating weights, whereas the tax rates, and therefore the attribution of revenues to vehicle classes, are based on registered or declared weights.<sup>3</sup>

For the 2003 Study, approximately 3,000 trucks were weighed at 12 weigh station sites around the state. These records were checked for accuracy and consistency, and added to the permanent database of some 40,000 special truck weighings conducted since 1988. Oregon has by far the largest database and most complete truck weight information of any state. In addition to its use in the HCASs, this information has been shared with university researchers, the FHWA, and staff in other states. It has also been shared with other ODOT offices and used in various planning, research, and pavement management analyses.

- **Studded Tire Damage Analysis** – For each HCAS an estimate is made of projected average annual expenditures over the next biennium to repair the pavement damage

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<sup>3</sup> Declared weight is the weight at which a single-unit or combination vehicle is reported for the weight-mile tax, which will typically be the maximum legal gross weight at which that vehicle can be operated. Operating weight is the actual weight of a vehicle on any given trip or trip segment, including the weight of the cargo. Registered weight is the weight at which a vehicle is registered for payment of registration fees. Under the Oregon weight-mile tax system there can be multiple declared weights associated with any given truck or truck-tractor, depending on the configuration in which the truck or tractor is being operated, i.e., with no attached trailers, one trailer, or multiple trailers. Therefore, as a general rule, the declared weight of a configuration will be the highest operating weight of that configuration during any given reporting period, and the registered weight of the power unit (truck or tractor) will be the highest declared weight associated with that power unit during the (usually annual) registration period.

resulting from studded tires. These expenditures are allocated solely to light vehicles since heavy vehicles rarely use studded tires.

For the present study, ODOT pavement engineers projected state expenditures of approximately \$7.8 million annually over the 2003-05 biennium to repair studded tire damage. Staff worked with local government officials to develop a comparable estimate of \$1.4 million per year for repairs to county roads and city streets. This produced a total projection of \$9.2 million annually for studded tire damage repair expenditures over the next biennium. This is somewhat lower than the \$11 million estimate used in the previous two Oregon studies.

- **Flat Fee Study** – Under existing Oregon law, log, wood chip, and sand and gravel haulers have the option to pay monthly flat fees in lieu of the weight-mile tax. The various flat fee rates are set so carriers paying them should, on average, pay the same amount as they would under the mileage tax.

The flat fee rates are required to be reviewed biennially, and appropriate adjustments in these rates presented to each regular session of the Legislature. The latest flat fee study was completed by a consultant in September 2002. This study was based on weight-mile and flat fee payments for CY 2001. It found flat fee wood chip haulers paid more than they would have on a mileage basis. Flat fee log haulers and sand and gravel haulers, on the other hand, were found to have paid less than they would have on a mileage basis.

The Flat Fee Study Final Report is reproduced in the Volume II: Technical Results Report.

- **Local Government Expenditure Allocation Survey** – Approximately 40 percent of State Highway Fund revenues are apportioned to Oregon counties and cities for use on local roads and streets. For each HCAS a special survey is conducted to determine how local governments plan to use these funds during the next biennium. For the 2003 Study questionnaires were sent to a sample of 59 cities and all 36 counties within the state. Completed questionnaires were received from 39 of the sample cities and 33 counties.<sup>4</sup>

Because of the decision to include all local expenditures – those financed by state, federal, and locally-generated revenues – in the 2003 Study, the data on local road and street expenditures assumed a heightened importance for this study. Considerable time was spent working with ODOT Financial Services staff and local government officials to obtain the best possible information on local government expenditures from all funding sources. This was accomplished by merging the information from the local government expenditure survey with that from the annual Local Roads and Streets Survey. The latter survey is conducted to obtain information on receipts and disbursements for local road and street purposes in order to fulfill federal reporting requirements.

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<sup>4</sup> The counties and cities responding were for the most part the larger ones, however, and so account for a very large majority of projected State Highway Fund apportionments to local governments during the next biennium. The respondent counties account for 98 percent of the projected apportionments to all counties; the respondent cities account for 88 percent of the projected apportionments to all cities.

Copies of the survey questionnaire and a discussion of the results are included in the Volume II: Technical Results Report. Also included in that volume is a detailed description of how the results from the local government expenditure allocation survey were combined with information from the Local Roads and Streets Survey for use in the study computer model.

- **Updated Pavement Responsibility Analysis** – Expenditures for pavement construction, reconstruction and rehabilitation, along with those for pavement maintenance and striping and marking, represent a significant dollar sum in most HCASs. Pavement expenditures in the present study total \$453.7 million, 30.4 percent of the total expenditures allocated in the study.<sup>5</sup> Pavement work is also the major expenditure area for which trucks and other heavy vehicles have the highest responsibility share. Heavy vehicles as a whole are responsible for 63.6 percent of total pavement-related expenditures in the present study.

In the Oregon studies prior to 1999, the basis for the allocation of pavement expenditures was the ESAL factors derived from the results of the AASHO Road Test research. These results were the basis for the so-called “fourth-power rule,” which states the stress applied to pavements increases at approximately the fourth power of increases in axle weight. A doubling of the weight on a single axle, in other words, results in an approximately 16-fold (i.e.,  $2 \times 2 \times 2 \times 2$ ) increase in the amount of stress applied to a pavement.

For highway cost allocation studies, the older AASHO Road Test results have been replaced by those from the new NAPCOM research conducted for the 1997 Federal HCAS.<sup>6</sup> This newer research finds the relationship between pavement deterioration and axle weight to be significantly less extreme than estimated by the previous research. Although the precise relationship varies depending on the type of pavement distress being considered, the NAPCOM research suggests, on average, the exponent relating pavement deterioration to increasing axle weight is closer to 2.5 than 4.<sup>7</sup> The NAPCOM results have been used to allocate most pavement costs in the 1999, 2001, and 2003 Oregon studies.

The allocation of pavement costs in the 2001 Study was based on the latest VMT data available at that time. However, the study was unable to use updated data on Oregon pavement characteristics from the state submissions to the federal HPMS. Although it didn't have a material effect on the results, the current study rectified this limitation of the previous study by using both the latest available VMT and pavement characteristics data in allocating the load-related portion of pavement expenditures.

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<sup>5</sup> For state (Highway Fund) financed expenditures only, pavement-related expenditures total \$159.1 million, or 24.1 percent of the total.

<sup>6</sup> Although the LEFs developed from the results of the new NAPCOM research are now used in HCASs, the older ESAL factors are generally still used for other applications such as pavement design.

<sup>7</sup> The AASHO Road Test results were also the basis for the statement that it takes 9,600 automobiles to do the same amount of pavement damage as one fully-loaded, 80,000-pound truck. Using a weighted average reflecting the overall mix of Oregon pavement types, the NAPCOM results suggest this relationship is instead more like 750 to 1. It should be noted, however, that the NAPCOM results also indicate weather and other non-load-related factors play less of a role in pavement deterioration than suggested by the earlier research. This largely offsets the impact of the lower exponential relationship between pavement wear and axle weight, so that the overall responsibility of heavy vehicles for pavement expenditures is approximately the same as under the older research.

The pavement expenditure allocation results are presented in Exhibit 5-5 of Chapter 5, and compared to the results from the 2001 Study.

- **Bridge Cost Responsibility Study** – The allocation of responsibility for bridge expenditures is an important element of virtually any HCAS. This issue has now assumed an even greater importance in Oregon with recent information on the condition of the state’s aging bridges, many of which were built in the 1950s and 1960s, and the consequent need to repair or replace a significant number of these bridges. This in turn raises the further issue of whether expenditures for replaced bridges should be allocated differently than those for totally new bridges and, if so, exactly how.

The cost responsibility for bridges differs for different types of bridges and categories of bridge expenditures. Most HCASs have divided capital outlays for bridges into three categories: new bridge construction, bridge replacement, and bridge rehabilitation. The 1997 Federal Study further split bridge rehabilitation into major and minor rehabilitation. Most state studies have also included a bridge maintenance category. Additionally, some states have split out expenditures for seismic retrofitting from other bridge rehabilitation expenditures.

For the present study projected bridge expenditures for the next biennium were classified into five major categories: new bridge construction, bridge replacement, seismic retrofitting of existing bridges, bridge rehabilitation other than seismic retrofitting, and bridge maintenance. ODOT bridge engineers were requested to perform an analysis of the cost responsibility for the expenditures in each of these categories.

Both the 1999 and 2001 Oregon studies based the allocation of new and replaced bridge expenditures on a study of bridge cost responsibility first conducted in 1986 and updated in 1992. Because the results of this older analysis are now outdated, and no longer applicable to Oregon’s current system of bridges, ODOT bridge engineers were requested to completely update the earlier analysis for the 2003 Study. Since Bridge Section staff did not have the internal resources to conduct this study, it was contracted out to an Oregon bridge engineering consultant firm.

The consultants analyzed construction costs for three common, pre-stressed concrete bridge types: a 100-foot simple span bridge, a 150-foot simple span bridge, and a 60-90-60-foot continuous bridge having a total length of 210 feet. Separate calculations were made for the substructure (columns, footings, and abutment walls), superstructure (beams and deck), and total structure costs. The analysis concluded heavy vehicles are responsible for a significantly greater share of the costs of the 60-90-60-foot continuous bridge than the costs of either of the two simple span bridges. The consultant’s report is reproduced in the Volume II: Technical Results Report.

Substantial analysis and discussion, both among internal staff and in the SRT meetings, was devoted to the issue of whether bridge replacement expenditures should be allocated differently than those for totally new bridges. Most recent studies by the federal government and other states have treated replacement bridges somewhat differently than new bridges, with the focus being on the reasons for replacement. One approach, for example, first calculates the proportionate amount of bridge sufficiency loss due to various factors. The cost associated with the

sufficiency loss due to weight is then allocated to those vehicle classes heavier than the load-carrying capacity of each specific bridge being replaced.

This type of approach assigns heavy vehicles a greater responsibility for replaced bridges than for totally new bridges. Exactly how much more depends on the study and approach used. In the 1997 Federal HCAS, for example, heavy vehicles were found to be responsible for 23.2 percent of new bridge expenditures versus 48.9 percent of bridge replacement expenditures.

For the present study the approach used was to begin with the incremental allocation results from the consultant study of new bridge costs. For replacement bridges, these results were modified to account for the impact of heavy vehicles on expected bridge life. Specifically, it was assumed a typical bridge used by light vehicles only has a life expectancy of 95 years and a comparable bridge used by mixed traffic a life expectancy of 75 years, a difference of 20 years. The incremental approach was adjusted to use annualized costs, using a discount rate of 4.32 percent, ODOT's projected cost of borrowed funds for the 2003-05 biennium.

This approach resulted in heavy vehicles being allocated a greater responsibility for replaced bridges than for totally new bridges. For example, the consultants calculated that 67.0 percent of the cost of a new, 100-foot simple span bridge is a common responsibility of all vehicle classes. Building this bridge for light vehicle traffic only, in other words, would cost 67 percent as much as building it for both light and heavy vehicle traffic. For a comparable replacement bridge, on the other hand, the approach used reduced the common responsibility portion from 67 percent to 61 percent.

Including expenditures for bridge maintenance and seismic retrofitting, this study projects light vehicles to be responsible for 50.4 percent of overall bridge expenditures and heavy vehicles 49.6 percent. This represents an increase in the heavy vehicle responsibility share as compared to previous Oregon studies.

The bridge expenditure allocation results are presented in Exhibit 5-6 of Chapter 5, and compared to the results from the 2001 Study.

- **Interchange Cost Responsibility Study** – Interchange design requirements and costs increase with the presence of heavier, longer, and wider vehicles. Larger and heavier vehicles, for example, require thicker pavements, longer and wider entrance and exit ramps, and less curved ramps.

Two interchange design/cost increments were used in the 1986 Oregon Study; the first increment representing the cost of building a typical interchange for light vehicles only, and the second representing the additional cost of building this same interchange for all vehicles. For the 1992 and 1994 studies, ODOT design engineers updated and considerably expanded the scope of the 1986 analysis. Five design/cost increments were used, with the defining limits of the increments being the same as those for new and replacement bridges.

For the present study ODOT design engineers were asked to perform a new analysis of the cost responsibility for interchanges. The design/cost increments used were the same as those used in the bridge cost responsibility study discussed above. All projected 2003-05 biennium interchange projects or projects including interchange

elements were included in the analysis. Interchange elements included in the analysis were typical ramps, ramp overlays, intersections, and new cross roads. Constructed items included roadway widths, surfacing (pavement and base), earthwork, right of way, sound walls, barriers, and structures. Several cost items, including signals, signing, illumination, striping, drainage/water quality, and staging, were assumed to be a part of any incremental design, i.e., these items were assumed to be a common responsibility of all vehicle classes.

The analysis found light vehicles responsible for 72.9 percent and heavy vehicles 27.1 percent of overall interchange project expenditures anticipated for the next biennium. The study report is reproduced in the Volume II: Technical Results Report.

## 4 Study Data and Forecasts

Four major types of data are required to conduct a highway cost allocation study. These are:

- The traffic data, including the number and mix of vehicles using the highways and the miles of travel by these vehicles on each of the road systems used in the study;
- The budget level and expenditure/program data, including the breakdown of projected total expenditures by major category and individual work type, road system, level of government, and funding source;
- The engineering data, broadly defined to include the methodology, engineering data and judgements, formulas, etc. used to assign each of the individual expenditure items to the vehicle classes; and
- The revenue data, including projected total revenues and the breakdown of this total by revenue source or tax instrument and vehicle class.

The first three data elements jointly determine the expenditure allocation results of any HCAS, and a change in any of these elements can therefore alter the results. Since responsibility for many of the individual expenditure items is assigned on the basis of a relative use measure such as VMT, an increase in light vehicle travel relative to heavy vehicle travel will (other things equal) increase the responsibility share of light vehicles and decrease that of heavy vehicles. Conversely, a major change in program emphasis toward pavement preservation or other work for which heavy vehicles have a large responsibility share will increase the overall responsibility of these vehicles and reduce that of light vehicles.

Once the calculation of vehicle class responsibility is made using the first three types of data, the revenue data is then used to determine how projected payments from each vehicle class compare to the responsibility of that class. This calculation is expressed in terms of equity ratios, defined as the ratio of projected payments to cost responsibility for each class.

The remainder of this chapter presents the traffic, expenditure/program, and revenue data used in the 2003 Study, and compares this with the data used in the prior two Oregon studies.

### 4.1 Traffic Data and Forecasts

VMT by road system and vehicle type and class are an important factor in the HCAS process. VMT estimates and projections are used both in the allocation of expenditures and attribution of revenues to detailed vehicle classes. Additionally, as explained in Chapter 3, VMT weighted by factors such as number of axles or PCEs is used to assign several of the individual expenditure items allocated in the study.

For the 2001 Study, base year 1999 traffic data was projected forward to CY 2002. For the present study, the required traffic data was first collected for the base year 2001, the latest year for which complete historical data was available. This data was then

projected forward to CY 2004, the mid-year of the 2003-05 biennium study analysis period.

The base year traffic data is obtained from a number of sources. These include ODOT Motor Carrier Transportation Division (MCTD) weight-mile tax information, ODOT traffic counts and traffic classification statistics, HPMS submittals, MCTD and Driver & Motor Vehicle Services vehicle registrations data, and the Special Truck Weight Study previously discussed. For each road system used in the study, travel estimates are developed for light vehicles and each 2,000-pound truck weight class.

Historical trend information, together with information from state economic forecasts and ODOT's revenue forecasting model, is used to forecast projected study year traffic from the base year data. Data from the Special Truck Weight Study is used to convert truck miles of travel by registered or declared weight class to miles of travel by actual operating weight class, and to obtain detailed information on vehicle configurations and individual axle types and weights.

Exhibit 4-1 shows total vehicle travel in Oregon is projected to increase from 33.7 billion miles in 2001 to 34.8 billion miles in 2004. This represents an increase of 3.3 percent, or an average annual growth of slightly under 1.1 percent. Light vehicle travel is projected to increase from 31.0 billion miles in 2001 to 32.0 billion miles in 2004, an increase of 3.2 percent or an average of 1.07 percent per year. Total heavy vehicle travel is forecast to grow from 2.66 billion miles in 2001 to 2.76 billion miles in 2004, an increase of 3.6 percent or average of 1.2 percent per year. These projections are directly based on, and consistent with, the projections from ODOT's revenue forecast model.

The traffic growth projections for the present study are lower than those in any recent Oregon study. The 1999 Study, for example, projected total state VMT would grow at an average annual rate of 1.7 percent between 1997 and 2000. The comparable average annual growth rate used in the 2001 Study for the 1999-2002 period was 1.3 percent. The reduced growth projections for the present study reflect the impact of the current economic downturn in Oregon and the nation, and the general consensus that it will be a couple more years before the state's economy fully recovers.

As in the 1999 and 2001 studies, travel by heavy vehicles is forecast to grow at a somewhat faster rate than travel by light vehicles. The difference between the projected growth for light and heavy vehicle travel, however, is quite small as compared to the projections used in the previous two studies. The 1999 Study projected heavy vehicle travel would increase by 2.3 percent per year versus 1.6 percent per year for travel by light vehicles. The 2001 Study projected heavy vehicle travel would grow at an average annual rate of 2.1 percent as compared to a 1.2 percent average annual growth for light vehicle travel. The forecasts for the present study again reflect the impacts of the economic downturn, and the fact the downturn has had a particularly pronounced impact on heavy commercial vehicle travel.

Because the projected VMT increases for light and heavy vehicles as a whole are quite similar, the relative share of travel accounted for by the two groups is expected to remain fairly constant over the 2001-04 period. For both 2001 and 2004, it is estimated light vehicles accounted for/will account for 92.1 percent of total statewide travel, and heavy vehicles 7.9 percent. The heavy vehicle travel shares in the present study are somewhat lower than the comparable estimates and forecasts in the 2001 Study. In that study, heavy vehicles were estimated/projected to account for 8.2 percent of total 1999 VMT

and 8.4 percent of total 2002 VMT. Since many of the expenditures in the study are allocated by relative VMT, or some measure of weighted VMT, this is a factor accounting for the lower heavy vehicle responsibility share found by the present study as compared to the 2001 Study.

Exhibit 4-1 also shows the growth projected for heavy vehicle travel varies significantly by weight group. Travel by vehicles with declared weights of 26,001 to 54,000 pounds, as a group, is projected to decline over the 2001-04 period. The fastest growth is forecast to continue to be in the heaviest weight classes (i.e., the 80,000-pound and over classes), although even this growth will likely be moderate in comparison to past periods.

<b>Exhibit 4-1: Current and Forecasted VMT by Weight Group (Millions of Miles)</b>					
<b>Declared Weight in Pounds</b>			<b>2001 VMT (Estimate)</b>	<b>2004 VMT (Forecast)</b>	<b>Average Annual Growth Rate</b>
1	to	8,000	31,029.0	32,033.8	1.1%
8,001	to	26,000	724.7	753.2	1.3%
26,001	to	46,000	309.9	280.4	-3.3%
46,001	to	54,000	93.2	90.1	-1.1%
54,001	to	78,000	75.1	75.6	0.2%
78,001	to	80,000	1,090.0	1,165.3	2.2%
80,001	to	104,000	189.1	202.2	2.3%
104,001	to	105,500	178.5	189.9	2.1%
105,501	and	up	2.0	2.0	1.2%
<b>Total</b>			<b>33,691.5</b>	<b>34,792.3</b>	<b>1.1%</b>
Total for Vehicles Under 8,001 Pounds			31,029.0	32,033.8	1.1%
% for Vehicles Under 8,001 Pounds			92.1%	92.1%	
Total for Vehicles Over 8,000 Pounds			2,662.5	2,758.6	1.2%
% for Vehicles Over 8,000 Pounds			7.9%	7.9%	
Total for Vehicles Under 26,001 Pounds			31,753.7	32,786.9	1.1%
% for Vehicles Under 26,001 Pounds			94.2%	94.2%	
Total for Vehicles Over 26,000 Pounds			1,937.8	2,005.4	1.2%
% for Vehicles Over 26,000 Pounds			5.8%	5.8%	

Exhibit 4-2 shows the distribution of projected CY 2004 travel between light and heavy vehicles for the six road systems used in the study, i.e., Interstate Urban, Interstate Rural, Other State Urban, Other State Rural, County Roads and City Streets. The VMT numbers in this exhibit and Exhibit 4-4 do not include travel on federally-owned (Forest Service, Bureau of Land Management, etc.) roads. That is why the VMT totals in these exhibits differ from the total shown in Exhibit 4-1. Although light vehicles are projected to account for 92.1 percent and heavy vehicles 7.9 percent of total statewide VMT, the mix of traffic varies significantly among the different road systems. Heavy vehicles are projected to account for over 20 percent of the travel on rural interstate highways, but

<b>Exhibit 4-2: Projected 2004 VMT by Road System (Millions of Miles)</b>					
<b>Road System</b>	<b>Light Vehicles</b>		<b>Heavy Vehicles</b>		<b>Total VMT</b>
	<b>Miles of Travel</b>	<b>Percent of Total</b>	<b>Miles of Travel</b>	<b>Percent of Total</b>	
Interstate Urban	3,496.3	90.1%	382.4	9.9%	3,878.7
Interstate Rural	3,483.4	79.7%	888.5	20.3%	4,371.9
Other State Urban	5,009.8	96.0%	210.1	4.0%	5,219.9
Other State Rural	6,800.7	90.7%	696.4	9.3%	7,497.1
<b>Subtotal - State Systems</b>	<b>18,790.2</b>	<b>89.6%</b>	<b>2,177.4</b>	<b>10.4%</b>	<b>20,967.6</b>
County Roads	8,463.8	95.3%	416.7	4.7%	8,880.4
City Streets	4,646.8	96.7%	157.2	3.3%	4,804.0
<b>Subtotal - Local Systems</b>	<b>13,110.6</b>	<b>95.8%</b>	<b>573.9</b>	<b>4.2%</b>	<b>13,684.4</b>
<b>Total - All Systems</b>	<b>31,900.7</b>	<b>92.1%</b>	<b>2,751.3</b>	<b>7.9%</b>	<b>34,652.0</b>

Note: VMT on federally-owned roads are not included in the totals above.

only a bit over 3 percent of the travel on city streets. Heavy vehicles are anticipated to account for 10.4 percent of the overall travel on state highways versus 4.2 percent of the travel on local roads and streets.

Exhibit 4-3 illustrates, in a slightly different manner, how the relative mix of traffic varies by road system. It presents the separate distributions of projected VMT by road system for light vehicles, heavy vehicles, and all vehicles. As shown, 60.5 percent of total travel in the state is expected to be on state highways and 39.5 percent on local roads and streets. These shares, however, differ significantly for light versus heavy vehicles. Rural interstate highways, for example, are projected to handle 12.6 percent of the total travel in 2004, but over 32 percent of the heavy vehicle travel. At the other extreme, almost 15 percent of light vehicle travel, but only 5.7 percent of heavy vehicle travel, is forecast to

<b>Exhibit 4-3: Distribution of Projected 2004 VMT by Road System</b>			
<b>Road System</b>	<b>Light Vehicle Percent of Total</b>	<b>Heavy Vehicle Percent of Total</b>	<b>All Vehicle Percent of Total</b>
Interstate Urban	11.0%	13.9%	11.2%
Interstate Rural	10.9%	32.3%	12.6%
Other State Urban	15.7%	7.6%	15.1%
Other State Rural	21.3%	25.3%	21.6%
<b>Subtotal - State Systems</b>	<b>58.9%</b>	<b>79.1%</b>	<b>60.5%</b>
County Roads	26.5%	15.1%	25.6%
City Streets	14.6%	5.7%	13.9%
<b>Subtotal - Local Systems</b>	<b>41.1%</b>	<b>20.9%</b>	<b>39.5%</b>
<b>Total - All Systems</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

be on city streets. State highways are expected to handle about 59 percent of the total travel by light vehicles and 79 percent of the travel by heavy vehicles.

Exhibit 4-4 compares the VMT projections by road system used in the 1999, 2001, and 2003 studies. It shows the VMT shares on the six road systems have not changed substantially from the comparable projections made in the 2001 Study. The two systems projected to account for the largest shares of total statewide travel are Other State Rural highways and County Roads. As compared to the previous study, the present study projects a higher share of travel on county roads, and lower shares on other state urban and rural highways and city streets.

<b>Exhibit 4-4: Comparison of Forecast VMT Used in OR HCASs: 1999, 2001, and 2003 (Billions of Miles)</b>						
<b>Road System</b>	<b>1999 Study</b>		<b>2001 Study</b>		<b>2003 Study</b>	
	<b>VMT</b>	<b>Percent of Total</b>	<b>VMT</b>	<b>Percent of Total</b>	<b>VMT</b>	<b>Percent of Total</b>
Interstate Urban	4.0	11.8%	3.9	11.4%	3.9	11.2%
Interstate Rural	4.4	12.9%	4.4	12.7%	4.4	12.6%
Other State Urban	4.5	13.2%	5.5	15.7%	5.2	15.1%
Other State Rural	7.5	22.1%	7.8	22.5%	7.5	21.6%
<b>Subtotal - State Systems</b>	<b>20.4</b>	<b>60.0%</b>	<b>21.7</b>	<b>62.3%</b>	<b>21.0</b>	<b>60.5%</b>
County Roads	8.6	25.3%	8.0	22.9%	8.9	25.6%
City Streets	5.0	14.7%	5.1	14.8%	4.8	13.9%
<b>Subtotal - Local Systems</b>	<b>13.6</b>	<b>40.0%</b>	<b>13.1</b>	<b>37.7%</b>	<b>13.7</b>	<b>39.5%</b>
<b>TOTAL</b>	<b>34.0</b>	<b>100.0%</b>	<b>34.8</b>	<b>100.0%</b>	<b>34.7</b>	<b>100.0%</b>

Note: VMT on federally-owned roads are not included in the totals above.

## 4.2 Expenditure Data and Forecasts

The expenditures allocated in all previous Oregon HCASs have been those funded from State Highway Fund revenues. These expenditures included those funded from the approximately 40 percent of Highway Fund revenues apportioned to Oregon counties and cities, but excluded local government expenditures from locally-generated revenues. Similarly, expenditures from federal revenues were excluded, i.e., for federal-aid projects, only the state match portion of the total project cost was included.

The 2003 Study, for the first time ever, includes all expenditures on roads and streets in the state. In addition to state-funded expenditures, expenditures funded from federal highway revenues and locally-generated revenues are also included. This change substantially increased the level and breadth of expenditures allocated in the present study as compared to previous studies.

The expenditure data and forecasts for the study were obtained from a number of sources. Data from ODOT's Budget and Cash Flow Forecast were used to develop projected construction expenditures for the 2003-05 biennium. Following the approach of the 2001 Study, staff relied on the Cash Flow Forecast to determine as accurately as possible the expenditures projected to be incurred during the 24 months of the next

biennium.<sup>1</sup> Projected expenditures on maintenance and other programs were obtained from ODOT Financial Services, and based on the most recent available budget forecasts.

Identifying those expenditures projected to be federally-funded was relatively straightforward, and based on detailed information from the ODOT Cash Flow Forecast model and Project Control System. Identifying the level and mix of projected local government expenditures funded from locally-generated revenues was a more challenging and time-consuming task. As explained in Chapter 3, and more fully in the Volume II: Technical Results Report, this was accomplished by merging information from the local government expenditure survey conducted for each HCAS with information from the annual Local Roads and Streets Survey. Staff worked closely with local government officials to develop the best information possible on planned local expenditures from all funding sources.

As noted in the previous chapter, enactment of the OTIA by the 2001 Legislature meant debt-financed expenditures, and the issue of how to treat these expenditures, played a significantly greater role in the 2003 Study than in any previous Oregon study. Because of the differential treatment of these expenditures and the associated debt service, care was taken to accurately identify the OTIA projects and treat them as a separate, independent program with its own expenditure allocation analysis.

Exhibit 4-5 presents the average annual expenditures projected for the 2003-05 biennium by major category (modernization, preservation, maintenance, bridge, and other) and funding source (state, federal, and local). As shown, projected expenditures total \$1,492 million. This compares to total expenditures allocated in the 1999 and 2001 studies of \$691 million and \$649 million, respectively.

<b>Exhibit 4-5: Average Annual Expenditures by Category and Funding Source (Thousands of Dollars)</b>							
<b>Major Expenditure Category</b>	<b>State Funds</b>	<b>Percent of Total</b>	<b>Federal Funds</b>	<b>Percent of Total</b>	<b>Local Funds</b>	<b>Percent of Total</b>	<b>Total Funds</b>
Modernization	25,285	11.0%	88,310	38.3%	117,088	50.8%	230,683
Preservation	38,126	22.0%	108,941	62.9%	26,107	15.1%	173,174
Maintenance	304,573	75.4%	15,548	3.8%	83,821	20.8%	403,942
Bridge	24,388	17.5%	92,675	66.7%	21,910	15.8%	138,973
Other	267,388	49.1%	129,423	23.7%	148,270	27.2%	545,081
<b>Total</b>	<b>659,760</b>	<b>44.2%</b>	<b>434,897</b>	<b>29.2%</b>	<b>397,196</b>	<b>26.6%</b>	<b>1,491,852</b>

Of the \$1,492 million total expenditures, \$660 million (44.2 percent) are projected to be state-funded, \$435 million (29.2 percent) federally-funded, and \$397 million (26.6 percent) locally-funded. The Local Funds column of Exhibit 4-5 includes only local

<sup>1</sup> In the Oregon studies prior to 2001, the construction expenditure data was derived solely from the projects listed in the two relevant years of the Statewide Transportation Improvement Program (STIP). Many projects, however, take several years to complete, and some get off to a slower start than anticipated. The approach of the earlier studies, therefore, resulted in the inclusion of some project expenditures that would be incurred in periods beyond the next biennium. This approach also excluded some continuing expenditures on projects listed in prior STIPs. The approach of the 2001 and present studies provides a more accurate projection of the level and mix of actual expenditures that will be incurred in the period under analysis.

expenditures from locally-generated revenues. Local expenditures from state and federal revenues are included in the State and Federal Funds columns, respectively. Bridge expenditures are broken out separately and include projected average annual expenditures for new, replaced and rehabilitated bridges as well as expenditures for interchanges.

The Other category in the exhibit encompasses expenditures for a large number of different activities. In addition to general administrative and tax collection costs for the state, counties, and cities, it includes state and/or local expenditures for:

- Preliminary engineering
- Right of way acquisition and property management
- Debt service
- Safety-related projects, safety inspections, and rehabilitation and maintenance of existing safety improvements
- Pedestrian/bike projects
- Railroad safety projects
- Fish and wildlife enabling projects (e.g., salmon culverts)
- Transportation demand management and transportation system management projects (e.g., Traffic Operations Centers)
- Multi-modal projects
- Reserve money, fund exchange, and Immediate Opportunity Fund reserves
- Capital construction and improvements, and maintenance of existing capital improvements
- Transportation program/project development and delivery
- Transportation planning, research and analysis projects
- Transfers to other agencies for highway-related purposes (e.g., transfers to State Parks for maintenance of rest areas)
- Special city and county allotments

The exhibit illustrates there are significant differences in the funding source for the various expenditure categories. Preservation and bridge expenditures, in particular, have a large federal funds component. Almost 63 percent of preservation expenditures and 67 percent of bridge expenditures are projected to be federally-funded. Maintenance expenditures, on the other hand, are largely state-, and to a lesser extent, locally-funded, with a very small federal funds component.

### **4.3 Revenue Data and Forecasts**

The revenues analyzed in the study include receipts from taxes and fees collected by the state from highway users, i.e., revenues flowing into Oregon's dedicated State Highway Fund. Federal revenues are estimated for use in the model, but are not included in the primary results presented in this report. Similarly, revenues generated by local governments from their own funding sources (e.g., property taxes, street assessments, system development charges, local fuel taxes, etc.) are not included. Locally-generated revenues may be included in future Oregon studies. At this time, however, the numerous conceptual and practical problems involved in estimating these revenues and attributing them to highway user classes preclude their inclusion.

The revenue data required for the study is obtained directly from ODOT's revenue forecasting model and semi-annual revenue forecasts. The revenue forecast used for

the present study was the June 2002 forecast; the latest available at the time the study was being conducted. The forecasts include the approximately 40 percent of State Highway Fund revenues transferred to local governments for use on local roads and streets, and all state funds used for highways including matching requirements for federal-aid highway projects.

Average annual state revenues for the 2003-05 biennium are forecast to total \$712.8 million. As shown in Exhibit 4-6, fuel taxes and the weight-mile tax are the two largest sources of state user-fee revenue. Revenue from the state fuel tax is projected to average \$389.4 million per year (54.6 percent of total revenues) and weight-mile tax revenue is forecast to average \$185.4 million (26.0 percent of total revenues). These two sources account for almost 81 percent of highway user revenues, illustrating Oregon's system of highway finance is very much based on taxes and fees directly related to use of the system.

<b>Exhibit 4-6: Revenue Forecasts by Tax/Fee Type - Average Annual Amounts for 2003-05 Biennium (Thousands of Dollars)</b>		
<b>Tax/Fee</b>	<b>Forecast Revenue</b>	<b>Percent of Total</b>
Fuel Tax	389,422	54.6%
Weight-Mile Tax	185,439	26.0%
Registration Fees	81,866	11.5%
Title Fees	39,770	5.6%
Flat Fees	7,970	1.1%
Other Motor Carrier Fees	7,525	1.1%
Road Use Assessment Fee	770	0.1%
<b>Total</b>	<b>712,762</b>	<b>100.0%</b>

Revenue from registration fees is anticipated to average \$81.9 million annually (11.5 percent of total revenues). Title fees, flat fees, other motor carrier charges, and the road use assessment fee are projected to bring in smaller amounts of revenue. Vehicle title fees were not identified as a separate revenue source in the 1999 and 2001 studies. Because of the significant increase in these fees enacted by the 2001 Legislature, they now produce net revenues, and so are listed as a separate revenue source.<sup>2</sup>

Exhibit 4-7 compares the forecasts of average annual total revenues used in the 1999, 2001, and 2003 Oregon HCASs. Total revenues forecast for the 1999 and 2001 studies were \$691.1 million and \$690.0 million, respectively. The total revenues of \$712.8 million forecast for the present study are 3.3 percent higher than the comparable forecast made for the 2001 Study.

Caution should be used in comparing these forecasts, however, since they were made at different times for different biennia, and used somewhat different assumptions regarding the treatment of ODOT beginning and ending balances. Additionally, as noted above, title fees were not identified as a revenue source in prior studies. The inclusion of

<sup>2</sup> The 2001 Legislature increased the title fee for most light vehicles from \$10 to \$30 and the fee for most trucks and heavy trailers from \$10 to \$90.

these fees is, in fact, the only reason for the increase in projected total revenues in the present study as compared to the previous two studies. Projected revenues from the other taxes and fees listed in Exhibit 4-6 are, on balance, actually lower than in the 1999 and 2001 studies.

<b>Exhibit 4-7: Comparison of Forecast Revenue Used in OR HCASs: 1999, 2001, and 2003 (Millions of Dollars)</b>	
<b>Year of Study</b>	<b>Average Annual Forecast Revenue</b>
1999	691.1
2001	690.0
2003	712.8

## 5 Expenditure Allocation and Revenue Attribution Results

This chapter presents the expenditure allocation (i.e., cost responsibility) and revenue attribution results of the 2003 Study, and compares these to the corresponding results of previous Oregon studies. The following chapter then brings together the expenditure allocation and revenue attribution results to calculate equity ratios for each vehicle weight group and class.

### 5.1 Expenditure Allocation Results

As discussed previously, the 2003 Study, for the first time in any Oregon study, based the expenditure allocation results on the inclusion of all highway expenditures – those financed by federal and locally-generated revenues as well as state revenues. This approach was considered necessary to deal with the impacts of the federal advance construction program on the expenditure mix allocated in and results of the study, and was endorsed by a majority of the SRT members. The reader needs to be cautioned, however, that this change in approach means the expenditure allocation results of the present study are not directly comparable to those of previous Oregon studies.

The results presented in this chapter are for all – both full-fee-paying and alternative-fee-paying – vehicles. Exhibit 5-1 presents the expenditure allocation results by major expenditure category and vehicle weight group. Light (1-8,000 pound) and heavy (over 8,000 pound) vehicles are projected to be responsible for 64.4 percent and 35.6 percent of average annual total expenditures for the 2003-05 biennium.

As shown in the exhibit, the responsibility shares vary significantly among the major expenditure categories. Heavy vehicles, as a group, are projected to be responsible for 52.5 percent of modernization expenditures and 65.8 percent of preservation expenditures, but only 26.5 percent of maintenance expenditures and 22.1 percent of other expenditures. This illustrates the point made previously that the mix of expenditures allocated in a HCAS can have a significant impact on the overall results.

The responsibility amounts for bridge and local expenditures are broken out separately in Exhibit 5-1. The amounts shown in the Bridge column are the combined expenditures for new, replaced and rehabilitated bridges. Light and heavy vehicles are projected to be responsible for 46.7 percent and 53.3 percent of these expenditures, respectively. The amounts in the Local column are for local expenditures from locally-generated revenues.

The allocation results for local expenditures from locally-generated revenues are further broken out by major category in Exhibit 5-2. As shown, light and heavy vehicles are projected to be responsible for 64.9 percent and 35.1 percent of these expenditures, respectively. Heavy vehicles are projected to be responsible for a majority of preservation and maintenance expenditures at the local level, but a smaller share of modernization and other expenditures. The preservation and maintenance results reflect the heavy concentration of these expenditures on pavement rehabilitation and maintenance at the local level.

**Exhibit 5-1: Average Annual Cost Responsibility by Expenditure Category and Weight Group for 2003-05 Biennium  
(Thousands of Dollars)**

Declared Weight in Pounds			Modernization	Preservation	Maintenance	Other	Local	Bridge	Total
1	to	8,000	53,969	50,236	235,324	309,166	257,755	54,649	961,099
8,001	to	26,000	3,088	3,108	8,204	8,881	13,754	8,507	45,542
26,001	to	46,000	2,461	2,618	5,069	8,410	9,500	3,330	31,389
46,001	to	54,000	1,118	1,280	2,029	2,895	3,843	1,368	12,534
54,001	to	78,000	1,298	1,643	1,927	2,590	3,469	1,301	12,228
78,001	to	80,000	32,779	56,306	43,610	46,892	70,139	34,490	284,216
80,001	to	104,000	9,612	16,284	11,824	9,190	18,900	6,972	72,782
104,001	to	105,500	8,545	14,357	10,878	8,532	17,479	6,367	66,159
105,501	and	up	725	1,234	1,255	255	2,357	78	5,904
<b>Total</b>			113,595	147,067	320,121	396,811	397,196	117,063	1,491,852
Total for Vehicles Under 8,001 Pounds			53,969	50,236	235,324	309,166	257,755	54,649	961,099
% for Vehicles Under 8,001 Pounds			47.5%	34.2%	73.5%	77.9%	64.9%	46.7%	64.4%
Total for Vehicles Over 8,000 Pounds			59,626	96,831	84,796	87,645	139,441	62,414	530,754
% for Vehicles Over 8,000 Pounds			52.5%	65.8%	26.5%	22.1%	35.1%	53.3%	35.6%
Total for Vehicles Under 26,001 Pounds			57,057	53,344	243,528	318,046	271,509	63,156	1,006,641
% for Vehicles Under 26,001 Pounds			50.2%	36.3%	76.1%	80.2%	68.4%	54.0%	67.5%
Total for Vehicles Over 26,000 Pounds			56,538	93,724	76,592	78,764	125,687	53,906	485,211
% for Vehicles Over 26,000 Pounds			49.8%	63.7%	23.9%	19.8%	31.6%	46.0%	32.5%

See Section 4.2 of Chapter 4 for a listing of the expenditure items included in the Other category.

**Exhibit 5-2: Average Annual Cost Responsibility by Expenditure  
Category and Weight Group - Local Government Detail for 2003-05 Biennium  
(Thousands of Dollars)**

Declared Weight in Pounds			Modernization	Preservation	Maintenance	Other	Bridge	Total
1	to	8,000	71,658	10,548	40,099	124,286	11,163	257,755
8,001	to	26,000	3,791	936	2,854	3,800	2,373	13,754
26,001	to	46,000	3,052	880	2,572	2,115	881	9,500
46,001	to	54,000	1,278	384	1,113	770	298	3,843
54,001	to	78,000	1,193	358	1,032	658	227	3,469
78,001	to	80,000	23,836	7,859	22,087	11,470	4,886	70,139
80,001	to	104,000	6,007	2,465	6,758	2,577	1,091	18,900
104,001	to	105,500	5,572	2,282	6,265	2,387	974	17,479
105,501	and	up	701	394	1,040	207	16	2,357
<b>Total</b>			117,088	26,107	83,821	148,270	21,910	397,196
Total for Vehicles Under 8,001 Pounds			71,658	10,548	40,099	124,286	11,163	257,755
% for Vehicles Under 8,001 Pounds			61.2%	40.4%	47.8%	83.8%	51.0%	64.9%
Total for Vehicles Over 8,000 Pounds			45,430	15,559	43,722	23,984	10,746	139,441
% for Vehicles Over 8,000 Pounds			38.8%	59.6%	52.2%	16.2%	49.0%	35.1%
Total for Vehicles Under 26,001 Pounds			75,450	11,484	42,952	128,086	13,536	271,509
% for Vehicles Under 26,001 Pounds			64.4%	44.0%	51.2%	86.4%	61.8%	68.4%
Total for Vehicles Over 26,000 Pounds			41,638	14,623	40,869	20,184	8,373	125,687
% for Vehicles Over 26,000 Pounds			35.6%	56.0%	48.8%	13.6%	38.2%	31.6%

See Section 4.2 of Chapter 4 for a listing of the expenditure items included in the Other category.

Exhibit 5-3 summarizes the expenditure allocations to light and heavy vehicles by funding source, i.e., state, federal, local, and all. The exhibit also shows the allocation results for under 26,001-pound versus over 26,000-pound vehicles. State-funded expenditures are projected to average \$659.8 million annually over the 2003-05 biennium. The comparable amounts for federally- and locally-funded expenditures are \$434.9 million and \$397.2 million, respectively.

<b>Exhibit 5-3: Expenditure Allocation Results for Broad Vehicle Weight Groups by Funding Source</b>					
<b>(Thousands of Dollars)</b>					
<b>Funding Source</b>	<b>Average Annual Total Expenditures Allocated</b>	<b>Allocation to Vehicles</b>			
		<b>Under 8,001 Pounds</b>	<b>Over 8,000 Pounds</b>	<b>Under 26,001 Pounds</b>	<b>Over 26,000 Pounds</b>
State (Highway Fund)	659,760	476,502	183,258	493,006	166,754
		72.2%	27.8%	74.7%	25.3%
Federal	434,897	226,842	208,055	242,126	192,771
		52.2%	47.8%	55.7%	44.3%
Local	397,196	257,755	139,441	271,509	125,687
		64.9%	35.1%	68.4%	31.6%
<b>Total</b>	<b>1,491,852</b>	<b>961,099</b>	<b>530,754</b>	<b>1,006,641</b>	<b>485,211</b>
		64.4%	35.6%	67.5%	32.5%

As illustrated, the expenditure allocation results vary by the funding source used to finance the expenditures. Heavy vehicles, as a group, are projected to be responsible for 27.8 percent of state-funded expenditures, 47.8 percent of federally-funded expenditures, 35.1 percent of locally-funded expenditures, and 35.6 percent of total expenditures.

Because of restrictions on the types of expenditures for which federal-aid highway funds can be used, these funds tend to be concentrated on construction (i.e., modernization and preservation) projects and other types of work for which heavy vehicles have the predominant responsibility. Additionally, federal funds are focused on projects on interstate and other higher-order highways where the heavy vehicle share of travel is highest. Hence, the inclusion of federally-funded expenditures in a state HCAS will almost always have the effect of reducing the light vehicle responsibility share and increasing the heavy vehicle share.

Conversely, state funds generally are more concentrated on maintenance, operations, administration and other activities for which light vehicles have the largest responsibility share. This is particularly the case at the present time with ODOT's use of the federal advance construction programming technique and aggressive strategy to "federalize" a large portion of the construction program for the 2003-05 biennium.

The inclusion of all local expenditures in a state HCAS will, by itself, typically increase the relative responsibility of light vehicles and reduce that of heavy vehicles. This is because many types of expenditures are allocated on a relative travel basis and heavy vehicles account for a comparatively small share of the total travel on local roads and streets. This factor, however, is somewhat offset by the fact local governments spend

most of their road and street funds on activities having a comparatively high heavy vehicle responsibility component; specifically rehabilitation, repair and maintenance of pavements and bridges. Thus, although heavy vehicles will tend to be responsible for a relatively smaller share of local expenditures, the difference will be less than would be suggested by simply comparing relative travel shares on local versus state roads.

For illustrative purposes, Exhibit 5-4 compares the expenditure allocation results of the present study with those of the previous study. As shown, the all-vehicle responsibility shares in the 2001 Study were 61.6 percent for light vehicles and 38.4 percent for heavy vehicles. The 2003 Study shares are 64.4 percent for light vehicles and 35.6 percent for heavy vehicles. This represents a significant increase in the light vehicle share and reduction in the heavy vehicle share as compared to the previous study. It again needs to be noted, however, that because of the inclusion of a substantially broader range of expenditures in the present study, the results of this study are only loosely comparable with the results of previous studies.

<b>Exhibit 5-4: Cost Responsibility Distributions by Weight Group - Comparison Between 2001 and 2003 OR HCASs</b>					
<b>Declared Weight in Pounds</b>			<b>2001 Study</b>	<b>2003 Study</b>	<b>Change in Percentage</b>
1	to	8,000	61.6%	64.4%	2.8%
8,001	and	up	38.4%	35.6%	-2.8%
8,001	to	26,000	3.5%	3.1%	-0.4%
26,001	to	46,000	3.1%	2.1%	-1.0%
46,001	to	54,000	1.5%	0.8%	-0.7%
54,001	to	78,000	1.2%	0.8%	-0.4%
78,001	to	80,000	20.2%	19.1%	-1.1%
80,001	to	104,000	4.4%	4.9%	0.5%
104,001	to	105,500	4.4%	4.4%	0.0%
105,501	and	up	0.2%	0.4%	0.2%
<b>Total</b>			100.0%	100.0%	

Because pavements and bridges represent two of the largest and most important expenditure areas in a HCAS, the responsibility results for these expenditures are broken out separately in Exhibits 5-5 and 5-6.

Exhibit 5-5 shows pavement expenditures allocated in the 2003 Study total \$453.7 million, over twice the level allocated in the 2001 Study. However, it needs to be kept in mind the current study includes expenditures from all funding sources, whereas the 2001 Study included only expenditures from state revenues. The more relevant comparison is, therefore, the share of overall expenditures accounted for by pavement-related projects in the two studies. As shown, pavement expenditures represented 32.5 percent of the total expenditures allocated in the 2001 Study versus 30.4 percent of the total expenditures allocated in the present study.

**Exhibit 5-5: Comparison of Pavement  
Responsibility Results From 2001 and 2003 OR HCASs  
(Thousands of Dollars)**

Expenditure Work Type	2001 Study			2003 Study		
	Expend. Allocated	Light Vehicle Respon.	Heavy Vehicle Respon.	Expend. Allocated	Light Vehicle Respon.	Heavy Vehicle Respon.
New Pavements	34,556	4,308	30,248	55,146	8,024	47,122
	5.3%	12.5%	87.5%	3.7%	14.6%	85.4%
Pavement and Shoulder Reconstruction	10,906	3,145	7,761	36,627	10,742	25,885
	1.7%	28.8%	71.2%	2.5%	29.3%	70.7%
Pavement and Shoulder Rehabilitation	35,971	14,199	21,772	159,690	47,635	112,054
	5.5%	39.5%	60.5%	10.7%	29.8%	70.2%
Pavement Maintenance	111,524	40,762	70,762	178,460	76,781	101,678
	17.2%	36.5%	63.5%	12.0%	43.0%	57.0%
Other Pavement Expenditures	17,940	14,698	3,242	23,733	21,763	1,970
	2.8%	81.9%	18.1%	1.6%	91.7%	8.3%
<b>Total Pavement Expenditures</b>	<b>210,897</b>	<b>77,112</b>	<b>133,785</b>	<b>453,656</b>	<b>164,945</b>	<b>288,709</b>
	<b>32.5%</b>	<b>36.6%</b>	<b>63.4%</b>	<b>30.4%</b>	<b>36.4%</b>	<b>63.6%</b>

Note: Percents in the Expend. Allocated columns are the share of the total expenditures allocated in each study accounted for by the expenditures for each pavement work type. Percents in the Light Vehicle Respon. and Heavy Vehicle Respon. columns are the light and heavy vehicle responsibility shares.

The responsibility shares for particular types of pavement work differ somewhat between the two studies. The current study finds heavy vehicles responsible for a greater share of pavement and shoulder rehabilitation expenditures, but a lower share of pavement maintenance and other pavement-related expenditures. For this exhibit, other pavement expenditures include those for climbing lanes, pavement striping and marking, maintenance of truck scale pavements, and studded tire damage repair. For all pavement expenditures combined, the results of the two studies are very similar, i.e., heavy vehicle responsibility shares of 63.4 percent in the 2001 Study versus 63.6 percent in the present study.

Exhibit 5-6 compares the bridge plus interchange expenditure amounts and responsibility results in the 2001 and present studies.<sup>1</sup> As shown, these dollars account for a significantly greater share of overall expenditures in the present study (10.7 percent) than in the 2001 Study (7.0 percent). This reflects the increased emphasis currently being placed on bridge rehabilitation and replacement by both ODOT and local governments.

<sup>1</sup> The 2003 Study separates expenditures for interchanges from those for bridges, and allocates the two differently. The 2001 Study did not make this separation. In that study, expenditures for interchanges were lumped together with those for bridges and allocated in the same way. Therefore, making a one-to-one comparison between the results of the two studies requires including both types of expenditures.

<b>Exhibit 5-6: Comparison of Bridge and Interchange Responsibility Results From 2001 and 2003 OR HCASs (Thousands of Dollars)</b>						
<b>Expenditure Work Type</b>	<b>2001 Study<sup>1</sup></b>			<b>2003 Study<sup>1</sup></b>		
	<b>Expend. Allocated</b>	<b>Light Vehicle Respon.</b>	<b>Heavy Vehicle Respon.</b>	<b>Expend. Allocated</b>	<b>Light Vehicle Respon.</b>	<b>Heavy Vehicle Respon.</b>
New, Replaced, and Rehabilitated Bridges <sup>2</sup>	34,354	19,171	15,183	120,745	52,623	68,121
	5.3%	55.8%	44.2%	8.1%	43.6%	56.4%
Interchanges <sup>3</sup>	---	---	---	18,707	13,642	5,065
	---	---	---	1.3%	72.9%	27.1%
<b>Bridge and Interchange Subtotal</b>	<b>34,354</b>	<b>19,171</b>	<b>15,183</b>	<b>139,452</b>	<b>66,265</b>	<b>73,186</b>
	5.3%	55.8%	44.2%	9.3%	47.5%	52.5%
Bridge Maintenance	11,145	10,228	917	19,651	18,131	1,519
	1.7%	91.8%	8.2%	1.3%	92.3%	7.7%
<b>Total Bridge and Interchange Expenditures</b>	<b>45,499</b>	<b>29,399</b>	<b>16,100</b>	<b>159,102</b>	<b>84,396</b>	<b>74,705</b>
	7.0%	64.6%	35.4%	10.7%	53.0%	47.0%

<sup>1</sup> Percents in the Expend. Allocated columns are the share of the total expenditures allocated in each study accounted for by the expenditures for each bridge/interchange work type. Percents in the Light Vehicle Respon. and Heavy Vehicle Respon. columns are the light and heavy vehicle responsibility shares.

<sup>2</sup> For both studies, includes expenditures for seismic retrofitting of existing bridges.

<sup>3</sup> The 2001 Study did not break out interchange expenditures separately from those for new, replaced, and rehabilitated bridges; the 2003 Study did.

The exhibit also illustrates the responsibility results differ between the two studies. The heavy vehicle responsibility share for total bridge plus interchange expenditures in the present study is 47.0 percent, as compared to 35.4 percent in the 2001 Study. This reflects the use of the new bridge cost responsibility study results in the present study, and the fact heavy vehicles are allocated a greater share of bridge replacement costs than in the 2001 Study.

## 5.2 Impact of Alternative Treatment of Weight-Mile Tax Collection Costs

A specific issue staff was requested to examine is how the study results would be impacted by an alternative approach to the allocation of weight-mile tax administration and collection expenses. The approach of past studies has been to allocate 100 percent of these costs to heavy vehicles, specifically those with declared weights over 26,000 pounds.

Projected weight-mile tax administration and collection costs for the next biennium are approximately \$30 million, or an average of \$15 million per year. An alternative to assigning these costs to heavy vehicles only would be to treat them as a common responsibility, and assign them to all vehicle classes based on the relative travel of each class. This would assign heavy vehicles about 8 percent of these costs, or \$1.2 million versus the \$15 million they are presently assigned. This in turn would reduce the overall

heavy vehicle responsibility share by about 0.9 percentage points, from 35.6 percent to 34.7 percent.<sup>2</sup>

### **5.3 Revenue Attribution Results**

The attribution of revenues to the various vehicle types and weight classes is an important element of a HCAS. Once accomplished, the projected payments are compared to the calculated responsibility of each class to determine whether each class is paying more or less than its responsibility under the existing tax structure and rates. Where significant imbalances are detected, recommendations for changes in tax rates are made to bring payments back into balance with cost responsibilities.

As noted in Chapter 4, most of the required revenue data for the study, including control totals for forecasted revenues by tax instrument (i.e., fuel, registration, weight-mile, etc.), is obtained from ODOT's revenue forecasting model. Every effort is made to ensure the data used in the HCAS is consistent with the most recent revenue forecast available at the time the study is being conducted. Some information required for the HCAS, however, is not available from the revenue forecasting model, and so must be estimated from other sources. The revenue model, for example, does not project fuel tax payments by detailed, 2,000-pound weight class. Therefore, estimated fuel efficiencies by vehicle type and weight group must be used together with control totals from the revenue model to attribute projected fuel tax payments to the detailed vehicle classes.

The revenue attribution results are summarized in Exhibit 5-7. For the next biennium, under existing tax rates, it is forecast light vehicles will contribute 64.8 percent of State Highway Fund revenues and heavy vehicles will contribute 35.2 percent. The 35.2 percent projected payment share for heavy vehicles is less than the overall responsibility share of 35.6 percent for these vehicles reported in Section 5.1. However, these results need to be adjusted to reflect the impacts of tax exemptions and reduced rates granted to certain types of vehicles. As explained in the following chapter, these adjustments have a significant effect on the relative shares of attributed revenues and allocated expenditures for the various vehicle classes.

Exhibit 5-7 shows the relative payments of different vehicle weight groups vary significantly by tax instrument. Light vehicles are projected to contribute approximately 94 percent of fuel tax revenues, 75 percent of registration fee revenues, and 91 percent of the revenues from title fees. Heavy vehicles, on the other hand, contribute 100 percent of weight-mile tax, flat fee, and road use assessment fee revenues. Heavy vehicles also contribute 100 percent of the "Other Motor Carrier" revenue identified in the exhibit. This category includes revenues from truck overweight/overlength permit fees, weight violation fines and penalties, etc.

An issue raised by the SRT was the impact on projected weight-mile tax revenues of the conversion to quarterly reporting. Legislation enacted by the 2001 Legislature authorized most motor carriers to apply to convert from monthly to quarterly reporting of the tax. This change introduces a lag in the receipt of weight-mile revenues during the period of the conversion. Since the HCAS model projects these revenues on an accrual rather than cash flow basis, however, it was determined the conversion does not affect the level of revenues projected by the model. Given the way the model projects these

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<sup>2</sup> This alternative approach is not one endorsed by the SRT. The impact of this approach is presented in this report for consideration by the Legislature.

revenues, in other words, it makes no difference whether the tax is reported and paid on a monthly or quarterly basis.

Exhibit 5-8 compares the revenue attribution results of the present study with those of the 2001 Study. The projected share of revenues contributed by light vehicles has increased from 63.3 percent in the 2001 Study to 64.8 percent in the present study. Conversely, the overall heavy vehicle share of projected payments has decreased from 36.7 percent in the previous study to 35.2 percent in the present study.

The numbers in the exhibit indicate a significant increase/decrease in the share of revenue contributions by light/heavy vehicles as compared to the previous study. However, this is somewhat misleading because of the different treatment of title fee revenues in the two studies. As explained in Chapter 4, these fees are now identified as a separate revenue source, whereas they were not included at all in the 2001 Study. Since these fees are predominately paid by light vehicles, their inclusion in the present study accounts for most of the difference in the projected revenue shares between the two studies.

The remainder of the change in the revenue attribution results between the two studies reflects the impacts of the current economic downturn in Oregon. Commercial trucking activity, and therefore the tax revenue generated by this activity, tends to be very sensitive to changes in the health of both the state and national economies.<sup>3</sup> This is illustrated by the fact projected average annual weight-mile tax revenues for the present study are actually lower than the comparable projection in the 2001 Study.

The use of automobiles and other light vehicles for job-related and personal travel is also sensitive to changes in economic conditions, but much less so than commercial truck travel. For a couple different reasons, light vehicle travel and fuel consumption have held up relatively well in the face of the economic downturn. First, in the aftermath of the September 11, 2001 terrorist attacks, some individuals have substituted personal vehicle travel for air travel. Second, improvements in the fuel efficiency of the light vehicle fleet have been slowed by the increased popularity of sport utility and other larger personal travel vehicles in recent years.

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<sup>3</sup> Changes in relative activity levels resulting from changes in economic conditions, or other factors, will have impacts on both the revenue attribution and expenditure allocation results. As noted in previous chapters, many of the individual expenditure items are allocated by relative VMT, or some weighted measure of VMT. Therefore, other things equal, a reduction in the share of total travel accounted for by heavy vehicles will reduce both their cost responsibility share and their share of projected revenue payments (although not necessarily in exact proportions).

**Exhibit 5-7: Average Annual Projected User-Fee Revenue by Tax Instrument and Weight Group for 2003-05 Biennium  
(Thousands of Dollars)**

Declared Weight in Pounds			Fuel Tax	Registration Fees	Title Fees	Weight-Mile Tax	Other Motor Carrier	Flat Fees	Road Use Assessment Fee	Total
1	to	8,000	364,489	61,197	36,272	0	0	0	0	461,958
8,001	to	26,000	22,078	5,907	427	0	0	0	0	28,412
26,001	to	46,000	2,128	2,408	393	4,942	626	1,800	0	12,298
46,001	to	54,000	198	1,460	171	4,250	317	58	0	6,453
54,001	to	78,000	80	1,066	165	5,327	289	68	0	6,994
78,001	to	80,000	299	8,373	2,149	128,282	4,706	3,088	0	146,898
80,001	to	104,000	62	1,001	129	21,115	815	2,189	17	25,328
104,001	to	105,500	87	454	65	21,523	763	768	11	23,669
105,501	and	up	0	0	0	0	8	0	743	751
<b>Total</b>			<b>389,422</b>	<b>81,866</b>	<b>39,770</b>	<b>185,439</b>	<b>7,525</b>	<b>7,970</b>	<b>770</b>	<b>712,762</b>
Total for Vehicles Under 8,001 Pounds			364,489	61,197	36,272	0	0	0	0	461,958
% for Vehicles Under 8,001 Pounds			93.6%	74.8%	91.2%	0.0%	0.0%	0.0%	0.0%	64.8%
Total for Vehicles Over 8,000 Pounds			24,933	20,669	3,499	185,439	7,525	7,970	770	250,804
% for Vehicles Over 8,000 Pounds			6.4%	25.2%	8.8%	100.0%	100.0%	100.0%	100.0%	35.2%
Total for Vehicles Under 26,001 Pounds			386,567	67,104	36,699	0	0	0	0	490,370
% for Vehicles Under 26,001 Pounds			99.3%	82.0%	92.3%	0.0%	0.0%	0.0%	0.0%	68.8%
Total for Vehicles Over 26,000 Pounds			2,854	14,762	3,072	185,439	7,525	7,970	770	222,392
% for Vehicles Over 26,000 Pounds			0.7%	18.0%	7.7%	100.0%	100.0%	100.0%	100.0%	31.2%

**Exhibit 5-8: Revenue Attribution Distributions by Weight Group - Comparison Between 2001 and 2003 OR HCASs**

Declared Weight in Pounds			2001 Study	2003 Study	Change in Percentage
1	to	8,000	63.3%	64.8%	1.5%
8,001	and	up	36.7%	35.2%	-1.5%
8,001	to	26,000	3.1%	4.0%	0.9%
26,001	to	46,000	2.1%	1.7%	-0.4%
46,001	to	54,000	1.2%	0.9%	-0.3%
54,001	to	78,000	1.0%	1.0%	0.0%
78,001	to	80,000	21.2%	20.6%	-0.6%
80,001	to	104,000	4.1%	3.6%	-0.5%
104,001	to	105,500	3.8%	3.3%	-0.5%
105,501	and	up	0.1%	0.1%	0.0%
<b>Total</b>			100.0%	100.0%	

## 6 Comparison of Expenditures Allocated to Revenues Paid

This chapter brings together the expenditure allocation and revenue attribution results reported in Chapter 5 to compare projected responsibilities and tax payments for each vehicle class and for broader groupings of vehicles (e.g., all heavy vehicles combined). This comparison is facilitated by the calculation of equity ratios, defined as the ratio of the revenues contributed by the vehicles in any class to the cost responsibilities of the vehicles in that class. An equity ratio greater than one indicates the vehicles in that class are projected to pay more than their cost responsible share. Conversely, an equity ratio less than one denotes the vehicles in a class are projected to pay less than their responsible share of user revenues.

The comparison of revenues to cost responsibilities in the Oregon studies is traditionally done for full-fee-paying vehicles only. This same approach is taken in the present study, and in turn requires some further adjustments to the numbers presented in Chapter 5. The model separately estimates the revenue contributions from full-fee-paying and alternative-fee-paying vehicles for each tax instrument. The expenditures allocated to each vehicle class are apportioned among full-fee-paying and alternative-fee-paying vehicles on the basis of the relative miles of travel of each in that class.<sup>1</sup>

### 6.1 Presentation of Equity Ratios

Exhibit 6-1 includes calculated equity ratios for the detailed 2,000-pound weight classes as well as the summary-level weight groups shown in earlier exhibits. It needs to be emphasized that these results are for full-fee-paying vehicles only, and exclude vehicles that pay on an alternative-fee basis.

As shown in the exhibit, projected 2004 VMT for full-fee-paying vehicles are 33,859 million, 93.0 percent of these miles being by light vehicles and 7.0 percent by heavy vehicles. This compares to projected 2004 miles of travel by all vehicles of 34,792 million, 92.1 percent by light vehicles and 7.9 percent by heavy vehicles. As explained in the previous chapter, alternative-fee-paying vehicles are disproportionately concentrated in the heavy vehicle classes, so excluding them will reduce the heavy vehicle share of VMT. The heavy vehicle percentage share of VMT, in other words, will always be lower if only full-fee-paying vehicles are considered than if all vehicles are considered.

The projected total responsibility of full-fee-paying vehicles is \$1,425.6 million, with responsibility shares of 66.3 percent for light vehicles and 33.7 percent for heavy vehicles. This compares to the projected total responsibility for all vehicles of \$1,491.9 million shown in Exhibit 5-1 of Chapter 5. The difference between these two amounts is the projected responsibility of alternative-fee-paying vehicles.

Forecasted average annual user fees paid by full-fee-paying vehicles total \$688.4 million, 66.1 percent from light vehicles and 33.9 percent from heavy vehicles. The

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<sup>1</sup> If, for example, 80 percent of the VMT in a weight class is by full-fee-paying vehicles and 20 percent by alternative-fee-paying vehicles, then 80 percent of the total responsibility of that class is assigned to full-fee-paying vehicles and 20 percent to alternative-fee-paying vehicles. This division is based on the reasonable assumption that two vehicles that are identical, except one is subject to full fees and the other alternative fees, have exactly the same per-mile responsibility.

**Exhibit 6-1: Comparison of Average Annual Cost Responsibility  
and User Fees Paid by Full-Fee-Paying Vehicles by Declared Weight Class**  
(Thousands)

Declared Weight in Pounds			Vehicle Miles Traveled	Cost Responsibility	User Fees Paid	Allocated Alternative-Fee Difference	Scaled Cost Responsibility with Alternative-Fee Difference	Scaled Equity Ratio	Equity Ratio, Difference Adjusted
1	to	8,000	31,481,191	944,520	454,995	8,981	465,051	0.9976	0.9921
8,001	to	26,000	598,507	34,947	23,202	171	17,045	1.3750	1.3803
26,001	to	46,000	143,580	15,805	7,636	41	7,673	1.0005	1.0091
46,001	to	54,000	76,930	10,714	6,008	22	5,196	1.1614	1.1727
54,001	to	78,000	70,148	11,297	6,782	20	5,475	1.2433	1.2561
78,001	to	80,000	1,125,285	274,465	143,210	321	132,849	1.0806	1.0931
80,001	to	104,000	180,436	64,945	23,014	51	31,411	0.7339	0.7430
104,001	to	105,500	180,980	63,065	22,789	52	30,503	0.7484	0.7576
105,501	and	up	2,019	5,891	751	1	2,845	0.2642	0.2678
<b>Total</b>			<b>33,859,076</b>	<b>1,425,649</b>	<b>688,388</b>	<b>9,660</b>	<b>698,048</b>	<b>1.0000</b>	<b>1.0000</b>
Total for Vehicles Under 8,001 Pounds			31,481,191	944,520	454,995	8,981	465,051	0.9976	0.9921
% for Vehicles Under 8,001 Pounds			93.0%	66.3%	66.1%	93.0%	66.6%		
Total for Vehicles Over 8,000 Pounds			2,377,885	481,130	233,393	678	232,996	1.0046	1.0158
% for Vehicles Over 8,000 Pounds			7.0%	33.7%	33.9%	7.0%	33.4%		
Total for Vehicles Under 26,001 Pounds			32,079,698	979,466	478,196	9,152	482,096	1.0111	1.0058
% for Vehicles Under 26,001 Pounds			94.7%	68.7%	69.5%	94.7%	69.1%		
Total for Vehicles Over 26,000 Pounds			1,779,378	446,183	210,192	508	215,951	0.9756	0.9870
% for Vehicles Over 26,000 Pounds			5.3%	31.3%	30.5%	5.3%	30.9%		
26,001	to	28,000	12,317	1,157	281	4	562	0.50	0.51
28,001	to	30,000	12,057	1,135	380	3	552	0.69	0.70
30,001	to	32,000	33,684	3,387	797	10	1,645	0.49	0.49
32,001	to	34,000	18,553	1,937	1,082	5	941	1.16	1.17
34,001	to	36,000	6,271	706	419	2	343	1.23	1.24
36,001	to	38,000	3,856	462	251	1	224	1.12	1.13
38,001	to	40,000	6,846	768	449	2	373	1.21	1.22
40,001	to	42,000	5,568	653	419	2	317	1.33	1.34
42,001	to	44,000	5,706	722	422	2	350	1.21	1.22
44,001	to	46,000	38,723	4,878	3,137	11	2,366	1.33	1.34
46,001	to	48,000	16,182	2,337	1,323	5	1,133	1.17	1.18
48,001	to	50,000	20,941	2,809	1,681	6	1,362	1.24	1.25
50,001	to	52,000	15,318	2,177	1,255	4	1,055	1.19	1.21
52,001	to	54,000	24,490	3,392	1,750	7	1,645	1.07	1.08
54,001	to	56,000	17,426	2,900	1,448	5	1,405	1.03	1.05
56,001	to	58,000	5,408	906	422	2	439	0.96	0.97
58,001	to	60,000	5,607	812	447	2	394	1.14	1.15
60,001	to	62,000	1,811	254	228	1	123	1.85	1.87
62,001	to	64,000	3,303	516	292	1	250	1.17	1.19
64,001	to	66,000	11,266	1,709	1,027	3	828	1.24	1.26
66,001	to	68,000	7,267	1,191	730	2	577	1.27	1.28
68,001	to	70,000	5,829	973	592	2	472	1.26	1.27
70,001	to	72,000	4,291	623	507	1	302	1.68	1.70
72,001	to	74,000	1,765	265	266	1	129	2.08	2.10
74,001	to	76,000	4,422	698	549	1	338	1.63	1.64
76,001	to	78,000	1,753	449	275	1	217	1.27	1.28
78,001	to	80,000	1,125,285	274,465	143,210	321	132,849	1.08	1.09
80,001	to	82,000	4,311	1,094	571	1	529	1.08	1.09
82,001	to	84,000	7,057	2,182	941	2	1,056	0.89	0.90
84,001	to	86,000	10,884	4,101	1,464	3	1,983	0.74	0.75
86,001	to	88,000	14,274	5,741	1,832	4	2,776	0.66	0.67
88,001	to	90,000	29,074	11,518	3,685	8	5,570	0.66	0.67
90,001	to	92,000	9,582	4,389	1,270	3	2,122	0.60	0.61
92,001	to	94,000	5,834	2,557	787	2	1,237	0.64	0.65
94,001	to	96,000	25,761	9,132	3,171	7	4,417	0.72	0.73
96,001	to	98,000	29,443	10,128	3,691	8	4,899	0.75	0.76
98,001	to	100,000	8,770	2,839	1,212	3	1,374	0.88	0.89
100,001	to	102,000	13,530	3,847	1,690	4	1,861	0.91	0.92
102,001	to	104,000	21,916	7,417	2,700	6	3,588	0.75	0.76
104,001	to	105,500	180,980	63,065	22,789	52	30,503	0.75	0.76

difference between this total and the \$712.8 million total for all vehicles shown in Exhibit 5-7 represents projected revenues from alternative-fee-paying vehicles.

The total of the Allocated Alternative-Fee Difference column represents the average annual difference between what alternative-fee-paying vehicles are projected to pay and what they would pay if subject to full fees. This total is \$9.66 million annually for the next biennium under existing tax rates.<sup>2</sup> Following the approach of previous studies, this amount is reassigned to the full-fee-paying vehicle classes based on the relative VMT of each of these classes.<sup>3</sup>

Because of the decision to base the responsibility calculations on the inclusion of all expenditures in the current study, the allocated expenditures for full-fee-paying vehicles are over twice the attributed revenues for these vehicles. This does not present a problem in calculating the equity ratios themselves, but does raise an issue as to how and at what stage the alternative-fee difference adjustment should be made.<sup>4</sup> The approach taken in this study is to first proportionately scale down the cost responsibility amounts so they sum to the total for full-fee-paying vehicle revenues. The allocated alternative-fee difference amounts are then added to the scaled-down responsibility amounts to produce the amounts in the Scaled Cost Responsibility with Alternative-Fee Difference column of Exhibit 6-1.

The equity ratios for the detailed, 2,000-pound declared weight classes and broader groupings of vehicles are calculated by comparing the amounts in the Scaled Cost Responsibility with Alternative-Fee Difference column with the amounts in the User Fees Paid column of the exhibit. As explained in footnote 4, the equity ratios are calculated by comparing revenue ratios to responsibility ratios, so it makes no difference that the amounts in these two columns sum to different totals.

The final two columns of Exhibit 6-1 present both the unadjusted and alternative-fee difference adjusted equity ratios so the reader can see what impact the adjustment makes. The adjusted ratios in the final column are the more important, however, since it is these results that are most comparable with the bottom-line results of the prior two studies, and form the basis for the tax rate changes recommended in the following chapter.

This study finds overall equity ratios of 0.9921 for light vehicles and 1.0158 for heavy vehicles as a group. This means that, for the 2003-05 biennium and under the existing

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<sup>2</sup> To clarify, these amounts represent the underpayment by alternative-fee-paying vehicles relative to what they would pay on a full-fee basis – the difference, for example, between revenues from publicly owned vehicles under the existing tax structure versus revenues from these vehicles if they were all subject to the state fuel tax or weight-mile tax and full registration fees. The amounts, however, do not necessarily represent an underpayment relative to the cost responsibility of these vehicles. If those classes in which alternative-fee-paying vehicles are concentrated are significantly overpaying their responsibility, then these vehicles may be meeting their responsibility even though they are paying less than full-fee-paying vehicles.

<sup>3</sup> As discussed in Chapter 3, there are other approaches that might be used to reassign the alternative-fee difference amount to full-fee-paying vehicles. One alternative is to treat this amount as an overhead cost and reassign the portion associated with light vehicles back to light vehicles, and the portion associated with heavy vehicles back to heavy vehicles. This approach would leave the relative cost responsibility shares unchanged by the alternative-fee difference adjustment.

<sup>4</sup> The calculation of equity ratios in the model is accomplished by comparing ratios of revenues attributed to ratios of expenditures allocated. For each vehicle class, the ratio of the revenues attributed to this class to the total revenues attributed to all classes is first calculated. This ratio is then divided by the ratio of the expenditures allocated to this class to the total expenditures allocated to all classes. Thus, the calculation of the equity ratios does not require scaling of either the attributed revenues or allocated expenditures when the two are not equal.

tax structure and rates, light vehicles as a group are projected to pay 99.2 percent of their responsibility, or to underpay their fair share by 0.8 percent. Heavy vehicles, as a group, are projected to pay 101.6 percent of their responsibility, or to overpay their responsibility by 1.6 percent. In dollar terms, this translates to an average annual underpayment by light vehicles and overpayment by heavy vehicles of approximately \$3.6 million.<sup>5</sup>

Exhibit 6-1 also shows the overall equity ratios for vehicles under and over 26,000 pounds, as well as for the summary-level weight groups shown in earlier exhibits. As a group, vehicles under 26,001 pounds are projected to overpay their responsibility by 0.6 percent and those over 26,000 pounds to underpay their responsibility by 1.3 percent.

In terms of the summary-level groups, vehicles with weights between 8,001 pounds and 80,000 pounds are projected to overpay their responsibility. The other summary-level groups are forecast to pay less than their responsibility over the next biennium. The projected underpayment is largest for those vehicles operated under special permit at declared weights in excess of 80,000 pounds.

Vehicles in the 78,001-80,000 pound class alone account for over 47 percent of the VMT by full-fee-paying heavy vehicles, and 63 percent of the VMT by over 26,000-pound vehicles. These vehicles also account for 57 percent of the cost responsibility and over 61 percent of the user fees paid by full-fee-paying heavy vehicles. This class is projected to overpay its responsibility by more than 9 percent without an adjustment of existing tax rates.

## **6.2 Comparison with 1999 and 2001 Oregon Studies**

The overall light and heavy vehicle equity ratios found by this study are somewhat different than those determined by the prior two Oregon studies. The alternative-fee difference adjusted equity ratios found by the 1999 Study were 0.97 for light vehicles and 1.05 for heavy vehicles as a group, indicating a projected underpayment of 3 percent by light vehicles and overpayment of 5 percent by heavy vehicles. The analysis period for the 1999 Study was the 1999-01 biennium or State Fiscal Years 2000 and 2001. On the basis of these results, the 1999 Legislature enacted an across-the-board 12.3 percent reduction in the weight-mile tax rates.<sup>6</sup> This reduction became effective September 1, 2000.

The 2001 Study found adjusted equity ratios of 1.003 for light vehicles and 0.995 for heavy vehicles as a group. This indicated a situation of near-perfect equity for the 2001-03 biennium analysis period, i.e., a 0.3 percent projected overpayment by full-fee-paying light vehicles and 0.5 percent projected underpayment by heavy vehicles. As a consequence, no adjustment in tax rates was deemed necessary by the Legislature to

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<sup>5</sup> As shown in Exhibit 6-1, full-fee-paying light vehicles are projected to pay an annual average of \$455.0 million during the 2003-05 biennium. If total revenues from full-fee-paying vehicles are held constant at \$688.4 million, re-establishing a cost responsibility balance means these vehicles should pay \$458.6 million, an increase of \$3.6 million. Conversely, full-fee-paying heavy vehicles are projected to pay an annual average of \$233.4 million and should pay \$229.8 million, a reduction of \$3.6 million.

<sup>6</sup> As noted, the overall results of the 1999 Study were implemented by a proportionate reduction in all the weight-mile tax rates. The Legislature, however, did not implement the detailed recommendations of either the 1999 or 2001 studies.

satisfy the constitutional requirement of “fairness and proportionality” between light and heavy vehicles.<sup>7</sup>

The equity ratio results for the present study are generally similar to those of the 1999 and 2001 studies for the heaviest truck classes, those above 78,000 pounds declared weight. All three studies have projected an overpayment by vehicles in the 78,001-80,000 pound class, and an underpayment by most individual weight classes above 80,000 pounds.

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<sup>7</sup> The constitutional language quoted in Chapter 1 is relatively new, and has yet to be tested in the courts. Consequently, it is not known “how close is close enough” – i.e., how far from unity the equity ratios have to be before the constitutional language requires legislative action to correct the imbalance. The 2001 Study results were clearly considered as close enough that no correction needed to be made.

## 7 Recommendations for Changes in Tax Rates

This chapter presents recommendations for changes in tax rates based on the equity ratio results reported in the previous chapter. These include the registration fees paid by 8,001-26,000 pound commercial vehicles, the Table "A" and "B" weight-mile tax rates, the optional flat fee rates for haulers of logs, sand and gravel, and wood chips, and the road use assessment fee applicable to vehicles operated under single-trip, non-divisible load permits at gross weights over 98,000 pounds.

### 7.1 Options for Balancing Revenue Shares to Responsibility Shares

There are a number of ways of addressing an imbalance between projected payments and responsibilities for broad vehicle groups. Under existing tax and fee rates, this study projects light vehicles will underpay and heavy vehicles, as a group, overpay their respective cost responsibilities over the next biennium. Therefore, eliminating this imbalance could be achieved by reducing revenues from heavy vehicles, increasing revenues from light vehicles, or any number of combinations of these two actions.

Exhibit 7-1 presents three options for balancing revenues from light and heavy vehicles to the alternative-fee difference adjusted responsibility shares reported in the previous chapter. All dollar amounts in the exhibit are for full-fee-paying vehicles only and are average annual amounts for the 2003-05 biennium.

The first option involves increasing payments from light vehicles and reducing those from heavy vehicles by equal amounts, so that total projected revenues from full-fee-paying vehicles remain constant. As shown, the required increase/decrease in revenues from light/heavy vehicles is \$3.62 million. This would represent a 0.8 percent increase in payments by light vehicles and a 1.6 percent reduction in payments by heavy vehicles.

The second option holds payments from heavy vehicles constant and increases light vehicle payments, thereby increasing average annual revenues from full-fee-paying vehicles. To bring the payment shares into line with the responsibility shares found by this study, this option would require increasing average annual payments from light vehicles by \$10.85 million, or 2.4 percent.

The third option involves holding payments from light vehicles constant and reducing heavy vehicle payments, thereby reducing overall average annual payments from full-fee-paying vehicles. This option requires reducing average annual payments from heavy vehicles by approximately \$5.44 million, or 2.3 percent.

All three options are equally valid ways of balancing projected light and heavy vehicle revenue shares to the responsibility shares found by this study. Nothing in the highway cost allocation study process guides the choice of the most appropriate option. The choice instead is a public policy decision that should be made on the basis of the relationship between resulting revenues and the cost of providing an appropriate level of service to highway users. Thus, all three options are presented in this report for consideration by the Legislature.

**Exhibit 7-1: Three Options for Balancing Full-Fee-Paying  
Vehicle Revenue Shares to HCAS Responsibility Shares  
(Thousands of Dollars)**

Option	Vehicle Type	Before Balancing		After Balancing		Change	Percent Change
		Projected Average Annual Revenues	Percent of Total	Projected Average Annual Revenues	Percent of Total		
1 <sup>1</sup>	Light	454,995	66.10%	458,616	66.62%	3,621	0.8%
	Heavy	233,393	33.90%	229,772	33.38%	-3,621	-1.6%
	Total	688,388	100.00%	688,388	100.00%	0	0.0%
2 <sup>2</sup>	Light	454,995	66.10%	465,844	66.62%	10,849	2.4%
	Heavy	233,393	33.90%	233,393	33.38%	0	0.0%
	Total	688,388	100.00%	699,237	100.00%	10,849	1.6%
3 <sup>3</sup>	Light	454,995	66.10%	454,995	66.62%	0	0.0%
	Heavy	233,393	33.90%	227,958	33.38%	-5,436	-2.3%
	Total	688,388	100.00%	682,952	100.00%	-5,436	-0.8%

<sup>1</sup> Balancing by increasing revenues from light vehicles and decreasing revenues from heavy vehicles by equal amounts so that total full-fee-paying vehicle revenues stay constant.

<sup>2</sup> Balancing by holding revenues from heavy vehicles constant and increasing revenues from light vehicles.

<sup>3</sup> Balancing by holding revenues from light vehicles constant and reducing revenues from heavy vehicles.

Each of these options gives rise to somewhat different recommendations for changes in the fee and tax rates for light vehicles and the various heavy vehicle types and weight classes. The recommended heavy vehicle rates presented in this chapter, for example, would be somewhat higher if the overall balancing between light and heavy vehicles was accomplished via the second rather than third option.

The recommended rates presented in the remainder of this chapter are based on the third option discussed above, that of holding overall revenues from full-fee-paying light vehicles constant and balancing to the new cost responsibility shares by reducing heavy vehicle revenues. As noted previously, this is only one of several equally valid ways of balancing to the study responsibility results. The selection of this option is arbitrary and made solely to minimize the number of recommended rate tables needed to be presented in this chapter.

## **7.2 Registration Fees for 8,001-26,000 Pound Commercial Vehicles**

Commercial vehicles registered at gross weights of 8,001 to 26,000 pounds pay the state fuel tax and relatively higher registration fees in place of the weight-mile tax. Raising the threshold for the weight-mile tax to 26,001 pounds was a recommendation of the 1988 Task Force on Motor Carrier Taxation. This change was enacted by the 1989 Legislature and became effective January 1, 1990. The existing annual registration fees for these vehicles range from \$110 for vehicles registered at 8,001-10,000 pounds to \$245 for vehicles registered at 24,001-26,000 pounds.<sup>1</sup>

<sup>1</sup> The annual registration fees for commercial vehicles above 26,000 pounds range from \$120 for vehicles registered at 26,001-28,000 pounds up to \$415 for vehicles registered at 104,001-105,500 pounds. The reason for the step reduction in the fee schedule at 26,001 pounds is that vehicles below this weight are not subject to the weight-mile tax, while those at or above this weight are.

**Exhibit 7-2: Registration Fees for  
8,001-26,000 Pound Commercial Vehicles  
(Dollars Per Year)**

Registered Gross Weight			Existing Registration Fee	Recommended Registration Fee	Difference
8,001	to	10,000	110	100	-10
10,001	to	12,000	125	110	-15
12,001	to	14,000	140	130	-10
14,001	to	16,000	155	140	-15
16,001	to	18,000	170	150	-20
18,001	to	20,000	190	170	-20
20,001	to	22,000	205	180	-25
22,001	to	24,000	225	200	-25
24,001	to	26,000	245	220	-25

The results presented in the previous chapter show full-fee-paying vehicles with registered weights between 8,001 and 26,000 pounds, as a group, will be paying more than their responsibility during the next biennium under existing tax rates. The recommended registration fees for these vehicles presented in Exhibit 7-2 address this projected overpayment. As shown, fee reductions of \$10 to \$25 are recommended for all weight classes between 8,001 and 26,000 pounds. The recommended reductions are smallest for the lighter weight classes and largest for the heavier weight classes in this group.

### 7.3 Weight-Mile Tax Table “A” and “B” Rates

Commercial vehicles operated at declared weights of 26,001 to 105,500 pounds are subject to the weight-mile tax for their Oregon miles of travel. Operators of vehicles with declared weights of 26,001-80,000 pounds pay the statutory Table “A” rates. Vehicles operated under special annual permits at declared weights of 80,001-105,500 pounds are subject to the statutory Table “B” rates.<sup>2</sup>

As shown in Exhibit 7-3, the Table “A” rates are graduated by 2,000-pound declared gross weight increments. The existing rates range from 3.64 cents per mile for vehicles declared at 26,001-28,000 pounds to 11.97 cents per mile for vehicles declared at 78,001-80,000 pounds.

The Table “B” rates are also graduated by 2,000-pound increments, except there are separate schedules for five, six, seven, eight, and nine or more axle vehicles. The rates are structured so that, at any given declared weight, carriers can qualify for a lower per-mile charge by utilizing additional axles. At a declared weight of 100,000 pounds, for example, the per-mile rate for a six-axle vehicle is 14.42 cents and the rate for a seven-axle vehicle is 12.36 cents. Thus, by adding an axle, a carrier can reduce his or her tax

<sup>2</sup> Under the Oregon weight-mile tax system, a vehicle can have multiple declared weights, depending on the configuration in which the vehicle is being operated (i.e., the number of trailers/semi-trailers the truck or tractor is pulling). Hence, during any given period, a portion of a vehicle’s miles may be reported under Table “A” and a portion under Table “B”.

Exhibit 7-3: Table "A" Weight-Mile Tax Rates (Dollars Per Mile)					
Declared Gross Weight			Existing Rate	Recommended Rate	Difference
26,001	to	28,000	0.0364	0.0386	0.0022
28,001	to	30,000	0.0386	0.0409	0.0023
30,001	to	32,000	0.0403	0.0415	0.0012
32,001	to	34,000	0.0421	0.0419	-0.0002
34,001	to	36,000	0.0438	0.0436	-0.0002
36,001	to	38,000	0.0460	0.0455	-0.0005
38,001	to	40,000	0.0478	0.0473	-0.0005
40,001	to	42,000	0.0495	0.0485	-0.0010
42,001	to	44,000	0.0513	0.0503	-0.0010
44,001	to	46,000	0.0530	0.0519	-0.0011
46,001	to	48,000	0.0548	0.0537	-0.0011
48,001	to	50,000	0.0566	0.0549	-0.0017
50,001	to	52,000	0.0587	0.0569	-0.0018
52,001	to	54,000	0.0609	0.0591	-0.0018
54,001	to	56,000	0.0631	0.0606	-0.0025
56,001	to	58,000	0.0658	0.0632	-0.0026
58,001	to	60,000	0.0688	0.0660	-0.0028
60,001	to	62,000	0.0723	0.0687	-0.0036
62,001	to	64,000	0.0763	0.0725	-0.0038
64,001	to	66,000	0.0807	0.0767	-0.0040
66,001	to	68,000	0.0864	0.0812	-0.0052
68,001	to	70,000	0.0925	0.0870	-0.0055
70,001	to	72,000	0.0986	0.0917	-0.0069
72,001	to	74,000	0.1043	0.0970	-0.0073
74,001	to	76,000	0.1096	0.1008	-0.0088
76,001	to	78,000	0.1149	0.1057	-0.0092
78,001	to	80,000	0.1197	0.1092	-0.0105

liability by over two cents per mile. As shown in Exhibit 7-4, the existing Table "B" rates range from 9.47 cents per mile for a nine-axle vehicle declared at 82,000 pounds to 16.84 cents per mile for a five-axle vehicle declared at 98,000 pounds.

The equity ratio results presented in the previous chapter show most individual weight classes between 26,001 and 80,000 pounds are projected to overpay their responsibility over the next biennium. Only the 26,001-32,000 and 56,001-58,000 pound classes are projected to underpay. All individual 2,000-pound classes between 32,001 and 80,000 pounds, except for the 56,001-58,000 pound class, are projected to overpay under the existing Table "A" rates.

As shown in Exhibit 7-3, rate increases are recommended for the 26,001-32,000 pound classes, and rate reductions are recommended for the classes between 32,001 and 80,000 pounds. As noted in earlier chapters, the 78,001-80,000 pound class is by far the most important single class in terms of miles of travel and revenue contributions. It is recommended the rate for this class be reduced from the existing 11.97 cents per mile to 10.92 cents per mile. Implementation of the recommended rates will minimize the cross-subsidization of some weight classes by others under the existing rate structure.

The equity ratios presented in Chapter 6 also show all vehicle classes between 80,001 and 105,500 pounds, except for the 80,001-82,000 pound class, are projected to underpay their responsibility under the existing Table “B” rates. The recommended Table “B” rates presented in Exhibit 7-4 reduce the existing rates for the 80,001-82,000 pound class and increase the rates for all declared weight classes over 84,000 pounds.

#### **7.4 Optional Flat Fee Rates**

Under existing law, carriers hauling certain qualifying commodities - namely logs, sand and gravel, and wood chips – have the option of paying monthly flat fees in lieu of the weight-mile tax. There are separate flat fee rates applicable to each of the three different commodity groups. Each rate is set so that carriers paying it should, on average, pay the same amount as they would on a mileage basis.

The existing statutory flat fee rate for carriers transporting logs is \$5.55 per 100 pounds of declared combined weight. The comparable rates for carriers transporting wood chips and sand and gravel are \$22.40 and \$5.50, respectively. These are annual rates which are typically paid in monthly installments. The monthly flat fee applicable to a log truck declared at 80,000 pounds, for example, is \$370 (i.e.,  $\$5.55 \times 800 = \$4,440 / 12 \text{ months} = \$370$ ). This amount must be paid each month the vehicle remains on a flat fee basis, regardless of the number of miles traveled during the month.

The flat fee rates are required to be reviewed biennially and appropriate adjustments in these rates presented to each regular legislative session. This review is accomplished through the biennial flat fee studies, the latest of which was completed in September 2002. As reported in Chapter 3, that study found wood chip haulers reporting on a flat fee basis paid more than they would have on a mileage basis in 2001, while flat fee log and sand and gravel haulers paid less than they would have on a mileage basis.

**Exhibit 7-4: Table "B" Weight-Mile Tax Rates  
(Dollars Per Mile)**

Declared Gross Weight (lbs.)		Existing Rate	Recommended Rate	Difference	Declared Gross Weight (lbs.)		Existing Rate	Recommended Rate	Difference		
<b>5 Axles</b>					<b>8 Axles</b>						
80,001	to	82,000	0.1236	0.1112	-0.0124	80,001	to	82,000	0.1004	0.0904	-0.0100
82,001	to	84,000	0.1276	0.1276	0.0000	82,001	to	84,000	0.1017	0.1017	0.0000
84,001	to	86,000	0.1315	0.1394	0.0079	84,001	to	86,000	0.1030	0.1092	0.0062
86,001	to	88,000	0.1359	0.1563	0.0204	86,001	to	88,000	0.1048	0.1205	0.0157
88,001	to	90,000	0.1412	0.1624	0.0212	88,001	to	90,000	0.1065	0.1225	0.0160
90,001	to	92,000	0.1473	0.1694	0.0221	90,001	to	92,000	0.1083	0.1245	0.0162
92,001	to	94,000	0.1539	0.1770	0.0231	92,001	to	94,000	0.1100	0.1265	0.0165
94,001	to	96,000	0.1609	0.1850	0.0241	94,001	to	96,000	0.1118	0.1286	0.0168
96,001	to	98,000	0.1684	0.1937	0.0253	96,001	to	98,000	0.1136	0.1306	0.0170
<b>6 Axles</b>					<b>9 or More Axles</b>						
80,001	to	82,000	0.1131	0.1018	-0.0113	80,001	to	82,000	0.0947	0.0852	-0.0095
82,001	to	84,000	0.1149	0.1149	0.0000	82,001	to	84,000	0.0960	0.0960	0.0000
84,001	to	86,000	0.1175	0.1246	0.0071	84,001	to	86,000	0.0973	0.1031	0.0058
86,001	to	88,000	0.1201	0.1381	0.0180	86,001	to	88,000	0.0986	0.1134	0.0148
88,001	to	90,000	0.1232	0.1417	0.0185	88,001	to	90,000	0.1004	0.1155	0.0151
90,001	to	92,000	0.1267	0.1457	0.0190	90,001	to	92,000	0.1022	0.1175	0.0153
92,001	to	94,000	0.1302	0.1497	0.0195	92,001	to	94,000	0.1035	0.1190	0.0155
94,001	to	96,000	0.1342	0.1543	0.0201	94,001	to	96,000	0.1052	0.1210	0.0158
96,001	to	98,000	0.1390	0.1599	0.0209	96,001	to	98,000	0.1070	0.1231	0.0161
98,001	to	100,000	0.1442	0.1658	0.0216	98,001	to	100,000	0.1087	0.1250	0.0163
<b>7 Axles</b>					<b>10 or More Axles</b>						
80,001	to	82,000	0.1057	0.0951	-0.0106	100,001	to	102,000	0.1105	0.1271	0.0166
82,001	to	84,000	0.1074	0.1074	0.0000	102,001	to	104,000	0.1127	0.1296	0.0169
84,001	to	86,000	0.1092	0.1158	0.0066	104,001	to	105,500	0.1149	0.1321	0.0172
86,001	to	88,000	0.1109	0.1275	0.0166						
88,001	to	90,000	0.1127	0.1296	0.0169						
90,001	to	92,000	0.1144	0.1316	0.0172						
92,001	to	94,000	0.1162	0.1336	0.0174						
94,001	to	96,000	0.1184	0.1362	0.0178						
96,001	to	98,000	0.1210	0.1392	0.0182						
98,001	to	100,000	0.1236	0.1421	0.0185						
100,001	to	102,000	0.1263	0.1452	0.0189						
102,001	to	104,000	0.1289	0.1482	0.0193						
104,001	to	105,500	0.1324	0.1523	0.0199						

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Exhibit 7-5 shows the flat fee rates necessary to implement the flat fee study results in combination with the overall light and heavy vehicle HCAS results. These rates represent an increase in the statutory rate for sand and gravel trucks, and a reduction in the statutory rates for log and wood chip trucks.

<b>Exhibit 7-5: Optional Annual Flat Fee Rates (Dollars per 100 Pounds of Declared Combined Weight)</b>			
	<b>Existing Rate</b>	<b>Adjusted Rate</b>	<b>Change from Existing Rate</b>
Log	5.55	5.40	-0.15
Sand & Gravel	5.50	5.60	0.10
Wood Chip	22.40	16.65	-5.75

## **7.5 Road Use Assessment Fee**

Since 1990, carriers operating vehicles under single-trip, non-divisible load permits at gross weights above 98,000 pounds pay a road use assessment fee. The road use assessment fee takes the place of the weight-mile tax for the loaded front haul portion of non-divisible load hauls. With rare exceptions, the empty back haul portion of these trips is subject to the weight-mile tax and taxed at the vehicle's regular declared weight.

The existing statutory road use assessment fee rate is 5.2 cents per ESAL mile of travel. The fees carriers actually pay are contained in a table of per-mile rates expressed in terms of permit gross weight and number of axles. The fees in this table are calculated on the basis of the 5.2 cents per ESAL-mile statutory rate. The table is similar to Table "B" for 80,001-105,500 pound divisible load vehicles, except substantially larger. Because of its size, it is not reproduced in this report. As with the Table "B" rates, carriers are charged a lower per-mile fee for the use of additional axles at any given gross weight. This reflects the fact that spreading any given total load over additional axles reduces the amount of pavement wear imposed by that load.

The equity ratio results presented in Chapter 6 suggest the weight classes above 105,500 pounds are significantly underpaying their responsibility. This result, however, is somewhat deceiving since no registration fee revenues are attributed to these vehicles. The registration fees for these vehicles are included in the weight class they ordinarily declare in when not transporting a non-divisible load. Current data limitations do not allow the attribution of registration fee revenues to weight classes above 105,500 pounds. If this were possible, then at least part of the apparent underpayment by these vehicles would disappear.

Given the situation described above, this study makes the same recommendation for an adjustment in the road use assessment fee rate as that made by the 2001 Study. Specifically, it is recommended this fee be increased from the existing rate of 5.2 cents per ESAL-mile to 10.0 cents per ESAL-mile.

## 8 Recommendations for Future Studies

The Oregon HCASs are an ongoing process, and now mandated to be conducted once every two years. Although Oregon has the longest history and most sophisticated approach of any state in conducting these studies, further improvements and enhancements are possible. Each study includes a careful critique and evaluation of the approaches and methods used in previous studies, as well as recommendations for improving future studies.

As part of the process for the present study, DAS retained an independent consultant to perform a thorough review and evaluation of the data, approaches, and methods used in conducting the study. The basic conclusion of this review was:

*“ . . . the procedures used are acceptable and the data used for the model appear to be valid and to reasonably represent the expected inputs into the model. However, there is room for improvement and there are a number of issues that should be addressed in the next Highway Cost Allocation Study.”<sup>1</sup>*

The consultant’s report is reproduced in the Volume II: Technical Results Report. Some of the recommendations made by the consultant are also made below.

Conducting the 2003 Study presented a unique challenge in terms of the number of changes and new issues addressed. No previous Oregon study has ever had to confront the number and range of issues faced in the present study. The issue of whether to continue the practice of including only state-funded expenditures or broaden the study focus to include expenditures funded from federal and local revenues was a particularly vexing one debated extensively by the SRT. The discussion and resolution of these many new issues necessarily increased the time and staff resources required to complete the study.

Some issues were satisfactorily resolved. Others, however, while temporarily resolved to allow completion of the study, require a better and more complete resolution before the next study is completed. The recommendations that follow focus primarily on these issues.

### 8.1 Continue Refinement of Local Government Data

The local government expenditures included in previous Oregon studies have been restricted to those financed from the State Highway Fund revenues apportioned to Oregon counties and cities. For the 2003 Study, it was decided the cost responsibility results should be based on the inclusion of all expenditures, including those funded from state, federal, and local revenues. For local expenditures, this includes those funded from federal and locally-generated revenues as well as state revenues.

The decision to include all local government road and street expenditures was made after extensive discussion by the SRT, but was also made relatively late in the study

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<sup>1</sup> “Review of Preliminary 2003 Oregon Highway Cost Allocation Study,” Dr. Anthony M. Rufolo, Professor of Economics, Urban Studies Program, Portland State University, February 13, 2003.

process. This meant staff had to quickly develop the required data and ensure it accurately reflected the level and mix of projected local expenditures by major expenditure category, individual worktype, and funding source. The process by which this was accomplished is described in Chapter 3, and in more detail in the Technical Results Report.

It is believed the process followed produced an accurate representation of projected local government expenditures for the 2003-05 biennium, and was the best that could be done for the present study. This, however, is an area where further refinement and better integration of the information from different sources is possible. It is recommended study staff continue to work with ODOT Financial Services staff and local government officials to accomplish these further refinements for the next HCAS.

Additionally, as pointed out in the independent consultant's report, there continues to be some uncertainty as to the appropriateness and/or constitutionality of including local expenditures beyond those funded with state revenues. It is therefore recommended this issue be revisited in the period before the next study and discussed further by the SRT early in the 2005 Study process.

## **8.2 Develop Improved Data on Reasons for Bridge Replacements**

In conducting the present study, one of several difficult issues faced was whether expenditures for bridge replacements should be treated differently than those for totally new bridges and, if so, how. This is an important and complex issue in any HCAS. However, this issue has assumed, and will continue to assume, an even greater importance in the Oregon studies because the state has embarked on an aggressive program to replace a significant number of its aging and damaged bridges.

A review of recent studies conducted by the federal government and other states determined most have treated the costs of replaced bridges differently than the costs of totally new bridges. The approaches used in these studies generally have resulted in trucks and other heavy vehicles being assigned a greater proportion of the responsibility for replaced bridges than for totally new bridges. However, the approaches and results of these studies vary and there does not appear to be consensus on a single best approach.

Researchers at Oregon State University (OSU) are presently involved in a project that, among other things, will investigate the reasons for bridge replacements. Since this project just recently got underway, the results of this research were not available for the present HCAS.

It is recommended staff and the consultants for the next HCAS carefully monitor the results of the OSU research as they become available for possible incorporation in the 2005 and subsequent studies. It is also recommended a more thorough and comprehensive review of the available literature and approaches used in other studies be undertaken in the period between the 2003 and 2005 studies. The information from this review should be carefully summarized in an issue paper for presentation to the 2005 SRT. This issue should be thoroughly discussed and resolved early in the process for the next study.

### **8.3 Continue to Develop Data Required to Implement Full Cost-Based Approach in Future Oregon Studies**

Highway cost allocation studies ideally should allocate the full costs associated with providing, maintaining and using the highway system. In addition to the full direct costs, these include the indirect or social costs associated with use of the system. These indirect costs include the costs of noise, air and water pollution, the time and economic efficiency loss due to traffic congestion, and personal and property losses due to traffic accidents.

Many transportation professionals argue exclusion of these costs results in underestimating the full costs of highways, thereby encouraging an over-utilization of existing facilities. These individuals further contend the inclusion of social costs could help determine appropriate user charges necessary to capture these costs. Implementing congestion charges could provide an explicit financial incentive for drivers to forego using congested roads during peak periods, or use alternative modes of transportation or less congested routes.

As explained previously, the Oregon studies to this point have chosen to exclude indirect or social costs, primarily because of the difficulty of estimating these costs. It is recommended, however, that future Oregon studies consider including at least some of these costs. It is further recommended work continue to more accurately quantify these costs for inclusion in future studies.

### **8.4 Continue Work to Develop Improved Estimates of Studded Tire Damage Repair Expenditures**

As discussed in Chapter 3, the projection of total studded tire damage repair expenditures used in the present study is \$9.2 million per year. This is lower than the approximately \$11 million annual projection used in the previous three Oregon studies, but appears reasonable given the increased use in Oregon of the newer, light-weight (aluminum) and less damaging studs.

The projection of spending to repair studded tire damage was accepted by the SRT as the best estimate that could be made at this time. Nevertheless, this is an area where further research and analysis is needed to improve the estimates for future studies. Estimating these expenditures is a difficult process. At the state level, there are some projects devoted entirely to repairing the rutting and other surface wear caused by studded tires. ODOT has very accurate data on the cost of these projects.

More commonly, however, studded tire damage is repaired as part of a larger project involving several other work elements. In these cases, it is often difficult to ascertain the exact portion of the total project cost due to studded tires versus other factors. This is particularly the case at the local level, where studded tire damage repair is almost always undertaken as part of a larger pavement rehabilitation or maintenance project involving multiple types of work. Additionally, the cost accounting of some local government agencies is less detailed, and most make no attempt to identify studded tire damage repairs as a separate and distinct work activity.

In short, further effort is warranted to improve the projections of studded tire damage repair expenditures used in future studies. It is recommended the work begun in the present study in this area be continued. It is further recommended this work focus primarily on the local government data where the need for improvement is the greatest. In this regard, it is specifically recommended the local government expenditure survey used in future studies be amended to include an explicit line item for studded tire damage repair expenditures. This one change alone would result in an improvement in the quality of the data used in future studies.

## 8.5 Continue Work on Refinements and Improvements to HCAS Model

The present study used the computer model developed by the consultants for the 2001 Oregon Study. This allowed for a significant reduction in the cost of conducting the 2003 Study. Several modifications were necessary to accommodate changes in the approach and methods used in the current study as compared to the previous study. These included rewriting portions of the code to allow for the inclusion of all local expenditures in the model and to incorporate the results of the new Bridge Cost Responsibility Study. These modifications are documented in the Volume II: Technical Results Report.

Based on a thorough review of the model inputs, outputs, and structure, study staff believe the model works as intended, and is one of the most complete and sophisticated models developed for any HCAS. Further refinements and enhancements to the model, however, are possible and should be undertaken. Specifically, additional refinements are needed to make the model more transparent and easily usable. Further enhancements could also make the model even more useful for performing sensitivity and other policy analyses. It is therefore recommended the work already underway to make additional improvements to the model be continued. The consultant who developed the model should work closely with study and legislative staff to accomplish as many of these enhancements as time and budget allow before the next study is conducted.